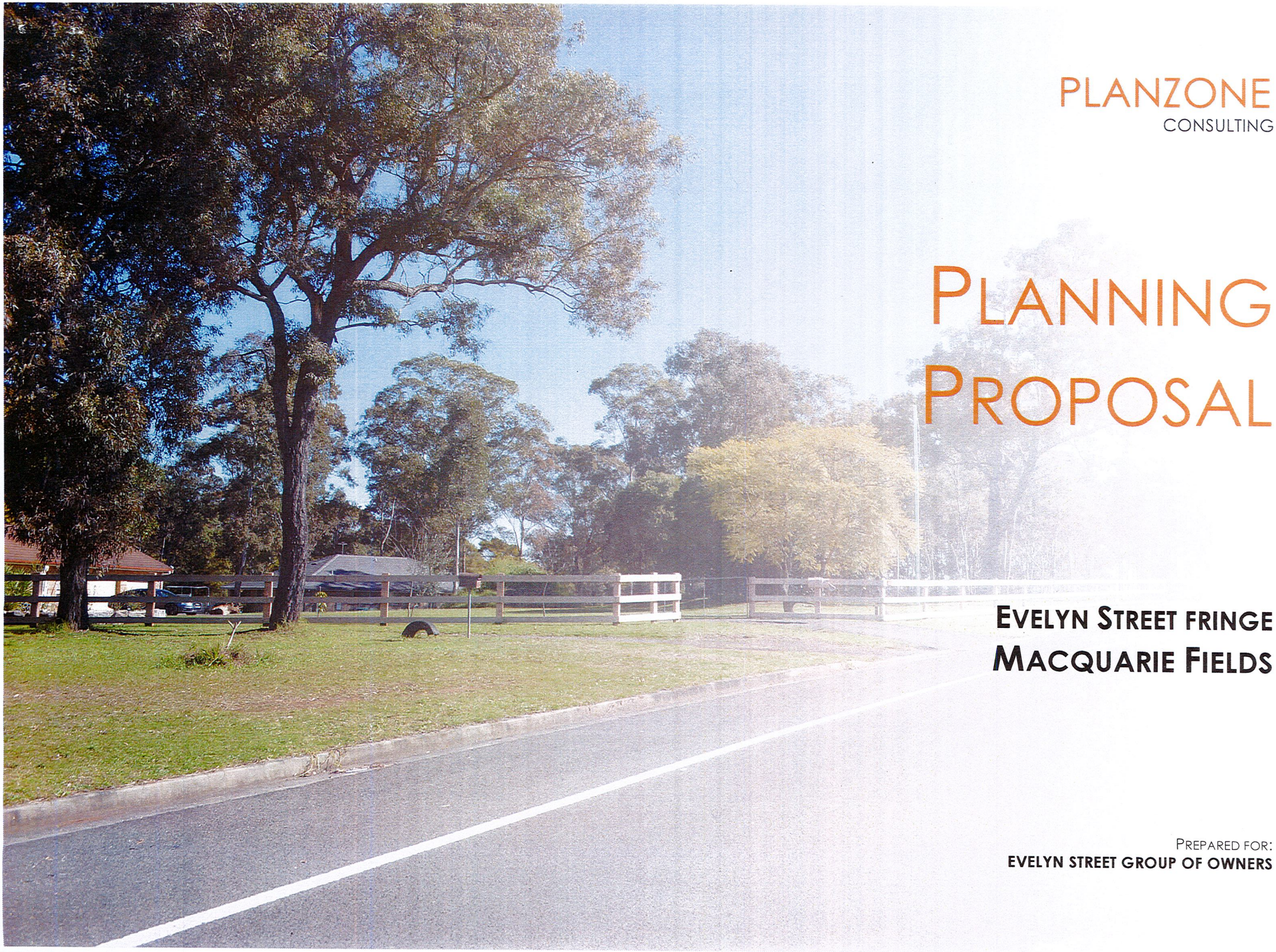


PLANZONE
CONSULTING

PLANNING PROPOSAL

EVELYN STREET FRINGE
MACQUARIE FIELDS

PREPARED FOR:
EVELYN STREET GROUP OF OWNERS

PLANZONE
CONSULTING

ABN: 30 605 941 482
Phone: (02) 9011 7620
Email: enquiry@planzone.com.au
Web: planzone.com.au
Office: Suite 102, Level 1, 20 Railway Street
Liverpool NSW 2170
Post: PO Box 3, Liverpool NSW 1871

QA Record:

Doc ID: PPR.20150604
Version: Final for Issue
Prepared By: RR
Approved By: NP
Issue Date: 22 August 2016

Disclaimer:

While every reasonable effort has been made to ensure that this document is correct at the time of publication, Planzone Pty Ltd, its subsidiaries, its agents and employees, disclaim any and all liability to any person in respect of anything or the consequences of anything done or omitted to be done in reliance upon the whole or any part of this document.

© Copyright

This document and any attachments referenced herein remain the property of Planzone Pty Ltd. Copying, editing, reproducing, disseminating or redistributing this document is not permitted without the prior consent of Planzone Pty Ltd.

Table of Contents

Page

1. Introduction 1
1.1. Brief 1
1.2. Background 1
2. The Subject Land 3
2.1. The Site & Surrounds 3
2.2. Site Context & Surrounds 6
2.2.1. The Subject Site & Surrounds 6
2.2.2. The Locality 7
2.3. Site Analysis 11
2.3.1. Topography & Visual Context 11
2.3.2. Land Capability 11
2.3.3. Flora & Fauna 11
2.3.4. Heritage 11
2.3.5. Bushfire 12
2.3.6. Drainage & Stormwater 12
2.3.7. Reticulated Water & Sewerage 12
2.3.8. Electricity 12
2.3.9. Gas 12
2.3.10. Telecommunications 12
3. Existing Provisions & Proposed Amendments 13
3.1. Existing Planning Controls 13
3.2. Proposed Planning Provisions 13
4. Justification 14
4.1. Need for the Planning Proposal 14
4.2. Relationship to Strategic Planning Framework 14
4.3. Environmental, Social & Economic Impact 17
4.4. State & Commonwealth Interests 18
5. Conclusion 18

Tables

Table 1: Lot Descriptions 4

Figures

Page

Figure 1: Edgelands Locality Map 2
Figure 2: Location Map - Evelyn Street and Oakley Road 3
Figure 3: Street view of No. 22 Oakley Road, Macquarie Fields 4
Figure 4: Street view of No. 109 Evelyn Street, Macquarie Fields 4
Figure 5: Street view of No. 18 Oakley Road, Macquarie Fields 4
Figure 6: Street view of No. 16 Oakley Road, Macquarie Fields 4
Figure 7: Street view of No. 89 Evelyn Street, Macquarie Fields 4
Figure 8: Street view of No. 87 Evelyn Street, Macquarie Fields 4
Figure 9: Street view of No. 85 Evelyn Street, Macquarie Fields 4
Figure 10: The Subject Land 5
Figure 11: View looking west along Evelyn Street from Lot 181 DP 834233 6
Figure 12: View looking west along Evelyn Street 6
Figure 13: View looking east along Oakley Road 6
Figure 14: Suburbs Map 7
Figure 15: Land Use Map 8
Figure 16: AHIMS Search Extract 11
Figure 17: AHIMS Search Extract 12
Figure 18: Zoning Map Extract 13
Figure 19: Minimum Lot Size Map Extract 13
Figure 20: South West Subregion 14
Figure 21: South West Subregion 16

Appendices

Appendix 1 SMEC Report
Appendix 2 Evelyn Street Streetscape Photomontage
Appendix 3 AHIMS Database Search Results
Appendix 4 Dial Before You Dig Search Results
Appendix 5 Proposed Campbelltown Local Environmental Plan 2015 Amendments
Appendix 6 Indicative Subdivision Layout
Appendix 7 A Plan for Growing Sydney Assessment Table
Appendix 8 GMREP No. 2 Assessment Table
Appendix 9 Section 117 Directions Assessment Table

1. INTRODUCTION

1.1. Brief

This Planning Proposal (PP) has been prepared for and on behalf of a consortium of landowners of land fronting Evelyn Street, Macquarie Fields (herein referred to as 'the Evelyn Street Landowner's Group').

The purpose of this submission is to support a request to Campbelltown City Council (the Council) to prepare a Planning Proposal which will facilitate the future subdivision and development of the subject land for low density residential purposes.

The Planning Proposal is the first step in the making of an amendment to the Campbelltown Local Environmental Plan 2015 (CLEP 2015) in accordance with the New South Wales (NSW) Planning & Environment's (P&E) 'Gateway' plan-making process. This submission has been prepared having regard to the matters for consideration identified by the NSW Planning & Infrastructure's guideline *A Guide to Preparing Planning Proposals* (October 2012).

1.2. Background

The land the subject of this PP has been the subject of numerous past discussions with Council, dating back several years.

With the exhibition of the draft Campbelltown Local Environmental Plan 2014, a submission was made on behalf of the Evelyn Street Landowner's Group seeking a variation to the proposed E4 Environmental Living zone and planning controls to permit the rezoning for residential purposes (R2 Low Density Residential) of the strip of land with direct frontage to Evelyn Street; consistent with the existing residential development adjoining and to the north. A copy of the SMEC Submission (SMEC Australia, dated: August 2014) accompanies this submission at Appendix 1.

The decision was made by Council to proceed with the intended E4 Environmental Living zone in the standard instrument, with consideration to be given to the potential for a Planning Proposal upon gazettal of the local environmental plan.

On 11 December 2015 the Campbelltown Local Environmental Plan 2015 (CLEP 2015) was gazetted with a three (3) month deferred commencement period to enable Council to finalise amendments to the Campbelltown (Sustainable City) Development Control Plan 2015 (CDCP 2015).

The CLEP 2015 commenced on 11 March 2016.

Prior to the commencement of the CLEP 2015, Planzone Pty Ltd, on behalf of the Evelyn Street Landowner's Group, were in discussions with Council staff to progress a PP for the rezoning of the Evelyn Street land.

As part of the strategic planning for the Campbelltown Local Government Area (LGA), Council have identified several localities for further investigation. The Evelyn Street land is located within the East Edge Scenic Protection Lands (Edgelands) Locality. The Edgelands Locality is made up of five (5) EECs, as follows:

- EEC 1: Macquarie Fields;
- EEC 2: Ingleburn;
- EEC 3: Minto North;
- EEC 4: Leumeah; and
- EEC 5: Ruse.

EEC 1 comprises the Evelyn Street land, as identified in Figure 1 below.

A formal Planning Proposal Request for EEC 1 was accepted by Council staff during a meeting held with Planzone Pty Ltd on 28 August 2015.

Since this confirmation was provided, Planzone Pty Ltd have been working with Council staff, Cumberland Ecology (ecological consultant), Harris Environmental (bushfire consultant) and the Evelyn Street Landowner's Group to prepare and fund a PP for the rezoning of the land.

At Council's Meeting on 21 June 2016, it was acknowledged that a group of property owners (Evelyn Street Landowner's Group) had commenced formative work in respect of a low density residential subdivision PP for the EEC 1 locality.

The policy position adopted at this meeting was as follows:

- *Any future developments reflect a transition from the existing residential density (generally 500sqm) to large lot sewered 4,000sqm allotments.*
- *Retention/management of remnant woodland and reinstatement of an informal rural /woodland verge character to Oakley Road where practical.*
- *Council should not initiate/resource any planning amendments in the subject locality.*

This PP has been prepared having regard to the outcomes of the discussions with Council and the recommendations of the Council Meeting, to ensure that a co-ordinated and holistic approach is taken.

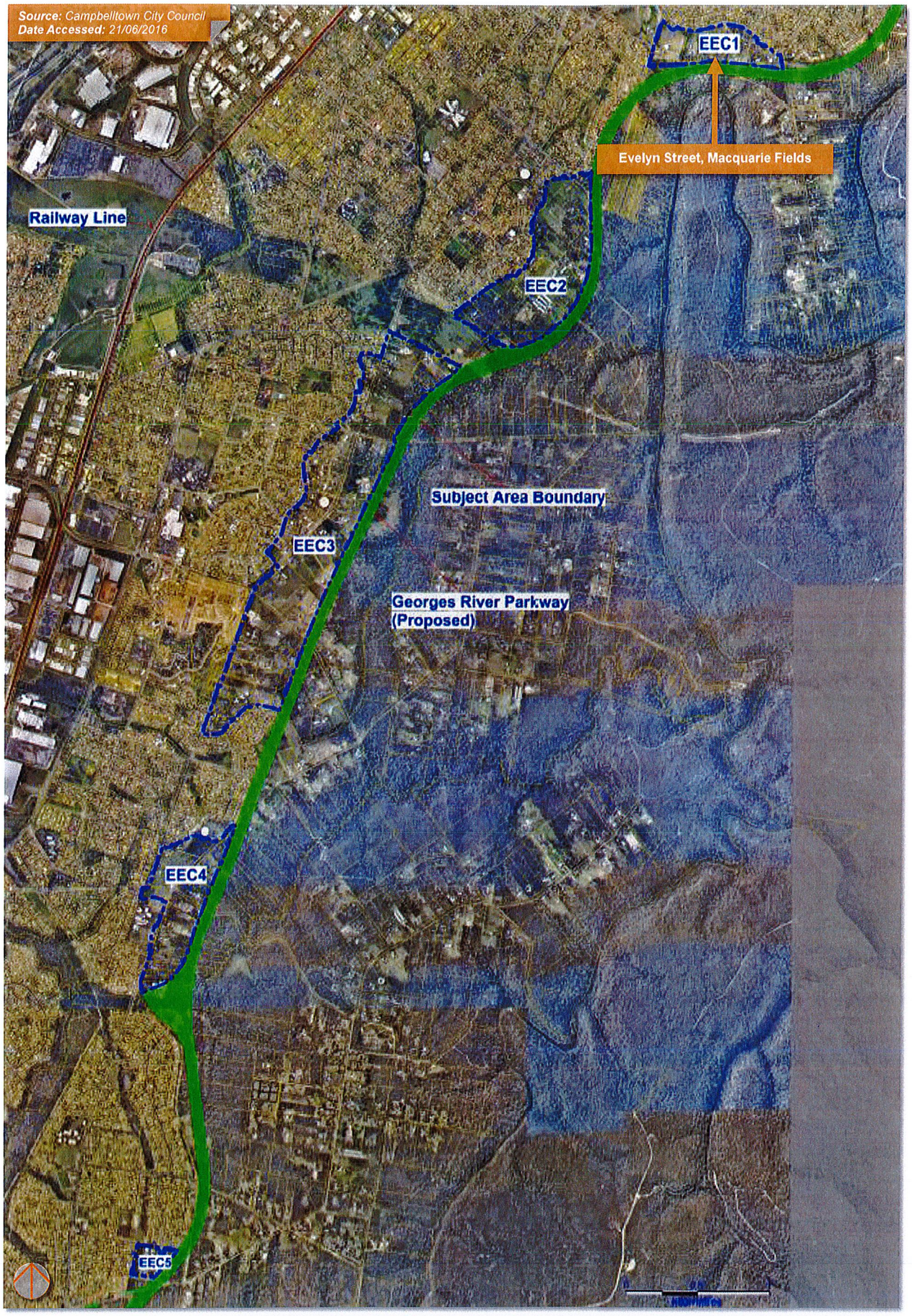


Figure 1: Edgelands Locality Map

2. The Subject Land

2.1. The Site & Surrounds

The land the subject of this PP as shown in Figure 2 comprises the following properties:

- Part Lot 1 DP 533662 known as 22 Oakley Road, Macquarie Fields;
- Part Lot 100 DP 261125 known as 109 Evelyn Street, Macquarie Fields;
- Part Lots 8 & 9 DP 826459 known as 18 Oakley Road & 16 Oakley Road, Macquarie Fields;
- Lot 181 DP 834233 known as 89 Evelyn Street, Macquarie Fields;
- Lot 305 DP 263295 known as 87 Evelyn Street, Macquarie Fields; and
- Lot 40 DP 623486 known as 85 Evelyn Street, Macquarie Fields.

As identified in Figure 2 all lots maintain a frontage to Evelyn Street, with the exception of Lot 1 DP 533662, 22 Oakley Road, which maintains a frontage to Oakley Road. Lots 100 DP 261125 and Lots 8 & 9 DP 826459 have dual frontages to Oakley Road and Evelyn Street.

Figure 2: Location Map - Evelyn Street and Oakley Road

Table 1 provides a description of each lot, which is identified in Figure 2.

Property Address Lot & DP	Description
22 Oakley Road, Macquarie Fields Lot 1 DP 533662	Slightly irregular shaped allotment comprising a total area of 2.02ha. The majority of the land is cleared with the exception of vegetation along the site's eastern boundary and its Oakley Road frontage. Current improvements comprise a single storey residential dwelling & associated outbuildings.
109 Evelyn Street, Macquarie Fields Lot 100 DP 261125	Irregular shaped allotment comprising a total area of 7,742sqm. The land is primarily cleared, with the exception of scattered trees within the northern portion of the lot & vegetation along the handle off Oakley Road.
18 Oakley Road, Macquarie Fields Lot 8 DP 826459	Slightly irregular shaped allotment comprising a total area of 1.65ha. The land is primarily cleared, with the exception of scattered vegetation along the lot's Oakley Road frontage. Current improvements comprise a dwelling, swimming pool and associated outbuildings.
16 Oakley Road, Macquarie Fields Lot 9 DP 826459	Slightly irregular shaped allotment comprising a total area of 2.03ha. The land is primarily cleared, with the exception of scattered vegetation towards the site's Oakley Road frontage. Current improvements include a dwelling (which gains access from Oakley Road) and associated outbuildings.
89 Evelyn Street, Macquarie Fields Lot 181 DP 834233	Sightly irregular shaped allotment comprising a total area of 3,029.9sqm. The land is vacant of improvements, with the exception of several clusters of vegetation.
87 Evelyn Street, Macquarie Fields Lot 305 DP 263295	Slightly irregular shaped allotment comprising a total area of 9,500.2sqm. The land is primarily cleared with the exception of scattered trees towards the central and rear portions of the lot. Current improvements include a single storey dwelling, swimming pool & associated outbuildings.
85 Evelyn Street, Macquarie Fields Lot 40 DP 623486	Slightly irregular shaped allotment comprising a total area of 4,834.2sqm. The land is primarily cleared with the exception of scattered trees across the site. Current improvements comprise an existing single storey dwelling & associated outbuildings.

Table 1: Lot Descriptions

The land specifically the subject of this PP ('the subject land') is defined as that land with a direct frontage to Evelyn Street, as delineated in the below Figure 10.

Figure 3: Street view of No. 22 Oakley Road, Macquarie Fields

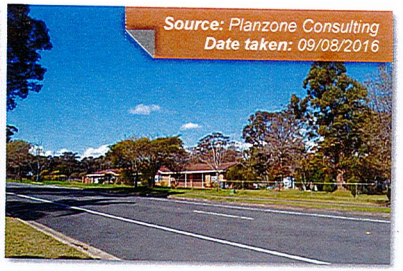


Figure 4: Street view of No. 109 Evelyn Street, Macquarie Fields

Figure 5: Street view of No. 18 Oakley Road, Macquarie Fields

Figure 6: Street view of No. 16 Oakley Road, Macquarie Fields

Figure 7: Street view of No. 89 Evelyn Street, Macquarie Fields

Figure 8: Street view of No. 87 Evelyn Street, Macquarie Fields

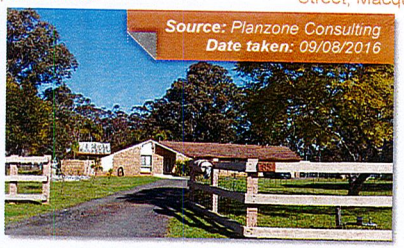


Figure 9: Street view of No. 85 Evelyn Street, Macquarie Fields

Figure 10: The Subject Land

2.2. Site Context & Surrounds

2.2.1. The Subject Site & Surrounds

The land the subject of the proposed rezoning maintains a frontage to Evelyn Street. Evelyn Street comprises a predominantly urban character, with the exception of the subject land, which provides a distinct disconnect from the existing low density residential development to the north, east and west. Refer to Figure 11 and Figure 12.

The land immediately opposite the subject land is characterised by a mix of predominantly low density residential dwellings, with interspersed duplex developments. Refer to photomontage at Appendix 2. Based on the existing pattern of dwelling types along the Evelyn Street frontage and the dwelling setbacks, it is clear that the land maintains a predominantly urban character.

In contrast, the Oakley Road frontage maintains a predominantly rural residential character, evidenced by the larger lots, denser vegetation and absence of formal infrastructure, i.e. kerb and gutter along the Oakley Road frontage. Refer to Figure 13. Furthermore, the dwelling setbacks to Oakley Road are consistent with a rural residential character.

Access to the subject land is gained via the existing Evelyn Street frontage. Evelyn Street is defined as a collector street which services the south-eastern portion of Macquarie Fields. Evelyn Street currently connects Harold Street to Eucalyptus Drive, with a major bus route servicing Macquarie Fields to the Campbelltown CBD.

Evelyn Street currently provides an on-street cycleway and pedestrian footpath along the northern road verge.

The subject land is considered to have high accessibility and connectivity to key activity nodes (including retail, commercial and community facilities) in terms of vehicular, cycling and pedestrian access.

The following section provides a discussion of key activity nodes in proximity to the subject land.

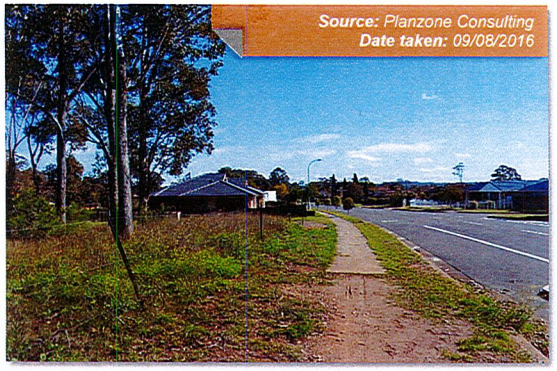


Figure 11: View looking west along Evelyn Street from Lot 181 DP 834233

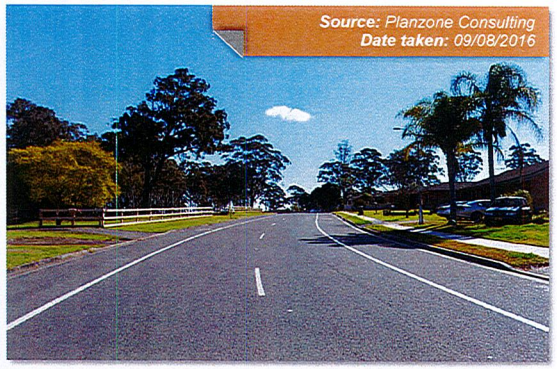


Figure 12: View looking west along Evelyn Street

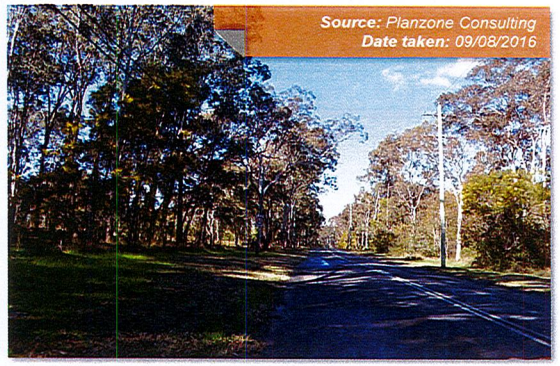


Figure 13: View looking east along Oakley Road

2.2.2. The Locality

The subject land is located in the suburb of Macquarie Fields. The suburb of Macquarie Fields is bounded by Bunbury Curran Creek in the north, the Georges River in the east and south-east, the suburbs of Long Point and Ingleburn to the south and west and railway line and suburb of Macquarie Links to the north-west.

The latest population data for Macquarie Fields (dated 2011) identifies 13,369 residents, with a population density of 14.75 persons per hectare (Source: profile.id.com.au).

Development in the vicinity of the subject land comprises Bensley Reserve directly to the west, existing residential development opposite to the north and adjoining to the east along Evelyn Street and existing large lot residential land to the south (along the site's Oakley Road frontage). Also situated in the vicinity of the subject land is the Macquarie Fields High School to the north and Hazlett Park to the east. Refer to Figure 14.

The subject land is well serviced by a range of retail, educational, recreational and community facilities within close proximity, these have been mapped in Figure 15.

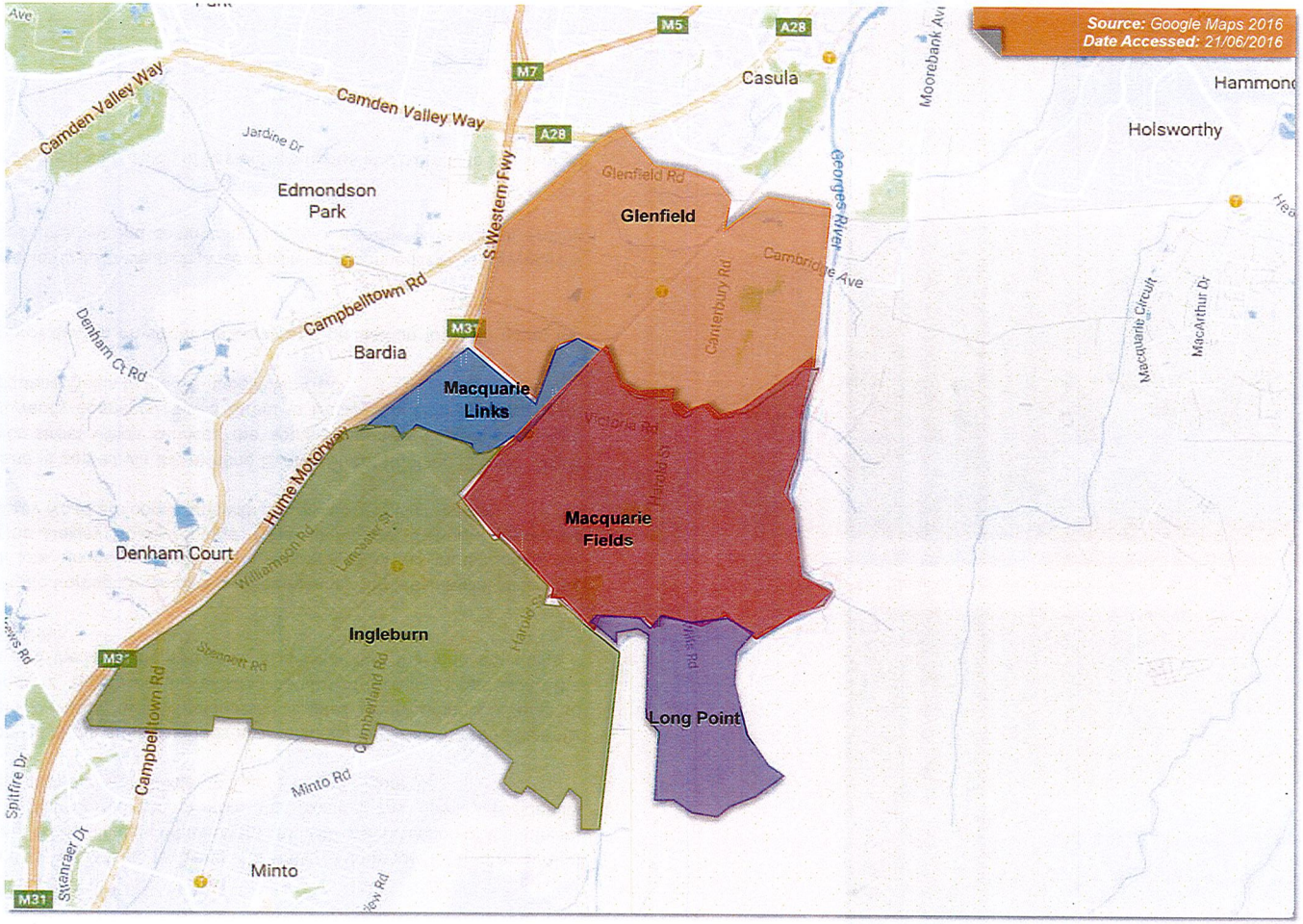


Figure 14: Suburbs Map

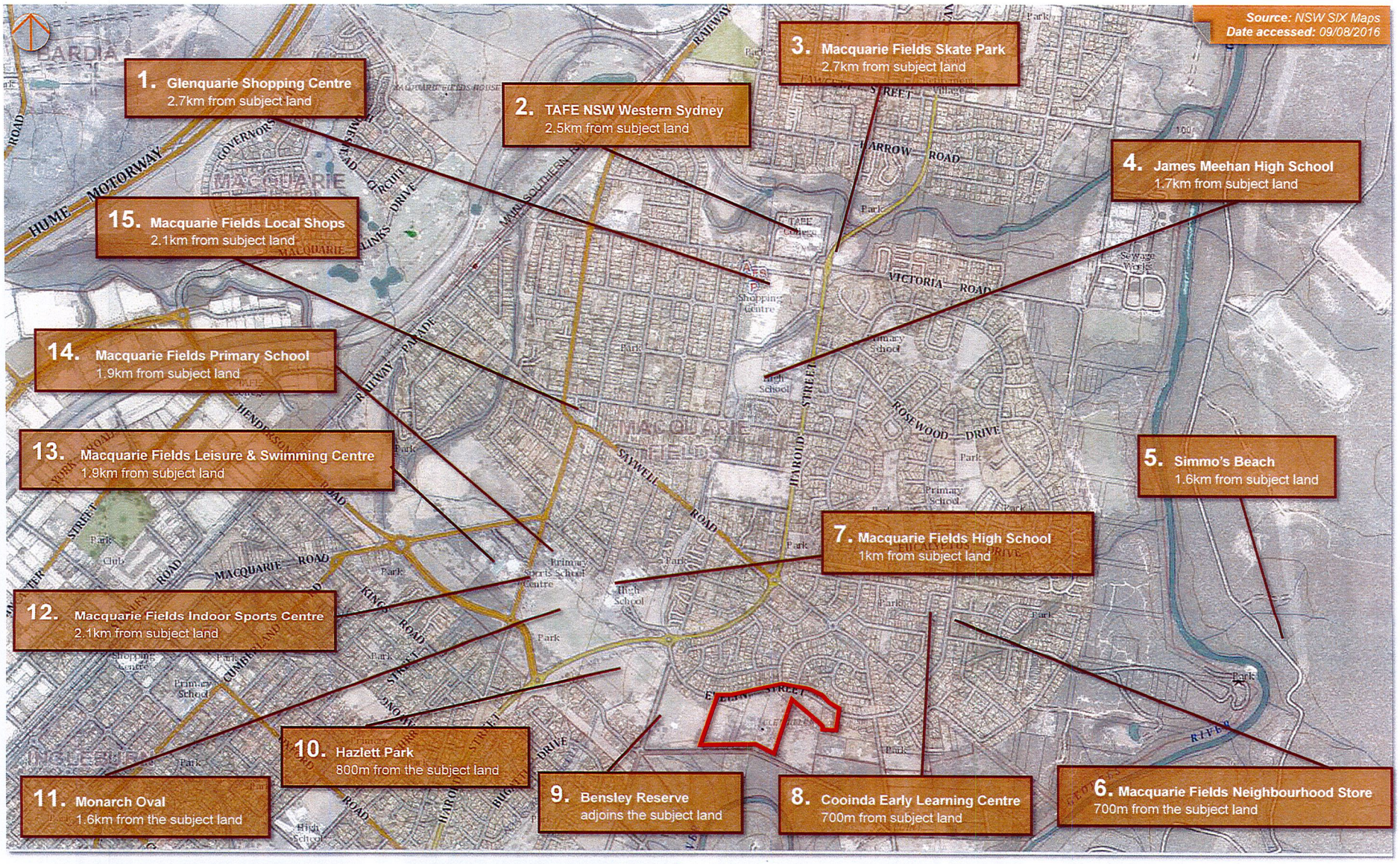


Figure 15: Land Use Map

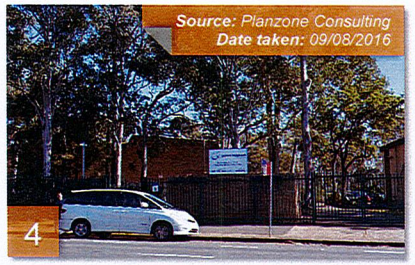
Glenquarie Shopping Centre

Glenquarie Pub

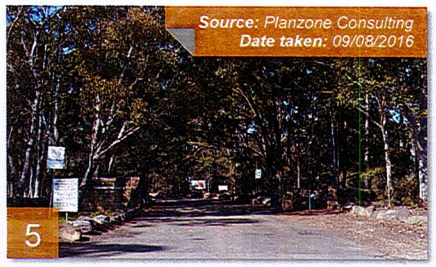
TAFE NSW Western Sydney

Macquarie Fields Skate Park

Macquarie Fields Skate Park



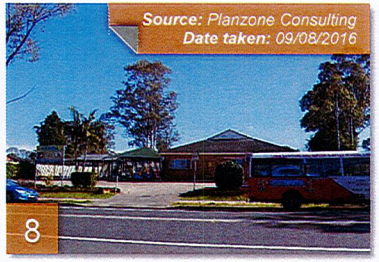
James Meehan High School



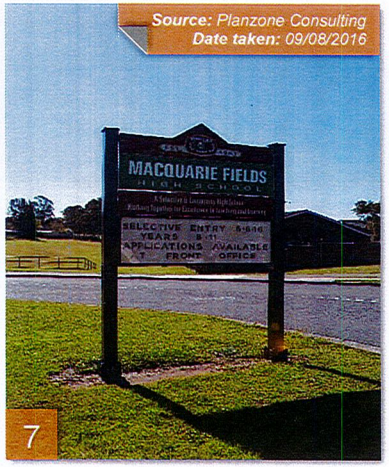
Simmo's Beach

Macquarie Fields Neighbourhood Store

Bensley Reserve

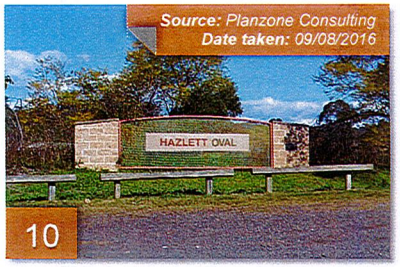


Coolinda Early Learning Centre

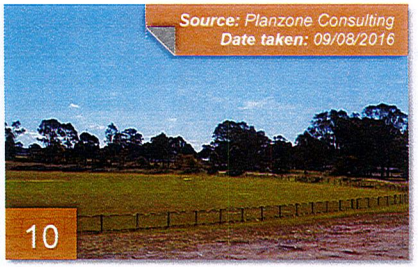


Macquarie Fields High School

Bensley Reserve

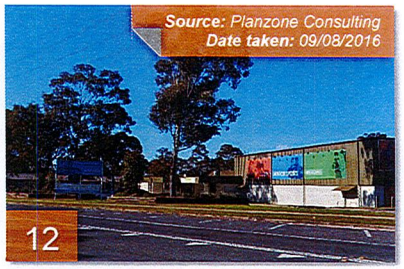


Hazlett Park

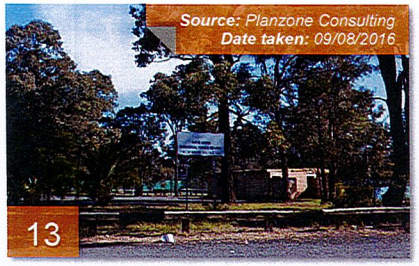


Hazlett Park

Monarch Oval

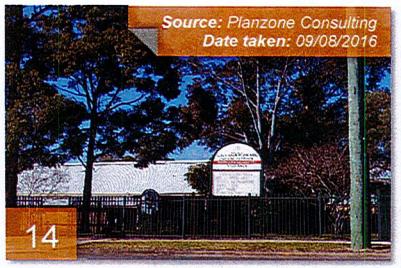


Macquarie Fields Indoor Sports Centre

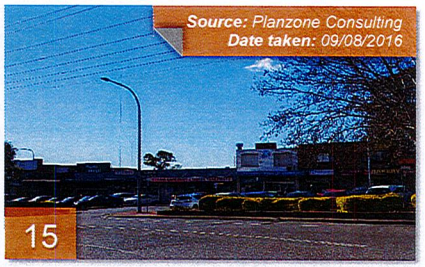


Macquarie Fields Leisure & Swimming Centre

Macquarie Fields Leisure & Swimming Centre



Macquarie Fields Public School



Macquarie Fields Local Shops

2.3. Site Analysis

2.3.1. Topography & Visual Context

The subject land is located on the urban fringe of Macquarie Fields and maintains a direct frontage to Evelyn Street. The existing topography of the subject land comprises a slight rise to Evelyn Street. The relatively flat existing topography of the subject land is conducive to the future development of the land for residential purposes.

2.3.2. Land Capability

Historically the subject land has been utilised for rural residential purposes. This land use is considered to present a low risk for contamination. A Preliminary Site Investigation (Phase 1) can be prepared upon detailed planning for the site to investigate the capability of the land for low density residential development.

2.3.3. Flora & Fauna

A Flora and Fauna Assessment has been prepared by Cumberland Ecology (Report No. 16066RP1, dated: July 2016) to evaluate the ecological impacts of the proposed rezoning, specifically impacts on threatened flora, fauna or ecological communities listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act) and/or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) known to occur on or within the locality of the subject land.

This Flora and Fauna Assessment provides the following conclusions:

"Despite the impacts of previous disturbance and location within a fragmented landscape, the proposed development will require the clearing of native vegetation that forms suitable habitat for some threatened fauna species. Past and current use of the subject site has entailed clearing and modification of the majority of pre-existing native vegetation.

Approximately 1.83 ha of vegetation will be cleared for the proposed development, consisting of up to 0.75 ha of Cumberland Plain Woodland (0.54 ha of moderate condition, 0.12 ha of low condition and 0.09 ha of canopy), 0.86 ha of Exotic Grassland, 0.07 ha of Acacia regrowth and 0.15 ha of Urban Native/Exotic Cover.

Within the subject site the Cumberland Plain Woodland community is in relatively low to moderate condition. The community largely lacks native species within the ground and midstorey layers, although there are a higher number of natives species present within moderate condition areas. Within the overall subject site the ground layer is dominated by exotic species, including noxious weeds particularly within the low condition and canopy areas, although these also occur within moderate condition areas.

The long-term viability of Cumberland Plain Woodland within the subject site has previously been reduced as the community has previously been fragmented by various developments and past land uses (including grazing and mowing) with the local extent existing as patches of varying conditions and sizes.

The SEPP 44 assessment of the subject site identified that the vegetation present on the site is consistent with the definition of Potential Koala Habitat. Survey for scats and scratches or review of historic records of Koala on the site failed to indicate the presence of breeding females on the site or any indication that resident individuals are present. The site does not meet the definition of core Koala habitat under SEPP44. Therefore, no site specific Koala Management Plan is required. The total impacts (direct and indirect) are not expected to significantly impact the Koala.

Some threatened species have been recorded from the locality, and some have the potential to occur within the subject site. Threatened fauna species have the potential to occur within the subject site based on the presence of suitable habitat and records in the locality.

The mitigation measures recommended to be implemented included:

- *Vegetation protection;*
- *Erosion, sedimentation and pollution control;*
- *Pre-clearing and clearing surveys; and*
- *Weed control measures.*

No significant impact is predicted to occur to threatened species, populations or communities as a result of the proposed development. Therefore, the preparation of a Species Impact Statement (SIS) is not warranted. A referral to the Commonwealth Department of the Environment, under the EPBC Act is also not required."

2.3.4. Heritage

A review of Schedule 5 (Environmental Heritage) of the CLEP 2015 has established that the subject land does not contain nor is it in the vicinity of any European items of heritage significance. The subject land is not in a Heritage Conservation Area.

A search of the AHIMS Database identified one (1) Aboriginal Site at the intersection of Oakley Road and Wills Road. The subject land is sufficiently removed from this Aboriginal Site and the proposed rezoning does not have the potential to impact this Site. The full search of the AHIMS database is attached at Appendix 3.

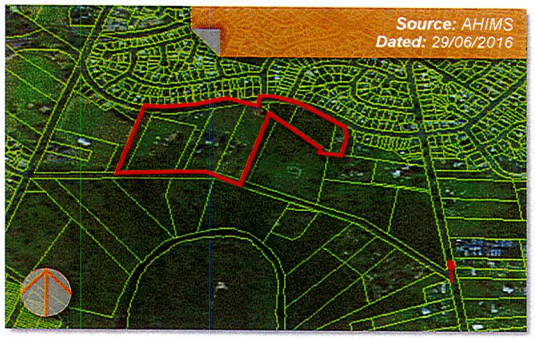


Figure 16: AHIMS Search Extract

2.3.5. Bushfire

Part of the subject land is identified as being Bushfire Prone on the Campbelltown City Council Bushfire Prone Land Map. The subject land located on Lot 100 DP 261125 and Lot 1 DP 533662 is identified as being Bush Fire Prone Land - Vegetation Buffer (100m & 30m), refer to Figure 17 below.

Figure 17: AHIMS Search Extract

A Bushfire Hazard Assessment (BHA) (Reference: 1820bf, dated: August 2016) has been prepared by Harris Environmental to identify the bushfire risk to the rezoning site, the key constraints and the general bushfire protection measures required.

The BHA relevantly provides that site specific bushfire protection measures are not provided at this stage and this assessment should be used to inform subsequent stages in the development assessment process.

The BHA has undertaken an assessment of the proposed subdivision layout and has determined that Building construction standards will be BAL 29 or less in accordance with AS 3959-2009 *Construction of Buildings in Bushfire Prone Areas* for all proposed lots with the exception of one lot proposed on Lot 181 DP 834233 (proposed Lot 30), which will require an alternate solution to facilitate a suitable building envelope. Subject to Gateway Determination, the BHA has acknowledged that an alternate solution can be provided subject to further assessment.

2.3.6. Drainage & Stormwater

The local drainage is conveyed to the Bensley Reserve trunk system, which is eventually conveyed to the Georges River. It is considered that the site can be well served by the existing drainage network.

Subject to Gateway determination, detailed drainage and stormwater investigations can be undertaken.

2.3.7. Reticulated Water & Sewerage

A *Dial Before You Dig* ('DBYD') search has identified reticulated water supply along Evelyn Street and Oakley Road.

Sewer is also available along part of Evelyn Street, with existing Lot 40 DP 623486, Lot 181 DP 834233 and Lots 8 & 9 DP 826459 each maintaining an existing Property Connection Point to the sewer main.

It is understood that these existing systems can be upgraded, where necessary, to facilitate the supply of reticulated water and sewer to future residential development. Subject to Gateway determination, detailed design works will be undertaken in consultation with Sydney Water.

A copy of the DBYD search is attached at Appendix 4.

2.3.8. Electricity

Electricity supply will be achieved through extension and augmentation (where necessary) of the existing supply delivered to the residential development to the north, east and west.

Subject to Gateway determination, detailed design works will be undertaken in conjunction with consultation with Endeavour Energy.

2.3.9. Gas

Gas supply where available will be achieved through extension and augmentation (where necessary) of the existing supply delivered to the residential development to the north, east and west.

2.3.10. Telecommunications

Telecommunications will be provided through extension and augmentation (where necessary) of the existing supply delivered to the residential development to the north, east and west.

3. Existing Provisions & Proposed Amendments

3.1. Existing Planning Controls

Pursuant to the provisions of the CLEP 2015, the subject land currently maintains an *E4 - Environmental Living* land use zone, as illustrated in Figure 18.

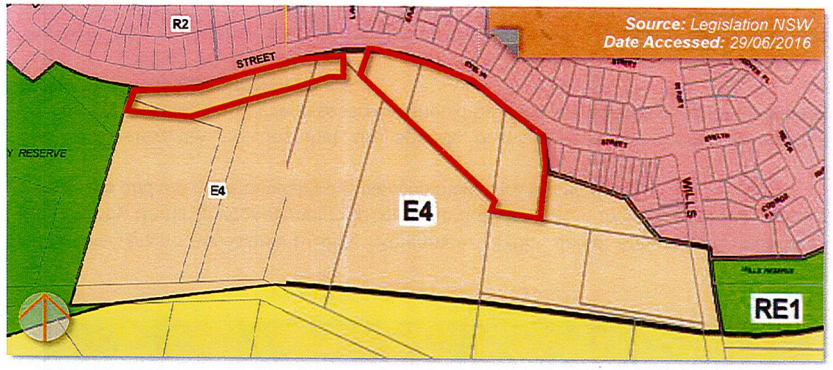


Figure 18: Zoning Map Extract

The subject land is currently affected by a *Z1 - 2 hectare* minimum lot size, as illustrated in Figure 19.

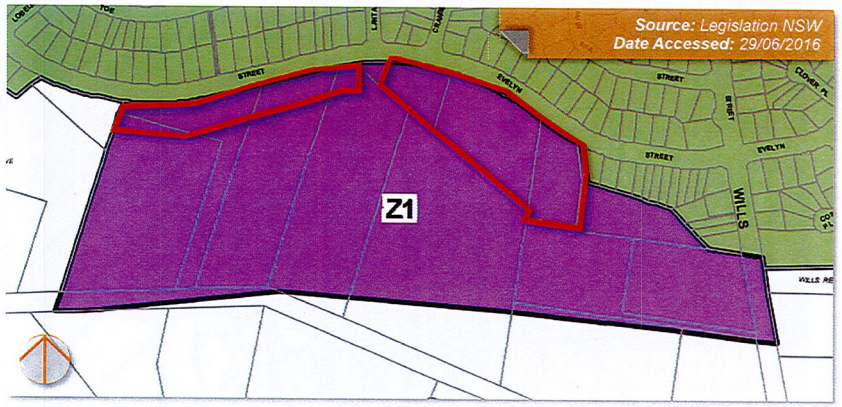


Figure 19: Minimum Lot Size Map Extract

3.2. Proposed Planning Provisions

As part of this PP, the Evelyn Street Landowners Group are seeking to have the current land use zoning and minimum lot size provisions amended to enable a higher and better land use that will be compatible with adjoining and surrounding land uses and provide additional in-fill residential development for the Campbelltown LGA.

This PP is seeking to amend the CLEP 2015 to rezone the subject land *R2 Low Density Residential* with a minimum lot size of 500sqm.

As a result of the abovementioned amendments, the minimum lot size of the residual land will need to be amended to a one hectare minimum lot size. The *E4 Environmental Living* land use zone is proposed to be maintained.

A plan illustrating the proposed CLEP 2015 zoning and lot size amendments is provided at Appendix 5.

The proposed rezoning and minimum lot size will facilitate the future residential subdivision of the subject land. An indicative subdivision layout plan has been provided at Appendix 6.

4. JUSTIFICATION

The following discussion provides justification for amending the zoning and lot size planning controls applicable to the subject land.

4.1. Need for the Planning Proposal

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

The planning proposal is not the direct result of any strategic study or report. The Evelyn Street Landowner's Group initiated the PP with Council.

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

The planning proposal is the only means of achieving the future low density residential subdivision and development of the subject land. In order to permit low density residential development, the land use zone and minimum lot size is required to be amended. The only means of achieving this is through an amendment to the LEP.

4.2. Relationship to Strategic Planning Framework

Is the planning proposal consistent with the objectives and actions of the applicable regional or sub-regional strategy (including the Sydney Metropolitan Strategy and exhibited draft strategies)?

A Plan for Growing Sydney ('the Plan') was released in December 2014. The Plan is the NSW Government's plan for the future of the Sydney Metropolitan Area over the next 20 years. The Plan provides key directions and actions to guide Sydney's productivity, environmental management, and liveability - including the delivery of housing, employment, infrastructure and open space.

The Plan identifies six Subregions across Sydney, with the Campbelltown LGA being one of five LGAs included within the South West Subregion.

The South West Subregion will grow by 325,850 people over the next 20 years. The South West subregion is projected to grow at a faster rate of 2.1% each year to 2031, compared with the rate of 1.6% for Sydney overall. This increase in population will generate the need for 126,900 new homes from the period between 2011 to 2031.

FIGURE 31: South West Subregion

Source: *A Plan for Growing Sydney*
Date Accessed: *29/06/2016*

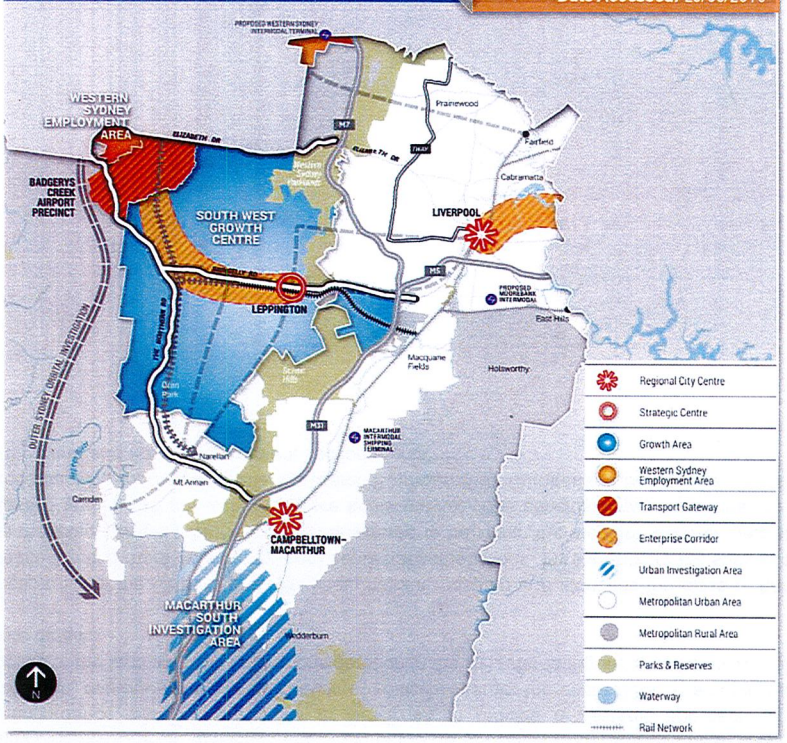


Figure 20: South West Subregion

The Table at Appendix 7 provides a discussion of the relevant sections of the Plan.

Based on the below discussion, this PP is considered to be consistent with the objectives and actions of the Plan. The proposed rezoning will facilitate the provision of infill housing in an established urban area that is currently well serviced by infrastructure including transport, utilities and social infrastructure such as schools, child care centres, health facilities, open space and recreation.

Is the planning proposal consistent with a council's local strategy or other local strategic plan?

Campbelltown 2025 Looking Forward ('Campbelltown 2025') is a statement of broad town planning intent for the longer term future of the City of Campbelltown that:

- responds to what Council understands people want the City of Campbelltown to look, feel and function like;
- recognises likely future government policies and social and economic trends; and
- sets down the foundations for a new town plan, that will help achieve that future.

Campbelltown 2025 identifies six strategic directions:

- Protecting and Enhancing the City's Key Environmental Assets;
- Growing the Regional City;
- Building a Distinctive Campbelltown Sense of Place;
- Getting Around the City;
- Building and Maintaining Quality Infrastructure; and
- Creating Education, Employment and Entrepreneurial Opportunities.

The proposed rezoning is consistent with these strategic directions, contributing to the provision of infill residential housing in an area that is already well serviced and maintains a sense of place. The proposed development will have positive flow on effects for the economy of the LGA.

Is the planning proposal consistent with applicable State Environmental Planning Policies?

A review of State Environmental Planning Policies ('SEPPs') has been undertaken. Whilst a number of policies may be applicable at the development application stage those applicable to this planning proposal are:

- State Environmental Planning Policy no. 44 - Koala Habitat Protection ('SEPP 44');
- State Environmental Planning Policy no. 55 - Remediation of Land ('SEPP 55'); and
- Greater Metropolitan Regional Environmental Plan No 2 - Georges River Catchment ('REP 2').

STATE ENVIRONMENTAL PLANNING POLICY NO. 44 - KOALA HABITAT PROTECTION

State Environmental Planning Policy No. 44 - Koala Habitat Protection (SEPP 44) applies to Campbelltown LGA. In accordance with SEPP 44, it must be ascertained whether the subject site contains potential koala habitat or core koala habitat.

A site is considered to contain potential koala habitat if the native vegetation contains a minimum of 15% of total number of tree species listed in Schedule 2 in the upper or lower strata. A site is considered to contain core koala habitat if a resident koala population is present.

A Draft Comprehensive Koala Plan of Management for Campbelltown City Council (Phillips 2016) is currently on public exhibition.

The Draft Comprehensive Plan of Management (CKPoM) 2016 prepared by Dr. Phillips for Campbelltown City Council was publicly exhibited for comment in June 2016. The Campbelltown CKPoM applies to the whole of the Campbelltown LGA and has been prepared in accordance with the provisions of SEPP 44 to provide a strategic approach to the protection, management and restoration of koala habitat for the entire LGA. The subject plan applies to the land which is under consideration in the PP refer to Figure 2.1 of the CKPoM for more details.

Section 5.3 of the CKPoM provides koala habitat mapping and identifies the class of habitat preference and more importantly, core koala habitat locations. In reference to the subject site, the mapping reveals that the area is considered to be within the medium to lower classes of Class B and C and not within the core koala habitat. This conclusion was supported in the accompanying Flora and Fauna Assessment prepared by Cumberland Ecology as discussed in the Flora and Fauna Assessment section of this PP.

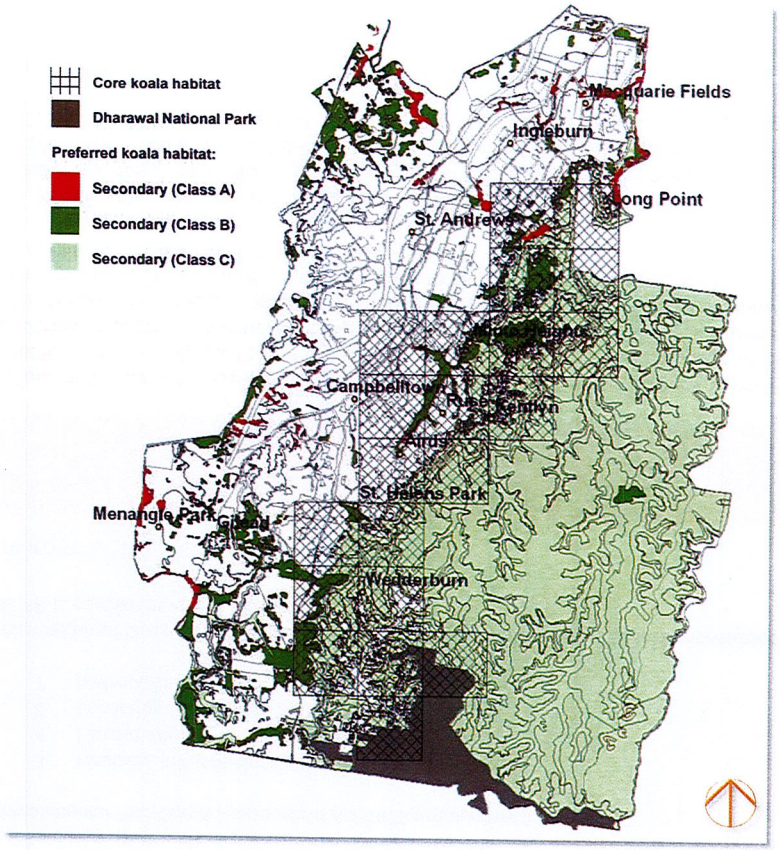


Figure 21: South West Subregion

The Flora & Fauna Assessment prepared by Cumberland Ecology to accompany this PP relevantly provides that within the subject site, two feed tree species listed under SEPP44 are present for the Koala: *Eucalyptus tereticornis* and *E. microcorys*.

Based upon the survey undertaken it was determined that the density of Schedule 2 Koala feed trees identified in SEPP 44 exceeds 15% of the total number of trees. The vegetation on site is therefore consistent with potential Koala habitat. No koala scats or individuals were recorded during the survey. As no evidence of a breeding population of Koala is present, the subject site is not considered to be Core Koala Habitat.

The subject site is not considered core Koala habitat under SEPP44, so it is unlikely that the Koala would occur on the subject site owing to the existing degraded nature of the vegetation. Therefore no site specific Koala Management Plan is required.

STATE ENVIRONMENTAL PLANNING POLICY NO. 55 - REMEDIATION OF LAND

State Environmental Planning Policy No. 55 - Remediation of Land (SEPP 55) contains planning controls for the remediation of contaminated land. Under Clause 6 *Contamination and remediation to be considered in a zoning or rezoning proposal* of SEPP 55 the following provisions must be taken into account:

(1) In preparing an environmental planning instrument, a planning authority is not to include in a particular zone (within the meaning of the instrument) any land specified in subclause (4) if the inclusion of the land in that zone would permit a change of use of the land, unless:

(a) the planning authority has considered whether the land is contaminated, and

(b) if the land is contaminated, the planning authority is satisfied that the land is suitable in its contaminated state (or will be suitable, after remediation) for all the purposes for which land in the zone concerned is permitted to be used, and

(c) if the land requires remediation to be made suitable for any purpose for which land in that zone is permitted to be used, the planning authority is satisfied that the land will be so remediated before the land is used for that purpose.

Note. *In order to satisfy itself as to paragraph (c), the planning authority may need to include certain provisions in the environmental planning instrument.*

(2) Before including land of a class identified in subclause (4) in a particular zone, the planning authority is to obtain and have regard to a report specifying the findings of a preliminary investigation of the land carried out in accordance with the contaminated land planning guidelines.

(3) If a person has requested the planning authority to include land of a class identified in subclause (4) in a particular zone, the planning authority may require the person to furnish the report referred to in subclause (2).

(4) The following classes of land are identified for the purposes of this clause:

(d) land that is within an investigation area,

(e) land on which development for a purpose referred to in Table 1 to the contaminated land planning guidelines is being, or is known to have been, carried out.

(f) to the extent to which it is proposed to carry out development on it for residential, educational, recreational or child care purposes, or for the purposes of a hospital - land:

(i) in relation to which there is no knowledge (or incomplete knowledge) as to whether development for a purpose referred to in Table 1 to the contaminated land planning guidelines has been carried out, and

(ii) on which it would have been lawful to carry out such development during any period in respect of which there is no knowledge (or incomplete knowledge).

Historically the subject land has been utilised for rural residential purposes. This land use is considered to present a low risk for contamination. Should it be considered necessary, a Preliminary (Phase 1) Site Investigation can be prepared upon detailed planning for the site to investigate the capability of the land for low density residential development.

GREATER METROPOLITAN ENVIRONMENTAL PLAN NO. 2 - GEORGES RIVER CATCHMENT (GMREP NO. 2)

The Greater Metropolitan Regional Environmental Plan No 2 - Georges River Catchment (GMREP No. 2) is a Deemed SEPP that aims to protect the water quality of the Georges River and its tributaries and the environmental quality of the whole catchment.

Pursuant to Clause 7(a), an assessment of the planning principles of GMREP No. 2 is to be undertaken when Council prepares a Local Environmental Plan. The assessment table is provided as Appendix 8 of this planning proposal.

Is the planning proposal consistent with applicable Ministerial Directions (s.117 directions)?

The following Directions issued by the Minister for Planning under Section 117(2) of the *Environmental Planning & Assessment Act 1979* are applicable to the PP:

- 3. Housing, Infrastructure and Urban Development;
- 4. Hazard and Risk;
- 6. Local Plan Making; and
- 7. Metropolitan Planning.

A discussion of these Directions is provided in the Table at Appendix 9. It is demonstrated that this PP is consistent with the Directions.

4.3. Environmental, Social & 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?

A Flora and Fauna Assessment has been prepared by Cumberland Ecology (Report No. 16066RP1, dated: July 2016) to evaluate the ecological impacts of the proposed rezoning, specifically impacts on threatened flora, fauna or ecological communities listed under the NSW Threatened Species Conservation Act 1995 (TSC Act) and/or the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) known to occur on or within the locality of the subject land.

This Assessment relevantly concludes that no significant impact is predicted to occur to threatened species, populations or communities as a result of the proposed development. Therefore, the preparation of a Species Impact Statement (SIS) is not warranted. A referral to the Commonwealth Department of the Environment, under the EPBC Act is also not required.

Refer to the discussion at Section 2.3.3 (Flora & Fauna) of this document.

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

Previous advice received from Council that has informed the preparation of this PP has identified the key environmental issues as being ecology and bushfire. In order to inform the preparation of this PP, a Flora and Fauna Assessment has been prepared as well as a Bushfire Hazard Assessment. The findings of these documents are discussed in Sections 2.3.3 (Flora & Fauna) and 2.3.5 (Bushfire) of this document.

It is considered that other potential environmental effects arising from future development of the subject land as a result of the proposed rezoning would be in relation to water quality and traffic.

The subject land is in the vicinity of the Georges River to the south, however the proposed rezoning is considered unlikely to have any adverse impacts on water quality, due to the distance of the subject land from the Georges River and the nature and scale of development proposed to be undertaken. Considering the future proposed residential development, adequate mitigation measures would be implemented during the construction and operation phases to ensure no adverse impacts on water quality.

Having regard to traffic impacts, the proposed rezoning would have the potential to yield in the order of thirty (30) residential lots, with vehicular access to be gained via Evelyn Street.

The RTA Guide to Traffic Generating Development suggests a traffic generation characteristic for single dwellings in urban areas of 0.85 vehicle trips per hour ('vtph') in the morning and afternoon peak periods. This would suggest a total peak generation of approximately 25.5 vtph from the proposed residential area to the road network.

It is considered, subject to the undertaking of detail traffic analysis, that the existing road networks for the area surrounding the subject land would be sufficient for accommodating any future increases in traffic volume.

Bus service routes currently operate along Evelyn Street, which provides connection to Campbelltown and Liverpool.

Notwithstanding the above it is considered that there is no traffic related impediment to the proposal or any inability to undertake any upgrading works required to provide a satisfactory traffic outcome.

Has the planning proposal adequately addressed any social and economic effects?

The rezoning of the subject land requested as part of this PP provides for the highest and best use of the subject land, in a manner which is considered to be compatible with the existing surrounding low density residential development.

The PP will also contribute to the achievement of the dwelling targets for the South West Subregion, as set out in the document A Plan for Growing Sydney. Furthermore, the additional housing supply will provide additional affordable housing in the Campbelltown LGA, consistent with the provisions of Council's local strategic plan Campbelltown 2025.

4.4. State & Commonwealth Interests

Is there adequate public infrastructure for the planning proposal?

There is considered that, subject to detailed design, there is adequate infrastructure available to service the future residential development of the subject land.

Should a favourable Gateway determination be achieved, detailed design works can be undertaken for the supply of reticulated water and sewer, electricity and gas supply.

What are the views of the state and Commonwealth public authorities consulted in accordance with the Gateway determination?

This is a matter for Council to address as part of the post-Gateway preparation of the Planning Proposal.

5. Conclusion

This Planning Proposal has been prepared by Planzone Consulting on behalf of the Evelyn Street Landowner's Group seeking the rezoning of the existing lots (Part Lot 100 DP 261125; Part Lots 8 & 9 DP 826459; Lot 181 DP 834233; Lot 305 DP 263295; Lot 40 DP 623486 and Part Lot 1 DP 533662) which are presently zoned E4 Environmental Living to R2 Low Density Residential.

This Planning Proposal is intended to facilitate the future subdivision and development of the subject land for low density residential use. Evelyn Street is characterised by low density housing and therefore the rezoning of the subject land from E4 Environmental Living to R2 Low Density Residential will allow for consistency in the zoning and zone objectives of the Street to be met.

The rezoning of the subject sites to R2 Low Density Residential will require an amendment to the existing minimum lot size from (2) hectares to 500 square metres. The amendment will help to achieve the planning outcomes of the established local area. The amendment in the lot size of the subject properties will require a modification to the existing lots from (2) ha lots to (1) ha lots as the residual lots will be unable to achieve the (2) ha minimum lot size requirement.

From a policy and strategic context, the planning proposal is considered to achieve the visions and objectives of the relevant state, subregional and local planning strategies. A continuation of the status quo would serve no planning benefit and would forgo the opportunity to provide the orderly and economic development of the land.

The accompanying flora and fauna study reveals that the sites are suitable for the rezoning without having negligible impacts on the ecology within the local area. The report further concluded that a Species Impact Statement is not required. The recently exhibited CKPoM by Council further identifies the land as not being a core koala habitat area.

The bushfire report prepared by Harris Environmental Consulting reveals that a number of sites are identified as bushfire prone land. All the proposed lots except proposed Lot 30 can provide a building envelope that meets BAL 29 or less. Post-Gateway determination, a detailed bushfire assessment for proposed Lot 30 could identify a solution such as a legal 88 B easement for the purposes of an APZ.

The PP reveals that all sites have access to the existing sewer network except for the properties No. 109 and 89 Evelyn Street. It is envisaged that further investigation and a detailed design for the sewer servicing of these sites will be required to be obtained subject to a favourable Gateway determination.

Based on the above, the proposed rezoning and amendment to the minimum lot size is considered to have merit and on behalf of the Evelyn Street Landowners Group we request that Council support the planning proposal and refer it to the NSW Department of Planning and Environment for determination.

Appendix 1

SMEC Report

Local People. Global Experience.

SUBMISSION ON DRAFT CAMPBELLTOWN LOCAL ENVIRONMENTAL PLAN 2014

NKG Investments

August 2014

Quality Assurance/Report Control Form

Contact Information

SMEC Australia Pty Ltd
ABN 19 067 492 755
Level 1, 178-180 Queen Street Campbelltown
Phone 02 4640 8222 Fax 02 4628 1056

Matt Loader
matt.loader@smec.com
www.smec.com

Document Control

Revision No.	Date	Prepared By:	Reviewed By:	Approved for issue by:
A	August 2014	RR	ML	ML
DRAFT	August 2014	RR	ML	ML – Client Review

Document Certification

This report has been developed based on agreed requirements as understood by SMEC Australia at the time of investigation. It applies only to a specific task on the lands nominated. Other interpretations should not be made, including changes in scale or application to other projects.

Any recommendations contained in this report are based on an honest appraisal of the opportunities and constraints that existed at the site at the time of investigation, subject to the limited scope and resources available. Within the confines of the above statements and to the best of my knowledge, this report does not contain any incomplete or misleading information.

Copyright

The information, including the intellectual property contained in this document is confidential and proprietary to SMEC Australia. It may be used by the person, company or organisation to whom it is provided for the stated purpose for which it is provided. It must not be given to any other person, company or organisation without the prior written approval of a Director of SMEC Australia. SMEC Australia reserves all legal rights and remedies in relation to any infringement of its rights in respect of confidential information.

TABLE OF CONTENTS

1 INTRODUCTION 4

2 THE SITE, locality & SITE CONTEXT 5

3 THE DRAFT CAMPBELLTOWN LOCAL ENVIRONMENTAL PLAN 2014 ('Draft LEP 2014') 10

3.1 Relevant Provisions of Draft LEP 2014 10

3.2 Proposed Amendments to Draft LEP 2014 10

3.3 Review of Relevant Studies 12

3.3.1 Relevant Provisions of the Campbelltown Residential Development Strategy ('Campbelltown RDS') 12

3.3.2 Relevant Provisions of the Campbelltown Local Planning Strategy ('Campbelltown LPS') 13

3.3.3 Relevant Provisions of Visual and Landscape Analysis of Campbelltown's Scenic Hills and East Edge Scenic Protection Lands ('Visual & Landscape Analysis') 14

4 JUSTIFICATION 18

5 CONCLUSION 19

1 INTRODUCTION

The preparation of this submission has been commissioned by Mr. Noel Gray, owner of Lot 305 DP 263295, Evelyn Street, Macquarie Fields, on behalf of the owners of lands subject to this submission. This submission is being prepared in response to the exhibition of the Draft Campbelltown Local Environmental Plan 2014 (Draft LEP).

This submission is made to the following lands:

- Lot 305 DP 263295;
- Lot 181 DP 834233;
- Lot 8 & 9 DP 826459;
- Lot 100 DP 261125;
- Lot 1 DP 533662; and
- Lot 40 DP 623486.

The Draft LEP has been certified for exhibition by the NSW Government and has been placed on public exhibition from Thursday 12 June through to Friday 8 August 2014. This exhibition period provides an opportunity for people to review and comment on the plan before it is finalised and gazetted as an Environmental Planning Instrument.

This submission is structured as follows:

- Introduction
- The Site, Locality & Site Context
- The Draft Campbelltown LEP 2014
- Justification
- Conclusion

2 THE SITE, LOCALITY & ANALYSIS

2.1 The Site

For the purpose of this submission, the subject land comprises:

- Lot 305 DP 263295;
- Lot 181 DP 834233;
- Lot 8 & 9 DP 826459;
- Lot 100 DP 261125;
- Lot 1 DP 533662; and
- Lot 40 DP 623486.

All lots maintain a frontage to Evelyn Street, with the exception of Lot 1 DP 533662, which only maintains a frontage to Oakley Road. Lots 100 DP 261125 and Lots 8 & 9 DP 826459 also maintain additional frontages to Oakley Road. Following is a description of each lot:

Lot & DP	Description
Lot 305 DP 263295	Slightly irregular shaped allotment comprising a total area in the order of 0.93ha. The land is primarily cleared with the exception of scattered trees towards the central and rear portions of the lot. Current improvements include a dwelling, swimming pool and associated outbuildings.
Lot 181 DP 834233	Slightly irregular shaped allotment comprising a total area in the order of. 0.3ha, land is vacant with the exception of several clusters of trees.
Lot 8 DP 826459	Slightly irregular shaped allotment comprising a total area in the order of 1.6ha. The land is primarily cleared, with the exception of scattered vegetation towards the site's Oakley Road frontage. Current improvements include a dwelling, swimming pool and associated outbuildings.
Lot 9 DP 826459	Slightly irregular shaped allotment comprising a total area in the order of 2ha. The land is primarily cleared, with the exception of scattered vegetation towards the site's Oakley Road frontage. Current improvements include a dwelling (which gains access from Oakley Road) and associated outbuildings.
Lot 100 DP 261125	Irregular shaped allotment comprising a total area in the order of 0.78ha. The land is primarily cleared, with the exception of scattered trees at in the northern portion of the lot and denser vegetation along the handle off Oakley Road.
Lot 1 DP 533662	Slightly irregular shaped allotment comprising a total area in the order of 2ha. The majority of the land is cleared with the exception of vegetation along the site's eastern boundary and its Oakley Road frontage. Current improvements comprise a residential dwelling and associated outbuildings.
Lot 40 DP 623486	Slightly irregular shaped allotment comprising a total area in the order of 0.5ha. The land is primarily cleared with the exception of scattered trees across the site. Current improvements comprise an existing dwelling and associated outbuildings.

The land the subject of this submission is currently zoned *7(d4) Environmental Protection 2ha Minimum* pursuant to Campbelltown (Urban Area) Local Environmental Plan 2002 and has a minimum lot size of 2 hectares.

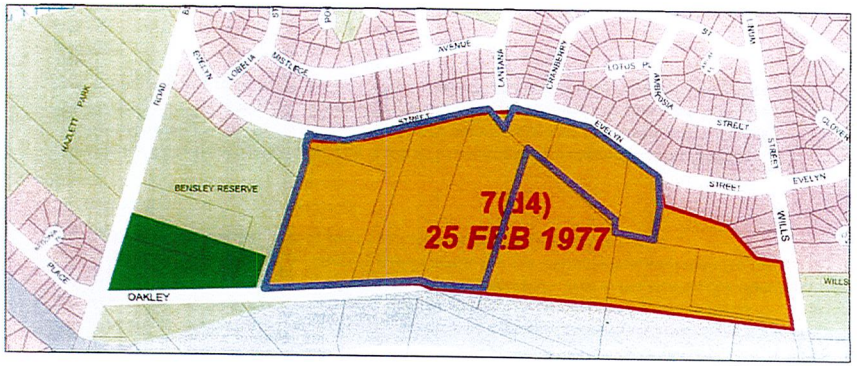


Figure 2: ***Extract from Campbelltown (Urban Area) LEP 2002 Zoning Map (Campbelltown Council website).***

It is noted that all of the abovementioned lots are already below the current 2ha minimum lot size requirement, with the exception of Lot 9 DP 826459 and Lot 1 DP 533662.

2.2 The Locality

The subject land is located in the residential suburb of Macquarie Fields. Development in the vicinity of the subject land comprises Bensley Reserve directly to the west, existing residential development opposite to the north and adjoining to the east in Evelyn Street and existing large lot residential land to the south. Also located in the vicinity of the subject land is Macquarie Fields High School to the north and Hazlett Park to the east. The Georges River is located further south.

Figure 1: ***The Subject Land and locality (SIX Viewer 2014).***

2.3 Site Analysis

2.3.1 Landform & Visual Context

The subject site is located on the urban fringe of Macquarie Fields. The sites present a direct urban frontage to Evelyn Street, which have an existing landform grade that would enable the immediate residential development. The sites generally exhibit a flat to slightly sloping land to the rear of the site.

View lines terminate in the foreground, with most properties fenced or developed to restrict view lines beyond. Extended view lines are generally linear to the prolongation of the western portion of the Evelyn Street approach to the Harold Street Intersection.

2.3.2 Flora & Fauna

The sites are generally clear of significant vegetation, with scattered trees located across the property of Lot 181 DP 834233. All sites are maintained to a rural residential standard with no established understorey of growth. Whilst native flora is generally scarce in the locality, this does not preclude opportunity for arboreal fauna to gather across the site. Nonetheless, alterations to the habitats will require further investigation upon the detailed planning of the site.

2.3.3 Land Capability

A Preliminary Site Investigation would be required to investigate the capability of the land for residential development. This can be prepared upon detailed planning of the site, with a Detailed Site Investigation occurring upon development of the site. Nonetheless, the sites have been used and maintained as a rural residential use, which suggest that the potential for unsuitable lands to be low.

2.3.4 2.4 Cultural Heritage

No items of either Aboriginal or European Heritage significance were identified on these lands.

2.3.5 Transport and Traffic Management

Access to the sites is achieved from the existing Evelyn Street frontage. Evelyn Street is identified as a collector street to service the south eastern portion of Macquarie Fields. It currently connects Harold Street to Eucalyptus Drive and contains a major bus route serving Macquarie Fields to the Campbelltown CBD. Evelyn street currently contains an on street cycle way and pedestrian footpath to the northern road verge.

It is considered that the site is highly accessible and connected with key activity nodes in terms of pedestrian and cycle activities.

2.3.6 Drainage & Stormwater Strategy

The local drainage is conveyed to the Bensley Reserve trunk system, which is eventually conveyed to the Georges River. It is considered that the site can be well served by the existing drainage network.

2.3.7 Water Reticulation and Sewerage

Water supply and sewerage will be achieved through extension and augmentation (where necessary) of the existing supply delivered to the residential development to the north, east and west.

2.3.8 Electricity

Electricity supply will be achieved through extension and augmentation (where necessary) of the existing supply delivered to the residential development to the north, east and west.

2.3.9 Telecommunications

Telecommunications will be provided through extension and augmentation (where necessary) of the existing supply delivered to the residential development to the north, east and west.

2.3.10 Gas

Gas supply where available will be achieved through extension and augmentation (where necessary) of the existing supply delivered to the residential development to the north, east and west.

2.3.11 Community Facilities

Existing community facilities to service the site are available in abundance. Local parks are less than 400m walk to the furthest proposed dwelling, whilst community facilities, local shops and schools being located no greater than 1500m from the site.

3 THE DRAFT CAMPBELLTOWN LOCAL ENVIRONMENTAL PLAN 2014 ('DRAFT LEP 2014')

3.1 Relevant Provisions of Draft LEP 2014

When preparing the Draft LEP 2014, it is understood that Council have adopted a Status Quo approach to the current land zonings, transferring the current LEP provisions to the equivalent Standard Instrument provisions. For example, having regard to zoning, the equivalent to the 7(d4) zone has been proposed for the subject land, this being the Standard Instrument *E4 Environmental Living* zone as identified on the Land Zoning Map.

The current minimum lot size of 2 hectares has been maintained as part of the Draft LEP 2014 Minimum Lot Size Map, with the Lot Average Map further permitting the subdivision of the subject land into 1 hectare minimum lots, subject to the subdivision achieving certain criteria stipulated at Clause 4.2D of the Draft LEP 2014.

A maximum building height of 9 metres is identified for the subject land on the Height of Buildings Map.

The subject land is not identified on the Environmental Constraints Map and nor is it identified on the Heritage Map.

3.2 Proposed Amendments to Draft LEP 2014

This submission seeks to reconsider the zoning and principle development standards of lands fronting Evelyn Street. This submission seeks the zoning of these lands from the proposed *E4 Environmental Living* zone which is currently proposed for the subject land, pursuant to the Draft LEP 2014, and consideration be given to the inclusion of a band of *R2 Low Density Residential* zoned land along the subject sites Evelyn Street frontage (refer to Figure 3).

This proposed band of R2 zoned land would maintain a depth in the order of 30 to 35 metres and span from the eastern boundary of Lot 141 DP 261125 through to the western boundary of Lot 41 DP 623486. It would be anticipated that this R2 zoned land would accommodate lots with a minimum lot size of 450sqm, consistent with the existing residential development along Evelyn Street and in the vicinity of the subject site.

It would be anticipated that this R2 zoned land would yield in the order of 30 residential lots, capable of accommodating low density residential dwellings.

The remainder of the subject land would maintain the E4 Environmental Living zone.

The figure on the following page demonstrates the proposed amendments requested as part of this submission.

Figure 3: Land fronting Evelyn Street, for which an R1 Low Density Residential zone is suggested (SIX Viewer 2014).

The site exhibits the unique quality that its frontage is of an urban standard, with land fronting Evelyn Street at grades which would accommodate immediate residential development. The site is currently service, or can be serviced by all relevant utilities. It is demonstrated in Section 2.3 of this submission that the capability of the land is suitable for residential development, being well served by existing community facilities and infrastructure.

3.3 Review of Relevant Studies

The following background studies were prepared to inform the preparation of the Draft LEP 2014:

- *Campbelltown Local Planning Strategy* prepared by Campbelltown City Council, dated: March 2013.
- *Campbelltown Residential Development Strategy* prepared by Campbelltown City Council, dated: March 2013 (Addendum dated: October 2013 & Amended: May 2014).
- *Visual and Landscape Analysis if Campbelltown's Scenic Hills and East Edge Scenic Protection Lands* prepared by Paul Davies Pty Ltd in association with Geoffrey Britton, dated: October 2011.

These studies were prepared having regard to the provisions of the relevant State policies guiding development including the Metropolitan Strategy (City of Cities – 2025) and more recently the Metropolitan Plan for Sydney 2036, together with the sub-regional planning in the form of the South West Region Draft subregional Strategy (2007).

A review of these background studies has been undertaken considering the capability of the subject land to accommodate an R2 Low Density Residential zone along its Evelyn Street frontage.

3.3.1 Relevant Provisions of the Campbelltown Residential Development Strategy ('Campbelltown RDS')

The Campbelltown Residential Development Strategy, prepared by Campbelltown City Council, (dated March 2013) acknowledges that in order to plan for Campbelltown City's population growth, future housing needs and the ever-changing house choices people are making; it is essential that Council review its current housing policy position and develop a relevant, responsive Residential Development Strategy (RDS).

Metropolitan Planning for Sydney as contained in the Metropolitan Strategy (City of Cities – 2025) and more recently the Metropolitan Plan for Sydney 20364, together with the sub-regional planning in the form of the Draft South West Region subregional Strategy (2007) (DSWS) were fundamental considerations to the review process and provided an integral platform for development of the Campbelltown RDS.

At a general level, future housing demand is reflected in the relevant housing targets established through the sub regional planning process, and detailed in the DSWS, the target figure for additional dwellings in the Campbelltown LGA to 2031 is 24,653. This target was importantly noted to comprise 19,953 additional "infill" dwellings and 4,700 additional "greenfields" dwellings, or an "infill/greenfield" mix of 81%:19%.

With respect to infill development, the Campbelltown RDS acknowledges that:

"Infill Development" refers to development focused on increasing densities in existing areas and developing or redeveloping underutilised sites within existing urban areas. It is critical to ensuring that population growth occurs in an efficient and sustainable manner. Consolidation of urban areas importantly contributes to the creation of a compact settlement pattern that facilitates efficient development and minimises adverse impacts on natural systems and scenic landscapes and promotes an efficient and sustainable use of infrastructure and public transport systems.

A series of growth opportunities focused largely on existing centres and fringing suburban development provide significant prospects for structured future development, these are identified at Appendices A, B & D of the Campbelltown RDS document. Whilst it is noted that the subject site is not identified as a designated 'infill area', it is considered that the proposed R2 zoned land meets the abovementioned definition of infill development.

Furthermore, the proposed addition of approximately 30 residential lots presents a very minor increase in infill development, equating to 0.15% of the identified DSWS target of 19,953 infill dwellings in the Campbelltown LGA to 2031.

Based on the above, it is not considered that the proposed R2 zoned land will have the potential to significantly impact the infill dwelling targets identified for the Campbelltown LGA.

3.3.2 Relevant Provisions of the Campbelltown Local Planning Strategy ('Campbelltown LPS')

The Campbelltown LPS is a document prepared by Campbelltown Council (dated March 2013) which provides a long term strategic planning framework for the future development of the City over the next 15 to 20 years. In setting out such long term planning directions, regard has been given to local opportunities and constraints and State and Regional planning policies/strategies, objectives and targets.

Having regard to the subject site, the Campbelltown LPS acknowledges that:

Areas that are designated for Environmental Living generally include land with some type of environmental sensitivity but that still retain a capacity to accommodate a dwelling, subject to the dwelling being appropriately located and designed. Therefore, these areas provide unique opportunities for careful integration of housing with sensitive environmental settings and the management of such settings.

These forms of housing flank the established urban areas of the LGA to the east, west and south. They comprise the Wedderburn Plateau and Gilead in the south, the Scenic Hills in the west, and East Edge Scenic Protection Lands and Georges River Landscape in the east and cover arrange of lot sizes from 0.4 ha to 4 (+) ha.

Considering this, the areas of the subject site which maintain environmental sensitivity are those areas towards Oakley Road, where the vegetation is denser and maintains a higher degree of connectivity. The vegetation along the Evelyn Street frontage comprises isolated scattered trees and shrubs which maintain no connectivity. The R2 zone has only been proposed along the Evelyn Street frontage, with the remainder of the subject land to maintain an E4 Environmental Living zone, with areas in the order of 0.4ha. It is therefore considered that the proposed R2 zone does not offend this provision of the Campbelltown LPS.

The Campbelltown LPS also provides a discussion of infill development, which is consistent with the above discussion at Section 3.3.1.

3.3.3 Relevant Provisions of Visual and Landscape Analysis of Campbelltown's Scenic Hills and East Edge Scenic Protection Lands ('Visual & Landscape Analysis')

The Visual and Landscape Analysis of Campbelltown's Scenic Hills and East Edge Scenic Protection Lands has been prepared for the Campbelltown City Council by Paul Davies Pty Ltd Heritage Consultants and Geoffrey Britton (Environmental Design Consultant). The fieldwork and reporting was undertaken between November 2008 and May 2009. The report was updated in 2011 to reflect changes to the planning system in NSW.

The land the subject of this submission is identified as being located within the East Edge Scenic Protection Lands (EESPLs). The EESPLs consist of six precincts located along the main ridge between the suburbs of Macquarie Fields and Ruse.

The subject land is located in the EESPL Unit 1 – Evelyn Street/Oakley Road (E-LU1), the northern-most of the EESPLs.

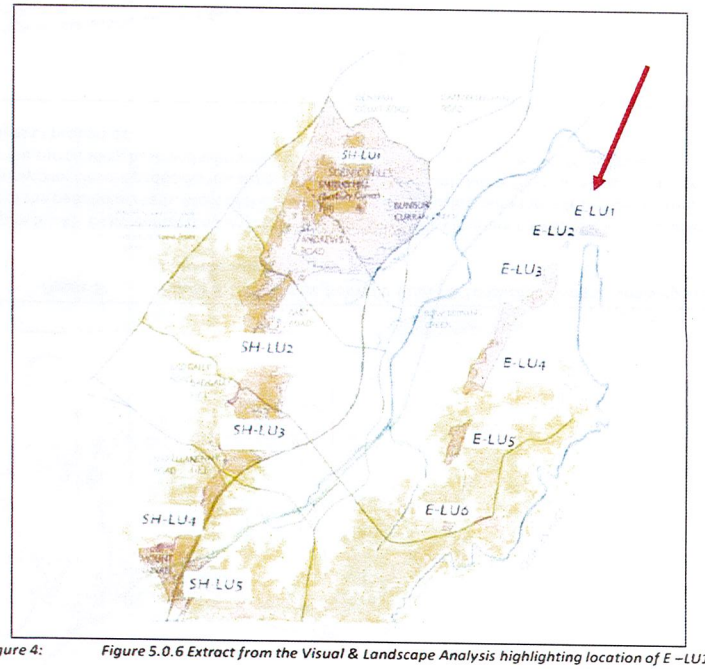


Figure 4: ***Figure 5.0.6 Extract from the Visual & Landscape Analysis highlighting location of E –LU1.***

With respect to significant views and vistas, the Visual & Landscape Analysis notes that the lack of internal roads mean that the identified significant views in E-LU1 are accessed from its periphery and include:

- *the focal point provided by the curve in Evelyn Street and the unfolding visual sequence towards the distant Scenic Hills when travelling from east to west;*
- *towards the remnant Woodland vegetation at the apex of the curve in Evelyn Street which provides a strong contrast in scale and form with the adjacent suburban development;*
- *from Evelyn Street towards the Woodland/bushland to the south – with the traditional contrast over the cleared paddock areas in the foreground;*
- *from Bensley Reserve towards the excellent group of tall trees marking its eastern edge; and*
- *along Oakley Road (both directions) – high quality bushland edge character.*

The enclosing character of the bushland and relatively flat topography to the north and west have limited the potential for distant views towards the Unit. Instead, the high quality bushland views are revealed at the last moment when approached from these directions. When approached from the heavily vegetated areas to the east and south the natural landscape opens more gradually through a series of openings.

Considering the abovementioned points, it is important to note that the views onto the subject land are limited to those available from the peripheral roads, i.e. existing residential roads which are already surrounded by established residential development. In this respect it is considered that the proposed R2 zoned land along Evelyn Street will only present a continuation of the existing residential development and will have minimal potential for adverse visual impacts when viewed from the north, east and west.

Views along Oakley Road will remain unaffected, with the R2 zone only being proposed along the Evelyn Street frontage.

Furthermore, the vegetation along Evelyn Street has altered since the fieldwork for the Visual & Landscape Analysis was undertaken in November 2008 and May 2009, with the current vegetation comprising isolated scattered trees and shrubs. This reduction in vegetation being the result of approved clearing across Lot 305 DP 263295.

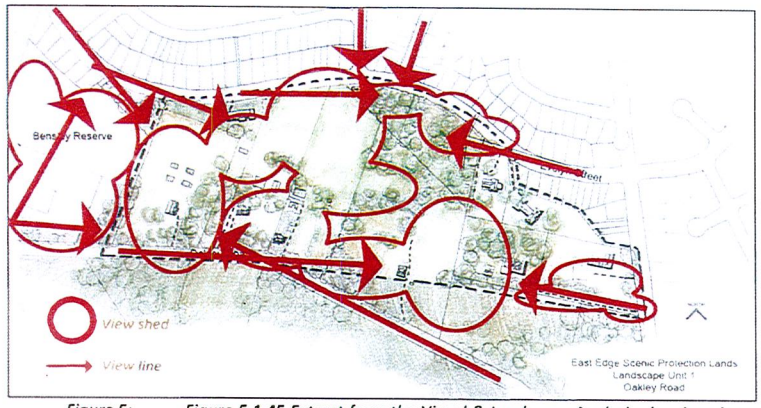


Figure 5: ***Figure 5.1.45 Extract from the Visual & Landscape Analysis showing views onto the subject land.***

Figure 5.1.45. E-LU1 contains no internal roads and accessible views are limited to those available from the peripheral roads. Most of these views are good in quality, with those from Evelyn Street mainly over cleared paddocks toward bushland, and those from Oakley Road being more enclosed by the surrounding bushland with views over the area filtered by the stands of trees lining the edges of properties.

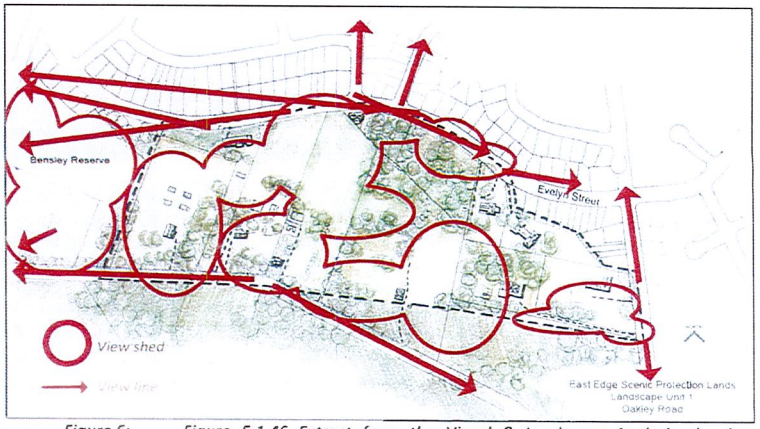


Figure 6: ***Figure 5.1.46 Extract from the Visual & Landscape Analysis showing outward views from the subject land.***

Figure 5.1.46. The outward views available to the community are directed along roads and through clearings. Most are tightly constrained by the curved alignments of the roads. A good

distance view towards the Scenic Hills in the west is available from Evelyn Street. Additional views are likely to be available from within the Unit from private property.

The local topography of the site, and its vicinity has a gentle slope (0 to <5%) from the north to the south. The origins of the vantage points are generally obscured by foreground objects or deflections in the curvilinear nature of the subdivision to the north.

In this regard, inward views are best enjoyed from a lower position (Oakley Road) looking back onto the view sheds. Sightlines are open to the foreground and the distant items, whilst a lengthy exposure to the wider view shed is gained from these positions.

The outward views available to the subject land are directed along roads and through clearings. It is not considered that the proposed R2 zoned land will have the potential to adversely affect these outward views, with residential development being restricted to the Evelyn Street frontage.

Attachment 1 provides a collation of photographs to demonstrate the inward and outward views and streetscapes of the existing development, which indicates a minimal impact to the E-LU1 view shed. Whilst sightlines deepen into the view shed, these are predominantly obscured by front fences and across open managed lands, which provide little conservation and scenic value. Sightlines from the development to distant items have a source point emanating from the journey along Evelyn Street. These will not be interrupted as a result of this development.

Notwithstanding the above, the view shed is preserved with the conservation of sightlines from Oakley Road. This is demonstrated in Attachment 1.

4 JUSTIFICATION

The proposed band of R2 zoned land presents a logical continuation of the existing residential development along Evelyn Street, having regard to the following:

- The proposed R2 zoned land would provide an increase of approximately 30 residential lots/dwellings. This represents a very minor increase in infill housing, one which is not likely to adversely affect, whist contributing to, the infill development targets identified in the Campbelltown RDS; equating to 0.15% of the South West Region Draft subregional Strategy infill dwelling target for the Campbelltown LGA to 2031.

- The anticipated increase in dwellings will not generate any additional demand on existing infrastructure or community facilities. Water, sewer and electricity are all readily available to the subject site. The subject land is located in close proximity to Bensley Reserve and Hazlett Park as well as the local Macquarie Fields Neighbourhood Store, located to the north-east along Evelyn Street.

- The majority of the site's Evelyn Street frontage is cleared, with the exception of scattered trees and shrubs which maintain minimal ecological significance and no connectivity. The existing denser vegetation along Oakley Road will not be affected by the proposed R2 zone and will remain within the proposed E4 zone.

- The existing Evelyn Street frontage is to an urban standard, with services running the length of the subject site.

- Having regard to views to and from the subject site, it is not anticipated that the proposed R2 zone will present the potential for any adverse visual impacts looking onto or out from E-LU1. Views onto the subject land are limited to those available from the peripheral roads, i.e. existing residential roads which are already surrounded by established residential development. In this respect it is considered that the proposed R2 zoned land along Evelyn Street will only present a continuation of the existing residential development and will have minimal potential for adverse visual impacts when viewed from the north, east and west.

5 CONCLUSION

This submission has been prepared on behalf of Mr. Noel Gray, owner of Lot 305 DP 263295, Evelyn Street, Macquarie Fields in response to the exhibition of the Draft LEP 2014.

This submission also includes the following lands which adjoin/are in the vicinity of Lot 305 DP 263295:

- Lot 181 DP 834233;
- Lot 8 & 9 DP 826459;
- Lot 100 DP 261125;
- Lot 1 DP 533662; and
- Lot 40 DP 623486.

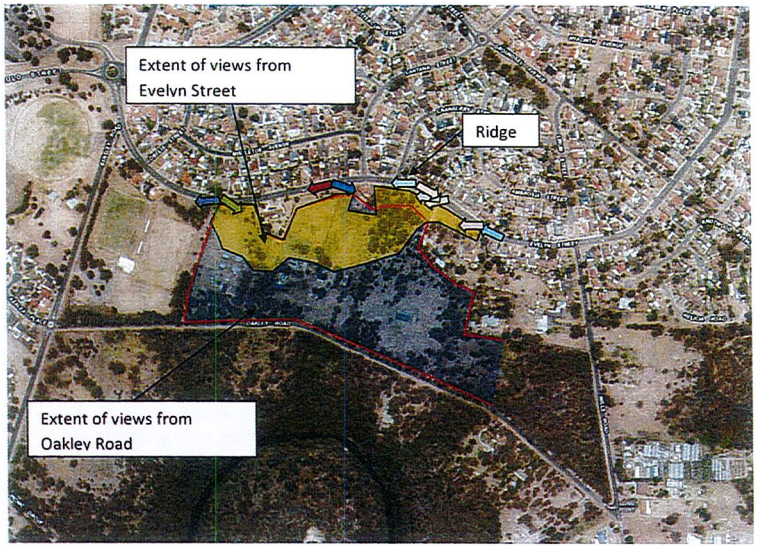
Having regard to the *E4 Environmental Living* zone which is currently proposed for the abovementioned land, pursuant to the Draft LEP 2014, it is requested that consideration be given to the inclusion of a band of *R2 Low Density Residential* zoned land along the subject site's Evelyn Street frontage. It would be anticipated that this R2 zoned land would accommodate a row of lots with a minimum lot size of 500sqm, consistent with the existing residential development along Evelyn Street.

The proposed R2 zone is considered to present a minor increase in infill housing which will not adversely affect the growth targets identified in the Campbelltown RDS. The subject land is capable of accommodating the minor increase in dwellings, with adequate facilities and infrastructure available. The visual impacts generated by the proposed zone and future dwellings are considered to be negligible. The majority of the site's Evelyn Street frontage is cleared, with the exception of scattered trees and shrubs which maintain no ecological significance.

The proposed R2 zone presents a logical continuation of the existing residential development along Evelyn Street, which will maintain overall positive environmental, economic and social impacts in the Macquarie Fields LGA.

Having regard to the above, it is respectfully requested that the proposed band of R2 zoned land and 500sqm minimum lot size along the site's Evelyn Street frontage be considered and implemented as part of the Campbelltown Local Environmental Plan 2014.

ATTACHMENT 1



Photograph 1

Limited views presented from this position. Views obscured by front fence. Canopy trees only.

Photograph 2

View into viewshed deepening, however predominantly limited to the foreground. Views of canopy trees only. Obscured by front fence.

Limited views to the viewshed. Distant views unavailable. Views of canopy trees only. Obscured by front fence.

Views limited to foreground. Views of canopy trees only. Obscured by front fence.

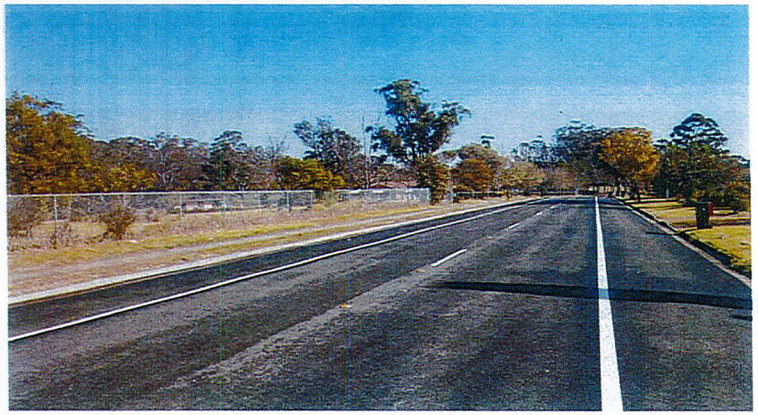
Distant views developing, however limited on the prolongation of Evelyn Street. View into viewshed deepening, however predominantly limited to the foreground. Views of canopy trees only. Obscured by front fence.

Views limited to residential development and foreground. Obscured by the front fence.

Photograph 7

Existing dwelling house demonstrates urban development on north and south street frontages. Views into view shed deepening. Obscured by front chainmail fence.

Photograph 8



. Views into view shed deepening. Predominantly open managed lands with little scenic value. Obscured by front chainmail fence.

Photograph 9

. Views into view shed deepening. Predominantly open managed lands with little scenic value.

Photograph 10

Entry to local parks in the foreground with urban edge of development in the distance. Low scale rural type fence allows good sightlines through to bushland in the foreground.

Appendix 2

Evelyn Street Streetscape Photomontage

83 Evelyn Street, Macquarie Fields

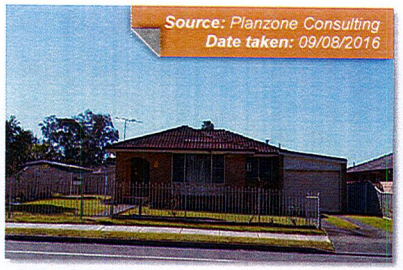
83A Evelyn Street, Macquarie Fields

70 Evelyn Street, Macquarie Fields

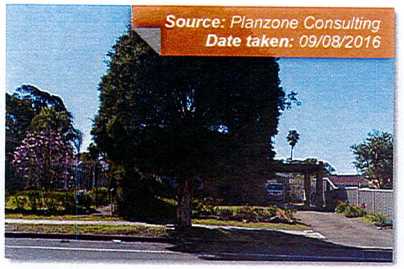
72 Evelyn Street, Macquarie Fields

74 Evelyn Street, Macquarie Fields

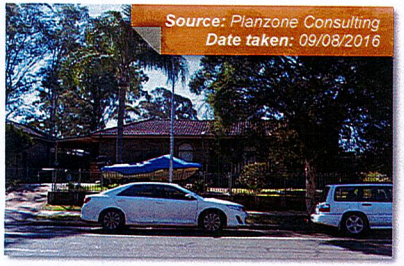
76 Evelyn Street, Macquarie Fields



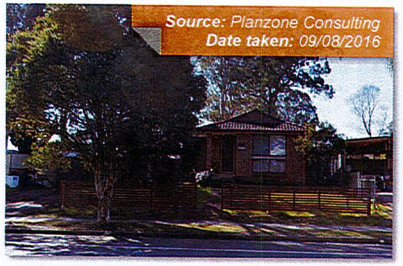
78 Evelyn Street, Macquarie Fields



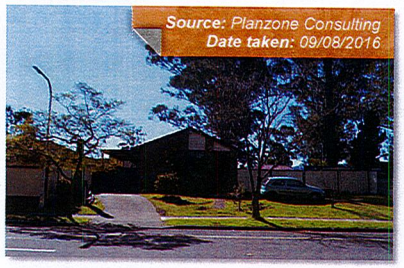
80 Evelyn Street, Macquarie Fields



82 Evelyn Street, Macquarie Fields

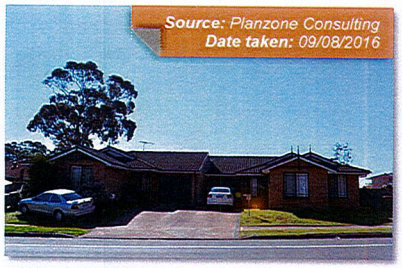


84 Evelyn Street, Macquarie Fields

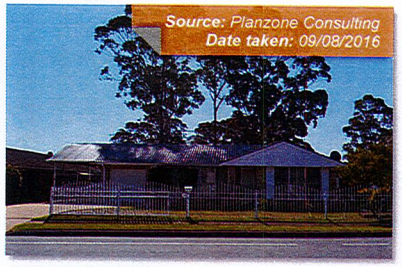


86 Evelyn Street, Macquarie Fields

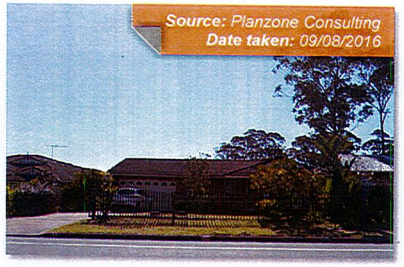
90A Evelyn Street, Macquarie Fields



90B Evelyn Street, Macquarie Fields

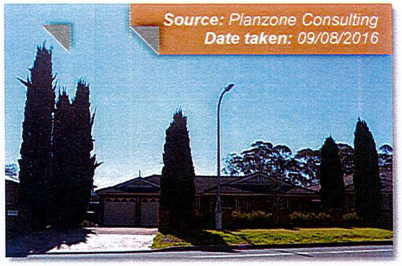


94 Evelyn Street, Macquarie Fields

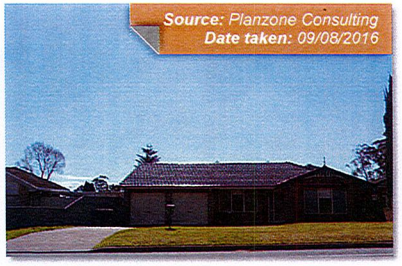


96 Evelyn Street, Macquarie Fields

98A & 98B Evelyn Street, Macquarie Fields

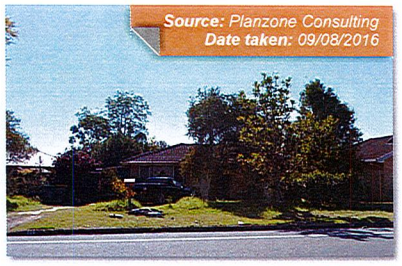


100 Evelyn Street, Macquarie Fields

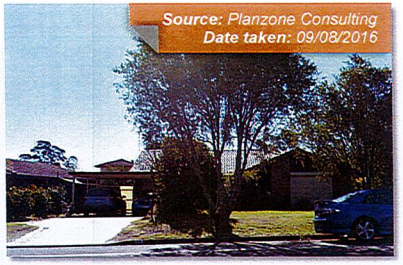


102 Evelyn Street, Macquarie Fields

104 Evelyn Street, Macquarie Fields

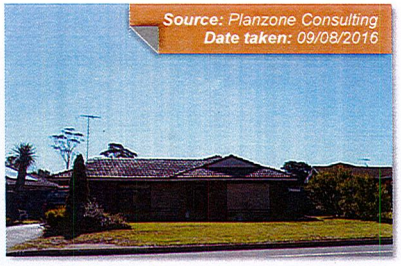


106 Evelyn Street, Macquarie Fields

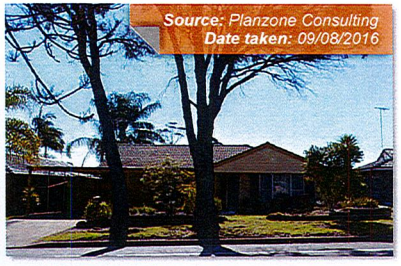


108 Evelyn Street, Macquarie Fields

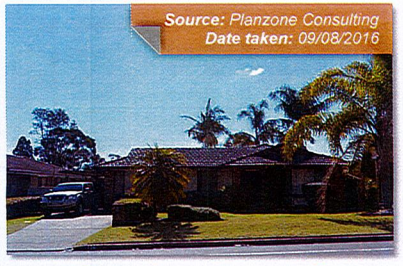
110 Evelyn Street, Macquarie Fields



112 Evelyn Street, Macquarie Fields



114 Evelyn Street, Macquarie Fields



116 Evelyn Street, Macquarie Fields

118 Evelyn Street, Macquarie Fields

120 Evelyn Street, Macquarie Fields

122 Evelyn Street, Macquarie Fields

Appendix 3

AHIMS Database Search Results

Office of Environment & Heritage

AHIMS Web Services (AWS)
Search Result

Purchase Order/Reference : 20160629

Client Service ID : 231774

Planzone Consulting

PO Box 3
LIVERPOOL New South Wales 1871

Attention: Rennie Rounds

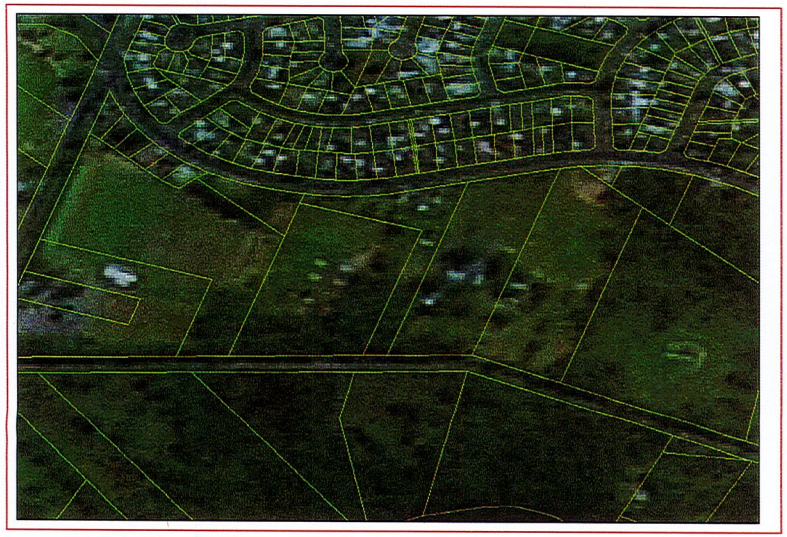
Email: rennie@planzone.com.au

Date: 29 June 2016

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lot : 100, DP:DP261125 with a Buffer of 200 meters, conducted by Rennie Rounds on 29 June 2016.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	**Aboriginal sites are recorded in or near the above location.**
0	**Aboriginal places have been declared in or near the above location. ***

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the NSW Government Gazette (http://www.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Office of Environment and Heritage's Aboriginal Heritage Information Unit upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Office of Environment and Heritage and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date .Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

Office of Environment & Heritage

AHIMS Web Services (AWS)
Search Result

Purchase Order/Reference : 20160629(2)

Client Service ID : 231775

Planzone Consulting
PO Box 3
LIVERPOOL New South Wales 1871
Attention: Rennie Rounds

Email: rennie@planzone.com.au

Date: 29 June 2016

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lot : 181, DP:DP834233 with a Buffer of 200 meters, conducted by Rennie Rounds on 29 June 2016.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.

A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	**Aboriginal sites are recorded in or near the above location.**
0	**Aboriginal places have been declared in or near the above location. ***

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the NSW Government Gazette (http://www.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Office of Environment and Heritage's Aboriginal Heritage Information Unit upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Office of Environment and Heritage and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date .Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

Office of Environment & Heritage

AHIMS Web Services (AWS)
Search Result

Purchase Order/Reference : 20160629(3)

Client Service ID : 231776

Planzone Consulting

PO Box 3
LIVERPOOL New South Wales 1871

Attention: Rennie Rounds

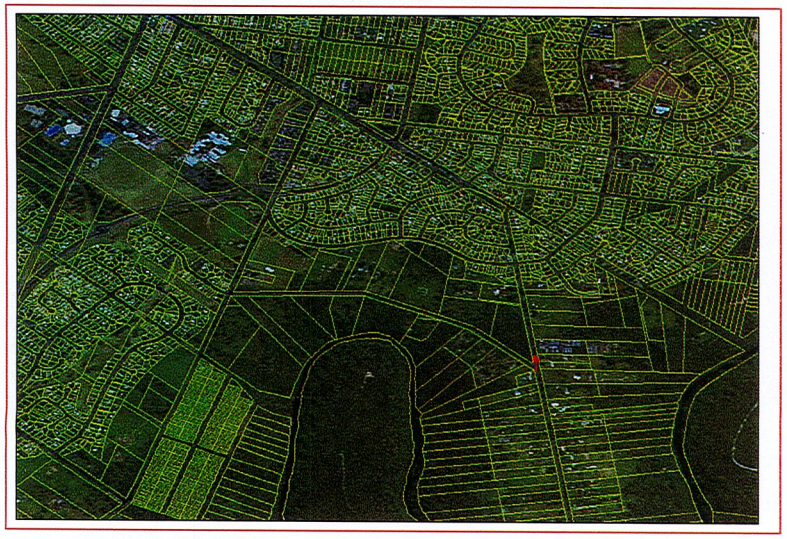
Email: rennie@planzone.com.au

Date: 29 June 2016

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lot : 9, DP:DP826459 with a Buffer of 1000 meters, conducted by Rennie Rounds on 29 June 2016.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

1	**Aboriginal sites are recorded in or near the above location.**
0	**Aboriginal places have been declared in or near the above location. ***

If your search shows Aboriginal sites or places what should you do?

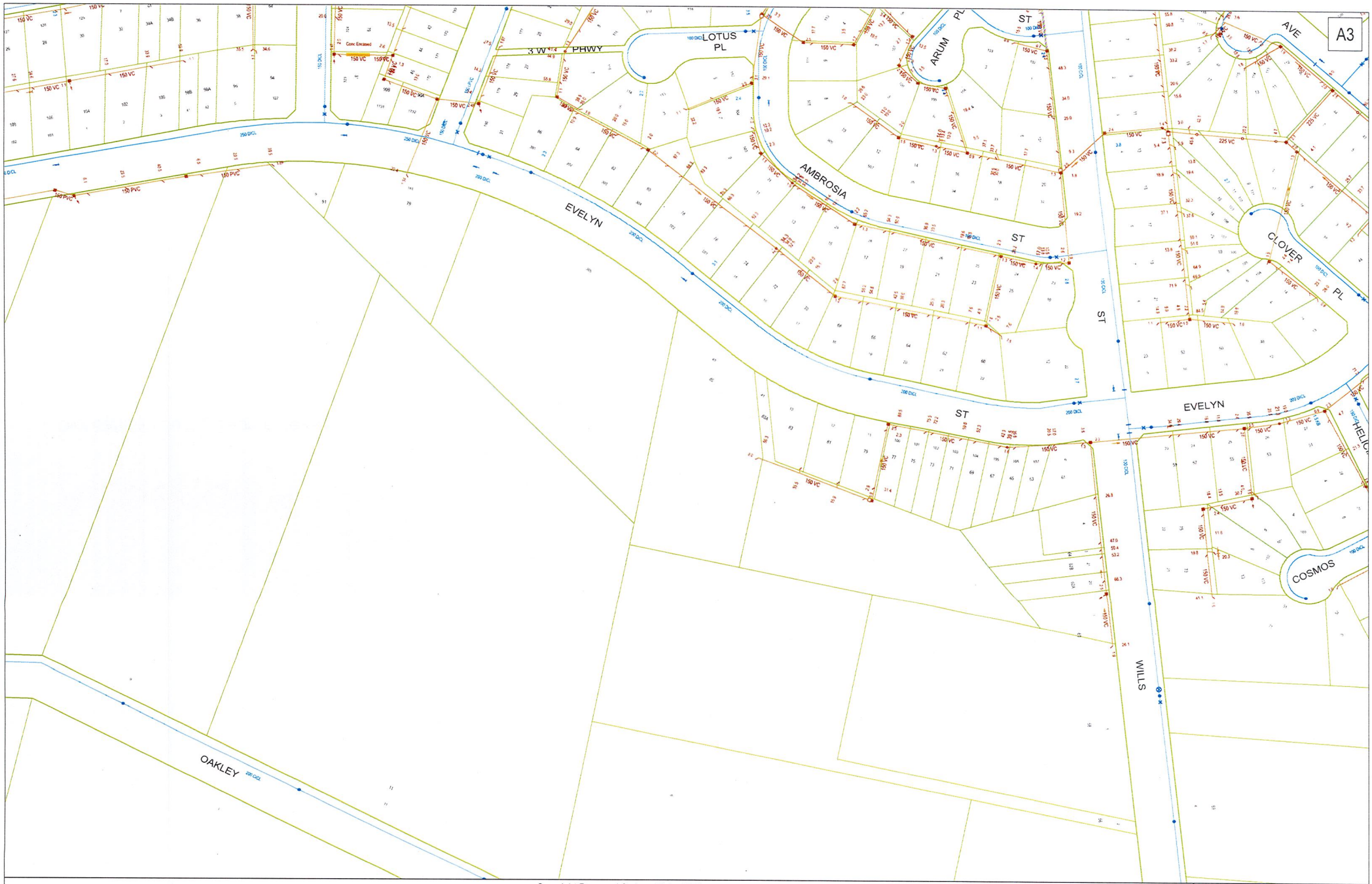
- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the NSW Government Gazette (http://www.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Office of Environment and Heritage's Aboriginal Heritage Information Unit upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Office of Environment and Heritage and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date .Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

Appendix 4

Dial Before You Dig Search Results



DBYD Address:
n/a Evelyn Street
Macquarie Fields NSW 2564

DBYD Job No: 10891918

DBYD Sequence No: 53884437

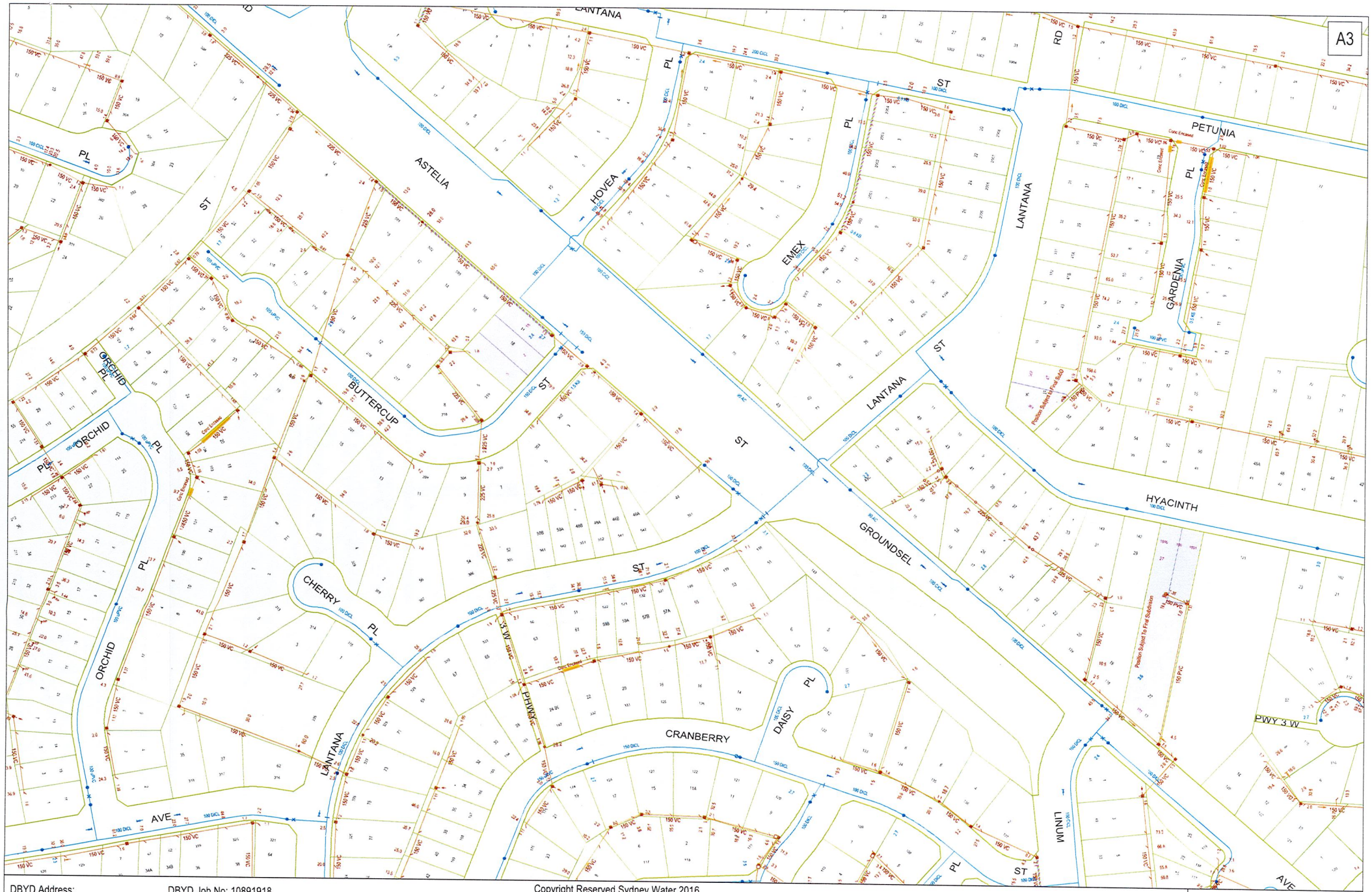
Copyright Reserved Sydney Water 2016
No warranty is given that the information shown is complete or accurate.
SYDNEY WATER CORPORATION

Scale: 1:1500

Date of Production: 29/06/2016

Plan 1 of 2

0m 9m 18m 27m 36m



DBYD Address:
n/a Evelyn Street
Macquarie Fields NSW 2564

DBYD Job No: 10891918

DBYD Sequence No: 53884437

Copyright Reserved Sydney Water 2016
No warranty is given that the information shown is complete or accurate.
SYDNEY WATER CORPORATION

Scale: 1:1500

Date of Production: 29/06/2016

Plan 2 of 2

N

0m 9m 18m 27m 36m

DBYD Address:
Ash Evelyn Street
Macquarie Fields NSW 2564

DBYD Job No: 10872382
DBYD Sequence No: 53766199

SYDNEY WATER CORPORATION
No warranty is given that the information shown is complete or accurate

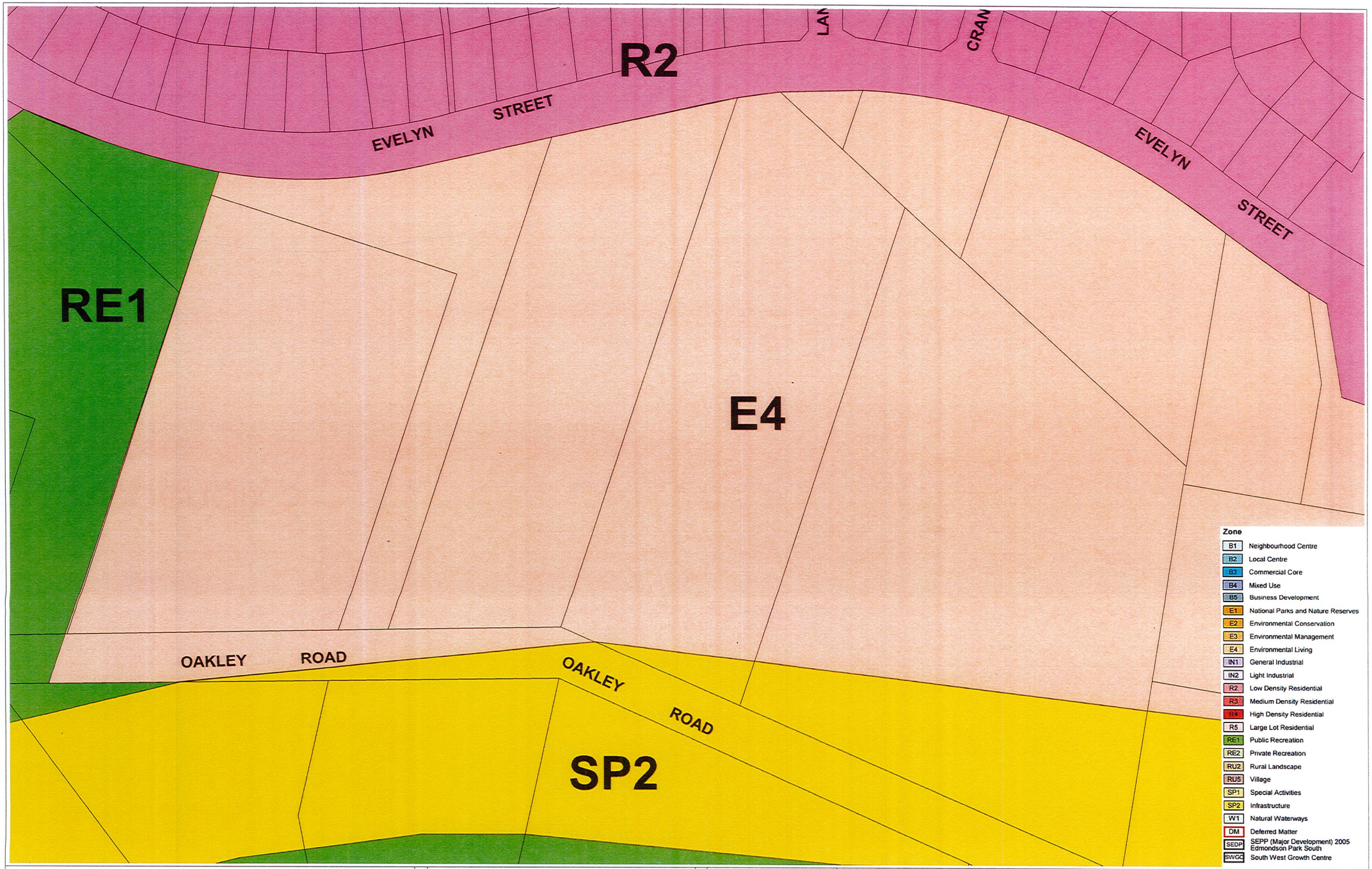
Copyright Reserved Sydney Water 2016

Scale: 1:2000
Date of Production: 24/06/2016 09:52:03

Plan 1 of 1

Appendix 5

Proposed Campbelltown Local Environmental Plan 2015 Amendments



N

PLANZONE CONSULTING
P: PO Box 3
Liverpool NSW 1871
T: (02) 9011 7620
E: enquiry@planzone.com.au
W: www.planzone.com.au

Notes

Do not scale off drawings, use stated measurements. All measurements to be confirmed on site prior to commencement of any works.

© Copyright
This plan is subject to copyright and remains the property of Planzone Consulting. This plans must not be used, reproduced, copied, reproduced, disseminated or republished, in whole or part without the prior written consent of Planzone Consulting.

These plans are site specific and can only be used for the project and property specified on the drawing details section of the plan.

These plans have been prepared to electrical design sheet only and are constructed to be done so, in accordance with the relevant local and statutory standards, codes and regulations including, but not limited to, the relevant Class of Australia and Australian Standards.

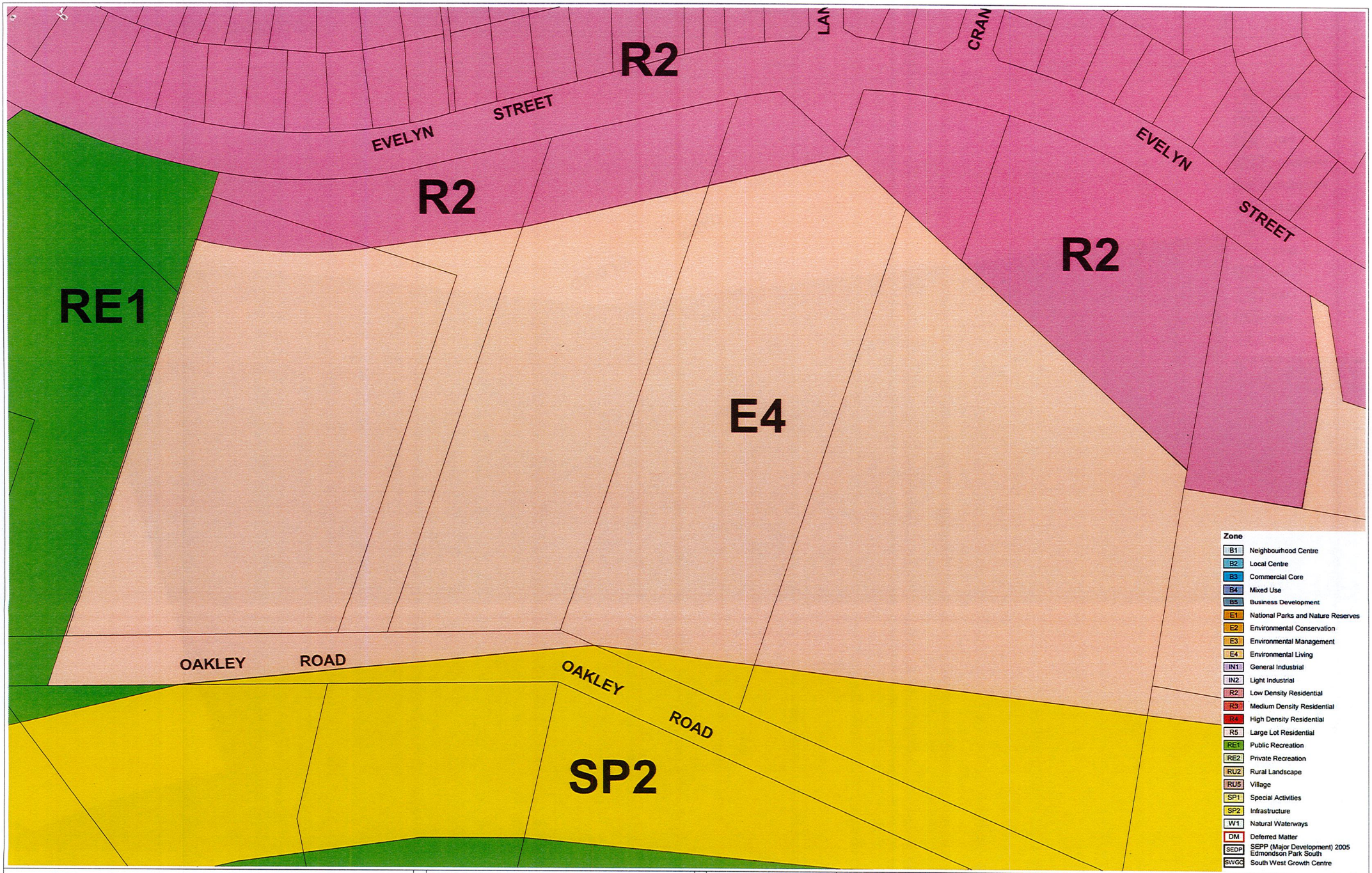
Disclaimer:
While every reasonable effort has been made to ensure that this plan is correct at the time of creation, Planzone Consulting, its agents and employees, disclaim any and all liability to any person in respect of anything or the consequences of anything done or omitted to be done in reliance upon the whole or any part of this plan.

Drawing Details

Proposal:	Subdivision
Address:	Evelyn Street, Macquarie Fields
LGA:	Campbelltown City Council
Drawing Title	Existing Land Use Zoning
Scale:	1:1000
Project No.:	20150604
Drawing No.:	RZ01
Revision No.	01
Drawn By:	AH
Date:	17/08/2016

Revisions

Rev No.	Revision Name	Issue Date	Rev No.	Revision Name	Issue Date
01	Final Revisions	17.06/2016			



N

PLANZONE CONSULTING
P: PO Box 3
Liverpool NSW 1871
T: (02) 9011 7620
E: enquiry@planzone.com.au
W: www.planzone.com.au

Notes

Do not scale off drawings, use scaled measurements. All measurements to be confirmed on site prior to commencement of any works.

© Copyright
This plan is subject to copyright and remains the property of Planzone Consulting. This plans must not be used, copied, reused, reproduced, disseminated or republished in whole or part without the prior written consent of Planzone Consulting.

These plans are site specific and can only be used for the project and property stipulated on the drawing details section of this plan.

These plans have been prepared to illustrate design ideas only and any construction is to be done so in accordance with the relevant local and statutory standards, codes and regulations including, but not limited to, the Building Code of Australia and Australian Standards.

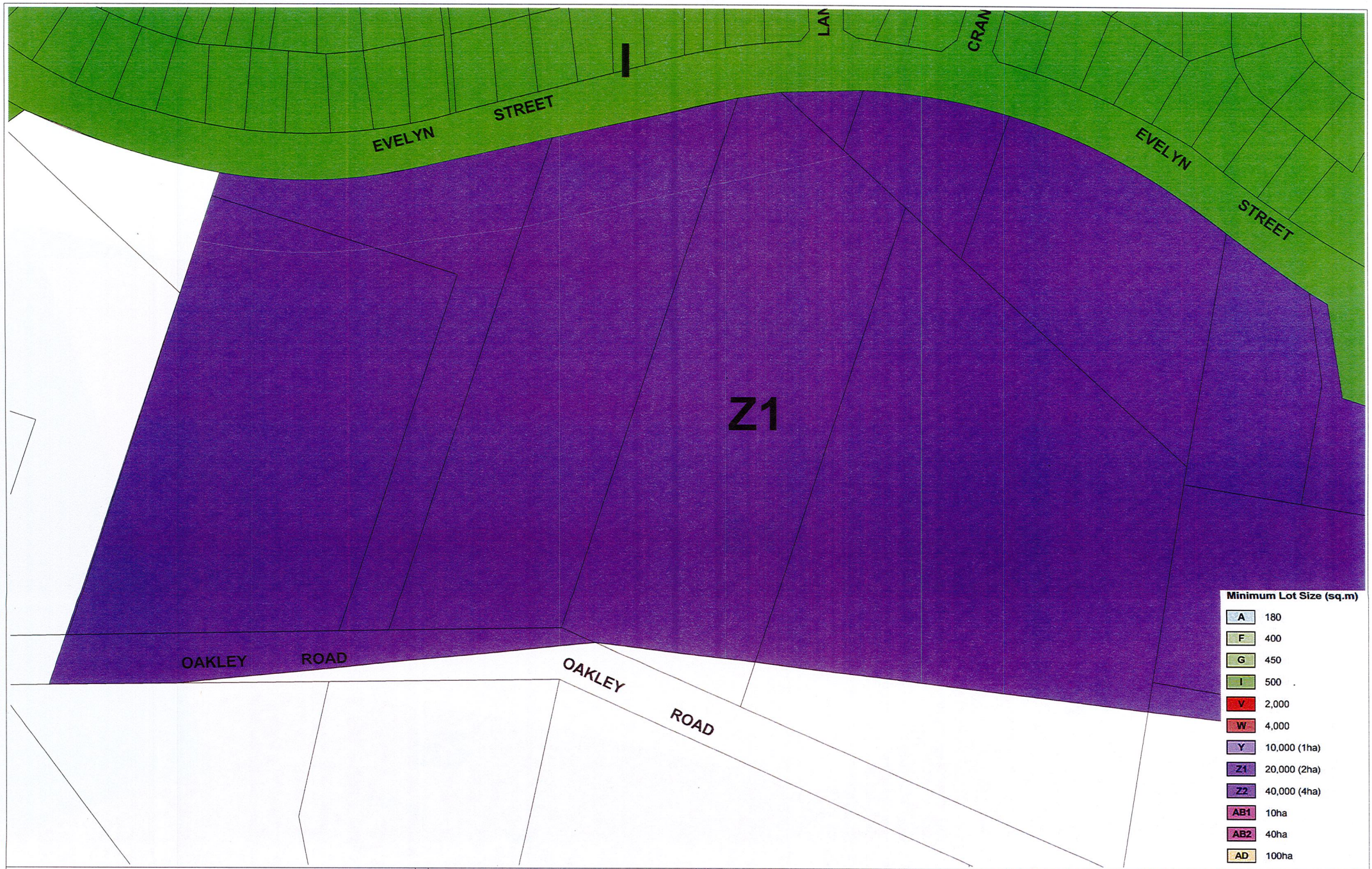
Disclaimer:
While every reasonable effort has been made to ensure that this plan is correct at the time of creation, Planzone Consulting, its agents and employees, disclaim any and all liability to any person in respect of anything or the consequences of anything done or omitted to be done in reliance upon the whole or any part of this plan.

Drawing Details

Proposal:	Subdivision
Address:	Evelyn Street, Macquarie Fields
LGA:	Campbelltown City Council
Drawing Title	Proposed Land Use Zoning
Scale:	1:1000
Project No.:	20150604
Drawing No.:	RZ01
Revision No.:	01
Drawn By:	AH
Date:	17/08/2016

Revisions

Rev No.	Revision Name	Issue Date	Rev No.	Revision Name	Issue Date
01	Final Revisions	17.08.2016			



N

PLANZONE CONSULTING
P: PO Box 3
Liverpool NSW 1871
T: (02) 9011 7620
E: enquiry@planzone.com.au
W: www.planzone.com.au

Notes

Do not scale off drawings, use stated measurements. All measurements to be confirmed on site prior to commencement of any works.

© Copyright
This plan is subject to copyright and remains the property of Planzone Consulting. This plans must not be used, copied, extend, reproduced, disseminated or redistributed, in whole or part without the prior written consent of Planzone Consulting.

These plans are site specific and can only be used for the project and property as stated in the drawing details section of this plan.

These plans have been prepared to illustrate design intent only and any construction is to be done so in accordance with the relevant local and statutory standards, codes and regulations including, but not limited to, the Building Code of Australia and Australian Standards.

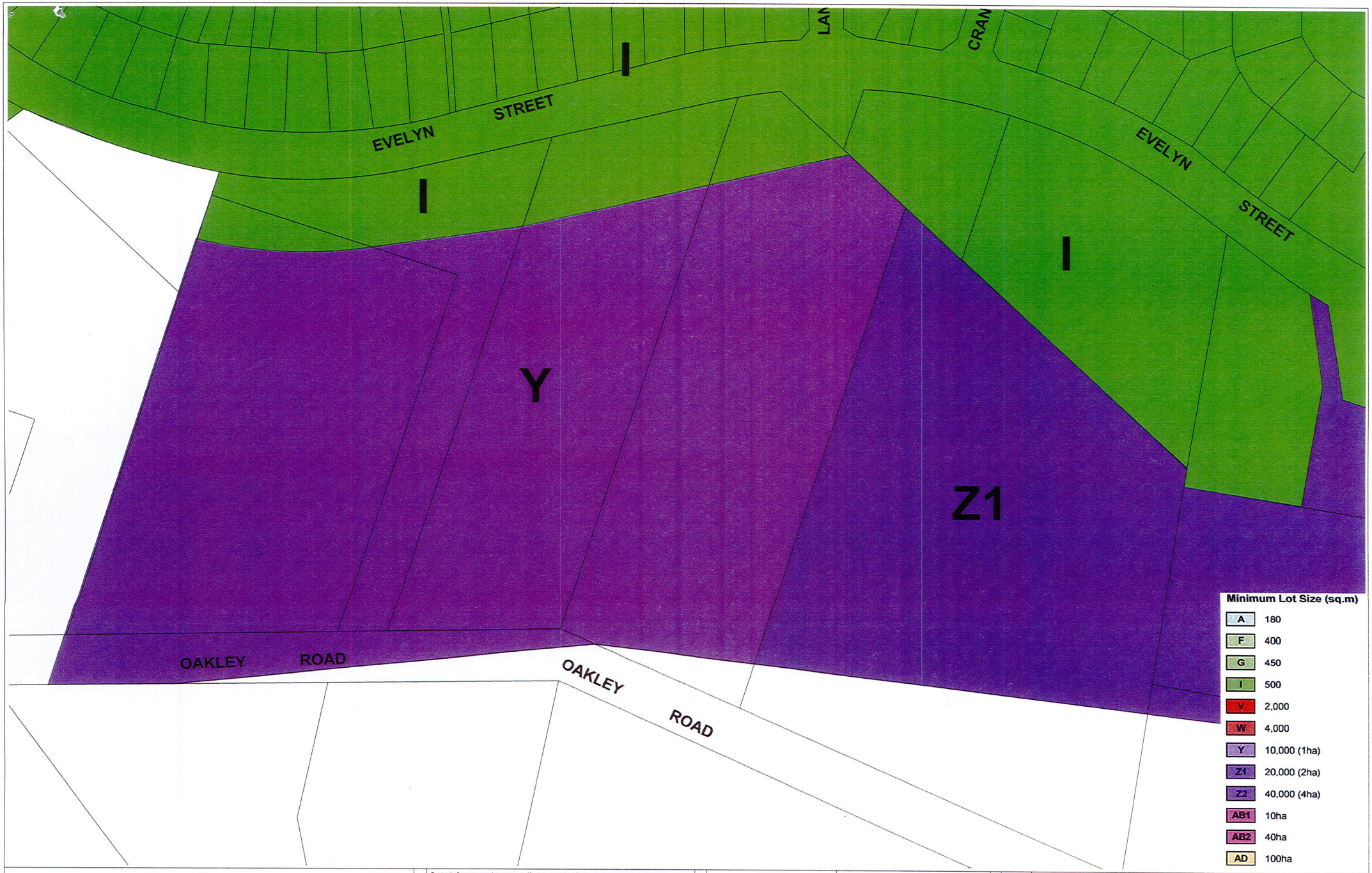
Disclaimer:
While every reasonable effort has been made to ensure that this plan is correct at the time of creation, Planzone Consulting, its agents and employees, disclaim any and all liability to any person in respect of anything or the consequences of anything done or omitted to be done in reliance upon the whole or any part of this plan.

Drawing Details

Proposal:	Subdivision
Address:	Evelyn Street, Macquarie Fields
LGA:	Campbelltown City Council
Drawing Title	Existing Minimum Lot Size
Scale:	1:1000
Project No.:	20150604
Drawing No.:	LSZ01
Revision No.:	01
Drawn By:	AH
Date:	17/08/2016

Revisions

Rev No.	Revision Name	Issue Date	Rev No.	Revision Name	Issue Date
01	Final Revisions	17.08.2016			



N

PLANZONE CONSULTING
P: PO Box 3
Liverpool NSW 1871
T: (02) 8011 7620
E: enquiry@planzone.com.au
W: www.planzone.com.au

Notes

Do not scale off drawings, use scaled measurements. All measurements to be confirmed on site prior to commencement of any works.

© Copyright
This plan is subject to copyright and remains the property of Planzone Consulting. This plans must not be used, copied, reproduced, disseminated or republished in whole or part without the prior written consent of Planzone Consulting.

These plans are site specific and can only be used for the project and property stipulated in the drawing details section of this plan.

These plans have been prepared to illustrate design intent only and are conceptual in its done so in accordance with the relevant local and statutory standards, codes and regulations including, but not limited to, the Building Code of Australia and Australian Standards.

Disclaimer:
While every reasonable effort has been made to ensure that this plan is correct at the time of creation, Planzone Consulting, its agents and employees, disclaim any and all liability to any person in respect of anything or the consequences of anything done or omitted to be done in reliance upon the whole or any part of this plan.

Drawing Details

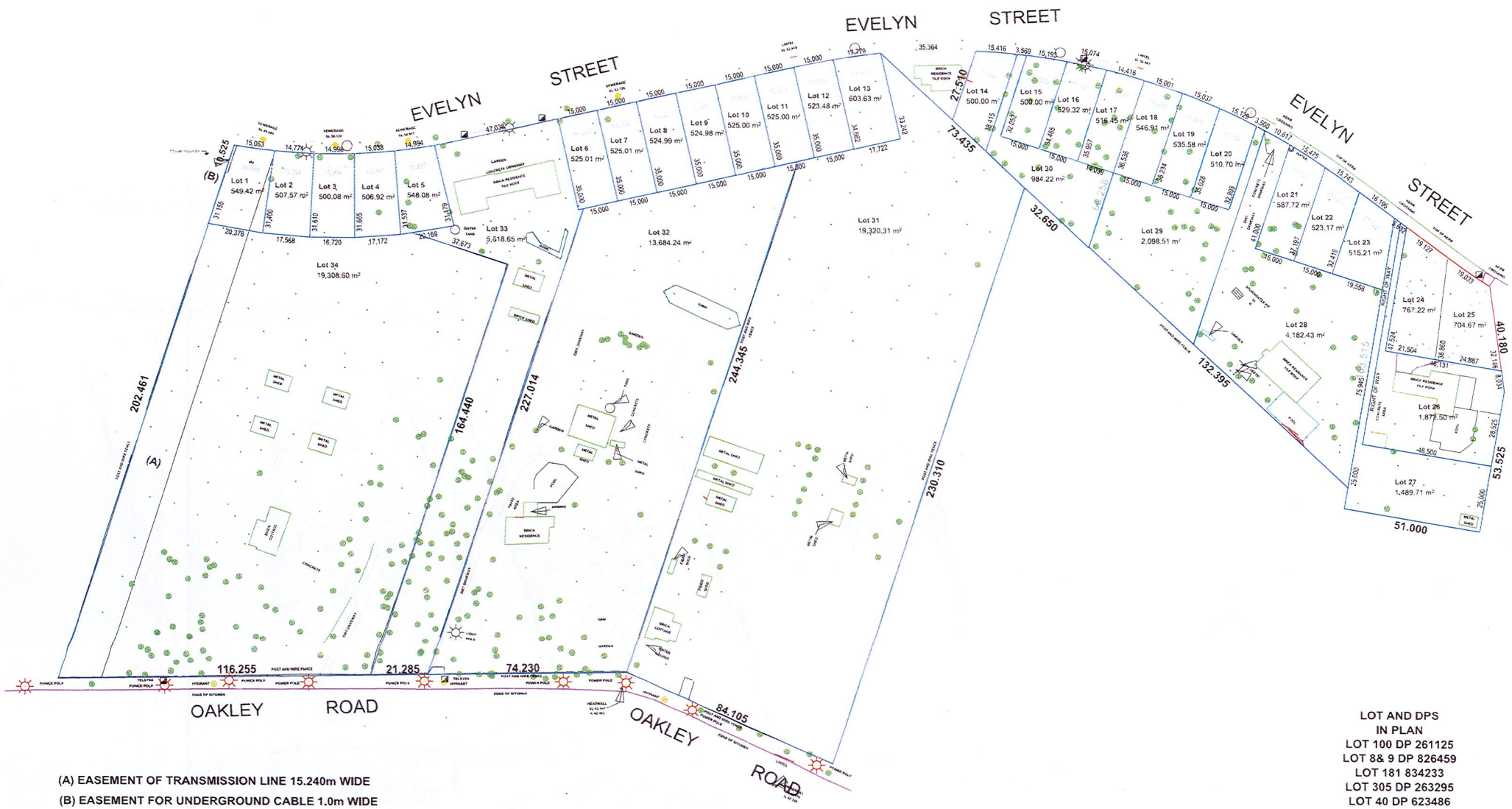
Proposal:	Subdivision
Address:	Evelyn Street, Macquarie Fields
LGA:	Campbelltown City Council
Drawing Title	Proposed Minimum Lot Size
Scale:	1:1000
Project No.:	20150604
Drawing No.:	LSZ01
Revision No.:	01
Drawn By:	AH
Date:	17/08/2016

Revisions

Rev No.	Revision Name	Issue Date	Rev No.	Revision Name	Issue Date
01	Final Revisions	17/08/2016			

Appendix 6

Indicative Subdivision Layout



(A) EASEMENT OF TRANSMISSION LINE 15.240m WIDE

(B) EASEMENT FOR UNDERGROUND CABLE 1.0m WIDE

LOT AND DPS
IN PLAN
LOT 100 DP 261125
LOT 8& 9 DP 826459
LOT 181 834233
LOT 305 DP 263295
LOT 40 DP 623486
LOT 1 DP 533662

N

PLANZONE CONSULTING

P: PO Box 3
Liverpool NSW 1871
T: (02) 9011 7620
E: enquiry@planzone.com.au
W: www.planzone.com.au

Notes

Do not scale off drawings, use stated measurements. All measurements to be confirmed on site prior to commencement of any works.

© Copyright
This plan is subject to copyright and remains the property of Planzone Consulting. This plans must not be used, copied, stored, reproduced, disseminated or incorporated in whole or part without the prior written consent of Planzone Consulting.

These plans are site specific and can only be used for the project and property stipulated in the drawing details section of this plan.

These plans have been prepared to illustrate design intent only and any construction is to be done so in accordance with the relevant local and statutory standards, codes and regulations including, but not limited to, the Building Code of Australia and Australian Standards.

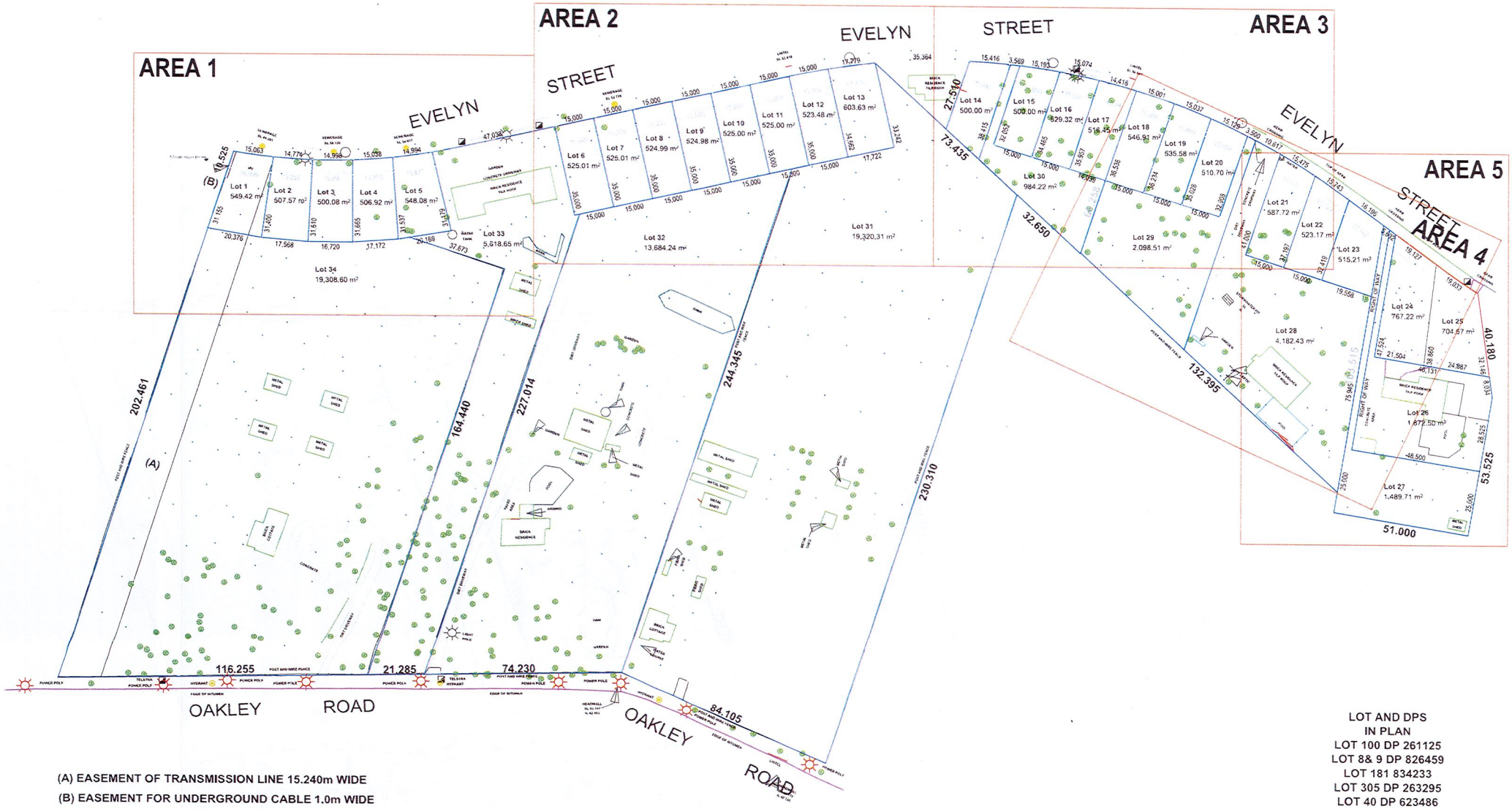
Disclaimer:
While every reasonable effort has been made to ensure that this plan is correct at the time of creation, Planzone Consulting, its agents and employees, disclaim any and all liability to any person in respect of anything or the consequences of anything done or omitted to be done in reliance upon the whole or any part of this plan.

Drawing Details

Proposal:	Subdivision
Address:	Evelyn Street, Macquane Fields
LGA:	Campbelltown City Council
Drawing Title	Proposed Subdivision Plan
Scale:	1:1000
Project No.:	20150604
Drawing No.:	PP01
Revision No.:	06
Drawn By:	AH
Date:	17/08/2016

Revisions

Rev No.	Revision Name	Issue Date	Rev No.	Revision Name	Issue Date
01	Draft 1 for Client Review	16/03/2016			
02	Draft 2 for Client Review	23/03/2016			
03	Draft 3 for Client Review	31/03/2016			
04	Draft 4 for Client Review	22/04/2016			
05	Revised Lot Layout for NKG	1/07/2016			
06	Final Revisions	17/08/2016			



(A) EASEMENT OF TRANSMISSION LINE 15.240m WIDE

(B) EASEMENT FOR UNDERGROUND CABLE 1.0m WIDE

LOT AND DPS
IN PLAN
LOT 100 DP 261125
LOT 8& 9 DP 826459
LOT 181 834233
LOT 305 DP 263295
LOT 40 DP 623486
LOT 1 DP 533662

N

PLANZONE CONSULTING
P: PO Box 3
Liverpool NSW 1871
T: (02) 9011 7620
E: enquiry@planzone.com.au
W: www.planzone.com.au

Notes

Do not scale off drawings, use stated measurements. All measurements to be confirmed on site prior to commencement of any work.

© Copyright
This plan is subject to copyright and remains the property of Planzone Consulting. This plans must not be used, copied, reproduced, disseminated or transmitted, in whole or part without the prior written consent of Planzone Consulting.

These plans are site specific and can only be used for the project and property stipulated in the drawing details section of this plan.

These plans have been prepared to illustrate design intent only and any construction is to be done so in accordance with the relevant local and statutory standards, codes and regulations including, but not limited to, the Building Code of Australia and Australian Standards.

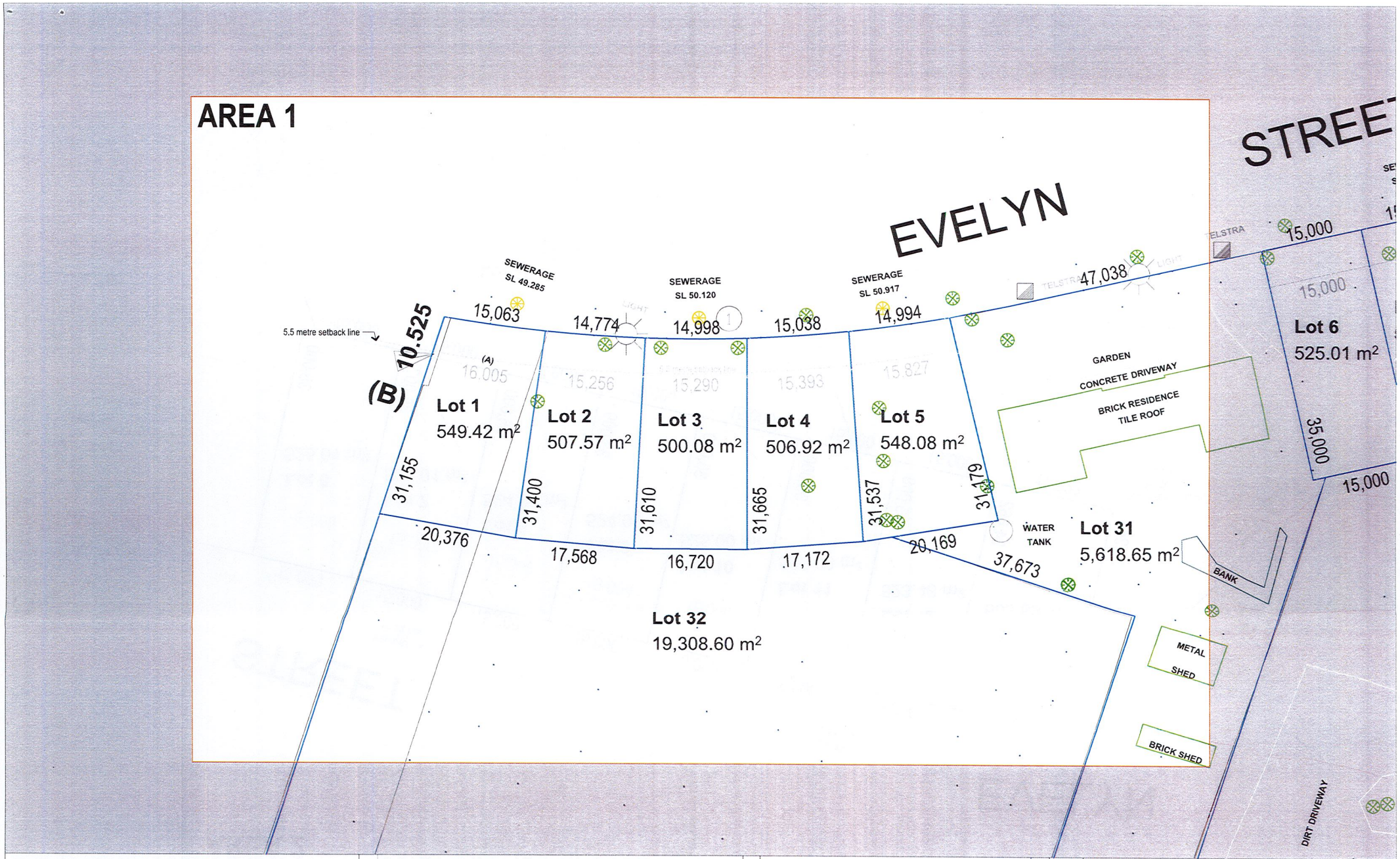
Disclaimer
While every reasonable effort has been made to ensure that this plan is correct at the time of creation, Planzone Consulting, its agents and employees, disclaim any and all liability to any person in respect of anything or the consequences of anything done or omitted to be done in reliance upon the whole or any part of this plan.

Drawing Details

Proposal:	Subdivision
Address:	Evelyn Street, Macquarie Fields
LGA:	Campbelltown City Council
Drawing Title	Zone Areas Plan
Scale	1:1000
Project No.	20150604
Drawing No.	PP02
Revision No.	04
Drawn By:	AH
Date:	17/08/2016

Revisions

Rev No.	Revision Name	Issue Date	Rev No.	Revision Name	Issue Date
01	Draft 3 for Client Review	31/03/2016			
02	Draft 4 for Client Review	22/04/2016			
03	Revised Lot Layout for NKG	1/07/2016			
04	Final Revisions	17/08/2016			



N

PLANZONE
CONSULTING

P: PO Box 3
Liverpool NSW 1871
T: (02) 9011 7620
E: enquiry@planzone.com.au
W: www.planzone.com.au

Notes

Do not scale off drawings, use scaled measurements. All measurements to be confirmed on site prior to commencement of any works.

© Copyright
This plan is subject to copyright and remains the property of Planzone Consulting. The plans must not be used, copied, edited, reproduced, disseminated or redistributed, in whole or part without the prior written consent of Planzone Consulting.

These plans are site specific and can only be used for the project and property stipulated in the drawing details section of this plan.

These plans have been prepared to illustrate design intent only and any construction is to be done so in accordance with the relevant local and statutory standards, codes and regulations including, but not limited to, the Building Code of Australia and Australian Standards.

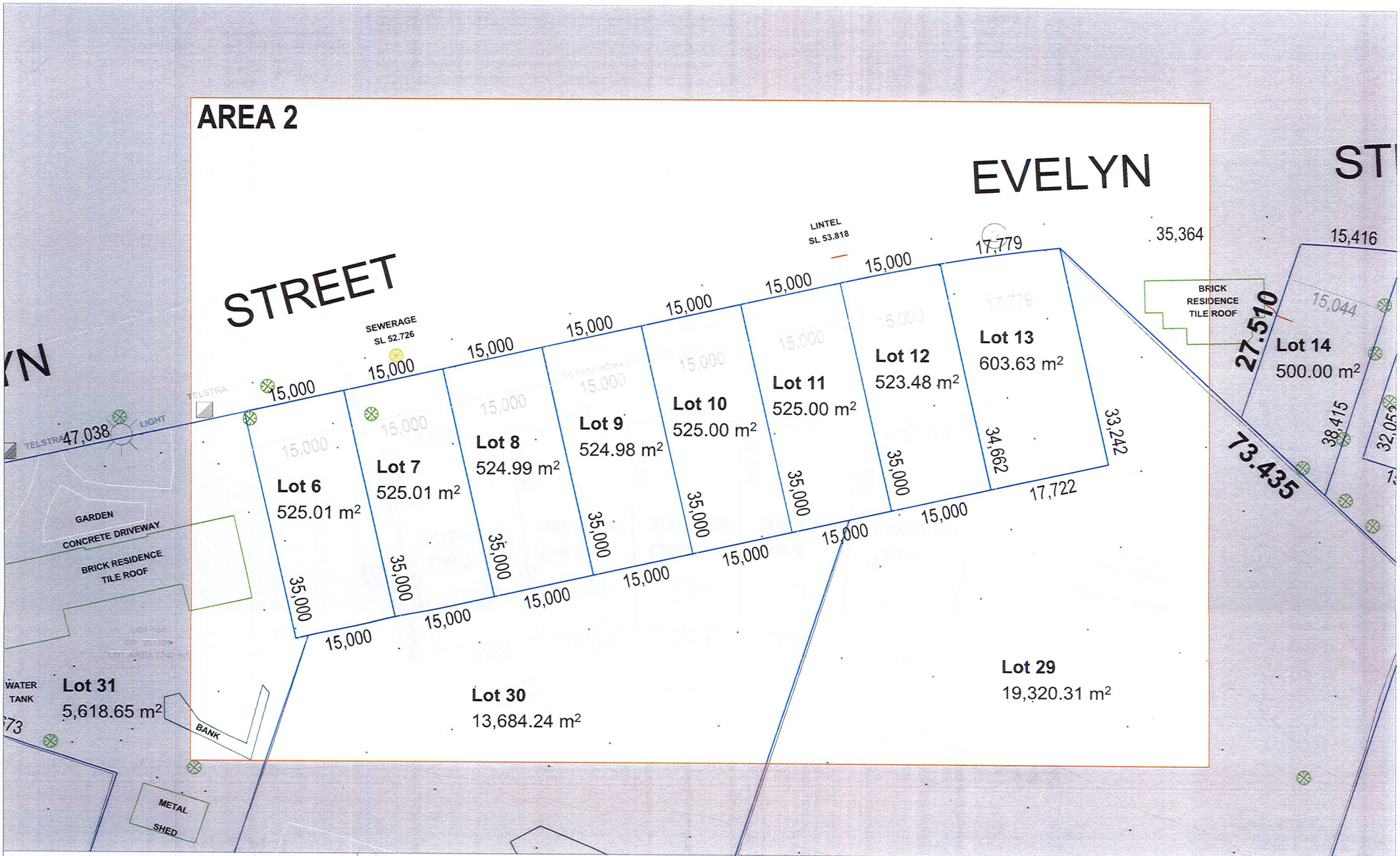
Disclaimer:
While every reasonable effort has been made to ensure that this plan is correct at the time of creation, Planzone Consulting, its agents and employees, disclaim any and all liability to any person in respect of anything or the consequences of anything done or omitted to be done in reliance upon the whole or any part of this plan.

Drawing Details

Proposal:	Subdivision		
Address:	Evelyn Street, Macquarie Fields		
LGA:	Campbelltown City Council		
Drawing Title:	Area 1 Detail Plan		
Scale:	1:500	Drawn By:	AH
Project No.:	20150604	Drawing No.:	PP03
Revision No.:	04	Date:	17/08/2016

Revisions

No.	Amendments	Date
01	Draft 3 for Client Review	31/03/2016
02	Draft 4 for Client Review	22/04/2016
03	Revised Lot Layout for NKG	1/07/2016
04	Final Revisions	17/08/2016



N

PLANZONE
CONSULTING

P: PO Box 3
Liverpool NSW 1871
T: (02) 9011 7620
E: enquiry@planzone.com.au
W: www.planzone.com.au

Notes

Do not scale off drawings, use scaled measurements. All measurements to be confirmed on site prior to commencement of any works.

© Copyright
This plan is subject to copyright and remains the property of Planzone Consulting. The plans must not be used, copied, edited, reproduced, disseminated or redistributed, in whole or part without the prior written consent of Planzone Consulting.

These plans are site specific and can only be used for the project and property stipulated in the drawing details section of this plan.

These plans have been prepared to illustrate design intent only and any construction is to be done so in accordance with the relevant local and statutory standards, codes and regulations including, but not limited to, the Building Code of Australia and Australian Standards.

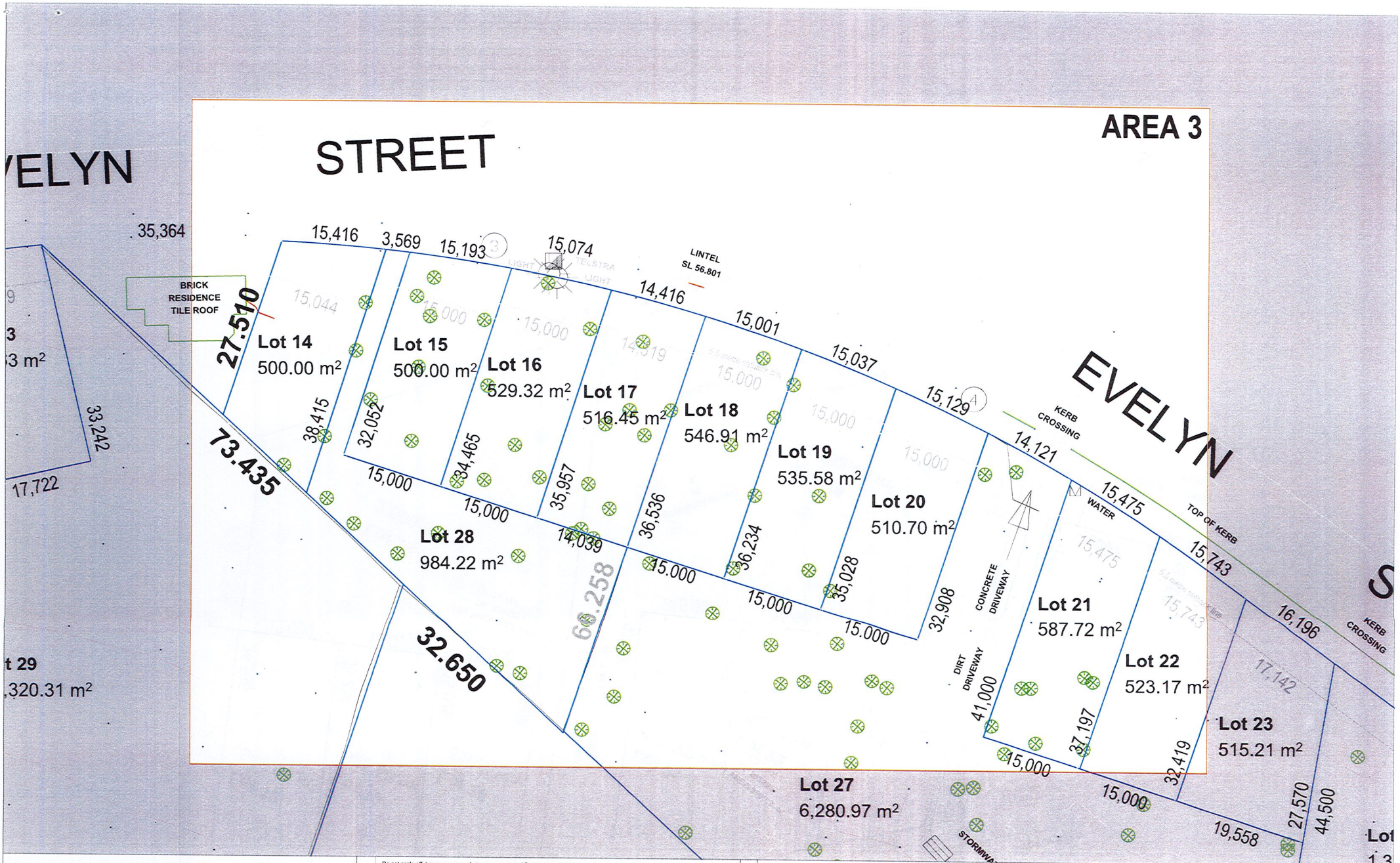
Disclaimer:
While every reasonable effort has been made to ensure that this plan is correct at the time of creation, Planzone Consulting, its agents and employees, disclaim any and all liability to any person in respect of anything or the consequences of anything done or omitted to be done in reliance upon the whole or any part of this plan.

Drawing Details

Proposal:	Subdivision		
Address:	Evelyn Street, Macquarie Fields		
LGA:	Campbelltown City Council		
Drawing Title:	Area 2 Detail Plan		
Scale:	1:500	Drawn By:	AH
Project No.:	20150604	Drawing No.:	PP04
Revision No.:	04	Date:	17/08/2016

Revisions

No.	Amendments	Date
01	Draft 3 for Client Review	31/03/2016
02	Draft 4 for Client Review	22/04/2016
03	Revised Lot Layout for NKG	1/07/2016
04	Final Revisions	17/08/2016



N

PLANZONE CONSULTING

P: PO Box 3
Liverpool NSW 1871
T: (02) 9011 7620
E: enquiry@planzone.com.au
W: www.planzone.com.au

Notes

Do not scale off drawings, use scaled measurements. All measurements to be confirmed on site prior to commencement of any works.

© Copyright
This plan is subject to copyright and remains the property of Planzone Consulting. The plans must not be used, copied, edited, reproduced, disseminated or redistributed, in whole or part without the prior written consent of Planzone Consulting.

These plans are site specific and can only be used for the project and property stipulated in the drawing details section of this plan.

These plans have been prepared to illustrate design intent only and any construction is to be done so in accordance with the relevant local and statutory standards, codes and regulations including, but not limited to, the Building Code of Australia and Australian Standards.

Disclaimer:
While every reasonable effort has been made to ensure that this plan is correct at the time of creation, Planzone Consulting, its agents and employees, disclaim any and all liability to any person in respect of anything or the consequences of anything done or omitted to be done in reliance upon the whole or any part of this plan.

Drawing Details

Proposal:	Subdivision		
Address:	Evelyn Street, Macquarie Fields		
LGA:	Campbelltown City Council		
Drawing Title:	Area 3 Detail Plan		
Scale:	1:500	Drawn By:	AH
Project No.:	20150604	Drawing No.:	PP05
Revision No.:	04	Date:	17/08/2016

Revisions

No.	Amendments	Date
01	Draft 3 for Client Review	31/03/2016
02	Draft 4 for Client Review	22/04/2016
03	Revised Lot Layout for NKG	1/07/2016
04	Final Revisions	17/08/2016

N

PLANZONE CONSULTING

P: PO Box 3
Liverpool NSW 1871
T: (02) 9011 7620
E: enquiry@planzone.com.au
W: www.planzone.com.au

Notes

Do not scale off drawings, use scaled measurements. All measurements to be confirmed on site prior to commencement of any works.

© Copyright
This plan is subject to copyright and remains the property of Planzone Consulting. The plans must not be used, copied, edited, reproduced, disseminated or redistributed, in whole or part without the prior written consent of Planzone Consulting.

These plans are site specific and can only be used for the project and property stipulated in the drawing details section of this plan.

These plans have been prepared to illustrate design intent only and any construction is to be done so in accordance with the relevant local and statutory standards, codes and regulations including, but not limited to, the Building Code of Australia and Australian Standards.

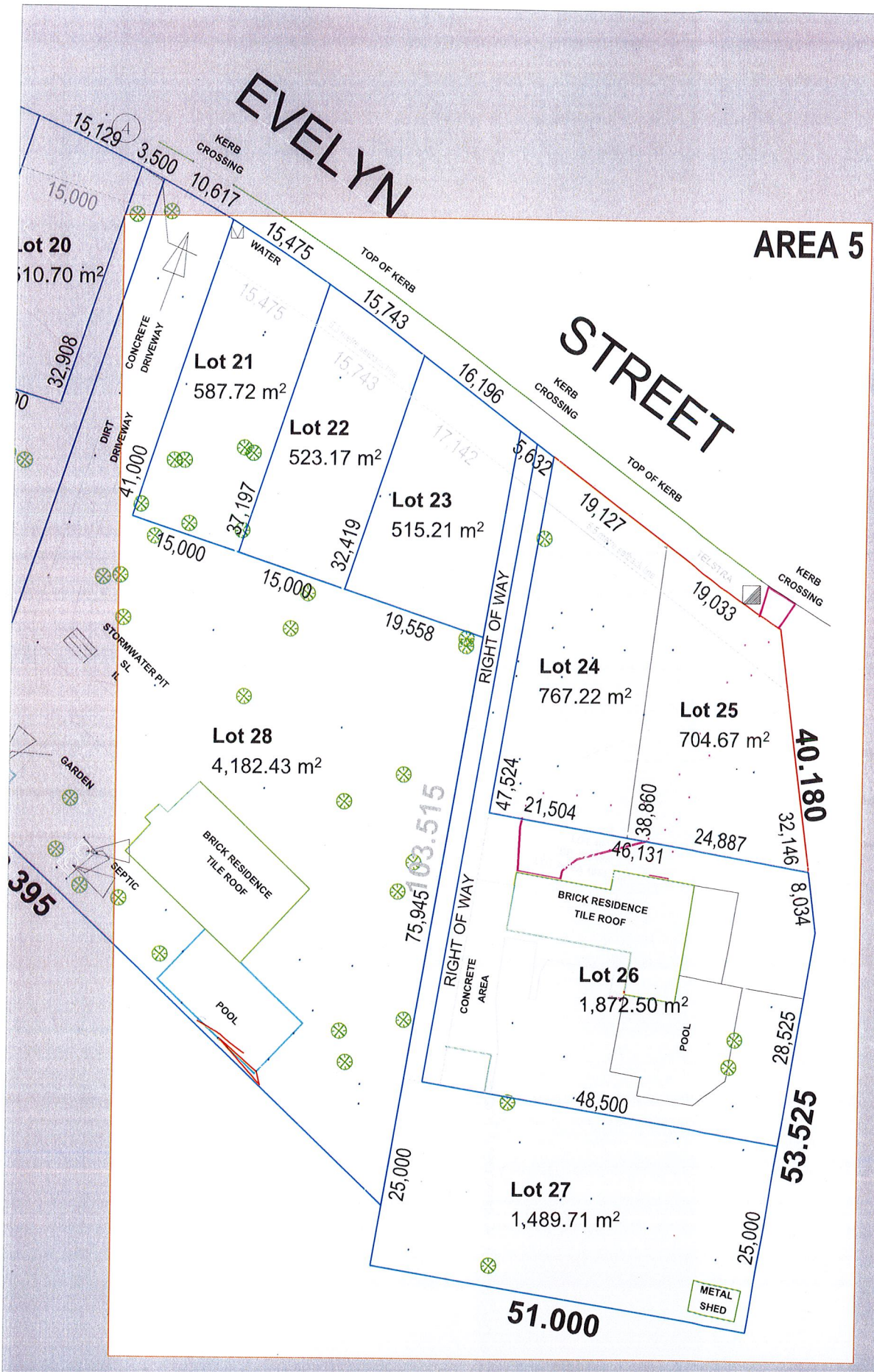
Disclaimer:
While every reasonable effort has been made to ensure that this plan is correct at the time of creation, Planzone Consulting, its agents and employees, disclaim any and all liability to any person in respect of anything or the consequences of anything done or omitted to be done in reliance upon the whole or any part of this plan.

Drawing Details

Proposal:	Subdivision		
Address:	Evelyn Street, Macquarie Fields		
LGA:	Campbelltown City Council		
Drawing Title:	Area 4 Detail Plan		
Scale:	1:500	Drawn By:	AH
Project No.:	20150604	Drawing No.:	PP06
Revision No.:	02	Date:	17/08/2016

Revisions

No.	Amendments	Date
01	Revised Lot Layout for NKG	1/07/2016
02	Final Revisions	17/08/2016



No.	Amendments	Date
01	Draft 3 for Client Review	31/03/2016
02	Draft 4 for Client Review	22/04/2016
03	Revised Lot Layout for NKG	1/07/2016
04	Final Revisions	17/08/2016

Revisions

Drawing Details

Proposal:	Subdivision
Address:	Evelyn Street, Macquarie Fields
LGA:	Campbelltown City Council
Drawing Title:	Area 5 Detail Plan
Scale:	1:500
Project No.:	20150604
Revision No.:	04
Drawn By:	AH
Drawing No.:	PP06
Date:	17/08/2016

Notes

Do not scale off drawings. Use scaled measurements. All measurements to be confirmed on site prior to commencement of any works.

© Copyright
This plan is subject to copyright and remains the property of Planzone Consulting. The plans must not be used, copied, edited, reproduced, disseminated or redistributed, in whole or part without the prior written consent of Planzone Consulting.

These plans are site specific and can only be used for the project and property stipulated in the drawing details section of this plan.

These plans have been prepared to illustrate design intent only and any construction is to be done so in accordance with the relevant local and statutory standards, codes and regulations including, but not limited to, the Building Code of Australia and Australian Standards.

Disclaimer:
While every reasonable effort has been made to ensure that this plan is correct at the time of creation, Planzone Consulting, its agents and employees do not accept any responsibility to any person in respect of anything done or omitted to be done in reliance upon the whole or any part of this plan.

PLANZONE CONSULTING
P: PO Box 3
Liverpool NSW 1871
T: (02) 9011 7620
E: enquiry@planzone.com.au
W: www.planzone.com.au

N

Appendix 7

A Plan for Growing Sydney Assessment Table

A PLAN FOR GROWING SYDNEY

	ACTION	DISCUSSION	COMPLIES?
GOAL 2 SYDNEY'S HOUSING CHOICES			
Over the next 20 years, the population in Sydney will grow much faster than in the last 20 years. Projections indicate that Sydney will need around 664,000 additional homes over the next 20 years. New housing will be needed in greenfield locations and the established urban area.			
DIRECTION 2.1: Accelerate Housing Supply Across Sydney			
2.1.1 - Accelerate housing supply and local housing choices	The Government is working to achieve its target of an additional 664,000 new dwellings by 2031. Increasing housing supply and addressing housing affordability and choice, requires the Government to: • work with councils to identify where development is feasible; • identify where investments in local infrastructure can create housing supply; • target locations which deliver homes closer to jobs; • directly facilitate housing supply and choice through the projects of UrbanGrowth NSW and Priority Precincts; and • direct the Greater Sydney Commission to work with councils over the long-term with a requirement that councils review housing needs when preparing their Local Environmental Plans.		
	The Government anticipates that these actions will increase housing supply across the whole metropolitan area, particularly in and around centres and greenfield areas. The most suitable areas for significant urban renewal are those areas best connected to employment and include: • in and around centres that are close to jobs and are serviced by public transport services that are frequent and capable of moving large numbers of people; and • in and around strategic centres.	It is anticipated that Council will be able to work with the Government to facilitate the proposed rezoning. The proposed rezoning will contribute to the supply of housing in the Campbelltown LGA.	✓
	The Government and local councils need to understand and respond to the housing market in each and every Local Government Area. The housing market reflects consumer demand and willingness to pay for particular types of housing in particular locations. • Local councils assist housing production by identifying and rezoning suitable sites for housing. It is the role of the private sector to build new houses. • Rezoned land will only translate into new housing construction where there is sufficient market demand. • The Government will use the Urban Feasibility Model to test local planning controls to see if they are likely to deliver housing where people want to live. The Urban Feasibility Model is a strategic planning tool which calculates the housing potential of each LGA, based on existing planning and development controls and the economic feasibility of delivering housing, based on development costs and the local housing market. • The Government will continue to work with councils so that local plans can deliver the level and type of housing that Sydney needs.		

A PLAN FOR GROWING SYDNEY			
	ACTION	DISCUSSION	COMPLIES?
DIRECTION 2.2:	**Accelerate Urban Renewal Across Sydney - Providing Homes Closer to Jobs**		
2.1.2 - Use the Greater Sydney Commission to support Council-led urban infill projects	A significant proportion of Sydney's additional housing supply needs to come from urban infill across Sydney. While significant programs are in place for large-scale urban renewal projects, small scale urban infill development can also have an impact on the demand for infrastructure services. Urban infill will be most successful where development is coordinated with social infrastructure delivery. The Government will: • support council-led urban infill and to support local efforts to lift housing production around local centres, transport corridors and public transport access points; and • • work with councils to improve their urban renewal skills, and to improve the coordination between the NSW Government, councils and private proponents of local urban infill projects.	The proposed rezoning comprises a small scale urban infill development, proposed in an area which has access to existing infrastructure services as well as established retail, community and open space land uses. This PP is the only means by which to facilitate the future development of the subject land for low density residential purposes, the highest and best land use.	✓
DIRECTION 2.3:	**Improve Housing Choice to Suit Different Needs and Lifestyles**		
2.3.2 - Enable the subdivision of existing homes and lots in areas suited to medium density housing	Subdividing existing homes and lots in areas that are suitable for medium density housing can help to meet consumer demand and reduce the cost of housing. By removing the barriers to subdivision of existing homes and blocks of a suitable size, more affordable housing options can be offered. The Government will: • modify the Standard Instrument Local Environmental Plan to make local development controls more consistent across Sydney.	The proposed rezoning will be facilitating the future residential subdivision of the subject land to assist with the provision of affordable housing in the Campbelltown LGA.	✓
SOUTH WEST SUBREGION The South West subregion is the fastest growing subregion in Sydney.			
	Accelerate housing supply, choice and affordability and build great places to live • Identify suitable locations for housing, employment and urban renewal - particularly around established and new centres and along key public transport corridors including the Cumberland Line, the South Line, the Bankstown Line, the South West Rail Link and the Liverpool-Parramatta T-Way.	This PP demonstrates the suitability of the subject land for residential development, given the proximity of the subject land to existing services. The subject land is also well located having regard to public transport, with bus services regularly servicing Evelyn Street, providing links to Campbelltown and Liverpool. The Macquarie Fields train station is also nearby, with services to the City and Wollongong.	✓
Priorities for Strategic Centres	**Campbelltown-Macarthur** • Work with council to retain a commercial core in Campbelltown-Macarthur, as required for long-term employment growth. • Work with council to provide capacity for additional mixed-use development in Campbelltown-Macarthur including offices, retail, services and housing. • Support health-related land uses and infrastructure around Campbelltown Hospital. • Support education-related land uses and infrastructure around the University of Western Sydney. • Work with council to investigate potential business park opportunities on the western side of the train line. • Work with council to improve walking and cycling connections to Campbelltown and Macarthur train stations from the western side of the train line. • Work with council to improve walking and cycling connections between Campbelltown Hospital and Queen Street.	The proposed rezoning will not offend these provisions.	✓

Appendix 8

Greater Metropolitan Regional Environmental Plan No. 2 - Georges River Catchment Assessment Table

GREATER METROPOLITAN REGIONAL ENVIRONMENTAL PLAN NO. 2

	PRINCIPLE	DISCUSSION	COMPLIES?
Cl. 8	**GENERAL PRINCIPLES**		
	When this Part applies the following must be taken into account: (a) the aims, objectives and planning principles of this plan, (b) the likely effect of the proposed plan, development or activity on adjacent or downstream local government areas, (c) the cumulative impact of the proposed development or activity on the Georges River or its tributaries, (d) any relevant plans of management including any River and Water Management Plans approved by the Minister for Environment and the Minister for Land and Water Conservation and best practice guidelines approved by the Department of Urban Affairs and Planning (all of which are available from the respective offices of those Departments), (e) the Georges River Catchment Regional Planning Strategy (prepared by, and available from the offices of, the Department of Urban Affairs and Planning), (f) all relevant State Government policies, manuals and guidelines of which the council, consent authority, public authority or person has notice,	Subject to Gateway determination, further detailed studies can be prepared to ensure that the proposed rezoning will not offend the objectives of REP2 and will be consistent with items (b) to (f).	✓
	(g) whether there are any feasible alternatives to the development or other proposal concerned.	There are no other feasible alternatives to the proposed rezoning.	✓
Cl. 9	**SPECIFIC PLANNING PRINCIPLES**		
	When this Part applies, the following must be taken into account:		
	(2) **Bank disturbance** Disturbance of the bank or foreshore along the Georges River and its tributaries is to be avoided and those areas and any adjoining open space or vegetated buffer area must be protected from degradation.	The proposed rezoning does not have the potential to cause disturbance to the bank or foreshore along the Georges River or its tributaries. The subject land is sufficiently removed from the Georges River area.	✓
	(3) **Flooding** The following are to be recognised: (a) the benefits of periodic flooding to wetland and other riverine ecosystems, (b) the pollution hazard posed by development on flood liable land in the event of a flood, (c) the cumulative environmental effect of development on the behaviour of flood water and the importance of not filling flood prone land.	The subject land is not identified as being flood affected.	-
	(5) **Land degradation** Land degradation processes, such as: (a) erosion, (b) sedimentation, (c) deterioration of soil structure, (d) significant loss of native vegetation, (e) pollution of ground or surface water, (f) soil salinity and acidity, and (g) adverse effects on habitats and sensitive natural environments (aquatic and terrestrial) within the Catchment, must be avoided where possible, and minimised where avoidance is not possible.	Appropriate erosion and sedimentation control measures can be implemented as part of the future subdivision and dwelling construction phase, which will address these issues.	✓

GREATER METROPOLITAN REGIONAL ENVIRONMENTAL PLAN NO. 2

PRINCIPLE	DISCUSSION	COMPLIES?
(7) **River-related uses** Uses located on immediate foreshore land on the Georges River and its tributaries must be water-related and public access to the foreshore of the river and its tributaries must be provided in order to enhance the environment of the Catchment.	The proposed rezoning will not facilitate any uses on the immediate foreshore land on the Georges River or its tributaries.	-
(8) **Sewer overflows** The adverse impact of sewer overflows, including exfiltration, on the environment within the Catchment, and specifically on the water quality of the river and its tributaries, is to be recognised and that issue is to be addressed through appropriate planning and management of development within the Catchment.	Should a favourable Gateway outcome be achieved, this matter can be addressed as part of the detailed Gateway process.	✓
(9) **Urban/stormwater runoff** The impacts of stormwater runoff, including sewage contaminated runoff into or near streams within the Catchment, is to be minimised and mitigation measures that address urban stormwater runoff are to be implemented in accordance with the local council requirements and the Managing Urban Stormwater series of documents. Development is also to be in accordance with the *NSW State Rivers and Estuaries Policy* available from offices of the Department of Urban Affairs and Planning. Stormwater management must be integrated so that quality, quantity and land use aspects are all encompassed.	Should a favourable Gateway outcome be achieved, this matter can be addressed as part of the detailed Gateway process.	✓
(10) **Urban development areas** The environment within the Catchment is to be protected by ensuring that new or expanding urban development areas are developed in accordance with the Urban Development Program and the Metropolitan Strategy and that the requirements of the *NSW Floodplain Development Policy and Manual* (prepared by and available from the Department of Land and Water Conservation) are also satisfied. It is important to ensure that the level of nutrients entering the waterways and creeks is not increased by the development.	Should a favourable Gateway outcome be achieved, this matter can be addressed as part of the detailed Gateway process.	✓
(12) **Water quality and river flows** Water quality and river flows within the Catchment are to be improved through the implementation of environmental objectives for water quality and river flows agreed between the Minister for Environment and the Minister for Land and Water Conservation and by the application of consistent decisions affecting the use and management of land.	Should a favourable Gateway outcome be achieved, this matter can be addressed as part of the detailed Gateway process.	✓

Appendix 9

Section 117 Directions Assessment Table

SECTION 117 LOCAL PLANNING DIRECTIONS

DIRECTION		DISCUSSION	COMPLIES?
3. HOUSING, INFRASTRUCTURE AND URBAN DEVELOPMENT			
3.1 - Residential Zones	*Objectives* (1) The objectives of this direction are: (a) to encourage a variety and choice of housing types to provide for existing and future housing needs, (b) to make efficient use of existing infrastructure and services and ensure that new housing has appropriate access to infrastructure and services, and (c) to minimise the impact of residential development on the environment and resource lands.	This PP will facilitate the potential for low density residential housing opportunities in an area that is readily serviced by existing infrastructure and services, including community, education and retail services. The subject land does not constitute resource lands and the proposed rezoning will not have any adverse environmental impacts.	✓
	What a relevant planning authority must do if this direction applies (4) A planning proposal must include provisions that encourage the provision of housing that will: (a) broaden the choice of building types and locations available in the housing market, and (b) make more efficient use of existing infrastructure and services, and (c) reduce the consumption of land for housing and associated urban development on the urban fringe, and (d) be of good design.	This PP will contribute to the provision of affordable housing in the locality. The rezoning is proposed in an area that is readily serviced by existing infrastructure and services. The proposed rezoning comprises infill development which presents a logical use of land for low density residential development.	✓
	(5) A planning proposal must, in relation to land to which this direction applies: (a) contain a requirement that residential development is not permitted until land is adequately serviced (or arrangements satisfactory to the council, or other appropriate authority, have been made to service it), and (b) not contain provisions which will reduce the permissible residential density of land.	This is a matter to be addressed at the detailed Planning Proposal phase and this requirement can be readily addressed with LEP provisions. See above comment.	✓
4. HAZARD AND RISK			
4.4 - Planning for Bushfire Protection	*Objectives* (1) The objectives of this direction are: (h) to protect life, property and the environment from bush fire hazards, by discouraging the establishment of incompatible land uses in bush fire prone areas, and (i) to encourage sound management of bush fire prone areas.	A Bushfire Hazard Assessment (BHA) (Reference: 1820bf, dated: August 2016) has been prepared by Harris Environmental to identify the bushfire risk to the rezoning site, the key constraints and the general bushfire protection measures required.	
	What a relevant planning authority must do if this direction applies (4) In the preparation of a planning proposal the relevant planning authority must consult with the Commissioner of the NSW Rural Fire Service following receipt of a gateway determination under section 56 of the Act, and prior to undertaking community consultation in satisfaction of section 57 of the Act, and take into account any comments so made,	The BHA relevantly provides that site specific bushfire protection measures are not provided at this stage and this assessment should be used to inform subsequent stages in the development assessment process.	
	(5) A planning proposal must: (a) have regard to Planning for Bushfire Protection 2006, (b) introduce controls that avoid placing inappropriate developments in hazardous areas, and (c) ensure that bushfire hazard reduction is not prohibited within the APZ.	The BHA has undertaken an assessment of the proposed subdivision layout and has determined that Building construction standards will be BAL 29 or less in accordance with AS 3959-2009 'Construction of Buildings in Bushfire Prone Areas' for all proposed lots with the exception of one lot proposed on Lot 181 DP 834233 (proposed Lot 30), which will require an alternate solution to facilitate a suitable building envelope. Should a favourable Gateway Determination be achieved, the BHA has acknowledged that there is a possibility for an alternate solution subject to further assessment.	

SECTION 117 LOCAL PLANNING DIRECTIONS			
	DIRECTION	DISCUSSION	COMPLIES?
4.4 - Planning for Bushfire Protection	(6) A planning proposal must, where development is proposed, comply with the following provisions, as appropriate: (a) provide an Asset Protection Zone (APZ) incorporating at a minimum: (i) an Inner Protection Area bounded by a perimeter road or reserve which circumscribes the hazard side of the land intended for development and has a building line consistent with the incorporation of an APZ, within the property, and (ii) an Outer Protection Area managed for hazard reduction and located on the bushland side of the perimeter road, (b) for infill development (that is development within an already subdivided area), where an appropriate APZ cannot be achieved, provide for an appropriate performance standard, in consultation with the NSW Rural Fire Service. If the provisions of the planning proposal permit Special Fire Protection Purposes (as defined under section 100B of the Rural Fires Act 1997), the APZ provisions must be complied with, (c) contain provisions for two-way access roads which links to perimeter roads and/or to fire trail networks, (d) contain provisions for adequate water supply for firefighting purposes, (e) minimise the perimeter of the area of land interfacing the hazard which may be developed, (f) introduce controls on the placement of combustible materials in the Inner Protection Area.		
6. LOCAL PLAN MAKING			
6.1 - Approval and Referral Requirements	*Objective* (1) The objective of this direction is to ensure that LEP provisions encourage the efficient and appropriate assessment of development. *What a relevant planning authority must do if this direction applies* (4) A planning proposal must: (a) minimise the inclusion of provisions that require the concurrence, consultation or referral of development applications to a Minister or public authority, and (b) not contain provisions requiring concurrence, consultation or referral of a Minister or public authority unless the relevant planning authority has obtained the approval of: (i) the appropriate Minister or public authority, and (ii) the Director-General of the Department of Planning (or an officer of the Department nominated by the Director-General), prior to undertaking community consultation in satisfaction of section 57 of the Act, and (c) not identify development as designated development unless the relevant planning authority: (i) can satisfy the Director-General of the Department of Planning (or an officer of the Department nominated by the Director-General) that the class of development is likely to have a significant impact on the environment, and (ii) has obtained the approval of Director-General of Dept. of Planning (or an officer of the Department nominated by the Director-General) prior to undertaking community consultation in satisfaction of S.57 of the Act.	This PPR does not seek to include further provisions to the CLEP 2015 that will require the concurrence, consultation or referral of Development Applications to the Minister or public authority. In the instance that concurrence, consultation or referral of a Minister or public authority is required, Council will be required to obtain the relevant approvals prior to any community consultation being undertaken. This PP will not result in designated development.	✓ ✓ ✓
7. METROPOLITAN PLANNING			
7.1 - Implementation of A Plan for Growing Sydney	*Objective* (1) The objective of this direction is to give legal effect to the planning principles; directions; and priorities for subregions, strategic centres and transport gateways contained in A Plan for Growing Sydney. *What a Relevant Planning Authority must do if this direction applies* (4) Planning proposals shall be consistent with: (a) the NSW Government's A Plan for Growing Sydney published in December 2014.	This PP does not offend the planning principles, directions and priorities for the South West Subregion as detailed in A Plan for Growing Sydney. Refer to Appendix 7 which provides a discussion of the relevant provisions of A Plan for Growing Sydney. This PP is consistent with A Plan for Growing Sydney as has been demonstrated in Appendix 7.	✓ ✓

Supplementary Reports by Proponent (required by Council)

PLANNING PROPOSAL - EVELYN STREET, MACQUARIE FIELDS

Traffic Impact Statement
Ecology Report
Letter from Council
Stormwater Management Report
Pre-Development Catchment Plan
Stormwater Drainage Concept Plan
Stormwater Easement Concept Plan

APEX ENGINEERS

APEX Engineers
ABN 52 487 919 980

Traffic and Parking Specialists

www.apexengineers.com.au

May 2017

Attention: Traffic Engineer at the Campbelltown City Council

TRAFFIC IMPACT STATEMENT FOR THE PROPOSED 34 LOT RESIDENTIAL SUBDIVISION ALONG EVELYN STREET FRINGE, MACQUARIE FIELDS NSW 2564

APEX Engineers have been engaged by the Evelyn Street Landowner's Group to provide a traffic impact statement as a part of the planning application which seeks rezoning of the existing lots (Part Lot 100 DP 261125; Part Lots 8 & 9 DP 826459; Lot 181 DP 834233; Lot 305 DP 263295; Lot 40 DP 623486 and Part Lot 1 DP 533662) along Evelyn Street fringe in Macquarie Fields, which are presently zoned E4 Environmental Living to R2 Low Density Residential.

This technical note will provide information in relation to;

- The existing transport conditions within the vicinity of the subject site;
- The anticipated traffic generation potential of the subject proposal; and
- Conclusions and recommendations for the proposed development.

During preparation of this traffic impact statement, the following documents have been referenced;

- Guide to Traffic Generating Developments (RMS, 2002);
- Evelyn Street, Macquarie Fields - Proposed Subdivision Plan PP01-06 (Planzone Consulting, 2016); and
- Evelyn Street, Macquarie Fields – Planning Proposal PPR.20150604 (Planzone Consulting, 2016).

1 BACKGROUND AND EXISTING CONDITIONS

The subject land is located in Macquarie Fields with frontage to Evelyn Street, as shown in **Figure 1** below. Evelyn Street at the site frontage, is a collector street which includes a single traffic lane in each direction and a posted speed limit of 50 km/hr. It currently connects Harold Street to Eucalyptus Drive and contains a major bus route serving Macquarie Fields to the Campbelltown CBD. Furthermore, Evelyn Street currently includes an on street cycle way on either side of its carriageway and a pedestrian footpath along the northern boundary of the subject site (see **Figure 2**).

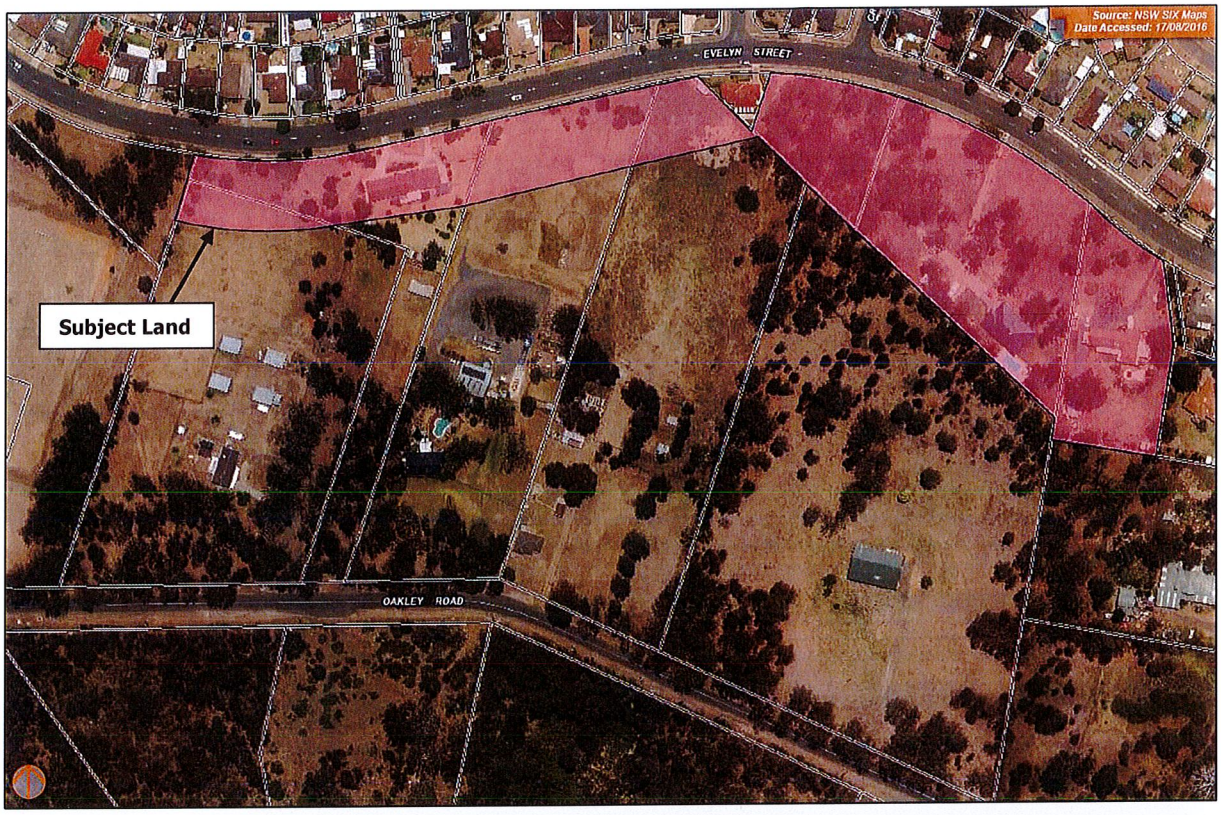


Figure 1: Location of the Subject Land (Extracted from Planzone Consulting Planning Proposal)

Figure 2: Existing Footpath and On-Street Cycleway along the Site Frontage on Evelyn Street

2 PUBLIC TRANSPORT ACCESSIBILITY

The local area was assessed for available public transport services that were both easily accessible from the subject site, and provide viable alternative options to private trips. This assessment identified that the site lies within walking distance to a number of bus routes, as listed below.

From Wills Road (approx. 500m from the subject site, 6 minute walk);

- **Bus route 876 –** Macquarie Fields loop via Eucalyptus Drive. Weekday service only.

From Groundsel Avenue (approx. 400m from the subject site, 5 minute walk);

- **Bus route 872 -** Campbelltown to Liverpool via Ingleburn, Macquarie Fields and Glenfield. Service operates daily.

Near Macquarie Fields High School (approx. 800m from the subject site, 9 minute walk);

- **Bus route 870** - Campbelltown to Liverpool via Ingleburn, Harrow Road and Glenfield. Service operates daily.

Figure 3 and **Figure 4** below provide the public transport map for the subject site area, outlining the coverage of the above listed services.

As per the above, there is a number of bus services that can be accessed within the vicinity (within a 10 minute walking distance) of the subject site. These routes operate with various frequencies, from low to high, and provide coverage to some suburbs including Campbelltown, Liverpool and Glenfield.

It is noted that both Ingleburn and Macquarie Fields train stations (which service T2: Airport, Inner West and South Line, T3: Bankstown Line and T5: Cumberland Line) are located approx. 3km from the subject site. Therefore, these train services are not considered to be accessible from the subject site by means of walking. As per the above, the subject site is moderately connected public transport services.

APEX ENGINEERS

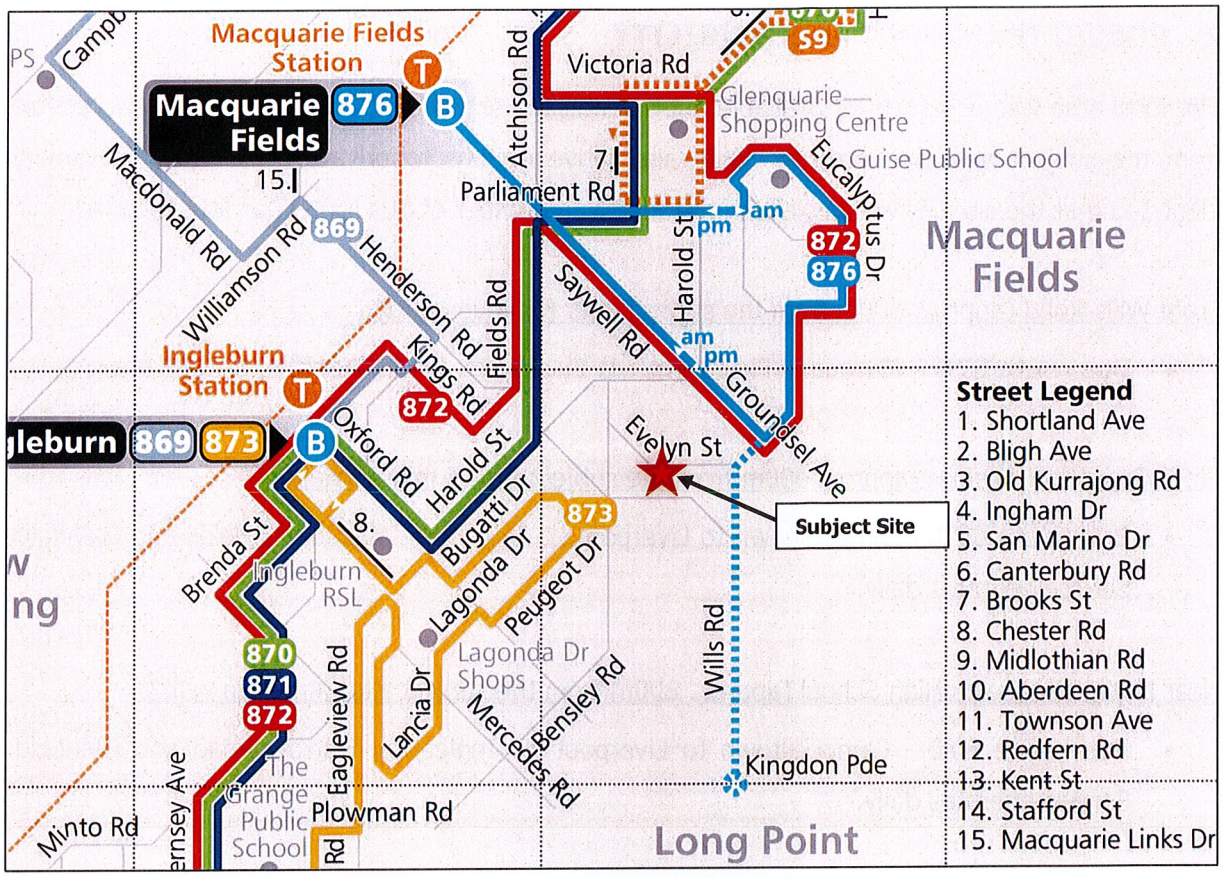


Figure 3: Public Transport Map for the Site Vicinity

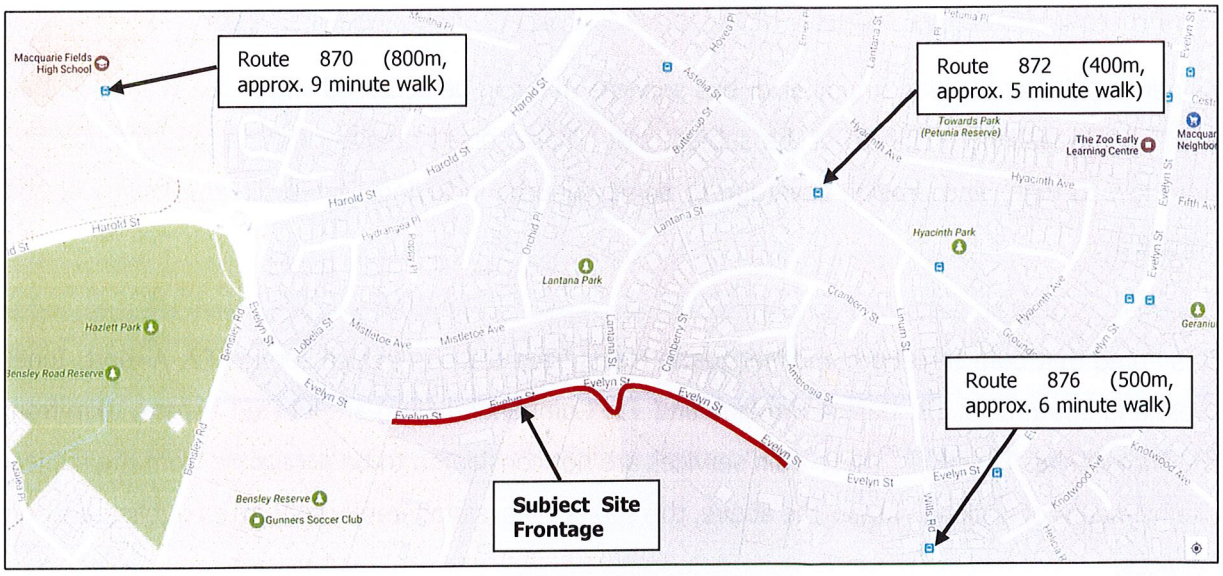


Figure 4: Bus Stop Locations within the Site Vicinity

3 WALKABILITY

The WalkScore tool was used to investigate the likelihood of car-less trips to and from the subject site. The WalkScore (www.walkscore.com) measures the walkability of any address using a patented system. For each address, Walk Score analyses hundreds of walking routes to nearby amenities. Points are awarded based on the distance to amenities in each category. Amenities within a 5 minute walk (.25 miles) are given maximum points. A decay function is used to give points to more distant amenities, with no points given after a 30 minute walk. Walk Score also measures pedestrian friendliness by analysing population density and road metrics such as block length and intersection density. Data sources include Google, Education.com, Open Street Map, the U.S. Census, Localeze, and places added by the Walk Score user community.

The subject site was found to have a WalkScore of 21 (which indicates that the subject site area is car dependent, where almost all errands require a car). Indeed, this WalkScore confirm the findings established in the earlier section – in relation to public transport service accessibility. Given the low density residential land use of the site vicinity, there exists only a few retail and commercial precincts that are accessible by means of walking.

In addition the WalkScore tool provides the 20 minute walking distance radius to and from the subject site. **Figure 5** below illustrates this 20 minute walking catchment to and from the subject site. As can be seen, this walking catchment includes a large area which predominantly includes parks and low density residential precincts.

Figure 5: 20 Minute Walking Catchment for the Subject Site

From the above information, it is evident that the future residents at the proposed residential dwellings at the subject land are likely to rely mostly on private transportation means (i.e. car trips) for most daily errands.

4 TRAFFIC GENERATING POTENTIAL OF THE PROPOSED DEVELOPMENT

The anticipated traffic generation potential, of the proposed subdivision development has been determined using the trip rates presented in the *Guide to Traffic Generating Developments (RMS 2002)* document. The following daily and peak hour trip rates provided, in the aforementioned document, for residential dwelling houses has been adopted for the subject proposal;

- *Daily vehicle trips = 9.0 per dwelling*
- *Weekday peak hour vehicle trips = 0.85 per dwelling*

It is noted that the RMS Guide stipulates that *the above rates are based on surveys conducted in areas where new residential subdivisions are being built. Public transport accessibility in such areas is often limited.* Accordingly, considering the limited public transport options available for the subject area, the above identified trip rates are deemed suitable for the proposed subdivision development.

The following table summarises daily and peak hour trip volumes estimated for the proposed development – note that the proposed rezoning would have the potential to yield some 34 residential lots.

Table 1: Anticipated Peak Hour and Daily Trips from the Proposed Development

Proposed Development	Daily Trips (in and out)	Peak Hour Trips (in and out)
34 residential lots	306 vehicles	29 vehicles

As can be seen from the above table, the subject proposal is likely to generate some 306 daily trips and 29 peak hour trips. It is noted that all the proposed 34 residential lots will gain vehicular access off Evelyn Street – therefore, all the trips generated will be realised on Evelyn Street mid-block locations. Given the purely residential nature of the proposal, most peak hour trips will likely be uni-directional (i.e. most trips will exit the site during AM peak and most trips will enter the site during PM peak).

Given the location of the subject site, it is noted that Harold Street/Evelyn Street intersection (roundabout) will experience the highest impact of the additional traffic. However, after this intersection, the traffic will be further distributed, thus resulting in lesser impacts. Also, given the low peak hour traffic generation level coupled with the distribution of this traffic across various roads as discussed above, the impacts of additional traffic generated from the proposed development, on the surrounding local road network, are expected to be minimal/negligible.

5 CONCLUSIONS

In light of the assessment presented in this document, the following can be concluded;

- The subject site is located within a predominantly residential area, with moderate connection to public transport service (only 3 bus routes are accessible within the walking distance of the site).
- Evelyn Street at the site frontage includes an on street cycle way on either side of its carriageway and a pedestrian footpath along the northern boundary of the subject site. However, the number of commercial and retail precincts accessible from the subject site by means of walking was found to be limited. Therefore, the subject area is likely to be car dependent.
- The subject proposal is likely to generate some 306 daily trips and 29 peak hour trips. All the trips generated will be realised on Evelyn Street mid-block locations. Given the purely residential nature of the proposal, most peak hour trips will likely be uni-directional (i.e. most trips will exit the site during AM peak and most trips will enter the site during PM peak).
- Given the low peak hour traffic generation level coupled with the distribution of this traffic across various roads, the impacts of additional traffic generated from the proposed development, on the surrounding local road network, are expected to be minimal/negligible.

Should Council require further information in relation to this assessment, please don't hesitate to contact the undersigned.

Supun Perera

Supun (Sam) Perera

BE Civil and Environmental Engineering (Hons), MS (Traffic Engineering)

NER, RPEQ

MIEAust, Member of AITPM

Traffic and Transport Engineer on behalf of APEX Engineers

Mobile: 041 6137635, Email: info@apexengineers.com.au

EVELYN STREET, MACQUARIE FIELDS

Flora and Fauna Assessment

For:

Evelyn Street Landowners Group

May 2017

Final Report

cumberland ecology

PO Box 2474
Carlingford Court 2118

cumberland ecology

Report No. 16066RP1

The preparation of this report has been in accordance with the brief provided by the Client and has relied upon the data and results collected at or under the times and conditions specified in the report. All findings, conclusions or recommendations contained within the report are based only on the aforementioned circumstances. The report has been prepared for use by the Client and no responsibility for its use by other parties is accepted by Cumberland Ecology.

Approved by:	Dr David Robertson
Position:	Director
Signed:	David Robertson
Date:	*22 May, 2017*

cumberland ecology

Table of Contents

EXECUTIVE SUMMARY

1 INTRODUCTION

1.1 Purpose 1.1

1.2 Background 1.2

1.2.1 Site Description 1.2

1.2.2 Description of the Proposed Development 1.3

1.3 Relevant Legislation 1.4

1.3.1 Environmental Planning and Assessment Act 1979 1.4

1.3.2 Environment Protection and Biodiversity Conservation Act 1999 1.4

1.3.3 Threatened Species Conservation Act 1995 1.4

1.3.4 Noxious Weeds Act 1993 1.5

1.3.5 State Environmental Planning Policy No. 44 – Koala Habitat Protection 1.5

1.3.6 Campbelltown Local Environmental Plan 2015 1.5

1.3.7 Campbelltown Development Control Plan 2015 1.5

2 METHODOLOGY

2.1 Database Analysis 2.1

2.2 Flora Survey 2.1

2.2.1 Vegetation Mapping 2.1

2.2.2 Quadrat Sampling 2.2

2.2.3 Random Meander Survey 2.2

2.2.4 Targeted Threatened Flora Surveys 2.2

2.3 Fauna Survey 2.2

2.3.1 Habitat Assessments 2.3

2.3.2 Incidental Observations 2.3

2.3.3 Koala Habitat Assessment 2.3

2.3.4 Cumberland Plain Land Snail Searches 2.3

2.4 Limitations 2.3

cumberland ecology

Table of Contents *(Cont'd)*

3 RESULTS

3.1 Vegetation Communities *3.1*

3.1.1 Cumberland Plain Woodland *3.2*

3.1.2 Exotic Grassland *3.6*

3.1.3 Urban Native/Exotic Cover *3.8*

3.1.4 Acacia Regrowth *3.9*

3.2 Flora Species *3.9*

3.2.1 General Species *3.9*

3.2.2 Threatened Species *3.10*

3.2.3 Noxious Weeds *3.10*

3.3 Fauna *3.13*

3.3.1 Fauna Habitat *3.13*

3.3.2 General Species *3.15*

3.3.3 Threatened Species *3.15*

4 IMPACT ASSESSMENT

4.1 Impacts to Vegetation Communities and Habitat *4.1*

4.1.1 Vegetation Removal *4.1*

4.1.2 Loss of Specific Habitat Features *4.2*

4.1.3 Impact on Remaining Vegetation and Habitats *4.2*

4.2 Impacts to Flora Species *4.2*

4.3 Impacts to Fauna Species *4.3*

4.3.1 General *4.3*

4.3.2 Koala *4.4*

5 MITIGATION MEASURES

5.1 Vegetation Protection *5.1*

5.2 Erosion, Sedimentation and Pollution Control *5.1*

5.3 Pre-clearing and Clearing Surveys *5.2*

5.4 Weed Control Measures *5.2*

cumberland ecology

Table of Contents *(Cont'd)*

6 CONCLUSION

REFERENCES

List of Appendices

A. FLORA SPECIES LIST

B. THREATENED FLORA LIKELIHOOD OF OCCURRENCE

C. FAUNA SPECIES LIST

D. THREATENED FAUNA LIKELIHOOD OF OCCURRENCE

E. ASSESSMENTS OF SIGNIFICANCE (7 PART TESTS)

List of Tables

3.1	Extent of vegetation communities within the subject site	3.1
3.2	Fauna habitat items recorded within the subject site	3.13
4.1	Proposed impact areas	4.1
A.1	Flora species recorded within the subject site	A.1
B.1	Threatened flora likelihood of occurrence	B.1
C.1	Fauna species recorded on the subject site	C.1
D.1	Threatened fauna likelihood of occurrence	D.1

List of Figures

1.1	Location of the Subject Site	1.6
1.2	Land Zoning of the Subject Site	1.7
1.3	Indicative Subdivision Layout for Planning Proposal Purposes	1.8
2.1	Survey Locations within the Subject Site	2.5
3.1	Vegetation Communities within the Subject Site	3.11

List of Figures

3.2	Threatened Flora Species Recorded within the Subject Site	3.12
3.3	Habitat Features on the Subject Site	3.19
3.4	Koala Feed Tree Locations	3.20
3.5	Cumberland Plain Land Snail Search Locations	3.21
4.1	Development Impact Site	4.5

List of Photographs

3.1	Cumberland Plain Woodland (Quadrat 1)	3.4
3.2	Cumberland Plain Woodland (Quadrat 3)	3.4
3.3	*Eucalyptus punctata* outside the subject site on the nature strip	3.5
3.4	Exotic Grassland (Quadrat 2)	3.7
3.5	Exotic Grassland near Evelyn Road frontage within Lot 305	3.7
3.6	Urban Native/Exotic Cover in Lot 40 (right side of mound)	3.8
3.7	Acacia Regrowth	3.9
3.8	Unsuitable Cumberland Plain Land Snail habitat	3.14
3.9	Unsuitable Cumberland Plain Land Snail habitat	3.15

Glossary of Terms

CEEC	Critically Endangered Ecological Community
DoE	Commonwealth Department of the Environment
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
GIS	Geographic Information System
GPS	Global Positioning System
LGA	Local Government Area
Locality	The area within a 5 km radius of the centre of the subject site
NSW	New South Wales
OEH	NSW Office of Environment and Heritage
the proposed development	The planning proposal is for the rezoning of the subject site from largely E4 (Environmental Living) (minimum 2 ha lot size) to R2 (Low Density Residential) (minimum 500 m² lot size). It is anticipated that the rezoning will yield approximately 34 residential lots (including existing dwellings at number 85, 87 and 109 Evelyn Street) along the north of the subject site with Evelyn Street frontage.
SEPP 44	State Environmental Planning Policy No. 44 – Koala Habitat Protection
Subject site	Evelyn Street, Macquarie Fields (comprising the following lots: Lot 100 DP 261125 , Lots 8 & 9 DP 826459 , Lot 181 DP 834233 , Lot 305 DP263295 , Lot 40 DP 623486 and part Lot 1 DP 533662 (see **Figure 1.1**))
The Campbelltown LEP 2015	The *Campbelltown Local Environment Plan 2015*
TSC Act	NSW *Threatened Species Conservation Act 1995*

cumberland ecology

Executive Summary

S1 Introduction

Cumberland Ecology Pty Ltd (Cumberland Ecology) has been commissioned by Planzone Consulting, on behalf of Evelyn Street Landowners Group, to conduct an ecological assessment to support a rezoning proposal at Evelyn Street, Macquarie Fields ('the subject site'). The purpose of this flora and fauna assessment is to evaluate the ecological impacts of the proposed development, specifically impacts on threatened flora, fauna or ecological communities listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act) and/or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) known to occur on or within the locality of the subject site.

S2 Background

The subject site is located within the Campbelltown Local Government Area (LGA) and is currently largely zoned as E4 (Environmental Living), with a minor portion in the south zoned as SP2 (Infrastructure – Future Transport Corridor) under the *Campbelltown Local Environment Plan 2015.* The subject site is approximately 6.36 ha in size and contains existing residential developments, planted garden areas and remnant native vegetation.

The proposed development is for the rezoning of the subject site from E4 (Environmental Living) to R2 (Low Density Residential) which will yield approximately 34 residential lots (including existing dwellings at number 85, 87 and 109 Evelyn Street) along the north of the subject site with Evelyn Street frontage.

S3 Methods

Database analysis, vegetation/flora surveys, fauna habitat surveys and incidental fauna observations were undertaken in May 2016. An additional survey was undertaken in March 2017 for a Koala habitat assessment and targeted Cumberland Plain Land Snail search. Flora surveys involved recording the presence and abundance of flora species within 20 m x 20 m quadrats, recording the presence of species using the random meander survey technique and targeted threatened flora surveys. All vascular plants were recorded or collected and later identified to species level where possible. Fauna surveys included a habitat assessment and any incidental observations of birds and other vertebrates.

S4 Results

Vegetation within the subject site was found to consist of 3.31 ha of Exotic Grassland, 0.37 ha of Urban Native/Exotic Cover and 2.38 ha of Cumberland Plain Woodland (CPW), a Critically Endangered Ecological Community (CEEC) under the TSC Act and the EPBC Act.

Generally, the vegetation within these communities comprises a mixture of predominantly exotic groundcover species, with scattered natives.

CPW is generally scattered throughout the subject site, with two larger patches occurring in the south-western corner and along the central northern boundary of the subject site. This community occurs in a highly modified form as it is dominated by exotic groundcover species with no understorey throughout the majority. Some understorey species were however found to persist in one patch along the central northern boundary. On the subject site, CPW occurs in a number of forms including moderate condition (1.04 ha), low condition (1.07 ha) and as scattered canopy trees (0.27 ha). Due to the historic and ongoing disturbance of the subject site, together with the high densities of exotic species, it is considered that there is limited scope for natural regeneration on the site.

Over 190 plant species were recorded during surveys. Species present within the subject site are dominated by a mix of exotics and non-endemic planted natives (61%) and locally indigenous species (39%). No naturally occurring threatened flora species were recorded within the subject site. A single planted *Eucalyptus nicholii* (Narrow-leaved Black Peppermint) is present in the west of the subject site. This species is listed as Vulnerable under both the TSC Act and EPBC Act, however it is not endemic to the Sydney region. A single individual of *Syzygium paniculatum* (Magenta Lilly Pilly) was recorded near the eastern boundary of the subject site. This species is also listed as Vulnerable under both the TSC Act and EPBC Act. This species is also not locally indigenous and is commonly planted in gardens and roadsides in the Sydney region.

The desktop assessment showed that a number of threatened fauna species have been recorded from the locality and have the potential to occur within the subject site. From the desktop assessment and subsequent site inspections, twelve threatened fauna species are considered as having potential to occur within the subject site. An additional two migratory species listed under the EPBC Act have the potential to forage aerially above the subject site or utilise some of the vegetation as part of a wider foraging range. The known and potentially occurring fauna species are highly mobile and are expected to move between areas of remaining habitat within the immediate vicinity of the subject site and wider area. These species are therefore not considered dependent upon the degraded habitats present on the subject site.

Under the State Environmental Planning Policy No. 44 – Koala Habitat Protection, the subject site constitutes potential Koala habitat as it is evident that at least 15% of the total number of trees in the upper/lower strata of the tree component comprise of Koala feed trees. Numerous feed trees, namely *Eucalyptus tereticornis* were mapped throughout the subject site. However, the subject site is not considered core Koala habitat as no resident population of Koalas is evident on the subject site based on previous records and the current site survey by Cumberland Ecology. The Koala is therefore not considered dependent on habitat on the subject site.

No Cumberland Plain Land Snails were sighted during targeted surveys. Habitat quality is very poor for this species on the subject site as the base of trees were either dominated by exotic species or did not contain sufficient leaf litter.

S5 Impact Assessment

The proposed development will involve the clearing of vegetation along the northern boundary of the subject site, consisting of a total of 1.83 ha of vegetation. This includes up to 0.75 ha of CPW (0.54 ha of moderate condition, 0.12 ha of low condition and 0.09 ha of canopy), 0.86 ha of Exotic Grassland, 0.07 ha of Acacia regrowth and 0.15 ha of Urban Native/Exotic Cover.

CPW is listed as a CEEC under the TSC Act and the EPBC Act. The proposed rezoning is expected to result in part of the CPW present on site to be cleared. Within the subject site, this community is highly modified, with canopy trees existing over a predominantly exotic groundcover. The Cumberland Plain Woodland community on the subject site is surrounded by existing residential development, and is considered to be in relatively poor condition as it generally has a low abundance of native species when compared to more intact examples. The small areas found to be of moderate condition were found to contain greater numbers of native species relative to the low condition section of this community and sections where only canopy trees of CPW persist. Based upon the historic and ongoing disturbance of the subject site, proposed clearing of this community for later residential development is considered unlikely to significantly impacted CPW.

No naturally occurring threatened flora species were detected on the subject site or are considered likely to occur. A single planted *Eucalyptus nicholii* (Narrow-leaved Black Peppermint) is present in the west of the subject site, and a single *Syzygium paniculatum* (Magenta Lilly Pilly) was recorded near the eastern boundary of the subject site, both of which are listed as Vulnerable under the TSC Act and EPBC Act. However, these threatened species are not endemic to the locality and are commonly planted within the Sydney region. The proposed development, therefore, will have no significant impact upon threatened flora species.

Some foraging habitat for threatened fauna species will be removed for the proposed development, however none of the known and potentially occurring threatened fauna species are likely to be dependent on the habitats present within the subject site for their survival. The species with potential to occur are highly mobile species that can access resources from a wide area. Assessments of Significance have determined that the proposed development is unlikely to have a significant impact on these threatened fauna species, including the Koala.

S6 Mitigation Measures

A number of mitigation measures are recommended for the proposed project. The mitigation measures recommended to be implemented included:

- Vegetation protection;
- Pre-clearing and Clearing Surveys;
- Erosion, sedimentation and pollution control; and

- Weed control measures.

S7 Conclusion

Despite the impacts of previous disturbance and the location of the subject site within a fragmented landscape, the proposed rezoning and subsequent development will require the clearing of native vegetation that forms suitable habitat for some threatened fauna species.

Up to 0.75 ha of CPW (0.54 ha of moderate condition, 0.12 ha of low condition and 0.09 ha of canopy trees), 0.86 ha of Exotic Grassland, 0.07 ha of Acacia regrowth and 0.15 ha of Urban Native/Exotic Cover is likely to be cleared for the rezoning and future development of the subject site. The vegetation and habitat occurring within the subject site is modified and exists as fragmented patches in varying condition.

Based upon the assessment undertaken in this report, no significant impact is expected to occur to threatened species, populations or communities as a result of the proposed rezoning and likely residential development of the subject site. Therefore, the preparation of a Species Impact Statement (SIS) is not warranted. A referral to the Commonwealth Department of the Environment, under the EPBC Act is also not required.

cumberland ecology

Chapter 1

Introduction

1.1 Purpose

Cumberland Ecology Pty Ltd (Cumberland Ecology) has been commissioned by Planzone Consulting, on behalf of Evelyn Street Landowners Group to conduct an ecological assessment to support a proposed rezoning planning proposal for land at Evelyn Street, Macquarie Fields (the 'subject site').

The purpose of this report is to describe the current biodiversity values of the subject site and to assess the potential impacts of the proposed development on flora and fauna, particularly threatened species, populations and communities that are listed under the New South Wales (NSW) *Threatened Species Conservation Act 1995* (TSC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The specific objectives of this report are to:

- Describe the vegetation communities on the subject site;
- Describe fauna habitats and fauna usage of the subject site;
- Identify any threatened species, populations or ecological communities (as listed under the TSC Act and/or EPBC Act) existing on the subject site;
- Assess the likelihood of occurrence of threatened species, populations or communities (as listed under the TSC Act and/or EPBC Act) within the subject site;
- Assess the potential impact of the project on threatened species, populations or communities (as listed under the TSC Act and/or EPBC Act), including the completion of Assessments of Significance under Section 5A of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act); and
- Where relevant, recommend mitigation measures to reduce the impacts of the proposed development on biodiversity values.

1.2 Background

1.2.1 Site Description

The subject site is located at Evelyn Street, Macquarie Fields, in the City of Campbelltown Local Government Area (LGA) (**Figure 1.1**) and comprises the following lots:

- Lot 100 DP 261125;
- Lots 8 & 9 DP 826459;
- Lot 181 DP 834233;
- Lot 305 DP263295;
- Lot 40 DP 623486; and
- Part Lot 1 DP 533662.

The subject site is bounded by Evelyn Street to the north, Oakley Road to the south and residential developments to the east and west. It is approximately 6.36 ha in size and contains existing residential developments, planted garden areas and remnant native vegetation. The subject site is largely open, with many small scattered patches of trees. Two larger patches are present in the south-west along the Oakley Road frontage, and another in the north-east along the Evelyn Street frontage.

i. Zoning

The subject site is currently largely zoned as E4 (Environmental Living) under the *Campbelltown Local Environment Plan 2015* (the 'Campbelltown LEP 2015') (**Figure 1.2**). The objectives of E4 Zoning are:

- *To provide for low-impact residential development in areas with special ecological, scientific or aesthetic values.*
- *To ensure that residential development does not have an adverse effect on those values.*
- *To conserve the rural and bushland character of land that forms the scenic eastern edge of Campbelltown's urban area.*
- *To protect and enhance areas of scenic value and the visual amenity of prominent ridgelines.*
- *To maintain significant stands of native vegetation and wildlife and riparian corridors.*
- *To ensure the preservation and maintenance of environmentally significant and environmentally sensitive land.*

The following actions are permitted without consent:

- *Home occupations.*

The following actions are permitted with consent:

- *Building identification signs; Business identification signs; Child care centres; Community facilities; Dual occupancies (attached); Dwelling houses; Eco-tourist facilities; Emergency services facilities; Environmental facilities; Environmental protection works; Extensive agriculture; Farm buildings; Flood mitigation works; Horticulture; Home-based child care centres; Home businesses; Home industries; Recreation areas; Recreation facilities (outdoor); Respite day care centres; Roads; Viticulture; Water supply systems.*

A minor portion is zoned as SP2 (Infrastructure – Future Transport Corridor) under the Campbelltown LEP 2015. The objectives of SP2 Zoning are:

- *To provide for infrastructure and related uses.*
- *To prevent development that is not compatible with or that may detract from the provision of infrastructure.*
- *To encourage activities involving research and development.*
- *To optimise value-adding development opportunities, particularly those associated with research.*
- *To provide for the retention and creation of view corridors.*
- *To preserve bushland, wildlife corridors and natural habitat.*
- *To maintain the visual amenity of prominent ridgelines.*

The following actions are permitted without consent:

- *Environmental protection works.*

The following actions are permitted with consent:

- *Flood mitigation works; Roads; the purpose shown on the Land Zoning Map, including any development that is ordinarily incidental or ancillary to development for that purpose*

1.2.2 Description of the Proposed Development

Planzone Consulting are acting on behalf of the Evelyn Street Landowners Group for submission of a rezoning planning proposal to Campbelltown City Council for the subject site. The planning proposal is for the rezoning of the subject site from largely E4 (Environmental Living) (minimum 2 ha lot size) to R2 (Low Density Residential) (minimum

500 m² lot size). It is anticipated that the rezoning will yield approximately 34 residential lots (including existing dwellings at number 85, 87 and 109 Evelyn Street) along the north of the subject site with Evelyn Street frontage (**Figure 1.3**). The remainder of the subject site will be unaffected by the current planning proposal. This Flora and Fauna Assessment addresses the current planning proposal.

1.3 Relevant Legislation

1.3.1 Environmental Planning and Assessment Act 1979

The EP&A Act is the overarching planning legislation in NSW. This act provides for the creation of planning instruments that guide land use. The EP&A Act also provides for the consideration of the environment and biodiversity values, which is addressed in Section 5A (Significant effect on species, populations or ecological communities or their habitats) should a land use change be proposed. This includes threatened species, communities, habitat and processes as listed under the TSC Act and *Fisheries Management Act 1994* (FM Act).

1.3.2 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is the Australian Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places — defined in the EPBC Act as Matters of National Environmental Significance (MNES). Under the EPBC Act, any action (which includes a development, project or activity) that is considered likely to have a significant impact on MNES (including nationally listed threatened ecological communities and species, and listed migratory species) must be referred to the Australian Government Minister for the Environment (the Minister). The purpose of the referral is to allow a decision to be made about whether an action requires approval on a Commonwealth level. If an action is declared a "controlled action", then Commonwealth approval is required.

1.3.3 Threatened Species Conservation Act 1995

The TSC Act is the key piece of legislation in NSW relating to the protection and management of biodiversity and threatened species. The TSC Act aims to protect and encourage the recovery of threatened species, populations and communities that are listed under the Act through threat abatement and species recovery programs.

The TSC Act requires consideration of whether a development (Part 4) or an activity (Part 5) is likely to significantly impact threatened species, populations, communities or their habitat. The potential impacts of any developments, land use changes or activities would need to undergo an "Assessment of Significance" under Section 5A of the EP&A Act.

If the results of an Assessment of Significance indicate that a development or activity is likely to significantly affect threatened species, populations or ecological communities, the DA must be accompanied by a Species Impact Statement (SIS), which is a detailed ecological study carried out in accordance with a set of assessment requirements issued by the Director-General of the National Parks and Wildlife Service.

1.3.4 Noxious Weeds Act 1993

The *Noxious Weeds Act 1993* provides a framework for the roles of government, private landholders and public authorities regarding the management of noxious weeds which may have an impact on the economy, community or environment. The aim of this legislation is to manage the negative impact of weeds by preventing, eliminating, or restricting significant weeds from spreading or establishing, and implementing effective management and monitoring of widespread noxious weeds.

1.3.5 State Environmental Planning Policy No. 44 – Koala Habitat Protection

State Environmental Planning Policy No. 44 – Koala Habitat Protection (SEPP 44) applies to Campbelltown LGA. In accordance with SEPP 44, it must be ascertained whether the subject site contains potential koala habitat or core koala habitat.

A site is considered to contain potential koala habitat if the native vegetation contains a minimum of 15% of total number of tree species listed in Schedule 2 in the upper or lower strata. A site is considered to contain core koala habitat if a resident koala population is present.

A Draft Comprehensive Koala Plan of Management for Cambelltown City Council (Phillips 2016) is currently on public exhibition.

1.3.6 Campbelltown Local Environmental Plan 2015

The subject site is located within the Campbelltown LGA and is therefore subject to the Campbelltown Local Environmental Plan 2015 (Campbelltown LEP 2015).

1.3.7 Campbelltown Development Control Plan 2015

The overall objectives of the Campbelltown Development Control Plan 2015 (Campbelltown DCP) are to ensure that future significant development in the Campbelltown area can be undertaken in accordance with the conservation, protection and enhancement of the natural environment of the City of Campbelltown.

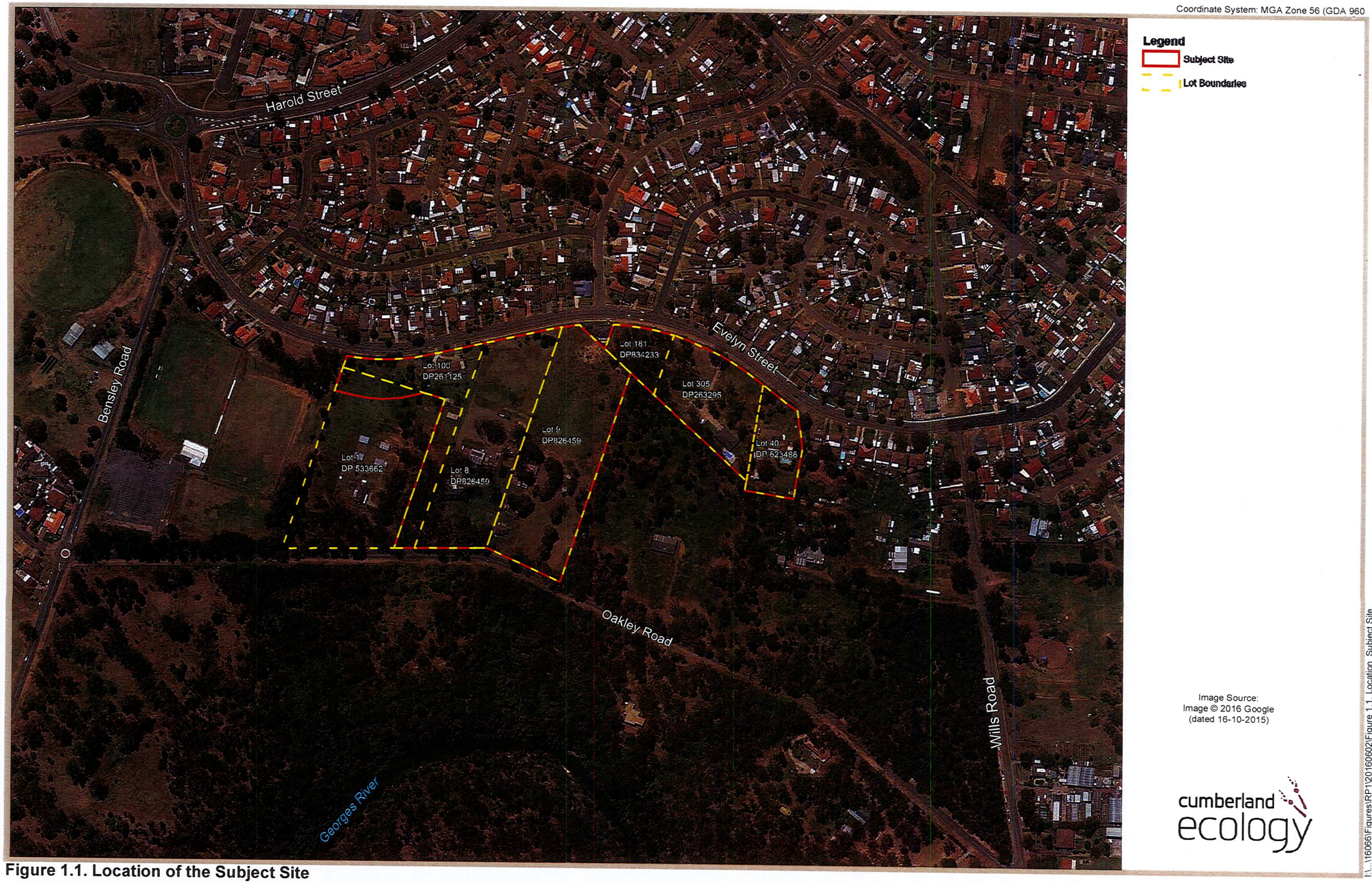


Figure 1.1. Location of the Subject Site

Coordinate System: MGA Zone 56 (GDA 960

Legend

Subject Site

Zone

E4 - Environmental Living

SP2 - Infrastructure

Grid North

Image Source:
Image © 2016 Google
(dated 16-10-2015)

Data Source:
Campbelltown City Council (2015).
Campbelltown Local Environmental
Plan - Zoning Map.

cumberland ecology

I:\...\16066\Figures\RP1\2016C602\Figure 1.2. Land ZOning_Subject Site

Figure 1.2. Land Zoning of the Subject Site

25 0 25 50 75 100 m

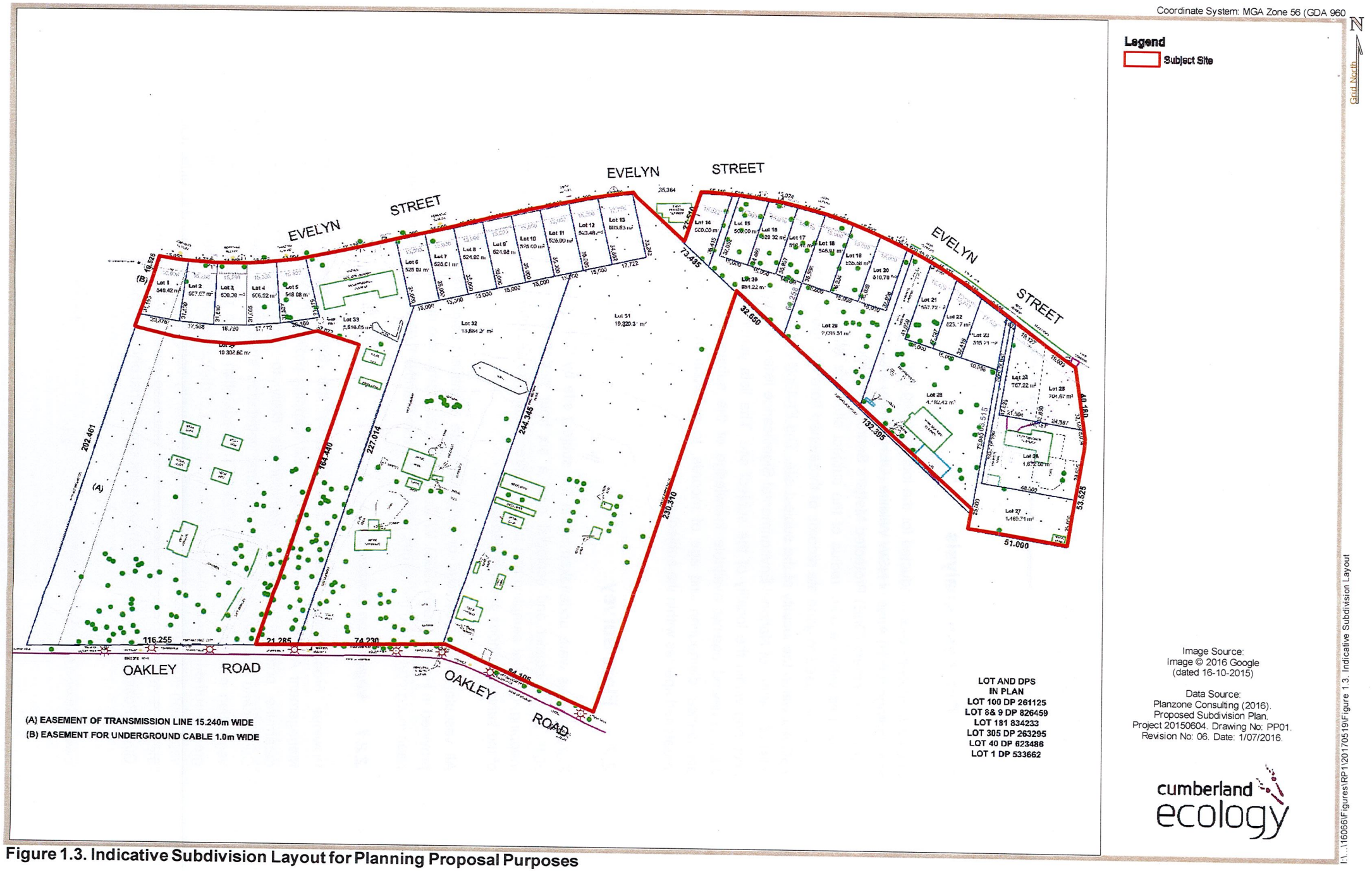


Figure 1.3. Indicative Subdivision Layout for Planning Proposal Purposes

Chapter 2

Methodology

2.1 Database Analysis

Database analysis was conducted for the locality using both the NSW Office of Environment and Heritage (OEH) Atlas of NSW Wildlife (OEH 2016a) and the Commonwealth Department of the Environment (DoE) Protected Matters Search Tool (DoE 2016). The locality is defined as the area within a 5 km radius of the subject site. The Atlas of NSW Wildlife Database search was used to generate records of threatened flora and fauna species listed under the TSC Act within the locality of the subject site. The Protected Matters Search Tool generated a list of Matters of National Environmental Significance listed under the EPBC Act potentially occurring within the locality of the subject site. The lists generated from these databases were reviewed against available knowledge of the subject site, in conjunction with the abundance, distribution and age of records, to ascertain the likelihood of occurrence of threatened species within the subject site.

2.2 Flora Survey

Flora surveys were undertaken within the subject site by Cumberland Ecology on 11 May 2016 by a botanist and ecologist over a six hour period. Surveys included vegetation mapping, quadrat sampling and targeted threatened flora searches. Further details of each of the survey methods are provided below.

All vascular plants recorded or collected were identified using keys and nomenclature provided in Harden (1990-1993). Where known, taxonomic and nomenclatural changes have been incorporated into the results, as derived from PlantNET (Botanic Gardens Trust 2016).

2.2.1 Vegetation Mapping

Previous broad-scale mapping conducted by the Sydney Metropolitan Catchment Management Authority (SMCMA) Vegetation Mapping project (OEH 2013) was utilised to determine potential vegetation communities likely to occur within the subject site. Cumberland Ecology conducted additional vegetation surveys to revise and update the vegetation mapping prepared by OEH. The vegetation within the subject site was then ground-truthed to examine and verify the mapping of the condition and extent of the different vegetation communities. Where vegetation community boundaries were found to differ from the OEH mapping, records were made of proposed new boundaries using a hand-held Global Positioning System (GPS) and mark-up of aerial photographs.

The resultant information was synthesised using a Geographic Information System (GIS) to create a spatial database that was used to interpret and interpolate the data to produce a vegetation map of the subject site.

2.2.2 Quadrat Sampling

Quadrat sampling was undertaken within the subject site to obtain information on species composition and community structure. A total of five quadrats were sampled within the subject site, within 20 m x 20 m plots. The locations of flora quadrats were recorded using a handheld GPS unit and are shown in **Figure 2.1**. The locations of the quadrats were selected so that sampling was conducted in areas most representative of the condition and composition of vegetation within the subject site. The process of quadrat sampling included the following:

- Identifying and recording all vascular flora species present within the quadrat or directly adjacent to the quadrat;
- The stratum in which each species occurred;
- Assigning a cover-abundance value to each species recorded within the plot, using a modified Braun-Blanquet scoring system (Braun-Blanquet 1927), to reflect their relative cover and abundance in the quadrat;
- Recording details about vegetation structure such as percentage foliage cover and height of each strata; and
- Taking photographs of the quadrat to provide a record of vegetation condition and appearance.

2.2.3 Random Meander Survey

Random meander surveys were also undertaken to detect additional flora species not recorded during quadrat sampling. These surveys were undertaken within all vegetation communities. **Figure 2.1** shows the area traversed.

2.2.4 Targeted Threatened Flora Surveys

Targeted threatened flora searches via random meanders were undertaken within suitable habitat of threatened flora species known from the locality. The locations of threatened flora specimens observed during surveys were recorded using a hand-held GPS.

2.3 Fauna Survey

Fauna surveys were undertaken within the subject site by Cumberland Ecology on 11 May 2016 and 24 March 2017. Surveys conducted in May 2016 included a fauna habitat assessment and incidental observations, while the survey undertaken on 24 March 2017 included searches for the Cumberland Plain Land Snail and a Koala habitat assessment. Further details of each of the survey methods are provided below.

2.3.1 Habitat Assessments

A fauna habitat assessment was undertaken on May 2016 over a six hour period. The assessment included consideration of important indicators of habitat condition and complexity including the occurrence of microhabitats such as tree hollows, fallen logs, bush rock and wetland areas such as creeks and soaks. Structural features considered included the nature and extent of the understorey and ground stratum and extent of canopy. The survey also included an assessment of the presence of habitat features suitable for use by threatened fauna species known from the locality.

2.3.2 Incidental Observations

Any incidental fauna species that were observed, heard calling, or otherwise detected on the basis of tracks or signs, were recorded and listed in the total species list for the subject site.

2.3.3 Koala Habitat Assessment

Any Koala feed trees listed under the *SEPP 44– Koala Habitat Protection* were recorded using a GPS. Scat searches were undertaken around the base of suitable feed trees to determine if Koalas were utilising these trees as well as observations of the canopy of all suitable trees for the presence of Koalas. The trunks of trees were also searched for the presence of Koala scratches .

2.3.4 Cumberland Plain Land Snail Searches

Targeted surveys for the Cumberland Plain Land Snail were undertaken in areas of suitable habitat. Snails were searched for around the base of trees with a diameter at breast height of greater than 10cm, with preference to trees with the presence of leaf litter within one metre of the base of the tree. The base of each tree was searched for up to two minutes.

2.4 Limitations

Vertebrate fauna and vascular flora of the locality are well known based upon a sizeable database of past records and various published reports. The surveys by Cumberland Ecology added to the existing database and helped to provide a clear indication of the likelihood that various species occur, or are likely to occur within the subject site. The data obtained from database assessment and surveys of the subject site furnished an appropriate level of information to support this assessment.

The weather conditions at the time of the flora surveys were generally favourable for plant growth and production of features required for identification of most species. Shrubs, grasses, herbs and creepers were readily identifiable in most instances. It is expected that not all flora species present would have been recorded during surveys. In addition, owing to time constraints not all areas were able to be adequately surveyed. Despite this, it is considered that sufficient information has been collected to assess issues including conservation significance of the flora, condition and viability of bushland and likely impact on native vegetation. An assessment of the likelihood of occurrence of threatened flora species

recorded within the locality of the subject site in the database searches was undertaken to supplement the flora survey.

Limited targeted fauna surveys were undertaken for this assessment, which relied on database analysis and fauna habitat assessment. In general, opportunistic observations of fauna provide a "snapshot" of some of the fauna present on a site that were active during time of the surveys. The data produced by the surveys is intended to be indicative of the types of species that could occur and not an absolute census of all vertebrate fauna species occurring within the subject site. Therefore not all fauna utilising the subject site are likely to have been recorded during surveys. An assessment of the likelihood of occurrence of threatened and migratory fauna species listed for the locality in the database searches was undertaken to supplement the fauna surveys. The combination of these techniques is considered appropriate for assessing the habitat values of the site for threatened fauna within the subject site.

Site access was denied on 24 March 2017 for the property at Lot 9 DP826459 For this reason the Koala feed trees in this area had to be assessed from a distance and no targeted Cumberland Plain Land Snail searches could be undertaken.

Figure 2.1. Survey Locations within the Subject Site

Chapter 3

Results

3.1 Vegetation Communities

Previous broad-scale mapping conducted by OEH indicates that Cumberland Shale Plains Woodland, Cumberland Shale-Sandstone Ironbark Forest, Undifferentiated Regenerating Shrubs, Urban Native and Exotic Cover and Weeds and Exotics are present within the subject site. A number of these communities are described as conforming to various threatened communities listed under the TSC Act and/or EPBC Act. Surveys by Cumberland Ecology for this assessment refined the existing vegetation mapping of the subject site and identified the following vegetation communities:

- Cumberland Plain Woodland in varying condition ;
- Acacia Regrowth.
- Urban Native/Exotic Cover; and
- Exotic Grassland.

The areas of these communities are provided in **Table 3.1** and the distribution of these communities is shown in **Figure 3.1**.Descriptions of each of the vegetation communities are provided below.

Table 3.1 Extent of vegetation communities within the subject site

Vegetation Community	Area (ha)
Cumberland Plain Woodland - Moderate condition	1.04
Cumberland Plain Woodland - Low condition	1.07
Cumberland Plain Woodland - canopy	0.27
Acacia Regrowth	0.07
Urban Native/ Exotic Cover	0.37
Exotic Grassland	3.31
TOTAL	**6.13**

3.1.1 Cumberland Plain Woodland

TSC Act Status: Critically Endangered Ecological Community (EEC) - Cumberland Plain Woodland in the Sydney Basin Bioregion

EPBC Act Status: Critically Endangered Ecological Community (EEC)

i. Overall Site Description

Cumberland Plain Woodland (CPW) is present throughout a total of 2.38 ha of the subject site as scattered patches of trees and as larger patches of woodland. Within the subject site, this community is considered to be in relatively poor to moderate condition. The canopy species within the subject site are *Eucalyptus moluccana* (Grey Box), *Eucalyptus tereticornis* (Forest Red Gum) and *Eucalyptus crebra* (Narrow-leaved Ironbark). To a lesser extent *Eucalyptus fibrosa* (Red Ironbark), *Eucalyptus amplifolia* (Cabbage Gum) and *Eucalyptus eugenioides* (Thin-leaved Stringybark) are also present in some areas.

The presence within Quadrat 1 of scattered *Eucalyptus moluccana* in the shrub layer suggests that there is some potential for natural regeneration of canopy/sub-canopy species. An example of this community within Quadrat 1 is shown in **Photograph 3.1**. Other shrub species are present in the area within and surrounding Quadrat 1, including *Bursaria spinosa* (Blackthorn). However, numerous exotic shrubs are also present including *Ligustrum lucidum* (Large-leaved Privet) and *Olea europaea* subsp. *cuspidata* (African Olive). The majority of CPW throughout the subject site lacks any shrub layer. A shrub layer was absent in Quadrat 3 and Quadrat 5, and throughout the majority of CPW throughout the subject site. See **Photograph 3.2** for example. A small patch of *Acacia decurrens* (Black Wattle) are present as small trees in the north of Lot 8 and within Quadrat 1. Other shrub species typical of CPW occurring within the subject site are *Indigofera australis* (Australian Indigo), *Acacia implexa* (Hickory Wattle) and *Exocarpos cupressiformis* (Cherry Ballart).

Generally, a fairly low abundance of native herbaceous species characteristic of this community were recorded as present within the subject site. However this varied in different areas. Thirty three native herbaceous, ferns and grass species typical of CPW are present within the subject site: *Brunoniella australis* (Blue Trumpet), *Euchiton sphaericus*, *Wahlenbergia gracilis* (Sprawling Bluebell), *Einadia hastata* (Berry Saltbush), *Einadia polygonoides*, *Dichondra repens* (Kidney Weed), *Pratia purpurascens* (Whiteroot), *Oxalis perennans*, *Veronica plebeia* (Trailing Speedwell), *Plectranthus parviflorus* (Cockspur Flower), *Solanum prinophyllum* (Forest Nightshade), *Cheilanthes sieberi*, *Desmodium varians* (Slender Tick-trefoil), *Glycine microphylla* (Small-leaf glycine), *Glycine tabacina*, *Hardenbergia violacea* (Purple Coral Pea), *Arthropodium minus*, *Commelina cyanea*, *Cyperus gracilis* (Slender Flat-sedge), *Juncus usitatus*, *Lomandra filiformis subsp. filiformis* (Wattle Mat-rush), *Dianella longifolia* (Blueberry Lily), *Aristida ramosa* (Purple Wiregrass), *Aristida vagans* (Threeawn Speargrass), *Bothriochloa macra* (Red Grass), *Chloris truncata* (Windmill Grass), *Chloris ventricosa* (Plump Windmill Grass), *Dichelachne micrantha* (Shorthair Plumegrass), *Digitaria diffusa* (Open Summer-grass), *Echinopogon ovatus* (Forest Hedgehog Grass), *Eragrostis leptostachya* (Paddock Lovegrass), *Microlaena stipoides* (Weeping Grass) and *Paspalidium distans*. These occur in varying compositions throughout CPW, where native species are more common in some areas and absent/low abundance in

other areas. Other native species are also present within the subject site but are not listed under the CPW assemblage within the Final Determination.

Exotic groundcover is generally dominant within CPW on the subject site and includes species such as *Sida rhombifolia*, *Bidens pilosa* (Cobblers Pegs), *Senecio madagascariensis* (Fireweed), *Sonchus oleraceus* (Common Sowthistle), *Plantago lanceolata* (Lamb's Tongues), *Araujia sericifera* (Moth Vine), *Asparagus asparagoides* (Bridal Creeper), *Ehrharta erecta* (Panic Veldtgrass) and *Pennisetum clandestinum* (Kikuyu Grass).

A full flora list is provided in **Appendix A**.

The vegetation within the subject site comprises species that are characteristic of CPW (listed as a critically endangered ecological community under both the TSC Act and EPBC Act). All of the canopy species within the subject site are characteristic of the community. Previous broad-scale mapping for the Campbelltown LGA indicates that part of the vegetation within the subject site is mapped as Shale Sandstone Transition Forest (SSTF) which is also listed as a CEEC under both the TSC Act and EPBC Act. Although the majority of species recorded within the subject site are also typical of SSTF, *E. amplifolia* is not listed as a typical species and this canopy species was scattered throughout various parts of the subject site. In addition, *Eucalyptus punctata* (Grey Gum) is a typical species of SSTF which was entirely absent within the subject site. Soils within the subject site are heavily clay influenced (typical of CPW), whereas SSTF has transitional soils between clay and sandy soils.

Near the southern boundary of the subject site *Eucalyptus punctata* (Grey Gum) is present on the nature strip on the roadside (**Photograph 3.3**). Some sandstone outcrops were exposed on the nature strip showing the underlying soil structure, with the combination of shale and sandstone typical of Shale Sandstone Transition Forest. However, no *E. punctata* are present within the subject site itself. *Eucalyptus punctata* (Grey Gum) occurs extensively on the south side of Oakley Road. Several small *E. punctata* are present adjacent to the east of the subject site on Lot 11 DP24328 indicating that Shale Sandstone Transition Forest and Cumberland Plain Woodland intergrade at this location but it was confirmed on 24 March that Shale Sandstone Transition Forest is not located on the subject site itself.

Photograph 3.1 Cumberland Plain Woodland (Quadrat 1)

Photograph 3.2 Cumberland Plain Woodland (Quadrat 3)

Photograph 3.3 *Eucalyptus punctata* outside the subject site on the nature strip

ii. Cumberland Plain Woodland - Moderate condition

Within the subject site, CPW in moderate condition (1.04 ha) occurs in two patches (see **Figure 3.1** for distribution). These patches are in better condition than the remaining CPW on the subject site as the groundcover contains a higher proportion of native species. Quadrat 1 and Quadrat 3 were undertaken in moderate condition CPW. Although the soil in these moderate condition CPW patches have been modified, there is some scope for natural regeneration. The native seedbank is still present as evident by regrowth of *E. moluccana* within the patch in the northern portion of the subject site, and the presence of some shrubs, *Acacia decurrens* and *E. moluccana* in the southern patch.

iii. Cumberland Plain Woodland - Low condition

CPW exists in a low condition form within scattered patches in the east and south of the subject site comprising 1.07 ha. The majority of these areas are in the immediate vicinity of residential dwellings and have been highly degraded from past clearing and mowing of the groundcover and understorey. Groundcover is typically dominated by *Cynodon dactylon* (Couch) which is a native species that is often cultivated as pasture. Understorey is absent in these low condition areas of CPW. The soil in these low condition areas have undoubtedly been modified and the native seed bank is likely to have been exhausted. As it exists, the low condition CPW has limited ecological quality and no scope for natural regeneration.

iv. Cumberland Plain Woodland – Canopy

CPW exists as scattered canopy trees (0.27 ha) over predominantly exotic mown grass. These canopy species include *E. crebra* (Narrow-leaved Ironbark). Understorey is completely absent in these areas of canopy CPW. The soil beneath the canopy trees have undoubtedly been modified and the native seed bank is likely to have been exhausted. As it exists, the CPW in the form of canopy has limited ecological quality and no scope for natural regeneration.

3.1.2 Exotic Grassland

TSC Act Status: Not listed

EPBC Act Status: Not listed

Exotic Grassland is the most dominant community, occurring throughout 3.31 ha of the subject site. Groundcover within this community is predominantly exotic grass and consists of species including *Pennisetum clandestinum* (Kikuyu), *Paspalum dilatatum* (Paspalum), *Setaria parviflora*, *Eragrostis leptostachya* (Paddock Lovegrass) and *Axonopus fissifolius* (Narrow-leafed Carpet Grass). Some native grasses are also present in some areas including *Eragrostis brownii* (Brown's Lovegrass), *Eragrostis leptostachya* (Paddock Lovegrass) and *Microlaena stipoides* (Weeping Grass). Herbaceous exotic species include *Gamochaeta americana* (Cudweed), *Hypochaeris radicata* (Catsear), *Senecio madagascariensis* (Fireweed) and *Sida rhombifolia*. Scattered natives include *Wahlenbergia gracilis* (Sprawling Bluebell), *Oxalis perennans* and *Portulaca oleracea* (Pigweed). A large patch of *Rubus fruticosus aggregate* (Blackberry) is present within the north of Lot 9. See **Appendix A** for full species list.

Examples of this community are shown in **Photograph 3.3** and **3.4**.

Photograph 3.4 Exotic Grassland (Quadrat 2)

Photograph 3.5 Exotic Grassland near Evelyn Road frontage within Lot 305

3.1.3 Urban Native/Exotic Cover

TSC Act Status: Not listed

EPBC Act Status: Not listed

Urban Native/Exotic Cover is present surrounding existing residential dwellings, and comprises 0.37 ha. Canopy and sub-canopy species within this vegetation community are predominantly planted exotic and non-endemic native species. Exotic canopy species include *Jacaranda mimosifolia* (Jacaranda), *Liquidambar styraciflua*, *Quercus robur* (English Oak), *Ulmus parvifolia* (Chinese Elm) and *Acer japonicum* (Japanese Maple). Planted non-endemic natives include *Eucalyptus microcorys* (Tallowwood), *Casuarina cunninghamiana* (River Oak), *Melaleuca armillaris* (Bracelet Honey-myrtle) and *Cupaniopsis anacardioides* (Tuckeroo). Groundcovers in garden beds include exotics such as *Buxus microphylla* var. *japonica* and planted natives such as *Doryanthes excelsa* (Giant Lily).

An example of the community is shown in **Photograph 3.5**.

Photograph 3.6 Urban Native/Exotic Cover in Lot 40 (right side of mound)

3.1.4 *Acacia Regrowth*

TSC Act Status: Not listed

EPBC Act Status: Not listed

Acacia decurrens (Black Wattle) regrowth is present within 0.07 patch near the centre of the northern boundary along Evelyn Street, and at the western boundary of the subject site. The groundcover predominantly consists of exotic mown grasses, including *Pennisetum clandestinum* (Kikuyu) (**Photograph 3.6**).

Photograph 3.7 Acacia Regrowth

3.2 Flora Species

3.2.1 *General Species*

Over 190 flora species were recorded throughout the subject site during surveys. The dominant plant families encountered within the subject site have consistently been represented by the Poaceae, Asteraceae and Myrtaceae. Species present within the subject site consists of a mix of exotics and non-endemic planted natives (61%) and locally indigenous species (39%). Quadrat and transect data for the subject site are provided in **Appendix A**.

3.2.2 Threatened Species

A single individual of *Eucalyptus nicholii* (Narrow-leaved Black Peppermint) was recorded in the west of the subject site. The location of this individual is shown on **Figure 3.2**. This species is listed as Vulnerable under the TSC and EPBC Act. This species is sparsely distributed but widespread on the New England Tablelands from Nundle to north of Tenterfield, being most common in central portions of its range. This species is not considered to be locally indigenous to the subject site and therefore its conservation significance is reduced. This species has been observed to be planted in gardens and roadside verges within the locality.

A single individual of *Syzygium paniculatum* (Magenta Lilly Pilly) was recorded near the eastern boundary of the subject site. The location of this individual is shown on **Figure 3.2**. This species is listed as Endangered under the TSC Act and Vulnerable under the EPBC Act. It occurs in subtropical and littoral rainforest within a narrow coastal strip between Upper Lansdowne and Conjola State Forest. This species is not considered to be locally indigenous to the subject site and therefore its conservation significance is reduced. This species has been observed to be planted in gardens and roadside verges within the locality.

No other threatened flora species have been recorded within the subject site. An analysis of the likelihood of occurrence on the subject site for each threatened flora species recorded within the locality is provided in **Appendix B**. This assessment concluded that none of threatened flora species known from the locality are likely to occur within the subject site.

3.2.3 Noxious Weeds

Thirteen of the exotic plant species recorded on the subject site are listed as Declared Noxious Weeds under the NSW *Noxious Weeds Act 1993* in the City of Campbelltown LGA. These species are; *Ligustrum lucidum* (Large-leaved Privet), *Ligustrum sinense* (Small-leaved Privet), *Olea europaea subsp. cuspidata* (African Olive), *Opuntia stricta* (Common Prickly Pear), *Ricinus communis* (Castor Oil Plant), *Cestrum parqui* (Green Cestrum), *Senecio madagascariensis* (Fireweed), *Hypericum perforatum* (St. Johns Wort), *Bryophyllum delagoense* (Mother-of-millions), *Bryophyllum pinnatum* (Live Plant), *Asparagus asparagoides* (Bridal Creeper), *Rubus fruticosus aggregate* (Blackberry) and *Asparagus aethiopicus* (Ground Asparagus). These species are all classified as Control Class 4 – locally controlled weeds, with the exception of *C. parqui* which is classified as Control Class 3 - regionally controlled weed. *Opuntia stricta, A. asparagoides, A. aethiopicus, R. fruticosus aggregate* and *S. madagascariensis* are also listed as a Weed of National Significance.

Figure 3.1. Vegetation Communities within the Subject Site

Figure 3.2. Threatened Flora Species Recorded within the Subject Site

25 0 25 50 75 100 m

3.3 Fauna

3.3.1 Fauna Habitat

The vegetation within the subject site provides some potential, albeit sub-optimal habitat for fauna. The habitats on the subject site are not of high faunal value due to their location in a developing area and the general lack of microhabitats such as tree hollows. There is very limited habitat potential for tree hollow-dependent fauna as only two trees present contain hollows (see **Table 3.1** below for details and **Figure 3.3** for habitat tree locations). Two Galahs' were seen congregating around one of the *Eucalyptus tereticornis* habitat trees. Although there are many exotic flora species within the subject site, these can provide potential foraging resources for nectivorous mammals and birds that may use the subject site from time to time as part of a larger foraging range.

Two stick nests were sighted during surveys, and one fallen log which may provide microhabitat for reptiles.

A small dam is present within the south of the subject site, providing potential habitat for fauna such as frogs.

Table 3.2 Fauna habitat items recorded within the subject site

Habitat ID	Type	Easting	Northing	Species	Description of Habitat
H1	Habitat tree	305510	6235722	*Syzygium paniculatum*	Small nest
H2	Ground habitat	305312	6235748	-	Fallen timber
H3	Habitat tree	305147	6235610	*Eucalyptus tereticornis*	2 medium hollows
H4	Habitat tree	305145	6235602	*Eucalyptus tereticornis*	Medium nest
H5	Waterbody	305173	6235601		Dam

i. Koala

Numerous Koala feed trees are present throughout the subject site (**Figure 3.4**). Two species listed under SEPP 44 are present; *Eucalyptus tereticornis* and *Eucalyptus microcorys. Eucalyptus punctata* is also present but is located outside the subject site. The dominant feed tree species throughout the subject site is *E. tereticornis* which occurs extensively throughout the subject site. Only a single *E. microcorys* is present, within the north-west of the subject site. These trees provide potential foraging habitat for the Koala. No Koala's were sighted during the surveys on 11 May 2016 or 24 March 2017. No scats or scratches were sighted during targeted surveys.

Additional feed trees listed within the Recovery Plan for the Central Coast region were also considered during the survey. *Eucalyptus moluccana* (Grey Box) is a secondary feed tree species which occurs extensively within the south and north of the subject site in CPW –

moderate condition vegetation and within CPW - low condition in the north-east and south west.

ii. Cumberland Plain Land Snail

Cumberland Plain Land Snail searches were undertaken throughout the subject site (**Figure 3.5**). Although the majority of trees had a DBH of at least 10cm, leaf litter was generally absent or scarce. The base of trees were either dominated by exotics (**Photograph 3.8**) or exposed (**Photograph 3.9**). No Cumberland Plain Land Snail's (live or empty shells) were found during targeted surveys on the subject site. The species is unlikely to occur within the subject site due to extensive previous disturbance, such as introduction of exotic groundcover and mowing.

Numerous exotic Garden Snails (*Cornu aspersa*) were located throughout the CPW – moderate condition patch in the north of the subject site along Evelyn Street.

Photograph 3.8 Unsuitable Cumberland Plain Land Snail habitat

Photograph 3.9 Unsuitable Cumberland Plain Land Snail habitat

3.3.2 General Species

Twenty vertebrate fauna species were recorded from the subject site during Cumberland Ecology surveys.

A species list of fauna recorded by Cumberland Ecology for the subject site is provided in **Appendix C**. Additional common bird, mammal and reptile species are likely to utilise the subject site and surrounds as part of a larger foraging habitat and so this list is not exhaustive. The disturbed nature of the subject site is likely to have an impact on the types and abundance of fauna species occurring.

3.3.3 Threatened Species

i. Introduction

A number of threatened fauna species have been recorded from the locality and have the potential to occur within the subject site. **Appendix D** analyses the likelihood of occurrence within the subject site for each threatened fauna species recorded or predicted to occur within the locality. Twelve threatened fauna species are considered as having potential to occur within the subject site. A discussion of the known and potentially occurring threatened fauna species is provided below.

ii. Potentially Occurring Species

a. Little Eagle

The Little Eagle (*Hieraaetus morphnoides*) is listed as Vulnerable under the TSC Act. It is a medium-sized raptor that is found throughout the mainland except within more densely vegetated parts of the Dividing Range. It occurs within open eucalypt forest, woodland, open woodland as well as Sheoak or Acacia woodlands and riparian woodlands of interior NSW. The Little Eagle builds a nest within a tall living tree in a remnant patch (OEH 2015c).

Potential foraging and breeding habitat for this species occurs within the subject site. The species could forage within the forest vegetation of the subject site as part of its wider foraging range. Although the species could breed within the subject site, no nests were observed during surveys.

b. Square-tailed Kite

The Square-tailed Kite (*Lophoictinia isura*) is listed as Vulnerable under the TSC Act. It is a medium-sized raptor up to 55 cm in length. It occurs throughout coastal and sub-coastal areas from south-western to northern Australia, Queensland, NSW and Victoria (OEH 2014e) . It is found in various timbered habitats such as dry woodlands and open forests, preferring timbered watercourses (OEH 2014e). The Square-tailed Kite builds its nest in the fork or large horizontal limb of a tree, usually near a watercourse (OEH 2014e).

Potential foraging habitat for this species occurs within the subject site. The species could forage within the forested vegetation of the subject site as part of its large home range which can be up to 100 km^2. Although the species could breed within the subject site, no nests were observed during surveys and it would likely nest closer to a watercourse such as near Georges River.

c. Little Lorikeet

The Little Lorikeet (*Glossopsitta pusilla*) is listed as Vulnerable under the TSC Act. It occurs across the coastal and Great Divide regions of eastern Australia from Cape York to South Australia (OEH 2014c). The species is found mainly in the canopy of open *Eucalyptus* forest and woodland, as well as at isolated flowering trees. They nest in small tree hollows, usually in riparian areas (OEH 2014c).

Potential foraging habitat for this species occurs within the subject site as there are numerous *Eucalyptus* species present. No suitable hollows and no riparian areas are present on the subject site so favourable breeding habitat is absent.

d. Powerful Owl

The Powerful Owl (*Ninox strenua*) is listed as Vulnerable under the TSC Act. It is the largest Owl in Australia and reaches 60 cm in length and can have a wingspan of up to 140 cm (OEH 2014d). The Powerful Owl is endemic to eastern and south eastern Australia and in NSW is widely distributed throughout the eastern forests from the coast inland to the

tablelands (OEH 2014d). It inhabits a range of vegetation types from woodland and open sclerophyll forest to tall open wet forest and rainforest and generally requires large tracts of forest or woodland habitat by can occur in fragmented landscapes (OEH 2016d). The Powerful Owl requires large tree hollows for nesting that are at least 50 cm deep in large old eucalypts that have a diameter at breast height of 80-240 cm, and roosts in dense vegetation (OEH 2014d).

Potential foraging habitat for this species occurs within the subject site, mainly within the forest vegetation. No breeding habitat occurs within the subject site as no large hollows suitable for nesting are present. The Powerful Owl is considered to have the potential to occur within the subject site given the species is known to utilise fragmented habitat within urban areas, however the subject site is considered to only provide marginal foraging habitat for this species.

e. Grey-headed Flying-fox

The Grey-headed Flying-fox (*Pteropus poliocephalus*) is listed as Vulnerable under the TSC Act and EPBC Act. The Grey-headed Flying-fox is distributed primarily along the eastern coastal plain from Bundaberg in Queensland, through NSW and south to eastern Victoria (NSW Scientific Committee 2004). Within its extent, the Grey-headed Flying-fox occurs in rainforests, open forest, woodlands, Melaleuca swamps and Banksia woodlands (NSW Scientific Committee 2004).

Potential foraging habitat for this species occurs within the subject site. Grey-headed Flying-foxes live in specific roost camps, the locations of which are well-known within the Sydney region. No camps were observed within the subject site.

f. Microchiropteran Bats

Microchiropteran bats are highly mobile species that access resources from a large area so have the potential to occur in the subject site. They are known to fly over disturbed areas while foraging and are not likely to be dependent on the habitat present in the subject site. No breeding habitat is present for any of the following species that may pass over the subject site: Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*), Eastern Freetail-bat (*Mormopterus norfolkensis*), Eastern False Pipistrelle (*Falsistrellus tasmaniensis*), Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*), Southern Myotis (*Myotis macropus*) and Greater Broad-nosed Bat (*Scoteanax rueppellii*). Only one tree hollow was observed (occupied by Galahs) and the existing residential buildings do not provide suitable roosting habitat as they lack suitable cavities.

g. Koala

The Koala (*Phascolarctos cinereus*) is listed as Vulnerable under the TSC Act and EPBC Act. It occurs in eucalypt woodlands and forests and in NSW it mainly occurs on the central and north coasts' with some populations in the west of the Great Dividing Range. The Koala is known to feed on foliage of over 70 *Eucalyptus* species as well as 30 non-eucalypt species, tending to select preferred species in any given area (OEH 2014a). Mostly active at night, and spends the majority of time within trees, occasionally moving between trees.

Feed tree species for the Koala listed under Schedule 2 of the SEPP 44 are: *E. tereticornis* (Forest Red Gum), *E. microcorys* (Tallowwood), *E. punctata* (Grey Gum), *E. viminalis* (Ribbon Gum), *E. camaldulensis* (River Red Gum), *E. haemastoma* (Broad-leaved Scribbly Gum), *E. signata* (Scribbly Gum), *E. albens* (White Box), *E. populnea* (Poplar Box) and *E. robusta* (Swamp Mahogany). Under SEPP 44, the subject site constitutes potential Koala habitat as it is evident that at least 15% of the total number of trees in the upper/lower strata of the tree component comprise of these feed tree species (namely *E. tereticornis* and a single *E. microcorys*). However, the subject site is not considered core Koala habitat under SEPP 44 as no resident population of koalas is evident on the subject site based on previous records and the current site survey by Cumberland Ecology. The site inspection failed to detect any scats or scratches and no evidence of breeding females was evident within the subject site. In addition, Figure 5.1 in the Comprehensive Koala Plan of Management (Phillips 2016) for Campbelltown City Council shows that the subject site is mapped outside of core Koala habitat. Previous records show two occurrences of Koala within 500 m of the subject site. One Koala in 2001 was recorded south-east of the site and one was recorded in 2011 at Evelyn Street/Wills Road.

Although there are no previous records of this species on the subject site itself, there is some potential habitat present within the larger tracts of CPW. Habitat on the subject site is highly disturbed and connectivity is generally poor. Trees on the subject site are scattered and separated by large areas of exotic grassland. Larger tracts of more intact CPW vegetation are present in Lot 181 in the north at Evelyn Street and in the patch in the south of Lot 100 and 8 at Oakley Road. More optimum Koala habitat would exist in the Georges River Bushland Area south of the subject site as it comprises a larger tract of intact native vegetation. This area of bushland has been mapped as preferred koala habitat in Figure 5.1 of the Comprehensive Koala Plan of Management.

iii. Migratory Species

Two species listed as migratory under the EPBC Act may potentially pass through the locality. These are the Fork-tailed Swift (*Apus pacificus*) and White-throated Needletail (*Hirundapus caudacutus*) which are aerial species that may forage aerially above the subject site on occasion.

Figure 3.3. Habitat Features on the Subject Site

Coordinate System: MGA Zone 56 (GDA 960

Figure 3.4. Koala Feed Tree Locations

25 0 25 50 75 100 m

I:\...\16066\Figures\RP1\20170329\Figure 3.4. Koala Feed Tree Locations

Figure 3.5. Cumberland Plain Land Snail Search Locations

Chapter 4

Impact Assessment

4.1 Impacts to Vegetation Communities and Habitat

4.1.1 Vegetation Removal

The primary impact resulting from the proposed development is the clearing of vegetation and associated habitat within the subject site for the purpose of the rezoning which will yield approximately 34 residential lots.

The subject site is 6.36 ha in size, of which 2.45 ha comprises a native vegetation community (Cumberland Plain Woodland and Acacia Regrowth). The remaining area consists of Exotic Grassland and Urban Native/Exotic Cover. A summary of the vegetation community areas and impact areas are provided in **Table 4.1** below and shown in **Figure 4.1**. Note that these impact areas exlude the new proposed lots 26, 28 and 33 as the three existing residential dwellings are being retained within the subject site.

Table 4.1 Proposed impact areas

Vegetation Community	Area (ha)	
	Subject Site	Impact Area
Cumberland Plain Woodland - Moderate condition	1.04	0.54
Cumberland Plain Woodland - Low condition	1.07	0.12
Cumberland Plain Woodland - canopy	0.27	0.09
Acacia Regrowth	0.07	0.07
Urban Native/ Exotic Cover	0.37	0.15
Exotic Grassland	3.31	0.86
Total	**6.13**	**1.83**

Past and current use of the subject site and surrounding areas have entailed clearing and modification of the majority of native vegetation. The CPW present within the subject site is highly modified, with canopy trees existing over a predominantly exotic groundcover. The proposed development will result in the removal of part of this community within the subject site (up to 0.75 ha of moderate condition, low condition and canopy CPW). No additional

vegetation outside of the development impact area will need to be cleared for the purpose of Asset Protection Zones (pers comm. Kate Harris, 4 April 2017). An assessment of significance of the impacts to this community is provided in **Appendix E**.

This assessment concluded that the proposed development is not likely to result in a significant impact to this community. A suite of mitigation measures are proposed which are relevant to minimising impacts to CPW (see **Chapter 5**).

4.1.2 Loss of Specific Habitat Features

In addition to the clearance of broad habitats within the subject site, a number of specific habitat features will be removed, including nectar-producing trees. Other features including fallen logs and hollow-bearing trees will not be impacted by the proposed development.

4.1.3 Impact on Remaining Vegetation and Habitats

The proposed development has the potential to indirectly impact remaining vegetation and habitats. These impacts include:

- Habitat fragmentation - affects biodiversity by reducing the amount of available habitat for some species to occupy due to increased distances between habitat patches;
- Edge effects – affects biodiversity through microclimatic changes in light, temperature, humidity and wind, which can favour a suite of different species and therefore cause significant changes to the ecology of the patch (Lindenmayer and Fischer 2006);
- Alteration to hydrological regimes – affects biodiversity through modification of hydrology necessary for vegetation and habitat survival, such as surface water drainage patterns; and
- Increased sedimentation and erosion – affects biodiversity through the smothering of vegetation, increasing turbidity of waterways and transportation of weed matter and nutrients.

4.2 Impacts to Flora Species

The proposed development has the potential to result in a number of direct and indirect impacts to flora species within the subject site. In addition to the direct removal and modification of vegetation within the subject site, potential indirect impacts to flora species include:

- Weed invasion;
- Run-off, erosion and sedimentation; and

- Modification of microhabitat features resulting from long and short-term edge effects (e.g. changes in light filtration).

A number of mitigation measures are proposed to minimise these impacts. These are discussed further in **Chapter 5**.

No threatened flora species, listed under the TSC Act or EPBC Act were recorded or are considered to have the potential to occur within the subject site. The proposed development, therefore, will have no significant impact upon threatened flora species.

4.3 Impacts to Fauna Species

4.3.1 General

The proposed development has the potential to result in a number of direct and indirect impacts to fauna species within the subject site. In addition to the direct removal and modification of vegetation within the subject site, potential indirect impacts to fauna species include:

- Habitat disturbance during the construction phase of the project (e.g. changes in noise);
- Runoff, erosion and sedimentation;
- Increased pollution;
- Hydrological changes resulting in altered fauna habitats; and
- Modification of microhabitat features resulting from long and short-term edge effects (e.g. changes in light filtration).

A number of other threatened fauna species are considered to have the potential to occur within the subject site (see **Section 3.3.3**). The subject site provides foraging opportunities for these threatened fauna but is unlikely to exclusively support a local population of any threatened fauna species.

These species may forage on or near the subject site from time to time as part of a much larger range. Impacts to these species are summarised below. Assessments of significance for these species are provided in **Appendix E**. These assessments concluded the project is not considered to significantly impact these species.

Likewise, any migratory birds are considered unlikely to utilise the subject site and surrounding vegetation for roosting or feeding as they are highly mobile, aerial species. Therefore the proposed development is not considered likely to have a significant impact on any migratory fauna species.

4.3.2 Koala

Within the subject site, two feed tree species listed under SEPP 44 are present for the Koala: *Eucalyptus tereticornis* and *E. microcorys*. Based upon the survey undertaken it was determined that the density of Schedule 2 Koala feed trees identified in SEPP 44 exceeds 15% of the total number of trees. The vegetation on site is therefore consistent with potential Koala habitat. No koala scats or individuals were recorded during the survey, As no evidence of a breeding population of Koala is present, the subject site is not considered to be Core Koala Habitat.

An area of highly marginal habitat will be cleared in the form of canopy (0.09 ha) and low condition CPW (0.12 ha) will be directly cleared. Of the moderate condition CPW on the subject site (1.04 ha), up to 0.54 ha is proposed to be directly cleared for the proposed development.

The other impact due to loss of vegetation will be habitat fragmentation, which is the process whereby habitat loss results in the division of large, continuous habitats into smaller isolated fragments. The area between fragments is typically man-made and largely inhabitable by the species that previously existed in the area. Although the proposed development will remove some potential habitat, it has been previously extensively cleared from mowing, grazing and other land uses being in a rural residential area. The proposed removal of this small area of vegetation and marginal habitat would very minimally add to fragmentation further than current conditions.

As an increased number of residential dwellings are proposed, light pollution will be increased. However, this should not significantly impact any fauna foraging in the remainder of the subject site. Light pollution is already present along the Evelyn Street frontage where the proposed development will occur.

The total impacts (direct and indirect) are not expected to significantly impact the Koala. The subject site is not considered core Koala habitat under SEPP 44, so it is unlikely that the Koala would occur on the subject site owing to the existing degraded nature of the vegetation. Therefore no site specific Koala Management Plan is required.

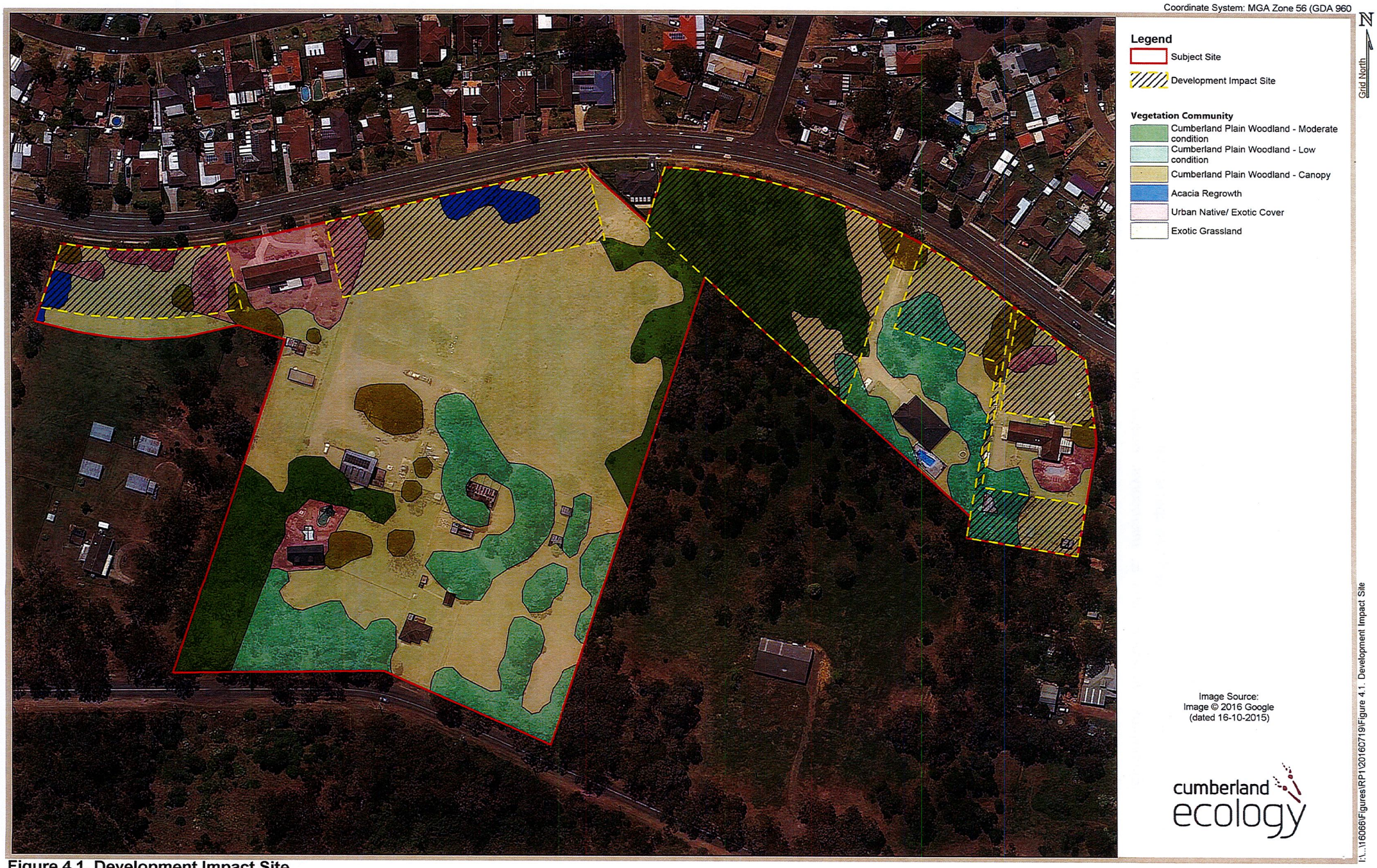


Figure 4.1. Development Impact Site

Chapter 5

Mitigation Measures

A number of mitigation measures are recommended for the proposed project. These measures should be implemented to minimise impacts to biodiversity impacts to adjoining habitats.

5.1 Vegetation Protection

To avoid unnecessary removal or damage to CPW vegetation adjacent to the proposed development area, the clearing area should be clearly demarcated and signed, where appropriate, to ensure no vegetation beyond these boundaries is removed. Clearing works and equipment should be excluded from areas outside the clearing area. Site inductions are to be given by the civil contractor to ensure all site workers and visitors are aware of any no-access areas.

It is recommended that replanting of native species typical of CPW occur within the proposed residential lots. If large native canopy species (*Eucalyptus*) are not able to be planted, then native shrubs and groundcover should be planted as these provide potential nesting and foraging habitat for a range of native fauna species. These should be planted in accordance with any Asset Protection Zone requirements for bushfire management.

Where possible, native canopy species should be retained when considering building envelopes as these trees will help maintain connectivity of habitat. These large trees provide foraging resources for a range of native fauna. Within the new lots, the future building envelopes will endeavour to retain existing native vegetation where possible.

5.2 Erosion, Sedimentation and Pollution Control

Potential impacts to flora and fauna occurring in the construction phase that can be managed include: run-off, sedimentation, erosion and pollution. To reduce sedimentation on the construction site, erosion control measures should be implemented. This includes minimising the amount of exposed soils on the site at any given time. All soil stockpiles should be adequately covered when not in use to prevent erosion from heavy rainfall. Sediment fences should be established around the perimeter of the development area to prevent the impacts of sedimentation on the adjoining vegetation. During development, precautions should be taken to ensure that no pollution, such as petrochemical substances or water containing suspended solids, escapes the construction site. Pollution traps and efficient removal of pollution to an off-site location would help to minimise pollution impacts.

5.3 Pre-clearing and Clearing Surveys

Pre-clearing surveys are to be undertaken by a suitably qualified ecologist. Pre-clearing surveys will include:

- Demarcation of key habitat features as hollow-bearing trees, fallen logs and bushrock; and
- Provision of a report following the completion of a pre-clearing survey, detailing the location and type of each habitat feature.

To minimise impacts to native fauna species, clearing should be undertaken in the following two-stage process under the supervision of a suitably qualified ecologist:

- The initial phase of clearing will involve clearing around identified habitat features and leaving the features overnight;
- The second stage will involve clearing of the habitat features left overnight followed by an inspection;

An ecologist should investigate all fallen trees for the presence of hollows not detected prior to clearing. Inspections should be undertaken of these hollows for native fauna.

An ecologist should be present while clearing to rescue animals injured during the clearance operation. Provisions will be made to protect any native fauna during clearing activities by the following means:

- All persons working on the vegetation clearing will be briefed about the possible fauna present and should avoid injuring any present;
- Animals disturbed or dislodged during the clearance but not injured should be assisted to move to the adjacent bushland; and
- If animals are injured during the vegetation clearance, appropriate steps will be taken to humanely treat the animal (either taken to the nearest veterinary clinic for treatment, or if the animal is unlikely to survive, it will be humanely euthanized).

5.4 Weed Control Measures

Noxious weed species occurring within the subject site should be managed in order to prevent further spread. Prior to any vegetation clearance, noxious weeds in the canopy and shrub layers should be demarcated in order for these to be disposed of separately from native material. All groundcover should be disposed of as exotic as the majority is exotic grass with scattered noxious species such as *Senecio madagascariensis, Bryophyllum delagoense* and *Asparagus asparagoides*.

Chapter 6

Conclusion

Despite the impacts of previous disturbance and location within a fragmented landscape, the proposed development will require the clearing of native vegetation that forms suitable habitat for some threatened fauna species. Past and current use of the subject site has entailed clearing and modification of the majority of pre-existing native vegetation.

Approximately 1.83 ha of vegetation will be cleared for the proposed development, consisting of up to 0.75 ha of Cumberland Plain Woodland (0.54 ha of moderate condition, 0.12 ha of low condition and 0.09 ha of canopy), 0.86 ha of Exotic Grassland, 0.07 ha of Acacia regrowth and.0.15 ha of Urban Native/Exotic Cover.

Within the subject site the Cumberland Plain Woodland community is in relatively low to moderate condition. The community largely lacks native species within the ground and midstorey layers, although there are a higher number of natives species present within moderate condition areas. Within the overall subject site the ground layer is dominated by exotic species, including noxious weeds particularly within the low condition and canopy areas, although these also occur within moderate condition areas. The long-term viability of Cumberland Plain Woodland within the subject site has previously been reduced as the community has previously been fragmented by various developments and past land uses (including grazing and mowing) with the local extent existing as patches of varying conditions and sizes.

The SEPP 44 assessment of the subject site identified that the vegetation present on the site is consistent with the definition of Potential Koala Habitat. Survey for scats and scratches or review of historic records of Koala on the site failed to indicate the presence of breeding females on the site or any indication that resident individuals are present. The site does not meet the definition of core Koala habitat under SEPP 44. Therefore no site specific Koala Management Plan is required. The total impacts (direct and indirect) are not expected to significantly impact the Koala.

Some threatened species have been recorded from the locality, and some have the potential to occur within the subject site. Threatened fauna species have the potential to occur within the subject site based on the presence of suitable habitat and records in the locality.

The mitigation measures recommended to be implemented included:

- Vegetation protection;
- Erosion, sedimentation and pollution control;

- Pre-clearing and clearing surveys; and
- Weed control measures.

No significant impact is predicted to occur to threatened species, populations or communities as a result of the proposed development. Therefore, the preparation of a Species Impact Statement (SIS) is not warranted. A referral to the Commonwealth Department of the Environment, under the EPBC Act is also not required.

cumberland ecology

References

Botanic Gardens Trust. 2016. PlantNET. National Herbarium of NSW, Royal Botanic Garden, Sydney.

Braun-Blanquet, J. 1927. Pflanzensoziologie Wien Springer.

DEC (NSW). 2006. Recovery Plan for the Large Forest Owls: Powerful Owl *Ninox strenua;* Sooty Owl *Tyto tenebricosa;* Masked Owl *Tyto novaehollandiae*. Department of Environment and Conservation (NSW), Hurstville.

DECCW. 2009. Draft National Recovery Plan for the Grey-headed Flying-fox *Pteropus poliocephalus*. Department of Environment, Climate Change and Water, Sydney, NSW.

DECCW. 2011. Approved Cumberland Plain Recovery Plan. DECCW, Hurstville.

DoE. 2016. EPBC Protected Matters Search Tool. Department of the Environment, Canberra.

Harden, G. J. 1990-1993. Flora of NSW Volumes 1-4. New South Wales University Press, Kensington.

Lindenmayer, D. B. and J. Fischer. 2006. *Habitat fragmentation and landscape change:* An Ecological and Conservation Synthesis. Island Press, Washington D.C.

NSW Scientific Committee. 2004. Grey-headed Flying-fox - vulnerable species listing. Department of Environment and Conservation (NSW), Hurstville.

OEH. 2011. Cumberland Plain Woodland in the Sydney Basin Bioregion - critically endangered ecological community listing.

OEH. 2013. The Native Vegetation of the Sydney Metropolitan Area. Office of Environment and Heritage, Sydney.

OEH. 2014a. Koala - profile. Office of Environment and Heritage, Hurstville.

OEH. 2014b. Koala habitat and feed trees. NSW Office of Environment and Heritage, Hurstville.

OEH. 2014c. Little Lorikeet - profile. Office of Environment and Heritage, Hurstville.

OEH. 2014d. Powerful Owl - profile. Office of Environment and Heritage, Hurstville.

OEH. 2014e. Square-tailed Kite - profile. Office of Environment and Heritage, Hurstville.

OEH. 2014f. Yellow-bellied Sheathtail-bat - profile. Office of Environment and Heritage, Hurstville.

OEH. 2015a. Eastern Freetail-bat - profile. Office of Environment and Heritage, Hurstville.

OEH. 2015b. Greater Broad-nosed Bat - profile Office of Environment and Heritage Hurstville.

OEH. 2015c. Little Eagle - profile. Office of Environment and Heritage, Hurstville.

OEH. 2015d. Southern Myotis - profile Office of Environment and Heritage, Hurstville

OEH. 2016a. BioNet. Office of Environment and Heritage.

OEH. 2016b. Eastern Bentwing-bat - profile. Office of Environment and Heritage, Hurstville.

OEH. 2016c. Eastern False Pipistrelle - profile Office of Environment and Heritage, Hurstville.

OEH. 2016d. Powerful Owl - profile. Office of Environment and Heritage, Hurstville.

Phillips, S. 2016. Campbelltown Comprehensive Koala Plan of Management. Prepared by Biolink for Campbelltown City Council. Campbelltown City Council, Campbelltown.

Appendix A

Flora Species List

cumberland ecology

Table A.1 Flora species recorded within the subject site

Family	Exotic/Non-endemic	Species	Common	Q1	Q2	Q3	Q4	Q5	RM1	RM2	RM3	RM4	RM5	RM6
				C	C	C	C	C						
Tree														
Altingiaceae	*	*Liquidambar styraciflua*												X
Myrtaceae		*Eucalyptus amplifolia*	Cabbage Gum		adj.							X	X	
Myrtaceae		*Eucalyptus crebra*	Narrow-leaved Ironbark	adj.		3			X					
Myrtaceae		*Eucalyptus fibrosa*	Red Ironbark											X
Myrtaceae	P	*Eucalyptus microcorys*	Tallowwood											X
Myrtaceae		*Eucalyptus moluccana*	Grey Box	35	adj.	30		25		X		X	X	
Myrtaceae		*Eucalyptus tereticornis*	Forest Red Gum			adj.				X		X	X	
Small Tree														
Anacardiaceae	*	*Schinus areira*	Pepper Tree										X	
Arecaceae	*	*Syagrus romanzoffiana*	Cocos Palm						X					
Bignoniaceae	*	*Jacaranda mimosifolia*	Jacaranda						X					
Casuarinaceae	P	*Casuarina cunninghamiana*	River Oak											X
Cupressaceae	*	*Cupressus sp.*							X				X	
Fabaceae (Mimosoideae)		*Acacia decurrens*	Black Wattle	15									X	
Fagaceae	*	*Quercus robur*	English Oak											X
Myrtaceae		*Eucalyptus amplifolia*	Cabbage Gum											X

Table A.1 Flora species recorded within the subject site

Family	Exotic/Non-endemic	Species	Common	Q1	Q2	Q3	Q4	Q5	RM1	RM2	RM3	RM4	RM5	RM6
Myrtaceae		*Eucalyptus crebra*	Narrow-leaved Ironbark										X	
Myrtaceae		*Eucalyptus eugenioides*	Thin-leaved Stringybark							X				
Myrtaceae		*Eucalyptus moluccana*	Grey Box	5	adj.	10				X				
Myrtaceae	P	*Eucalyptus nicholii*	Narrow-leaved Black Peppermint											X
Myrtaceae	P	*Eucalyptus sideroxylon*	Mugga Ironbark											X
Myrtaceae		*Eucalyptus tereticornis*	Forest Red Gum					5		X		X		
Myrtaceae	P	*Melaleuca armillaris*	Bracelet Honey-myrtle											X
Myrtaceae		*Melaleuca styphelioides*	Prickly-leaved Tea Tree									X	X	
Oleaceae	*	*Ligustrum lucidum*	Large-leaved Privet						X				X	
Oleaceae	*	*Olea europaea subsp. cuspidata*	African Olive									X		
Pinaceae	*	*Pinus sp.*												X
Sapindaceae	*	*Acer japonicum*	Japanese Maple											X
Sapindaceae	P	*Cupaniopsis anacardioides*	Tuckeroo											X
Sapindaceae	*	*Koelreuteria bipinnata*												X
Ulmaceae	*	*Ulmus parvifolia*	Chinese Elm						X					X
Shrub														

Table A.1 Flora species recorded within the subject site

Family	Exotic/Non-endemic	Species	Common	Q1	Q2	Q3	Q4	Q5	RM1	RM2	RM3	RM4	RM5	RM6
Apocynaceae	*	*Plumeria sp.*	Frangipani											X
Buxaceae	*	*Buxus microphylla var. japonica*							X					
Cactaceae	*	*Opuntia stricta*	Common Prickly Pear	<1										
Cupressaceae	*	*Cupressus sp.*												X
Ericaceae	*	*Rhododendron sp.*												X
Euphorbiaceae	*	*Ricinus communis*	Castor Oil Plant										X	
Fabaceae (Faboideae)		*Indigofera australis*	Australian Indigo	1						X				
Fabaceae (Mimosoideae)		*Acacia decurrens*	Black Wattle	1	adj.	adj.						X		
Fabaceae (Mimosoideae)		*Acacia floribunda*	White Sally Wattle		adj.									
Fabaceae (Mimosoideae)		*Acacia implexa*	Hickory Wattle	1	adj.							X		
Lythraceae	*	*Lagerstroemia sp.*	Crepe Myrtle											X
Malaceae	*	*Cotoneaster pannosus*											X	
Malaceae	*	*Eriobotrya japonica*	Loquat						X					
Moraceae	*	*Morus alba*	White Mulberry											X
Myrtaceae		*Callistemon citrinus*	Crimson Bottlebrush											X
Myrtaceae	P	*Callistemon rigidus*	Stiff Bottlebrush											X
Myrtaceae	P	*Callistemon salignus*	Willow Bottlebrush						X				X	
Myrtaceae		*Eucalyptus amplifolia*	Cabbage Gum									X		

Table A.1 Flora species recorded within the subject site

Family	Exotic/Non-endemic	Species	Common	Q1	Q2	Q3	Q4	Q5	RM1	RM2	RM3	RM4	RM5	RM6
Myrtaceae		*Eucalyptus moluccana*	Grey Box	10	adj.	adj.		<1						
Myrtaceae		*Eucalyptus tereticornis*	Forest Red Gum		adj.									
Myrtaceae	P	*Leptospermum petersonii*	Lemon-scented Teatree											X
Myrtaceae	P	*Melaleuca armillaris*	Bracelet Honey-myrtle						X					
Myrtaceae	P	*Syzygium paniculatum*	Magenta Lilly Pilly						X					
Oleaceae	*	*Ligustrum lucidum*	Large-leaved Privet		adj.									
Oleaceae	*	*Ligustrum sinense*	Small-leaved Privet	<1									X	
Oleaceae	*	*Olea europaea subsp. cuspidata*	African Olive	<1										
Ochnaceae	*	*Ochna serrulata*	Mickey Mouse Plant	<1										
Pittosporaceae		*Bursaria spinosa*	Blackthorn	4	adj.			<1		X			X	
Plumbaginaceae	*	*Plumbago auriculata*											X	
Polygalaceae	*	*Polygala myrtifolia*												X
Proteaceae	P	*Grevillea 'Robyn Gordon'*							X					X
Rosaceae	*	*Photinia sp.*												X
Rosaceae	*	*Rosa sp.*												X
Rubiaceae	*	*Gardenia sp.*											X	
Rutaceae	*	*Citrus × limon*	Lemon											X
Rutaceae	*	*Murraya paniculata*	Murraya										X	

cumberland ecology

Table A.1 Flora species recorded within the subject site

Family	Exotic/Non-endemic	Species	Common	Q1	Q2	Q3	Q4	Q5	RM1	RM2	RM3	RM4	RM5	RM6
Santalaceae		*Exocarpos cupressiformis*	Cherry Ballart	<1										
Solanaceae	*	*Cestrum parqui*	Green Cestrum									X		
Theaceae	*	*Camellia sp.*												X
	*	*Washingtonia filifera*	California Fan Palm										X	
Dicot Herb														
Acanthaceae		*Brunoniella australis*	Blue Trumpet	<1		<1				X				
Amaranthaceae	*	*Gomphrena celosioides*	Gomphrena Weed	adj.			2		X				X	
Amaranthaceae	*	*Amaranthus retroflexus*	Redroot Amaranth		adj.									
Amaranthaceae		*Alternanthera nana*	Hairy Joyweed			<1								
Asteraceae	*	*Arctotheca calendula*	Capeweed						X					
Asteraceae	*	*Bidens pilosa*	Cobblers Pegs	<1	2	1							X	X
Asteraceae	*	*Bidens subalternans*	Greater Beggar's Ticks	adj.										
Asteraceae	*	*Cirsium vulgare*	Spear Thistle		2		1						X	
Asteraceae	*	*Conyza sumatrensis*	Tall Fleabane		3	<1	2						X	X
Asteraceae		*Cotula australis*	Common Cotula			<1		<1						
Asteraceae		*Euchiton sphaericus*			2									
Asteraceae	*	*Gamochaeta americana*	Cudweed		4		2	<1	X				X	
Asteraceae	*	*Gamochaeta calviceps*	Cudweed		2									

Table A.1 Flora species recorded within the subject site

Family	Exotic/Non-endemic	Species	Common	Q1	Q2	Q3	Q4	Q5	RM1	RM2	RM3	RM4	RM5	RM6
Asteraceae	*	*Hypochaeris microcephala*	White Flatweed			<1		<1						
Asteraceae	*	*Hypochaeris radicata*	Catsear		4			<1	X	X			X	
Asteraceae	*	*Lactuca saligna*	Willow-leaved Lettuce		3									
Asteraceae		*Lagenophora stipitata*	Blue Bottle-daisy			<1								
Asteraceae	*	*Osteospermum fruticosum*	Trailing African Daisy	adj.										
Asteraceae	*	*Senecio madagascariensis*	Fireweed	<1	4	1	2	<1						X
Asteraceae	*	*Soliva sessilis*	Bindyi			<1	2					X		
Asteraceae	*	*Taraxacum officinale*	Dandelion				2		X		X		X	
Asteraceae	*	*Sonchus oleraceus*	Common Sowthistle			<1	2		X	X			X	X
Asteraceae		*Vittadinia cuneata*	Fuzzweed					<1						
Asteraceae		*Vittadinia sulcata*		<1				<1		X				
Brassicaceae	*	*Brassica fruticulosa*	Twiggy Turnip	<1	adj.	<1		<1	X	X				
Brassicaceae	*	*Capsella bursa-pastoris*	Shepherd's Purse						X					
Brassicaceae	*	*Lepidium africanum*								X				
Brassicaceae	*	*Lepidium didymum*	Lesser Swinecress									X		
Campanulaceae		*Wahlenbergia gracilis*	Sprawling Bluebell		2			<1	X					
Caryophyllaceae	*	*Paronychia brasiliana*	Chilean Whitlow Wort			<1	3	<1	X			X	X	X
Caryophyllaceae	*	*Stellaria media*	Common Chickweed			<1								

cumberland ecology

Table A.1 Flora species recorded within the subject site

Family	Exotic/Non-endemic	Species	Common	Q1	Q2	Q3	Q4	Q5	RM1	RM2	RM3	RM4	RM5	RM6
Chenopodiaceae		*Atriplex semibaccata*	Creeping Saltbush	adj.									X	
Chenopodiaceae		*Dysphania pumilio*							X					
Chenopodiaceae		*Einadia hastata*	Berry Saltbush	1	adj.								X	
Chenopodiaceae		*Einadia nutans* subsp. *linifolia*		<1				<1		X				
Chenopodiaceae		*Einadia polygonoides*		<1		<1		<1		X			X	
Clusiaceae	*	*Hypericum perforatum*	St. Johns Wort		3									
Convolvulaceae		*Dichondra repens*	Kidney Weed	1		1	2	<1	X	X		X	X	X
Crassulaceae	*	*Bryophyllum delagoense*	Mother-of-millions	2				<1		X				
Crassulaceae	*	*Bryophyllum pinnatum*	Live Plant											X
Crassulaceae	*	*Crassula sarmentosa* var. *sarmentosa*		adj.										
Fabaceae (Faboideae)	*	*Lotus uliginosus*	Birds-foot Trefoil		2		3							
Fabaceae (Faboideae)	*	*Medicago polymorpha*	Burr Medic						X					
Fabaceae (Faboideae)	*	*Trifolium repens*	White Clover		adj.		4						X	X
Geraniaceae	*	*Pelargonium sp.*											X	X
Lamiaceae		*Mentha satureioides*	Creeping Mint					<1						
Lamiaceae	*	*Stachys arvensis*	Stagger Weed								X	X		
Lobeliaceae		*Pratia purpurascens*	Whiteroot	adj.		<1								
Malvaceae	*	*Modiola caroliniana*	Red-flowered Mallow		adj.		3	<1	X		X	X	X	X

cumberland ecology

Table A.1 Flora species recorded within the subject site

Family	Exotic/Non-endemic	Species	Common	Q1	Q2	Q3	Q4	Q5	RM1	RM2	RM3	RM4	RM5	RM6
Malvaceae	*	*Sida rhombifolia*		5	3	10	3	<1	X	X		X		X
Malvaceae	*	*Malva parviflora*	Small-flowered Mallow			<1			X			X		
Myrsinaceae	*	*Anagallis arvensis*	Scarlet Pimpernel		2				X					
Oxalidaceae		*Oxalis perennans*		<1	2	<1		<1		X			X	
Plantaginaceae	*	*Plantago lanceolata*	Lamb's Tongues	<1		1	3	1	X	X			X	X
Plantaginaceae		*Veronica plebeia*	Trailing Speedwell								X			
Polygonaceae	*	*Acetosella vulgaris*	Sheep Sorrel					<1	X					
Lamiaceae		*Plectranthus parviflorus*	Cockspur Flower	adj.		<1								
Portulacaceae		*Portulaca oleracea*	Pigweed				2						X	
Portulacaceae	*	*Talinum paniculatum*		adj.		1								
Rubiaceae	*	*Richardia stellaris*					2						X	
Solanaceae	*	*Lycopersicon esculentum*	Tomato											X
Solanaceae	*	*Solanum nigrum*	Black-berry Nightshade											X
Solanaceae		*Solanum prinophyllum*	Forest Nightshade	<1										
Solanaceae	*	*Solanum pseudocapsicum*	Madeira Winter											X
Verbenaceae	*	*Verbena bonariensis*	Purpletop		adj.									
Verbenaceae	*	*Verbena officinalis*	Common Verbena		3									
Ferns and Allies														

Table A.1 Flora species recorded within the subject site

Family	Exotic/Non-endemic	Species	Common	Q1	Q2	Q3	Q4	Q5	RM1	RM2	RM3	RM4	RM5	RM6
Lomariopsidaceae	*	*Nephrolepis cordifolia*	Fishbone Fern										X	
Pteridaceae		*Cheilanthes sieberi*		adj.										
Climbers and Vines														
Apocynaceae	*	*Araujia sericifera*	Moth Vine	24		<1							X	X
Asparagaceae	*	*Asparagus asparagoides*	Bridal Creeper	3		1		<1		X			X	
Fabaceae (Faboideae)		*Desmodium varians*	Slender Tick-trefoil							X				
Fabaceae (Faboideae)		*Glycine microphylla*	Small-leaf glycine	<1				<1		X				
Fabaceae (Faboideae)		*Glycine tabacina*		<1	2	<1	2	<1	X	X				
Fabaceae (Faboideae)		*Hardenbergia violacea*	Purple Coral Pea	<1						X				
Loranthaceae		*Amyema miquelii*								X				
Oleaceae	*	*Jasminum polyanthum*	White Jasmine										X	
Rosaceae	*	*Rubus fruticosus aggregate*	Blackberry	adj.	adj.					X				X
Vitaceae		*Cayratia clematidea*	Native Grape	1										
Monocots (Other)														
Agavaceae	*	*Yucca aloifolia*	Spanish Bayonet										X	
Anthericaceae		*Arthropodium sp.*		<1										
Anthericaceae		*Arthropodium minus*						<1		X				
Anthericaceae		*Caesia parviflora*	Pale Grass-lily	<1										

Table A.1 Flora species recorded within the subject site

Family	Exotic/Non-endemic	Species	Common	Q1	Q2	Q3	Q4	Q5	RM1	RM2	RM3	RM4	RM5	RM6
Araceae	*	*Monstera deliciosa*	Fruit Salad Plant										X	
Araceae	*	*Zantedeschia aethiopica*	Arum Lily										X	
Asparagaceae	*	*Asparagus aethiopicus*	Ground Asparagus	<1						X				
Asteliaceae	*	*Cordyline australis*	Cabbage Tree						X	X	X			
Commelinaceae		*Commelina cyanea*				1								
Commelinaceae	*	*Tradescantia fluminensis*	Wandering Jew	adj.										
Commelinaceae	*	*Cyperus Eragrostis*	Umbrella Sedge											X
Cyperaceae		*Cyperus gracilis*	Slender Flat-sedge			5	2	<1	X			X	X	X
Cyperaceae		*Gahnia aspera*	Rough Saw-sedge	<1										
Doryanthaceae	P	*Doryanthes excelsa*	Giant Lily							X	X			
Juncaceae		*Juncus usitatus*											X	
Lomandraceae		*Lomandra filiformis* subsp. *filiformis*	Wattle Mat-rush	adj.						X				
Orchidaceae		*Dendrobium sp.*											X	
Phormiaceae		*Dianella caerulea* var. *caerulea*	Blue Flax Lily	<1										
Phormiaceae		*Dianella longifolia*	Blueberry Lily	<1		<1		<1						
Zingiberaceae	*	*Hedychium gardnerianum*	Ginger Lily											X
Monocots (Grasses)														
Poaceae		*Aristida ramosa*	Purple Wiregrass	<1										

Table A.1 Flora species recorded within the subject site

Family	Exotic/Non-endemic	Species	Common	Q1	Q2	Q3	Q4	Q5	RM1	RM2	RM3	RM4	RM5	RM6
Poaceae		*Aristida vagans*	Threeawn Speargrass					<1		X				
Poaceae		*Austrostipa rudis*		10										
Poaceae	*	*Axonopus fissifolius*	Narrow-leafed Carpet Grass		5									
Poaceae		*Bothriochloa macra*	Red Grass						X					
Poaceae	*	*Briza subaristata*												X
Poaceae	*	*Bromus catharticus*	Prairie Grass			5								
Poaceae		*Chloris truncata*	Windmill Grass							X				
Poaceae		*Chloris ventricosa*	Plump Windmill Grass	<1				<1		X				
Poaceae	*	*Chloris virgata*	Feathertop Rhodes Grass						X					
Poaceae	*	*Cynodon dactylon*	Couch	adj.	5		5	1	X	X		X	X	
Poaceae		*Dichelachne micrantha*	Shorthair Plumegrass							X				
Poaceae		*Digitaria diffusa*	Open Summer-grass	<1										
Poaceae		*Digitaria parviflora*	Small-flowered Finger Grass	2										
Poaceae	*	*Digitaria sanguinalis*	Summer Grass											X
Poaceae		*Echinopogon caespitosus*	Bushy Hedgehog-grass	adj.										
Poaceae		*Echinopogon ovatus*	Forest Hedgehog Grass	<1						X				
Poaceae	*	*Ehrharta erecta*	Panic Veldtgrass	5		20		<1	X				X	
Poaceae	*	*Eleusine tristachya*	Goose Grass				2							

Table A.1 Flora species recorded within the subject site

Family	Exotic/Non-endemic	Species	Common	Q1	Q2	Q3	Q4	Q5	RM1	RM2	RM3	RM4	RM5	RM6
Poaceae		*Entolasia marginata*	Bordered Panic	<1										
Poaceae		*Eragrostis brownii*	Brown's Lovegrass		2									
Poaceae	*	*Eragrostis curvula*	African Lovegrass		2									
Poaceae		*Eragrostis leptostachya*	Paddock Lovegrass	<1	3			1		X				
Poaceae		*Imperata cylindrica*	Blady Grass							X				
Poaceae		*Microlaena stipoides*	Weeping Grass	60	5	30	3	5		X			X	X
Poaceae		*Oplismenus aemulus*	Australian Basket Grass	<1										
Poaceae		*Paspalidium distans*		1		10	2	5		X			X	
Poaceae	*	*Paspalum dilatatum*	Paspalum	<1	6		5	1	X	X			X	X
Poaceae	*	*Pennisetum clandestinum*	Kikuyu Grass	<1	adj.		7	5	X	X			X	X
Poaceae	*	*Poa annua*	Winter Grass									X		
Poaceae		*Rytidosperma caespitosum*	Ringed Wallaby Grass					<1						
Poaceae		*Rytidosperma fulvum*	Wallaby Grass	<1	3	<1								
Poaceae		*Rytidosperma racemosum*				<1		50		X				
Poaceae	*	*Setaria parviflora*		<1	4		3	<1						
Poaceae	*	*Sporobolus africanus*	Parramatta Grass		adj.									

cumberland ecology

Appendix B

Threatened Flora Likelihood of Occurrence

Table B.1 Threatened flora likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
Casuarinaceae	*Allocasuarina glareicola*		E	E	0	Found in open woodland with *Eucalyptus parramattensis*, *Eucalyptus fibrosa*, *Angophora bakeri*, *Eucalyptus sclerophylla* and *Melaleuca decora* on lateritic soil.	Unlikely to occur. No records within the locality and the subject site does not support suitable habitat for this species.
Ericaceae	*Leucopogon fletcheri subsp. fletcheri*		E		1	Occurs on flat to gently sloping ground along ridges and spurs in dry eucalypt woodland or shrubland. Grows on soils which are clayey lateritic.	Unlikely to occur. The subject site only supports highly marginal suitable habitat for this species. The single record is dated at 1989 near Georges River, at least 2 km south of the subject site.
Ericaceae	*Leucopogon exolasius*	Woronora Beard-heath	V	V	0	Found in woodland on sandstone.	Unlikely to occur. No records within the locality and the subject site does not support suitable habitat for this species.
Fabaceae (Faboideae)	*Pultenaea pedunculata*	Matted Bush-pea	E		1	Occurs in dry sclerophyll forest and disturbed sites on a variety of soils. On the Cumberland Plain the species is recorded	Unlikely to occur. The subject site supports suitable habitat for this species, however within the locality it is only known from

Table B.1 Threatened flora likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						from Cumberland Plain Woodlands, the shale-soil form of Shale Sandstone Transition Forests and Cooks River/Castlereagh Ironbark Forest.	around the Holsworthy Military Area.
Fabaceae (Mimosoideae)	*Acacia pubescens*	Downy Wattle	V	V	1	Grows in dry sclerophyll forest and woodland in clay soils.	Unlikely to occur. The subject site does not support suitable habitat for this species. Within the locality, the species is known to occur around the Holsworthy Army Base.
Fabaceae (Mimosoideae)	*Acacia bynoeana*	Bynoe's Wattle	E	V	0	Occurs in heath or dry sclerophyll forest on sandy soils. Seems to prefer open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches.	Unlikely to occur. No records within the locality and the subject site does not support suitable habitat for this species.

Table B.1 Threatened flora likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
Geraniaceae	*Pelargonium sp. Striatellum* (G.W.Carr 10345)	Omeo Storksbill	E	E	0	Has a narrow habitat that is usually just above the high-water level of irregularly inundated or ephemeral lakes, in the transition zone between surrounding grasslands or pasture and the wetland or aquatic communities.	Unlikely to occur. No records within the locality and the subject site does not support suitable habitat for this species.
Myrtaceae	*Eucalyptus nicholii*	Narrow-leaved Black Peppermint	V	V	0	Often found in dry grassy woodland mainly on infertile soils.	Present on site. One individual occurs as a planting, not in its natural state.
Myrtaceae	*Melaleuca deanei*	Deane's Paperbark	V	V	2	Grows predominately in ridgetop woodland although rarely found in heath on sandstone. Found in two disjunct locations in Ku-ring-gai/Berowra and Holsworthy/Wedderburn.	Unlikely to occur. The subject site does not support suitable habitat for this species. Recorded within the locality at Holsworthy.
Myrtaceae	*Melaleuca biconvexa*	Biconvex Paperbark	V	V	0	Found near watercourses on alluvium soils over shale. Often forming a dense stand in a narrow strip in damp areas	Unlikely to occur. No records within the locality and the subject site does not support suitable

Table B.1 Threatened flora likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						adjacent to a watercourse.	habitat for this species.
Myrtaceae	*Syzygium paniculatum*	Magenta Lilly Pilly	E	V	0	Rainforest species on sandy soils.	Present on site. One individual occurs as a planting, not in its natural state.
Orchidaceae	*Pterostylis saxicola*	Sydney Plains Greenhood	E	E	13	Found in sclerophyll forests or woodland on shale/sandstone transition soils or shale soils over flat sheets of sandstone rock shelves above cliff lines and also in crevices between sandstone boulders.	Unlikely to occur. The subject site does not support suitable habitat for this species. Within the locality, the species is known to occur within more vegetated areas around Georges River.
Orchidaceae	*Cryptostylis hunteriana*	Leafless Tongue Orchid	V	V	0	Grows in swamp-heath on sandy soils.	Unlikely to occur. No records within the locality and the subject site does not support suitable habitat for this species.
Orchidaceae	*Genoplesium baueri*	Bauer's Midge Orchid	E	E	0	Grows in dry sclerophyll forest and moss gardens over sandstone.	Unlikely to occur. No records within the locality and the subject site does not support suitable

Table B.1 Threatened flora likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
							habitat for this species.
Orchidaceae	*Pterostylis gibbosa*	Illawarra Greenhood	E	E	0	All known populations grow in open forest or woodland, on flat or gently sloping land with poor drainage.	Unlikely to occur. No records within the locality and the subject site does not support suitable habitat for this species.
Orchidaceae	*Thelymitra kangaloonica*	Kangaloon Sun Orchid	CE	CE	0	Grows in swamps in sedgelands over grey silty grey loam soils.	Unlikely to occur. No records within the locality and the subject site does not support suitable habitat for this species.
Proteaceae	*Grevillea parviflora* subsp. *parviflora*	Small-flower Grevillea	V	V	1	Grows in heathy associations or shrubby woodland, in sandy or light clay soils usually over shale substrates.	Unlikely to occur. The subject site does not support suitable habitat for this species. Within the locality it is known to occur east of Moorebank Ave.
Proteaceae	*Persoonia nutans*	Nodding Geebung	E	E	28	Northern populations are confined to aeolian and alluvial sediments and occur in a range of sclerophyll forest and woodland vegetation	Unlikely to occur. The subject site does not support suitable habitat for this species. Within the locality it is known to occur within Simmos Beach Recreation Reserve

Table B.1 Threatened flora likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						communities, with the majority of individuals occurring within Agnes Banks Woodland or Castlereagh Scribbly Gum Woodland and some in Cooks River / Castlereagh Ironbark Forests. Southern populations also occupy tertiary alluvium, but extend onto shale sandstone transition communities and into Cooks River / Castlereagh Ironbark Forest.	located east of the subject site.
Proteaceae	*Persoonia hirsuta*	Hairy Geebung	E	E	0	Found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone.	Unlikely to occur. No records within the locality and the subject site does not support suitable habitat for this species.
Rhamnaceae	*Pomaderris brunnea*	Brown Pomaderris	E	V	0	Occurs in moist woodland or forest on clay and alluvial soils of flood plains and creek lines.	Unlikely to occur. No records within the locality and the subject site does not support suitable habitat for this species.

Table B.1 Threatened flora likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
Rutaceae	*Asterolasia elegans*		E	E	0	Found in sheltered forests on mid- to lower slopes and valleys, e.g. in or adjacent to gullies which support sheltered forest.	Unlikely to occur. No records within the locality and the subject site does not support suitable habitat for this species.
Santalaceae	*Thesium australe*	Austral Toadflax	V	V	0	Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast.	Unlikely to occur. No records within the locality and the subject site would only support marginal suitable habitat for this species.
Thymelaeaceae	*Pimelea spicata*	Spiked Rice-flower	E	E	4	On the Cumberland Plain sites it is associated with Grey Box communities (particularly Cumberland Plain Woodland variants and Moist Shale Woodland) and in areas of ironbark. In the coastal Illawarra it occurs commonly in Coast Banksia open woodland with a better developed shrub and grass understorey. Coastal headlands and hilltops are the	Possible but unlikely to occur. The subject site supports some suitable, albeit degraded habitat for this species. However there are no records on or adjacent to the subject site and it was not sighted during the Cumberland Ecology survey. It has been recorded at Minto and Casula.

Table B.1 Threatened flora likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						favoured sites.	
Thymelaeaceae	*Pimelea curviflora* var. *curviflora*		V	V	0	Occurs on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands	Unlikely to occur. No records within the locality and the subject site does not support suitable habitat for this species.

* *CE = Critically Endangered, E = Endangered, V = Vulnerable*

Appendix C

Fauna Species List

Table C.1 Fauna species recorded on the subject site

Family	Exotic	Common Name	Scientific Name
Aves			
Accipitridae		Wedge-tailed Eagle	Aquila audax
Artamidae		Grey Butcherbird	Cracticus torquatus
Artamidae		Australian Magpie	Cracticus tibicen
Artamidae		Pied Currawong	Strepera graculina
Cacatuidae		Galah	Eolophus roseicapillus
Columbidae		Crested Pigeon	Ocyphaps lophotes
Columbidae	*	Spotted Dove	Streptopelia chinensis
Corvidae		Australian Raven	Corvus coronoides
Meliphagidae		Noisy Miner	Manorina melanocephala
Meliphagidae		Yellow-faced Honeyeater	Lichenostomus chrysops
Meliphagidae		Bell Miner	Manorina melanophrys
Meliphagidae		Red Wattlebird	Anthochaera carunculata
Monarchidae		Magpie-lark	Grallina cyanoleuca
Pardalotidae		Spotted Pardalote	Pardalotus punctatus
Psittacidae		Rainbow Lorikeet	Trichoglossus haematodus
Psittacidae		Eastern Rosella	Platycercus eximius
Psittacidae		Musk Lorikeet	Glossopsitta concinna
Psittacidae		Australian King Parrot	Alisterus scapularis
Rhipiduridae		Willie Wagtail	Rhipidura leucophrys
Sturnidae	*	Indian Myna	Acridotheres tristis

cumberland ecology

Appendix D

Threatened Fauna Likelihood of Occurrence

Table D.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
Amphibia							
Hylidae	*Litoria aurea*	Green and Golden Bell Frog	E	V	1	Inhabits marshes, dams and stream-sides, particularly those containing bullrushes (*Typha* spp.) or spikerushes (*Eleocharis* spp.).	Unlikely to occur. No suitable habitat present on the subject site.
Hylidae	*Litoria littlejohni*	Littlejohn's Tree Frog	V	V	0	Occurs in heath based forests and woodlands. Breeding habitat occurs in upper reaches of permanent streams and in perched swamps.	Unlikely to occur. No suitable habitat present on the subject site.
Hylidae	*Litoria raniformis*	Southern Bell Frog	E	V	0	Occurs in or around permanent or ephemeral Black Box/Lignum/Nitre Goosefoot swamps, Lignum/Typha swamps and River Red Gum swamps or billabongs along floodplains and river valleys, and also at irrigated rice crops.	Unlikely to occur. No suitable habitat present on the subject site.
Myobatrachidae	*Heleioporus australiacus*	Giant Burrowing Frog	V	V	1	Found in heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based.	Unlikely to occur. No suitable habitat present on the subject site.
Myobatrachidae	*Pseudophryne australis*	Red-crowned Toadlet	V		3	Occurs in open forests, mostly on Hawkesbury and Narrabeen Sandstones. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings. Shelters under rocks and amongst	Unlikely to occur. No suitable habitat present on the subject site.

Table D.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						masses of dense vegetation or thick piles of leaf litter. Breeding congregations occur in dense vegetation and debris beside ephemeral creeks and gutters.	
Aves							
Accipitridae	*Hieraaetus morphnoides*	Little Eagle	V		4	Occurs in open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used.	Potential to occur. Highly mobile, aerial species that may pass over the subject site on occasion.
Accipitridae	*Lophoictinia isura*	Square-tailed Kite	V		2	Occurs in diverse habitats from dry woodlands to open forests. Shows a particular preference to timbered watercourses.	Potential to occur. Highly mobile, aerial species that may pass over the subject site on occasion.
Accipitridae	*Pandion haliaetus*	Osprey	V		0	Found at littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands.	Unlikely to occur. No suitable habitat present on the subject site.
Accipitridae	*Haliaeetus leucogaster*	White-bellied Sea-Eagle		C	0	Found in coastal habitats (especially those close to the sea-shore) and around terrestrial wetlands in tropical and temperate regions of mainland Australia and its offshore islands.	Unlikely to occur. No suitable habitat present on the subject site.

Table D.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
Apodidae	*Apus pacificus*	Fork-tailed Swift		C,J,K	0	Forages aerially over a variety of habitats usually over coastal and mountain areas with a preference for wooded areas.	Potential to occur. Highly mobile, aerial species that may pass over the subject site but unlikely to utilise it directly.
Apodidae	*Hirundapus caudacutus*	White-throated Needletail		C,J,K	0	Almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Occur over most types of habitat, particularly above wooded areas including open forest and rainforest, between trees or in clearings and below the canopy.	Potential to occur. Highly mobile, aerial species that may pass over the subject site but unlikely to utilise it directly.
Ardeidae	*Botaurus poiciloptilus*	Australasian Bittern	E	E	0	Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (*Typha* spp.) and spikerushes (*Eleocharis* spp.).	Unlikely to occur. No suitable habitat present on the subject site.
Cacatuidae	*Callocephalon fimbriatum*	Gang-gang Cockatoo	V		1	Occurs in tall mountain forests and woodlands in summer and drier more open eucalypt forests and woodlands in winter, and often found in urban areas. Require old growth attributes for nesting and roosting.	Possible but unlikely. Only marginal suitable habitat present on the subject site and no records on/adjacent to the site.
Cacatuidae	*Calyptorhynchus lathami*	Glossy Black-Cockatoo	V		6	Inhabits open forest and woodlands of the coast and the Great Dividing Range up to	Unlikely to occur. No suitable habitat present

Table D.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						1000 m in which stands of she-oak species, particularly Black She-oak (*Allocasuarina littoralis*), Forest She-oak (*A. torulosa*) or Drooping She-oak (*A. verticillata*) occur. Feeds almost exclusively on the seeds of several species of she-oak (*Casuarina* and *Allocasuarina* species). Dependent on large hollow-bearing eucalypts for nest sites.	on the subject site as feed trees generally absent (*Casuarina cunninghamiana* only recorded in west of site) and large hollow-bearing trees absent.
Cuculidae	*Cuculus optatus*	Oriental Cuckoo		M	0	Inhabits forest and woodland.	Unlikely to occur. Although suitable habitat present on the subject site, the species is sparsely recorded in NSW.
Dasyornithidae	*Dasyornis brachypterus*	Eastern Bristlebird	E	E	0	Habitat for central and southern populations is characterised by dense, low vegetation including heath and open woodland with a heathy understorey. In northern NSW the habitat occurs in open forest with dense tussocky grass understorey and sparse mid-storey near rainforest ecotone; all of these vegetation types are fire prone.	Unlikely to occur. No suitable habitat present on the subject site.
Estrildidae	*Stagonopleura guttata*	Diamond Firetail	V		1	Inhabits grassy eucalypt woodlands, open	Unlikely to occur.

Table D.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. Often occurs in riparian areas.	Although marginal suitable habitat is present on the subject site,
Meliphagidae	*Anthochaera phrygia*	Regent Honeyeater	CE	CE	0	The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak.	Unlikely to occur. Highly marginal suitable habitat present on the subject site and no records within the locality.
Meliphagidae	*Epthianura albifrons*	White-fronted Chat	V		1	Inhabits salt marsh and other damp areas with low vegetation such as swampy farmland and roadside verges.	Unlikely to occur. No suitable habitat present on the subject site.
Meliphagidae	*Epthianura albifrons*	White-fronted Chat population in the Sydney Metropolitan Catchment Management Area	EP,V		1	Regularly observed in the saltmarsh of Newington Nature Reserve (with occasional sightings from other parts of Sydney Olympic Park and in grassland on the northern bank of the Parramatta River). Regularly observed in the saltmarsh and on the sandy shoreline of a small island of Towra Point Nature Reserve.	Unlikely to occur. No suitable habitat present on the subject site.
Meliphagidae	*Melithreptus gularis gularis*	Black-chinned Honeyeater (eastern subspecies)	V		2	Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark	Unlikely to occur. Highly marginal suitable habitat present on the

Table D.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						(Eucalyptus sideroxylon), White Box (*Eucalyptus albens*), Grey Box (*Eucalyptus microcarpa*), Yellow Box (*Eucalyptus melliodora*) and Forest Red Gum (*Eucalyptus tereticornis*). Also inhabits open forests of smooth-barked gums, stringybarks, ironbarks and tea-trees. Feeding territories are large making the species locally nomadic. The Black-chinned Honeyeater tends to occur in the largest woodland patches in the landscape as birds forage over large home ranges of at least 5 hectares (ha).	subject site.
Meliphagidae		Painted Honeyeater	V	V	0	Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests.	Unlikely to occur. No suitable habitat present on the subject site.
Monarchidae	*Monarcha melanopsis*	Black-faced Monarch		M	0	Wetter, denser forest, often at high elevations.	Unlikely to occur. No suitable habitat present on the subject site.
Monarchidae	*Myiagra cyanoleuca*	Satin Flycatcher		M	0	Found in rainforest, dense wet eucalypt and monsoon forests, paperbark and mangrove swamps and riverside vegetation.	Unlikely to occur. No suitable habitat present on the subject site.
Motacillidae	*Motacilla flava*	Yellow Wagtail		C,J,K	0	Prefers moist areas, such as the edges of	Unlikely to occur.

Table D.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						sewage works and exposed mudbanks.	No suitable habitat present on the subject site.
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella	V		14	Eucalypt forest and woodlands, especially with rough barked species, smooth-barks with dead branches, mallee and acacia. Nests in living trees and feeds off insects in dead trees.	Possible but unlikely. Marginal suitable habitat present on the subject site. Recorded within Georges River Bushland Area and near Edmondson Park.
Petroicidae	*Petroica boodang*	Scarlet Robin	V		7	Found in dry eucalypt forests and woodlands with open and grassy understorey with few scattered shrubs.	Possible but unlikely. Marginal suitable habitat present on the subject site. All records within Georges River Bushland Area.
Psittacidae	*Glossopsitta pusilla*	Little Lorikeet	V		13	Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophoras, Melaleucas and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Also utilises isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban trees. Roosts in treetops, often distant from feeding areas. Nests in	Potential to occur. Suitable foraging habitat present scattered throughout the subject site. Scattered records mainly within Georges River Bushland Area. Species is highly nomadic and forages over a large area.

Table D.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						proximity to feeding areas if possible, most typically selecting hollows in the limb or trunk of smooth-barked Eucalypts.	
Psittacidae	*Lathamus discolor*	Swift Parrot	E	E	1	Occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations.	Possible but unlikely. Marginal suitable habitat present on the subject site, with single record from 2007 at Myrtle Creek at least 2km south-west of subject site.
Rhipiduridae	*Rhipidura rufifrons*	Rufous Fantail		M	0	Inhabits rainforest, dense wet forests, swamp woodlands and mangroves, preferring deep shade, and is often seen close to the ground.	Unlikely to occur. No suitable habitat present on the subject site.
Rostratulidae	*Rostratula australis*	Australian Painted Snipe	E	E	0	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	Unlikely to occur. No suitable habitat present on the subject site.
Scolopacidae	*Gallinago hardwickii*	Latham's Snipe		C,J,K	0	Inhabit open, freshwater wetlands with low, dense vegetation.	Unlikely to occur. No suitable habitat present on the subject site.
Scolopacidae	*Tringa nebularia*	Common Greenshank		C,J,K	0	Inhabits inland wetlands and sheltered coastal habitats.	Unlikely to occur. No suitable habitat present on the subject site.

Table D.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
Strigidae	*Ninox connivens*	Barking Owl	V		1	Inhabits eucalypt woodland, open forest, swamp woodlands and, especially in inland areas, timber along watercourses. Denser vegetation is used occasionally for roosting. During the day they roost along creek lines, usually in tall understorey trees with dense foliage such as Acacia and Casuarina species, or the dense clumps of canopy leaves in large Eucalypts. Nests in hollows of large, old eucalypts.	Unlikely to occur. Marginal suitable habitat present on the subject site. Would more likely inhabit larger tracts of native vegetation such as Georges River Bushland Area.
Strigidae	*Ninox strenua*	Powerful Owl	V		5	Inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. Also occurs in fragmented habitats. Nests in hollows of large, old eucalypts.	Potential to occur. Known to utilise fragmented landscapes, may utilise the subject site as part of a larger foraging area. No breeding habitat present.
Mammalia							
Dasyuridae	*Dasyurus maculatus*	Spotted-tailed Quoll	V	E	1	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual	Unlikely to occur. No suitable habitat present on the subject site.

Table D.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						animals use hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den sites. Females occupy home ranges up to about 750 ha and males up to 3500 ha; usually traverse their ranges along densely vegetated creek lines.	
Emballonuridae	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail-bat	V		9	Found in a large variety of habitats including treed and treeless areas. Inhabits tree hollows or mammal burrows in treeless areas.	Potential to occur. Highly mobile, aerial species that may pass over the subject site as part of a larger foraging range.
Macropodidae	*Petrogale penicillata*	Brush-tailed Rock-wallaby	E	V	0	Occupies rock outcrops, escarpments and cliffs with features such as caves, fissures and ledges. Browses on adjacent vegetation. Has a home range of about 15 ha and shelters in caves.	Unlikely to occur. No suitable habitat present on the subject site.
Molossidae	*Mormopterus norfolkensis*	Eastern Freetail-bat	V		11	Occur in dry sclerophyll forest and woodland east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark or in man-made structures.	Potential to occur. Highly mobile, aerial species that may pass over the subject site as part of a larger foraging range.
Muridae	*Pseudomys*	New Holland Mouse		V	0	Occurs in open habitats (heathland, woodland	Unlikely to occur.

Table D.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
	novaehollandiae					and forest) with a heath understorey and vegetated sand dunes. The species prefers deep soft top soils in order to burrow.	No suitable habitat present on the subject site.
Petauridae	*Petaurus norfolcensis*	Squirrel Glider	V		2	Found in mature or old growth Box, Box-Ironbark woodlands and River Red Gum Forest. Nests and dens in tree hollows.	Unlikely to occur. No suitable habitat present on the subject site.
Phascolarctidae	*Phascolarctos cinereus*	Koala	V	V	63	Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size.	Potential to occur. Marginal suitable habitat present on the subject site. Scattered records throughout the subject site, mainly in the Georges River Bushland Area. Closest record dated at 2011 from Evelyn Street/ Wills Road. Would more likely utilise larger tracts of intact native vegetation such as in Georges River Bushland Area.
Pteropodidae	*Pteropus poliocephalus*	Grey-headed Flying-fox	V	V	12	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths	Potential to occur. Highly mobile, aerial

Table D.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						and swamps as well as urban gardens and cultivated fruit crops.	species that may pass over the subject site as part of a larger foraging range. No roost camps present.
Vespertilionidae	*Chalinolobus dwyeri*	Large-eared Pied Bat	V	V	1	Found in well-timbered areas containing gullies. Roosts in caves, crevices in cliffs and old mine workings frequenting low to mid-elevation dry open forest and woodland close to these features.	Unlikely to occur. No suitable habitat present on the subject site. No roosting habitat present on the subject site or in the vicinity.
Vespertilionidae	*Falsistrellus tasmaniensis*	Eastern False Pipistrelle	V		5	Prefers moist habitats, with trees taller than 20 m. Generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings.	Potential to occur. Highly mobile, aerial species that may pass over the subject site as part of a larger foraging range.
Vespertilionidae	*Miniopterus australis*	Little Bentwing-bat	V		1	Moist eucalypt forest, rainforest or dense coastal banksia scrub. Little Bentwing-bats roost in caves, tunnels and sometimes tree hollows during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats.	Unlikely to occur. No suitable habitat present on the subject site.
Vespertilionidae	*Miniopterus*	Eastern Bentwing-bat	V		8	Caves are the primary roosting habitat, but also	Potential to occur.

Table D.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
	schreibersii oceanensis					use derelict mines, storm-water tunnels, buildings and other man-made structures. Hunt in forested areas, catching moths and other flying insects above the tree tops.	Highly mobile, aerial species that may pass over the subject site as part of a larger foraging range.
Vespertilionidae	*Myotis macropus*	Southern Myotis	V		4	Roosts close to water in caves, mines, tree hollows, storm water channels, bridges, buildings or in dense foliage. Forages over streams and pools catching insects and fish.	Potential to occur. Highly mobile, aerial species that may pass over the subject site as part of a larger foraging range. Although no riparian habitat present, Georges River is in the vicinity south of the subject site.
Vespertilionidae	*Scoteanax rueppellii*	Greater Broad-nosed Bat	V		10	More commonly found in tall wet forest but also occurs in dry eucalypt forest. Roosts in tree hollows and buildings. Forages along creek and river corridors.	Potential to occur. Highly mobile, aerial species that may pass over the subject site as part of a larger foraging range. Although no riparian habitat present, Georges River is in the vicinity south of the subject site.

Table D.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
Reptilia							
Elapidae	*Hoplocephalus bungaroides*	Broad-headed Snake	E	V	0	Shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. Moves from the sandstone rocks to shelters in crevices or hollows in large trees within 500m of escarpments in summer.	Unlikely to occur. No suitable habitat present on the subject site.
Gastropoda							
Camaenidae	*Meridolum corneovirens*	Cumberland Plain Land Snail	E		46	Primarily inhabits Cumberland Plain Woodland (an endangered ecological community). This community is a grassy, open woodland with occasional dense patches of shrubs. Lives under litter of bark, leaves and logs, or shelters in loose soil around grass clumps. Occasionally shelters under rubbish.	Possible but unlikely. Highly marginal suitable habitat present on the subject site. The majority of groundcover at suitably sized trees was either dominated by exotics, frequently mown or cleared around the base. Not previously recorded on or adjacent to the subject site.

** CE = Critically Endangered, E = Endangered, EP = Endangered Population, V = Vulnerable*

cumberland ecology

Appendix E

Assessments of Significance (7 Part Tests)

E.1 Endangered Ecological Communities

E.1.1 Cumberland Plain Woodland

Background

Cumberland Plain Woodland (CPW) typically comprises an open tree canopy layer, sometimes with a shrub layer and groundcover dominated by grasses and herbs. Dominant canopy species are *Eucalyptus moluccana* (Grey Box) and *E. tereticornis* (Forest Red Gum), often with *E. crebra* (Grey Ironbark), *E. eugenioides* (Narrow-leaved Stringybark), *Corymbia maculata* (Spotted Gum) or other less frequently occurring eucalypts, including *Angophora floribunda*, *A. subvelutina* (Broad-leaved Apple), *E. amplifolia* (Cabbage Gum) and *E. fibrosa* (Broad-leaved Ironbark) (OEH 2011). Soils within this community are derived from Wianamatta Group geology. CPW is listed as a Critically Endangered Ecological Community under the TSC and EPBC Act.

CPW exists in scattered patches throughout the subject site. The canopy species within the subject site are dominated by *Eucalyptus moluccana* (Grey Box), *Eucalyptus tereticornis* (Forest Red Gum) and *Eucalyptus crebra* (Narrow-leaved Ironbark). To a lesser extent *Eucalyptus fibrosa* (Red Ironbark), *Eucalyptus amplifolia* (Cabbage Gum) and *Eucalyptus eugenioides* (Thin-leaved Stringybark). The trees are currently set within a highly disturbed environment and have very little scope for regenerating naturally in the majority of areas where the community occurs. It is evident that the vegetation on the subject site has been cleared extensively from historic and on-going mowing and grazing as the groundcover contains predominantly exotic species and the understorey is very sparse to absent in the majority of the community on the subject site.

However, as the Final Determination of the TSC Act lists scattered trees, these individuals do form a part of the listed community. Characteristic native shrub and groundcover species are also present throughout the community, however they are generally in low abundances.

Assessment of Significance

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Not applicable.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

Not applicable.

(c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

The total area of CPW present within the subject site is 2.38 ha. Of this, up to 0.75 ha of the community is proposed to be removed for the planning proposal. The proposed action will not result in an adverse effect on the extent of the ecological community as it currently exists in a highly fragmented and generally degraded form.

Within the subject site, the community is considered to be in relatively poor to moderate condition. The canopy trees exist over a predominantly exotic groundcover, with scattered native species typical of CPW present in the groundcover. The composition of the ecological community as provided in the final determination consists of a far greater number of native plants than that occurring on the subject site. The vegetation of the subject site is considered to be in poor condition with low diversity and abundance of native species throughout. As a consequence, this vegetation in its current condition holds little ecological value. The removal of the community within the subject site is not considered to modify the remaining extent of this community such that its local occurrence is likely to be placed at risk of extinction.

The proposed action will have no significant direct or indirect impacts on the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

(d) In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

Approximately 0.75 ha of CPW will be removed as a result of the proposed action. This includes 0.54 ha of moderate condition, 0.12 ha low condition and 0.09 ha canopy.

The CPW occurring within the subject site and immediate surrounds has previously been fragmented by various developments. Within this area, this community exists in fragmented patches in varying conditions. The proposed development will fragment some areas of existing vegetation; however the proposed development predominantly requires clearing at the edge of treed habitat and will therefore encroach further into remaining habitat rather than creating fragmented habitat patches.

The community within the subject site has already been impacted by previous and current land uses, including grazing and mowing, as well as the development of land immediately adjacent. To the north of Evelyn Street, extensive residential housing development has occurred. Within the subject site, this community is highly modified, with exotic species dominating the ground layer, including the presence of noxious weeds. A greater number of native species are present within moderate condition CPW. Given the occurrence within many small degraded fragmented patches and the condition of the vegetation, the area of habitat to be removed within the subject site is not considered to be important for the long-term survival of this community.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

There is no critical habitat for CPW currently listed by the Director-General of the OEH.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

The overall objective of the Cumberland Plain Recovery Plan (DECCW 2011) is to provide for the long-term survival of the threatened biodiversity of the Cumberland Plain. Specific recovery objectives provided in the plan are:

> *1) To build a protected area network, comprising public and private lands, focused on the priority conservation lands;*
>
> *2) To deliver best practice management for threatened biodiversity across the Cumberland Plain, with a specific focus on the priority conservation lands and public lands where the primary management objectives are compatible with biodiversity conservation;*
>
> *3) To develop an understanding and enhanced awareness in the community of the Cumberland Plain's threatened biodiversity, the best practice standards for its management, and the recovery program;*
>
> *4) To increase knowledge of the threats to the survival of the Cumberland Plain's threatened biodiversity, and thereby improve capacity to manage these in a strategic and effective manner.*

The Recovery Plan acknowledges that Campbelltown City Council contains priority conservation lands. However, the subject site itself has not been mapped within the boundary of these priority conservation lands. The threats to CPW are further loss and fragmentation of habitat, weed invasion, changes in fire regimes and urban run-off.

Within the subject site, the community is not considered to be significant. It has been highly degraded from past clearing and mowing of the groundcover and understorey. As it exists, a total of 1.04 ha of moderate condition CPW is present within the subject site, with up to 0.54 ha proposed to be removed. .A further 1.34 ha of low condition/canopy CPW exists

within the subject site with up to 0.21 ha of this to be removed. The proposed development will occur along the frontage to Evelyn Street.

The proposed development is not considered to threaten the objectives of the recovery plan.

No threat abatement plan is relevant to this community.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The following key threatening processes are relevant to CPW occurring within the subject site:

- 'Clearing of native vegetation' as this reduces the area habitat available for this community;
- 'Invasion of native plant communities by African Olive *Olea europaea L.* subsp. *cuspidata*'; and
- 'Invasion of native plant communities by exotic perennial grasses' that readily invade disturbed sites and communities as they can dominate and suppress native flora species.

The primary key threatening process relevant to the proposed development is the clearing of native vegetation, as up to 0.75 ha of Cumberland Plain Woodland will be removed within the subject site. The proposed development is not considered to exacerbate the key threatening process of invasion by exotic perennial grasses further than current conditions.

Conclusion

The local occurrence of Cumberland Plain Woodland in the subject site is comprised of a total of 2.38 ha in varying condition, with 0.75 ha proposed to be removed for the proposed development. The CPW on the subject site is set within an urbanised environment and has very little scope for regenerating naturally or long term survival, particularly in the low condition and canopy areas. The proposed development will not have a significant impact on CPW on the subject site and subsequently no Species Impact Statement is required.

E.2 Fauna

This Assessment of Significance covers the following threatened fauna species with the potential to occur:

- Little Eagle (*Hieraaetus morphnoides*);
- Square-tailed Kite (*Lophoictinia isura*);
- Little Lorikeet (*Glossopsitta pusilla*);

- Powerful Owl (*Ninox strenua*);
- Grey-headed Flying-fox (*Pteropus poliocephalus*)
- Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*);
- Eastern Freetail-bat (*Mormopterus norfolkensis*);
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*);
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*);
- Southern Myotis (*Myotis macropus*);
- Greater Broad-nosed Bat (*Scoteanax rueppellii*); and
- Koala (*Phascolarctos cinereus*).

Background

The Little Eagle (*Hieraaetus morphnoides*) occurs throughout the mainland except within more densely vegetated parts of the Dividing Range. It occurs within open eucalypt forest, woodland, open woodland as well as Sheoak or Acacia woodlands and riparian woodlands of interior NSW. It is listed as Vulnerable under the TSC Act (OEH 2015c).

The Square-tailed Kite occurs from south-western to northern Australia, Queensland, NSW and Victoria. The Square-tailed Kite can hunt over large ranges over 100 km^2 and breeds within the vicinity of watercourses. It occurs within dry woodland and open forest and prefers timbered watercourses. It is listed as Vulnerable under the TSC Act (OEH 2014e).

The Little Lorikeet occurs across the coastal and Great Divide regions of eastern Australia from Cape York to South Australia (OEH 2014c). The species is found mainly in the canopy of open *Eucalyptus* forest and woodland, as well as at isolated flowering trees. They nest in small tree hollows, usually in riparian areas. It is listed as Vulnerable under the TSC Act.

The Powerful Owl is distributed from Mackay to south western Victoria, mainly on the coastal side of the Great Dividing Range. This species occurs in many vegetation types from woodland and open sclerophyll to tall open wet forest and rainforest. It requires large tracts of native vegetation but can survive in fragmented landscapes. It roosts in dense vegetation and nests in large tree hollows. The Powerful Owl is listed as Vulnerable under the TSC Act (OEH 2014d).

The Grey-headed Flying-fox is distributed along the east coast from Bundaberg in Queensland to Melbourne, Victoria. It occurs as far west as the western slopes of the Great Dividing Range in northern NSW. It occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps. Grey-headed Flying-foxes migrate according to the availability of native fruits, nectar and pollen. They roost in large "camps" which are generally within 20 km of a food source (NSW Scientific Committee 2004). The Grey-headed Flying-fox is listed as Vulnerable under the TSC Act and the EPBC Act.

The Yellow-bellied Sheathtail-bat is found in a range of habitats including forest, agricultural and urban areas across northern and eastern Australia. It requires tree hollows, buildings, abandoned mammal dens or burrows for roosting. Yellow-bellied Sheathtail-bats forage on insects from 2m to 25m above the ground, depending on the environment. It roosts singly or in groups of up to six, in large tree hollows and buildings (OEH 2014f). The Yellow-bellied Sheathtail-bat is listed as Vulnerable under the TSC Act.

The Eastern Freetail-bat is distributed along the east coast from southern Queensland to southern NSW. The species inhabits dry sclerophyll forest and woodland east of the Great Dividing Range. It roosts singly and communally, mainly in tree hollows but will also roost under decorticating bark or in man-made structures (OEH 2015a). The Eastern Freetail-bat is listed as Vulnerable under the TSC Act.

The Eastern False Pipistrelle is distributed along south-east coast and ranges of Australia. It inhabits moist habitats with trees taller than 20m. The species generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings. It preys on insects above or just below tree canopy and forages up to 12km from roost sites (OEH 2016c). The Eastern False Pipistrelle is listed as Vulnerable under the TSC Act.

The Eastern Bentwing-bat occurs throughout the east and north-west coast of Australia. They hunt in forested areas above the canopy, and roost primarily in caves, however derelict mines, storm-water tunnels, buildings and other man-made structures can be utilised (OEH 2016b). The species is listed as Vulnerable under the TSC Act.

The Southern Myotis is found from the north-west through to western Victoria along the coast. It forages over pools and streams. The Southern Myotis roosts in groups of 10-15 close to water in caves, but can also roost in mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage (OEH 2015d). The species is listed as Vulnerable under the TSC Act.

The Greater Broad-nosed Bat occurs from the Atherton Tableland to north-eastern Victoria. It is found in various habitats being most commonly found in tall wet forest. Predominantly roosts in tree hollows but also roosts in buildings. The Greater Broad-nosed Bat flies approximately 3 to 6m above creek and river corridors (OEH 2015b). The species is listed as Vulnerable under the TSC Act.

Within NSW, the Koala mainly occurs on the central and north coasts' with some populations in the west of the Great Dividing Range. The species occurs in eucalypt woodlands and forests and feeds on the foliage of over 70 *Eucalyptus* species as well as 30 non-eucalypt species (OEH 2014a). It is listed as Vulnerable under the TSC Act and EPBC Act.

Assessment of Significance

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The above listed species are likely to use the subject site as foraging habitat as part of a much larger foraging range. They are all highly mobile species that accesses resources from across a wide area and would not depend upon resources contained on the subject site for their survival. The proposal is not likely to place a viable local population of any of these species at risk of extinction due to the limited amount of foraging habitat present within the subject site.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

Not applicable.

(c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

> *(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
>
> *(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable.

(d) In relation to the habitat of a threatened species, population or ecological community:

> *(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and*
>
> *(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
>
> *(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

Approximately 0.75 ha of Cumberland Plain Woodland, 0.86 ha of Exotic Grassland, 0.07 ha of Acacia Regrowth and 0.15 ha of Urban Native/Exotic Cover will be cleared for the proposed development. This represents a relatively small area of potential foraging habitat within the locality for these species. However, this is not optimum foraging habitat for any of these species as they would tend to forage in more vegetated forests and woodlands, such as in Georges River Nature Reserve south of the subject site.

The habitat occurring within the subject site and immediate surrounds has previously been fragmented by various developments and previous land uses. Within this area, available habitat for these species exists in fragmented patches in varying conditions. The proposed development will fragment some areas of existing habitat; however the proposed development predominantly requires clearing at the edge of treed habitat and will therefore encroach further into remaining habitat rather than creating fragmented habitat patches. The

threatened fauna species known or potentially occurring are highly mobile and would be able to move across the remaining fragments.

The proposed action will not remove, modify, fragment or isolate important habitat. Habitat on the subject site is not important for these species in the locality as it a small area of largely cleared and modified vegetation. The subject site would only likely provide minimal foraging habitat. Much larger areas of potential habitat occur throughout the wider locality in more heavily vegetated areas, particularly along Smalls Creek and Cattai Creek north-east of the subject site. These tracts of vegetation would provide more favourable roosting and foraging habitat for these species. It is therefore considered that the habitat provided on the subject site is not important for the long-term survival of the species in the wider locality.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

No critical habitat for any of these species has currently been identified by the Director-General of the OEH.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

A recovery plan has been prepared for large forest owls, including the Powerful Owl (DEC (NSW) 2006). The ultimate aim of the recovery plan is to ensure that the species it covers persist in the wild in NSW in each region where they presently occur. The proposal is not considered to threaten the objectives of that Recovery Plan. No Threat Abatement Plan exists for this species.

A National Draft Recovery Plan for the Grey-headed Flying-fox (DECCW 2009) has been prepared. A number of threats to this species are listed in the Plan, including the removal of critical habitat. The proposal will remove a small amount of marginal foraging habitat for this species, which is not critical habitat and is well-represented throughout the locality. Therefore the proposal is not considered to threaten the objectives of the Recovery Plan.

A recovery plan has been prepared for the Koala (DEC (NSW) 2008). Current threats to the species are land clearing (mainly for increasing urbanisation), habitat fragmentation, fire, dogs and cars. The overall aim of the recovery plan is to reverse decline of the Koala in NSW. The proposal will remove a small amount of marginal foraging habitat, but the subject site is not core Koala habitat. Therefore the proposal is not considered to threaten the objectives of the Recovery Plan.

No specific recovery plan or threat abatement plans have been prepared for the other species assessed.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The following key threatening processes are relevant to the proposed development:

- Clearing of native vegetation;
- Invasion and establishment of exotic vines and scramblers;
- Invasion of native plant communities by African Olive *Olea europaea* L. subsp. *cuspidata*; and
- Invasion of native plant communities by exotic perennial grasses.

The key threatening process of 'Clearing of native vegetation', 'potentially impact habitat for these species further than current conditions. However, the vegetation on the subject site is not considered to constitute significant habitat for these species. As potential habitat will remain in the vicinity of the subject site, the clearing of native vegetation is not likely to significantly impact habitat for potentially occurring threatened species.

Conclusion

A total of 1.83 ha of vegetation will be cleared for the proposed development comprising potential habitat for some threatened fauna species. The proposed development will result in the removal of modified vegetation, dominated by exotic species. No significant habitat for the assessed species will be removed within the subject site. The proposal is not likely to place a viable local population of any of these species at risk of extinction. These species are highly mobile and are expected to move between areas of remaining habitat within the immediate vicinity of the subject site and wider area. The project is not likely to have a significant detrimental impact upon any of the potentially occurring threatened fauna species discussed above.

campbelltown
city council

22 November 2016

The Managing Director
Plan Zone Consulting
PO Box 3
LIVERPOOL NSW 1817

Dear Ms Pokar

Planning Proposal request – Evelyn Street, Macquarie Fields (2755/2016/E-LEP)

I refer to your requests for an update on the subject project and initially apologise for the delay in responding.

Specialist technical advice has been compiled in response to an initial review of the submitted documentation. The review has highlighted the need to provide the following information before a report can be prepared for Council's consideration.

1) Traffic

- a Traffic Impact Assessment (TIA) is required for the proposal. The TIA shall detail the pre-development and post-development traffic parameters for all of the intersections that are directly or indirectly impacted as a result of the proposed rezoning. Traffic parameters shall include (but not be limited to) directional analysis, delay, queue and level of service. SIDRA models are to be submitted for assessment.
- Assessment of pedestrian and public transport access to school, shops and major public transport needs.

2) Stormwater/Flooding

- The submitted proposal indicates that the local drainage is conveyed to the Bensley Reserve trunk system (section 2.3.6). This is not acceptable as currently there is no trunk system in Bensley Reserve.
- A concept stormwater/drainage management plan is required, which addresses both water quantity and quality, in accordance with Council's relevant standards (Engineering Design for Development).
- The potential requirement to create drainage easements due to the slope of the subject site away from the Evelyn Street.
- Details of water quality improvement measures with the proposed types, maintenance requirements and their locations.

Civic Centre Queen Street Campbelltown PO Box 57 Campbelltown NSW 2560 DX5114
Telephone 02 4645 4000 Facsimile 02 4645 4111 TTY 02 4645 4615
Email council@campbelltown.nsw.gov.au Web www.campbelltown.nsw.gov.au
ABN 31 459 914 087

- Computer modelling (DRAINS, HEC RAS, MUSIC etc.) for drainage and water quality analysis accompanied by a detailed report.

3) Ecology

- A quantitative and qualitative assessment of the direct and indirect impacts of the additional clearing of the Cumberland Plain Woodland in association with the environmental impact assessment for bushfire protection outlined in the Bushfire Hazard Assessment.
- A Fauna Survey is required for the site in accordance with DEC Threatened Species Survey and Assessment: Guidelines (2004), and should specifically include the Cumberland Plain Land Snail.
- A Flora Survey to determine the presence of Shale Sandstone Transition Forest (SSTF), which is mapped as occurring in the south eastern area of the site.
- Clarification in regard to the vegetation community map; the map colour and legend are inadequate to clearly represent the vegetation communities.
- A koala habitat survey must be undertaken in accordance with Circular B35 - SEPP 44 Koala Habitat Protection Guidelines - Section 2.1 Investigating Potential Koala Habitat for Core Koala Habitat (i)-(iv) as the Ecological Assessment Report has identified the land as potential koala habitat. Under SEPP 44 Guidelines if the land is identified as potential koala habitat a koala survey must be undertaken on the site, in order to determine whether the site is core koala habitat. The Ecological Assessment Report is to be updated with the findings of the survey and submitted for Council endorsement.
- A contamination assessment must be undertaken in accordance with SEPP 55 - Remediation of Land. Council must consider the potential for contamination to adversely affect the suitability of a site for its proposed use at the rezoning stage. The policy states that land must not be developed if it is unsuitable for a proposed use because it is contaminated. If the land is unsuitable, remediation must take place before the land is developed.

If you require any further information please contact Council's Senior Strategic Planner, Graham Pascoe on 4645 4666.

Yours sincerely

Renee Winsor
A/Manager Sustainable City and Environment

REF: SW04_171

STORMWATER MANAGEMENT REPORT, CONCEPT PLAN JUNE-2017

Development Site:

85-109, Evelyn Street, Macquarie Fields

NSW

statiker
PO Box 232 Condell Park NSW Australia 2200
Ph: 02 8319 9449 Fax: 02 8790 6424
info@statiker.com.au www.statiker.com.au

Stormwater Management Report (Concept Plan)

for

Development Site at:

85-109, Evelyn Street, Macquarie Fields, NSW

Project	PROPOSED SUBDIVISION PLAN	**Ref. No.** SW04_171
Client		
Prepared By: Chij Shrestha, MIEAust PhD (Hydraulics), MEM, BEng (Civil) STATIKER		
Reviewed and Approved By : Sam Dennawi Senior Project Manager STATIKER		

Revision	Description	Date
1	Submitted for DA application	05/06/2017

Date: 05/06/2017

Table of Contents

LIST OF FIGURES iv

LIST OF TABLES v

1.0 INTRODUCTION 6

1.1 Site Description 6

1.2 Objective 7

2.0 PROPOSED DEVELOPMENT 8

3.0 STORMWATER MANAGEMENT STRATEGY 9

3.1 Flow Contributing Catchments: 9

4.0 SITE DISCHARGE 12

4.1 Drains Modelling 12

4.2 Infiltration Frequency Duration 12

4.3 Hydrological Model Parameters 15

4.4 Time of Concentration 15

4.5 Drains Modelling Result 16

5.0 WATER SENSITIVE URBAN DESIGN 17

5.1 Treatment Devices 17

5.1.1 Rainwater Tank *17*

5.1.2 Stormwater Inlet Pits and Pipes *17*

5.1.3 Bioretention Basin *18*

5.2 Stormwater Quality Modelling 20

5.2.1 Rainfall Data *21*

5.2.2 Evaporation Data *21*

5.2.3 Model Inputs *22*

5.3 MUSIC Model Layout 22

5.4 results and Discussion 24

6.0 CONCLUSION AND RECOMMENDATION 25

APPENDIX – A: PROPOSED DEVELOPMENT SITE PLAN 26

APPENDIX – B: PRE / POST DEVELOPMENT CATCHMENT AREA 33

APPENDIX – C: PROPOSED DEVELOPMENT SITE PLAN 35

APPENDIX – D: DRAINS MODEL 36

APPENDIX – E : ECOSOL GPT TECHNICAL SPECIFICATION 40

LIST OF FIGURES

Figure 2. 1 Site Plan of the Proposed Development 8

Figure 3. 1 Catchment Contributing predevelopment flow to the control point 9

Figure 3. 2 Catchment Contributing predevelopment flow to the control point 9

Figure 3. 3 Stormwater Management Concept Plan 11

Figure 4. 1 Rainfall intensity in mm/h for various durations and average recurrence interval; a) IFD Chart and b) IFD table (Source: Bureau of Meteorology, Australian Government) 14

Figure 5. 1 Typical ECOSOL GPT 18

Figure 5. 2 Properties of Bio-retention Basin 19

Figure 5. 3 Typical Schematics of Bio-retention Basin 20

Figure 5. 4 MUSIC Model Layout for South Basin 23

Figure 5. 5 MUSIC Model Layout for North Basin 23

LIST OF TABLES

Table 4. 1 Hydrological Model Parameters 15

Table 4. 2 Time of Concentration 16

Table 4. 3 Peak Flow for Pre and Post Development Cases 16

Table 5. 1 Performance Criteria of ECOSOL GPT 18

Table 5. 2 Target to Annual Pollutant Load Reduction in Western Catchment 21

Table 5. 3 Monthly Evapotranspiration 21

Table 5. 4 MUSIC Pervious/ Impervious Properties 22

Table 5. 5 MUSIC Pollutant Loads 22

Table 5. 6 MUSIC Results 24

1.0 INTRODUCTION

Evelyn Street Landowners Group commissioned STATIKAR Pty Ltd to prepare stormwater concept plan for the proposed planning proposal at 85-109, Evelyn Street, Macquarie Fields (2755 / 2016 / E-LEP)

This report has been prepared to ensure that the proposal can be carried out while meeting the requirements for stormwater management. The location of proposed development is shown in Figure 1 below.

Figure 1: Location of Site (Source: Department of Lands - Six Maps)

This report contains the stormwater concept for the development of the site and provides strategy for the development.

The outline of the site given in Figure 1 is the outline of the proposed development site. The site has an overall area of approximately 8.20 Ha.

1.1 Site Description

The site is currently developed with six residential houses. The land slopes away from the Evelyn Street towards the Oakley Road. There is an existing Kerb Inlet Pit Just front of 109 Evelyn Street close to Western boundary. Additionally, there is a small Pipe culvert on the Oakley Road about

80 m west from the Eastern boundary of the development site. There is no stormwater drainage within the site.

1.2 Objective

The main aim of this report is to propose a satisfactory management of post development stormwater from the site. To fulfil this requirement, the following main objectives are proposed:

- To prepare a concept stormwater management plan
- To conduct the pre and post development stormwater quality analysis.

2.0 PROPOSED DEVELOPMENT

Figure 2.1 shows the indicative layout plan for the proposed development. The proposed development includes creation of :

- 31 low density residential lots
- 3 rural lots

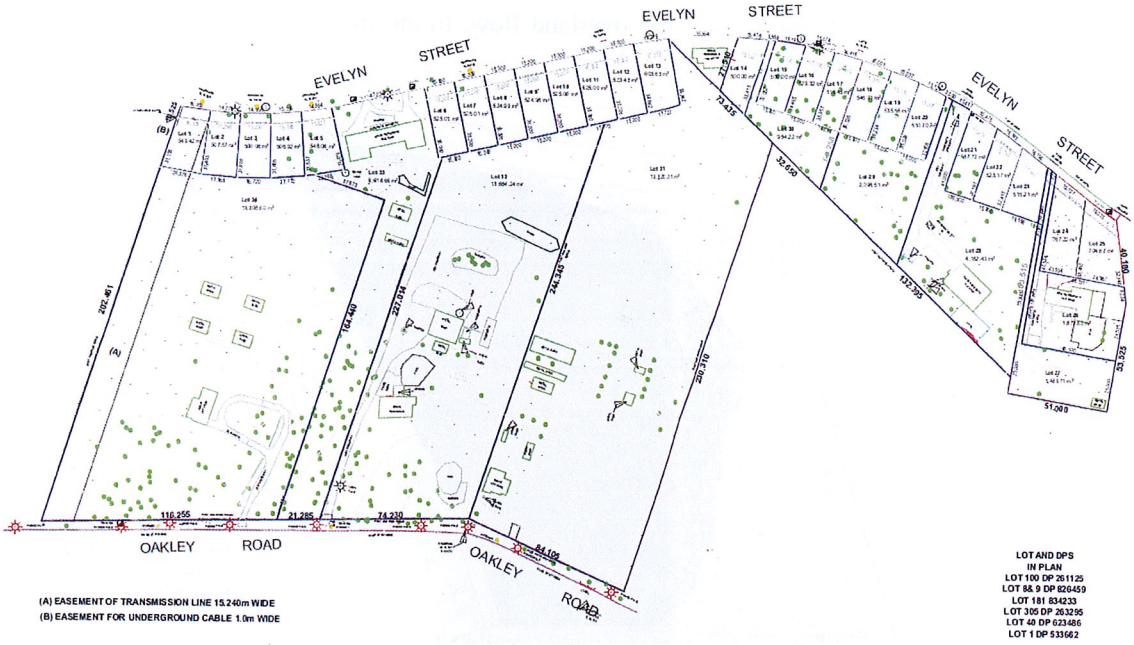


Figure 2. 1 Site Plan of the Proposed Development

3.0 STORMWATER MANAGEMENT STRATEGY

3.1 Flow Contributing Catchments:

For the predevelopment condition, the catchment area contributing flow to the control point is shown in Figure 3.1. The control point is the location where the detention basin has been proposed. The blue shaded portion of the proposed development site shows the catchment area contributing the flow to the control point. Runoff from the rest of the development site flows to the Oakley Road as natural overland flow. In the figure, red line represents the overland flow path.

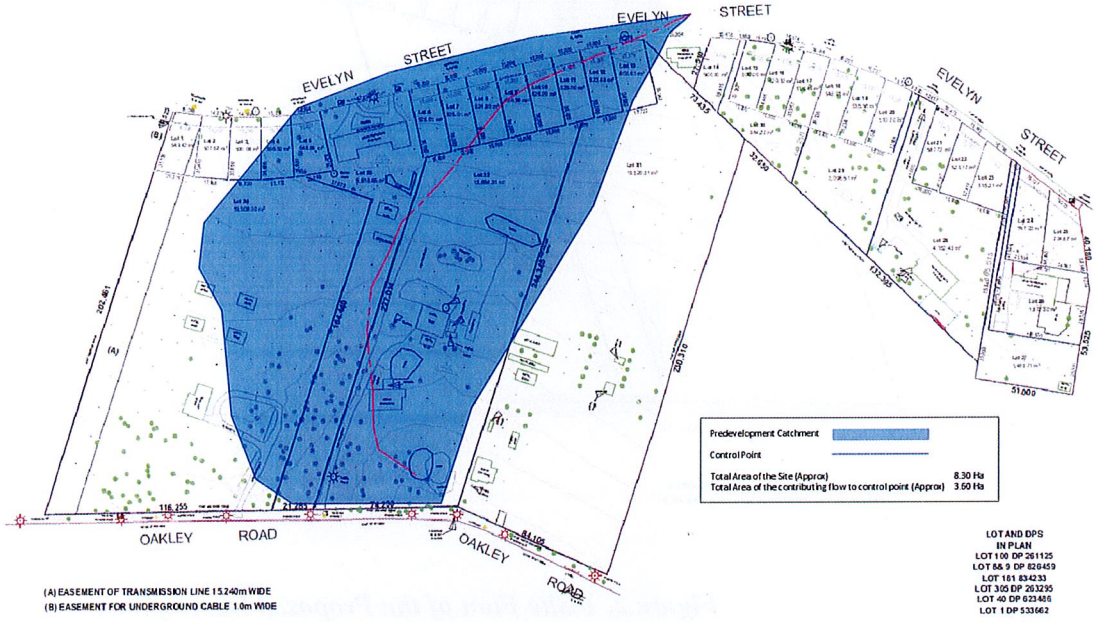


Figure 3. 1 Catchment Contributing predevelopment flow to the control point

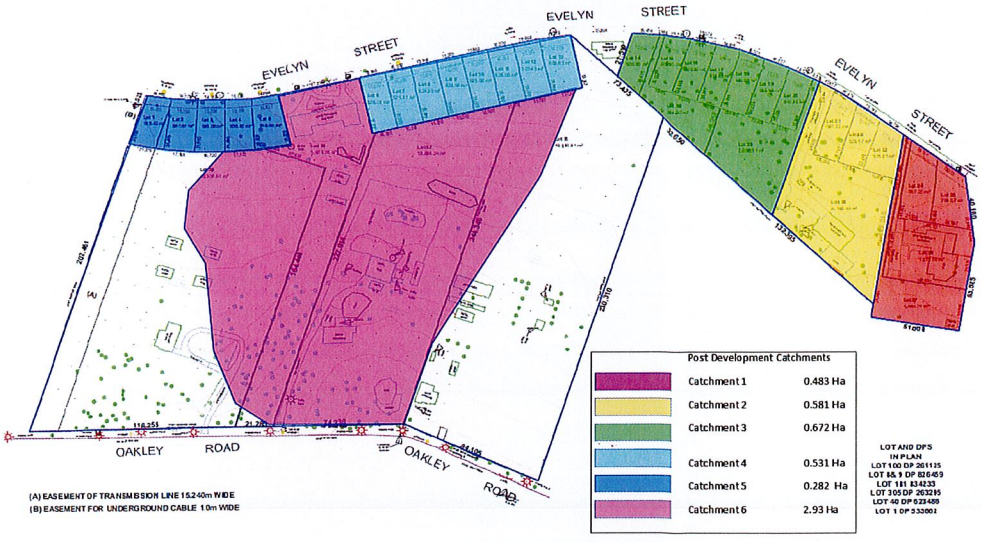


Figure 3. 2 Catchment Contributing predevelopment flow to the control point

For the post development case, the whole catchment contributing flow to the control point has been divided into six sub catchments. Figure 3.2 shows the post development sub-catchment plan, which is also presented in Appendix B. Among six sub catchments, flow from catchment 5 is proposed to discharge to the Kirb Kerb Inlet Pit located inform of proposed Lot 1. Flow from rest of the catchments are proposed to discharge to the proposed detention basin located near the control point.

Table 3.1 shows the percentage impervious and pervious area of different catchments under pre and post development conditions. The impervious area percentage for the pre development condition was estimated from aerial photography. Furthermore, the impervious area for the proposed new lots are assumed to be 80% of an individual size.

Table 3. 1 Impervious Area Calculation under Pre and Post Development Cases

S.N.	Catchment Name	Total Area, Ha	% Impervious	% Pervious
Pre Development Condition				
1	Pre development	3.60	12	88
Post Development Condition (South Basin)				
1	Catchment 1	0.483	80	20
2	Catchment 2	0.581	80	20
3	Catchment 3	0.672	80	20
4	Catchment 4	0.531	80	20
5	Catchment 6	2.930	13	87
Post Development Condition (North Basin)				
1	Catchment 5	0.282	70	30

Figure 3.3 shows the stormwater concept plan for the proposed development (See Appendix C for Detail). In the plan, stormwater runoff from catchment 1-4 and 6 is connected to onsite detention basin (South Basin). Runoff from catchment 5 is connected to onsite detention tank (North Basin). In South Basin, Bio-retention infiltration system is proposed to improve the water quality. Additionally, Gross Pollutant Tank (GPT) for each onsite detention is proposed. Further to this, inter-allotment drainage system is proposed as shown in Figure 3.3.

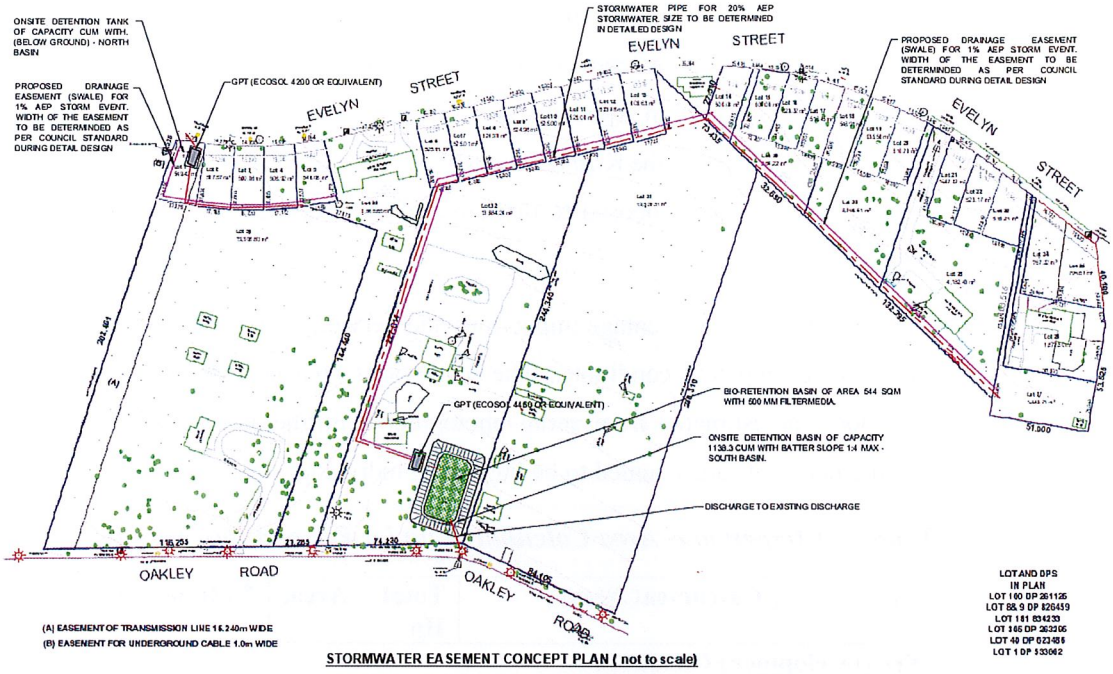


Figure 3. 3 Stormwater Management Concept Plan

4.0 SITE DISCHARGE

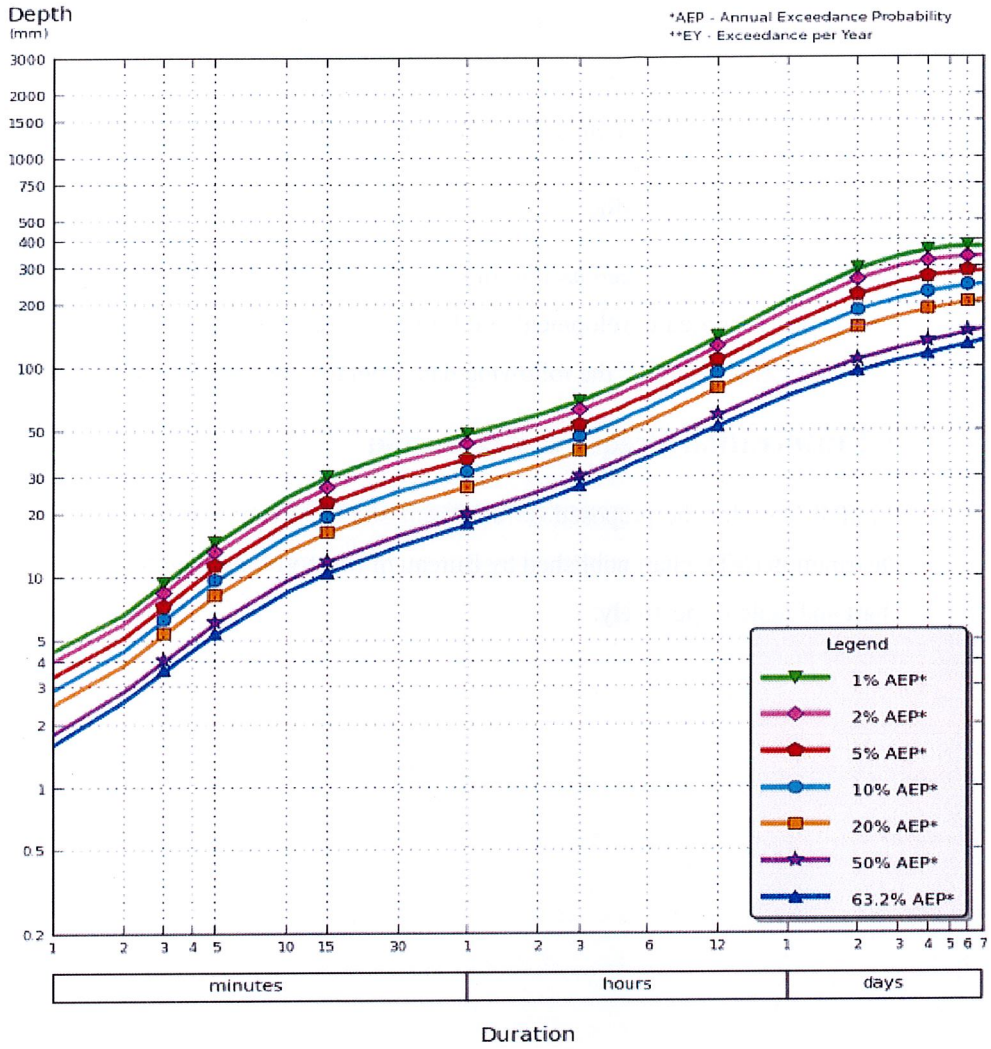
The site has been modelled to ensure that at all storm events from the 20% to the 1% AEP events, the discharge from the site does not exceed the pre development (current) conditions.

4.1 Drains Modelling

DRAINS software has been used to model the catchment and determined the overland flow rate through the proposed development site for 6.2.3%, 20% and 1% AEP storm events. To conduct the hydrological analysis, the following data from different sources have been used:

4.2 Infiltration Frequency Duration

Rainfall Data for the proposed development site has been extracted from Intensity Frequency Distribution (IFD) chart published by Bureau of Meteorology. Figures 4.1 a and b show the IFD chart and table respectively.



©Copyright Commonwealth of Australia 2016, Bureau of Meteorology (ABN 92 637 533 532)

(a)

Location

Label: Macquarie fields

Latitude: 34 [Nearest grid cell: 33.9875 (S)]

Longitude:150 [Nearest grid cell: 150.0125 (E)]

IFD Design Rainfall Depth (mm)

Issued: 04 June 2017

Rainfall depth for Durations, Exceedance per Year (EY), and Annual Exceedance Probabilities (AEP).
FAQ for New ARR probability terminology

Table | Chart

Unit: mm

	Annual Exceedance Probability (AEP)						
Duration	**63.2%**	**50%#**	**20%***	**10%**	**5%**	**2%**	**1%**
1 min	1.61	1.81	2.48	2.94	3.40	4.02	4.51
2 min	2.57	2.87	3.82	4.49	5.17	6.03	6.70
3 min	3.61	4.03	5.40	6.35	7.30	8.55	9.51
4 min	4.56	5.12	6.90	8.13	9.36	11.0	12.2
5 min	5.42	6.10	8.26	9.76	11.3	13.2	14.8
10 min	8.58	9.71	13.3	15.8	18.3	21.7	24.4
15 min	10.6	12.0	16.5	19.6	22.8	27.0	30.4
30 min	14.1	15.9	21.8	25.9	30.0	35.6	40.0
1 hour	18.0	20.2	27.2	32.1	37.0	43.7	48.9
2 hour	23.1	25.8	34.3	40.2	46.1	54.0	60.2
3 hour	27.3	30.4	40.2	47.0	53.7	62.8	69.8
6 hour	37.5	41.8	55.5	64.8	73.9	86.2	95.6
12 hour	52.8	59.4	80.0	94.0	108	126	140
24 hour	73.3	83.0	115	137	159	187	209
48 hour	95.7	109	154	187	221	262	294
72 hour	108	123	175	213	253	301	338
96 hour	116	133	188	229	271	322	361
120 hour	123	140	197	238	280	332	373
144 hour	129	147	204	245	285	337	377
168 hour	135	153	211	250	288	339	378

Note:
The 50% AEP IFD **does not** correspond to the 2 year Average Recurrence Interval (ARI) IFD. Rather it corresponds to the 1.44 ARI.
* The 20% AEP IFD **does not** correspond to the 5 year Average Recurrence Interval (ARI) IFD. Rather it corresponds to the 4.48 ARI.

(b)

Figure 4. 1 Rainfall intensity in mm/h for various durations and average recurrence interval; a) IFD Chart and b) IFD table (Source: Bureau of Meteorology, Australian Government)

4.3 Hydrological Model Parameters

The ILSAX model has been used in DRAINS software to calculate design flows. The data used in the model are presented in Table 7 below.

Table 4. 1 Hydrological Model Parameters

Parameter	Value
Design Storm Event:	
Minor	5% AEP
Major	1% AEP
Paved (Impervious) area depression storage	1 mm
Grass (Pervious) area depression storage	5 mm
Soil type	2 (medium infiltration rate)

The rainfall data were taken from ARR-2016 and ILSAX model has been used to derive design rainfall. The IFD data required for DRAINS is obtained from the BOM website and temporal patterns from the ARR Data Hub, and inputted into DRAINS.

4.4 Time of Concentration

The time of concentration for the overland flow of the catchment has been derived from Pilgrim and McDermott (1982) expression

$Tc = 0.76A^{0.38}$

Where Tc = Time of concentration in hrs

A = Area of catchment in km^2

The adopted time of concentrations for different catchments under pre and post development conditions area presented in Table 4.2

Table 4. 2 Time of Concentration

S.N.	Catchment Name	Tc, min Pervious	Tc, min Impervious	Remarks
Pre Development Condition				
1	Pre development	5	15	
Post Development Condition (South Basin)				
1	Catchment 1	5	13	
2	Catchment 2	5	14	
3	Catchment 3	5	15	
4	Catchment 4	5	10	
5	Catchment 6	5	15	
Post Development Condition (North Basin)				
1	Catchment 5	5	10	

4.5 Drains Modelling Result

The catchment of the development site was modelled in DRAINS software using ILSAX model. Table 9 below presents pre development and post development flows from the development site for various storm events. Screen shot of Drains model for different rainfall events are presented in Appendix D.

Table 4. 3 Peak Flow for Pre and Post Development Cases

AEP	Peak Flow (m^3/s)		
	Pre Development	Post Development Without Attenuation	Post Development With Attenuation
Flow to South Basin			
20%	0.283	0.636	0.192
1%	0.876	1.48	0.425
Flow to North Basin			
20%	0	0.064	0.016
1%	0	0.122	0.023

5.0 WATER SENSITIVE URBAN DESIGN

To meet the water quality requirements of the Campbelltown City Council DCP stormwater treatment is required on the site. The proposed stormwater treatment system includes roof water reuse tanks, gross pollutant trap and bioretention basin.

5.1 Treatment Devices

The stormwater design for the proposed development will use a combination of at source and conveyance controls to treat the stormwater runoff from the site. The following are the treatment trains proposed for this development and the requirement of Campbelltown City Council.

5.1.1 Rainwater Tank

It is required to use non potable water on all new buildings. According to Council DCP, for roof areas upto 200 sq m, a 3000 L rainwater tank is to be installed to meet basix requirement. For roof 201 to 1000 sq m, a 5000 L rainwater tanks are required. The tank is to be fitted with a council approved first flush device and conform to BASIX requirements. Overflows from rainwater tanks will be directed to the nearest pit from where it is conveyed to bioretention basin and on site detention tank.

5.1.2 Stormwater Inlet Pits and Pipes

Council requires that new inlet pits and stormwater pipes within the proposed development site creating inter allotment drainage easements, which shall be designed to convey minor (20% AEP) and major flows (1% AEP)

In the proposed stormwater management system, Gross Pollutant Traps (GPT) are proposed upstream of Onsite Detention basin and Onsite Detention tank. At upstream side of bio retention basin at south basin, ECOSOL 4450 or similar GPT to be used and at upstream side of OSD at north basin a GPT of ECOSOL 4200 or similar to be used. According to manufacturer specification, the performance of ECOSOL GPT is presented in Table 5.1. Typical Schematic of ECOSOL GPT is shown in Figure 5.1 and its technical specification is presented in Appendix E.

Table 5. 1 Performance Criteria of ECOSOL GPT

Performance Criterial- Low Flow ECOSOL GPT	
Pollutants	**Capture Efficiency**
Gross Pollutants (> 2000μm)	99%
Total Suspended Solids (TSS) (20 – 2000μm)	80%
Total Phosphorus (TP)	45%
Total Nitrogen (TN)	45%
Total Petroleum / Hydrocarbon	99%

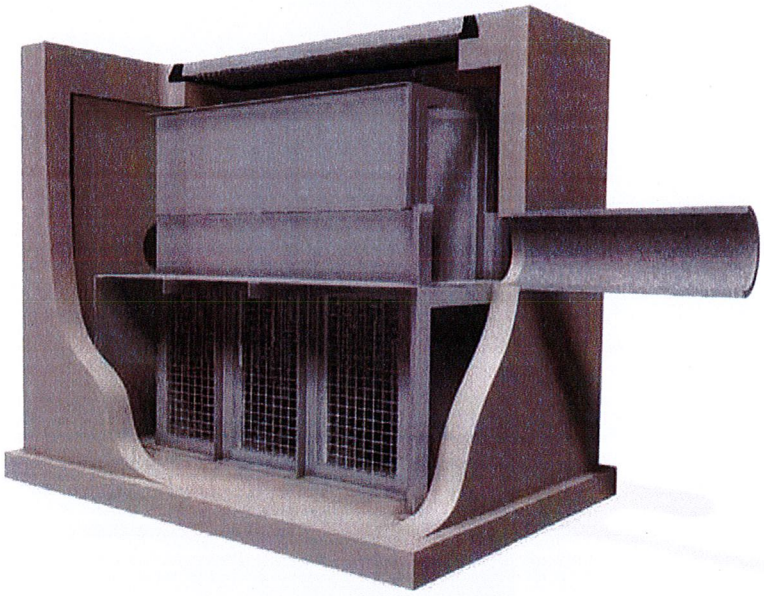


Figure 5. 1 Typical ECOSOL GPT

5.1.3 Bioretention Basin

In this development proposal, an onsite detention basin consisting of bio-retention system is proposed. The basin will have high flow bypass weir to help safely convey the 1% AEP flow and to treat low flows before they are discharged into the On Site Detention Basin. The properties of Bio-retention basin proposed is presented in Figure 5.2 and typical schematic of Bio-retention basin is shown in Figure 5.3.

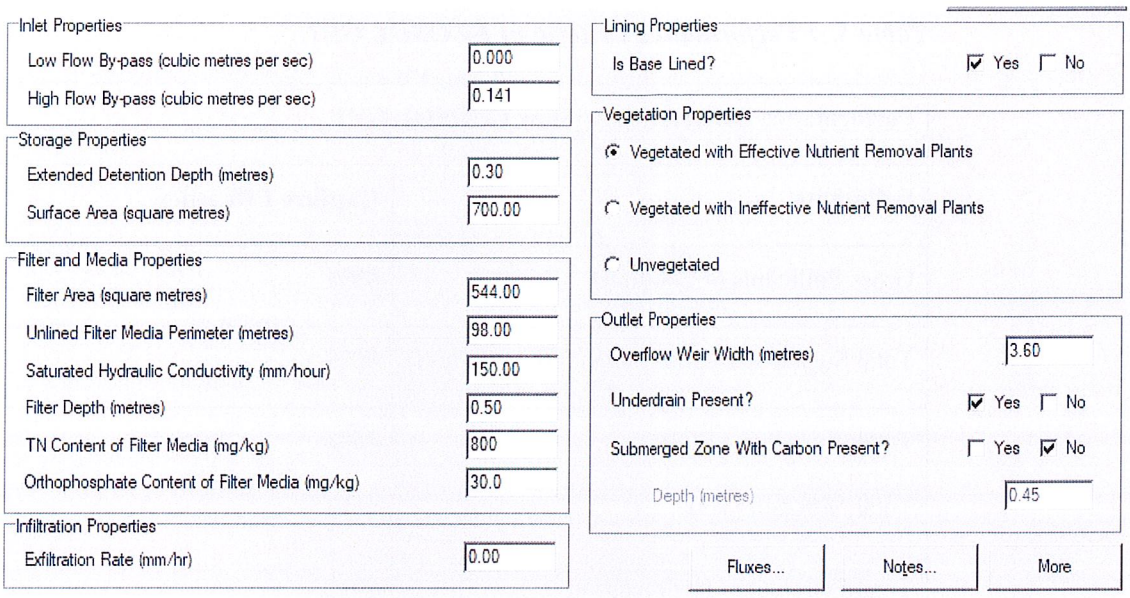


Figure 5. 2 Properties of Bio-retention Basin

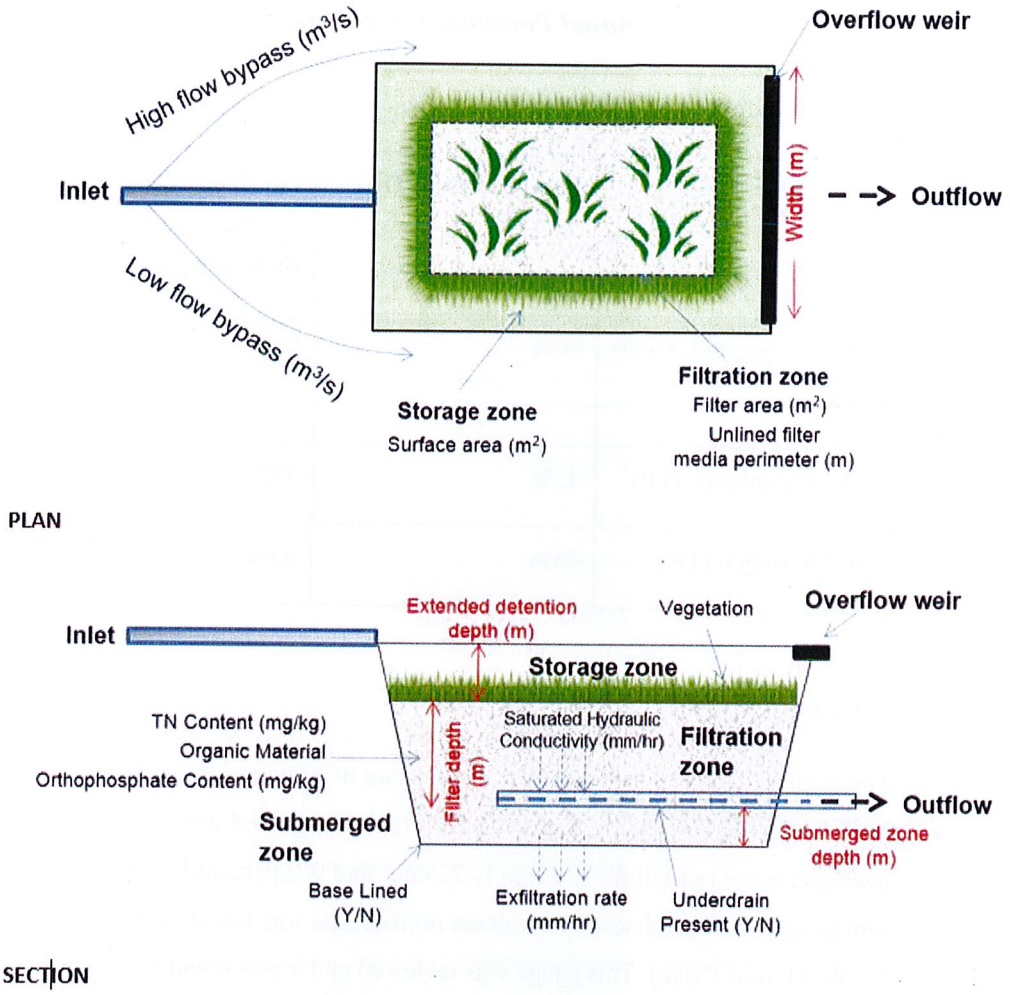


Figure 5. 3 Typical Schematics of Bio-retention Basin

5.2 Stormwater Quality Modelling

The software used for the water quality modelling is MUSIC 6 SL. This program is well regarded as industry best practice for analysis of the effectiveness of treatment mechanisms on the quality of stormwater runoff from a development site of this size. MUSIC simulates the performance of stormwater management systems in removing nutrients and sediments from a catchment by evaluating the average annual pollutant load delivered to the receiving waters. It uses both source nodes (produce pollutants) and treatment nodes (remove pollutants) to analyse a stormwater system.

According to the Campbelltown Development Control Plan, target to annual reduction in pollution load to western catchment is presented in Table 5.2. The table also presents the base

target and stretch target as per Landcom WSUD policy. In this development proposal, the stretch target has been adopted as pollutant load reduction target.

Table 5. 2 Target to Annual Pollutant Load Reduction in Western Catchment

Annual Reduction in Pollution Load			
Pollutants	**Campbelltown DCP**	**Landcom WSUD Policy**	
		Base Target	**Stretch Target**
Total Suspended Solids (TSS)	80%	80%	90%
Total Phosphorus (TP)	45%	45%	85%
Total Nitrogen (TN)	45%	45%	65%

5.2.1 Rainfall Data

The rainfall data was sourced from the Bureau of Meteorology (BOM). The rainfall data from Station 066190 (Ingleburn, Sackville Street) was reviewed and it was found that the historical average annual rainfall for the area is 725mm and 90th percentile annual rainfall is 923mm. The rain gauge with complete six (6) minute rainfall data was found to be station 066124 (Parramatta North, Masons Drive). This gauge was reviewed and it was found that the average annual rainfall of 15 year period between 1985 and 1999 is 926mm. To be in conservative side, the rainfall data for this period was deemed the most valid to use for the MUSIC model.

The three month ARI flow is assumed to be 55% of 1 year ARI flow. The 3 months ARI post development low from the development site is estimated to be 0.1408 m^3/s.

5.2.2 Evaporation Data

Evaporation data is also sourced from Bureau of Meteorology and is presented in Table 5.3

Table 5. 3 Monthly Evapotranspiration

SN	**Month**	**Potential Evapotranspiration (mm)**	
1	January	173	
2	February	128	
3	March	116	

4	April	76	
5	May	50	
6	June	38	
7	July	38	
8	August	55	
9	September	75	
10	October	120	
11	November	146	
12	December	154	

5.2.3 Model Inputs

MUSIC requires the input of both soil data and pollutant concentrations for each node. Both of these data sets were sourced from the DRAFT MUSIC modelling Guidelines NSW. Those parameters are presented in Tables 5.4 and 5.5

Table 5. 4 MUSIC Pervious/ Impervious Properties

Impervious Properties	
Node Type	**Rainfall Threshold (mm)**
Roofs	0.3
Landscaped Area	1.0
Driveway / Car Park	1.5
Pervious Properties	
Soil Storage Capacity – 98 mm	Initial Depth – 10mm
Initial Storage – 25%	Daily Recharge Rate – 60%
Field Capacity – 70 mm	Daily Base Flow Rate – 45%
Infiltration Coefficient A - 250	Daily Seepage Rate – 0%
Infiltration Coefficient B – 1.3	

Table 5. 5 MUSIC Pollutant Loads

Node Type	**Base Flow (Log_{10}mg/L)**	**Std Dev (Log_{10}mg/L)**	**Storm Flow (Log_{10}mg/L)**	**Std Dev (Log_{10}mg/L)**
Landscaped Area				
TSS	1.15	0.17	1.95	0.32
TP	-1.22	0.19	-0.66	0.25
TN	-0.05	0.12	0.30	0.19
Roofs				
TSS	-	-	1.30	0.32
TP	-	-	-0.89	0.25
TN	-	-	0.30	0.19
Driveway / Car Park				
TSS	1.20	0.17	2.43	0.32
TP	-0.85	0.19	-0.30	0.25
TN	0.11	0.12	0.34	0.19

5.3 MUSIC Model Layout

A screenshot of the MUSIC model of the development site is shown in Figures 5.5 and 5.5

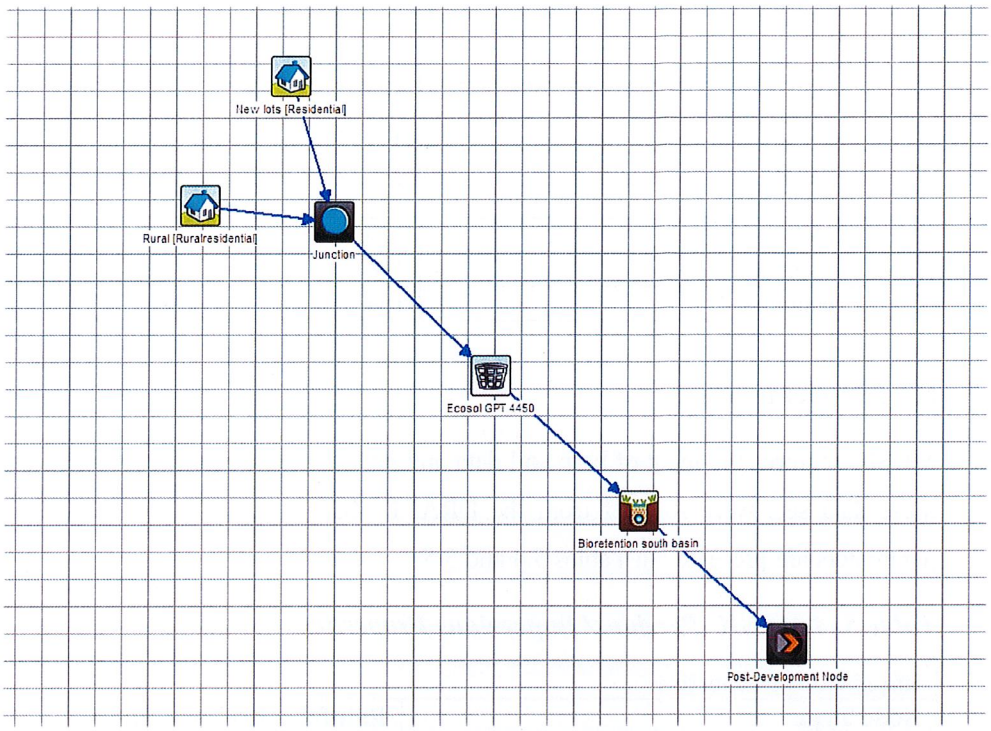


Figure 5. 4 MUSIC Model Layout for South Basin

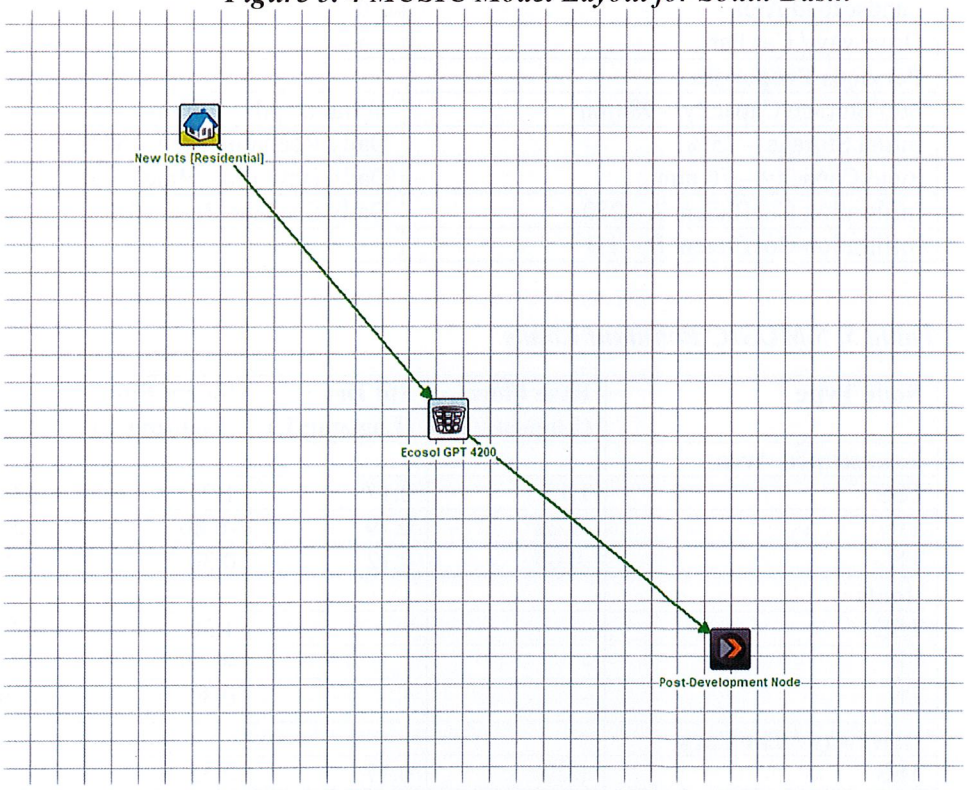


Figure 5. 5 MUSIC Model Layout for North Basin

5.4 results and Discussion

Table 5.6 below shows a screen capture from the MUSIC model giving the expected treatment efficiencies for the system before it releases water to existing culvert and Oatley Road and the corresponding reduction targets (stretch target)

Table 5. 6 MUSIC Results

	Sources	Residual Load	% Reduction
Flow (ML/yr)	18.2	16.9	6.9
Total Suspended Solids (kg/yr)	2800	169	94
Total Phosphorus (kg/yr)	4.82	0.678	85.9
Total Nitrogen (kg/yr)	37.6	12.3	67.2
Gross Pollutants (kg/yr)	515	6.63	98.7

It can be seen from Table 5.6 that the reduction targets Total Suspended Solids (TSS), Phosphorous, Nitrogen and Gross Pollutant are met by the treatment system.

MUSIC does not explicitly calculate treatment efficiency for hydrocarbons and oils. It is not expected that treatable levels of hydrocarbons will come off the roof and landscaped area as there will be no mechanism for them to be deposited there, the car park and driveway will however accumulates some hydrocarbons and oils. GPT and bioretention basins are expected to meet any hydrocarbon and oils removal requirement as set by Campbelltown City Council.

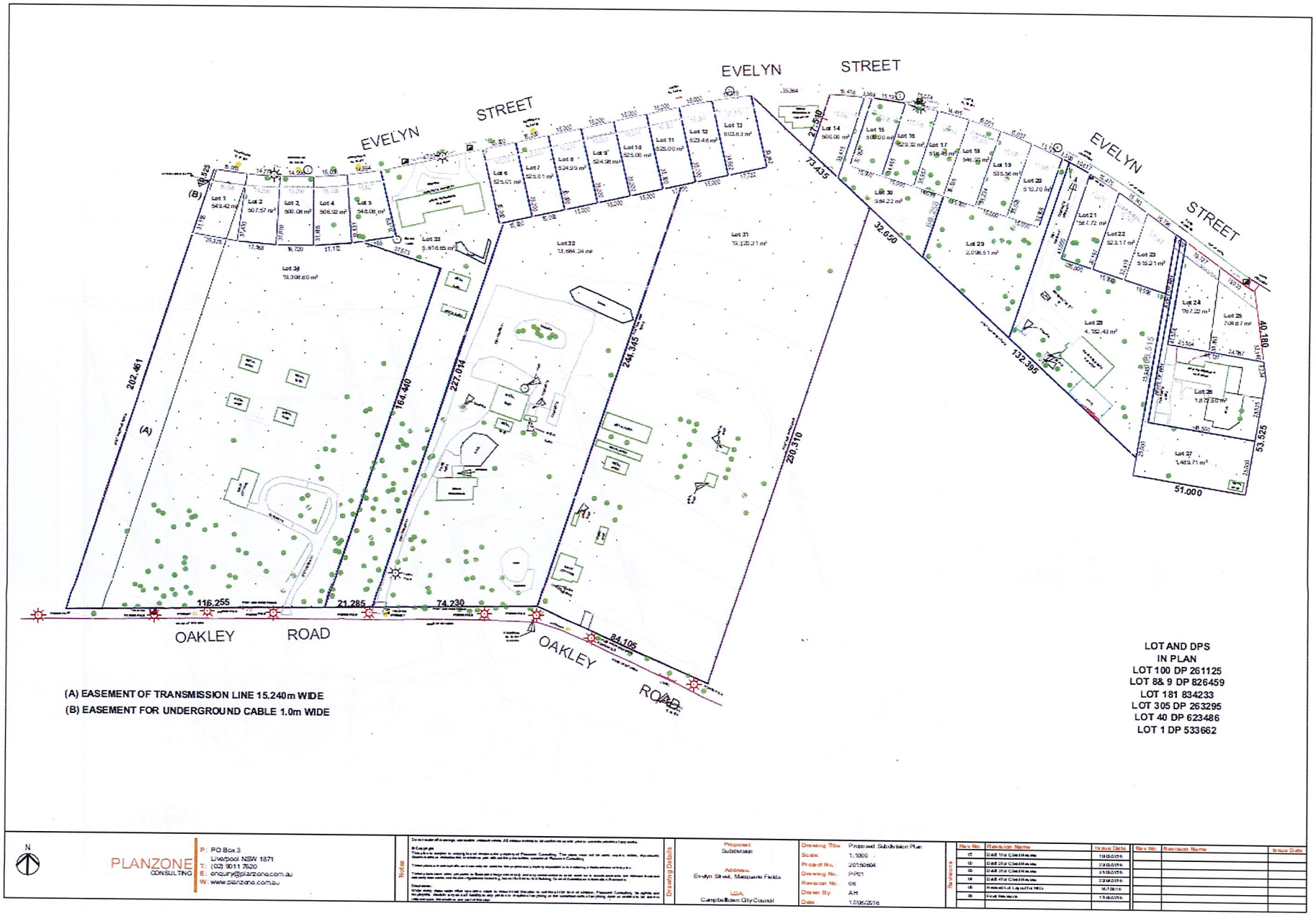
6.0 CONCLUSION AND RECOMMENDATION

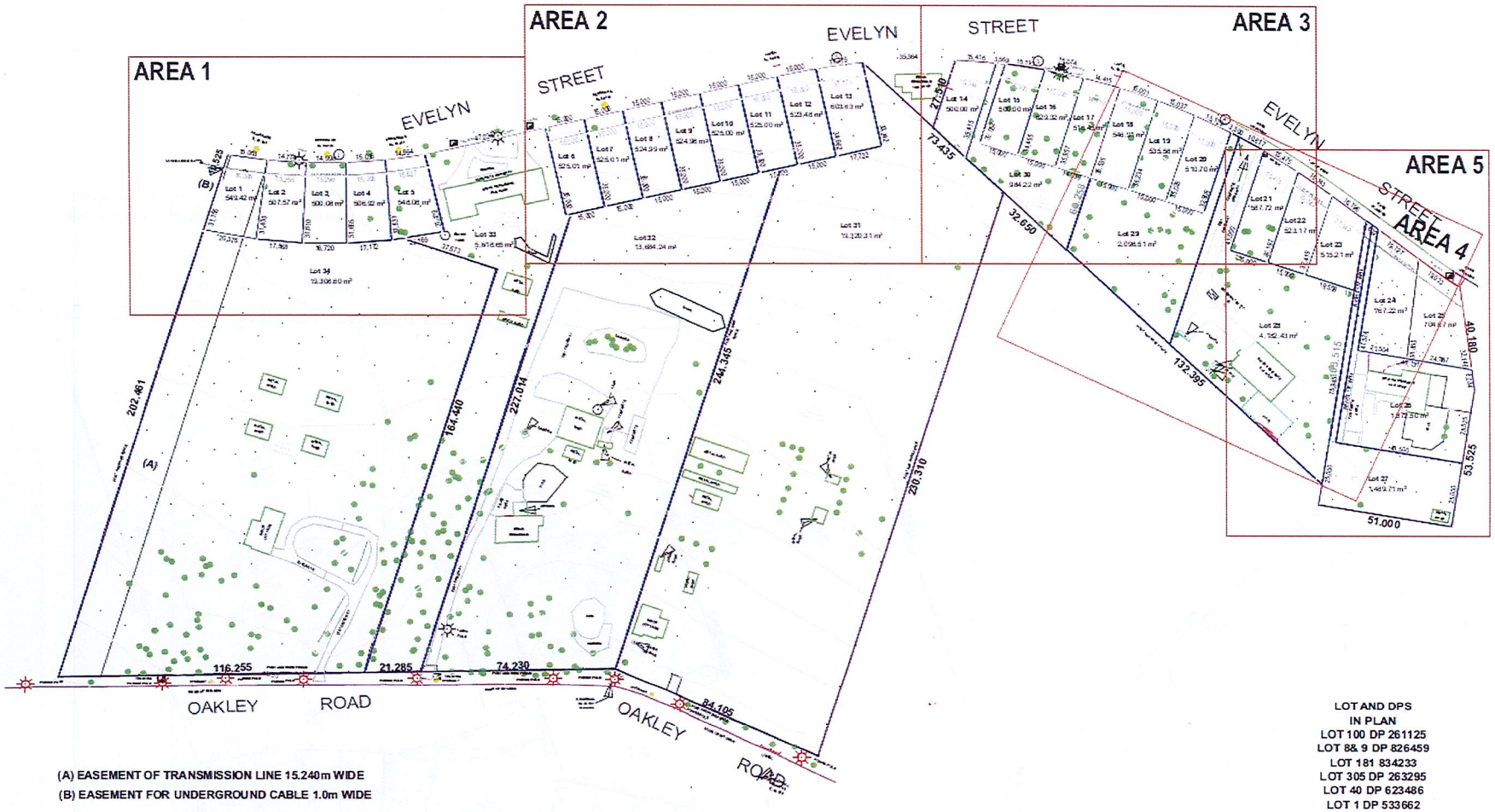
The concluding remarks drawn out from the proposed stormawater concept plan and modelling results are:

- The proposed development includes creation of 31 low density residential lots and 3 rural lots
- Stormwater runoff from Catchment 5 is proposed to discharge to existing Kerb Inlet Pit located at Evelyn Street. A Onsite detention tank of Capacity of 90 m^3 and a Gross Pollutant Trap have been proposed at upstream of the OSD.
- Stormwater runoff from Catchments 1-4 and 6 is proposed to discharge to Existing pipe culvert at Oatley Road. An onsite detention basin of capacity 1138.3 m^3 with Biofiltration basin with filter area 544 m2 and 0.5 m deep filter media. A Gross Pollotant Trap is also proposed at upstream of Bio-retention basin.
- 3000 L rainwater tank is required on each dwelling, non potable water to be used for toilets and irrigation.
- The proposed treatment devices are effective at reducing total pollutant loads, peaks flows and total volume of flows generated across the proposed site in accordance with Council's requirements.
- The proposed stormwater management strategy can effectively manage stormwater runoff to ensure that the proposed residential subdivision will not result in an increase in pollutants or stormwater flows and result in any significant impacts to receiving waterways or downstream infrastructure.

Detailed analysis and investigations will be undertaken at future stages of detailed design so as to confirm and precisely detail the relevant hydraulic analysis and calculations.

APPENDIX – A: PROPOSED DEVELOPMENT SITE PLAN





(A) EASEMENT OF TRANSMISSION LINE 15.240m WIDE
(B) EASEMENT FOR UNDERGROUND CABLE 1.0m WIDE

LOT AND DPS
IN PLAN
LOT 100 DP 261125
LOT 8& 9 DP 826459
LOT 181 834233
LOT 305 DP 263295
LOT 40 DP 623486
LOT 1 DP 533662

N

PLANZONE CONSULTING
P: PO Box 3
Liverpool NSW 1871
T: (02) 9011 7620
E: enquiry@planzone.com.au
W: www.planzone.com.au

Notes

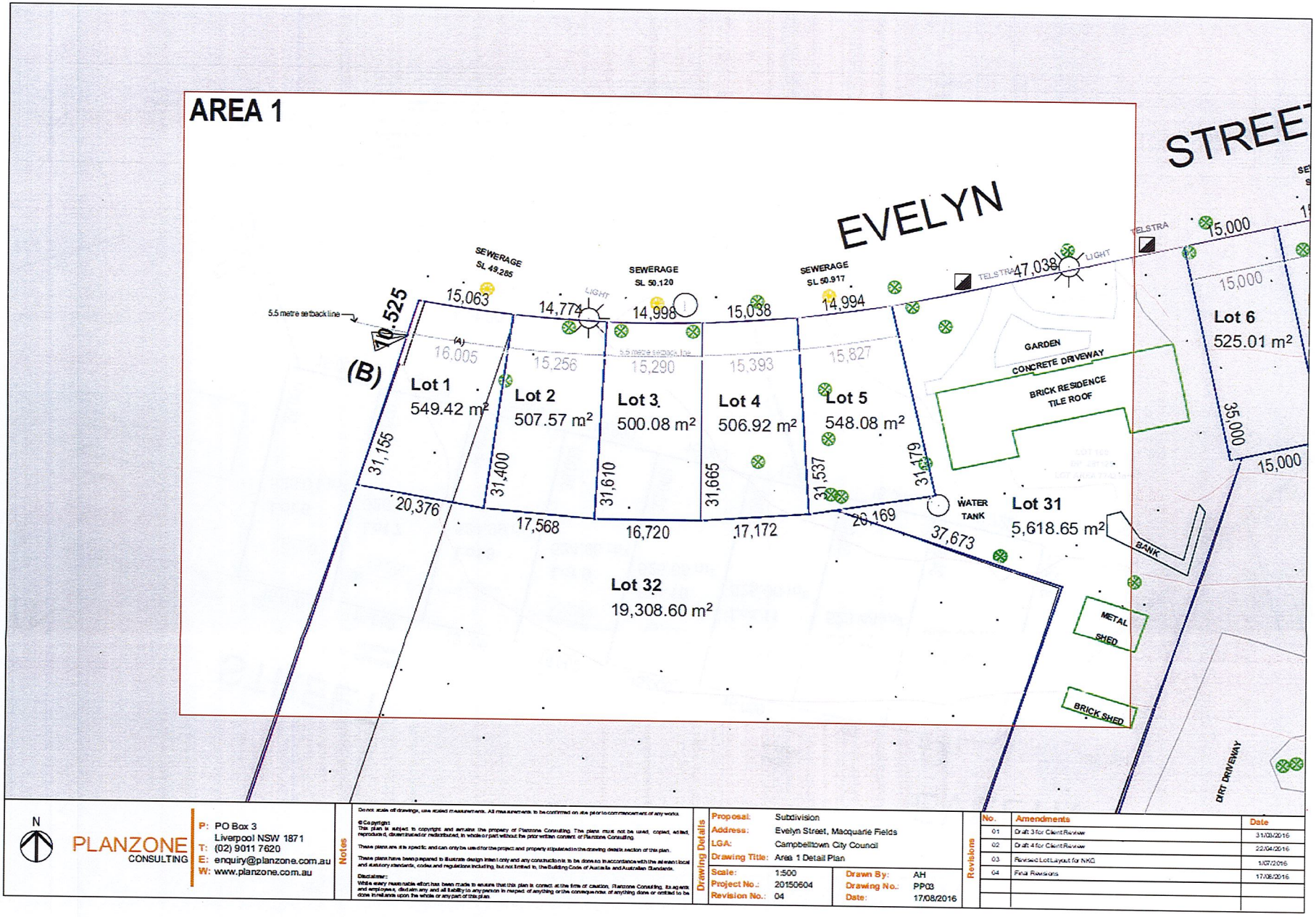
Drawing Details

Proposed: Subdivision
Address: Evelyn St est, Macquarie Fields
LGA: Campbelltown City Council

Drawing Title	Zone Areas Plan
Scale	1:1000
Project No.	20150604
Drawing No.	PP02
Revision No.	04
Drawn By	AH
Date	12/06/2016

Revisions

Rev No.	Revision Name	Issue Date	Rev No.	Revision Name	Issue Date
01	Draft Site Concept Plan	31/10/2015			
02	Draft Site Concept Plan	22/12/2015			
03	Revised Lot Layout for NSW	10/2/2016			
04	First Revision	17/10/2016			



N

PLANZONE CONSULTING

P: PO Box 3
Liverpool NSW 1871
T: (02) 9011 7620
E: enquiry@planzone.com.au
W: www.planzone.com.au

Notes

Do not scale off drawings, use scaled measurements. All measurements to be confirmed on site prior to commencement of any works.

© Copyright:
This plan is subject to copyright and remains the property of Planzone Consulting. This plans must not be used, copied, edited, reproduced, disseminated or redistributed, in whole or part without the prior written consent of Planzone Consulting.

These plans are site specific and can only be used for the project and property stipulated in the drawing details section of this plan.

These plans have been prepared to illustrate design intent only and any construction is to be done so in accordance with the relevant local and statutory standards, codes and regulations including, but not limited to, the Building Code of Australia and Australian Standards.

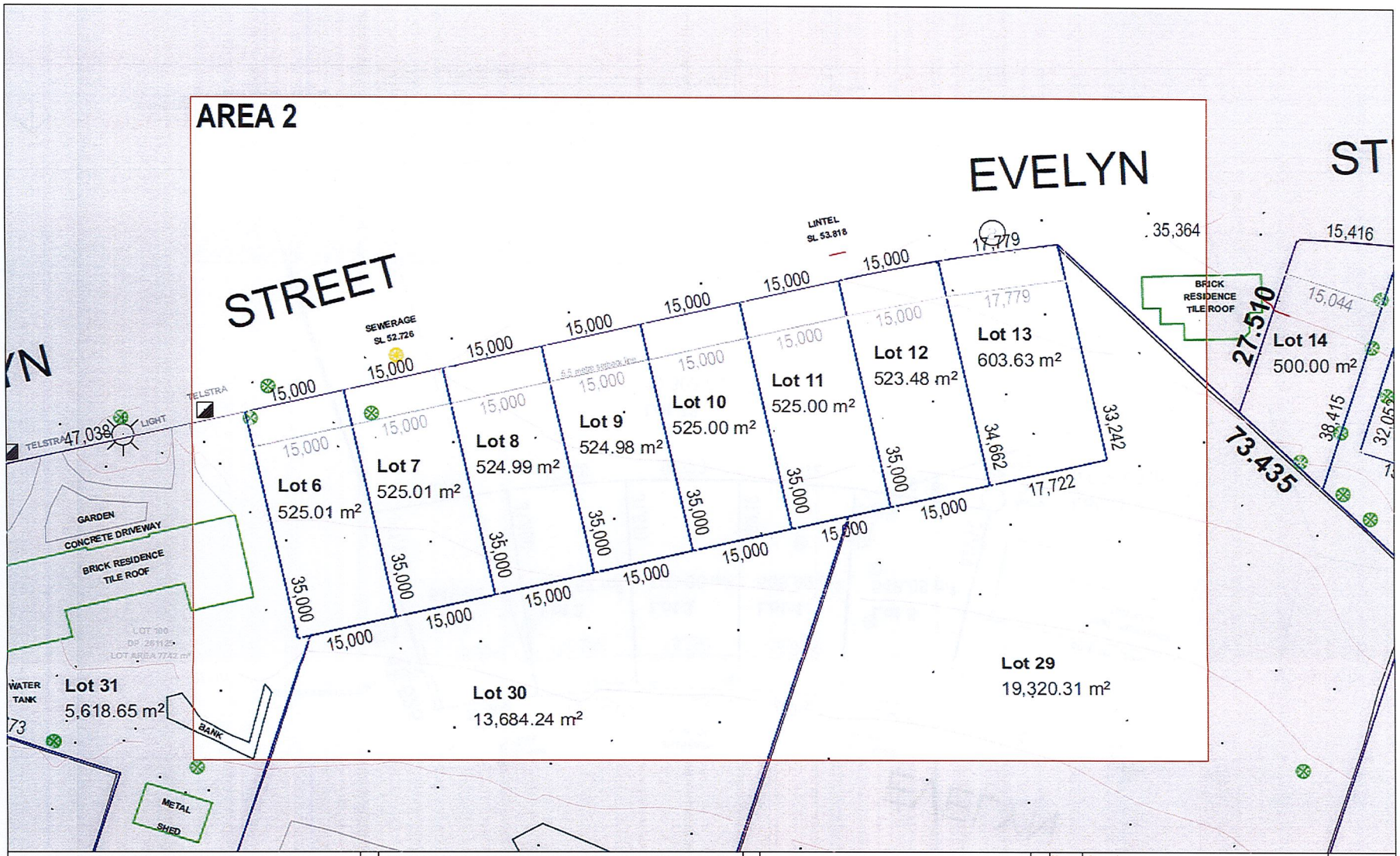
Disclaimer:
While every reasonable effort has been made to ensure that this plan is correct at the time of caution, Planzone Consulting, its agents and employees, disclaim any and all liability to any person in respect of anything or the consequence of anything done or omitted to be done in reliance upon the whole or any part of this plan.

Drawing Details

Proposal:	Subdivision		
Address:	Evelyn Street, Macquarie Fields		
LGA:	Campbelltown City Council		
Drawing Title:	Area 1 Detail Plan		
Scale:	1:500	Drawn By:	AH
Project No.:	20150604	Drawing No.:	PP03
Revision No.:	04	Date:	17/08/2016

Revisions

No.	Amendments	Date
01	Draft 3 for Client Review	31/03/2016
02	Draft 4 for Client Review	22/04/2016
03	Revised Lot Layout for NKC	1/07/2016
04	Final Revisions	17/08/2016



N

PLANZONE
CONSULTING

P: PO Box 3
Liverpool NSW 1871
T: (02) 9011 7620
E: enquiry@planzone.com.au
W: www.planzone.com.au

Notes

Do not scale off drawings, use scaled measurements. All measurements to be confirmed on site prior to commencement of any works.

©Copyright
This plan is subject to copyright and remains the property of Planzone Consulting. The plans must not be used, copied, edited, reproduced, disseminated or redistributed, in whole or part without the prior written consent of Planzone Consulting.

These plans are site specific and can only be used for the project and property stipulated in the drawing details section of this plan.

These plans have been prepared to illustrate design intent only and any construction is to be done so in accordance with the relevant local and statutory standards, codes and regulations including, but not limited to, the Building Code of Australia and Australian Standards.

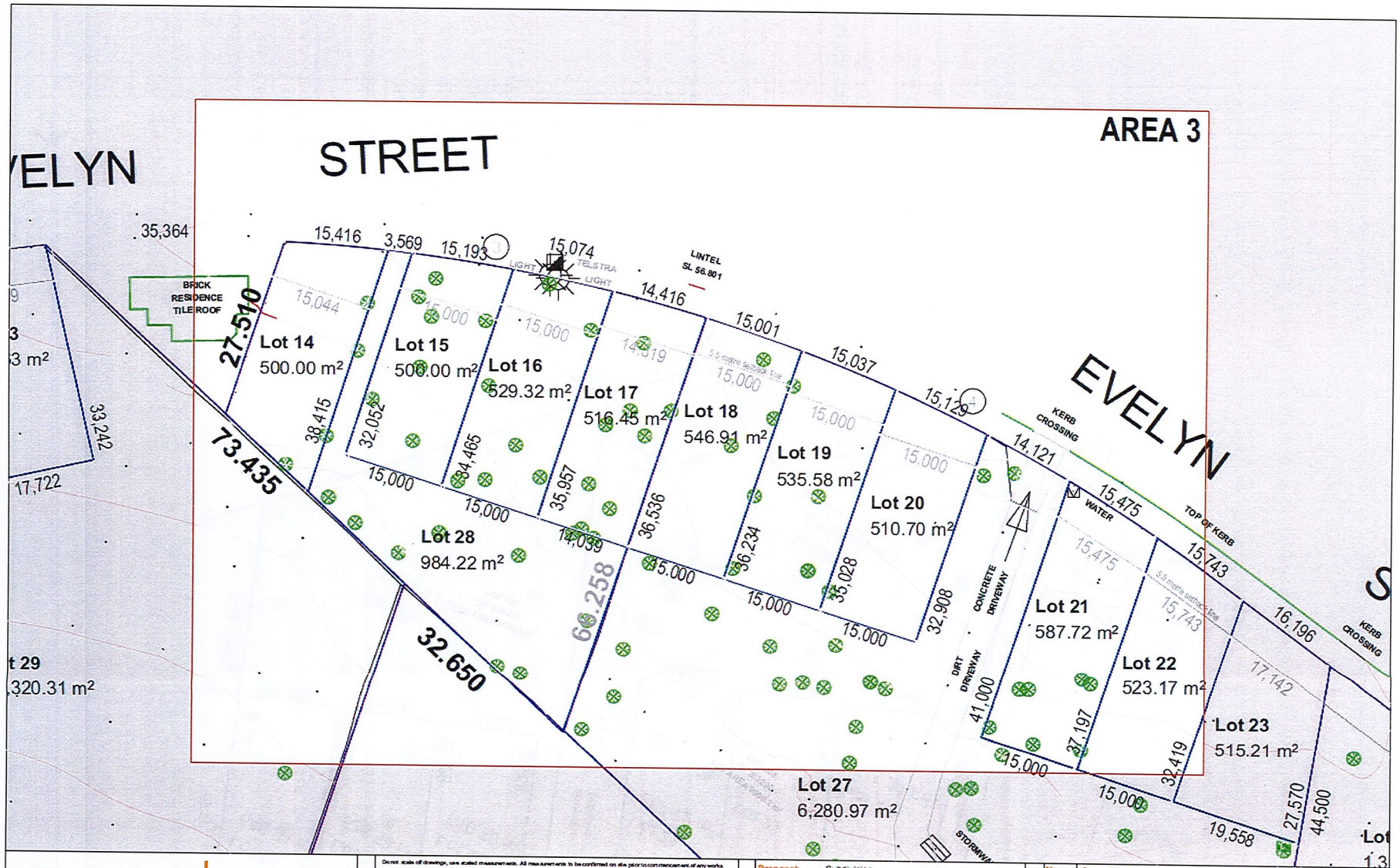
Disclaimer:
While every reasonable effort has been made to ensure that this plan is correct at the time of creation, Planzone Consulting, its agents and employees, disclaim any and all liability to any person in respect of anything or the consequences of anything done or omitted to be done in reliance upon the whole or any part of this plan.

Drawing Details

Proposal:	Subdivision		
Address:	Evelyn Street, Macquarie Fields		
LGA:	Campbelltown City Council		
Drawing Title:	Area 2 Detail Plan		
Scale:	1:500	Drawn By:	AH
Project No.:	20150604	Drawing No.:	PP04
Revision No.:	04	Date:	17/08/2016

Revisions

No.	Amendments	Date
01	Draft 3 for Client Review	31/03/2016
02	Draft 4 for Client Review	22/04/2016
03	Revised Lot Layout for NKC	1/07/2016
04	Final Revisions	17/08/2016



N

PLANZONE CONSULTING

P: PO Box 3
Liverpool NSW 1871
T: (02) 9011 7620
E: enquiry@planzone.com.au
W: www.planzone.com.au

Notes

Do not scale off drawings, use scaled measurements. All measurements to be confirmed on site prior to commencement of any works.

©Copyright
This plan is subject to copyright and remains the property of Planzone Consulting. The plans must not be used, copied, edited, reproduced, disseminated or redistributed, in whole or part without the prior written consent of Planzone Consulting.

These plans are site specific and can only be used for the project and property stipulated in the drawing details section of this plan.

These plans have been prepared to illustrate design intent only and any construction is to be done so in accordance with the relevant local and statutory standards, codes and regulations including, but not limited to, the Building Code of Australia and Australian Standards.

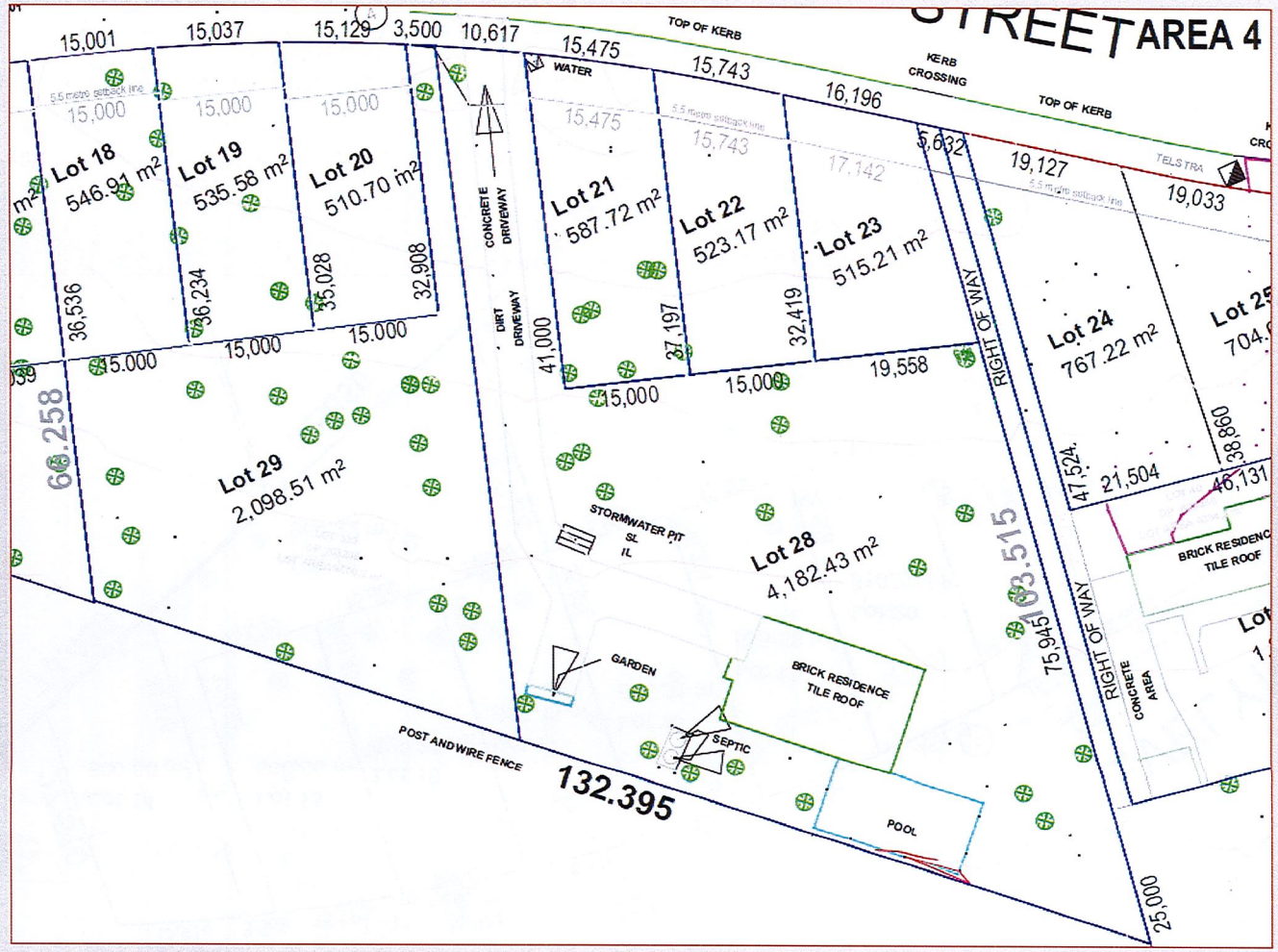
Disclaimer:
While every reasonable effort has been made to ensure that this plan is correct at the time of creation, Planzone Consulting, its agents and employees, disclaim any and all liability to any person in respect of anything or the consequences of anything done or omitted to be done in reliance upon the whole or any part of this plan.

Drawing Details

Proposal:	Subdivision
Address:	Evelyn Street, Macquarie Fields
LGA:	Campbelltown City Council
Drawing Title:	Area 3 Detail Plan
Scale:	1:500
Project No.:	20150604
Revision No.:	04
Drawn By:	AH
Drawing No.:	PP05
Date:	17/08/2016

Revisions

No.	Amendments	Date
01	Draft 3 for Client Review	31/03/2016
02	Draft 4 for Client Review	22/04/2016
03	Revised Lot Layout for NKG	1/07/2016
04	Final Revisions	17/08/2016



N

PLANZONE CONSULTING

P: PO Box 3
Liverpool NSW 1871
T: (02) 9011 7620
E: enquiry@planzone.com.au
W: www.planzone.com.au

Notes

Do not scale off drawings, use scaled measurements. All measurements to be confirmed on site prior to commencement of any works.

©Copyright
This plan is subject to copyright and remains the property of Planzone Consulting. This plans must not be used, copied, edited, reproduced, disseminated or redistributed, in whole or part without the prior written consent of Planzone Consulting.

These plans are site specific and can only be used for the project and properly stipulated in the drawing details section of this plan.

These plans have been prepared to illustrate design intent only and any construction is to be done so in accordance with the relevant local and statutory standards, codes and regulations including, but not limited to, the Building Code of Australia and Australian Standards.

Disclaimer:
While every reasonable effort has been made to ensure that this plan is correct at the time of creation, Planzone Consulting, its agents and employees, disclaim any and all liability to any person in respect of anything or the consequences of anything done or omitted to be done in reliance upon the whole or any part of this plan.

Drawing Details

Proposal:	Subdivision
Address:	Evelyn Street, Macquarie Fields
LGA:	Campbelltown City Council
Drawing Title:	Area 4 Detail Plan
Scale:	1:500
Project No.:	20150604
Revision No.:	02
Drawn By:	AH
Drawing No.:	PP06
Date:	17/08/2016

Revisions

No.	Amendments	Date
01	Revised Lot Layout for NKG	1/07/2016
02	Final Revisions	17/08/2016

No.	Amendments	Date
01	Draft3 for Client Review	31/03/2016
02	Draft4 for Client Review	22/04/2016
03	Revised Lot Layout for WCC	10/7/2016
04	Final Revisions	17/08/2016

Revisions

Proposal: Subdivision
Address: Evelyn Street, Macquarie Fields
L.G.A.: Campbelltown City Council
Drawing Title: Area 5 Detail Plan
Scale: 1:500
Project No.: 2015/0604
Revision No.: 04
Drawn By: AH
Drawing No.: PP06
Date: 17/08/2016

Drawing Details

Do not scale off drawings, use indicated measurements. All measurements to be confirmed on site prior to commencement of any work.

© Copyright
This plan is subject to copyright and remains the property of Planzone Consulting. The plans must not be used, copied, edited, reproduced, distributed or republished, in whole or part without the prior written consent of Planzone Consulting.

These plans are site specific and are only issued for the project and property detailed in the drawing details section of the plan.

These plans have been prepared to illustrate development only and any construction is to be done in in accordance with the relevant local and statutory standards, codes and regulations including, but not limited to, the Building Code of Australia and Australian Standards.

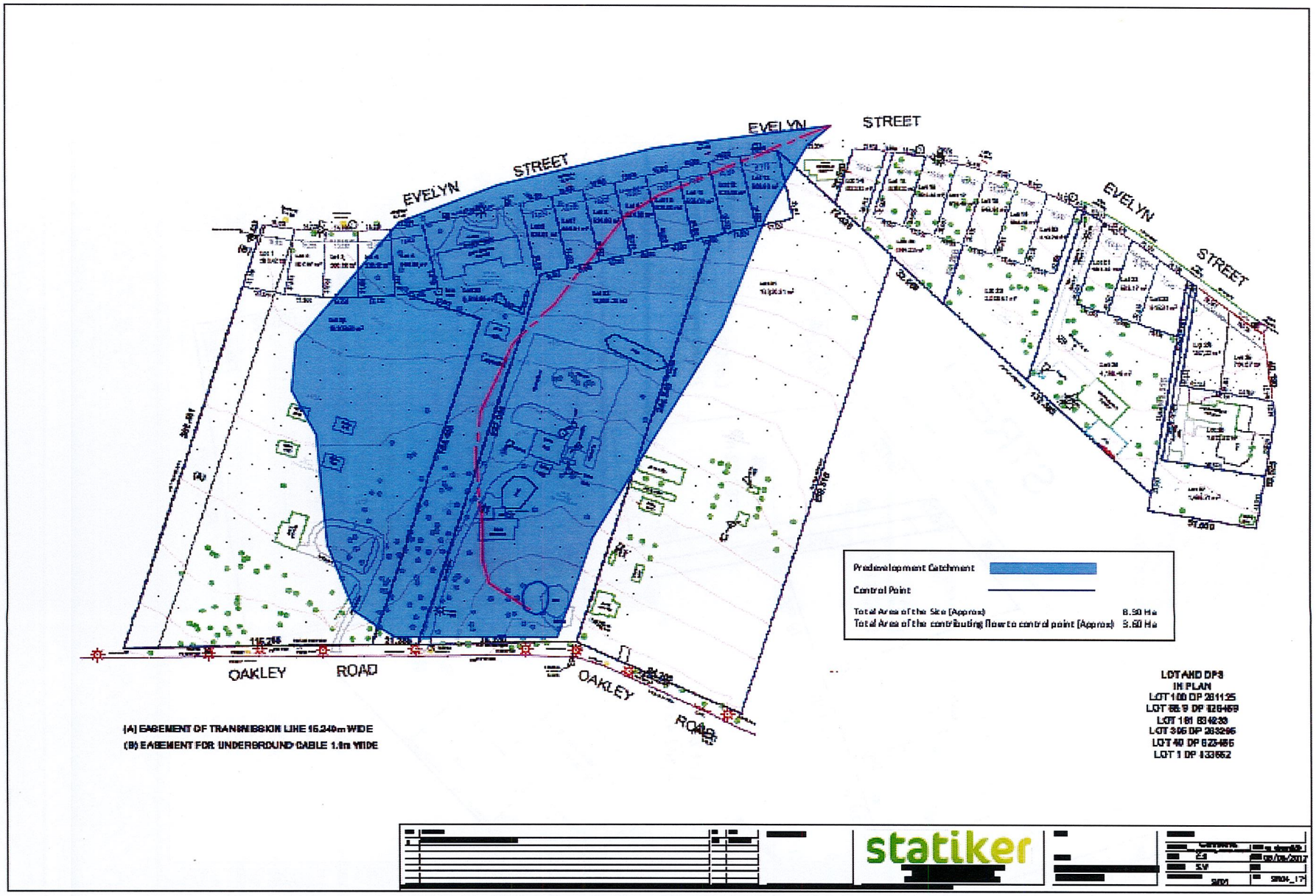
Disclaimer:
Planzone Consulting Pty Ltd has been made to ensure that this plan is correct at the time of creation. Planzone Consulting, its agents and employees, disclaim any and all liability for any loss or damage howsoever arising out of the consequences of anything done or omitted to be done in reliance upon the whole or any part of this plan.

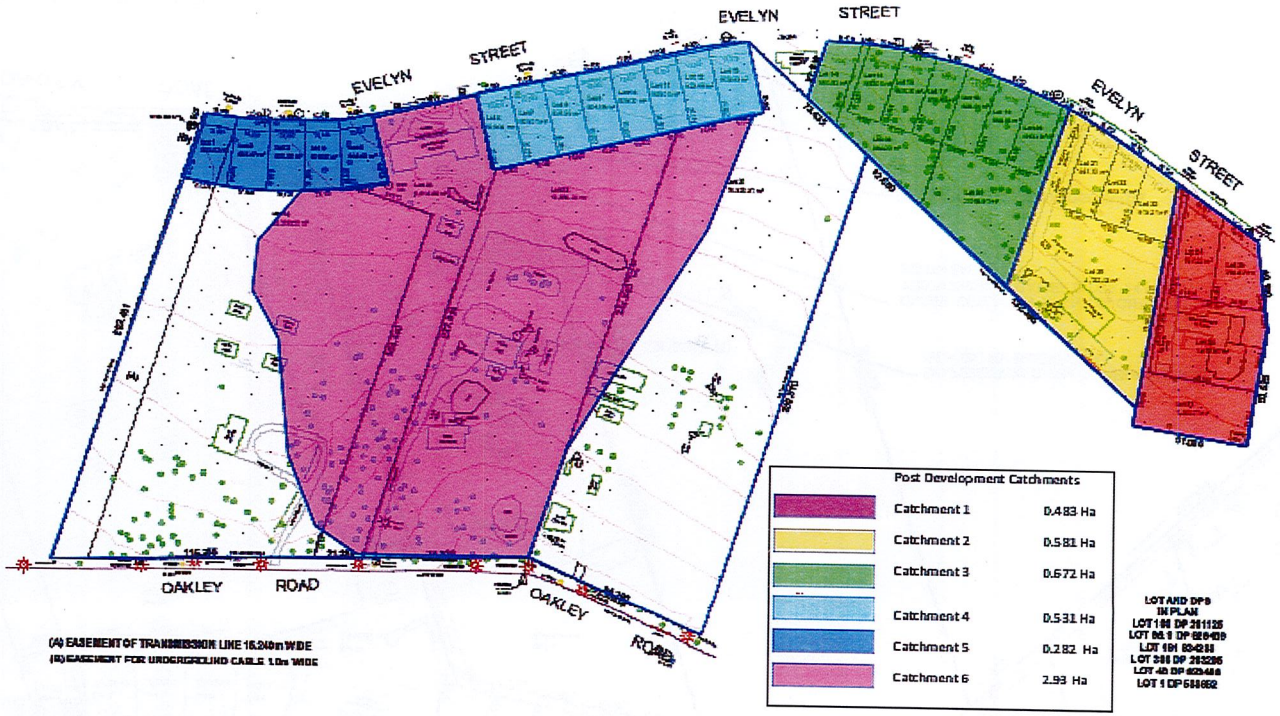
Notes

PLANZONE CONSULTING
P: PO Box 3
Liverpool NSW 1871
T: (02) 9011 7620
E: enquiry@planzone.com.au
W: www.planzone.com.au

N

APPENDIX – B: PRE / POST DEVELOPMENT CATCHMENT AREA





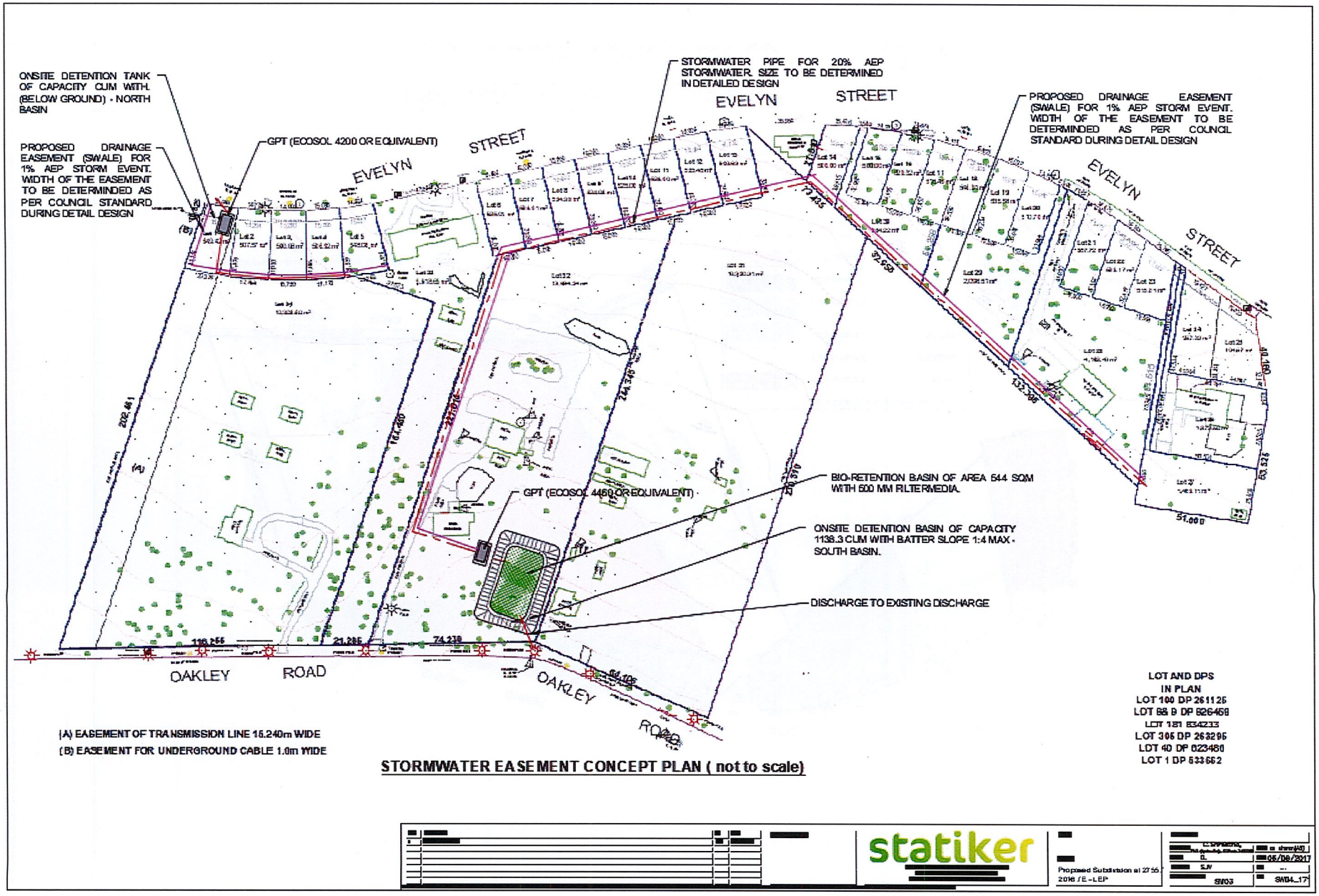
STORMWATER DRAINAGE CONCEPT PLAN (ROOF AND OSD)
scale 1:200

statiker

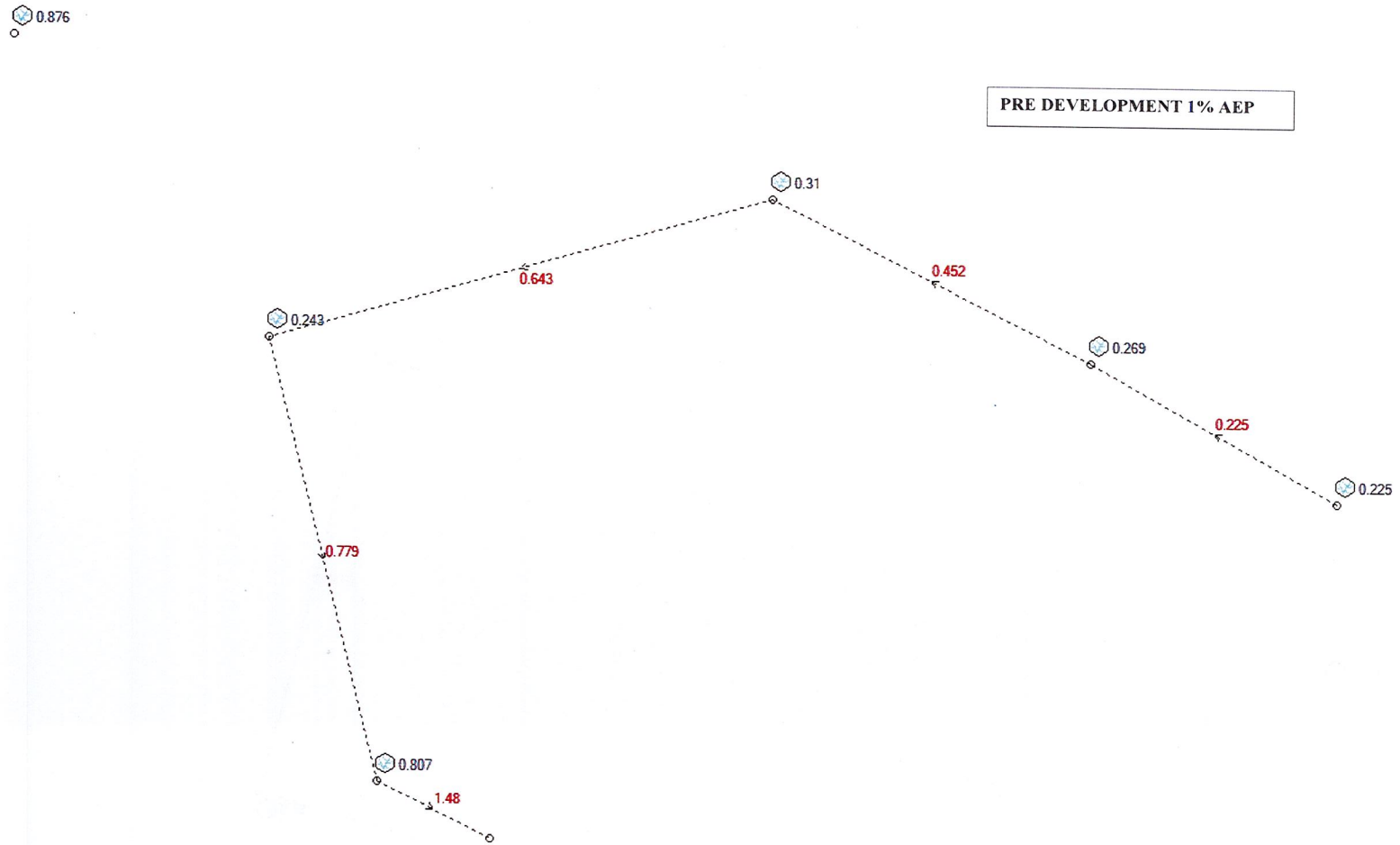
Proposed Subdivision at 2755 2018/E - LEP

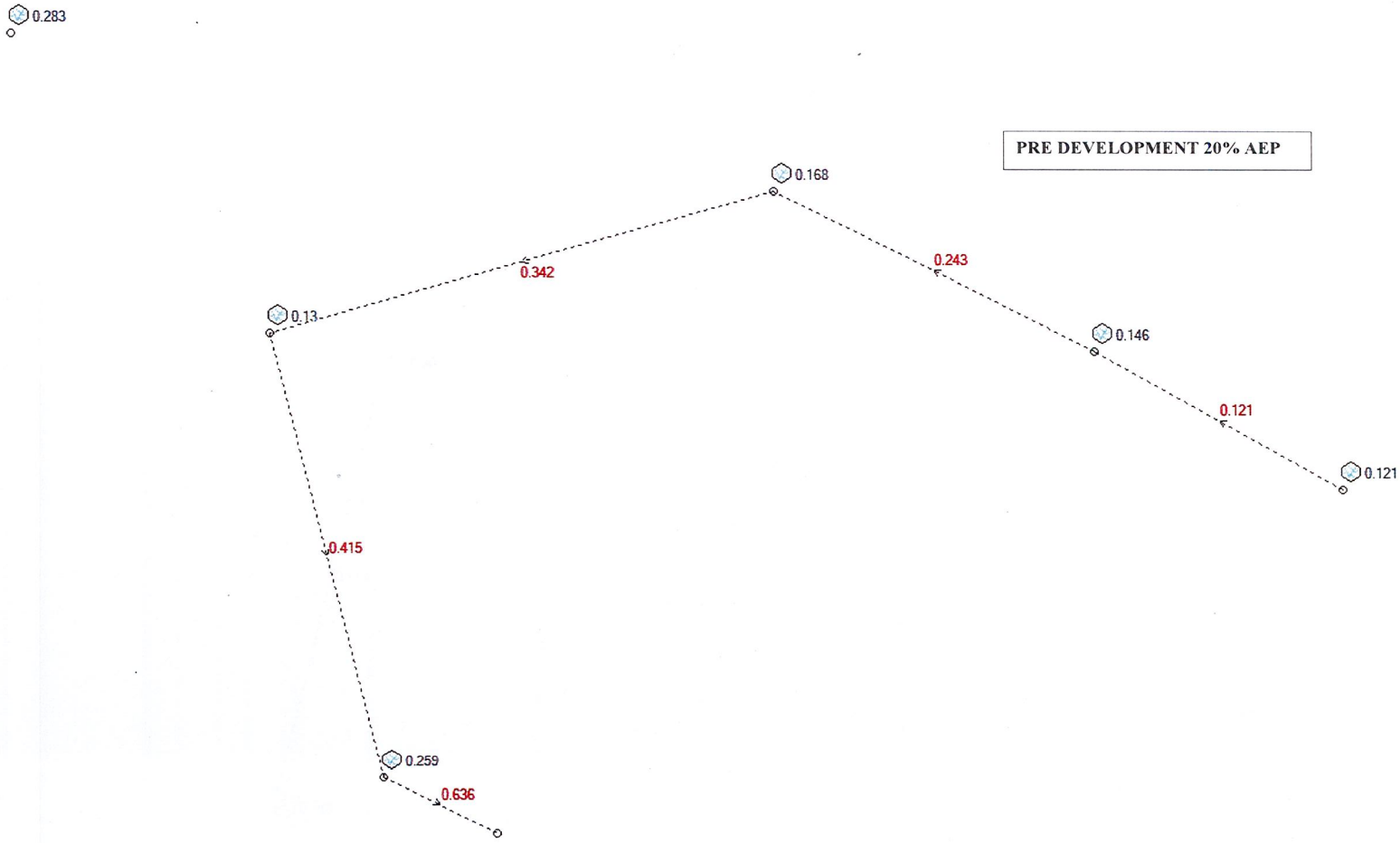
05/06/2017

APPENDIX – C: PROPOSED DEVELOPMENT SITE PLAN

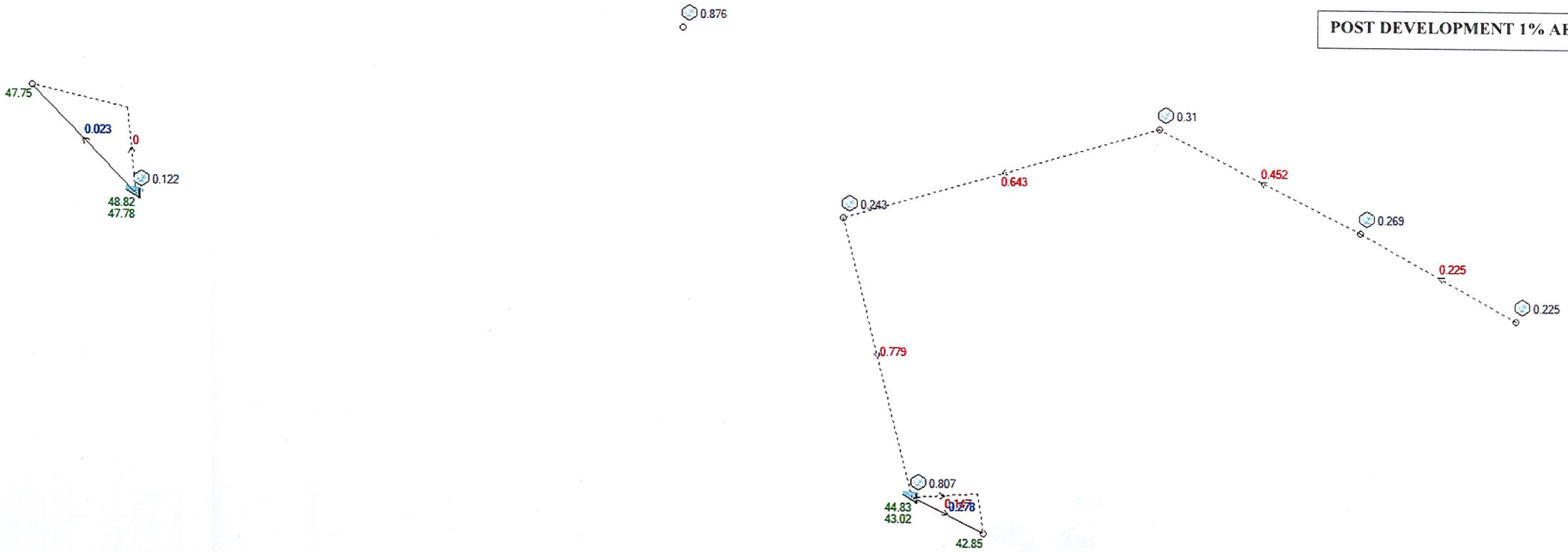


APPENDIX – D: DRAINS MODEL

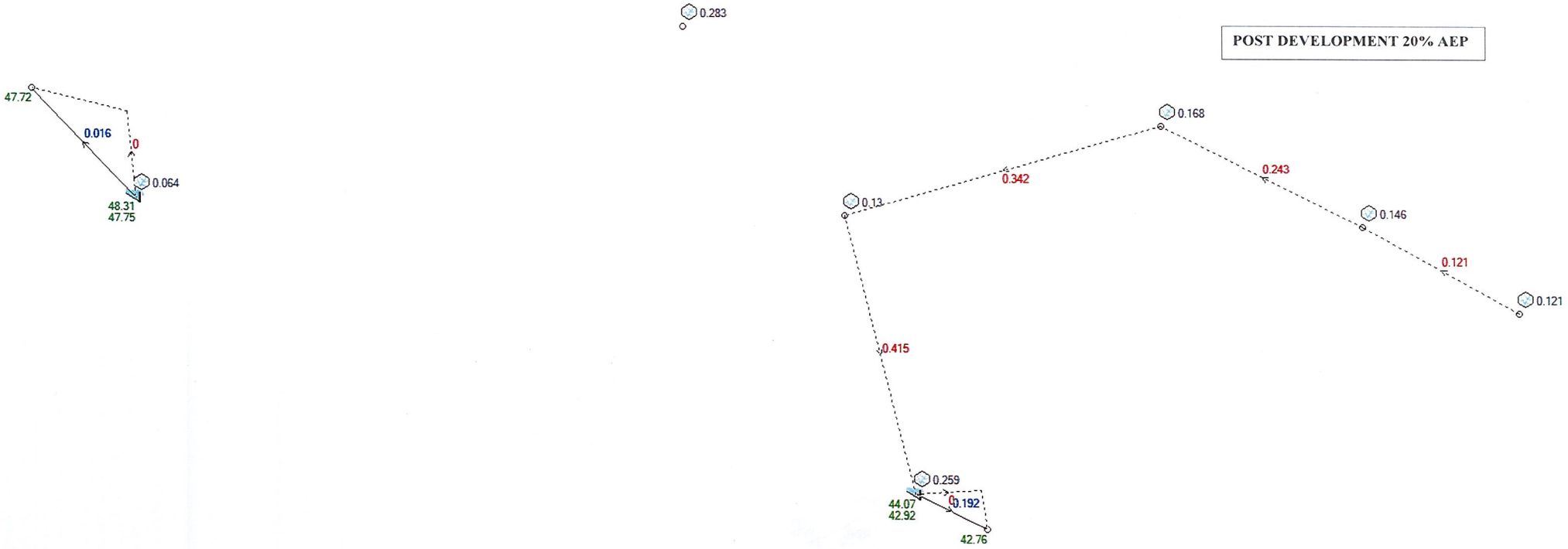



PRE DEVELOPMENT 20% AEP
0.283
0.168
0.342
0.243
0.13
0.146
0.121
0.121
0.415
0.259
0.636

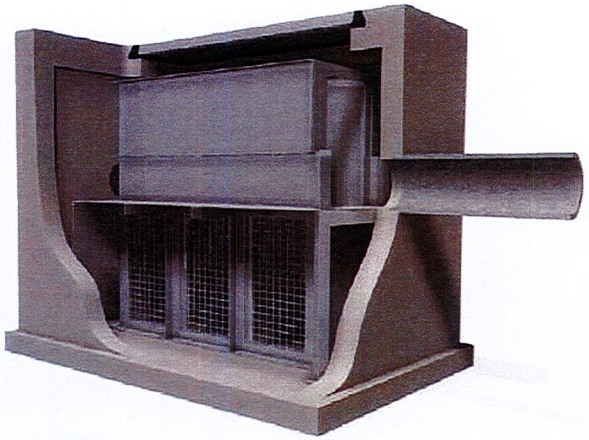
POST DEVELOPMENT 1% AEP



POST DEVELOPMENT 20% AEP



Ecosol™ Gross PollutantTrap Technical Specification



environmentally engineered
for a better future

Ecosol
WASTEWATER FILTRATION SYSTEMS

CONTENTS

1.0 Introduction

1.1 How and Why the Ecosol™ GPT Works
1.2 Low Flow Ecosol™ GPT
1.3 High Flow Ecosol™ GPT

2.0 Ecosol™ GPT Credentials and Case Studies

3.0 Warranty and Life Expectancy

4.0 Safety Considerations

5.0 Environmental Impact

6.0 Key Features and Benefits

7.0 Key Dimensions

8.0 Collection and Removal Efficiencies
8.1 Low Flow Ecosol™ GPT Capture Efficiency Data
8.2 High Flow Ecosol™ GPT Capture Efficiency Data

9.0 MUSIC Modelling Guidelines
9.1 Product performance
9.2 Creating the node

10.0 Design Guidelines

11.0 Hydraulic Specification
11.1 Low Flow Ecosol™ GPT Treatable Flow Rates
11.2 Low High Ecosol™ GPT Treatable Flow Rates
11.3 By-pass Capacity and Headloss

CONTENTS continued

12.0 Cleaning and Maintenance
12.1 Indicative Catchment Size and Recommended Cleaning Frequencies for the Low Flow Ecosol™ GPT Treatable Flow Rates
12.2 Indicative Catchment Size and Recommended Cleaning Frequencies for the High Flow Ecosol™ GPT Treatable Flow Rates

13.0 Monitoring

14.0 Ecosol Cleaning and Maintenance Services

15.0 Applications and Configurations

16.0 Turnkey Service

17.0 Accreditation

18.0 Supplier Technical Product Contact Details

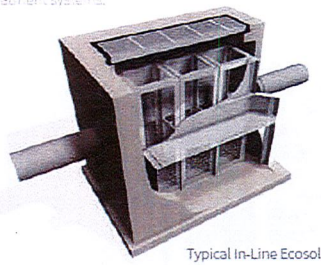
Appendix 1 - Ecosol™ GPT Essential Information Form

Appendix 2 - References

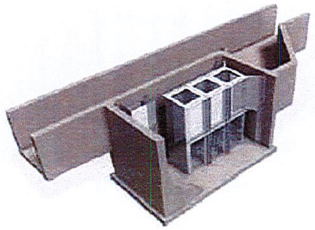
1.0 Introduction

Increasingly stringent environmental best management practice requires planners and developers to apply a fit-for-purpose treatment train approach to stormwater treatment to achieve today's water quality objectives (WQOs). An integral element to any good WSUD is primary treatment or pre-screening of stormwater flows to remove coarse sediment and gross pollutants prior to downstream secondary or tertiary treatment systems such as wetlands.

The Ecosol™ Gross Pollutant Trap provides effective primary treatment of stormwater flows thereby significantly enhancing the operational life of downstream secondary and tertiary treatment systems.



Typical In-Line Ecosol GPT configuration



Typical Off-Line Ecosol GPT configuration

The system has been designed to provide a robust and durable cost effective in-line primary treatment system that captures and retains solid pollutants conveyed in stormwater conduits.

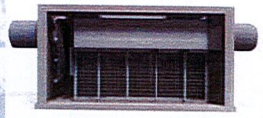
In developing this innovative stormwater treatment system careful consideration has been given to durability, longevity, cost, and maintainability. Key commercial technical features include:

- low visual impact and energy footprint;
- designed hydraulics with proven performance and longevity;
- scalable design; and
- cost effective maintenance regime.

This technical manual describes the operation and performance characteristics of the system.

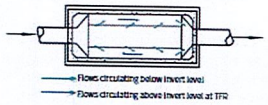
Ecosol™
WASTEWATER FILTRATION SYSTEMS

1.1 How the Ecosol™ GPT Works



The objective of stormwater treatment is to achieve a real, visible, and sustainable improvement in water quality. Pollution control measures, including Gross Pollutant Traps (GPTs), such as the Ecosol™ GPT, litter baskets, sediment basins, grass swales, infiltration systems, and sand filters all reduce the level and concentration of a variety of pollutants, thereby enhancing water quality.

The Ecosol™ GPT is a non-blocking, wet sump, tangential filtration system that has been specifically designed to filter stormwater pollutants conveyed in stormwater conduits by capturing and retaining all contaminants larger than 3mm up to a designed treatable flow rate (TFR). It can play and integral role in reducing pollution in urbanised catchments and help reduce the footprint of a total stormwater treatment train by providing essential prescreening.



Developed in 1996 and tested by the University of South Australia and also EngTest the commercial consulting division of the Adelaide University it remains today one of the most widely recognised and used stormwater primary treatment systems. Today as part of our continual product improvement program the modern Ecosol™ GPT is designed to provide high pollutant retention rates with little hydraulic impact on the drainage infrastructure.

Two unique systems have been designed, the Low Flow Ecosol™ GPT for primary treatment of stormwater at low flow velocities and the High Flow Ecosol™ GPT for primary treatment of stormwater at high flow velocities.

1.2 Low Flow Ecosol™ GPT Works

The Low Flow Ecosol™ GPT has been designed and tested specifically to treat low flows to capture and retain fine particulates and hydrocarbons from stormwater. Its tangential screening along with its large detention chamber enables gravitational separation to occur at low flow velocities retaining fine particulate matter conveyed in stormwater providing essential primary treatment.

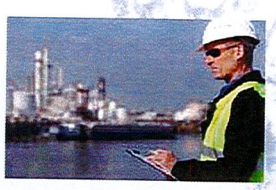
Key Features

- high capture efficiency of solids at low flow velocities;
- designed high flow by-pass capacity;
- Independently tested and verified by the University of Adelaide;
- designed hydraulics provides minimal hydraulic headloss;
- shallow depth below invert reduces water table problems;
- visually unobtrusive; and
- easily cleaned using eductor truck or removable lift out baskets.

Ecosol™ WASTEWATER FILTRATION SYSTEMS

1.3 High Flow Ecosol™ GPT

The range of High Flow Ecosol™ GPT's, are designed specifically to provide essential primary treatment of gross pollutants conveyed in stormwater at high velocities. Typically this system has been designed to capture and retain more than 99% of pollutants larger than 3mm.



Key Features

- minimal head/hydraulic loss;
- designed hydraulics enables high treatable flow rates;
- shallow depth below invert reduces water table problems;
- visually unobtrusive;
- Independently tested and verified by the University of Adelaide; and
- easily cleaned using eductor truck or removable lift out baskets.

2.0 Ecosol™ GPT Credentials & Case Studies

The Ecosol™ GPT is designed specifically to provide essential primary treatment of stormwater runoff. It is a compact, efficient, and cost-effective solution to the ever-increasing problem of gross pollutants present in stormwater flows. Key to its success is the robust, engineered design and tangential screens housed in a pre-cast concrete pit that provides a significantly greater screening area than that of traditional direct screening trash rack designs. Further its large detention chamber enables gravitational separation to occur at low flow velocities retaining fine particulate matter conveyed in stormwater.

THE UNIVERSITY of ADELAIDE

University of South Australia

Urban Water Resources Centre – University of South Australia
Product Performance Testing.

In 1997 and 1998 the University of South Australia (UniSA), was commissioned to undertake a series of tests on the widely-used Ecosol™ GPT (formerly known as the RSF 4000) to confirm product's performance. The tests measured the capture efficiency of the system under varying flow conditions and gradients and also the hydraulic headloss of the system under varying flows and gradients.

EngTest Department of Civil and Environmental Engineering –
University of Adelaide – Product Performance Testing

In October 1998 after further product development Ecosol commissioned Engtest the Department of Civil and Environmental Engineering at the University of Adelaide to undertake further testing on the system to confirm hydraulic headloss and capture efficiencies.

Ecosol™ WASTEWATER FILTRATION SYSTEMS

2.0 Ecosol™ GPT Credentials & Case Studies continued

Avocet Consulting - CFD Modelling to determine Pollutant Trapping Performance and fluid hydraulic characteristics under varying flow conditions.

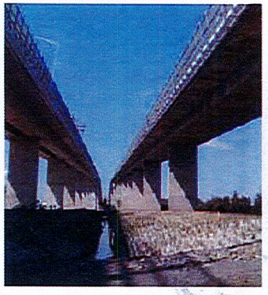
In early 2000 to mid-2001 as part of the companys continuous product improvement program Ecosol engaged the services of Avocet Consulting to assess the Ecosol™ GPTs hydraulic performance, structural integrity, capture efficiency, treatable flow rates relevant to product sizing and scaling. Additional laboratory testing was also completed to monitor its performance as it filled and also to review the non-blocking, tangential filtration longevity of the system under varying flow conditions and percentage of fill.

EngTest Department of Civil and Environmental Engineering - University of Adelaide - Performance Review

In June 2013 the University of Adelaide (EngTest) completed a series of additional product tests to further verify product performance and concurrently reviewed all past laboratory and field testing on the performance of the product to comprehensively determine its performance for current industry applications.

3.0 Warranty and Life Expectancy

The Ecosol™ GPT has a one-year warranty covering all components and workmanship. Ecosol will rectify any defects that fall within the warranty period. The warranty does not cover damage caused by vandalism and may be invalidated by inappropriate cleaning procedures or where the unit is not cleaned with the recommended frequency. The Ecosol™ GPT is designed to meet strict engineering guidelines and manufacturers guarantees and is one of the most durable stormwater treatment systems available. The stainless steel components have a life expectancy of 15 years while the precast concrete pit has a life expectancy of 50 years providing appropriate maintenance practices are employed.

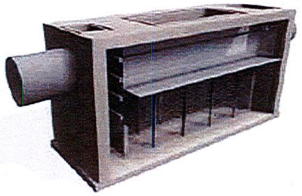


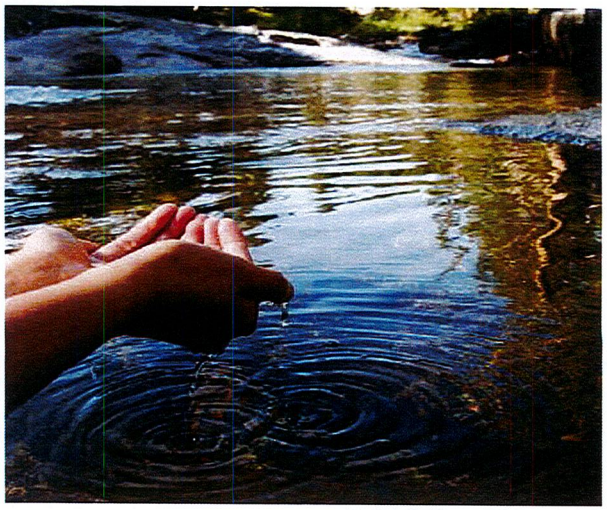
4.0 Safety Considerations

The simple, yet effective design of the Ecosol™ GPT reduces OH&S risks as most of the work is undertaken in a controlled factory environment. The unit arrives to site complete and ready for installation reducing significantly on-site time, an important factor given the costs associated with delays that can be caused by inclement weather.

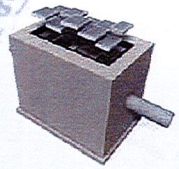
5.0 Environmental Impact

Ecosol is accredited to ISO 14001:2004 (Environment) and undertakes all manufacturing and construction within the requirements of this Standard. Hence, its carbon impact is limited and as the Ecosol™ GPT is housed in a precast pit and is located underground, it is aesthetically unobtrusive. Further the installation of the system provides a positive outcome for the environment significantly reducing the volume of pollutants conveyed in stormwater runoff from reaching receiving waterways.





6.0 Key Features and Benefits



The High Flow Ecosol™ GPT captures and retains more than 99% of pollutants larger than 3mm and the Low Flow Ecosol™ GPT whilst also designed as a primary treatment solution can capture and retain a significant percentage of attached Total Suspended Solids, Total Phosphorous and Total Nitrogen at its design Treatable Flow Rate (TFR) depending on the chemical composition of the particles and the bonding of these chemical constituents to the surface of particles and the body of pollutants forming a media within the device.

Easily installed, the pre-cast, modular Ecosol™ GPT can be fitted to conduits of almost any size and shape, either within the drainage network or off-line adjacent to creeks or in open channels ;in-line and end-of-line in drainage networks. Its range of applications include industrial and commercial sites, such as car parks, shopping centres, and wash-bays, residential developments, airports, freeways, civil construction projects, and wetlands.

Key Features	Benefits
Hydraulics	• Low headloss (k) factor • Designed and managed hydraulics eliminates blockage risk • Patented hydraulically-driven barrier reduces premature by-pass • Non-blocking tangential filtration screening
Pollutant Capture and Retention	• Captures and retains more than 98% of solid pollutants > 2mm • Captures and retains up to 80% of TSS and up to 99% free oils and grease in spill situations • No remobilisation of captured pollutants
Design and Construction	• Can be sized to suit a wide range of flows, gradients, and pipe sizes • Up to a GPT 4900 unit comes complete to site making installation easy and safe[1] • Shallow depth below invert reduces water table problems • Product is made in-house thereby reducing lead times significantly
Cleaning and Maintenance	• Cost-effective vacuum cleaning so no need for the pollutants to be handled • Large pollutant storage capacity • Baffle design for emergency spill storage
Environmental Impact	• Effective pre-screening as part of a treatment train to achieve water quality objectives • Positive effect on natural ecosystem by improving water quality • Unit is housed in its own pit with little effect on the site aesthetics
Tried and Tested	• Independently laboratory field tested • Meets industry standards and guidelines

Ecosol™ WASTEWATER FILTRATION SYSTEMS

7.0 Key Dimensions

The table below shows the approximate dimensions and holding capacities for both, the low and high flow Ecosol™ GPT systems. Their capacity to retain large quantities of captured pollutants ensures that its specified capture efficiency is maintained between scheduled cleaning events.

Ecosol Product Code	Inlet/Outlet Pipe Diameter	Approx. External Dimensions (L x W x D from invert)	Holding Capacities		
			Solid Pollutants	Free Oil and Grease	Water
		(mm)	(m^3)	(litres)	(litres)
GPT 4200	Up to 375mm	2200 x 900 x 750	0.23	268	667
GPT 4300	250 to 600mm	2700 x 1350 x 750	0.32	469	1,181
GPT 4450	225 to 900mm	3600 x 1650 x 1050	1.01	1,347	3,348
GPT 4600	300 to 1200mm	4500 x 1950 x 1350	2.43	2,994	7,211
GPT 4750	450 to 1350mm	5400 x 2300 x 1650	4.83	5,711	13,608
GPT 4900	600 to 1650mm	6500 x 2600 x 1975	8.30	9,576	22,788
GPT 41050	750 to 1800mm	7450 x 2950 x 2300	13.11	14,850	35,262
GPT 41200	900 to 2100mm	8450 x 3300 x 2625	19.52	22,793	51,698
GPT 41350	1050 to 2400mm	9700 x 3700 x 2950	27.70	30,578	72,495
GPT 41500	1200 to 2400mm	10580 x 4000 x 3250	37.94	41,491	98,317
GPT 41800	1350 to 2400mm	12730 x 4700 x 3900	65.33	70,452	166,836

Table 2

Notes:
1. The unit can be sized to suit almost any type of pipe or box culvert.
2. Unit dimensions can vary depending on the vehicle load requirements and the wall thickness.

The Ecosol™ GPT is available in three configurations:
- In-line/End of Line, Low Flow Ecosol™ GPT
- In-Line/End of Line, High Flow Ecosol™ GPT and
- Off-Line Ecosol™ GPT.

Unit Design Basis

Standard product design is based on Exposure Classifications A2 for external surfaces in contact with the ground and for installations in non-aggressive soils. Where the conditions are outside the design limits of the standard Ecosol™ GPT, Ecosol must be notified in writing so that the product is quoted specific to these site conditions. This includes instances where the unit is to be installed in aggressive soils, or below any permanent, or transient water table, or if the maximum depth of fill, above the cover slab exceeds 3.0m for Ecosol™ GPT 4300 - 4600 and 2.0m for the Ecosol™ GPT 4750. Confirmation of the site ground and water conditions including cover is the responsibility of the client.

Unit Design Loading

The range of Ecosol™ GPT's are designed for Class B, D and up to Class G loadings suitable for underground installations in highways, airport and wharf applications

Ecosol™ WASTEWATER FILTRATION SYSTEMS

8.0 Capture Efficiencies

In order to determine a meaningful characterisation of the products collection efficiency, an extensive verification phase was undertaken by Avocet Consulting Pty Ltd, Ecosol Pty Ltd and EngTest (The University of Adelaide). To best summarise the capture efficiency results of extensive product testing a regression of the data points using a sigmoidal regression curve was selected as it provided a conservative fit to the wide scatter of data collected. Refer to figure 1 for results of the Low Flow Ecosol™ GPT and figure 2 for results of the High Flow Ecosol™ GPT and Table 3 summarises these results

Pollutant Capture Efficiency PSD		
Sieve Size (micron)	Capture Efficiency (%)	
	Low Flow Ecosol GPT	High Flow Ecosol GPT
600 - 2000	100%	99%
200 - 600	98%	88%
60 - 200	83%	44%
20 - 60	39%	6%

Table 3 – Typical PSD results

8.1 Low Flow Ecosol™ GPT Capture Efficiency Data.

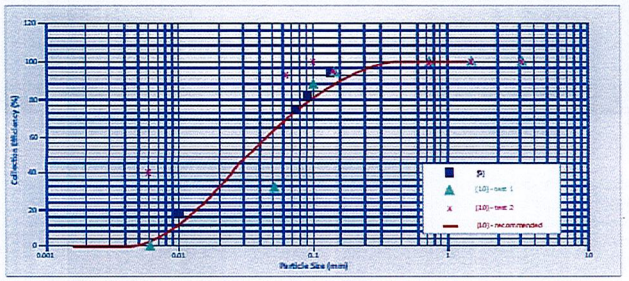


Figure 1 - Sigmoidal regression curve graph for the Low Flow Ecosol™ GPT.

8.0 Collection and Removal Efficiencies continued

Performance Criteria - Low Flow Ecosol GPT	
Pollutants	Capture Efficiency
Gross Pollutants (>2000µm)	99%
Total Suspended Solids (TSS) (20 - 2000µm)	80%
Total Phosphorous (TP)	45%
Total Nitrogen (TN)	45%
Total Petroleum/Hydrocarbon	99%

Table 4 – Mean average pollutant percentage reductions

Figures quoted are mean collection efficiency statistics based on available product testing data. It is important to note that the water quality CE values are indicative of potential field CEs given that the product is designed as a primary treatment solution providing physical screening and the removal of chemical constituents is largely dependent on the chemical composition of the particles and the bonding of these chemical constituents to the surface of particles. Further, finer and attached particle filtration performance of the product is also dependent on the body of pollutants forming a media already captured by the filter. Quoted CE values are intended as a general guide, please consult with your Ecosol representative for site specific product sizing and modelling

8.2 High Flow Ecosol™ GPT Capture Efficiency Data

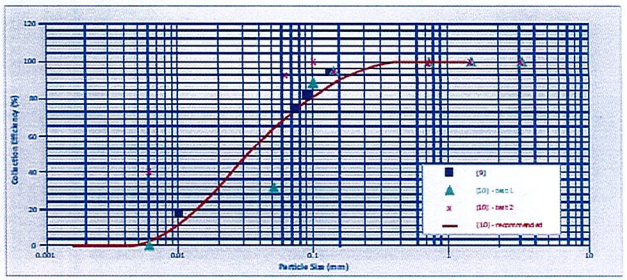


Figure 2 - Sigmoidal regression curve graph for the High Flow Ecosol™ GPT.

8.2 High Flow Ecosol™ GPT Capture Efficiency Data continued

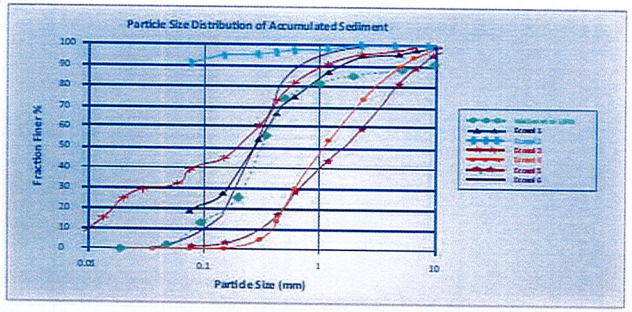


Figure 3 – Field Testing Particle size distribution data for six separate High Flow Ecosol™ GPT installations

Performance Criteria - High Flow Ecosol GPT (In-Line)	
Pollutants	**Capture Efficiency (Up to)**
Gross Pollutants (>2000µm)	99%
Total Suspended Solids (TSS) (20 – 2000µm)	55%
Total Phosphorous (TP)	40%
Total Nitrogen (TN)	40%
Total Petroleum/Hydrocarbon	99%

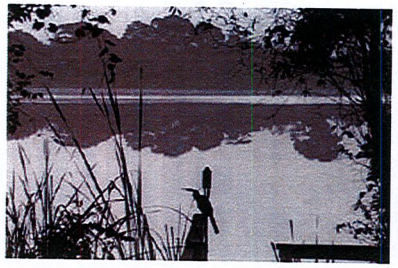
Table 5 – High Flow Ecosol™ GPT performance summary

Figures quoted are mean collection efficiency statistics based on available product testing data. It is important to note that the water quality CE values are indicative of potential field CEs given that product is designed primarily as a primary treatment solution providing physical screening and the removal of chemical constituents is largely dependent on the chemical composition of the particles and the bonding of these chemical constituents to the surface of particles. Further, finer and attached particle filtration performance of the product is also dependent on the body of pollutants forming a media already captured by the filter. Quoted CE values are intended as a general guide- please consult with your Ecosol representative for site specific product sizing and modelling.

Ecosol™ WASTEWATER FILTRATION SYSTEMS

9.0 MUSIC Modelling Guidelines

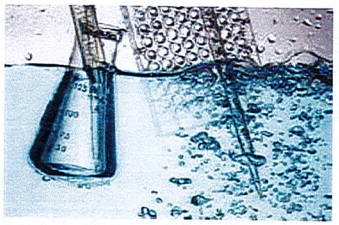
These guidelines provide instruction to the creation and application of a treatment node for the Ecosol™ GPT for the Model for Urban Stormwater Improvement Conceptualisation (MUSIC). The Ecosol™ GPT can be modelled in MUSIC using the Generic Treatment node to represent the results derived from independent laboratory testing and field testing by the University of South Australia and the University of Adelaide (ENGTEST The school of civil, environmental and mining engineering). The guidelines apply to the creation of the treatment node within MUSIC v6.0.4.



9.1 Product Performance

Ecosol has always sought pro-actively to validate its products through independent laboratory, and extensive field, testing. The test results have been verified, where appropriate, by computer simulation and industry peers.

In 2012 the University of Adelaide (Engtest Civil, Environmental and Mining) completed extensive testing and measurements of the products capture efficiency, hydraulic performance and durability at varying flow rates and compiled a comprehensive product performance report (Performance Review of the Ecosol GPT) reviewing both past and present field and laboratory testing data. A copy of this detailed report is available on request.



Ecosol™ WASTEWATER FILTRATION SYSTEMS

9.2 Creating the Node

Insert a GPT treatment node into your model by selecting "GPT" under the treatment nodes menu. When the node is created the node properties dialog is displayed. There are several changes that need to be made in this dialog

- Describes the type of treatment device "Ecosol GPT"
- Described as any flow (m3/sec) up to the treatable flow rate (TFR).
- Described as any flow (m^3/sec) above the treatable flow rate (TFR).
- Described as the types of pollutants with manipulation to input/ output values
- Displays graphically the input and output values after manipulation.

NOTES: Can be used to describe assumptions or location of reduction values for authority approvals.

The transfer function for each pollutant can be defined to meet the input and output values that reflect the capture efficiencies (CE) of the treatment device. Table 6 provides the input and output values for the High Flow Ecosol™ GPT and table 7 provides input and output for the Low Flow Ecosol™ GPT ..

Pollutant	Removal Rate (%)	Entered Input Value	Entered Output Value
Total Suspended Solids (20 - 2000µm)	55	1000	450
Total Phosphorus	40	1000	600
Total Nitrogen	40	1000	600
Gross Pollutants (>2000µm)	99	1000	10
Heavy Metals	25	n/a	n/a
Total Petroleum/Hydrocarbons (Dry weather spill situation)	99	n/a	n/a

Table 6 - Ecosol™ Gross Pollutant Trap – High Flow, input and output values

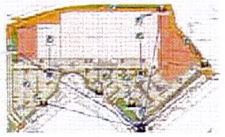
Ecosol WASTEWATER FILTRATION SYSTEMS

9.2 Creating the Node continued

Pollutant	Removal Rate (%)	Entered Input Value	Entered Output Value
Total Suspended Solids (20 - 2000µm)	80	1000	450
Total Phosphorus	45	1000	600
Total Nitrogen	45	1000	600
Gross Pollutants (>2000µm)	99	1000	10
Heavy Metals	25	n/a	n/a
Total Petroleum/Hydrocarbon (Dry weather spill situation)	99	n/a	n/a

Table 7 - Ecosol™ Gross Pollutant Trap – Low Flow, input and output values

9.0 9.2 Creating the node



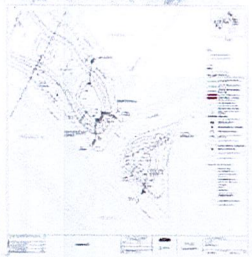
It is important to select the appropriate Treatable Flow Rate relevant to the target water quality objective for the project. Traditionally the higher the TFR of the treatment device the lower the capture efficiency, therefore it is recommended you select the optimal output values and then determine the correlating treatable flow rate of the proposed Ecosol™ GPT.

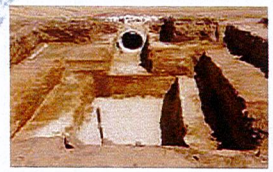
An Ecosol representative can assist you in selecting the most appropriately sized unit for your next project.

Ecosol GPT Model	Dimensions Length x Width (mm)	Low Flow Treatable Flow Rate (L/s)	High Flow Treatable Flow Rate (L/s)
Ecosol GPT 4200	2,200 x 900	15	51
Ecosol GPT 4300	2,700 x 1,350	36	120
Ecosol GPT 4450	3,600 x 1,650	78	260
Ecosol GPT 4600	4,500 x 1,950	141	470
Ecosol GPT 4750	5,600 x 2,300	219	730
Ecosol GPT 4900	6,500 x 2,600	315	1,050
Ecosol GPT 41050	7,450 x 2,950	429	1,430
Ecosol GPT 41200	8,630 x 3,300	561	1,870
Ecosol GPT 41350	9,700 x 3,700	674	2,370
Ecosol GPT 41500	10,680 x 4,000	803	2,930
Ecosol GPT 41800	12,730 x 4,700	1,076	4,210

Table 8

Ecosol WASTEWATER FILTRATION SYSTEMS





10.0 Design Guidelines

To ensure your system is appropriately designed for its intended application and meets local water quality objectives it is essential that the following minimum information is provided.

- Confirm the required treatable flow rate – this is the minimum stormwater run-off volume that must be treated. Typically this is the 1 in 3 month to 1 in 1 year ARI.
- Confirm the maximum design flow capacity of the drainage line. This is important as it allows us to appropriately design and model the system to cater for these peak flows at minimal headloss.
- Confirm the proposed number and locations of Ecosol™ GPT's to be installed. Where possible please provide clearly marked drainage plans indicating the proposed locations.
- Confirm local water quality objectives - Recent state governmental planning policies have established clear stormwater quality bench mark objectives for local and regional councils. Accordingly local and regional council water sensitive urban design objectives have been amended to meet these stormwater pollution reduction targets. It is important we are provided this information specific to your site and local council regulations so that we can clearly advise you of the products removal efficiency relevant to these WQO's.

For further assistance in sizing or specifying a system for your next project please complete the form in Appendix 1 and forward to your local Ecosol representative.

Ecosol's engineering team is able to provide a comprehensive design proposal for almost any project where the Ecosol™ GPT is proposed either individually or in conjunction with any other filtration systems working together in a treatment-train approach. Services offered include preliminary hydraulic, structural, and total concept designs, as well as consideration to access and hardstand designs for cleaning and maintenance. This includes MUSIC (Model for Urban Stormwater Improvement Conceptualisation) modelling, CAD drawings and product specifications together with maintenance schedules and associated CAPEX and OPEX costs.

Further, Ecosol can also undertake all civil and structural installation works, and our complete turnkey service also includes full maintenance of the proposed stormwater treatment systems and reporting.

Ecosol™
WASTEWATER FILTRATION SYSTEMS

11.0 Hydraulic Specification

Gross Pollutant Traps (GPT's), such as the Ecosol GPT, are primarily designed to remove gross pollutants (>5mm) from stormwater at high treatable flow rates (TFR) and can play an integral role reducing pollution in heavily-urbanised catchments that discharge into our waterways.

11.1 Low Flow Ecosol™ GPT - Treatable Flow Rates

The Treatable Flow Rate (TFR) is the minimum flow that a GPT must treat, without by-pass, to achieve the desired pollutant capture criteria for a particular development. It varies dependent on that catchment size and percentage of impervious area thereby determining the pipe size and gradient. Typically, the Low Flow Ecosol™ GPT is designed to treat the 1-in-3 month Annual Rainfall Intensity (ARI) discharges, with greater flows by-passing the unit.

The Low Flow Ecosol™ GPT was designed specifically to achieve high pollutant removal rates at low inflow velocities thereby providing improved gravitational separation of particulates conveyed in stormwater. The table below summarises the Low Flow Ecosol™ GPTs typical treatable flow rates based on product pipe size and gradient.

Ecosol™
WASTEWATER FILTRATION SYSTEMS

11.0 Hydraulic Specification continued

LOW FLOW ECOSOL™ GPT - TREATABLE FLOW RATES (L/s)

Ecosol GPT product code	Gradient	Outlet pipe Diameters (mm)													
		100	150	225	300	375	450	525	600	750	900	1050	1200	1350	1500
GPT 4200	0.5%	1	4	6	8	9									
	1.0%	2	4	7	8	10									
	2.0%	3	5	7	9	11									
	5.0%	3	6	10	13	15									
GPT 4300	0.5%	4	6	15	23	30	35	36	36						
	1.0%	5	7	17	24	31	36	36	36						
	2.0%	7	9	18	26	33	36	36	36						
	5.0%	8	10	20	30	36	36	36	36						
GPT 4450	0.5%	9	14	15	28	36	43	48	55	64	72				
	1.0%	10	15	18	29	38	45	52	57	67	76				
	2.0%	12	18	21	31	41	49	56	63	74	78				
	5.0%	12	21	24	37	50	62	72	78	78	78				
GPT 4600	0.5%	12	15	28	36	53	67	78	88	106	121	135			
	1.0%	12	19	32	40	56	69	81	92	111	128	141			
	2.0%	12	26	38	43	59	75	89	101	122	141	141			
	5.0%	12	31	41	48	69	90	109	126	141	141	141			
GPT 4750	0.5%	9	19	34	38	55	67	79	89	107	123	137	149	161	
	1.0%	10	22	33	41	58	71	83	95	114	131	146	159	172	
	2.0%	12	28	41	48	74	77	92	105	128	375	165	180	195	
	5.0%	14	33	44	57	84	96	117	137	171	201	219	219	219	
GPT 4900	0.5%	11	23	43	59	86	97	108	118	146	169	190	209	226	242
	1.0%	12	24	44	62	91	103	111	125	154	180	202	222	240	258
	2.0%	14	30	45	68	97	111	118	138	172	202	247	251	272	292
	5.0%	16	35	47	77	108	118	124	174	226	270	309	315	315	315
GPT 43050	0.5%	11	25	53	88	127	130	133	155	187	220	249	275	299	321
	1.0%	13	27	55	91	129	133	138	158	197	233	264	293	318	343
	2.0%	16	31	57	93	130	141	142	164	217	260	297	329	359	387
	5.0%	18	37	61	96	130	146	149	171	279	342	397	429	429	429
GPT 41200	0.5%	12	27	57	97	132	168	178	181	239	272	312	347	379	410
	1.0%	14	31	59	101	134	171	181	184	241	288	331	369	404	437
	2.0%	16	35	62	104	137	175	184	193	248	320	369	415	454	492
	5.0%	18	42	66	107	142	178	186	198	251	412	487	555	561	561
GPT 41350	0.5%					134	168	178	181	239	272	378	428	467	504
	1.0%					146	174	181	184	241	288	401	450	496	537
	3.0%					154	175	184	193	248	320	445	504	556	605
	5.0%					164	182	186	198	251	412	489	557	618	674
GPT 41500	0.5%								181	239	400	471	505	558	607
	1.0%								184	241	408	476	535	592	646
	3.0%								193	248	411	481	594	662	725
	5.0%								198	251	419	488	654	732	803
GPT 41800	0.5%								181	239	503	610	707	752	828
	1.0%								184	241	508	624	713	740	876
	3.0%								193	248	513	619	718	881	975
	5.0%								198	251	521	625	724	967	1076

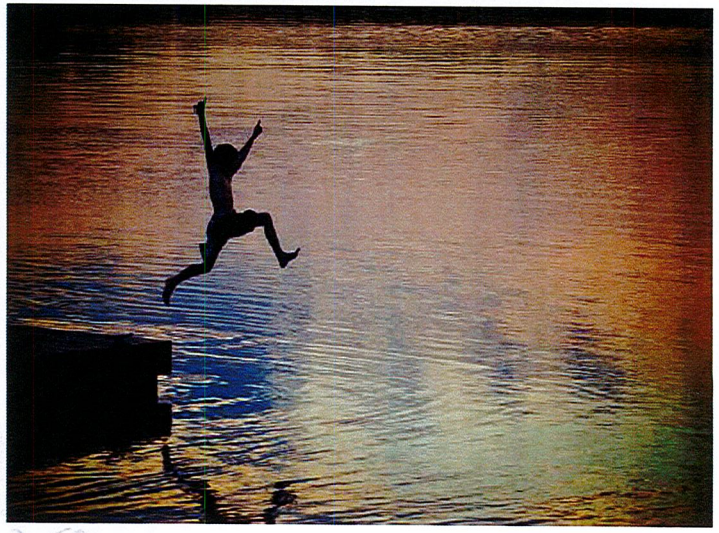
Table 9

11.0 Hydraulic Specification continued

11.2 High Flow Ecosol™ GPT - Treatable Flow Rates

The Treatable Flow Rate (TFR) is the minimum flow that a GPT must treat, without by-pass, to achieve the desired pollutant capture criteria for a particular development. It varies dependent on that catchment size and percentage of impervious area thereby determining the pipe size and gradient. Typically, the High Flow Ecosol™ GPT is designed to treat the 1-in-3 month to and 1-in1 year Annual Rainfall Intensity (ARI) discharges, with greater flows by-passing the unit.

The High Flow Ecosol™ GPT was designed specifically to provide essential primary treatment of stormwater flows targeting gross pollutants. The table below summarises the High Flow Ecosol™ GPTs typical treatable flow rates based on product selection, pipe size and gradient.



11.0 Hydraulic Specification continued

HIGH FLOW ECOSOL™ GPT - TREATABLE FLOW RATES (L/s)																	
Ecosol GPT product code	Gradient	Outlet pipe Diameters (mm)															
		100	150	225	300	375	450	525	600	750	900	1050	1200	1350	1500	1650	1800
GPT 4200	0.5%	4	14	21	26	31											
	1.0%	6	15	22	28	33											
	2.0%	9	16	25	32	37											
	5.0%	10	20	33	43	51											
GPT 4300	0.5%	20	21	50	79	99	116	120	120								
	1.0%	21	23	57	82	103	120	120	120								
	2.0%	23	29	60	87	110	120	120	120								
	5.0%	27	34	67	101	120	120	120	120								
GPT 4450	0.5%			52	93	121	143	163	182	212	240						
	1.0%			60	98	126	150	171	190	223	252						
	2.0%			69	105	137	164	188	209	246	260						
	5.0%			79	124	167	205	235	260	260	260						
GPT 4600	0.5%				120	175	222	260	294	354	403	450					
	1.0%				134	185	231	272	308	371	425	470					
	2.0%				142	157	249	295	336	408	469	470					
	5.0%				161	231	299	363	421	470	470	470					
GPT 4750	0.5%						224	263	298	358	410	456	497	536			
	1.0%						236	278	315	381	437	486	531	573			
	2.0%						258	307	350	427	491	549	601	650			
	5.0%						319	391	457	571	669	730	730	730			
GPT 4900	0.5%								395	487	564	634	695	753	807	855	
	1.0%								417	515	600	674	741	803	860	913	
	2.0%								459	574	673	758	836	908	973	1036	
	5.0%								579	753	900	1050	1050	1050	1050	1050	
GPT 41050	0.5%									622	733	831	916	996	1070	1141	1204
	1.0%									657	777	881	977	1062	1143	1217	1287
	2.0%									726	867	985	1096	1198	1291	1378	1430
	5.0%									929	1139	1323	1430	1430	1430	1430	1430
GPT 41200	0.5%										907	1041	1158	1264	1367	1456	1544
	1.0%										941	1103	1230	1347	1455	1554	1647
	2.0%										1066	1231	1382	1515	1639	1756	1866
	5.0%										1375	1625	1840	1870	1870	1870	1870
GPT 41350	0.5%											1261	1416	1556	1683	1802	1916
	1.0%											1337	1501	1653	1791	1924	2045
	2.0%											1483	1681	1854	2016	2171	2310
	3.0%											1630	1858	2061	2247	2370	2370
GPT 41500	0.5%												1634	1861	2023	2175	2323
	1.0%												1782	1974	2153	2315	2467
	2.0%												1981	2206	2418	2604	2778
	3.0%												2180	2441	2677	2902	2930
GPT 41800	0.5%													2506	2753	2978	3190
	1.0%													2647	2919	3170	3394
	2.0%													2936	3251	3540	3801
	3.0%													3222	3586	3916	4210

Table 10

11.3 By-pass Capacity and Headloss

The range of Ecosol™ GPT's has been designed to cater for maximum flow by-pass at minimal headloss. The placement of any structure into a stormwater line will induce headloss. The extent of this headloss is a function of the velocity in the outlet pipe and the k factor adopted. The k factor must be representative of the type of structure and its operation during full-flow conditions as distinct from the TFR.

The Ecosol™ GPT has one of the lowest k factors of any GPT currently available. Extensive independent testing has been carried out to confirm the unit's k factor for a range of pipe and unit sizes based on full flow, worstcase scenarios. These tests show that the k factor can vary between 0.6 and 1.5 depending on the pipe configuration and the relative unit size, as shown below

Gradient	*k* Factor
1%	0.6
2%	1.0
3%	1.5

Table 11 – Measured maximum k factor for the Ecosol GPT at the suggested treatable flow rate for nonsurcharged flows.

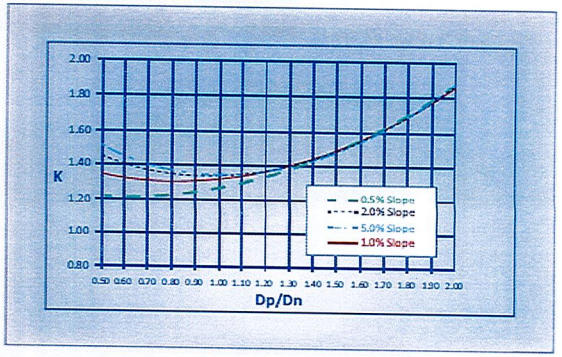
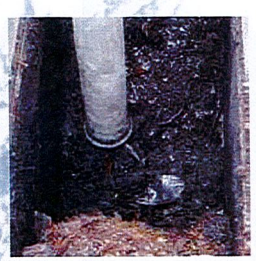


Figure 4 Measured maximum k factors for the Ecosol GPT at its designed maximum by-pass flow rate (designed discharge rates) in a surcharged environment.

12.0 Cleaning and Maintenance



As with all filtration systems, the Ecosol™ GPT should be inspected and cleaned regularly. The cleaning frequency, and the cost, depends heavily on the catchment size and type, the unit's proximity to a waste facility, and rainfall.

The cleaning frequency may vary with local catchment conditions but the below figures are based on typical gross pollutant loads expected for typical commercial, residential, and light industrial catchments and provide a broad guideline about the catchment size and the number of cleans required annually. Gross pollutants include vegetation as well as anthropogenic litter but excludes sediment. The figures give consideration to the volume of pollutants in the unit and to eductor truck holding capacities and cleaning costs for a fully-loaded truck. In some instances, it may be cheaper to clean a unit more frequently than undertaking, say, annual cleans where the volume requires more than one truck load. One of the key advantages of the Ecosol GPT is that it can be designed for cleaning by either vacuum (eductor truck) or removable basket (crane truck) method.

12.1 Indicative Catchment Size and Recommended Cleaning Frequencies for the Low Flow Ecosol™ GPT

Product Code	Catchment Size (Ha)	Recommended number of cleans based on catchment Sizes and typical pollutant loads (annually)[1]		
		Residential	Commercial	Light Industrial
Low Flow Ecosol GPT 4200	Up to 1	1	1	1
Low Flow Ecosol GPT 4300	Up to 2	1	1	1
Low Flow Ecosol GPT 4450	Up to 3	1	1	1
Low Flow Ecosol GPT 4600	Up to 6	1	1	1
Low Flow Ecosol GPT 4750	Up to 11	1	1	1
Low Flow Ecosol GPT 4900	Up to 14	1	1	1
Low Flow Ecosol GPT 41050	Up to 21	1	1	1
Low Flow Ecosol GPT 41200	Up to 27	1 - 2	1 - 2	1 - 2
Low Flow Ecosol GPT 41350	Up to 33	1 - 2	1 - 2	1 - 2
Low Flow Ecosol GPT 41500	Up to 45	1 - 2	1 - 2	1 - 2
Low Flow Ecosol GPT 41800	Up to 54	2	2	2

Table 12

12.2 Indicative Catchment Size and Recommended Cleaning Frequencies for the High Flow Ecosol™ GPT

Product Code	Catchment Size (Ha)	Recommended number of cleans based on catchment Sizes and typical pollutant loads (annually)[1]		
		Residential	Commercial	Light Industrial
High Flow Ecosol GPT 4200	Up to 1.0	2	2	2
High Flow Ecosol GPT 4300	Up to 2.0	2	2	2
High Flow Ecosol GPT 4450	Up to 5.0	2	2	2
High Flow Ecosol GPT 4600	Up to 20.0	2	2	2
High Flow Ecosol GPT 4750	Up to 35.0	2	2	2
High Flow Ecosol GPT 4900	Up to 45.0	2	2	2
High Flow Ecosol GPT 41050	Up to 70.0	2	2	2
High Flow Ecosol GPT 41200	Up to 90.0	2	2 - 3	2 - 3
High Flow Ecosol GPT 41350	Up to 110.0	2 - 3	2 - 3	2 - 3
High Flow Ecosol GPT 41500	Up to 150.0	3	2 - 3	2 - 3
High Flow Ecosol GPT 41800	Up to 180.0	3	3	3

Table 13

13.0 Monitoring

Under normal weather and operating conditions, your Ecosol™ GPT should be checked, minimum every six months depending on quality and quantity of the inflow to the unit. Initially, Ecosol recommends that monitoring is undertaken monthly or immediately after a major rain event. Once the unit has been in operation for an extended period of time (say, 12 months) then the monitoring schedule can be adjusted to reflect the actual operating conditions specific to the catchment.

Under normal operating conditions the unit would normally require cleaning approximately every 6 - 12 months.

14.0 Ecosol Monitoring, Cleaning, and Maintenance Service

An essential element of any good stormwater management program includes regular inspections, cleaning, and maintenance of Installed Stormwater Quality Improvement Devices (SQIDS) to ensure that they continue to capture and retain pollutants to their designed specifications without premature by-pass and without any adverse impact on the drainage capacity of the stormwater conduit that it is installed on.

Cleaning frequencies, methodologies and even they equipment used to maintain these systems will vary depending on the type of device installed the catchment type, size and rainfall patterns.

At Ecosol we offer:

- a competitive cleaning and maintenance service
- a long-standing record in safe work practices, supported by Quality Assured processes.
- in-depth knowledge and experience with all popular types and brands of GPTs;
- a complete understanding of pollution removal and disposal regulations and processes that ensures your unit is cleaned effectively and efficiently without risk of damage; and
- useful, easy-to-read reports, allowing you to track performance and pollution loading

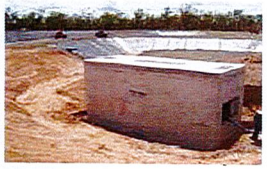
15.0 Applications and Configurations continued

The Ecosol™ GPT is usually installed in-line/End-of-Line on stormwater pipes or box culverts ranging in size from 200mm to 1800mm, although is suitable for larger pipes and box culverts. The product can be easily intergrated into most drainage designs for residential, commercial or industrial applications.

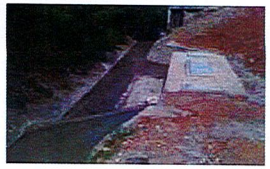
Commercial Precincts

Carparks

Residential Development



The unit is also suitable for installation off-line adjacent to large open channels or drains.



The Ecoso™ GPT is able to be custom designed specific to you application. We can vary the loading class, pit depth and accommodate varying pipe types and sizes.

16.0 Turnkey Services

Ecosol's design and estimating staff provide a dedicated management approach towards your project. In addition all staff are capable of liaising with the client, the consulting engineer, the contractor, and all other interested third parties to achieve a successful outcome.

17.0 Accreditation

Ecosol is accredited to AS/NZS ISO 14001:2004 (Environment) and AS/NZS 9001:008 (Quality). Our commitment to continuously improving our products and services is demonstrated by our ongoing accreditation for Quality and Environmental Management. Ecosol is also committed to a safe environment for its employees. We are fully third-party accredited to AS/NZS 4801:2001.

ECAAS ISO 9001 CERTIFIED QUALITY MANAGEMENT

ECAAS AS/NZS4801 CERTIFIED SAFETY MANAGEMENT

ECAAS ISO 14001 CERTIFIED ENVIRONMENTAL MANAGEMENT

18.0 Suppiler and Technical Product Contact Details

For any maintenance or technical product enquiries please contact:
Ecosol Pty Ltd
Tel: 1300 706 624
Fax: 1300 706 634
Email: info@ecosol.com.au

Ecosol™ WASTEWATER FILTRATION SYSTEMS

Appendix 1

Ecosol™ GPT Essential Information Form

To ensure your system is appropriately designed for its intended application and meets local water quality objectives it is essential that the following minimum information is provided:

Customer Details	
Contact Person:	
Company Name:	
Phone:	
Fax:	
Email:	

Project and Site Information	
Project Name:	
Project Address:	
Type of Development/Catchment Type:	
Pollutant Removal Targets (%): Site Water Quality Objectives (WQO's)	Gross Pollutants (>2000µm)
	Total Suspended Solids (20 – 2000µm)
	Total Phosphorus
	Total Nitrogen
	Heavy Metals
	Total Petroleum/ Hydrocarbon
	Other
Local Authority:	
Device Location:	
Designed Discharge (Peak ARI Flow Rate) L/s:	
Treatable Flow Rate (L/s):	
Tidal or submerged (Inundated) system:	
Inlet Pipe Diameter/Size	
Depth to inlet pipe invert level	
Preferred access cover type and loading (Grated or solid top) (Class A, B or D)	
Other essential design or site relevant information:	

Please forward the above information for your next project to your local Ecosol representative. On receipt Ecosol will model and design the most appropriately sized system to suit your application to assist you achieve the project Water Sensitive Urban design objectives. - Email: info@ecosol.com.au - Fax: 1300 706 634

Ecosol™ WASTEWATER FILTRATION SYSTEMS

Appendix 2

References

Please note that the Ecosol™ GPT was originally known as the Ecosol RSF 4000.

Mr J Pisanielo & Assoc. Prof. J Argue (1998) Testing of the Ecosol RSF 4000 (commonly known as the Ecosol™ GPT) for Hydraulic Headloss – Urban Water Resources Centre University of South Australia.

Mr I Charlton (1998) RSF 4000 (commonly known as the Ecosol TM GPT) Field Testing Report Playford City Council – Ecosol Pty Ltd

Mr A Wundke & Dr. M. Lambert (1999) Hydraulic Headloss and Capture Efficiency Testing of the Ecosol RSF 4000 and RSF 6000 Filtration Unit – EngTest - The Department of Civil & Environmental Engineering – The University of Adelaide

Dr. A Wallace (2000) Technical Report – Ecosol RSF 4000 Fluid Mechanics – Avocet Consulting Pty Ltd

Dr. A Wallace (2000) Technical Report – Review of Bypass Capacity of RSF 4000 - Avocet Consulting Pty Ltd

Dr. A Wallace (2000) Technical Report – Ecosol RSF 4000 Fluid Mechanics, Measurements of Headloss at peak flow in units with and without secondary lids - Avocet Consulting Pty Ltd

Mr J Wiltshire (2000) Eurobodalla Shire Council Stormwater Quality Management and Monitoring Report 1998 – 2000, Ecosol Gross Pollutant Traps and Litter Baskets Batemans Bay Industrial Area – Ecosol Pty Ltd

Dr. A Wallace (2001) Technical Report – Head Loss and Treatable Flow Rate measurements - Avocet Consulting Pty Ltd

Appendix 2 continued

References

Dr. A Wallace (2001) Technical Report – RSF 4000 Performance Testing (Capture Efficiency Versus fill of silo) - Avocet Consulting Pty Ltd

Dr. A Wallace (2001) Technical Report – RSF 4000 Performance Testing (Capture Efficiency Versus fill of silo with impermeable material) - Avocet Consulting Pty Ltd

Dr. A Wallace (2001) Technical Report – RSF 4000 Hydraulic Modelling (Modelling TFR with a range of pipe diameters) - Avocet Consulting Pty Ltd

Dr M Lambert (2001) RSF 4000 Stormwater Filter Performance Testing – EngTest, The Department of Civil and Environmental Engineering – The Adelaide University.

Dr. A Wallace (2002) Technical Report – Oil collection efficiency measurements on Ecosol 4100 Gross Pollutant Trap - Avocet Consulting Pty Ltd

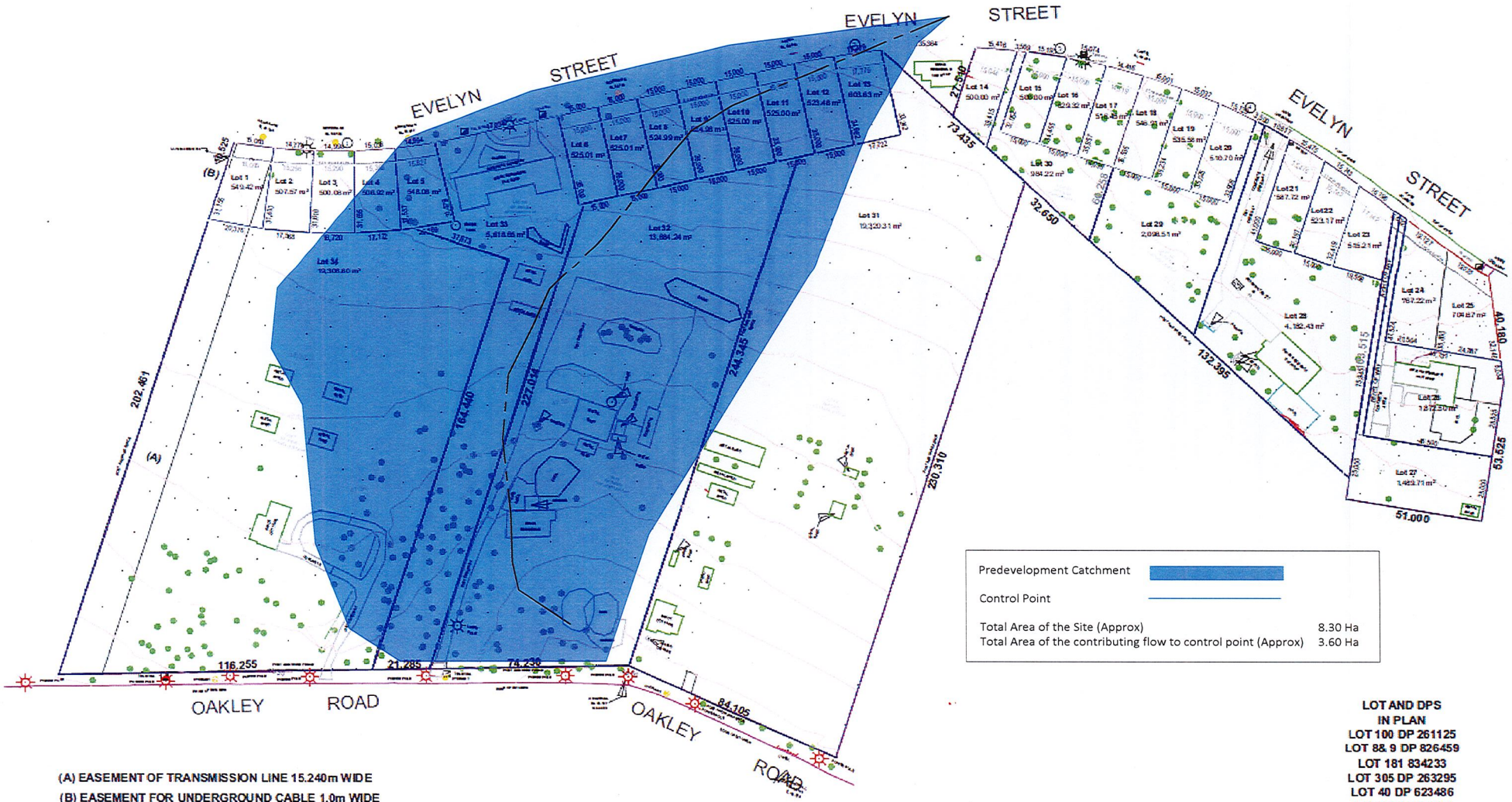
Dr. A Wallace (2002) Technical Report – Sediment Collection Efficiency measurements on the Ecosol 4000 Gross Pollutant Trap - Avocet Consulting Pty Ltd

Dr. A Wallace (2002) Technical Report – Study on the performance of an Ecosol RSF 4000 Gross Pollutant Trap subjected to heavy loadings of grass clippings in the input stream - Avocet Consulting Pty Ltd

Manly Hydraulics Laboratory (2004) (NSW Department of Commerce) – SQIRTS Assessment at Solander Park Erskineville

Prof. M Lambert, Dr. A Zecchin (2013) Experimental determination of collection efficiency of Ecosol In-Line GPT Solid Pollutant Filter – EngTest , The Department of Civil and Environmental Engineering – The Adelaide University.

Prof. M Lambert, Dr. A Zecchin (2013) Performance Review of the Ecosol GPT Stormwater Pollutant Filter – EngTest , The Department of Civil and Environmental Engineering – The Adelaide University.



(A) EASEMENT OF TRANSMISSION LINE 15.240m WIDE

(B) EASEMENT FOR UNDERGROUND CABLE 1.0m WIDE

LOT AND DPS IN PLAN
LOT 100 DP 261125
LOT 8& 9 DP 826459
LOT 181 834233
LOT 305 DP 263295
LOT 40 DP 623486
LOT 1 DP 533662

Rev	Description	By	Date
1	ISSUED FOR DEVELOPMENT APPLICATION	SW	05/06/2017

Legend & Notes

statiker
PO Box 232 Cordell Park NSW Australia 2200
Ph. 02 8319 3449 Fax. 02 8596 6221
info@statiker.com.au www.statiker.com.au

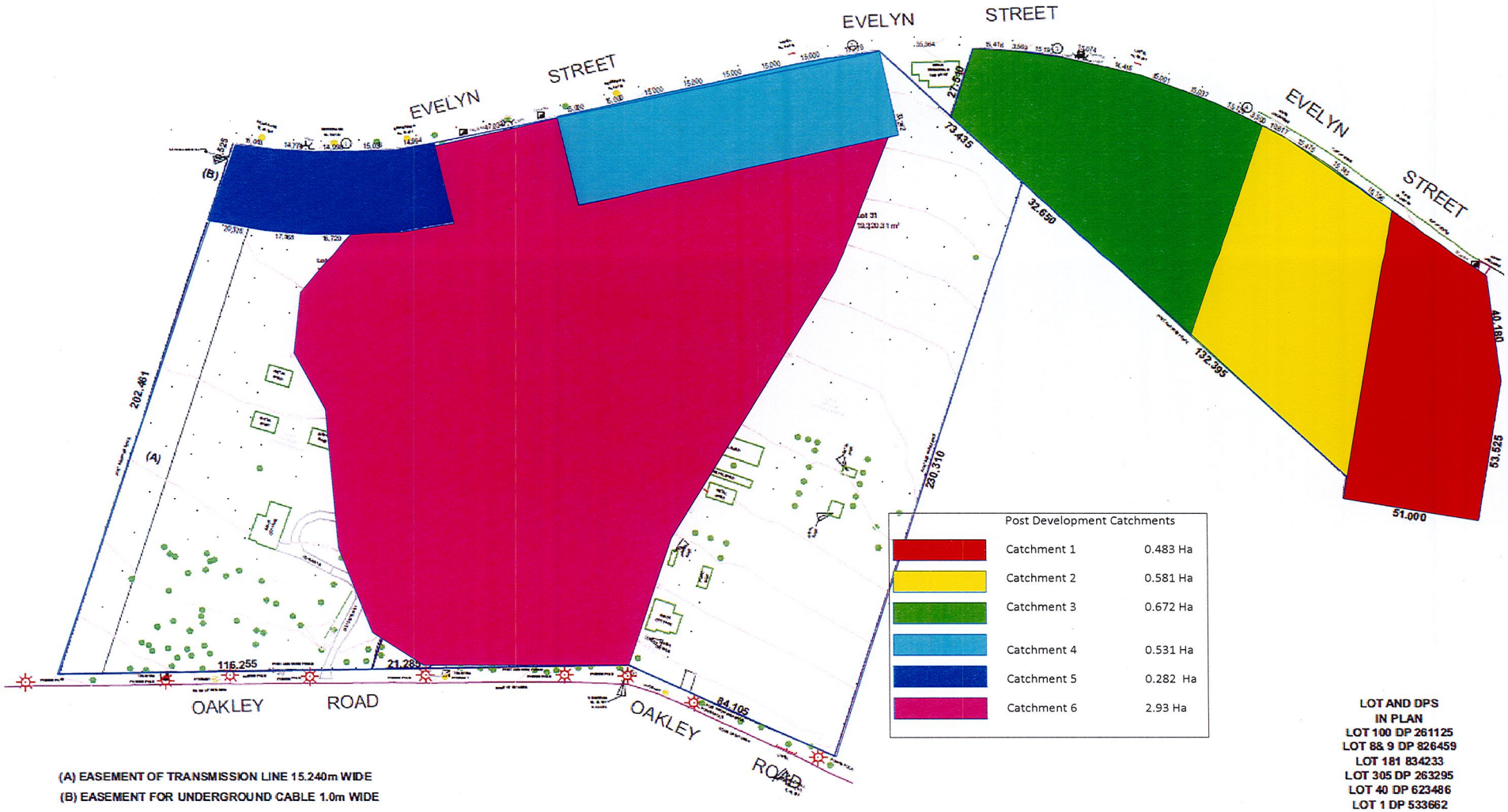
Client
N & A Gray, C Karouz, O Muse, M Hansen, and S Cheema

Project
Proposed Subdivision at 2755 / 2016 / E - LEP

OSD DETAIL

Designer	C.Stevetha, PhD (hydrologic), MEAust 3422206	Scale	05 shown(A2)
Drawn	C.S	Date	05/06/17
Checked	S.W	Rev	A
Drawing Number	SW-01	Job	17066

© COPYRIGHT OF STATIKER. INFORMATION CONTAINED IN THIS PLAN IS THE COPYRIGHT OF STATIKER. ANY FORM OF USE OR REPRODUCTION OF THIS DRAWING IN FULL OR IN PART WITHOUT THE WRITTEN PERMISSION OF STATIKER, CONSTITUTES AN INFRINGEMENT OF COPYRIGHT.



(A) EASEMENT OF TRANSMISSION LINE 15.240m WIDE

(B) EASEMENT FOR UNDERGROUND CABLE 1.0m WIDE

LOT AND DPS IN PLAN
LOT 100 DP 261125
LOT 8& 9 DP 826459
LOT 181 834233
LOT 305 DP 263295
LOT 40 DP 623486
LOT 1 DP 533662

STORMWATER DRAINAGE CONCEPT PLAN (ROOF AND OSD)

scale 1:200

Rev	Description	By	Date
A	ISSUED FOR DEVELOPMENT APPLICATION	SW	05/06/2017

Legend & Notes

statiker
PO Box 232 Condell Park NSW Australia 2200
Ph. 02 8319 7449 Fax 02 8750 6121
info@statiker.com.au www.statiker.com.au

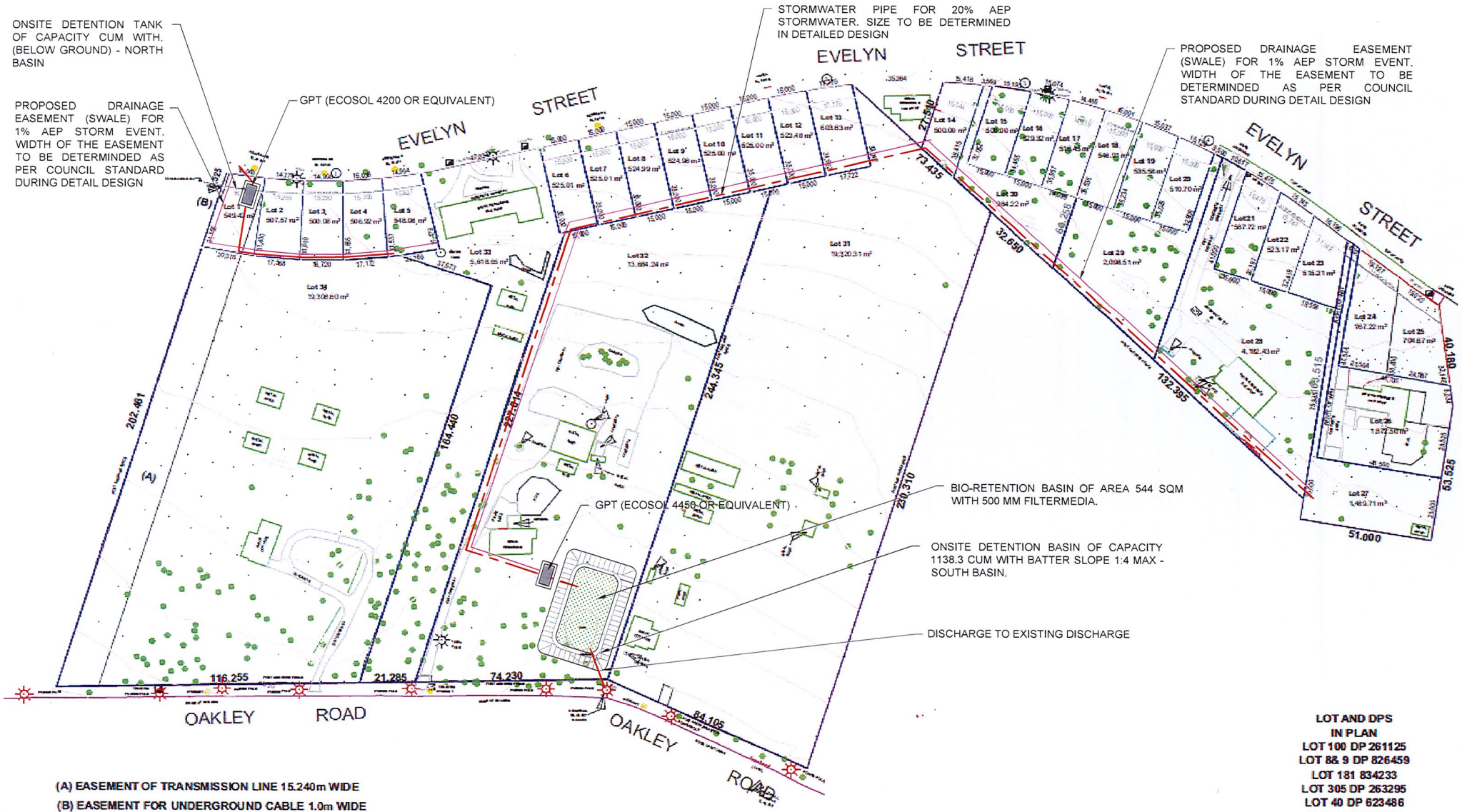
Client: N & A Gray, C Kairouz, O Muso, M Hansen, and S Cheema

Project: Proposed Subdivision at 2755 / 2016 / E - LEP

OSD DETAIL

Designed: C.Shrestha, PhD (hydraulics), MIEAust 3422286 | Scale: as shown(A2)
Drawn: C. | Date: 05/06/17
Checked: S.W | Rev: A
Drawing Number: SW-02 | Job: 17066

© COPYRIGHT OF STATIKER. INFORMATION CONTAINED IN THIS PLAN IS THE COPYRIGHT OF STATIKER. ANY FORM OF USE OR REPRODUCTION OF THIS DRAWING IN FULL OR IN PART WITHOUT THE WRITTEN PERMISSION OF STATIKER, CONSTITUTES AN INFRINGEMENT OF COPYRIGHT.



(A) EASEMENT OF TRANSMISSION LINE 15.240m WIDE

(B) EASEMENT FOR UNDERGROUND CABLE 1.0m WIDE

LOT AND DPS IN PLAN
LOT 100 DP 261125
LOT 8& 9 DP 826459
LOT 181 834233
LOT 305 DP 263295
LOT 40 DP 623486
LOT 1 DP 533662

STORMWATER EASEMENT CONCEPT PLAN (not to scale)

Rev	Description	By	Date
A	ISSUED FOR DA	SW	28/03/2017

Legend & Notes

statiker
PO Box 252 Cordell Park NSW Australia 2200
Ph 02 8319 9449 Fax 02 8796 6424
info@statiker.com.au www.statiker.com.au

Client
N & A Gray, C Karouz, O Muso, M Hansen and S Cheema

Project
Proposed Subdivision at 2755 / 2016 / E - LEP

OSD DETAIL

Designed	C.Sivathiru, PhD. (hydraulics), MIEAust 3422266	Scale as shown(A2)	
Drawn	C.S	Date	05/06/17
Checked	S.W	Rev	A
Drawing Number	SW-03	Job	17066

© COPYRIGHT OF STATIKER, INFORMATION CONTAINED IN THIS PLAN IS THE COPYRIGHT OF STATIKER. ANY FORM OF USE OR REPRODUCTION OF THIS DRAWING IN FULL OR IN PART WITHOUT THE WRITTEN PERMISSION OF STATIKER, CONSTITUTES AN INFRINGEMENT OF COPYRIGHT.