# REEVES CREEK STUDY AREA

# PLANNING REPORT


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**Prepared for Wollondilly Shire Council**

**August 2018**

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# *Glossary of Abbreviations and Terms*

| | |
|---|---|
| AADT | Annual average daily traffic |
| AHD | Australian Height Datum: a standard reference level used to express the relative elevation of features to a common reference point |
| ANZECC | Australian and New Zealand Environment and Conservation Council |
| ARI / AEP | Annual Recurrence Interval / Annual Exceedance Probability |
| Biodiversity | Encompassing biological variety at genetic, species and ecosystem scales |
| Bioretention | Biological removal of contaminants or nutrients as fluid passes through a media or biological |
| CLM Act | Contaminated Land Management Act, 1997 |
| Catchment | The area which will contribute to the discharge of a stream after rainfall at the point under consideration |
| CP | Contributions Plan |
| CMP | Concept Master Plan |
| Council | Wollondilly Shire Council |
| CPW | Cumberland Plain Woodland |
| DCP | Development Control Plan |
| DCP 2012 | Wollondilly Shire Council's prevailing consolidated DCP |
| DoPE | Department of Planning and Environment |
| DECC | Department of Environment and Climate Change |
| DPI | Department of Primary Industries |
| DDCP | Draft Development Control Plan |
| Draft LEP | Draft Local Environmental Plan |
| Endangered species | Those plants and animal species likely to become extinct unless action is taken to remove or control the factors that threaten their survival |
| End of line | At the end of the stormwater management 'train' |
| EP&A Act | Environmental Planning and Assessment Act 1979 |
| EP&A Regulations | Environmental Planning and Assessment Regulations 2000 |
| EPA | Environment Protection Authority |
| EPBC Act | Environment Protection and Biodiversity Conservation Act 1999 |
| ESD | Ecologically sustainable development |
| Exceedance | Occasion on which results are greater than a limit, goal or standard |
| Reeves Creek Study Area | An area focussed on the Study Area |
| GPT | Gross pollutant trap |

| | |
|---|---|
| Ground water | All subsurface water, especially the part that is in the zone of saturation |
| Infrastructure | The system of essential services, utilities and public and community facilities necessary to enable human communities to function |
| ILP | Indicative Layout Plan |
| LoS | Level of Service |
| LEP | Local Environmental Plan |
| LGA | Local Government Area |
| M | Metre |
| MSB | Mine Subsidence Board. The Board responsible for development control/compensation associated with the South Mine Subsidence District |
| MUSIC | Model for Urban Stormwater Improvement Conceptualisation |
| NEPC | Australian National Environment Protection Council |
| NEPM | National Environment Protection Measure |
| NPWS | National Parks and Wildlife Service |
| NSW | New South Wales |
| Off-line | Placed beside the stormwater management system |
| On-line | Placed in the stormwater management system |
| Overland flow | Down slope, surface movement of run-off other than in defined channels |
| PAD | Potential Archaeological Deposit |
| Particulate | Small particles usually suspended in air |
| PCB | A class of organic compounds comprising Polychlorinated generally used as a coolant |
| pH | A measure of the degree of acidity or alkalinity; expressed on a logarithmic scale of 1 to 14 – 1 is most acid, 7 neutral and 14 most alkaline |
| PBP | Planning for Bushfire Protection Guidelines, 2006 (produced by Rural Fire Services |
| PCA | Potentially contaminated area |
| PMF | Probable maximum flood |
| POEO Act | Protection of the Environment Operations Act 1997 |
| Potable | Suitable for human consumption |
| Project Plan | The Project “Brief” |
| Project Team | The group pf specialist consultants assembled to respond to specific aspects of the Project Plan |
| RAP | Remediation Action Plan |

| | |
|---|---|
| Remediate/Remediation | To clean up a contaminated area to the level required for the intended use, often according to regulations |
| RFS | Rural Fire Service |
| Reticulated | Supply and disposal of water transported by pipes |
| Riparian | Situated on or relating to a stream bank |
| Riparian zone | Any land which adjoins, directly influences, or is influenced by a body of water |
| RMS | Roads and Maritime Services |
| Run-off | The portion of precipitation (rain, hail, snow) which flows across the land surface and does not soak into the ground; can be a major agent of water erosion |
| Salinity | Elevated salt levels occurring as a result of natural soil-forming processes or in disturbed landscapes through clearing or other activities that interfere with the water and salinity balance and lead to shallow water tables |
| SIDRA | A computerised intersection performance tool |
| SEPP | State Environmental Planning Policy |
| SES | State Emergency Service |
| Sewage | Waste matter discharged to a sewerage system |
| Sewerage | Works for collecting, treating and disposing sewage |
| Socioeconomic | Relating to or involving a combination of social and economic factors |
| Statutory authority | A government authority set up as a requirement of legislation |
| Stormwater | The run-off from rainfall events |
| STP | Sewerage Treatment Plant |
| Study Area | The area which is the focus of the planning investigations |
| SWC | Sydney Water Corporation |
| Threatened species | Animals or plants that are in danger of extinction or may now be considered extinct |
| Total Catchment Management (TCM) | The coordinated and sustainable use and management of land, water vegetation and other natural resources on a catchment basis to balance resource utilisation and conservation |
| TSC Act | NSW Threatened Species Conservation Act 1995 |
| TSC (Amendment) | NSW Threatened Species Legislation Amendment Act, 2004 |
| VKT | Vehicle kilometres travelled |
| VMP | Vegetation management plan |
| VPA | Voluntary Planning Agreement |
| WSUD | Water sensitive urban design |

# Executive Summary

Overview

The Picton East (referred as Reeves Creek) Study Area comprises a strategic Study Area of approximately 39ha of variable land located proximate to the Picton Town Centre burgeoning urban development and within a broader sensitive natural systems and cultural landscape. It is a Study Area which, for some period of time, has been identified to exhibit significant potential for development as a residential extension of Picton Township as identified in Council's Growth Management Strategy (GMS 2011). It is this potential which led to the commencement of a formal investigation and rezoning process in July 2012 and concludes with a recommendation that the land is suitable for rezoning for residential purposes. The majority of the Study Area has been used for agricultural purposes for some period of time, being a former diary.

The Site/Its Context and Ownership

The site comprises a series of allotments in two principal ownerships. The property details are Lot 106 DP 1111043, Lot 2 DP 229679 and Lot 9 DP 2333840, Menangle Street, Picton. These various properties provide an aggregate site of 39ha suitable for more comprehensive residential purposes. Part of the land will be required for a riparian corridor as part of the drainage catchment, which has been the subject of discussions with NSW Department of Primary Industries - Water (DPI).

Importantly, it displays interfaces with adjoining lands in Margaret and Menangle Streets. Further, it has an important contextual relationship (including visual) with the hills (Vault Hill), which is located west of the land.

The Rezoning Process/Planning Proposal

Commencement

On 17 December 2012 Wollondilly Shire Council resolved to provide 'in principle' support to the intentions of the Planning Proposal (PP).

The Department of Planning and Environment (DoPE) were advised of the decisions in accordance with the prevailing Statutory requirements and a Gateway Determination was issued on 28 March 2013, with the effective commencement date of 4 April 2013. The Gateway Determination required that the rezoning of the land was to be finalised within 24 months, i.e. 4 April 2015. Since that time, DoPE has issued extensions of time in which to complete the process and have the land rezoned. On 16th October 2018, DoPE issued an alteration of Gateway Determination, which required the amending LEP to be finalised by 30th November 2018 and that such an amending draft LEP has to be with the DoPE six (6) weeks prior to this date.

The Process/Management Structure

A comprehensive Project Brief (specification) detailing investigations and planning outputs was compiled and adopted in its final form on July 2013. The Study process sought to respond to the Project Plan. It employed a methodology which embraced the following elements:

- Field Investigation (site visitation and research/observations);
- Consultation (interchange with authorities, specialists and owners);
- Interaction (consultant team and Council and Authority staff);

- Synthesis of Findings (constraints/opportunities review and development of a Concept Master Plan and Management Principles);
- Establishment of a Framework for Advancement (development principles and recommendations);
- Review (critique by Council and Authorities staff);
- Finalisation.

In addition a team of specialist consultants was assembled to inform the Study process, through the provision of expert advice. The Team assembled focussed upon the following specific areas with a view to providing conclusions which could be synthesised in the Planning Report and inform a suite of relevant planning documents.

Biodiversity and Riparian Land Assessment

Flood Impact Assessment

Traffic Impact Assessment

Built Heritage Assessment

Aboriginal Cultural Heritage Assessment

Services Assessment

Concept Masterplan

Slope Stability Assessment

Bushfire Assessment

Social Planning

Preliminary Site Investigation (Contamination)

Stormwater Management Report

Current Planning Position

Statutory

The prevailing statutory planning framework involves the controls/regulations at State, Regional and Local level, with the latter reflecting the influence of Wollondilly Shire Council.

A raft of State strategies and policies impact on the rezoning proposal. At a strategic level these are less specific in terms of the Planning Proposal and are not prejudiced by the proposal; whilst at a policy level they are guiding principles and control mechanisms that must be complied with. The underlying principles of the relevant policies have been complied with where relevant at this stage of the planning process, whereas the others will be addressed in more detailed planning and the preparation of Development Applications.

Deemed State Environmental Planning Policy REP 20 – Hawkesbury/Nepean River (No 2 – 1997) is the major regional plan of relevance together with the Growth Management Strategy 2011 (GMS). In respect of the Deemed SEPP concern with water quality management in the catchment and impacts upon the visual qualities of the riverine environment have been addressed and underpin the development/management principles espoused in the various technical studies. In recent times, the following documents have been released; namely Wollondilly Community Strategic Plan – 2033 and the Metropolis of Three Cities – The Greater Sydney Region Plan, the Western City District Plan and planning documents attached to the Greater Macarthur Growth Area.

The principal planning controls are embodied in Wollondilly Shire Local Environmental Plan No. 2011 (as amended). WLEP 2011 is the principal local planning instrument controlling development of the areas of the Wollondilly Shire LGA. That component of the Study Area, which is subject to the provisions of WLEP 2011 is zoned R1U with a 40 hectare requirement in respect of subdivision.

The principal detailed development control document is Wollondilly Shire Development Control Plan (2014). The document includes generic good practice development controls, landuse specific controls and the capacity for Study Area specific controls. Importantly, they provide a template for integrated future Study Area specific planning controls. A number of the technical studies have been revisited given the passage of time and reports, where necessary have been updated to reflect the current concept development plans and zone plans.

Strategic

The current strategic planning framework also involves State, Regional and locally derived strategies and plans.

The Growth Management Strategy 2011 (GMS) identifies the Reeves Creek Study Area for investigation for future residential opportunities, with the latter establishing LGA residential opportunities targets to which development of the Reeves Creek Study Area may make a significant contribution.

Existing Environment

The existing environment was comprehensively documented in the series of technical underpinning studies accompanying this report.

Landuse

The Study Area was extensively cleared with European Settlement for the grazing of livestock and other agricultural activities (diary). Only a relatively small area comprised the more productive creek systems.

The bulk of the lands is of variable topography and characterised by the more marginal and, in some instances, unstable soils on the higher parts of the land.

Land Capability/Slope Stability

The Study Area is of variable terrain. It comprises the creek systems (Reeves Creek), an elevated and highly variable hills that are a dominate feature of the Picton Township.

There is some evidence of surface erosion in the slope areas and subject to moderate erosive forces. Douglas Partners has prepared a report on the land capability of the site, which confirms that the site is suitable for residential purposes.

Biodiversity and Riparian

The Study Area is generally highly disturbed, with much of the area having been previously cleared and developed for agricultural landuses. The Reeves Creek tributary is the drainage line through the Study Area connecting with Stonequarry Creek to the south. An issue arose during the review process that drainage may not be a permissible development within the E2 Environmental Conservation zone. As a result, it is proposed that drainage be added to the permissible use column. In this regard to overcome any ambiguity, it is considered that Council amend the Standard LEP Template by adding drainage to this column.

There are no existing wildlife corridors within the Study Area, although there are some poor quality links traversing the steeper slopes. The existing ecological framework provides opportunities for modification and enhancement of the corridors.

Bushfire Assessment

The subject land is identified by Wollondilly Shire Council to be "bushfire prone" in accordance with the Bushfire Hazard map. The existing vegetation is generally located on the areas of more variable terrain, generally aligning with the riparian vegetation and ridges.

Traffic Assessment

The Study Area has an important strategic main road context. The major elements in the immediate main road network include the South Western Freeway (F5), Argyle Street and Menangle Street. It is accessed by a local road network being Margaret Street.

Passenger rail network is accessible from Picton Station. The Study Area is currently serviced by a limited bus service, mainly servicing along Menangle Street. A bus service will ultimately operate through the Study Area.

Flood Impact Assessment

The majority of the Study Area drains to Reeves Creek. Flood modelling for the Reeves Creek Study Area indicates that the entire Study Area development footprint is outside the existing 100 year ARI (and PMF).

Stormwater Management Assessment

This report considers the stormwater behaviour for the proposed change of land use, in order to develop a strategy for stormwater quantity and quality management that follows Water Sensitive Urban Design (WSUD) principles. The findings will guide the future development of the precinct and the subsequent detailed works required to give effect the strategy.

Built Heritage Assessment and Aboriginal Cultural Heritage

The Study Area and, moreover the locality, display a range of Indigenous and European heritage qualities of varying levels of significance. A summary of investigations concludes that there are areas of variable sensitivity.

The Reeves Creek Study Area has no heritage listed items or areas. However, the Study Area comprises part of a broader cultural and natural landscape of significance and is proximate to places of local heritage significance.

The Study Area also bears a sensitive relationship to the significant natural and cultural landscape of the hilltop (Vault Hill).

Landscape and Visual

The Reeves Creek Study Area is visible in the local and subregional landscape, the cultural and natural importance of the surrounding landscape having been highlighted above. It is noted that the highly variable nature of the Study Area and relationship with neighbouring landscapes has implications for the nature and extent of future development in terms of landscape amenity.

Services Assessment

The Study Area is supplied with town water, via a local reticulation system. Currently the Study Area has no sewerage systems, with development serviced by private on-site systems.

Social Planning

An understanding of the social implications associated with the development of the land for residential purposes has been undertaken.

Conclusion

This Report establishes the suitability of the Study Area for principally residential purposes as depicted conceptually in the accompanying Concept Master Plan.

The Studies underpinning this Report although sufficiently rigorous for arriving at the abovementioned rezoning recommendation highlight the need for further investigations to inform more detailed planning for the preparation of development applications. The Studies also provide an insight into development and management principles to be further developed in the preparation of such documents.

This Report also provides an overview of the infrastructure implications of the proposed development at a local and district level. In doing so it establishes an agenda for on-going dialogue in respect of future Developer Contributions, Works In Kind and/or Voluntary Planning Agreements (VPAs).

# 1 Introduction

## 1.1 Background

The continually evolving nature of activities in the Study Area, the identified inherent potential, the evolution and planning for the locality, together with service infrastructure provision, occasioned a need to review the prevailing planning controls.

It has become clear of recent times that current landuse (agriculture) may not represent the highest and best use of the land. At the same time, the GMS 2011 identified the Reeves Creek locality as an area for future investigation for residential purposes.

## 1.2 Purpose of Report

This Report is concerned with the environmental investigations commissioned by Council into the suitability of the Study Area, principally for residential purposes.

Specifically, the Study Brief, underpinning the investigations and reproduced as **Annexures "A"** to **"M"**, seeks to provide "an appropriate level of environmental investigation to facilitate:

- An understanding of the capability/suitability of the land to support future residential development;
- Preparation of a development scheme plan/Indicative Layout Plan and zoning plans;
- An understanding and planning for appropriate local level infrastructure required to support development of the Study Area for residential activities.

The Report as such seeks to summarise and synthesise a series of technical studies aimed at establishing land capability and to produce a Concept Master Plan (CMP) which has regard to this environmental understanding.

The Report seeks to also outline development/management principles associated with implementation of the CMP. Finally, it summarises a statutory path to advance the rezoning of the subject land, and outlines a relevant development control framework.

## 1.3 Local Economic Development Aspirations

The burgeoning residential growth of the Wollondilly Shire Local Government Area (LGA) has generated concerted moves to ensure that there is a degree of "self-containment" of such growth through enhanced residential opportunities.

## 1.4 Study Methodology

The formulation of the Project Plan (Brief) outlines outputs and conclusions/recommendations as embraced in this Planning Report.

The Study process sought to respond to the Project Plan/Study Brief contained at **Annexure "A"**. It employed a methodology which embraced the following elements:

- Field Investigation (site visitation and research/observations);

- Consultation (interchange with authorities, specialists and owners);
- Interaction (consultant team and Council and Authority staff);
- Synthesis of Findings (constraints/opportunities review and development of a Concept Master Plan and Management Principles);
- Establishment of a Framework for Advancement (development principles and recommendations);
- Review (critique by Council and Authorities staff);
- Finalisation.

### *1.5 Project Team*

A team of specialist consultants was assembled to inform the Study process, through the provision of expert advice (Refer to **Table 1** below).

The team assembled comprised:

| Role | Consultant |
|---|---|
| Lead Planning Consultant | Michael Brown Planning Strategies Pty Ltd |
| Slope Stability Assessment | Douglas Partners Pty Ltd |
| Biodiversity and Riparian Land | Eco Logical Australia Pty Ltd |
| Social Planning | Elton Consulting |
| Stormwater Management Assessment | Cardno Australia Pty Ltd & JMD Development Consultants |
| Flood Management | Cardno Australia Pty Ltd & JMD Development Consultants |
| Traffic Impact | Cardno Australia Pty Ltd |
| Built Heritage | AHMS Pty Ltd |
| Aboriginal Cultural Heritage | AHMS Pty Ltd |
| Landscape and Visual | Taylor Brammer Pty Ltd |
| Services Assessment | Cardno Australia Pty Ltd |
| Preliminary Site Investigation | Douglas Partners Pty Ltd |
| Masterplanning/Urban Design | Saturday Studio and Urban Futures |
| Bushfire Assessment | Eco Logical Australia Pty Ltd |

**Table 1: The Project Team**

### *1.6 Structure of the Report*

An Executive Summary provides an overview of the Planning Report.

The introductory section (Section 1) provides a background to the Report and the Study methodology underpinning it. Further, it documents the nature of investigations, the Project Team and structure of the Report.

Section 2 describes the Study Area and its context. The Strategic Planning framework, both local and regional, is described for Council in Section 3; whilst Section 4 describes the prevailing Statutory Planning framework and its implications.
A Development Scenario is advanced, its potential impacts identified and management issues established in Section 5.

Statutory Compliance is detailed in Section 6. Zoning is provided in Section 7; whilst Conclusions/Recommendations are advanced in Section 8.

## *2 The Study Area and its Context*

### *2.1 Study Area (The Site)/Ownership Pattern*

The Study Area represents some 39 hectares, which is the subject of detailed investigation. **Figure 1** below depicts the Study Area and the context of the area.


**Figure 1: Study Area.**

# 3 Strategic Planning Environment

## 3.1 Introduction

A broad ranging planning context provides the framework for assessing the rezoning proposal and analysing the proposed development scheme (as embodied in the CMP). One component of this framework, by its very nature, has a strategic "flavour". This strategic planning framework is comprised of state, regional and local plans, policies and strategies and such has been identified in the Planning Proposal submitted by this firm and in a number of technical studies. As such it is not proposed to reiterate the strategic documents within this report.

# 4 Statutory Planning Framework

## 4.1 Introduction

The Planning Proposal summarised the local and regional statutory planning frameworks for the Wollondilly Shire Local Government Area for the Reeves Creek rezoning proposal and therefore it is not proposed to reiterate this information given that this report provides an overview of the technical studies undertaken to support rezoning of the subject site.

# 5 The Development Scenario, Its Potential Impacts and Management Implications

## 5.1 The Development Scenario

### 5.1.1 Introduction

The initial focus of the Technical Studies was to document the nature of the existing environment and to establish a constraints and opportunities platform for the development of the CMP. The CMP is reproduced over as **Figure 2** and is referenced in the various Technical Studies.

### 5.1.2 Planning & Design Principles

A series of Design Principles were developed having regard to the underpinning constraints and opportunities and informed the Concept Master Plan. Such principles are produced below.

**An accessible and connected place**

Reeves Creek Village is designed with a connected street and landscape structure 'with' or 'including':

- An accessible street and access network that connects with Picton's existing urban areas
- A well connected and easily understood street structure that respects and responds to the landscape setting and existing landform
- Street and block structure characterised by parallel north-south access streets with connecting east-west streets aligned with creek-line corridors
- Streets largely aligned with the typical east-west sloping landform and optimise WSUD opportunities
- Being well located and within practical walking distance of Picton town centre, while maintaining its 'hidden' character
- Streets designed to be slower and safer for residents and visitors alike

**A Connected and sustainable landscape**

Reeves Creek Village is designed as a connected and sustainable landscape:

- That physically and visually respects and integrates with the existing edge of Picton and provides a visually attractive transition between urban and rural areas and the ridgeline surrounding Picton
- Creates opportunities for: recreation with walking / cycling connections into Picton, hill top parks, ridgeline walking trails and cycle trail routes
- Offers the future opportunity for the creation of ridgeline parklands with improved public access
- Utilisation of natural WSUD principals that are integrated with the riparian corridor vegetation precinct
- That is influenced by the dominance of the natural riparian habitat of the creek lines and associated nature plant communities

**A village of distinctive character and place**

Reeves Creek Village is designed as a village to form an integrated part of Picton:

- With a sense of place that reflects and reinforces the existing and planned growth patterns, builds upon and reinforces the character of Picton and responds sensitively the strong landscape context
- That defines and frames the urban and landscape character of the town of Picton
- Optimises the use of existing physical and community infrastructure
- Increases local housing supply and affordability in existing settlements with a diversity of housing and range of densities responsive to the range of urban and landscape settings - parkside terraces, creekline housing, medium density / village typologies, and lower density ridgeline housing
- With a central core of riparian vegetation that provide opportunities for appreciation and enjoyment of the natural environment
- Limits the extent of development, supports the sustainable growth of the local community and preserves the important landscape backdrop of the ridgeline to the setting of Picton

### *5.1.3 Design Strategy*

Reeves Creek Village benefits from being close to and connected with Picton and yet discretely located within its own unique valley landscape.

These unique characteristics present opportunities for a landscape sensitive design response that respects the landscape and environmental character of the site whilst integrating and connecting the new village with its landscape.

The Reeves Creek Village design strategy:

- Creates a new walkable village with a natural vegetated creek line at the heart of the new community;
- Directly connects Reeves Creek Village with the town of Picton with new streets, pedestrian paths and cycleways;
- Contains the village environment within the visual catchment of the valley landscape and limits visual impact to within the lower slopes;
- Establishes the heart of the village centre at the confluence of two creeks, proposed bridges and connecting key streets and pathways;
- Creates a strong and accessible landscaped public open space corridor that enhances existing open space areas and positively links Reeves Creek and Margaret Street with Vault Hill;
- Enhances green connections with the environmental regeneration of riparian corridors and linking these creeks with the Vault Hill Ridge
- Defines key view corridors across the valley that aligns key streets with creeks and the village centre;

- Enhances safety and environmental management by integrating edge roads to riparian area and open space; and
- Optimises Water Sensitive Urban Design opportunities with integrated bio-retention basins and roadside swales as part of the natural environment.

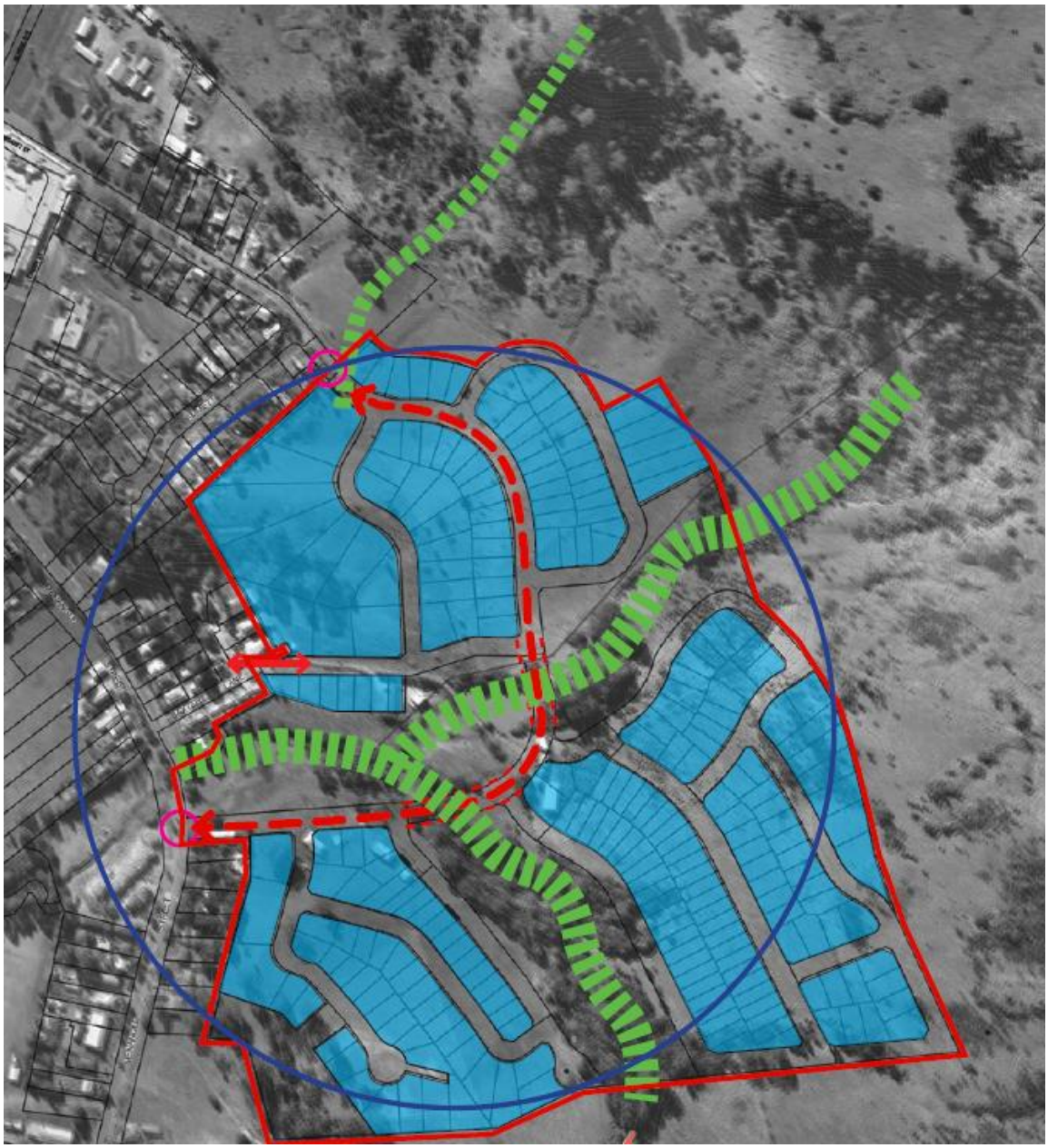

**Figure 2: Design Strategy**

### *5.2 Slope Stability Assessment & Review*

Douglas Partners has undertaken a land capability assessment of the Study Area (refer to **Annexure K**). The study covered a significant amount of existing geotechnical field investigation / assessment data undertaken previously by Douglas Partners of the area.

### *5.2.1 Mines Subsidence*

The Study Area is located in the northern portion of the Wilton Mine Subsidence District. In this regard Subsidence Advisory NSW has provided a letter stating that no objections to the rezoning proposal (refer to **Annexure N**).

Items that will require MSB approval include: (a) subdivision of land; (b) multi-storey developments; (c) extensions to homes: and (d) building applications for new homes and structures.

### *5.2.2 Geotechnical Constraints*

The proposed development area and layout, as included in **Figure 2**, is subject to significant geotechnical constraints as described in the following sections. The distribution of constraints, suggested precautionary and remedial works and areas considered suitable (from slope stability considerations) for development are summarised in the report.

#### 5.2.2.1 **Slump-flow landslides**

Slump-flow landslides form a major constraint over the higher elevations of the site. The observed landslides, inferred to have developed in the recent (historical) past, are currently mostly inactive (within the time frame of observations) but at least one is currently active. Furthermore, even the remaining ridge sections (within the upper slopes), that have not been subject to landslide activity in the historical past, are subject to soil creep of soils formed, at least in part, from ancient landslides. The groundwater conditions (including springs) within these upper debris and soil covered slopes will continue to result in a high risk of slope instability (refer to **Figure 3** below).

Natural processes or site preparation works involving removal of landslide debris from within landslide flow areas or excavations to provide foundation areas for retaining works or roadways within these materials are likely to initiate of additional landslide movement. As such, it is recommended that the areas of slump-flow landslides are excluded from the development area and that buffer zones be provided between the observed landslide areas and building envelopes or service corridors.

Precautionary works within the non-developable landslide affected areas should include:

- Planting of trees across the slope;
- Improvement of surface drainage to reduce the potential for saturation and instability of the debris materials, where this is possible without adversely affecting the already disturbed materials;
- Surface and subsoil drainage at the toes of debris lobes where seepage is observed or inferred.

#### 5.2.2.2 **Small Volume Slumps**

The potential for small volume slumps from gully sides mostly forms a minor constraint, but locally where entrenchment is deep (i.e. near the southern boundary) a minor to moderate constraint is assessed. Depending on the location, proposed development and extent of buffer zones required, remedial and precautionary works will range from increasing vegetation cover of the banks and adjacent crest areas, provision of channel lining or reconstruction of the drainage path with inclusion of pipes or culverts to collect and discharge stormwater flows.

A similar potential for small volume slumps is noted where a drainage swale, at the head of Zone 7, discharges collected stormwater to a steep slope section. Appropriate remedial works would include the lining of the swale and discharge of the stormwater via pipes to Reeves Creek.

#### 5.2.2.3 Soil creep affected areas

Soil creep affects or potentially affects the overburden profiles within steeper slope sections of Areas 2 and 3. It is assessed as a minor constraint where overburden depths are 1.5 m to 2 m or less.
Precautionary and remedial works should include:

- Improvement of surface drainage;
- Installation of subsoil drainage in areas of observed or potential (e.g. from sandstone bands or alluvium) seepage with discharge to the street stormwater system; and
- Founding of retaining and residential structures in undisturbed bedrock of at least low strength.

### *5.2.3 Summary of Review*

The proposed road and lot layout included on the drawings provided by JMD:

- Is generally in accordance with DP's recommendations with respect to slope instability within the steeper hillsides in the eastern section of the site.
- Recognises the requirement for remedial works where a proposed road batter locally extends into an area (Zone 15) of high susceptibility to slope instability and has nominated potential alternative batter treatments.
- Current do not provide information on the treatment or potential effect on layout, of two entrenched drainage lines with susceptibility for erosion and bank slumping (Zone 16) within the south-east section of the site.

Details of appropriate remedial and precautionary works in relation to slope instability, including soil creep, bank erosion/slumping affected areas are included in Project 76579.05, dated 2 February 2015. Also included in the DP report are the requirements for additional investigation in: proposed areas of cut for roadways or lots; for determination of final retaining, pavement thickness design and lot classification; for the earthworks; and for assessment of mine subsidence in nominated areas of cut within the roadway and lots.


**Figure 3: Land Susceptibility Zoning**

#### 5.2.3.1 Soil Erosion

The potential for soil erosion in slopes disturbed by development activities is assessed as a moderate constraint to development within areas of acceptable risk of instability either currently or after completion of appropriate engineering works. To minimise the constraints imposed by extreme erosion potential, earthworks within the site should be undertaken in small stages, with adequate erosion and sedimentation controls in place.

Appropriate treatment of new exposed batters and current areas of localised gully erosion and rill erosion would include:

- Site regrading by filling using select materials (i.e. non–dispersive or erodible) placed under controlled conditions;
- Provision of temporary surface cover (e.g. pegged matting) during the period of gully floor or batter revegetation;
- Channel lining or piping of drainage paths where appropriate;
- The re-establishment of a zone of tree cover or appropriate vegetation in the hillslopes above the developable area.

#### 5.2.3.2 **Waterlogging**

The potential for waterlogging of alluvial soils and underlying colluvium (including material deposited by ancient slope instability) within a gully floor (Zone 3) within Area 1 within the northern sections (parts Zones 6 and 13) of Area 2. This is assessed as a minor to moderate constraint to development.

Precautionary and remedial works should include:

- Improvement of surface drainage including the interception of overland flow in drainage paths at the downslope end of debris lobes;
- Site regrading;
- Installation of subsoil drainage to protect road subgrades;
- Collection of stormwater from roofs, hardstand areas, together with the intercepted surface and subsurface water and discharge to the Council street stormwater system in Remembrance Drive (for Area 1) and to the Council street stormwater system or to Reeves Creek as appropriate in Areas 2 and 3.

#### 5.2.3.3 **Site Classification**

Classification of individual lots within the site should comply with the requirements of AS 2870 – 2011 *"Residential Slabs and Footings"* (Ref 1). Based on the results of the field investigation and the previous DP laboratory testing, together with experience in similar geological settings preliminary site classifications for sections of the site assessed as being of acceptable risk levels after inclusion of precautionary and remedial works (refer Sections 9.7 and 9.8) are as follows:

- Class P is applicable to moderate or steeper slopes (greater than 10°), within and adjacent to localised areas of slope instability on the lower slopes and areas adjoining landslides within the upper and mid-slopes. The main requirement of a Class P site is for design to be undertaken by a suitably qualified engineer with design based on engineering principles.
- Variously Class M (moderately reactive) or Class H1 to H2 (highly reactive), with the final classifications dependent on soil reactivity, soil strength and rock depth in the lower, gently sloping (<10°) remaining sections of Areas 2 and 3.
- Class P conditions may be present in the drainage paths if weak soils are encountered during lot specific subsurface investigation. Re-classification of such areas to Class M or H1/2 may be possible subject to the extent of earthworks undertaken during construction.

Any requisite classification of foundation soil reactivity will need to be done on a lot by lot basis after consideration of all final cut and fill profiling.

#### 5.2.3.4 **Site Preparation**

##### *5.2.3.4.1 General*

As a consequence of the current assessment of slope instability, it is considered that the site layout within Area 1 as shown in Figure 2 will require significant modification. Minor modification will also be required within some sections along the north-eastern boundary of Area 2 where potential landslide activity, including remobilisation of debris lobes, is assessed as a major constraint.

It is expected that both cutting and filling will be required for road construction and lot development within areas of acceptable risk level. Based on the results of the investigations thus far completed, topsoil stripping depths are expected to mostly be less than 300 mm (few areas to 0.7 m). It should also be noted that final depths of stripping required may also be subject to prevailing weather conditions, as silty clay which may be exposed in some areas following stripping, would be susceptible to strength loss due to saturation and would quickly become un-trafficable in times of wet weather.

The surface, organic-rich topsoils and vegetation layer would not be suitable for incorporation in filling used for construction and consequently, provision should be made for stripping these materials ahead of earthworks operations. It is expected that most of the materials could be re-used on site for landscaping purposes or, alternatively, provision will need to be made for off-site disposal.

#### *5.2.3.4.2 Excavation*

The test pitting within mid-slope locations has variously intersected very low to high strength shale, siltstone and sandstone in all pits, with the exception of Pit 201, at depths ranging from 0.8 m (Pit 205) to 3.2 m (Pit 202). The gully exposures indicate that, within gently sloping footslope areas of Area 2, bedrock depths may exceed 10m.

Excavation of the alluvium, colluvium, residual soils and very low to low strength rock should be achieved by conventional medium sized excavator with a toothed bucket, elevating scraper, with some light ripping, or bulldozer operation. However, in constrained bulk excavation areas such as road cuttings, medium and greater strength bedrock with joint spacing as little as 0.3 m is likely to require heavy ripping or use of larger rock breaking equipment.

The excavation of subsoil drains cut into medium or greater strength rock to protect road pavements or to improve slope stability will require the use of one or a combination of rock hammering, with rock sawing or boxing of roadways during bulk excavation. It should be noted that on moderate or steeper slopes, jointing or bedding in the rock mass may result in seepage water by-passing subsoil drains in road subgrades. In these areas, over-excavation and replacement with a processed rock drainage layer may be used to protect the overlying road pavement.
The anticipated plant required for rock removal is given as a guide only. Removal of rock will be based on the earthworks contractors' assessment of the materials following detailed assessment of excavation conditions and batter slope, undertaken once civil design works have progressed to the preliminary stage. However, for long-term stability within the site, which is characterised by extensive areas of historical and ancient slope instability:

- Unsupported cuts in soil should not exceed 1.0 m height and should be battered at no steeper than 3H:1V. Due to the potential presence of fissuring (possibly the result of historical or ancient slope instability) in the clay soil profiles, the suitability for steeper temporary batters will need to be assessed on a case by case basis.
- The growth of vegetation on soil covered slopes should be encouraged and assisted by hydromulching, as soon as possible after construction, to minimise erosion.
- Where cuts are deeper than described above, the slope should be supported by engineer designed retaining walls founded on bedrock of at least low strength unless site specific investigation is able to confirm acceptable risk levels upon excavation.
- All rock cuts should be thoroughly cleaned of loose debris prior to final inspection to determine requirements for any additional face support works (e.g. shotcrete or rock bolting).

Where rock is encountered at design finished cut surface level, it is recommended that a minimum of 200 mm of topsoil be placed over the surface in order to better promote revegetation of the surface.

#### *5.2.3.4.3 Filling*

Appropriate requirements for placement of new filling on the site include:

- After the removal of topsoil and any deleterious soft, loose or compressible material, the exposed surface should be compacted with a minimum of 8 passes of a 12 tonne (minimum dead weight) roller, followed by test rolling in the presence of a geotechnical engineer and rectified as required.
- Where soft spots are identified, they should be excavated and then backfilled using a suitable granular material and compacted in 250 mm (loose thickness) layers. If soft materials exceed 500 mm, a bridging layer may be required.
- New filling brought to site should be approved by either the civil or geotechnical engineer before use. Moderately to highly reactive clay filling should be avoided.
- Where the ground slopes are steeper than 8H:1V, each layer should be placed and compacted horizontally in a cut and benched formation in accordance with AS 3798 – 2007. "Guidelines on Earthworks for Commercial and Residential Developments" (Ref 11).
- All lot filling materials should be approved and placed under full time supervision (to Level 1 criteria in accordance with AS 3798 – 2007. Supervision to Level 2 standard is considered appropriate for pavement construction and backfilling of service trenches unless otherwise specified by the designer. It is also recommended that the Geotechnical Inspection and Testing Authority (GITA) should be engaged directly on behalf of the principal and not by the earthworks contractor. Testing of all filling should be undertaken progressively during the course of the earthworks to ensure quality control with respect to material type, compaction and moisture. The test frequency should be in accordance with Table 8.1 of AS 3798 – 2007.
- Filling depths on the hillside lots should be generally restricted to less than 1.0 m and battered at no steeper than 3H:1V to provide for grassing (as soon as possible after placement of the filling) and subsequent maintenance, unless supported by engineer-designed retaining walls which should be founded on intact bedrock of at least low strength.
- Retaining walls should include free draining backfill over the full height for a width of at least 0.3 m behind the face to reduce the risk of water pressure build-up. Drainage should be facilitated by an 'ag' drain at the base of the granular fill and by a lined surface drain at the crest. The collected water should be discharged to the site stormwater system. The subsurface drainage lines (stormwater and subsoil lines) should include flexible couplings and adequate inspection points for maintenance purposes.
- Borrow material or approved imported filling material for earth fill embankments should be placed in horizontal layers of nominally 250 mm thickness, with the actual thickness dependent upon the equipment proposed for use on site. All filling placed as part of the construction process should be compacted to a least 98% of the maximum dry density (MDD) obtained in the laboratory standard compaction test. Compaction levels should be increased to at least 100% within the upper 500 mm of filling underlying road pavements. Where filling comprises clays of high plasticity, compaction should not exceed 104% of the MDD to prevent potential for heave. Moisture contents of the filling material should be maintained within ± 2% of the optimum moisture content for standard compaction.
- Prompt protection of placed earth filling by vegetation cover, facilitated by spray mulching or by use of jute mattresses or rip rap protection, to minimise erosion.
- In order to minimise the effects of erosion and to prevent drying of the site soils, all allotments will need to be revegetated promptly after completing filling/regrading; this should include a minimum of 100 mm of topsoil. The allotments must also be graded to a minimum of 1%.

The overburden materials on site are typically clay-rich and of high plasticity, and hence are likely to be moisture sensitive. It is therefore important to ensure that both areas of filling and excavation are kept dry and that water does not pond on site. Wherever practical, the ground surface exposed after stripping should be shaped to assist drainage and be compacted to the same requirements as for the overlying layers of filling. If rain is threatening or the site is to be left unattended, the upper surfaces of fills should be crowned and if possible blinded by smooth wheeled plant. Any stockpiles should be blinded to allow water to run off. It is also important to avoid allowing the subgrade to become overly dry in hot weather. The reason for the above precautions is to limit the amount of shrink-swell movement resulting from a future change in moisture content of the clay.

#### *5.2.3.4.4 Treatment of Farm Dams*

The preparation of farm dams in areas to be filled should include:

- initial stripping out of silt and water softened soils;
- test rolling of the exposed surface;
- where soft spots are identified, they should be excavated and then backfilled using a suitable granular material and compacted in 250 mm (loose thickness) layers;
- completion of filling in accordance with the requirements of Section 9.11.3.

It should be noted that farm dams, such as present adjacent to Remembrance Drive in Area 1, are frequently constructed in areas of natural springs. As such, site inspection will be required to identify any zones of water ingress which may necessitate the installation of subsoil drainage to ensure long term amenity to the area following site preparation.

#### *5.2.3.4.5 Road Pavements*

The roadways to service the available development area will result in subgrade materials comprising variously alluvium, colluvium, residual soils and probably weathered rock, together with earth fill embankments. The final arrangement or category of roads (after the requirements of Wollondilly Shire Council) are not yet known but are expected to range in category from Minor Cul-de-sac and Access way (Category A & B) with design traffic loading of 2 x $10_4$ Equivalent Standard Axles (ESA) to Collector Street (Category E) with a design traffic loading of 1 x $10_6$ ESA or Local Distributor (Category E) with a design traffic loading of 2 x $10_6$ ESA.

No laboratory testing to determine California bearing ratio (CBR) values has yet been carried out. However, testing by DP of clayey soils derived from Wianamatta Shales, and on weathered rock samples, on other sites has indicated variable CBR results within even the same material type. It is expected that most of the clay subgrades will have CBR values in the range 2 – 4%. Similar values may be obtained from some weathered rock samples, particularly claystone bands. Consequently, it is recommended that a preliminary design CBR value of 3% be applied where the pavement subgrade comprises in situ soil or part soil and part rock.

Example pavement thickness designs for cul-de-sac/access way, local street, collector and local distributor street categories given in Table 4 are based on the requirements of Wollondilly Shire Council, Special Report No.41 ARRB (Ref 15), AUSTROADS – 2012 (Ref 13), the design parameters detailed above, a granular pavement with asphaltic concrete (AC) surfacing, and a range of likely subgrade CBR values.

### *5.2.4 Summary*

Assessment of the urban capability of the Reeves Creek site has principally been carried out on the basis of geotechnical considerations, specifically risk of slope instability, soil erodibility, waterlogging potential and foundation conditions. The distribution of the geotechnical constraints for the site are summarised in Drawing 7.

Extensive slope instability (slump-flow landslides) affects, or has the potential to affect, the moderately and steeply sloping hillsides of Vault Hill and its associated southeast-trending ridgeline bounding the site. This instability hazard is considered to be a major constraint to development (i.e. instability would result in high or very high risk to property) such that the affected areas should not be developed for residential use. The consequence of the assessment is that the provided Masterplan (refer Figure 1 on page 10) will require significant alteration to the proposed site development layout for Area 1 and minor alteration within the north-eastern boundary sections of Area 2.

Ridge crests, gently sloping, lower and footslope areas of Areas 2 and 3 are, however, together with a small area of Area 1, assessed as suitable for residential development, although some areas will require remedial and precautionary works to achieve acceptable risk to property. It is considered that the soil creep, erosion and waterlogging hazards within the areas assessed as acceptable risk of slope instability could be managed by good engineering and land management practices.

General development considerations will require the classification of residential lots to comply with the requirements of AS 2870 – 2011 (Ref 1).

### *5.2.5 Further Investigation*

Detailed geotechnical investigation and assessment will be required as the design of the development proceeds and as such, this report must be considered as being preliminary in nature. Specific geotechnical investigation would include (but not necessarily be limited to):

- Detailed subsurface investigation assessment and laboratory testing of possible relic landslide shear planes which may affect the stability of proposed cut areas for roadways or lots;
- Detailed geotechnical investigations for determination of final retaining and pavement thickness designs and lot classifications;
- Routine inspections and earthworks monitoring during construction;
- Further investigation into the potential for future coal mining and correspondence with the relevant authorities regarding mine subsidence and any foreseen restrictions on development.

## *5.3 Preliminary Site Investigation (Contamination)*

Douglas Partners has undertaken a Preliminary Site Investigation and review for the site (refer to **Annexure G**). The potential AEC comprise the following:

- AEC 1 – A telecommunications tower (located north of the current site boundary);
- AEC 2 – Four areas of crop cultivation (two of which are located within the current site boundary);
- AEC 3 – Two areas of ground disturbance (neither of which is located in the current site boundary);
- AEC 4 – Two residential dwellings one of which is located within the current site boundary)
- AEC 5 – A former building (located within the current site boundary); and
- AEC 6 – Diary and farm sheds (located within the current site boundary).

All the above mentioned potential AECs are essentially localised and pose little or no current risk to human health or the environment. The risks will be increased, however, under the proposed residential development and therefore the contamination status of soils beneath the AEC should be assessed prior to site redevelopment.

The outcomes of the assessment are provided below.

### *5.3.1 Phase 1 Assessment Review*

#### 5.3.1.1 **Conclusion**

DP considers that the recommendations and conclusions of the PSI are still valid and so many still be used for the current rezoning proposal. In addition to the AC identified in the PSI, the following areas have also been identified and require further investigation prior to re-development:

- The area of surficial suspected ACM and pre-existing stockpiles adjacent to the dairy (assigned under AEC 6);
- The footprints of the former stockpiles (suspect ACM and chemical contaminants) (AEC7); and
- The riparian corridors (AEC8).

## *5.4 Biodiversity & Riparian Land Use*

### *5.4.1 Introduction & Review*

Eco Logical Australia undertook an ecological assessment at **Annexure F**.

The Reeves Creek watercourse runs predominately south to northwest through the study area. There are a number of reaches upstream of Reeves Creek that are in a highly modified and degraded state. The natural geomorphic conditions have been extensively altered through the creation of dams, clearing of native vegetation, unrestricted access for cattle grazing and the proliferation of weeds. Despite this, the larger reaches of Reeves Creek have a high recovery potential given the presence of AW and other remnant riparian vegetation.

Habitat features were generally lacking and unlikely to support the threatened species identified as having the potential to occur within the study area. Four hollow bearing trees were identified, three within the study area and one on the study area boundary.

The study area is 39.1 ha, of which the majority is made up of cleared land or land dominated by exotic species. The remaining area is made up of Shale Hills Woodland (SHW) and Alluvial Woodland (AW) in varying levels of condition and recovery potential. SHW is a sub-community of Cumberland Plain Woodland, which is a critically endangered ecological community under both the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and NSW *Threatened Species and Conservation Act 1995* (TSC Act), although none of the SHW was in a state of condition to satisfy the EPBC Act listing criteria within the study area. Also present within the study area is the AW sub-community of River-flat Eucalypt Forest, which is an endangered ecological community under the TSC Act.

Areas of high, medium and low ecological constraint were identified across the study area. The ecological constraint ranking was determined on the basis of conservation status, condition, recovery potential, and habitat value. Endangered ecological communities in low to good condition (with moderate to high recovery potential) and hollow bearing trees were ranked as having a high ecological constraint, while areas cleared of native vegetation to pasture were considered low constraint.

The proposed ILP seeks to rezone the study area from its current RU2 Rural Landscape and R2 Low Density Residential zoning under *Wollondilly Local Environmental Plan 2011* (WLEP), to a combination of E2 Environmental Conservation, E4 Environmental Living, and R2 Low Density Residential zones.

The proposed ILP would rezone approximately 0.58 ha (23%) of the 2.49 ha of high ecological constraint AW within the study area to residential zones R2. The remaining 1.91 ha (77%) retained within an environmental conservation E2 zone. Approximately 2.59 ha (77%) of the SHW will be zoned residential (R2), however, more than 50% of this is either Derived Native Grassland or Derived Native Shrubland that is in low condition with only moderate to very low recovery potential. In general, these vegetation types are located in relatively small isolated patches within the cleared parts of the study area.

Five reaches Reeves Creek with high riparian recovery potential and one with low recovery potential would be rezoned within as E2 Environmental Conservation. One reach would be removed and offset within the averaged riparian corridor and another reach was determined not to be waterfront land.

ELA has calculated that a riparian corridor of 6.0 ha is required within the study area to meet the NSW Department of Primary Industries - Water (DPI) guidelines. This riparian corridor area can be achieved by the current ILP by application of the averaging rule (DPI 2012) within the riparian areas of the study area and immediately adjacent within residual lands proposed for rezoning at a later stage. The current ILP has been developed in consultation with the DPI, who have provided their in-principle support for the proposed layout.

Given the environmental features of the study area and the land uses proposed in the ILP, the rezoning of the land is not likely to result in unacceptable environmental impacts and is considered to provide a suitable balance between the maintenance and protection of the biodiversity values of the study area, and orderly urban development.

#### 5.4.1.1 Riparian Assessment

Throughout the project and in consultation with DPI many changes were made to the proposed ILP to ensure protection of an adequate RC. Due to constraints of existing farm dams, site topography, existing lots both within and outside the study area and a narrow entry to the study area the following departures from the matrix are still proposed and would require merit based assessment at the development application stage:

- Reach E – proposed stream realignment associated with reshaping of existing farms dams and proposed online basins and an APZ within the inner 50% RC
- Reach F – proposed entrance road, online detention basin and APZs within the inner 50% RC
- Reach G – proposed online detention basin within inner 50% RC
- Reach H – proposed filling of reach.

The DPI has provided in-principle support for these proposed departures from the riparian matrix through verbal consultation on and offsite and in writing. The detailed design of the proposed online basins at the DA stage will need to comply with the requirements as specified in the DPI (2012). DPI require these basins to have a defined channel, remain dry (except during flood events), have fully structured vegetation, and to help maintain suitable flow velocities within the watercourses to prevent erosion and the deposition of sediment within the downstream catchment.

In terms of feasibility of the proposed rezoning to achieve DPI RC requirements, a total RC of 6.0 ha has been achieved for the study area (including adjacent headwaters of reaches B, C and D). The averaging rule has been applied to ensure the offset of the following (as occurring within the inner and outer 50% RC):

- APZs
- Retaining wall structures to proposed online basins
- Public recreation area to south of reach E
- Roads (including entrance road)
- Required RC width of entire reach H to be removed.

The retained reaches will be afforded adequate protection from the surrounding residential land use and, in time, will be maintained and improved in accordance with a VMP that will be prepared as part of a controlled activity approval under the WM Act at the development application stage. The inclusion of the RC within the riparian protection layer of the WLEP is recommended as the RC contains features of high biodiversity, riparian and water quality significance which will contribute to the maintenance of both biodiversity and water quality outcomes within the broader locality. Indeed vegetation within this corridor will assist in filtering nutrients and sediment and other contaminants from future urban development, while appropriately designed vegetated dry basins will assist in the attenuation storm flows, both of which will help protect and maintain water quality within the study area and the locality more generally.

The bushfire hazard of future vegetation has been considered in applying the averaging rule, whereby the extent of the RC has been kept to a minimum to ensure a reduced fire run for future development. APZs are mapped adjacent the averaged RC. Vegetation species and their densities would be determined during preparation of a VMP at the development application stage.

No changes, note that the 2015 report included the following;

"*A total riparian corridor (RC) of 5.98 ha (rounded to 6.0 ha) would be required within the study area, as calculated from the required VRZ and channel widths of the validated streams. The required RC could not be achieved within the bounds of the study area, however NoW have given in-principle support for the headwaters of streams B, C and D outside of the study area to be used for offsetting of the required RC, given it will improve upstream areas and is proposed for rezoning at a later stage (pers comm. Jeremy Morice NoW, during site visit on 21 November 2014).*"

#### 5.4.1.2 Endangered Ecological Communities

Vegetation proposed to be included in residential areas (R2 and R3) have been calculated based on the proposed ILP and zoning. Areas of cleared and retained endangered ecological communities are shown in **Figure 4**.

##### *5.4.1.2.1 Shale Hills Woodland*

The proposed rezoning and ILP would include approximately 1.04 ha (58%) of the SHW (Open Woodland) and all of the SHW (DNS) (0.98 ha) and SHW (DNG) (0.57 ha) within the study area as residential. It is assumed that areas zoned residential will be proposed for removal at the DA stage.

The SHW (Open Woodland) patch on the western boundary proposed for residential zoning is approximately 0.49 ha. This patch has mature canopy trees and is considered to have moderate ecological constraint. This patch of vegetation is located on the boundary of the study area adjacent to existing residential development, and if retained would be subject to considerable edge effects that would detract from its integrity in the medium to long term.

The remaining SHW (Open Woodland) remnants containing individual paddock trees scattered throughout the study area, SHW (DNS) and SHW (DNG) are all considered to be in low condition and of low ecological constraint, and these areas are proposed for residential zoning.

## Vegetation communities

Vegetation proposed to be included in residential areas (R2) have been calculated based on the proposed lot layout plan and zoning. Area of cleared and retained endangered ecological communities are shown in **Table 1**. Balance areas are those which will be impacted by APZ and associated infrastructure.

**Table 1: Vegetation communities and proposed zoning**

| Vegetation community | ELA 2015 | | | Addendum 2018 | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Zoned E2 and E3 (ha) (retained) | Zoned R2 and R3 (ha) (cleared) | Total (ha) | Zoned E2 | | Zoned E4 | | Zoned R2 | Total (ha) |
| | | | | Retained (ha) | Balance (ha) | Retained (ha) | Balance (ha) | Impacted (ha) | |
| Shale Hills Woodland (Open Woodland) | **0.76 (42%)** | **1.04 (58%)** | **1.80** | - | - | **0.73 (42%)** | **0.04 (3%)** | **0.98 (56%)** | **1.75** |
| Shale Hills Woodland (DNS) | **0** | **0.98 (100%)** | **0.98** | - | - | - | - | **0.06 (100%)** | **0.06** |
| Shale Hills Woodland (DNG) | **0** | **0.57 (100%)** | **0.57** | - | - | - | - | - | - |
| **Sub-Total (SHW)** | **0.76 (23%)** | **2.59 (77%)** | **3.35** | - | - | **0.73 (40%)** | **0.04 (2%)** | **1.04 (57%)** | **1.8** |
| **Alluvial Woodland** | **1.91 (77%)** | **0.58 (23%)** | **2.49** | **1.77 (74%)** | **0.4 (17)** | - | - | **0.22 (9%)** | **2.38** |
| **TOTAL EEC** | **2.67 (46%)** | **3.17 (54%)** | **5.84** | **1.77 (42%)** | **0.4 (10%)** | **0.73 (17%)** | **0.04 (1%)** | **1.26 (30%)** | **4.18** |

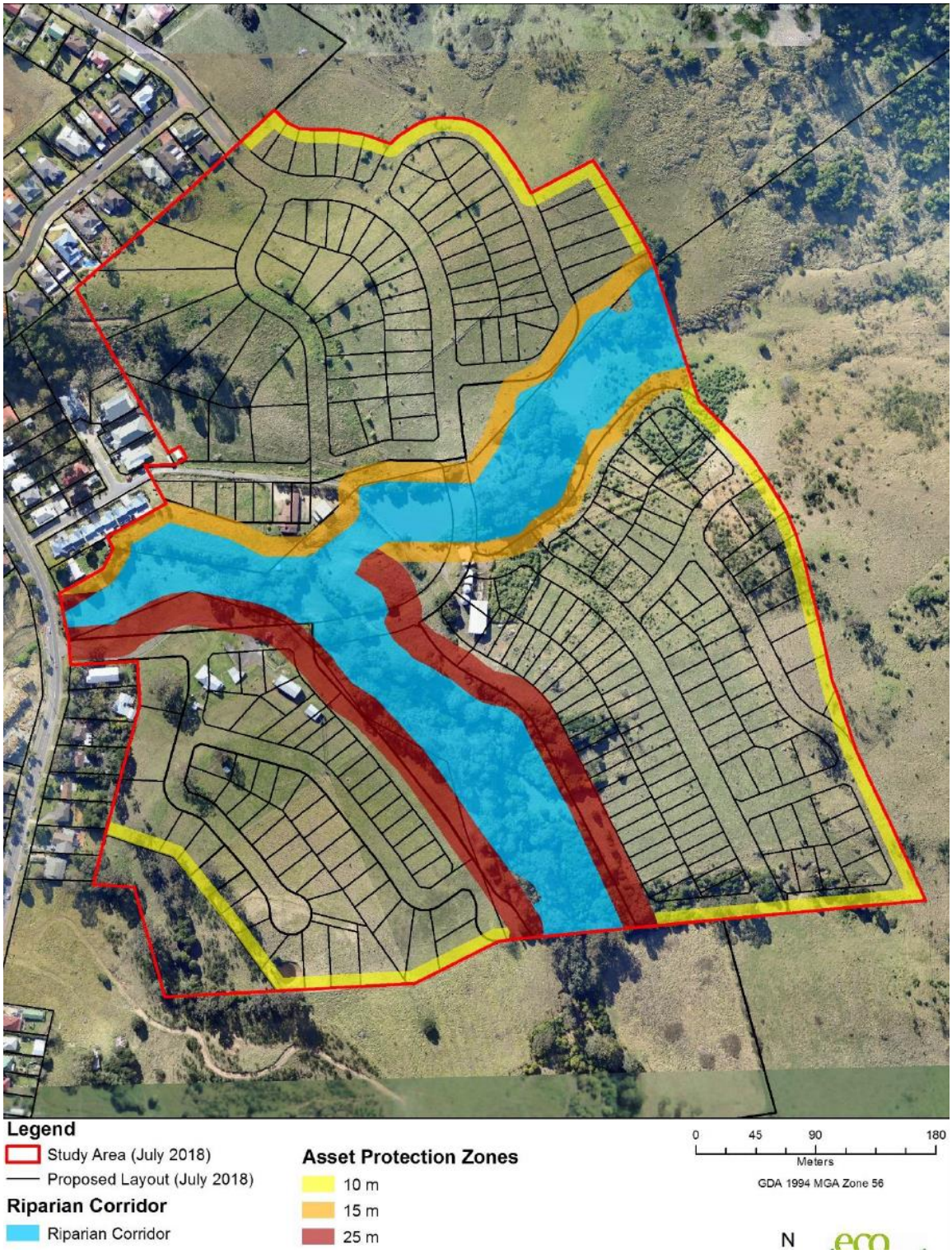


**Figure 4: Averaged riparian corridor and associated APZs**

#### 5.4.1.3 Threatened Flora and Fauna

Flora

No threatened flora species were recorded during the field works or were considered to have the potential to occur within the study area or residual lands.

Fauna

Habitat assessments for fauna identified a number of hollow bearing trees within the south western corner of the study area in a patch of SHW (Open Woodland). These four trees are proposed for E4 Environmental Living and as such will be retained. Three of these trees are within the study area and the other is on the property boundary.

Three patches of vegetation categorised as „high" and one patch of „moderate" ecological constraint would be rezoned for environmental conservation or management within the study area. Riparian corridor and habitat linkages with remnant vegetation beyond the study area would also be enhanced to ensure connectivity is maintained with the broader locality, by revegetation / regeneration of 6.0 ha of RC through a VMP. Moreover, key habitat features including ephemeral water bodies would continue to provide important habitat for birds and microbats that may frequent the study area.

#### 5.4.1.4 Zone E4 Environmental Living

The SHW (Open Woodland) in the south western corner of the study area will assist in protecting 0.73 ha of the EEC, including three hollow bearing trees within the study area and one on the study area boundary. The area contains open woodland with important habitat features, and is located on the edge of the remnant vegetation that adjoins the study area. While the condition of the vegetation beyond the site is unknown, given that the vegetation within the study area is at its edge, the proposed E4 zoning is considered appropriate. In this regard, the proposed zone would provide for suitable low impact recreation opportunities for adjoining residential properties while also contributing to the maintenance of the study areas broader environmental values.

#### 5.4.1.5 Residual Land

A portion of land to the immediate east, north and south of the study area is identified as „residual lands" and is intended for future rezoning. The residual lands are not the subject of this rezoning, but are addressed here to the limited extent required to address the *Specialist Studies Requirements – Picton East Planning Proposal* (July 2013).

The total area of the residual land is 82.5 ha. The residual lands are currently zoned RU2: Rural landscape and RE1: Public recreation. It is understood that the residual lands will form part of a future planning proposal that will include a combination of land uses similar to those proposed in this rezoning. In general, the urban development types will extend to the south of the study area, while the remaining ridge top lands are proposed for a combination of environmental conservation and / or managed riparian corridor areas.
Within the residual lands, the following vegetation communities were identified:

- Cleared (Exotic pasture) and (Exotic vegetation)
- Shale Hills Woodland (SHW) (Open Woodland), (Woodland), (Derived Native Grassland) and (Derived Native Shrubland)
- Alluvial Woodland (AW)
- Moist Hills Woodland.

These vegetation communities are listed as CEECs and EECs under the EPBC and TSC Acts, and areas of ecological values are concentrated within the riparian areas in the south and along the ridge top vegetation. The current proposal excludes the rezoning of the residual lands and, therefore, any environmentally sensitive areas would be conserved and continue to be managed for agricultural purposes.

The current proposal does not preclude the use of the residual lands for agricultural purposes. Indeed, low intensity cattle grazing that is used in a strategic and / or rotational manner would assist in the management of both weeds and fuel loads within the residual lands. This management approach is considered the most appropriate agricultural production method for the residual lands given that its steep slopes are likely to prevent the use of tillage equipment and pasture improvement and / or fodder production.

Given the recommended use of low intensity and targeted cattle grazing, the potential for urban – rural land use conflicts is considered limited. Low intensity grazing will also ensure that impacts on any unfenced watercourses within the residual lands are minimised. Well managed grazing activity, together with a combination of appropriate herbicide use and slashing (to control excessive pasture growth and weed proliferation) will also help maintain the environmental values and biodiversity of the residual lands, while also facilitating ongoing rural land uses.

In terms of riparian features, reach G continues upstream of the development (to the south) as a 2nd order stream, with an additional two 1st order streams located off this reach. Reach H also continues upstream into the residual lands, although this reach has been approved for removal by DPI. Portions of reaches B, C and D have been included within the proposed RC for the study area rezoning, therefore future rezoning / development of the residual lands will need to observe this RC area.

Constraints for future rezoning of the residual lands will need to consider slope, vegetation communities and required buffers to protect riparian vegetation and water quality. Bushfire protection is being considered under a separate *Bushfire Assessment* report.

#### 5.4.1.6 **Recommendation**

The following recommendations are provided to guide the rezoning and future development of the land to assist in maintaining the biodiversity and riparian integrity of the study area.

##### *5.4.1.6.1 Vegetation communities, flora and fauna*

- Avoid impact to areas of high ecological constraint.
- Retain, protect and manage important vegetation identified for inclusion within the Biodiversity map layer of the WLEP (**Figure 5**).
- Manage retained AW within the RC in accordance with a Vegetation Management Plan (VMP), to be prepared for Controlled Activity Approval at the development application stage
- Manage retained SHW (Open Woodland) within the study area, including retained hollow bearing trees (HBT) to provide habitat for hollow dependent species.

##### *5.4.1.6.2 Riparian recommendations*

- Avoid impact to areas of high ecological constraint.
- Retain, protect and manage important riparian areas identified for inclusion in the Riparian map layer of the WLEP (**Figure 6**)

- Design watercourses in the study area to mimic the natural hydrology and geomorphology of the local creeks. Development must not increase the frequency and intensity of flows to the watercourses
- Basins are to be constructed in accordance with DPI guidelines to provide a suitably functioning watercourse and habitat corridor
- Any road crossing of Reeves Creek must be in accordance with DPI guidelines
- Prepare a Vegetation Management Plan (VMP) which details the management and revegetation of the riparian corridor, at the development application stage
- The subdivision layout should not increase lot frontage to the watercourses within the study area and the creation of new basic landholder rights (BLRs).

With respect to the residual lands, consideration and integration of the study area and its environmental values should be undertaken for any future planning proposal prepared for the residual lands.


**Figure 5: Land in Biodiversity Map**

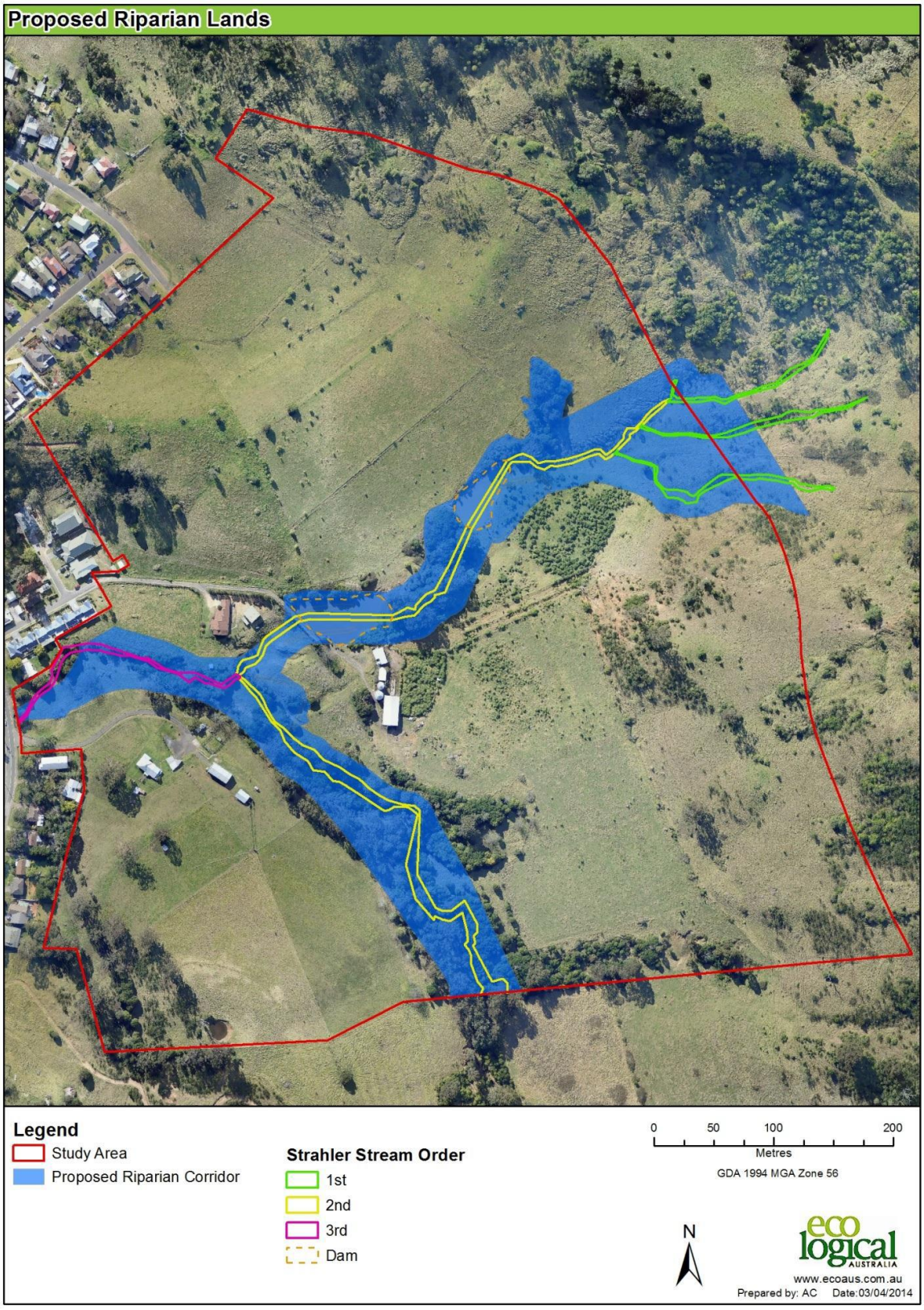


**Figure 6: Land in Biodiversity Map**

#### 5.4.1.7 Conclusion

This report highlights the ecological values and constraints of the study area, comments on the proposed future land use of the ILP and makes recommendations to avoid or alleviate areas of ecological and riparian value.

The Reeves Creek study area contains a number of important biodiversity and riparian features including Shale Hills Woodland (SHW), a sub community of Cumberland Plan Woodland (CPW) which is listed as a critically endangered ecological community under TSC Act. The CPW community is also listed under the EPBC Act, but the condition and size of the vegetation patches within the study area did not meet the EPBC Act criteria. The site also contains Alluvial Woodland, a component of River Flat Eucalypt Forests of the NSW North Coast, Sydney Basin and South-East corner Bioregions, which is listed as and EEC under the TSC Act.

Approximately 0.76 ha (42%) of moderate ecological constraint SHW and two hollow bearing trees of high ecological constraint (one on boundary of study area) are proposed for rezoning to E4 Environmental Living. Approximately 1.91 ha (77%) of high ecological constraint AW within the study area would also be rezoned as E2 Environmental Conservation.

The proposed rezoning would rezone 1.04 (58%) of the SHW considered to have moderate to low ecological constraint, and two hollow bearing trees to residential. An area of 0.58 ha (23%) of the high ecological constraint AW within the study area would be rezoned residential. The remainder of impacted areas are made up of cleared land or land dominated by exotic species with very low biodiversity value.

The watercourses within study area are in moderate to degraded condition. Nevertheless, remnant riparian vegetation along some of the reaches have high potential to serve as important habitat corridors that would integrate the study area with relatively large stands of the remnant vegetation on the ridge tops to the east of the study area, and the broader catchment up and downstream of the study area.

While the ILP does not avoid all areas of high ecological constraint, it does retain many of these features. This includes the key riparian corridors of Reeves Creek and its eastern tributary within the central portion of the study area and the majority of SHW and AW vegetation considered to have high to moderate ecological constraint. The impact of the planning proposal must be assessed at the development application stage by Wollondilly Shire Council on behalf of the landowner.

### *5.5 Bushfire Assessment*

The Study Area was assessed having regard to its inherent bushfire hazard and management implications in the context of implementation of the Concept Master Plan against the “Planning for Bushfire Protection” (PBP) guidelines (produced by the NSW Rural Fire Service, 2006). It should be noted that the central aim of PBP is to “use the NSW development assessment system to provide for the protection of human life (including fire fighters) and to minimise impacts on property from the threat of bushfire, while having due regard to the development potential, onsite amenity and protection of the environment”.

A combination of bushfire protection measures, based on PBP, is recommended to manage the bushfire threat in the report prepared by Eco Logical Australia at **Annexure C**.

#### *5.5.1 Asset Protection Zones - Review*

The proposed amendments to the previous plans from 2015 have resulted in several changes as shown in the updated plans (**Figure 7**). In summary the main points regarding bushfire protection are:

- The study area has been reduced in size, notably to the east. This provides further separation to the Woodland hazard in that direction resulting in the main hazard being Grassland. This provides a better bushfire risk outcome.
- The new design has reduced the number of cul-de-sacs within the development and created more through roads. The Acceptable Solution in Section 4.1.3(1) of Planning for Bushfire Protection (PBP) relating to road design is that all roads should be through roads and dead ends are not recommended. The removal of the cul-de-sacs complies with the acceptable solution and facilitates a simpler design for residents evacuating the area. The one remaining cul-de-sac will be within 200m of the intersection of another road and will also comply with the acceptable solution within PBP.
- The updated design can accommodate all Area Protection Zones (APZ's) by way of perimeter roads adjacent to the Riparian Corridor or within individual Lots.

In summary, while the overall rezoning area, indicative lot layout plan, and zonings have evolved since our assessment and corresponding report was completed, we acknowledge that our assumptions made are still valid and our report may still be used for the current rezoning proposal.

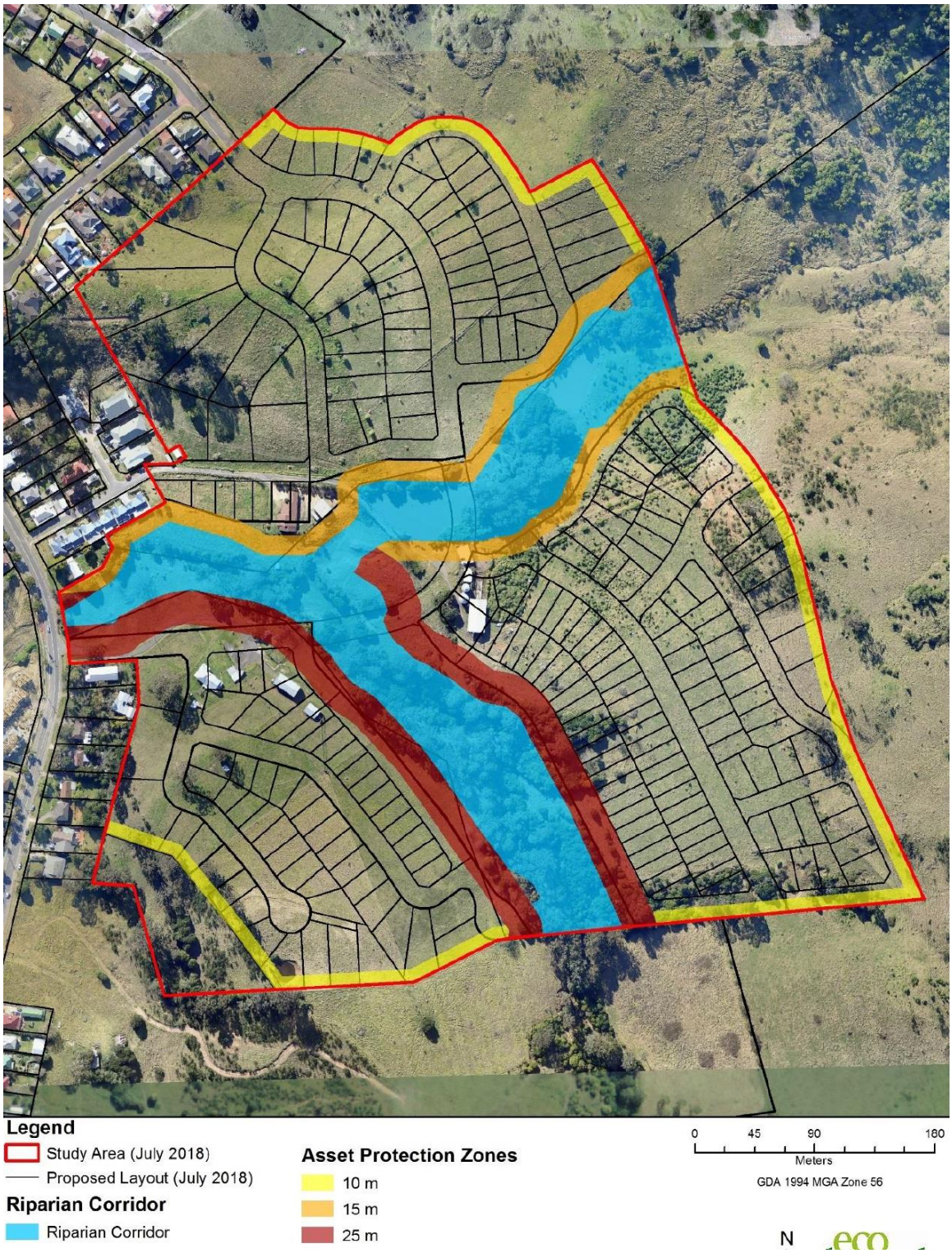


**Figure 7: Asset Protection Zones**

### *5.5.2 APZ Perimeter Access*

### *5.5.3 APZ Management*

### *5.5.4 Access*

PBP requires an access design that enables safe evacuation away from an area whilst facilitating adequate emergency and operational response to the area requiring protection. The following sections present the bushfire planning requirements for access in bushfire prone land.

#### 5.5.4.1 **Safe Access and Egress**

All bushfire prone areas should have an alternate access or egress option. This is usually achieved by providing more than one public road into and out of a precinct. The need for an alternative road and its location depends on the bushfire risk, the density of the development, and the chances of the road being cut by fire. All precincts within the study area should allow for an alternative public access road.

The proposed access arrangements within the study area are in accordance with the intent and principles of PBP regarding the provision of safe access and egress for both residents and fire fighters.

#### 5.5.4.2 **Perimeter Roads**

Depending on the bushfire risk, all bushland interface areas containing an APZ for a significant bushfire hazard should feature a perimeter public road within the APZ. It is acceptable for some areas not to have a perimeter road or have a perimeter trail instead. These include areas of lower bushfire risk (such as adjoining low hazard areas), rural residential areas with large lot sizes whereby perimeter access can be provided within each lot, or areas where it may not be feasible to provide a continuous road due to the shape of the interface or the terrain. These areas should have some other access strategy such as trails or regular access points including access to a hydrant network.

#### 5.5.4.3 **Road Design and Construction Standards**

Provision of a simple layout with perimeter roads and frequent direct access to the internal road system will provide sufficient access/egress in the case of an emergency. Public roads should provide safe operational access to structures and water supply. Perimeter roads will be required at APZ bushland interface locations where a significant bushfire hazard exists. However, minor drainage corridors and the setbacks provided within larger 'lifestyle lots' present a lower risk scenario and, therefore, may not require implementation of perimeter roads. Property access roads will also need to provide safe access for emergency services and provide protection to properties and occupants during a bushfire.

### *5.5.5 Conclusion*

Bushfire hazard has been assessed across the subject study area and found to be low, based on the relatively gentle slopes and low fuel accumulation of the vegetation present. On the basis of this assessment, indicative Asset Protection Zone requirements have been mapped across the proposed rezoning area.

A number of strategies have been provided in the form of planning controls such that the risk from bushfire can be minimised and future rezoning or development approval processes can be streamlined. Further, it has been found that development of the anticipated land uses within the subject study area, from a bushfire planning perspective, are considered suitable.

A number of strategies have been provided in this report such that the risk from bushfire can be mitigated. The main strategies suggested include:

- Ensure adequate setback from bushfire prone vegetation (APZs)
- Integrate non-combustible infrastructure within APZs such as roads, easements and parking areas. The majority of APZs should be contained within perimeter roads and front yard setbacks
- Ensure adequate access and egress from the study area through a well-designed road system
- Consider the adequacy of water supply and the delivery of other services (gas and electricity)
- Provide temporary APZs during any staged development
- Consider SFPP and other development types
- Provide for effective and ongoing management of APZs; and
- Consider construction standards (AS3959) implications for future developments.

The ILP has been prepared based on the advice and constraints contained within this report. In relation to the furthering of the planning processes as they relate to the future uses of the Precinct, it is considered appropriate that more detailed assessment and consideration of the relevant bushfire protection strategies across the Precinct should be undertaken. This further assessment should include a more comprehensive review of the ILP and subsequent planning controls, to ensure they are well designed in terms of bushfire protection outcomes.

Formalised bushfire assessments will also be required to facilitate the development approvals process if the future rezoning proceeds to land subdivision. For future development of individual dwellings, exemptions for the further consideration of bushfire requirements may apply, in accordance with Clause 273 of the *Environmental Planning and Assessment Regulations 2000*, and as detailed in section 1.3.6 of this report.

### *5.6 Traffic Impact Assessment*

#### *5.6.1 Introduction*

The assessment of the impacts of implementing the Plan has been assessed by Cardno (**Annexure J**). The following summarises the assessment.

#### *5.6.2 Internal Road Hierarchy*

The internal road hierarchy within the Reeves Creek masterplan area shall be based on the function and anticipated traffic volumes. The cross sections for the internal roads to the Reeves Creek development shall accord with Council requirements (reference shall be made to Wollondilly Shire Council Subdivision & Engineering Standards – Design Specifications). At this early stage, the anticipated internal road hierarchy is illustrated in **Figure 8** below.

Given that it is intended for the proposed collector roads to accommodate buses, these roads will be constructed to comprise a 13m minimum carriageway width with provision for bus stop spaces at the required intervals.

#### *5.6.3 Site Access*

Access to the site will be provided via both Margaret Street and Menangle Street as discussed below:

- Margaret Street Access – Margaret Street extends south east from its intersection with Emmett Close. This extension of Margaret Street will be used as a connection point to the proposed internal collector road within the subject development. It is noted that the Argyle Street / Margaret Street / Cliffe Street intersection is to be upgraded to a signals by late 2015.

- Menangle Street Access – It is proposed to upgrade the existing access located to the east side of Menangle Street, in order to join the proposed internal collector road within the subject development. The proposed access configuration with Menangle Street is discussed in further detail below.

The locations of the above mentioned connections are shown noting in **Figure 8**.

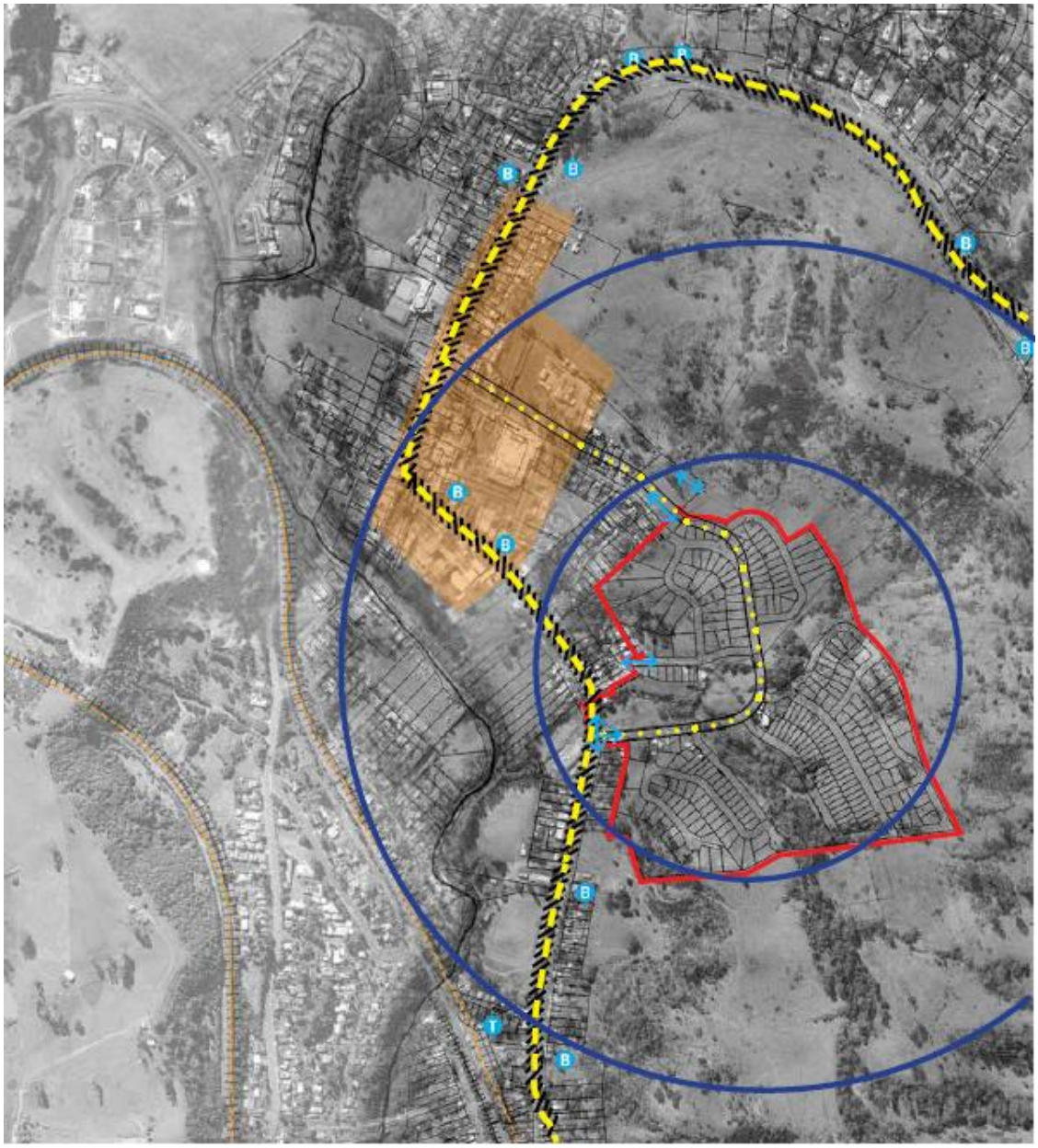

**Figure 8: Road Connections**

#### 5.6.3.1 Menangle Street Access

Given the current arrangement and location of the Menangle Street access point, it is acknowledged that the existing access arrangement shall need to be upgraded in order to safely and operationally accommodate the forecast traffic flows generated by the proposed residential lead development.

The following sub-sections will outline the constraints of the existing situation and further investigate a suitable access upgrade.

#### *5.6.3.1.1 Menangle Street/Site Access – Safe Intersection Sight Distance*

It is acknowledged that the site access point intersects the outside of the horizontal curvature of Menangle Street. Therefore the Safe Intersection Sight Distance (SISD) has been assessed at this location to ensure that adequate visibility is provided between the motorists on conflicting movements.

Referring to Table 3.2 in Austroads Guide Part 4A, the SISD applicable for the site access on Menangle Street is 123m (based on 60 km/h design speed along Menangle Street and a reaction time of 2.0 seconds). The following **Figure 9** outlines the SISD model applied to this scenario.

From the SISD envelop illustrated in the figure below, it is evident that the vehicles approaching the site access point can foresee any potential conflicts with a clear sight envelop of 123m (with no permanent obstructions present within the sight triangles). Therefore, this sight distance, along Menangle Street, is deemed adequate to cater for the access point to the proposed development.

#### *5.6.3.1.2 Menangle Street/Site Access – Minimum Gap Sight Distance*

The Minimum Gap Sight Distance (MGSD) is based on distances corresponding to the critical acceptance gap that drivers are prepared to accept when undertaking a crossing or turning manoeuvre at intersections. **Figure 9** below also illustrates the sight distance to a through vehicle from a vehicle turning left. Based on the Austroads Guide the minimum gap sight distance required is 83m. This requirement can be sufficiently met at the site access intersection with Menangle Street.


**Figure 9: SISD Envelop**

### *5.6.4 Traffic Impact Assessment 2018 Review*

Following the completion of the TIA, Cardno recently completed the Picton Town Centre Transport Plan 2026 (Transport Plan) for Wollondilly Shire Council (July 2018). The scope of work included traffic modelling, detailed strategic design and cost estimation.

The Transport Plan assessed the cumulative impact of background traffic growth and committed development including Reeves Creek (assumed to be 400 residential dwellings) in 2026. The Transport Plan recommended short-term road network upgrades to mitigate the impacts of traffic growth as outlined below.

| Intersection | Proposed Option |
|---|---|
| **Menangle Street / Argyle Street** | Right turn ban on the eastern approach (Menangle Street) |
| **Argyle Street / Margaret Street / Cliffe Street** | Increase maximum green time of the signal control plan on the eastern approach from 15s to 20s |
| **Menangle Street / Prince Street** | Upgrade to traffic signals |
| **Argyle Street / Prince Street** | Reduce the northern approach (Argyle Street) to one lane southbound<br>New continuous left turn out of Prince Street<br>Install a 90m right turn bay on the southern approach (Argyle Street) |
| **Argyle Street / Barkers Lodge Road** | No upgrades proposed assuming the above options are implemented |
| **Argyle Street / Lumsdaine Street** | Option 1 – upgrade to traffic signals<br>Option 2 – install pedestrian (zebra) crossing on Argyle Street south of the intersection |

Given the recommendations of the Transport Plan supersede the TIA previously prepared by Cardno in July 2014, the purpose of this addendum technical memo is to detail the impact of the proposed yield reduction of the Reeves Creek development from 400 dwellings to 241 dwellings. Access arrangements to the development remains unchanged.

#### 5.6.4.1 Trip Generation

The "Roads and Maritime Guide to Traffic Generating Developments TDT 2013/04a" defines the updated generation rates for the volume of generated peak hour trips per type of development. The generation rate is influenced by the type of development (high or low density), proximity to public transport and location. Based on the Roads and Maritime definition, high-density developments contain 20 or more dwellings, are close to public transport and are almost exclusively residential in nature. As there are no guidelines on trip generation for medium density residential developments the trip generation rate of low density land use was assumed across all developments (previous and proposed yield).

#### 5.6.4.2 Conclusion

Cardno previously prepared a traffic impact assessment in July 2014 for the Reeves Creek development, assumed to be of 400 residential dwellings at the time. Cardno recently completed the Picton Town Centre Transport Plan 2026 (Transport Plan), which included and assumed the Reeves Creek (also known as Picton East) development consisted of 400 residential dwellings. The Transport Plan recommended short-term upgrades to the road network to mitigate the impacts of background traffic growth and committed developments, subsequently superseding any upgrades proposed in the traffic impact assessment Cardno prepared in July 2014.

This addendum technical memo details the impact of the proposed yield reduction of Reeves Creek development from 400 residential dwellings to 241 residential dwellings. Access arrangements to the development remain unchanged. The proposed reduction to 241 residential dwellings results in about 113 less vehicular trips during the AM peak hour and 124 less vehicular trips in the PM peak hour.

Given the Transport Plan assumed the Reeves Creek development consisted of 400 residential dwellings, the proposed reduction in residential dwellings reduces vehicular peak hour trips on the road network and extends the life of the upgrades recommended in the Transport Plan.

### *5.7 Flood Impact Assessment*

Cardno undertook an assessment of the potential impacts of flooding as a result of the proposed development (refer to **Annexure D**). The following provides details of the assessment.

#### *5.7.1 Flood Model Results*

The pre-development and post-development scenarios were modelled for the 1%, 2%, 5% and 20% AEP events, together with the PMF event. Model runs were carried out for the 15mins, 30mins, 45mins, 60mins, 90mins, 2 hour, 3 hour, 6 hour, 12 hour and 18 hour durations. The peak water level, depth, velocity and hazard of the different durations of each AEP were then extracted to assess the flooding in the study area.

##### 5.7.1.1 **Pre-development Flood Results**

The flooding within the study area is predominantly constrained within the Riparian Corridor in all the flood events. The modelling results show that the Menangle Street culvert downstream of the study area is running full and has a capacity less than a 20% AEP. This has the effect of causing the Reeves Creek floodplain to fill as temporary storage for flood events and overtop Menangle Street. The overtopping of the road occurs in all the flood events.

It should be noted that the pre and post development models have been run using a fixed tail water level as the Stonequarry Creek can have sustained periods of elevated flooding. This is a conservative approach to the assessment and this measure was taken as this scenario is the most likely to impact the Reeves Creek flooding. The flooding that occurs within the Stonequarry Creek floodplain is generated by a large upstream catchment (the details of this modelling are summarised in Appendix B) and is not impacted by the addition of the development on Reeves Creek (see Section 6.1 for discussion).

The pre development results show that for Reeves Creek the flows are largely constrained to the deep valley areas up to the 1% AEP event (refer to **Figures 10** & **11**). This is expected due to the steep valley nature of the catchment. In the PMF event the floodwaters extent out of the main floodplain however, much of the flooding at the downstream end of the model is associated with the PMF event within Stonequarry Creek.

For the 20% AEP scenario the downstream tail water level has been set at the 5% AEP flood event for Stonequarry Creek as this was the smallest available event simulated within the Stonequarry Creek investigation. This causes the flooding downstream of Menangle street to appear high for the 20% AEP event but as this was outside the study area (area of interest) this was considered to be appropriate.

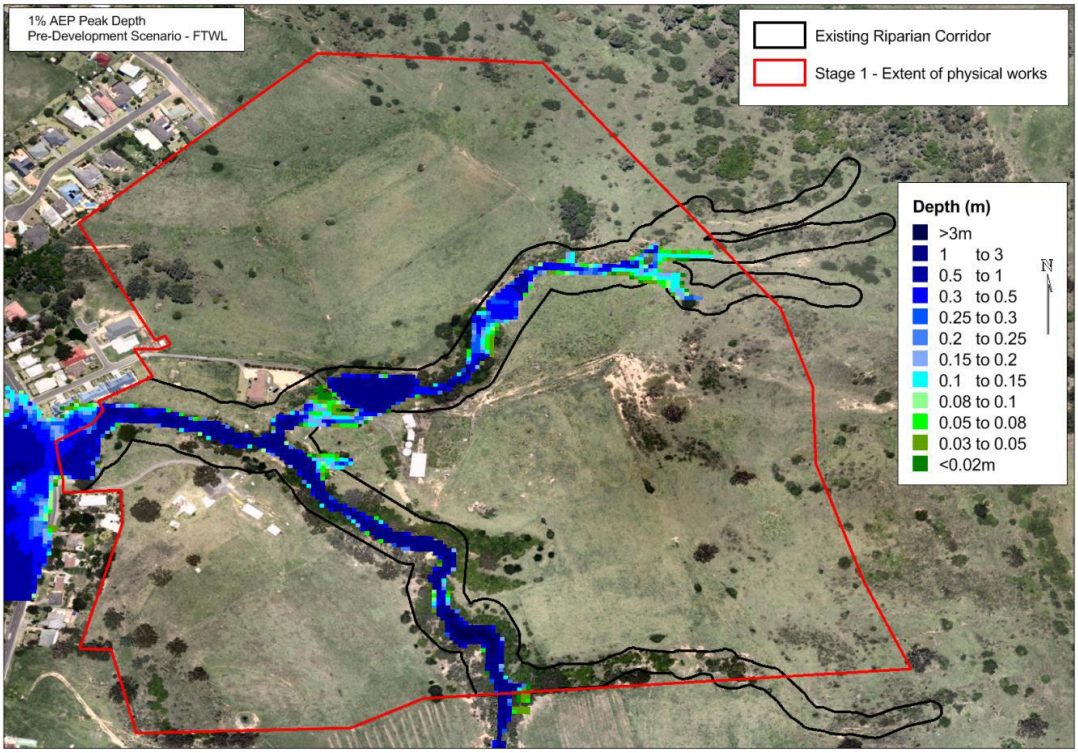


**Figure 10: 1% AEP Peak Flood Depths (Pre-development)**

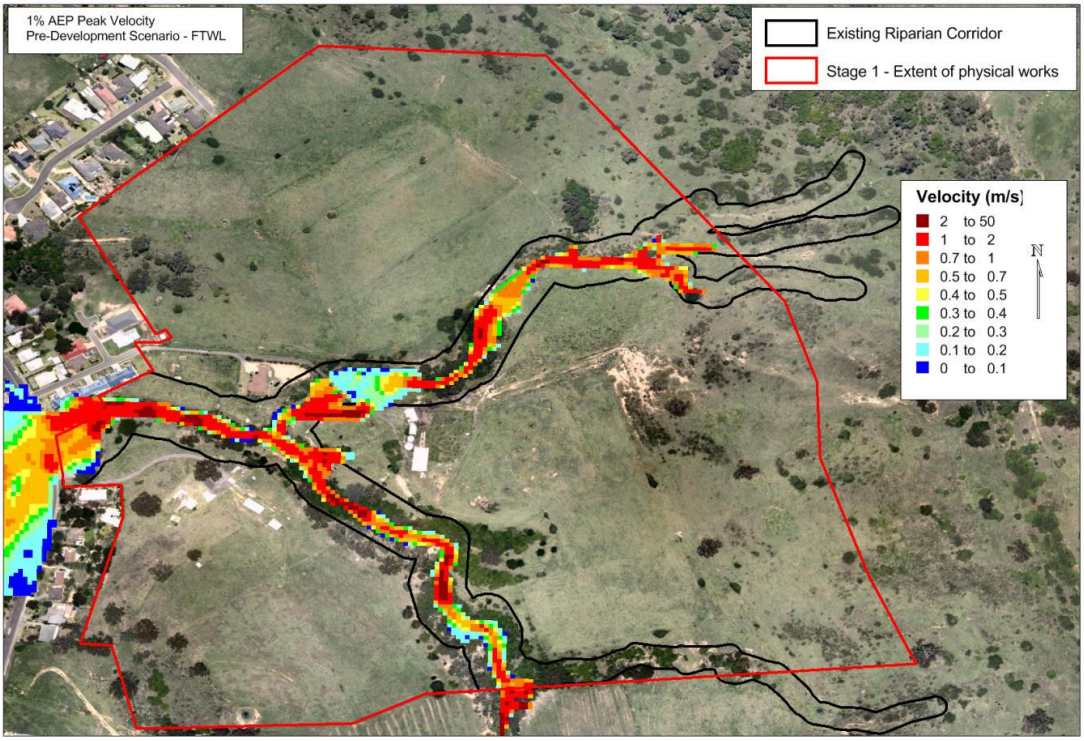


**Figure 11: 1% AEP Peak Flood Velocity (Pre-development)**

#### 5.7.1.2 **Post Development Results**

The post-development flood model results for depth, velocity, hazard and hydraulic categories are provided in a series of **Figures 12** & **13**.

The Post-development results are similar to that of the pre-development results. Within the figures the proposed basin alignment is evident in the depth plots. This is the main change to the flood behaviour within the model which aims at retarding the additional runoff from the catchments back to the existing levels.

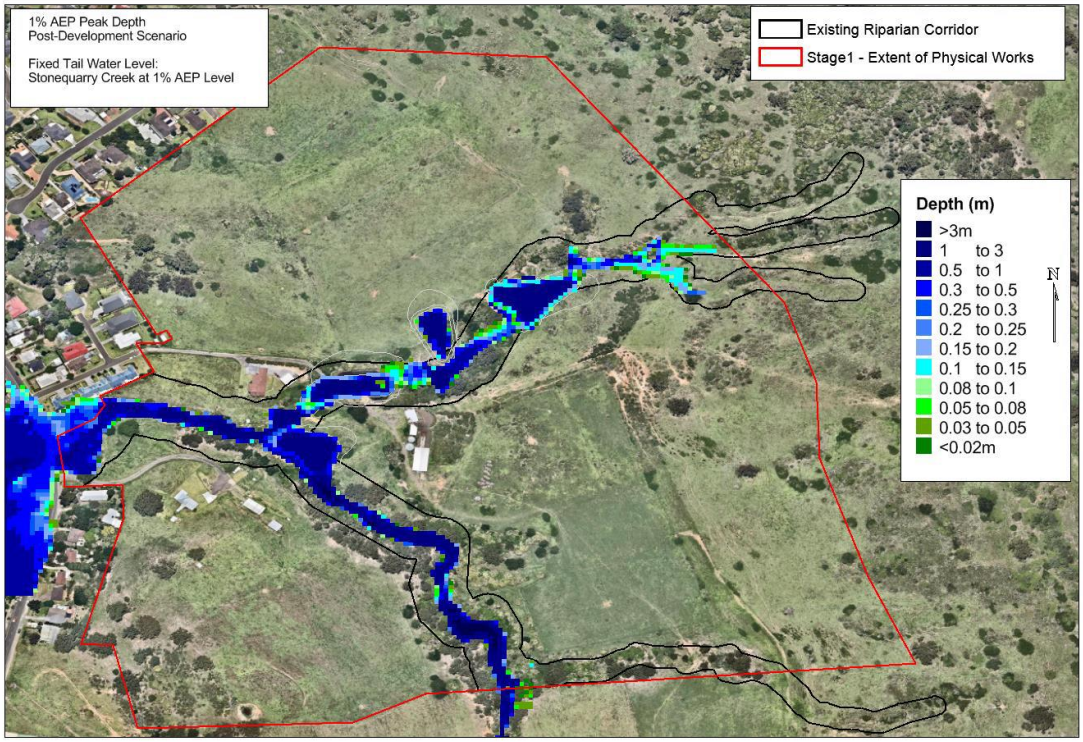


**Figure 12: 1% AEP Peak Flood Depths (Post-development)**

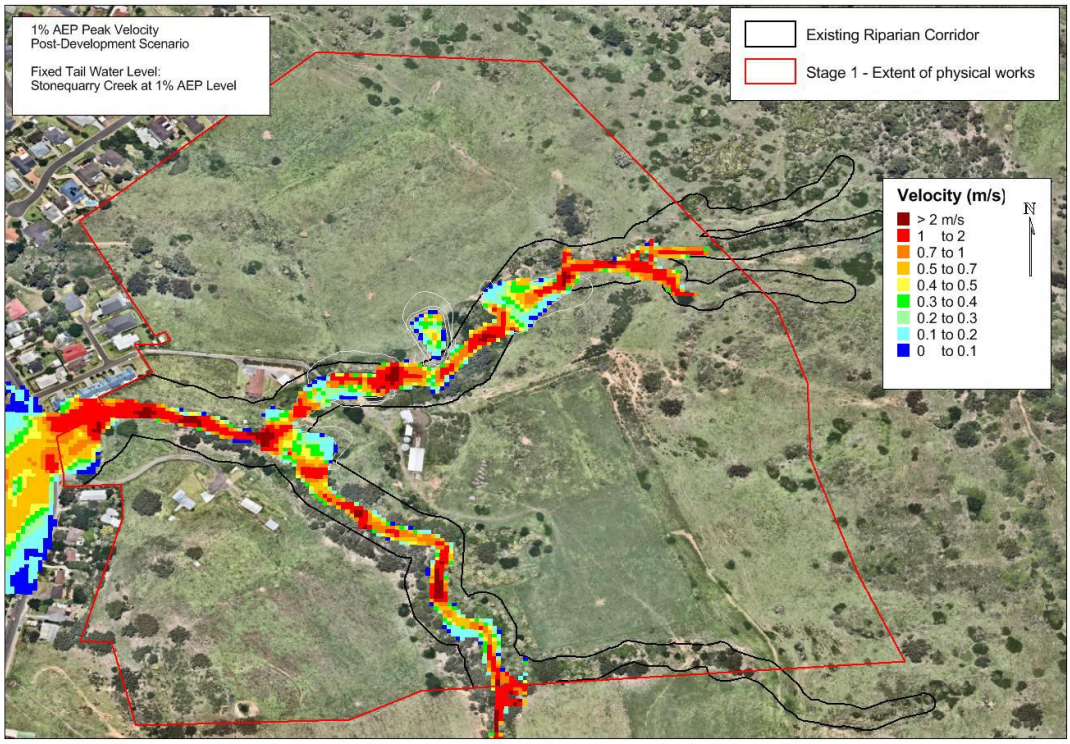


**Figure 13: 1% AEP Peak Flood Velocity (Post-development)**

### *5.7.2 Flood Impact and Risk Assessment – Review 2018*

JMD have now reviewed the Stormwater Hydraulic Report prepared by Cardno and dated April 2015. The report has been reviewed to confirm if the current changes to the rezoning limits and proposed lot layout will affect the results and conclusions detailed in the report.

To help reduce developed peak flows to pre-development levels Cardno had proposed that five (5) new OSD basins be installed. Four (4) of the basins were to be located in the main reaches of the creek while the fifth basin was proposed to be located upstream of the Emmett Street outlet.

The Cardno Report concluded that **"From the preliminary assessment it is evident that proposed concept design has no impact on the peak flood levels observed downstream of the site. Within the study area the main changes to the flood behaviour are the introduction of the series of basins to retard the additional surface water runoff due to the proposed development. This assessment demonstrates that these basins are adequately sized and that the changes to the flood conditions are minor within the study area. Again it is important to note that there is no downstream change to the flood conditions as a result of the proposed development."**

Since this report was issued the limits of rezoning have been reduced and under a request from Council an additional diversion drain and OSD Basin has been proposed upstream of the four (4) basins in the main creek but located outside the Creek. The intention of these additional drainage elements was to reduce the existing flow being conveyed through Emmett Street. The additional diversion drain and OSD Basin will be designed to reduce peak flows to pre-development levels for all storm events up to and including the 1% AEP.

As the limits of the proposed development have been reduced the site will be less impervious than originally estimated in the Cardno modelling. This will result in lower peak flows and lower flood impacts. As the Cardno already confirmed that **"From the preliminary assessment it is evident that proposed concept design has no impact on the peak flood levels observed downstream of the site**." JMD confirm that the current changes to the rezoning limits and proposed lot layout will not affect the results and conclusions detailed in the original report.

### *5.8 Stormwater Management Assessment*

Cardno undertook an assessment of the potential impacts on water quality as a result of the proposed development (refer to **Annexure M**). The following provides details of the assessment.

#### *5.8.1 Zoning Issues*

An issue arose during the review process that drainage may not be a permissible development within the E2 Environmental Conservation zone. As a result, it is proposed that drainage be added to the permissible use column. In this regard to overcome any ambiguity, it is considered that Council amend the Standard LEP Template by adding drainage to this column. In this regard it is recommended that the 'permitted with consent column' be amended as follows:

Drainage; Earthworks; Environmental facilities; Environmental protection works; Flood mitigation works; Recreation areas; Roads; Sewage reticulation systems; Water recycling facilities; Water supply systems; Waterbodies (natural)

These uses are consistent with the State Environmental Planning Policy (Sydney Region Growth Centres) 2006 list of uses permitted in the E2 Environmental Conservation zone.

#### *5.8.2 Water Quality Assessment*

The XP RAFTS model was developed to estimate existing condition storm hydrographs for the 1, 5, 20 and 100 year ARIs. The resulting flows were used as the permissible site discharge (PSD) requirements for stormwater detention basin sizing to ensure pre-development flows are maintained in the post-developed condition.

The modelling results demonstrate that the basins will limit the post development runoff to match existing peak flows for all storms up to and including 1% AEP events. Results from the basin modelling indicate depths are generally less than 1.5m except Basin A1 and A2, where they are located at the junction of two watercourses.

#### *5.8.3 Stormwater Quality Analysis*

The Water Sensitive Urban Design (WSUD) goal for the proposed development is to reduce the pollutants and nutrients from the stormwater runoff whilst the land transitions from its current rural usage into an urban development. The strategy is to utilise established and accepted treatment devices such as bio-retention basins and Gross Pollutant Traps (GPT) to improve the water quality.

##### 5.8.3.1 **Proposed WSUD Strategy**

The gross pollutants and coarse sediments can be removed effectively by GPT. A vortex type GPT can remove up to 98% of gross pollutants and 95% of coarse sediment.

A number of studies have found that most hydrocarbons, oil and grease are attached to sediments. Based on CRCCH, up to 70% of oils are associated with solids in stormwater. Specification from a CDS unit shows the GPT has removal efficiency up to 94%.

Site Constraints, particularly topography, makes that it difficult to provide end of catchment measures such as wetlands or large bioretention basins. The following strategy has been proposed:

- For catchments K, L, R1, T and W, large end of catchments bio-retention basins are proposed in the treatment train to remove the suspended solids and nutrients from the stormwater runoff. Each bioretention basin will have a 300mm extended detention zone and 500mm thick sand filter to treat the stormwater runoff.
- For catchments J and S, it is proposed to use a proprietary end-of-line device such as a Humes Jellyfish filter rather than a bio-retention basin.

#### 5.8.3.2 **Water Quality Modelling**

The industry standard Water Quality Modelling package MUSIC (version 6) was used to analyse the performance of the proposed treatment train. For the purposes of this report, the multiple bioretention measures proposed for catchments J and S have been modelled as a single node. The treatment train has been checked to ensure stormwater quality targets are met before stormwater runoff leaves the site.

Historical rainfall records have been obtained from the Bureau of Meteorology (BOM) to replicate the mean annual rainfall for the site. The closest station to Picton with reliable long term data is Station No. 67035 at Liverpool. Ten years of data, 1966 to 1977, has been extracted from this station data set to simulate Camden's mean annual rainfall. The adopted historical mean annual rainfall is 823mm compared to Camden's 800mm.

The data provided by BOM did not include evapotranspiration data and Parramatta monthly average aerial PET data has been used in lieu for the modelling.

GPT's were modelled as a vortex type unit with the efficiency outlined below:

- Total Suspended Solids (TSS) – 70% for inflow concentrations greater than 75mg/L;
- Total Nitrogen (TN) – 0%; and
- Total Phosphorus (TP) – 30% for inflow concentration greater than 0.5mg/L.

The properties adopted for the modelling of the bio-retention basin are:

- Extended detention depth – 300mm;
- Hydraulic conductivity – 120mm/h;
- TN Content of Filter Media – 400mg/kg; and
- Orthophosphate Content of Filter Media– 40mg/kg.

#### 5.8.3.3 **Review 2018**

JMD have now reviewed the Stormwater Management Report prepared by Cardno and dated April 2015 with Ref: NA50613047. The report has been reviewed to confirm if the current changes to the rezoning limits and proposed lot layout will affect the results and conclusions detailed in the report.

To help reduce developed peak flows to pre-development levels Cardno had proposed that five (5) new OSD basins be installed. Four (4) of the basins were to be located in the main reaches of the creek while the fifth basin was proposed to be located upstream of the Emmett Street outlet.

To help improve water quality from stormwater flows discharging from the development, five (5) bioretention filters (raingardens) and three (3) Humes Jellyfish filters were proposed by Cardno. They are to be located at appropriate locations throughout the development.

The Cardno Report concluded that:
**"This stormwater management report investigated the performance of the proposed stormwater management strategy which includes on-site detention basins, gross pollutants traps and bioretention basins to treat the stormwater runoff from the development.**

**The combination of the above measures and the modelling results has demonstrated the proposed stormwater management strategy has:**

- **Meets the water quality objectives in accordance with Wollondilly Shire Council Design Specification;**
- **Incorporated the WSUD principles and managing urban stormwater as outlined in the OEH General Guidelines for Strategic Planning;**
- **Controlled the post development peak runoff to match the pre development condition; and**
- **Identified the order of the existing watercourses and the associated requirements to protect and maintain them."**

Since this report was issued the limits of rezoning have been reduced and under a request from Council an additional diversion drain and OSD Basin has been proposed upstream of the four (4) basins in the main creek but located outside the Creek. The intention of these additional drainage elements was to reduce the existing flow being conveyed through Emmett Street. The additional diversion drain and OSD Basin will be designed to reduce peak flows to pre-development levels for all storm events up to and including the 1% AEP.

As the limits of the proposed development have been reduced, the site will be less impervious than originally estimated in the Cardno modelling. This will result in lower peak flows and lower levels of suspended solids and nutrients within the water runoff. As such, JMD confirm that the current changes to the rezoning limits and proposed lot layout will not affect the results and conclusions detailed in the original report.

As the additional diversion drain and OSD Basin are located outside the creek and will reduce post development flows to pre-development levels for all storm events up to and including the 1% AEP, they will have a negligible impact on the results detailed in the Cardno report. JMD note that all sizes and locations are subject to detailed design and modelling during future DA applications.

### *5.9 Heritage*

#### *5.9.1 Aboriginal*

AHMS undertook an assessment of the subject sites (refer to **Annexure I**). The following provides details of the assessment.

##### 5.9.1.1 Predictive Sensitive Modelling

As a result of the investigation, we have developed and mapped the predictions made regarding archaeological potential. The purpose of the predictive model is to:

- Provide the proponent, landowners, Wollondilly Shire Council and the Registered Aboriginal Parties with information about areas of Aboriginal archaeological sensitivity to feed into constraints and opportunities analysis; and
- Help inform early planning and design work.

In developing the model, we drew on a number of environmental and disturbance variables that were used to identify areas of varying 'archaeological sensitivity'. For the purposes of the model, the term 'archaeological sensitivity' is defined as a combination of likely density, integrity and research value of archaeological deposits within any given area (refer to **Figure 14**).

#### *5.9.1.1.1 Factors included in Predictive Model*

**Proximity to water sources:**

Proximity to water is one of the key determinants of archaeological potential. In general, sites are larger, more complex and more frequently found in close proximity to water sources. Levels of sensitivity are predicted to increase with higher order drainage lines and more permanent wetlands.
Drainage and hydrology patterns have been significantly altered since European settlement in order to retain water in storage dams for agricultural purposes and drain waterlogged areas to open them up for grazing and cultivation.

**Low Spur/Crest Landforms**

Previous investigations throughout the Cumberland sub-bioregion have shown that low spur/crest landforms are often associated with a higher density and frequency of archaeological deposits – particularly when they are also located in close proximity to water sources. Low spur/crest landforms were delineated using aerial photography and topographic mapping.

**Areas of cut and fill disturbance:**

These areas are considered unlikely to contain Aboriginal archaeological deposits because topsoil units (i.e. artefact bearing soil units) have been removed. These areas include roads, dams and the construction of building platforms for houses and sheds. They are considered to have negligible archaeological sensitivity.
The model traits for the subject area are:

- Low spurs/crest/terrace landforms situated within 100m of a waterway/drainage line: very high archaeological potential;
- Land within 50m of a waterway/drainage line: high archaeological potential;
- Land within 100m of a waterway/drainage line: moderate archaeological potential;
- Land within 200m of a waterway/drainage line: low archaeological potential;
- All other areas = very low sensitivity; and
- Cut and fill disturbance = very low - nil sensitivity.

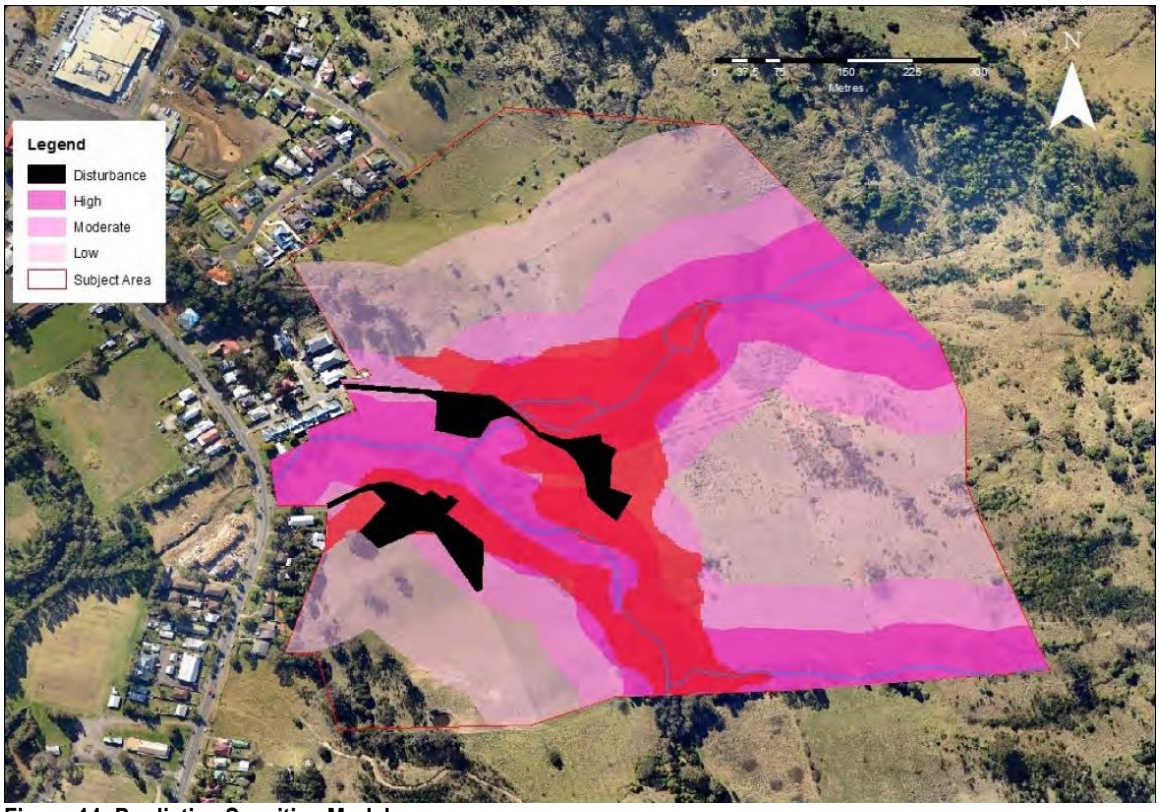


**Figure 14: Predictive Sensitive Model**

### *5.9.2 Impact Assessment and Management Strategies*

The following section details the potential archaeological impact of the proposed development, and the relevant legislative requirements to address this impact. Options to avoid, minimise and/or mitigate impact are outlined.

#### 5.9.2.1 **Potential Impact**

The findings of this assessment have revealed no significant archaeological or cultural Aboriginal objects or sites, with which to reject the proposed re-zoning. It is, however, highlighted that extensive areas that have potential to contain such sites were identified, and remain poorly defined as this stage.

While these areas are all largely within the riparian corridors, and will probably remain unaffected by any development resulting from the proposed rezoning, recommendations below are made to accurately explore these areas as a priority. It is considered that at the very least no ground disturbance should be permitted prior to such investigations, which will then inform any future management of the subject area.

#### 5.9.2.2 **Recommendation**

The following recommendations are based on:

» The requirements of the National Parks and Wildlife Act 1974;

» The results of the archaeological investigation and assessment documented in this report; and

» The views and recommendations of the registered Aboriginal parties.

The general recommendations are as follows:

» The final report should be submitted to the registered Aboriginal parties for their information; and

» If the boundaries and/or design of the proposed development are revised, archaeological impact assessment of this revision should be undertaken.

### *5.9.3 Built Heritage Assessment*

A commentary in respect of the management of European heritage significance having regard to prevailing Statutory Controls, in the context of the proposed development, is contained in the report by AHMS (refer to **Annexure E**). An overview of the subject commentary is provided below.

#### 5.9.3.1 Built Heritage

The built environment of the subject site has been previously surveyed as part of the Picton component of the Wollondilly Council Heritage Study, 1992 by JRC Planning Services Pty Ltd and in subsequent reviews.

#### 5.9.3.2 Existing Heritage Listings

There are no existing heritage items listed on heritage registers within the subject site. One item is located in the vicinity, being a culvert under Menangle Road, 60m south of the intersection with Baxter's Lane (refer to **Figure 15** below.

#### 5.9.3.3 Other Items

The subject site was surveyed to identify any other potential built heritage items which may not yet be recognised through heritage listing. No new potential built heritage items were identified within the subject site.

#### 5.9.3.4 Conservation Areas

The Picton Heritage Conservation Area (HCA) has one border contiguous with the western boundary of the Subject site, with a very small area adjacent to Menangle Street contained within the HCA boundary. Picton HCA is divided into sub-precincts and the subject site is adjacent to Precinct 4 - Menangle Street Precinct. Figure 19 shows the boundaries of the Picton Conservation Area and its sub-precincts.

The Wollondilly Development Control Plan 2011 provides a description of the form and character of the Precinct:

*"The Menangle Street Precinct provides an aesthetic heritage gateway into Picton, which is due to the number of 19th and early 20th century buildings appearing at intervals along the road. Key historic buildings include the Imperial (former Terminus) Hotel (1863), Wendover House (1886), and the former Great Southern Hotel (circa 1885). The development of the railway yards and associated infrastructure in the 1890s led to the development of a small commercial area near the railway station. Key historic buildings in the Precinct include the Jarvisfield Store (1863), Stationmasters House (1877) and Railway Station (1863), former Furriers factory (1920) and the former railway turntable and inspection pit for the Great Southern Railway Line.*

*The well-established landscaping along the street incorporates a mix of introduced deciduous and native trees adding to the visual context and overall gateway feel of the Menangle Street approach into Picton. Unfortunately there have been unsympathetic residential flat buildings constructed along Menangle Street which detract from the overall heritage character of the precinct.*

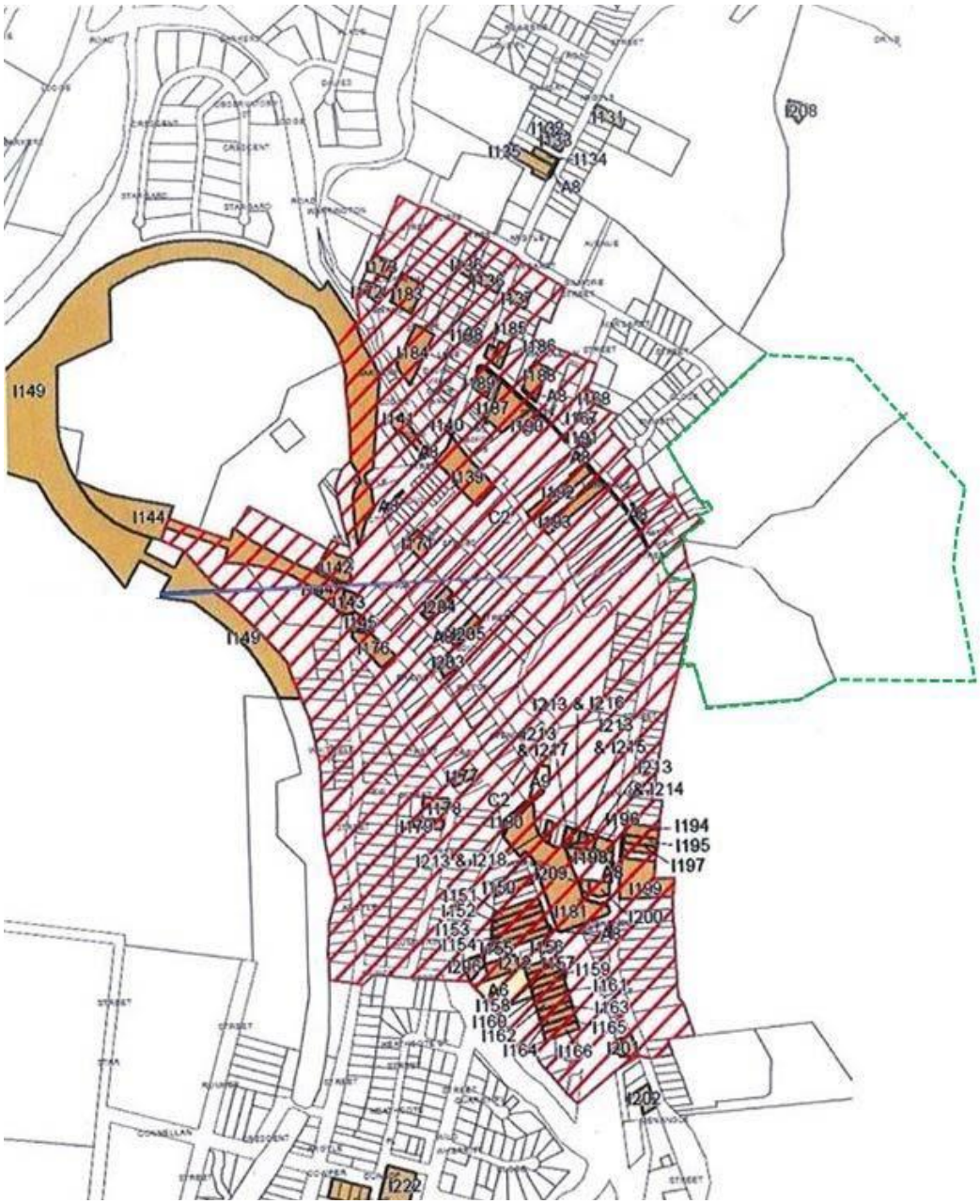


**Figure 15: Picton Heritage Map**

### 5.9.3.5 Conclusions and Recommendations

#### *5.9.3.5.1 Conclusions*

- The subject site was part of the first grants in the area to Henry Antill and formed part of the Jarvisfield subject site remained in the Antill family ownership until the late twentieth century;
- The subject site has been utilised for cattle grazing for the majority of the past two hundred years;
- A site inspection indicated that there are no historic buildings or structures within the subject site;
- There is one heritage item located adjacent to the site, being the culvert under Menangle Road. This item is owned by Wollondilly Council;
- The subject site contains fences, gates, animal trails and other minor features associated with cattle grazing;

- A small number of modern buildings associated with small-scale rural activity, including horse and cattle agistment, have been added to the subject site in the recent few decades; and
- Proposed rezoning, subdivision and subsequent development of the subject site is unlikely to have any substantive impact upon any heritage items or heritage conservation areas.

#### *5.9.3.5.2 Recommendations*

The following recommendations are made based on the conclusions of the report:

- Based on the findings of this report, no further built heritage, historic archaeological assessment or historic heritage permits and/or approvals are required prior to the proposed rezoning and development;
- If the boundaries of the proposed development are revised to include areas not investigated as part of this report, assessment of these additional areas should be undertaken in order to identify and appropriately manage historical archaeological remains that may exist in these areas and may be considered to be 'relics' as defined by the *Heritage Act 1977*;
- The future development of the subject site should respect the heritage values of the adjacent Culvert under Menangle Road. Any potential impacts upon the culvert arising from the development should be minimised and may require a Heritage Impact Assessment to be prepared for Wollondilly Council.
- The future development of the subject site should respect the heritage values of the adjacent Picton Heritage Conservation Area.
- When a future development plans are known, a Heritage Impact Statement should be prepared to assess the potential impacts of the proposed development to the heritage values of the Picton Heritage Conservation Area.
- A copy of this report should be lodged with the Picton Library Local Studies section; and
- Should any suspected relics be exposed or disturbed during the development, the Heritage Council needs to be formally notified, as required by Section 146 of the NSW *Heritage Act 1977*, and advice should be sought from a heritage professional regarding any further action.

### *5.10 Landscape and Visual Impacts*

A Visual & Landscape Assessment (**Annexure B**) report prepared by Taylor Brammer has assessed the landscape and visual impacts:

#### *5.10.1 Visual Analysis*

As part of the site analysis, a visual landscape study addressed the visual impact of the proposed Reeves Creek development. This study establishes four sections through the Reeves Creek site. The cross-sections and visual analyses use the concept master plan to identify the location of future streets and show two storey housing forms to illustrate highest potential building forms. A site analysis and context plan is provided by **Figure 16**.

A visual analysis of the cross-sections reveals and demonstrates that the visual impact of the Reeves Creek development to the existing urban areas of Picton will be minor. The main reason for this is that the proposed development is located within a discrete valley (Reeves Creek) that runs parallel to Menangle Street. Within this valley, the proposed development is placed and designed to both minimise visual impact to the existing areas of Picton and to limit the impact of development on the ridgeline. Some parts of the Reeves Creek development will be visible at the two proposed access points at Menangle Street and Margaret St.

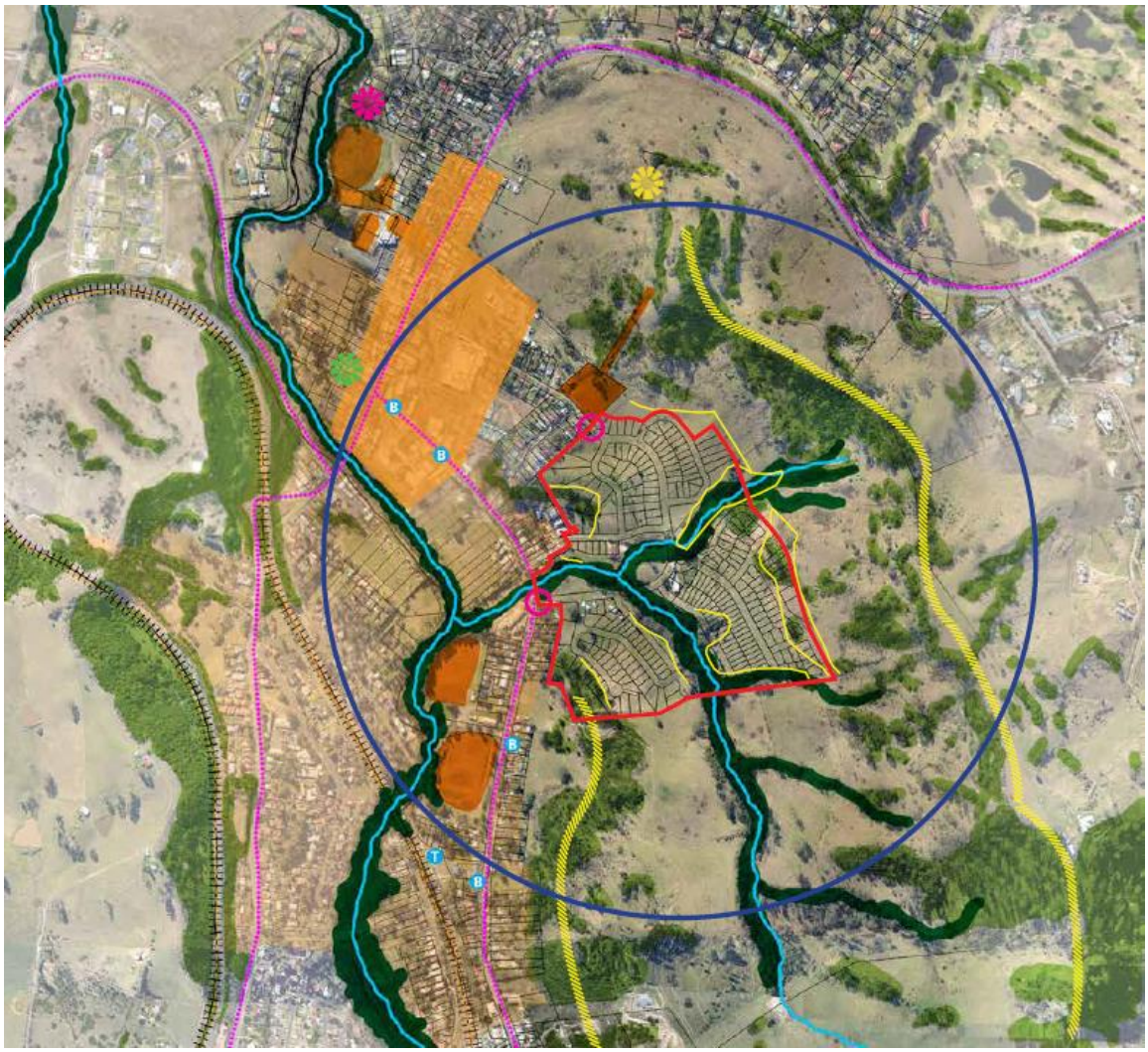

**Figure 16: Site Analysis and Context Plan**

### *5.10.2 Accessible and Connected Place*

The Reeves Creek development is designed to optimise access and connections, both to Picton and within the site itself.

To service the Reeves Creek development, two key connections into Picton's existing street network are proposed for Margaret Street and Menangle Street. The Margaret Street connection is proposed as a southerly extension of the existing street into Reeves Creek. The Menangle Street connection proposes a new junction onto this street that provides access the Reeves Creek development from the west and south.

The Reeves Creek development is designed with a strong and connected urban street structure. Local street connectivity is a key design principle and cul de sacs are only used in circumstances where a combination of landform and / or the structure of existing urban development prevent street connections being made. This connected street structure will also benefit both pedestrian and cycleway access for new residents.

The primary street network directly connects both Margaret Street and Menangle Street into the Reeves Creek development and these two connector streets intersect in the centre of the proposed village.

The Margaret Street extension is designed as the key structural north-south avenue within the Reeves Creek development.

The proposed Reeves Creek development will have good access to existing bus services (900, 901, 912A) that currently run along Menangle Street. Should changes and extensions to the local bus network be implemented as a response to the potential urban growth of Picton, the development's primary connector streets are designed to accommodate future bus routes. Ahead of any potential changes to bus routes, connected

The proposed Reeves Creek development is conveniently located within 900m walking distance of Picton Train Station, which provides good rail access to the Sydney Trains network. The Reeves Creek development proposes residential streets that are designed to the both slower and safer.

### *5.10.3 Visual Analysis*

As part of the site analysis, a visual landscape study addressed the visual impact of the proposed Reeves Creek Village development. This study establishes four cross sections through the Reeves Creek Village site. The cross-sections and visual analysis use the concept master plan to identify the location of future streets and show two storey housing forms to illustrate highest potential building forms.

The cross-sections reveal and demonstrate that the visual impact of the Reeves Creek development to the existing urban areas of Picton will be minor. The main reason for this is that the proposed development is located within a discrete valley (Reeves Creek) that runs parallel to Menangle Street. Within this valley, the proposed development is placed and designed to both minimise visual impact to the existing areas of Picton and to limit the impact of development on the ridgeline.

The visibility of the Reeves Creek Village development is limited to the two proposed access points at Menangle Street and Margaret St (refer to **Figure 17** .

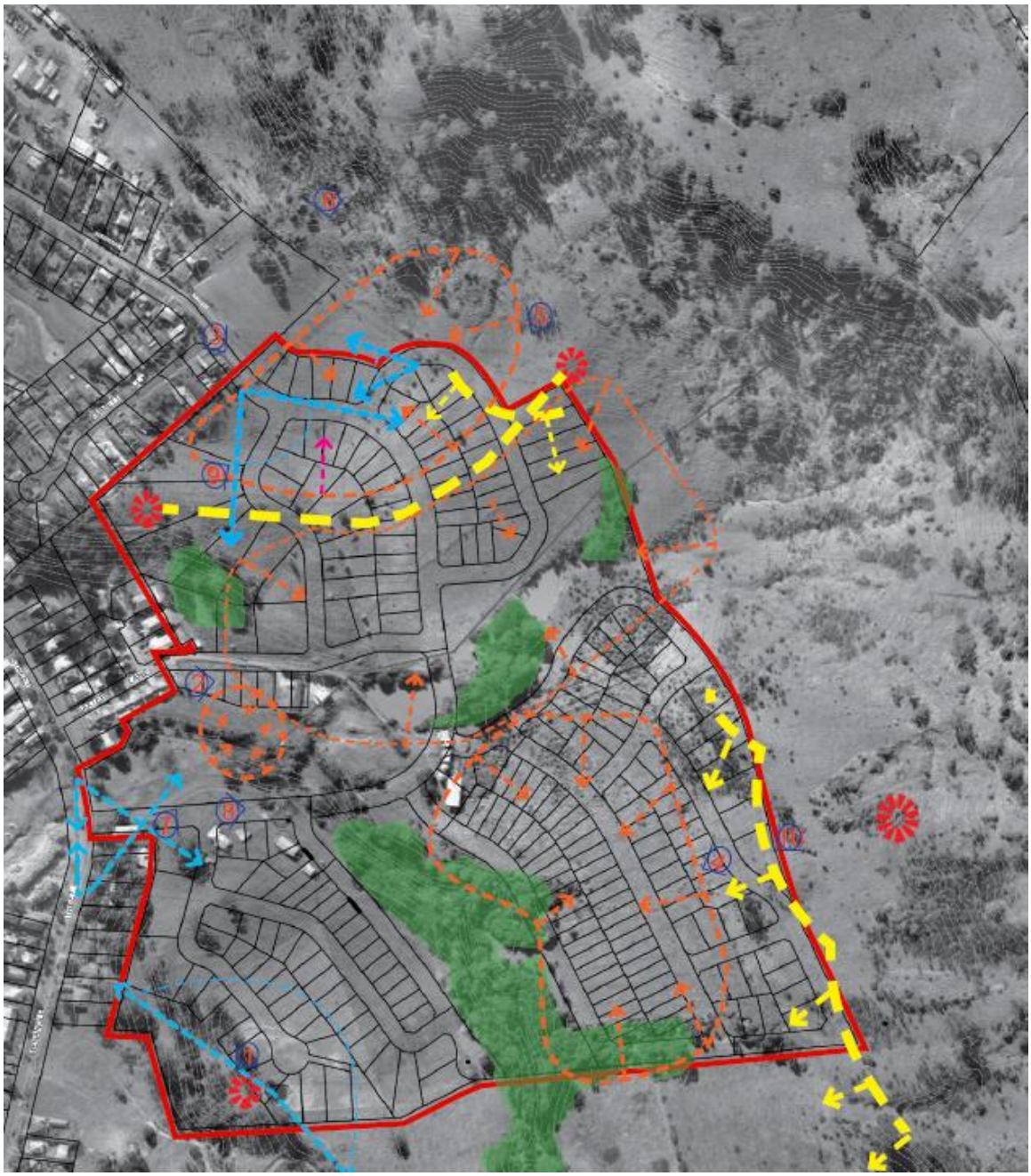

**Figure 17: Visual Analysis**

### *5.10.4 Landscape Master Plan*

The following design notes present a commentary on specific areas of the Reeves Creek Village landscape.

1. Reeves Creek Village will be accessed from Margaret Street and Menangle Street. Margaret Street entry provides views to vault hill and the ridgeline.
2. Menangle Street entry provides an opportunity to recognise the history of the area by enhancing and integrating the existing sandstone culvert that captures Reeves Creek and guides it under Menangle Street.

3. The existing degraded creekline area is to be rehabilitated to establish an appropriate fully structured riparian corridor that integrates both bioretention basins and the requirements of bushfire A.P.Z's
4. Bridge access across Reeves Creek is located to minimise the impact on the existing vegetation and provide a dynamic entry point to the heart of the project.
5. The existing significant stand of remnant vegetation is mainly retained and acts as a key feature to the centre of the project.
6. On site detention within the riparian area is integrated with the natural landscape using locally sourced rock and gravel with inter plantings of macrophytes, native grasses and canopy trees.
7. The existing minor watercourses at the top of the creek catchment are re-vegetated to establish a series of "green fingers" with Indigenous trees and grassland planting.
8. The riparian zone forms a vegetated edge to the Collector Road with the natural bushland extending to the road edge. Vegetation is to be managed along the road edge to meet the Bushfire APZ requirements.
9. Street tree plantings along all roads will include small native trees to develop a sense of place to the village and ameliorate any distant views to the project from adjoining residential areas.
10. The existing hilltop area will be retained in its current form with the establishment of some additional mature canopy trees to strengthen the hilltop as a visual marker for the project.

Refer to **Figure 18** below.


**Figure 18 Landscape Master Plan**

### *5.11 Proposed Planning Controls*

#### *5.11.1 Proposed Land Uses*

The Reeves Creek Village design and land use strategy seek to balance the impact of proposed new residential uses with a strong contextual landscape, the re-establishment of riparian corridors and environmental areas and the creation of new local public open spaces and key landscape connections.

The two main riparian creeks within the Reeves Creek site are proposed to be zoned Environmental Conservation (E2). The hilltop located in the southwestern part of the site is proposed to be zoned Environmental Living (E4), which will retain and manage the environmental values of the group of mature trees located on the top of the hill (refer to **Figure 19** below). Low density residential uses (R2), which are generally located within the valley floor, the lower slopes of the ridge and the hilltop. The following land uses and associated areas (ha) are proposed for Reeves Creek:

| | |
|---|---|
| R2 Low density residential | 21.68 ha |
| E2 Environmental conservation | 7 ha |
| E4 Environmental Living | 0.82 ha |

The zoning plan highlights a geotechnical constraint line which limits the extent of higher density residential development to the lower slopes of the ridge and is shown by a red dotted line, as determined by DP and addressed above in Section 5.2.

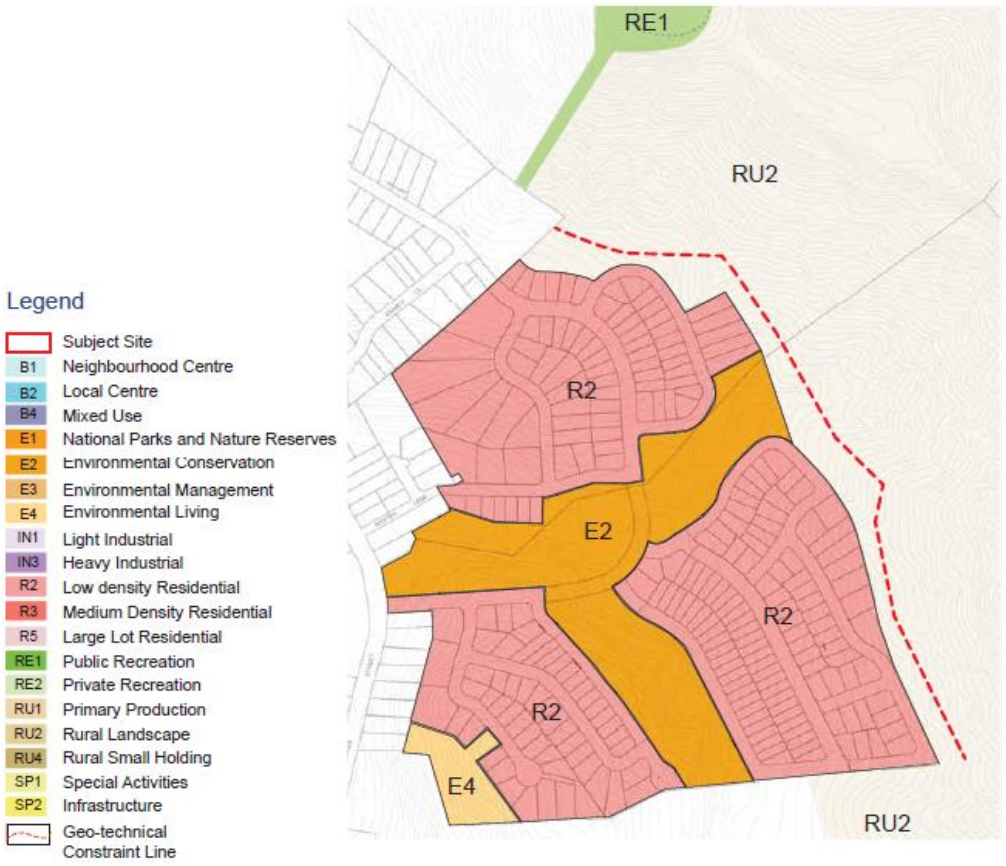


**Figure 19: Zone Plan**

### *5.11.2 Proposed Building Heights*

The Reeves Creek development is proposed to provide a mix of building heights that have been considered in parallel with proposed site structure and housing layout. Across the site, a general maximum building height of 9m is proposed, which enables housing of up to 2 storeys on sloping land.

The proposed building heights will be represented by a building height plan, as illustrated below, which forms part of the amending LEP for the site, as illustrated below in **Figure 20**.

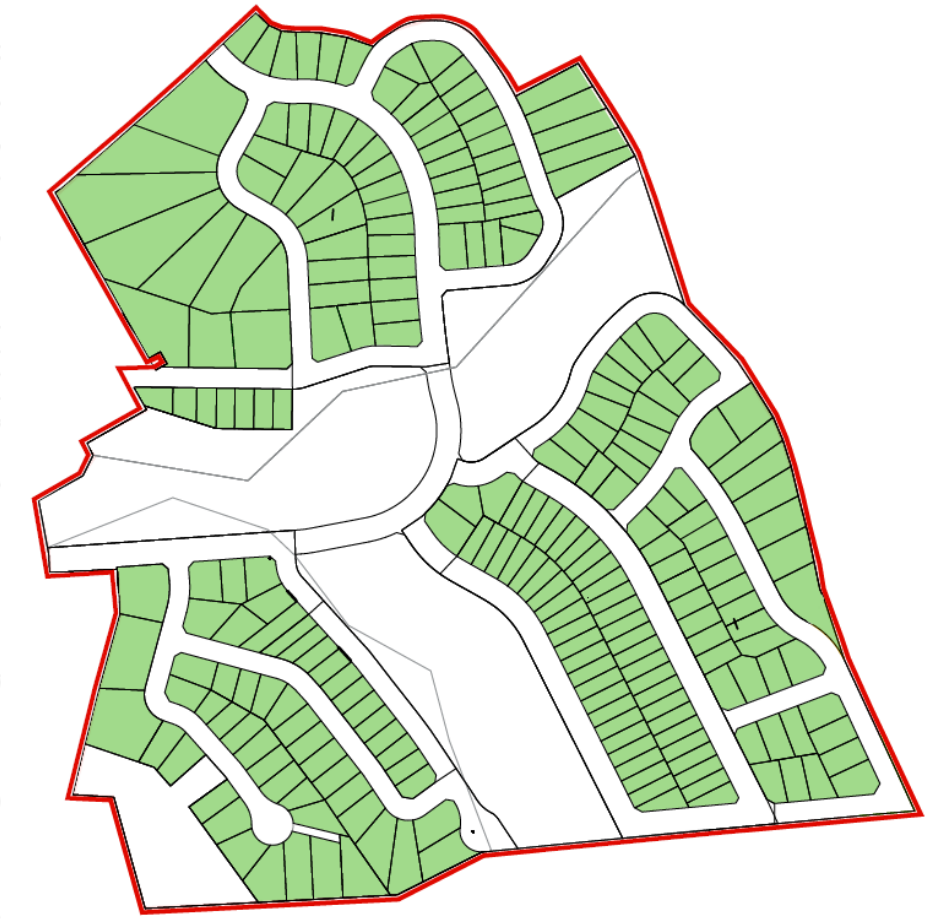

**Figure 20: Building Heights**

### *5.11.3 Housing Densities*

To support a diverse dwelling mix and improve affordability, the Reeves Creek development proposes a balance of dwelling densities that support the Reeves Creek design strategy and are consistent with proposed building heights.

Housing densities across the proposed Reeves Creek development are to be managed using minimum lot sizes, which will apply for both the R2 Residential zone.

The proposed minimum lot sizes are represented by a minimum lot size plan, as illustrated below, which forms part of the amending LEP for the site, as illustrated below in **Figure 21**.

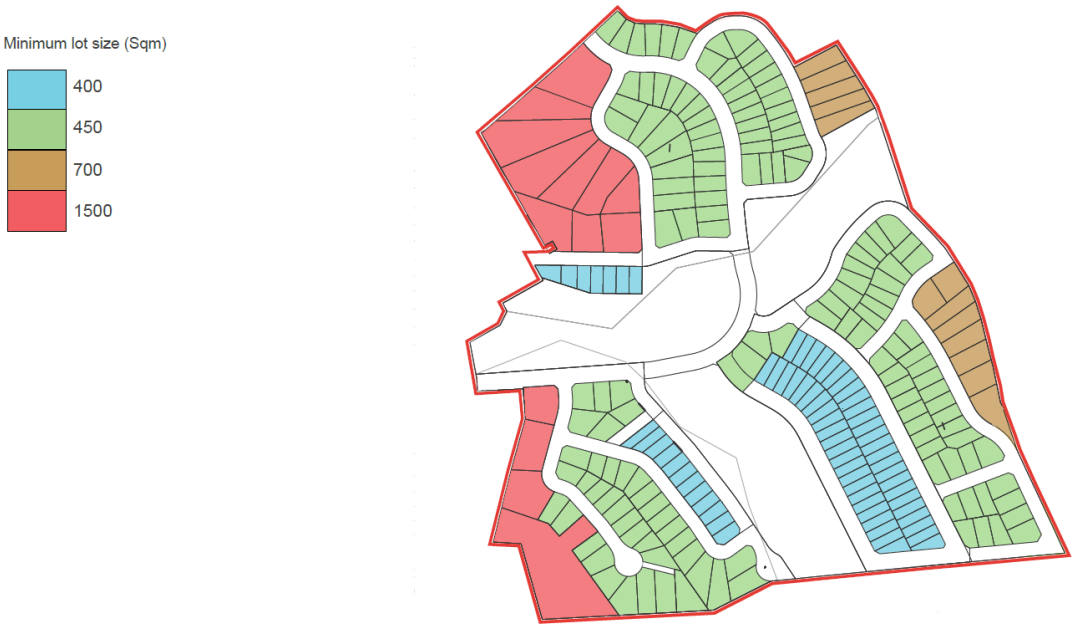


**Figure 23: Densities**

### *5.11.4 E2 Environmental Conservation*

It is recommended that the 'permitted with consent column' of the E2 Environmental Conservation zone be amended as follows:

Drainage; Earthworks; Environmental facilities; Environmental protection works; Flood mitigation works; Recreation areas; Roads; Sewage reticulation systems; Water recycling facilities; Water supply systems; Waterbodies (natural)

These uses are consistent with the State Environmental Planning Policy (Sydney Region Growth Centres) 2006 list of uses permitted in the E2 Environmental Conservation zone

### *5.11.5 Housing and Future Population*

The design development of the concept master plan, combined with a socio economic assessment of the proposal has revealed the following housing projections and population profile. The concept master plan illustrates that the proposed Reeves Creek Village development can deliver up 243 dwellings with an indicative mix of:

- 14 low-density houses designed to respond to the landscape (1,500+sqm)
- 14 houses on large landscaped lots (700+sqm)
- 149 houses on large lots (450+sqm)
- 67 houses on smaller 400sqm lots

Based upon typical local dwelling occupancy rates, the forecast population of Reeves Creek will be up to 683 persons. This eventual population will not be large enough to warrant the provision of any new social infrastructure, with the exception of local public open space.

The Reeves Creek Village population will however, contribute funds towards a need for augmentation and upgrading of a range of off-site local government facilities serving Picton and the wider Wollondilly area.

These will include facilities such as council's community, library, cultural, sporting and indoor recreation Facilities

### *5.11.6 Indicative Staging*

Development of Reeves Creek is proposed in a staged manner that can minimise the impact of construction on Picton's existing residents and the town centre. The staging strategy seeks to utilise both site access points at both Margaret Street and Menangle Street.

- In the early stages of the proposed development, Margaret Street is to be extended into the site to service the development of the Picton Edge Precinct.
- The Village Green Precinct and then the Vale Precinct will follow this stage.
- Finally the Hilltop Precinct, which can be accessed via Menangle Street and by bridge from within the Reeves Creek site itself.

## *5.12 Services Assessment*

Servicing of the Study Area with the requisite infrastructure needs to be considered to ensure that the land can be serviced when rezoned. In this regard Cardno undertook the necessary services investigation to ensure that the Study Area could be serviced. A copy of the assessment is provided at **Annexure H**.

### *5.12.1 Potable Water*

The existing infrastructure is not suitable to service the complete development. It is estimated that the following upgrades may be required:

- Linking existing 150mm potable water mains across Prince Street Rail overpass;
- Extending existing 250mm trunk main down Argyle Street and Margaret Street to the site boundary; or
- Amplification of the 150mm main from Tahmoor to a 300mm main (approximate length of 3.7 km).

Supply of potable water to the proposed development can be achieved and this should not prevent rezoning.

### *5.12.2 Wastewater Servicing*

The existing trunk infrastructure has adequate capacity to service the proposed development. The proposed development falls outside the Picton Service Scheme boundaries. Cardno recommends an application is made to Sydney Water and the Department of Planning in order to modify the existing Servicing Scheme boundaries. This application may be made following rezoning.

### *5.12.3 Gas Servicing*

There are no existing gas assets in the Picton area. Provision of gas services is demand driven, and at this time Cardno does not know of any future plans to provide gas to the proposed development. As gas is not an essential service this will not prevent rezoning.

### *5.12.4 Power Servicing*

There are high-voltage power assets in close proximity to the site, it is anticipated that these can be utilised to service the site. Through ongoing discussions with Endeavour Energy a more definitive servicing strategy will be developed, however the outcome of these discussions will not prevent rezoning.

### *5.12.5 Telecommunications Servicing*

There are Telstra assets in close proximity to the site boundaries which will be able to service the site. Further to this there are also existing NBN assets in Argyle Street that can be extended to service the proposed development. It is recommended discussions with telecom providers is initiated early following rezoning to ensure there is adequate time to plan the servicing of the proposed development.

## *5.13 Social Planning*

The purpose of this social planning report is to support and inform the proposed amended rezoning of the site in relation to social planning matters, and in particular to address the Specialist Studies Requirements issued by Wollondilly Shire Council for the Picton East Planning Proposal with regard to community facilities and open space. In this regard Elton Consulting undertook an assessment of the social aspects of the proposal (refer to **Annexure L**). The following summarises the assessment.

### *5.13.1 Recommendation*

The forecast population of the proposed development, at just under 900 people, will not be large enough to warrant the provision of any new social infrastructure for that population alone, with the exception of local public open space.

Local open space within the development will take the form of a central park of 1.5 ha, to be provided as works-in-kind and handed over to Wollondilly Council to own and manage. This park will be suitably embellished to meet the local recreation needs of the new community.

While not generating a need for its own facilities (apart from the park), the Picton East population will contribute towards a need for augmentation and upgrading of a range of facilities in the wider Picton area.

These will include:

- Council community, library, cultural, sporting and indoor recreation facilities. The development will contribute towards the expansion of these facilities in line with the requirements of the *Wollondilly Development Contributions Plan 2011*

- Primary and high schools. At this stage, it is not clear how the DEC might expand the capacity of local schools to accommodate the incoming population and whether this might be through adjustment of catchment zone boundaries, more demountable classrooms on existing sites or the development of additional schools. The DEC will need to develop a strategy which takes account of cumulative population forecasts for Picton once the Wollondilly Growth Management Strategy is released.
- Private sector services, including childcare centres, medical centres, allied health services and entertainment and leisure facilities. These types of services and facilities are provided on a commercial basis according to the feasibility assessments of operators. They are currently quite limited in the Picton area and the proposed development will contribute to the population numbers that will help to support and make viable a greater range of services, for the benefit of the whole Picton community.

The incoming population will also rely upon access to a range of district and regional facilities and services, including community health and hospital, welfare and support services, cultural and entertainment facilities and regional open space. Such facilities and services have very large population catchments, and the incoming population, at less than 900 people, will impact only marginally on these.

# *6 Compliance with Statutory Requirements*

## *6.1 Introduction*

The fundamental objectives of key pieces of NSW and Commonwealth legislation have been addressed in this planning process and the technical studies. Demonstration of compliance with those Acts has been considered and addressed. This section briefly describes how the fundamental objectives of key pieces of NSW and Commonwealth legislation have been addressed in this planning process. It is not intended to be an exhaustive demonstration of compliance with those Acts because many of them have operational sections which will be addressed over time if the development proceeds. All Acts listed below are NSW legislation, unless specifically noted.

## *6.2 Environmental Planning and Assessment Act, 1979 (as amended)*

The Environmental Planning and Assessment Act (EP&A Act) is the primary planning legislation in NSW, and is therefore necessarily wide-ranging and complex. A number of the parts of the Act, as well as several of the objectives, are therefore not directly relevant to the planning investigations for the Study Area. However, the Act does provide the statutory planning framework in which these investigations have been undertaken.

The site is importantly nominated for further investigation in the GMS 2011, given its inherent ability to contribute to the balanced development of the locality by providing additional residential land in a manner which promotes the orderly and economic development of the land and fosters the rehabilitation of natural systems and sustainability generally.

### *6.2.1 Section 9.1 Directions*

Section 9.1 of the EP&A Act allows the Minister to issue directions to Councils and other public authorities in relation to their functions and roles under the Act.

A wide range of section 9.1 directions have been issued but a number of them are not relevant to this Study Area and were addressed in the submission to both Councils.

## *6.3 Summary*

This Overview Report has demonstrated that the planning work undertaken to support this Planning Proposal has been cognisant of the various legislative requirements applying to urban development in NSW. A number of the Acts referred to in this technical studies will continue to be applicable throughout the detailed planning and development phases of the Study Area, so it is not intended that this section be a demonstration of complete compliance with the relevant Acts.

# *7 Zoning*

## *7.1 Introduction*

The prevailing statutory planning framework involves the controls/regulations at State, Regional and Local level, with the latter reflecting the influence of Wollondilly Shire Council.

A raft of State strategies and policies impact on the development proposal. At a strategy level these are less specific in terms of the Planning Proposal and are not prejudiced by the proposal; whilst at a policy level they are guiding principles and control mechanisms that must be complied with. The underlying principles of the relevant policies have been complied with where relevant at this stage of the planning process, whereas the others will be addressed in more detailed planning and the preparation of Development Applications.

Deemed SEPP 20 – Hawkesbury/Nepean River (No 2 – 1997) is the major regional plan of relevance. In this respect concern with water quality management in the catchment and impacts upon the visual qualities of the riverine environment have been addressed and underpin the development/management principles espoused.

The principal planning controls are embodied in Wollondilly Shire Local Environmental Plan No. 2010 (as amended). WLEP 2010 is the principal local planning instrument controlling development of residential areas of the Wollondilly Shire LGA.

The principal detailed development control document is Wollondilly Shire Development Control Plan 2014. The document includes generic good practice development controls, landuse specific controls and the capacity for Study Area specific controls. Importantly, it provides a template for integrated future Study Area specific planning controls.

The studies and investigation together with the Concept Master Plan development and testing have clearly demonstrated the ability to develop the Study Area for residential purposes, subject to appropriate environmental safeguards and the implementation of the previously cited management principles.

A range of landuses and their positioning on site is depicted in the Concept Master Plan. To realise such development the prevailing landuse zoning provisions must be amended by way of the preparation of an amending LEP. Such LEP must be stylized on the Department of Planning's Standard Instrument (i.e. Template).

### *7.2 Draft Local Environmental Plans*

A Local Environmental Plan has been prepared which seeks to address:

- The objectives of the rezoning.
- Relevant development standards and requirements.
- Appropriate landuse provisions.
- Support infrastructure environmental systems provisions.

The relevant zonings adopted are:

- R2 Low Density residential
- RU2 Rural landscape
- E2 Environmental conservation
- E4 Environmental living

#### *7.2.1 E2 Environmental Conservation*

It is recommended that the 'permitted with consent column' of the E2 Environmental Conservation zone be amended as follows:

Drainage; Earthworks; Environmental facilities; Environmental protection works; Flood mitigation works; Recreation areas; Roads; Sewage reticulation systems; Water recycling facilities; Water supply systems; Waterbodies (natural)

These uses are consistent with the State Environmental Planning Policy (Sydney Region Growth Centres) 2006 list of uses permitted in the E2 Environmental Conservation zone

## *8 Conclusion*

This report has provided an overview of the environmental investigations commissioned by Council into the suitability of the Study Area (Reeves Creek Study Area), principally for residential purposes.

Based on these investigations and subject to the implementation of the strategies/actions summarised in Section 5 of the Report (and standard requirements), the Study Area is considered to be suitable for residential purposes, as depicted conceptually in the accompanying zone plan.

The Studies underpinning this Report although sufficiently rigorous for arriving at the abovementioned rezoning recommendation, highlight the need in many instances for further investigations to inform more detailed planning and the preparation of development applications. The Studies also provide an insight into development and management principles to be further developed in the preparation of such documents.

This Report also provides an overview of the infrastructure implications of the proposed development at a local and district and level. In doing so it establishes an agenda for on-going dialogue in respect of future Developer Contributions, Works In Kind and/or Voluntary Planning Agreements.

# ANNEXURE “A”
# SPECIALIST STUDIES

# ANNEXURE “B”
# CONCEPT MASTER PLAN

# ANNEXURE “C”
# BUSHFIRE ASSESSMENT

.

# ANNEXURE “D”
# FLOOD IMPACT ASSESSMENT

# ANNEXURE “E”
# BUILT HERITAGE ASSESSMENT

# ANNEXURE “F”
# BIODIVERSITY AND RIPARIAN LAND ASSESSMENT

# ANNEXURE “G”
# PRELIMINARY SITE INVESTIGATION

# ANNEXURE “H”
# SERVICES ASSESSMENT

# ANNEXURE "I"
# ABORIGINAL CULTURAL HERITAGE ASSESSMENT

# ANNEXURE “J”
# TRAFFIC IMPACT ASSESSMENT

# ANNEXURE “K”
# SLOPE STABILITY ASSESSMENT

# ANNEXURE “L”
# SOCIAL STUDY

# ANNEXURE “M”
# STORMWATER MANAGEMENT ASSESSMENT

# ANNEXURE "N"
# SUBSIDENCE ADVISORY NSW