Cardno
Shaping the Future

Calderwood Urban Development Project

Concept Plan Transport Management and Accessibility Plan (TMAP)

FINAL REPORT

Prepared for Delfin Lend Lease
February 2010

Delfin
Lend Lease

Volume i
Main Report

Sydney
Level 3, Cardno Building
910 Pacific Highway
Gordon NSW 2072
Tel: (02) 9496 7700
Fax: (02) 9499 3902

Brisbane
Green Square
Level 11, North Tower
515 St Paul's Terrace
Locked Bag 4006
Fortitude Valley QLD 4006
Tel: (07) 3310 2401
Fax: (07) 3369 9722

Wollongong
278 Keira Street
Wollongong NSW 2500
Tel: 1300 369 093

Gold Coast
Level 2, Emerald Lakes Town Centre
1/3321 Central Place
Carrara QLD 4211
PO Box 391 Nerang QLD 4211
Tel: (07) 5502 1585
Fax: (07) 5502 1586

DOCUMENT CONTROL

FR110026
Calderwood Urban Development Project
Concept Plan Transport Management & Accessibility Plan (TMAP)
FINAL REPORT

Version	Date	Author		Reviewer	
		Name	Initials	Name	Initials
1.0	10.12.2009	Russell Yell Adrian Bateman Sam Laybutt Anissa Levy	RY AB SL AL	Anissa Levy	AL
2.0	22.12.2009	Adrian Bateman Sam Laybutt Anissa Levy	AB SL AL	Anissa Levy	AL
3.0	22.01.2010	Anissa Levy	AL	Anissa Levy	AL
4.0	10.02.2010	Anissa Levy	AB	Anissa Levy	AL
5.0	18.02.2010	Adrian Bateman Anissa Levy	AB	Anissa Levy	AL

Table of Contents

Appendices

List of Figures

List of Tables

List of Charts

EXECUTIVE SUMMARY

Delfin Lend Lease (DLL) commissioned Cardno to undertake a Transport Management & Accessibility Plan (TMAP) to accompany a Concept Plan Application under Part 3A of the *Environmental Planning & Assessment Act, 1979* (EP&A Act) and a proposal for State Significant Site listing under Schedule 3 of *State Environmental Planning Policy Major Development 2005* (SEPP Major Development) in relation to the Calderwood Urban Development Project (CUDP).

During the production of the TMAP the Department of Planning (DoP), transport agencies and local Councils were formally consulted and an appropriate set of land uses and likely road upgrade improvements were determined to assist in the study process.

The Project

The CUDP, master planned community development by DLL, proposes a mix of residential, employment, retail, education, conservation and open space uses. The development proposes approximately 4,800 dwellings and approximately 50 hectares of retail, education, community and mixed use / employment land. The overall development will accommodate approximately 12,400 people and will deliver an estimated $2.9 billion in development expenditure and create approximately 8,000 full time equivalent jobs by 2031.

The CUDP site is located within the Calderwood Valley in the Illawarra Region. The Calderwood Valley has long been recognised as a location for future urban development within key strategic planning documents.

Key themes identified through a review of existing plans and policies in regard to transport are the need to reduce car dependency, increase the attractiveness and usage of sustainable transport modes, reduce the growth in vehicle kilometres travelled and provide an urban form which supports public transport provision.

DLL have undertaken numerous residential master planned community projects which featured the implementation of a range of sustainable transport initiatives. Such measures, which have previously been demonstrated through the successful implementation at other DLL master planned communities, are proposed for inclusion within CUDP to influence travel patterns onto more sustainable transport.

A concept plan has been developed which provides the range of complementary land uses (residential, retail, employment, education & recreational) and public domain features, which are supported by a cohesive and permeable road network. Principle access is provided within the CUDP via a sub arterial north-south road which connects to the existing road network at its southern and northernmost points. Access to the existing Calderwood Road is maintained to the east and west of the site. A further lower order network of internal CUDP roads are proposed with major collector roads capable of accommodating buses, providing a linkage between the sub-arterial road and the lowest category minor collector roads, which will provide the principal pedestrian links.

By committing to a range of sustainable transport and other initiatives DLL is confident that the proposed development can achieve a 10% modal transfer away from private vehicles onto other transport modes. This ‘stretch target’ is based upon their success of implementing a range of similar measures at Ropes Crossing, Rouse Hill and Forde.

Existing Conditions

Traffic modelling was undertaken using the WOLSH TRACKS traffic model to assess the operation of the road network during both a weekday morning and evening commuter peak period. For the base year of 2009 satisfactory operation was generally found to occur except for the Princes Highway between Illawarra Highway and Southern Freeway.

A solution that is being considered by the RTA is for the implementation of an F6 freeway extension between Tallawarra and Oak Flats interchanges which will provide a bypass to the existing section of congested roadways and provide appropriate capacity to provide for the needs of increasing strategic traffic and road freight movements through the area.

Future Planned Land Uses & Transport Network

In accordance with the Director General Requirements (DGR) an agreed set of land use changes were included within the future years traffic modelling. The following road infrastructure upgrades were tested within assessments:

- F6 Freeway extension: Yallah to Oak Flats.
- Tripoli Way (Albion Park Bypass).
- North-facing ramps at Tallawarra interchange.

Traffic Modelling

Sustainable transport planning is a key driver in the urban design and land use process. However, it is recognised that the need to accommodate private vehicle mobility within and external to a site is still of fundamental importance, to ensure the viability and functionality of any urban development project. Accordingly, the transport planning for the CUDP has to ensure that a safe and efficient road network will also be provided for the movement of people and goods.

To assess road network operation an iterative series of traffic modelling runs were performed to test the effects of a range of assumptions on road infrastructure provision and modal transfer targets, both with and without the CUDP development.

Key points from the traffic model assessments identified that in 2031 ***without the CUDP*** the following infrastructure upgrades would be necessary to satisfactorily accommodate the forecast traffic demands:

- North-facing ramps at Tallawarra interchange were not required. It is noted that the future stage of the West Dapto Release Area beyond 2031 may indicate the need for the north facing ramps at Tallawarra interchange.
- F6 Freeway extension: Tallawarra to Oak Flats was required to address existing deficiencies.
- Tripoli Way (Albion Park Bypass) stages 1-3 were required including north and south facing ramp connections to the F6 Freeway extension (including the planned intersection upgrades along its length and at its terminal ends).
- Princes Highway between Mount Brown Road and Southern Freeway northbound offload ramp would need to be duplicated (including intersection upgrades along the duplicated section).
- Princes Highway between the Southern Freeway northbound offload ramp and Yallah Bay Road would require and additional southbound lane.
- The Southern Freeway northbound off load ramp and the southbound on load ramp would need to be duplicated with associated merge diverge improvements undertaken on the Southern Freeway.
- Marshall Mount Road & Yallah Road would need to be upgraded to a suitable two lane-two way standard.

Key points from the traffic model assessments identified that in 2031 ***with the CUDP*** the following infrastructure upgrades would be necessary to satisfactorily accommodate the forecast traffic demands (additional to those identified ***without the CUDP***.

- Upgrade the priority controlled Marshal Mount Road / Yallah Road intersection to a roundabout.
- Upgrade Calderwood Road to the east of the CUDP boundary to a suitable two lane-two way standard.
- Provide the CUDP north-south sub-arterial road and intersection upgrades at its terminal ends.

Mode Share

The post development mode share target was established to be 10% shift away from car based transport following the implementation of a range of sustainability measures to increase non-car mode share.

Public Transport Provision

Public transport principles and a network concept were developed for bus services to integrate the CUDP within the wider bus network at both strategic level and a district level. A Strategic bus corridor is proposed to route to the north of the CUDP along Marshall Mount Road, Huntley Road and Princes Highway to Dapto and Wollongong. To the east of the CUDP site, it is proposed the route proceeds eastwards along Illawarra Highway, Tongarra Road and Princes Highway to Oak Flats interchange and then Shellharbour CBD.

Two lower order routes (classed as 'district routes)' would link the remainder of the CUDP with Calderwood Town Centre and Albion Park for onward connections to local and regional rail services.

The proposed bus services and associated bus stop infrastructure provide a satisfactory level of coverage for the CUDP to in accord with the coverage targets set out in the *Outer Metropolitan Service Planning Guidelines.* A two tier bus stop hierarchy is proposed with higher order facilities (for strategic bus services including shelters/plinth to NSWTI standard) based around the sub-arterial north-south road with and the second order district services providing stops with timetable information. The proposed public transport nodes are located to maximise the opportunity for provision of higher density land uses clusters around the facilities in line with the desired urban design principles and sustainable transport objectives.

TMAP Measures

A package of deliverable sustainable transport measures is identified whose implementation would assist in achieving a 10% mode shift away from private vehicle. The proposed measures are as follows:

- Timely Provision of Facilities and Services.
- Fibre to the Home (FttH) and National Broadband Network.
- Website/Community Portal.
- Resident Kits.
- Promotions.
- Public transport incentives.
- Land Use/Transport Interaction including:
  - Provision of walking and cycling networks.
  - A diversity of land uses and housing types across the project to accommodate a diverse population.
  - Engaging and active streets that provide a positive experience for the users particularly along primary pedestrian and cycle corridors.
  - Crime Prevention Through Environmental Design (CPTED) principles applied to provide a greater sense of safety through passive surveillance of streets, parks and other areas of open space.
  - Establish a sub network of lit paths to provide for safer walking and cycling after dark.
  - Locate key amenities to maximise walkable access.
  - Holistic approach to the design of the street network, carefully balancing the needs for vehicle movement with the needs of pedestrians and cyclists.
- Local Access Street Design.
- Pedestrian and Cycle Hierarchy.
- Way-finding Signage.
- Parking Strategies.
- Safety Elements for Network.
- Bicycle parking at key destinations within CUDP.
- Bus Network Provision
- Bus Service levels that meet and exceed NSWTI's Outer Metropolitan Service Planning Guidelines
- Early bus service provision
- Branding and Publicity
- Bus Stop Infrastructure
- Bus Network Infrastructure

Apportionment

Further traffic model runs were undertaken to determine the required timing for the road network upgrades. Intermediate assessment years (consistent with planning timelines) of 2016, 2021 & 2026 were adopted for this assessment. Using conventional level of service assumptions about acceptable peak hour operations, timings of upgrades were identified and assumed to be implemented within the next assessment year. However, due to the extent of planning, design and construction time required to implement the F6 freeway extension, it was assumed in the modelling that this would be complete within the period 2017 to 2021.

CUDP, if considered in isolation, does not specifically identify the need for the significant range of road upgrades required. An assessment process was undertaken to determine cost allocations for road upgrade works to ensure a reasonable and equitable allocation of costs between those deriving direct benefits from the road network upgrades. The apportionment assessment was undertaken based upon the year which the improvement was implemented.

The overall package of road upgrade costs included the provision of the CUDP north-south sub-arterial road on the basis of its strategic benefits to the wider road network.

A further breakdown of the works package based upon the potential staging of works at CUDP was undertaken and a funding mechanism for these works being undertaken as works in kind or through planning agreements (State Infrastructure Contribution or Voluntary Planning Agreement).

01

Introduction

This Transport Accessibility Study has been prepared as a Transport Management and Accessibility Plan (TMAP) by Cardno to accompany a Concept Plan Application under Part 3A of the *Environmental Planning & Assessment Act, 1979* (EP&A Act) and a proposal for State Significant Site listing under Schedule 3 of *State Environmental Planning Policy Major Development 2005* (SEPP Major Development) in relation to the Calderwood Urban Development Project (CUDP).

The Calderwood Urban Development Project is a master planned community development by Delfin Lend Lease (DLL).

The Calderwood Urban Development Project proposes a mix of residential, employment, retail, education, conservation and open space uses. The development proposes approximately 4,800 dwellings and approximately 50 hectares of retail, education, community and mixed use / employment land. The overall development will accommodate approximately 12,400 people and will deliver an estimated $2.9 billion in development expenditure and create approximately 8,000 full time equivalent jobs by 2031.

1.1 THE SITE

The Calderwood Urban Development Project site is located within the Calderwood Valley in the Illawarra Region. It is approximately 706 hectares in area with approximately 600 hectares of land in the Shellharbour LGA and the balance located within the Wollongong LGA.

The Calderwood Valley is bounded to the north by Marshall Mount Creek (which forms the boundary between the Shellharbour and Wollongong LGAs), to the east by the Macquarie Rivulet, to the south by Johnstons Spur and to the west by the Illawarra Escarpment. Beyond Johnstons Spur to the south is the adjoining Macquarie Rivulet Valley within the suburb of North Macquarie. The Calderwood Urban Development Project land extends south from the Calderwood Valley to the Illawarra Highway. Refer to Location Plan at Figure 1.1.

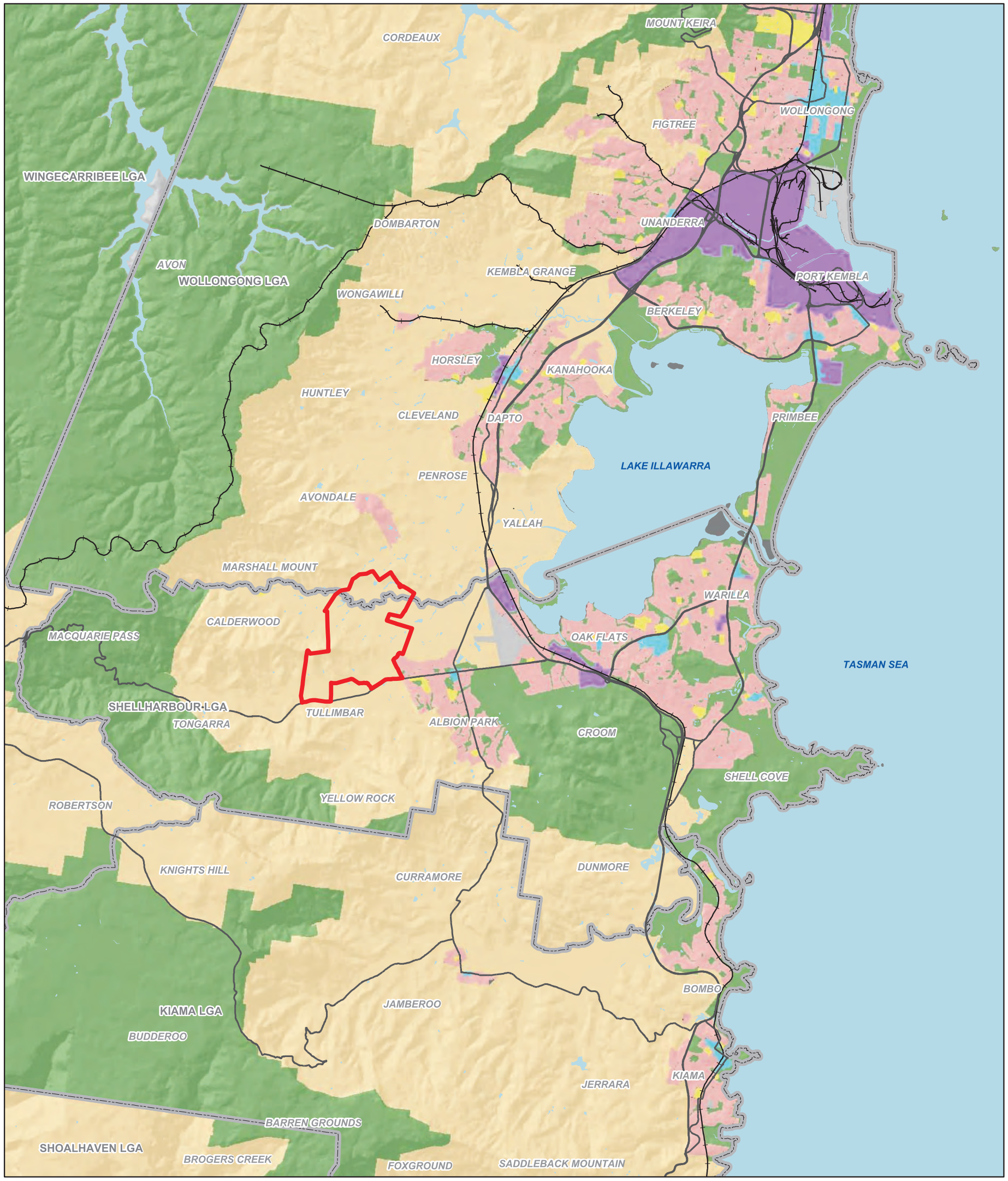
The Calderwood Valley has long been recognised as a location for future urban development, firstly in the Illawarra Urban and Metropolitan Development Programmes and more recently in the Illawarra Regional Strategy (IRS).

The IRS nominates Calderwood as an alternate release area if demand for additional housing supply arises because of growth beyond projections of the Strategy, or if regional lot supply is lower than expected.

In 2008, the former Growth Centres Commission reviewed the proposed West Dapto Release Area (WDRA) draft planning documents . The GCC concluded that forecast housing land supply in the IRS cannot be delivered as expected due to implementation difficulties with the WDRA, and the significantly lower than anticipated supply of housing land to market in the Illawarra Region is now been recognised as a reality.

The GCC Review of the WDRA also recognised that there is merit in the early release of Calderwood in terms of creating a higher dwelling production rate and meeting State government policy to release as much land to the market as quickly as possible. Given the demonstrated shortfall in land supply in the Illawarra Region and the WDRA implementation difficulties highlighted in the GCC Report, the release of Calderwood for urban development now conforms to its strategic role under the IRS as a source of supply triggered by on-going delays in regional lot supply. The Calderwood Urban Development Project can deliver about 12% of the IRS' new dwelling target.

Changes in outlook arising from global, national and regional factors influencing investment and delivery certainty, housing supply and affordability and employment and economic development also add to the case for immediate commencement of the Calderwood Project.



Delfin Lend Lease

Figure 1.1

Location Plan

CALDERWOOD
URBAN DEVELOPMENT PROJECT

Legend

- Site Boundary
- Major Roads (LPMA)
- Railway (LPMA)
- Waterbodies (LPMA)
- Local Government Area (LPMA)

Land Use (ABS)

- Other
- Rural
- Commercial
- Education
- Industrial
- Parkland
- Residential

N
W E
S

Cardno
Shaping the Future

Map Produced by Cardno Forbes Rigby
Date: 22 October 2009
Coordinate System: Zone 56 MGA/GDA 94
GIS MAP REF: 110026-01_18022_LocationPlan.mxd 02

1.2 BACKGROUND

In April 2008 the Minister for Planning issued terms of reference for the preparation of a Justification Report to address the implications of initiating the rezoning of Calderwood for urban development including associated staging, timing and infrastructure considerations.

In February 2009 the Minister for Planning considered a Preliminary Assessment Report for the Calderwood Urban Development Project that provided justification for the planning, assessment and delivery of the project to occur under Part 3A of the EP&A Act, having regard to the demonstrated contribution that the project will have to achieving State and regional planning objectives.

Subsequently, on the 16 April 2009, pursuant to Clause 6 of SEPP Major Development, the Minister for Planning formed the opinion that the Calderwood Urban Development Project constitutes a Major Project to be assessed and determined under Part 3A of the EP&A Act, and also authorised the submission of a Concept Plan for the site. In doing so, the Minister also formed the opinion that a State significant site (SSS) study be undertaken to determine whether to list the site as a State Significant site in Schedule 3 of SEPP Major Development.

The Part 3A process under the EP&A Act allows for the Calderwood Urban Development Project to be planned, assessed and delivered in an holistic manner, with a uniform set of planning provisions and determination by a single consent authority. Given the scale of the proposal, the Concept Plan and SSS listing provide the opportunity to identify and resolve key issues such as land use and urban form, development staging, infrastructure delivery and environmental management in an integrated and timely manner.

1.3 SCOPE OF STUDY

This TMAP has been prepared to fulfil the Environmental Assessment Requirements issued by the Director General for the inclusion of the Calderwood site as a State Significant Site under SEPP Major Development, and for a Concept Plan approval for the development. Specifically, this TMAP addresses the following requirements:

DGR 1:	Prepare a Traffic Management Plan that considers the traffic constraints of the site and surrounding locality.
DGR 2:	Demonstrate a strategy for providing linkages to regional transport networks.
DGR 3:	Demonstrate that there is the ability for sites located within the release area, but not within the proponent's control, to connect to infrastructure.
DGR 4:	Detailed traffic modelling to determine level of infrastructure needed plus annual traffic growth/approved development (including Delmo Albion Park).
DGR 5:	Timing/delivery/scope of local and regional road infrastructure.
DGR 6:	Network modelling for impacts on Illawarra Highway, Princes Highway/Southern Freeway, Tongarra Road, Marshall Mount Road, Yallah Road and the future Southern Freeway corroder between Yallah and Oak Flats.
DGR 7:	Intersection modelling, using SIDRA, for any junctions likely to be impacted by the development as identified in the network modelling, including AM and PM peaks, from the occupation of the Stage 1 development to the completion of the full development of the Concept Plan site.
DGR 8:	Identify infrastructure including road, pedestrian and cycling infrastructure to ameliorate the impacts of the development.
DGR 9:	Measures to promote public transport usage and reduce car usage.
DGR 10:	Identify various Travel Demand Management (TDM) measures that will optimise the opportunity provided by the projects sites proximity to public transport.
DGR 11:	Provide a road network plan identifying the proposed road hierarchy including cycleways, footpaths and car parking. Plan should identify public, private roads and typical cross sections and long sections.

DGR 12: Prepare a Transport Management and Accessibility Plan (TMAP) generally in accordance with the Ministry of Transport's Interim TMAP Guidelines, also including:

a. Staging/Sequencing Plan.
b. Measures to maximise public transport, walking and cycling.
c. Proposed pedestrian, cycling and public transport infrastructure.
d. Measures to mitigate any potential impacts on pedestrian safety.

In addition to the above DGRs a number of issues are to be considered and assessed as part of the study to be undertaken pursuant to clause 8 of the SEPP Major Projects 2005 to determine whether the site should be included as a State significant site in Schedule 3 to the SEPP. The issues to be considered were identified in the Minister for Planning's declaration letter to the proponent dated 22 April 2009. Specifically, this TMAP addresses the following issues:

SSS 1: The suitability of the site for any proposed land use taking into consideration environmental, social or economic factors, the principles of ecologically sustainable development and any relevant State or regional planning strategy.

SSS 2: The implications of any proposed land use for local and regional land use, infrastructure, service delivery and natural resource planning.

These requirements differ slightly from the DGRs although the overall issues follow the same theme to be resolved through this study.

In accordance with the Director General's Requirements this TMAP has been prepared following consultation with the following agencies:

- Department of Planning (Regional).
- Roads and Traffic Authority of NSW (RTA).
- NSW Transport and Infrastructure (NSWTI) formerly known as the Ministry of Transport (MoT).
- Wollongong City Council.
- Shellharbour City Council.
- Premier Illawarra Bus Company.

Copies of relevant documents can be found in the following Appendices:

- Appendix 1-A - DGRs.
- Appendix 1-B - the Minister for Planning's declaration letter (including SSS issues to be considered).
- Appendix 1-C - minutes of the formal consultation with each of the above agencies.
- Appendix 1-D - DLL/RTA correspondence.

1.4 TMAP OBJECTIVES

This TMAP has been prepared in accordance with the Ministry of Transport's Draft Guidelines for TMAPs. The objectives of this TMAP are to generally:

- Meet the DGR's.
- Manage the transport impacts of the Calderwood development.
- Help reduce growth in overall VKT generated by Calderwood, both by cars and by commercial vehicles.
- Help reduce reliance on the private car.
- Maximise the use of public transport, walking and cycling.

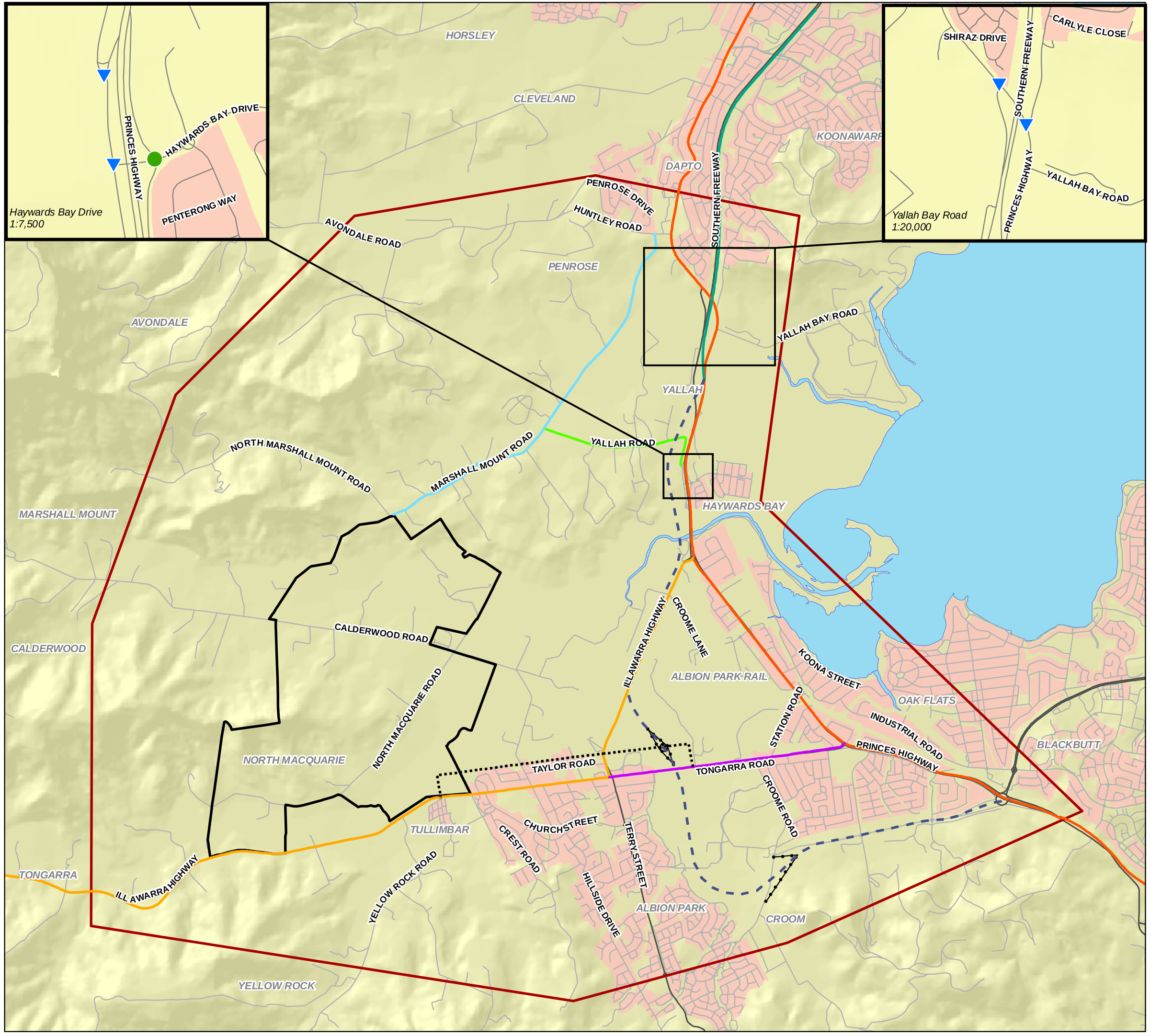
1.5 KEY ACCESS AND TRANSPORT OPPORTUNITIES

Calderwood is an extension of the existing Illawarra urban area. The CUDP location presents a number of opportunities when considering transport accessibility to ensure a satisfactory movement network is provided to accommodate the total sub-regional transport task. Key transport opportunities include:

- An opportunity to create a master planned community with key sustainable transport principles included within its planning and design from the outset.
- The planning of a regional road network sufficient to resolve the currently experienced significant peak period congestion at key intersections and mid-block sections, e.g. Princes Highway/Illawarra Highway intersection.
- The progressive upgrading of the existing low-demand, rural local road network to provide roads capable of providing an acceptable condition with safe and efficient operation to benefit all road users within the local and strategic context.
- A site integrated within the regional road network and existing urban areas by flood-prone riparian corridors.
- The opportunity to rebalance the current regional high car dependence and promote sustainable transport.
- Contribute to a transport network suitable to accommodate other significant urban development planned at nearby Tallawarra, Yallah/Marshall Mount and West Dapto.

1.6 AREA OF INFLUENCE FOR TRANSPORT ASSESSMENT

For the purpose of modelling and for the transport assessment, it has been agreed with the RTA the extent of the road network over which the existing transport network deficiencies and the proposed transport demands associated with the CUDP should be assessed. This area is described as the 'area of influence' the extent of road network is shown in Figure 1.2. The key road sections and intersections within the area of influence that are considered to be significant, and therefore assessed within the transport assessment, are detailed in Appendix 1-E.



Delfin Lend Lease

Figure 1.2

Area of Influence

CALDERWOOD
URBAN DEVELOPMENT PROJECT

Legend

- Major Roads (LPMA)
- Local Roads (LPMA)
- Lake Illawarra (LPMA)
- Existing Built Up Areas (LPMA)
- Site Boundary
- Area Of Influence Boundary

Key Existing Junctions to be Assessed

- Priority Controlled Intersections
- Roundabout
- Traffic Signals
- Grade-Separated Interchange

Key Existing Routes to be Assessed

- A - Illawarra Highway (HW25) - State
- B - Princes Highway (HW1) - State/Regional
- C - Southern Freeway (F6) - State
- D - Tongarra Road (MR262) - State
- E - Marshall Mount Road - Local
- F - Yallah Road - Local

Proposed Major Road Network Upgrades (Do Minimum)

- Proposed Roundabout
- ProposedTraffic Signals
- Potential Freeway Ramps
- Tripoli Way Extension
- F6 Freeway Extension (Yallah to Oak Flats)

N W E S

Scale 1:40,000 (at A3)

Metres

0 250 500 1,000 1,500 2,000 2,500

Cardno

Map Produced by Cardno Wollongong
Date: 20 January 2010
Coordinate System: Zone 56 MGA/GDA 94
GIS MAP REF: 110026-01_58012_TransportAreaOfInfluence.mxd 06

1.7 REPORT STRUCTUE

This report is structured to provide a full assessment of the transport accessibility issues relating to the proposed CUDP. This report is laid out in accordance with the TMAP Guidelines as follows:

- **Section 1** provides an overview of the project, background information and the study objectives.
- **Section 2** details the strategic context within which the assessment has taken place. This section provides a literature review of all relevant, state, regional, local and other documents.
- **Section 3** provides a more detailed overview of the project concept plan in terms of land uses, yields, road hierarchy etc.
- **Section 4** establishes the existing transport context in the surrounding area. An assessment of the existing road network has been undertaken to establish road network characteristics, performance criteria and any existing road network deficiencies. The chapter also provides an overview of existing travel patterns in the region as well as existing public transport, walk and cycle provisions.
- **Section 5** provides an overview of the future transport network context in terms of potential growth scenarios and road network upgrades.
- **Section 6** presents the modelling methodology undertaken to assess the road network impacts of the proposed development. This chapter outlines the scenarios that have been tested.
- **Section 7** documents the road network performance under base and development scenarios. The recommended package of road network measures is identified through an iterative testing process.
- **Section 8** provides an assessment of the demand for non car trips including public transport, walk and cycle.
- **Section 9** documents the full package of measure to be implemented as part of the TMAP.
- **Section 10** details the cost apportionment of road network infrastructure upgrades.

02

Strategic Context

2.1 FEDERAL POLICIES

2.1.1 National Broadband Network

As part of The National Broadband Network the Government has announced that all greenfield developments should have fibre optic infrastructure to prepare them for the future.

The objective of the program is to create opportunities for reductions in greenhouse gas emissions through greater use of improved telecommunications technologies and a reduction in the need to travel.

The CUDP will incorporate the broadband network in accordance with the national directions. The infrastructure will facilitate residents to work from home, reducing the need to travel.

2.2 STATE AND REGIONAL STRATEGIC POLICIES

The key driver behind state and regional strategic planning policies in recent years has been the desire to reduce the environmental impact of everyday life, such as through the reduction of greenhouse gas emissions. Key themes in these policies have been the need to reduce car dependency, increase the attractiveness and usage of sustainable transport modes, reduce the growth in vehicle kilometres travelled and provide an urban form which supports public transport provision.

The following New South Wales government policies, plans and strategies contain the strategic context relevant to the local planning and development of the CUDP. The following documents have been reviewed:

- NSW State Plan 2009 and Illawarra Local Action Plan 2009.
- NSW State Infrastructure Strategy 2008.

Other relevant government strategies reviewed include:

- Action for Air (2006 update).
- Action for Bikes (1999).
- Integrating Land Use and Transport (2001).
- Section 117 Ministerial Decisions Direction no.17 – Integrating Land Use and Transport (2005)
- Planning Guidelines for Walking and Cycling (2004).
- Accessible Transport action Plan (2007)
- Review of Bus Services in NSW – Final Report (2004).

Important aspects from the relevant state and regional documents have been summarised in Appendix 2-A. In relation to transport these strategies have the following common themes:

- Improve public transport.
- Integrating land use and transport.
- Reduction of mode share to private motor vehicles.
- Reducing the need to travel.

2.2.1 THE NSW STATE PLAN 2009

The *NSW State Plan* sets out the goals and priorities for government action in a range of key areas. In terms of transport, the key target relevant to this project is to increase public transport mode share to 15% for commuter journeys to Wollongong CBD. There are also a number of public transport improvement projects to encourage public transport use in the region. This TMAP has been developed on the basis of a mode share of 15% (refer to Section 3.4).

2.3 ILLAWARRA TRANSPORT CONTEXT

A large number of transport planning investigations and reports relating to the Southern Illawarra area have been prepared in recent years. These include the following:

- Illawarra Regional Strategy 2006-2031 and 2009 Update Report.
- Illawarra Urban Transport Opportunities Study
- Illawarra Action for Transport
- Moving Together 'Illawarra Regional Strategy'
- West Dapto Release Area Studies
- Albion Park Traffic Study

The key actions from the strategies are:

- Wollongong Strategic Bus Corridor.
- Dapto as one of the three sub-regional transport interchanges.
- Albion Park West Corridor.

The key theme of all strategies is the need to significantly improve public transport in tandem with developing a more sustainable urban form to support public transport provision in order to reduce the dependence on the private vehicle. The key issues and conclusions of relevant documents are provided within Appendix 2-B.

2.4 LOCAL PLANNING CONTEXT

The following local government plans were reviewed to gain an insight into the local planning context for Calderwood and adjoining:

- Shellharbour Rural LEP 2004
- Wollongong LEP 1990 and Draft Wollongong Local Environmental Plan (West Dapto) 2009
- West Dapto Urban Release Area planning documents.

The key issues and conclusions of relevant documents are provided in Appendix 2-C.

2.5 CALDERWOOD PLANNING CONTEXT

DLL controls approximately 706 hectares of land in the Calderwood Valley in the Illawarra Region for which it is seeking government approval for urban development. Approximately 600 hectares of land in the Shellharbour LGA and the balance located within the Wollongong LGA. An overview of the Calderwood planning context is provided in Appendix 2-D.

03

The Project

3.1 DLL EXPERIENCE IN SUSTAINABLE TRANSPORT INITIATIVES

Included as Appendix 3-A are fact sheets provided by DLL which provide examples from three other award-winning master plan communities. These demonstrate the high level of commitment that DLL has to the incorporation of sustainable transport objectives in the planning, design and construction of master planned communities. Some of the objectives incorporated in these communities included:

- Establish an urban form to maximise use of and access to public transport.
- Concentrate high trip generating uses adjacent to major public transport routes and nodes.
- Provide public transport infrastructure and services to achieve higher public transport use.
- Provide public transport and services early in the development to establish use pattern.
- Incorporate a range of uses within the site to minimise demand for travel outside the area.
- Establish high quality and efficient pedestrian and cycle routes to encourage travel by these modes.
- Incorporate fibre to the home or premises in an early stage.
- Community education to support public transport initiatives.

3.2 URBAN DESIGN PRINCIPLES

DLL's philosophy is for the development of sustainable communities, to ensure the development's ongoing viability and desirability. Provision of an appropriate urban form, sustainable transport options and travel demand management are key components of this. This accords with the strategic directions set out by the Government policies reviewed as part of Chapter 2.

The information presented in this TMAP demonstrates the ability of the CUDP to incorporate a broad range of social, economic and environmental sustainability measures. In summary, these include (but are not limited to) the items detailed in the following sections.

3.2.1 INTEGRATED PLANNING

Objective

To establish an integrated land use and transport planning framework within the Calderwood Urban Development Project that minimises travel needs and encourages walkability and public transport use.

Strategy

- Concept Plan is designed based on the principle of walkability. The majority of the residents can gain access to an activity node (commercial centre, bus stop and/or public parkland) within a 10 minute walk (800m).
- Road pattern is designed to facilitate walking, cycling and bus services.
- Mixed use centre to encourage pedestrian activities within the centre.

3.2.2 DIVERSITY CHOICE AND LIFESTYLE

Objective

To deliver and maintain housing choice, diversity and relative affordability levels to cater for a range of local housing needs.

Strategy

The development will incorporate a range of densities, lot sizes and dwelling types. This range will provide housing choice to satisfy the needs of a wide spectrum of households, at different life cycle stages and with varying socio-economic circumstances and lifestyle preferences. Housing solutions to support the creation of a diverse community will range from the more traditional detached homes to smaller attached houses, including studio homes, villas, townhouses, live-work, apartments and retirement units.

Housing types will make also special provision for home based businesses and others who wish to work from home.

3.2.3 NATIONAL BROADBAND

Objective

To encourage residents to work from home, shop from home, be entertained at home, bank from home etc and thereby minimise travel needs.

Strategy

Incorporate Fibre to the Home or Premise (FttH/FttP) in an early stage to service all homes to provide opportunities for residents to work from home and facilitate communication between businesses without the need to travel outside the site.

3.2.4 TOWN AND NEIGHBOURHOOD STRUCTURE

Objective

To create a town centre structure that is accessible to all residents, provide a range of services and facilities to minimise the need to travel elsewhere.

Strategy

The structure of the Calderwood project establishes the Town Centre at a principle focal point in the community and is both visually and physically central to many of the neighbourhoods created as part of this project.

A second smaller centre in the form of a Village Centre will also be established to bring services and amenities closer to the homes of residents and to facilitate in the early delivery of these amenities. Both of these centres will be well connected with a range of distinct neighbourhoods.

The key features of each of these elements are summarised below.

<u>Town centre</u>

- Located adjacent to the main north-south road transecting the Calderwood project and the near the principal east-west road connecting the balance of the Calderwood Valley with Albion Park.
- A mixed use precinct with retail, entertainment, learning, employment, civic and residential uses.
- Street focused retail with a main street feel.
- Primarily a local serving retail centre providing the day-to-day needs of the Calderwood project.
- Both civic and recreational open spaces including a range of gathering spaces.
- Respecting the cultural heritage elements of the site.
- Explore the opportunity for shared parking options in the detailed design to help facilitate a more walkable and pedestrian friendly centre.
- Bicycle parking in several locations throughout the centre.
- The Town Centre will become the key built identity for the whole of the Calderwood community.

- A range of higher density home types including terraces, small lot detached homes, apartments, live-work, shop-top and retirement living.
- Strong pedestrian and cycle linkages to the balance of Calderwood and nearby communities.
- Attractive, high quality built-form, using robust materials and reflecting the sustainability expectations for when it is created.
- Will be designed to accommodate the specific climatic characteristics of the site.
- Attract a range of commercial/retail owners, which will provide for a greater diversity in the retail offering.
- Located to maximise walkable access for many residents.
- A holistic urban design approach that balances the needs of all users creating interesting and engaging streets.

Village centre

- Located in an early stage of the project to provide the ready supply of local retail and basic temporary community needs.
- A street-based centre with a main street character.
- A strong identity with a high quality of built-form.
- Located adjacent to the main north-south road transecting the Calderwood community.
- Provides local serving day-to-day convenience retail needs.
- A range of housing types including possible opportunities for live-work homes.
- A Sales and Information Centre built to a high standard and design to reflect the aspirations of the Calderwood community.
- Incorporates a display village in close proximity to the Sales and Information Centre.
- Will be designed to accommodate the specific climatic characteristics of its location.
- Incorporating a range of community gathering spaces.
- Will also incorporated areas of high quality open space providing both recreation and civic needs.
- Well connected with both pedestrian and cycle routes to the adjacent neighbourhoods, Johnstons Spur, the nearby Macquarie Rivulet and the town centre.
- Consider a shared parking approach to further enhance the walkability and social interaction the centre will offer.
- Serviced by a bus route providing regular public transport.
- Identifiable neighbourhoods.
- The Calderwood community will ultimately be made up of a series of distinct neighbourhoods.
- Each neighbourhood will derive its character from its natural context; more specific urban design approach will be undertaken in detailed design.
- Public art and interpretive elements will further enhance the individual character of each neighbourhood.
- Landscape character will also be a key determinant in defining a neighbourhood.
- Neighbourhoods will be inclusive and inviting for all residents.
- An identifiable heart with be established for each neighbourhood, typically as an element of open space; a natural site characteristic or through leveraging specific views and vistas.
- Even though each neighbourhood will have its own identity, each will have a permeable connection with its adjacent neighbours.

3.2.5 A HEALTHY, SAFE AND ACCESSIBLE ENVIRONMENT

Objectives

- Creating public spaces that are "child friendly".
- Ensuring residents of all ages (children and older people) have access to basic services such as employment opportunities, public facilities, public transport, shops, infrastructure, health care, education and social support, and to diverse activities.
- Providing housing to suit the needs of older people.
- Designing neighbourhoods that encourage physical activity, an active lifestyle and social interaction.
- Environments that promote walking, cycling and incidental physical activity.
- Focus on safety and sense of security.
- Promote activation and passive surveillance of public areas and streets to ensure safety of all users.

Strategy

- All streets will be designed as pedestrian friendly environments to encourage walkability and pedestrian use. This will be achieved through:
  - Provision of well-lit and well-maintained footpaths.
  - Landscaping and streetscapes designed to create interest, shade and promote walking.
  - Legible and permeable street and block patterns.
  - High level of connectivity between centres and residential neighbourhoods.
  - Activation of parks / open space by promoting passive surveillance.
- A cycle friendly environment will be provided, through a range of cycle facilities including both on and off road paths, parking and signage.
- A variety of open spaces and sport and recreation opportunities will be provided to meet the needs of all age groups and promote physical activity and play. An interconnected network of parks, with a high level of pedestrian access, will ensure that most residents will be within five minutes walk from quality open space.
- A variety of public spaces will be provided to encourage informal meeting and gathering, and to provide places for relaxation and community activity. The public domain will be designed to be accessible so that all community members have the opportunity to access a range of spaces and facilities in their local area.
- Streets, walking paths, bike trails, open spaces and civic areas will have planting and lighting strategies to maximise visibility and safety.

3.2.6 ENCOURAGING SOCIAL INTERACTION AND ACTIVE NEIGHBOURHOOD LIFE

Objective

To provide safe and quality public domain to encourage social interaction and encourage pedestrian activities.

Strategy

- Public spaces of appropriate scale around the town and village centres will promote casual social interaction and informal gathering, as well as allow for outdoor civic and cultural activities. This will create attractive environment for pedestrian activities.
- Provide active frontages in all public areas to enhance casual surveillance and a sense of passive ownership, promoting safety and a sense of security.
- Public spaces are designed to meet the needs of different ages and promote equitable access for all segments of the population.
- A mixed-use land use pattern in the town and village centres will further enhance the opportunities for social interaction and minimise travel demand.

3.2.7 ACCESS TO RESOURCES IN THE WIDER AREA

Objective

To encourage residents to take public transport when travelling outside of the Calderwood area.

Strategy

- The town centre is proposed to be well serviced by bus services operating through the development. Investigations have shown that bus services will be the most effective form of public transport for the site, both in terms of economic feasibility and in providing a high quality, high frequency public transport service. Bus priority routes are proposed to be established from Calderwood to Shellharbour and Wollongong to help improve service reliability and to encourage the use of public transport.
- Bus stops will generally be located within five minutes walking distance of the majority of homes. Buses will be routed to travel via the town centre.
- The provision of public transport services will ensure the connectivity of the development with surrounding areas and to the regional transport network, primarily the train services linking with Wollongong and the metropolitan area, enhancing access to jobs, schools, shops, services and opportunities in the wider region.

3.2.8 ACCESSIBILITY OF EMPLOYMENT LANDS

Objectives

Local employment opportunities within the development will include retail, hospitality and commercial services within the centres, community facilities such as schools and childcare centres, and opportunities within the employment lands, the town and village centres.

Strategy

- Effective public transport system and pedestrian and cycle access between the employment area and the shops, services and facilities located in the town centre
- The need to make the employment area a safe and secure place, both for the workforce and for the adjacent residential community by providing appropriate lighting, security, and opportunities to promote activity in order to facilitate casual surveillance over key public areas. The design and location of buildings, entrances and car parking will have regard to safety and security considerations. In addition, strategies are required to ensure that the employment area is not used for anti-social activities at nights and weekends. Crime Prevention through Environmental Design (CPTED) principles will be incorporated into the detailed design of the Precinct
- It is important that all routes leading to and within the Employment Zone be pleasant and appealing for pedestrians, with appropriate lighting, shade, signage and bus shelters, and attractive streetscapes

3.2.9 COMMUNITY IDENTITY AND SENSE OF BELONGING

Objectives

To encourage residents to access local services by creating community identity within the development.

Strategy

- The unique location of the development and its environment and topography, dominated by the Illawarra Escarpment and also incorporating Johnstons Spur, Macquarie Rivulet and a number of other creeks
- The extensive public realm that responds to the unique environmental features of the site, with its outdoor recreation focus
- Elements of high quality and purposeful design in public spaces

- The vibrancy of the town and village centres associated with their integrated mix of uses and their distinct positioning
- Provision of community facilities which are responsive to the needs of residents and reflective of local culture
- The high quality residential environment, dwelling design, open space and landscaping
- Responsiveness to the cultural heritage of the site.
- Public art will be used as an integral place-making component in creating identity for the new community through engagement, a sense of ownership and belonging, and through encouraging the development of a creative community.
- Design elements in open space such as shelters may reflect the design character of existing buildings or themes from the local area

3.2.10 INTEGRATION WITH NEIGHBOURING COMMUNITIES

Objectives

To ensure social facilities are provided locally to service all residents.

Strategy

- Provision of community and recreation facilities, retail, commercial and open space within Calderwood that will be publicly accessible for the surrounding community
- Use of facilities in the surrounding area such as schools by the Calderwood population
- Provision of local employment opportunities within Calderwood. A high degree of integration will be achieved through the employment opportunities to be provided within the development, which will attract a workforce from the surrounding area and wider region. Jobs will be available not only in the Employment Zone, but also in the retail and commercial services within the town and village centres.

3.3 CONCEPT PLAN

The DLL proposal is for a master planned community development with a mix of residential, employment, retail, education, conservation and open space uses. The DLL landholdings, with development potential for 4,800 dwellings, would accommodate about 12,400 people. It also includes approximately 50 hectares of retail, education, community and mixed use/employment land.

DLL has prepared a Concept Plan for its landholding at Calderwood. The Concept Plan has the following attributes:

- Provides the basis for a linear north-south grid with associated environmental benefits in building orientation.
- Promotes logical staging of urban development together with supporting employment, physical and social infrastructure.
- Provides the basis for a movement network that promotes trip containment, walking, cycling and public transport.
- Delivers Town and Village Centres that meet the full range of community needs and are integrated into the urban form.
- Respects the objectives of the 7(n) conservation zone and promotes wider regional open space linkages.
- Provides for water quality and water quantity controls.
- Combines visual engagement with topography.
- Delivers non-urban land solutions.
- Allows for integration of adjoining lands in the broader Calderwood Valley Release Area.

The infrastructure required to implement the scope of the DLL CUDP outlined above can be provided in a managed, predictable and incremental process. These have been designed to meet the needs of both the DLL controlled land and the broader Calderwood Release Area.

The Concept Plan is shown at Figure 3.1.

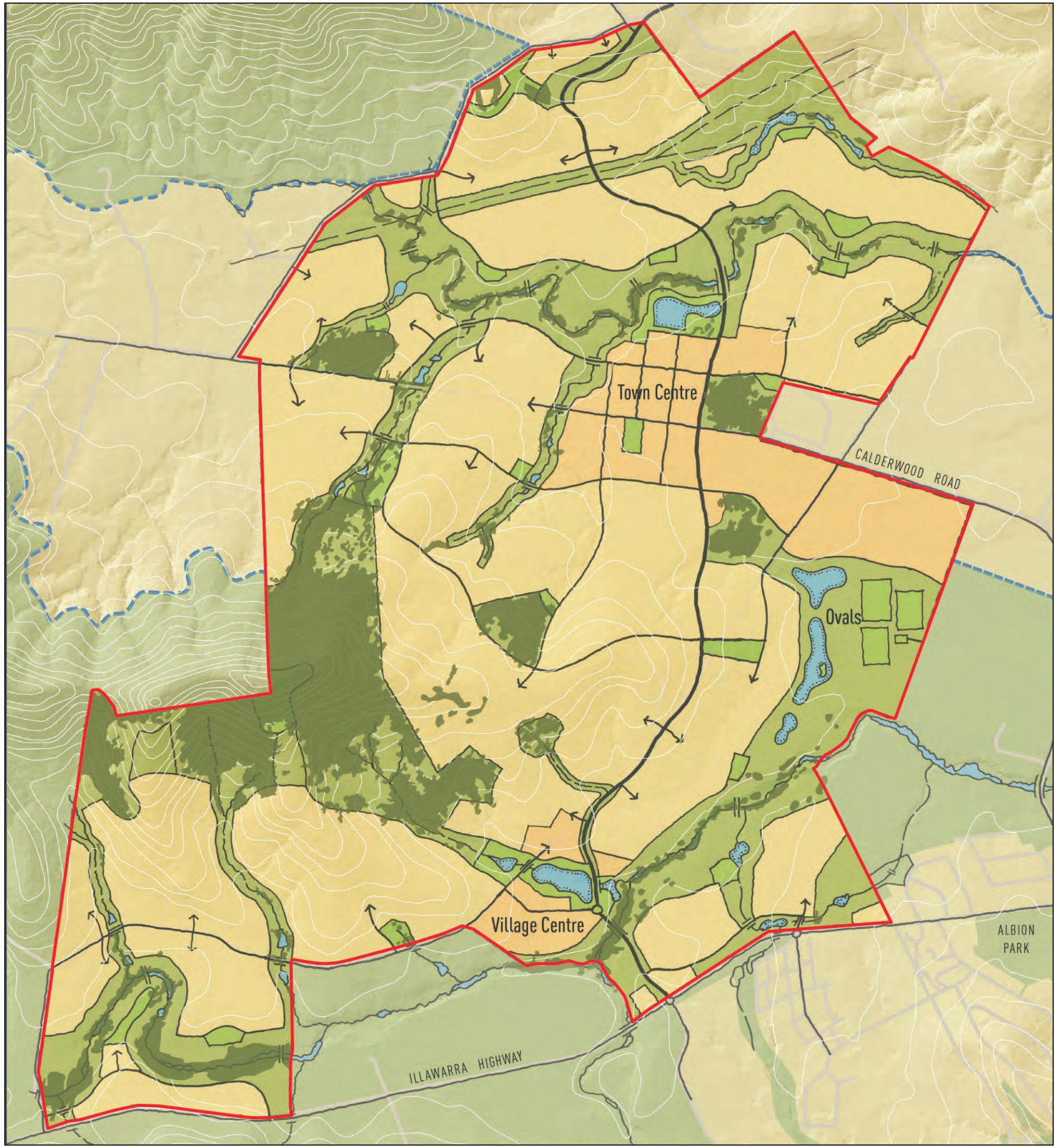
Section 6.4.3 describes how assessments of the sensitivity of the implementation of these measures are accounted for in the traffic modeling assessments to identify potential road network upgrades.

3.3.1 LAND USE

For traffic modeling purposes DLL identified an indicative subdivision of the CUDP. Figure 3.2 shows the internal CUDP road network with the indicative yields connections shown.

In summary, the following land uses will be provided:

- Residential – approximately 4,800 dwellings including approx 280 retirement living dwellings.
- The Town Centre will include:
  - 25,000sqm of retail floor area.
  - 20,000sqm of mixed use employment floor area.
  - Community facilities.
  - Public Primary School and High School.
  - Residential mixed use dwellings.
- A village centre including:
  - 5,000sqm of retail floor area.
  - 1,000sqm of mixed use employment land.
  - A mix of residential dwellings.



Delfin
Lend Lease

Figure 3.1

Concept Plan

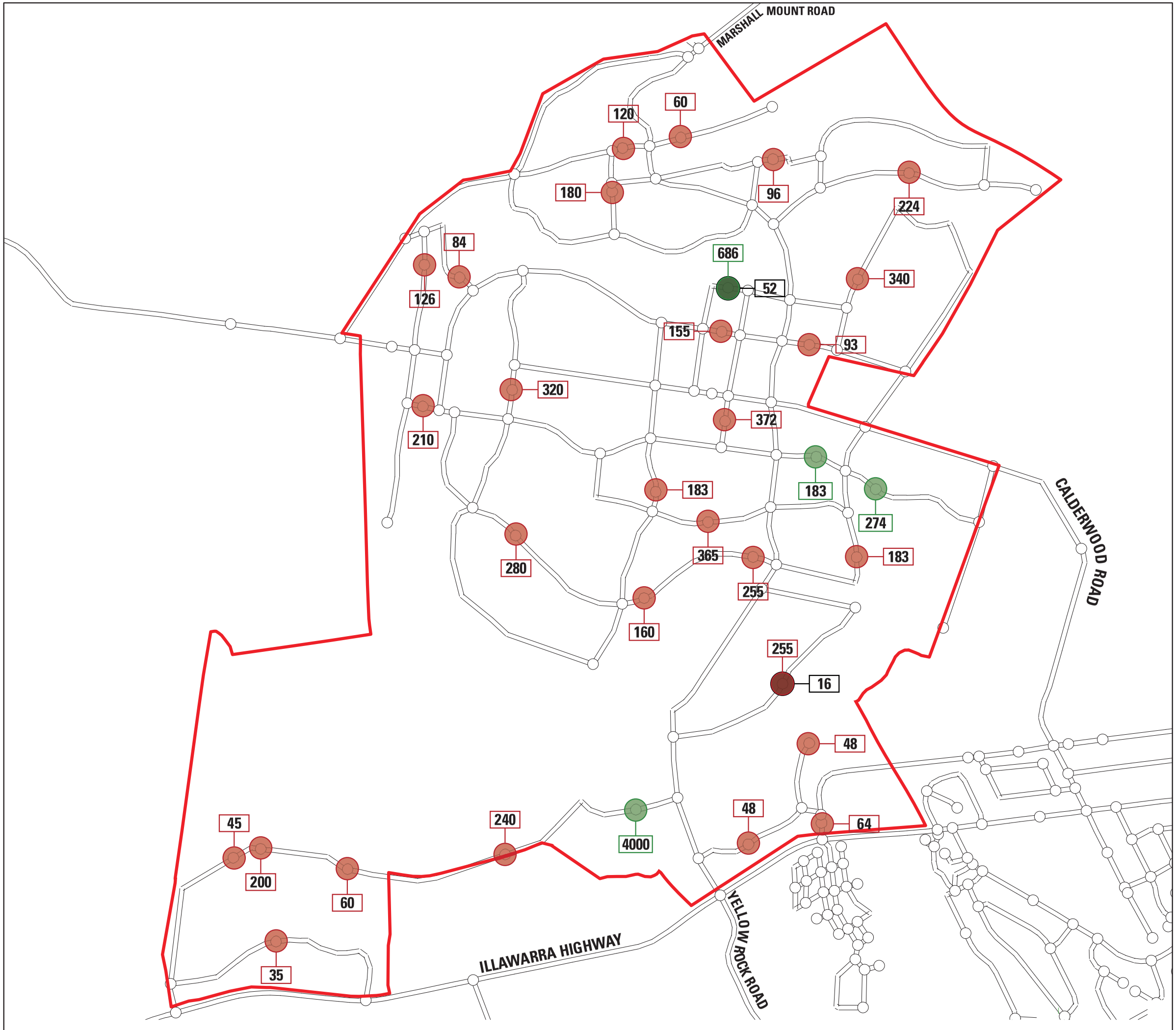
CALDERWOOD
URBAN DEVELOPMENT PROJECT

- Town and Village Centres
  Mixed Uses including Retail, Employment, Residential, Learning and Community Amenities
- Residential Neighbourhoods
- Parks
  eg Citywide, district and local parks
- Principal Open Space and Drainage
  eg Environmental Conservation, Environmental Management and Drainage Corridors
- Indicative Water Bodies

0 100m 500m 1,000m

February 2010

Cardno
Shaping the Future



Delfin Lend Lease

Figure 3.2

Yield Plan

CALDERWOOD
URBAN DEVELOPMENT PROJECT

Legend

- Modelled Road Network
- Modelled Intersection
- CUDP Boundary (approx)
- Residential Zone Connector
- Employment Zone Connector
- Education Zone Connector
- No. of Dwellings
- No. of Education Jobs
- No. of Other Jobs

CUDP INTERNAL ROAD NETWORK IS INDICATIVE ONLY SHOWN FOR TRAFFIC MODELLING PURPOSES

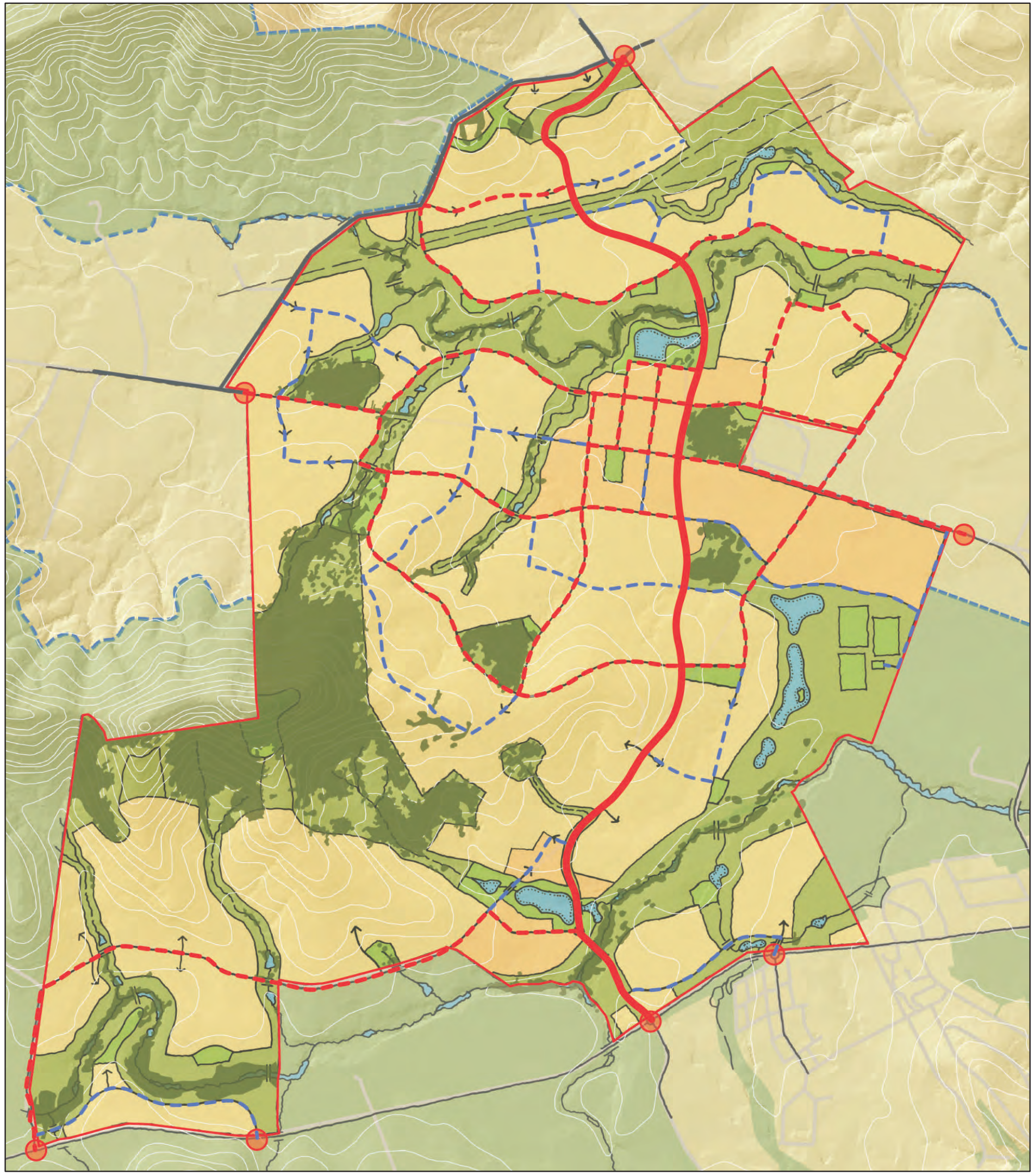
Cardno
Shaping the Future

3.3.2 ROAD NETWORK

An indicative road network layout and hierarchy has been developed for assessment of the Concept Plan. The road hierarchy is presented in Figure 3.3. Key features of the proposed road network include:

- Key external road connections include:
  - Marshall Mount Road in the north-west.
  - Calderwood Road to the east and the west.
  - Four connections to the Illawarra Highway are proposed:
    - At the existing Illawarra Highway/Broughton Avenue intersection.
    - At the existing Illawarra Highway/Yellow Rock Road intersection.
    - To the east of the existing North Macquarie Road Intersection.
    - At the existing Illawarra Highway/North Macquarie Road intersection.
- A north-south sub-arterial road that connects to:
  - The Illawarra Highway in the south opposite Yellow Rock Road.
  - Marshall Mount Road in the north near North Marshall Mount Road.
- North Macquarie Road is retained to the west of the site although its central section within the CUDP site is realigned.
- Calderwood Road is retained to the east and west of the site although its central section within the CUDP site is realigned.
- Marshall Mount Road is retained in its current alignment forming a boundary along the north-western portion of the site.
- Access to North Marshall Mount Road will remain off Marshall Mount Road.
- Major Collector Roads serving each precinct, designed to facilitate the use of regular bus services.

The detailed form of the road network including intersection controls and cross-sections will be assessed through individual project applications. This concept plan provides a strategic assessment of the primary north-south corridor and other key routes.



Delfin
Lend Lease

Figure 3.3
Road Hierarchy

CALDERWOOD
URBAN DEVELOPMENT PROJECT

Road Layout and Hierarchy

- Sub-Arterial Road
  2-4 lanes, Bus Route
- Major Collector Street
  Bus Route
- Minor Collector Street
  Principal Pedestrian Link
- Access Points
  Principal Links

n 1 ha

m 0 100 500 1,000

Cardno
Shaping the Future

3.3.3 PUBLIC TRANSPORT

It is proposed to service the Calderwood Urban Development via a network of bus services. Indicative routes, stop locations and 400m walking catchments are presented in Figure 3.4.

A detailed bus route network with recommended stop locations and walking catchments for the CUDP will be developed as part of the TMAP, however final design will be subject to consideration by NSW Transport & Infrastructure and the relevant service providers.

3.4 MODE SHARE TARGETS

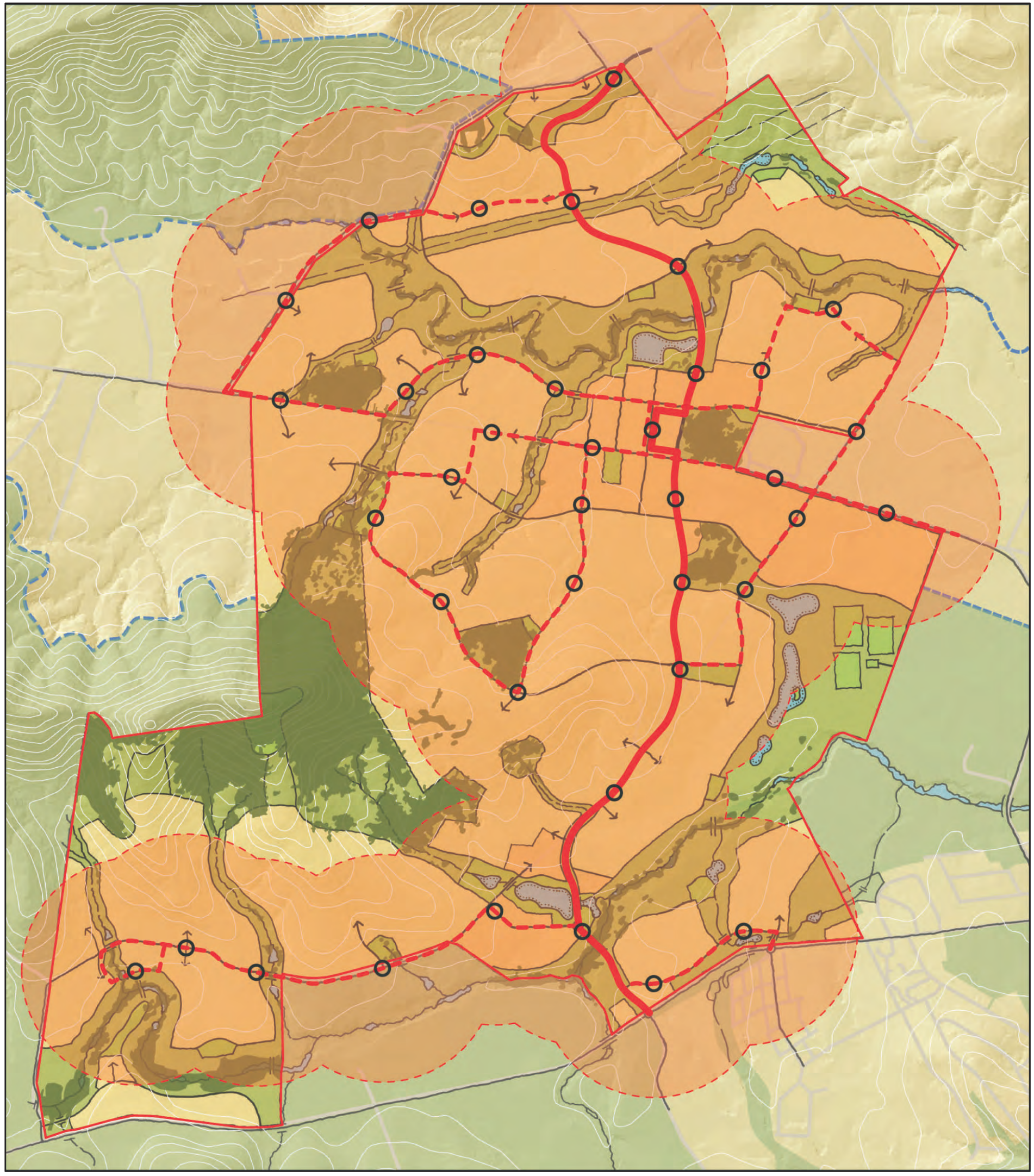
DLL is committed to implementing sustainability initiatives / transport measures and urban design that encourage the uptake of non car mode transport and reduce the dependence on the private motor vehicle.

The current transport mode share across the total Wollongong and Shellharbour LGA's stands at around 90% car based trips, according to the 2006 Journey to Work data provided by the TDC. The remaining 10% consists of 5% public transport trips and 5% other trips which are assumed to be predominantly active transport trips, such as cycling and walking. These travel patterns are discussed in more detail in Section 4.4.

Based upon the experience of DLL in successfully implementing master planned communities which included a range of sustainable transport initiatives (see section 3.1). It is expected that a mode shift of 10% away from private vehicle use is likely to occur in the CUDP.

This TMAP sets out a range of measures which, if implemented in a timely and co-ordinated fashion, can achieve a shift in mode share. Key infrastructure links will be constructed from the outset to ensure that policy measures aimed at changing travel behaviour can be supported by viable alternatives to car travel.

As well as changing the mode split of person trips, DLL is also committed to reducing the actual need to travel long distances at all. With the implementation of the National Broadband Network and other advances in technology relating to home shopping and telecommuting the number of trips made per residence will also reduce.



Delfin
Lend Lease

Figure 3.4
Bus Routes

CALDERWOOD
URBAN DEVELOPMENT PROJECT

Bus Service

- Strategic Trunk Bus Route
  To be negotiated with future operator
- Approximate Bus Route
  To be negotiated with future operator
- Approximate Bus Stop Location
  To be negotiated with future operator
- 400m Radius from Bus Stops
  Typically 5 minute walking radius

n 1 ha

m 0 100 500 1,000

Cardno
Shaping the Future

3.5 STAGING

A staging plan has been developed to deliver incremental community growth over the next two decades. The staging plan is detailed in Table 3.1. It is also of note that the stage yields also envisage completion by 2036. However, for traffic modeling purposes and to align with the agreed 2031 assessment year the full development has been assumed to be completed by 2031 to provide a conservative assessment of the impact of traffic related to CUDP on the road network.

Table 3.1 CUDP Annual Yields

Financial Year End	Annual Occupied dwellings	Cumulative Occupied dwellings	Cumulative Population
2012			
2013	53	53	135
2014	128	180	464
2015	203	383	987
2016	225	608	1,567
2017	225	833	2,148
2018	225	1,058	2,728
2019	225	1,283	3,309
2020	225	1,508	3,889
2021	225	1,733	4,470
2022	225	1,958	5,050
2023	225	2,183	5,631
2024	225	2,408	6,211
2025	225	2,633	6,792
2026	225	2,858	7,372
2027	225	3,083	7,953
2028	225	3,308	8,533
2029	225	3,533	9,114
2030	225	3,758	9,694
2031	225	3,983	10,275
2032	225	4,208	10,855
2033	225	4,433	11,436
2034	225	4,658	12,016
2035	120	4,778	12,326
2036	23	4,800	12,384
TOTAL	**4,800**	**4,800**	**12,400**

Note: These figures are indicative and are for traffic modeling purposes only. The figures are subject to change without notice. DLL & Cardno are not liable for the accuracy of these figures. Estimate assumes 70% of sales will be occupied in 12 months with remaining 30% the following year.

04

Existing Transport Context

4.1 CURRENT ROAD AND FREIGHT INFRASTRUCTURE

An initial area of influence was considered over which to describe the current road infrastructure as described in the following paragraphs. The area of influence is shown in Figure 1.2.

4.1.1 ROAD CLASSIFICATION

There are two main systems for the classification of roads in New South Wales, the functional classification system and the funding classification system. A third system that defines the environmental capacity of residential streets is also a form of classification.

Funding Classification

The RTA has adopted a "funding related" classification system that is primarily for administrative purposes. The key road classifications under the funding classification system are defined as:

- State Roads – roads performing an important state function and for which the RTA fully funds the maintenance cost. State roads are essentially arterial roads.
- Regional Roads – roads performing a significant regional function and for which the RTA and Council share the costs of maintenance. Regional roads are essentially sub-arterial roads.
- Local Roads – roads performing a local or collector function and for which the Councils fully fund the maintenance cost. Additional funding is available from the RTA in certain circumstances on the grounds of urban amenity and road safety.

The funding road classification in the CUDP area of influence is represented in Figure 4.1.

Functional Classification

The functional role or performance of individual roads can be appraised according to the classification of that road within an overall road hierarchy. Changes to traffic flows on the road can then be assessed within the context of the road hierarchy. The functional hierarchy consist of arterial, sub-arterial, collector and local roads. A detailed explanation of functional classification is contained in Appendix 4-A.

The functional road classification (Road Hierarchy) in the Calderwood area is represented in Figure 4.2.

4.1.2 FREIGHT ROUTES

The Southern Freeway and Princes Highway form the dominant freight route through the region, linking Port Kembla and Sydney with the Shoalhaven and South Coast regions. The Illawarra Highway carries some freight between the Illawarra and inland New South Wales, however the steep grades and poor alignment of Macquarie Pass limits its use by heavy vehicles, many of which prefer Picton Road.

Approved B-double routes through the CUDP area of influence are shown in Figure 4.3.

Delfin
Lend Lease

Figure 4.1

Calderwood Area Road Network - Funding Classifications

CALDERWOOD
URBAN DEVELOPMENT PROJECT

Legend

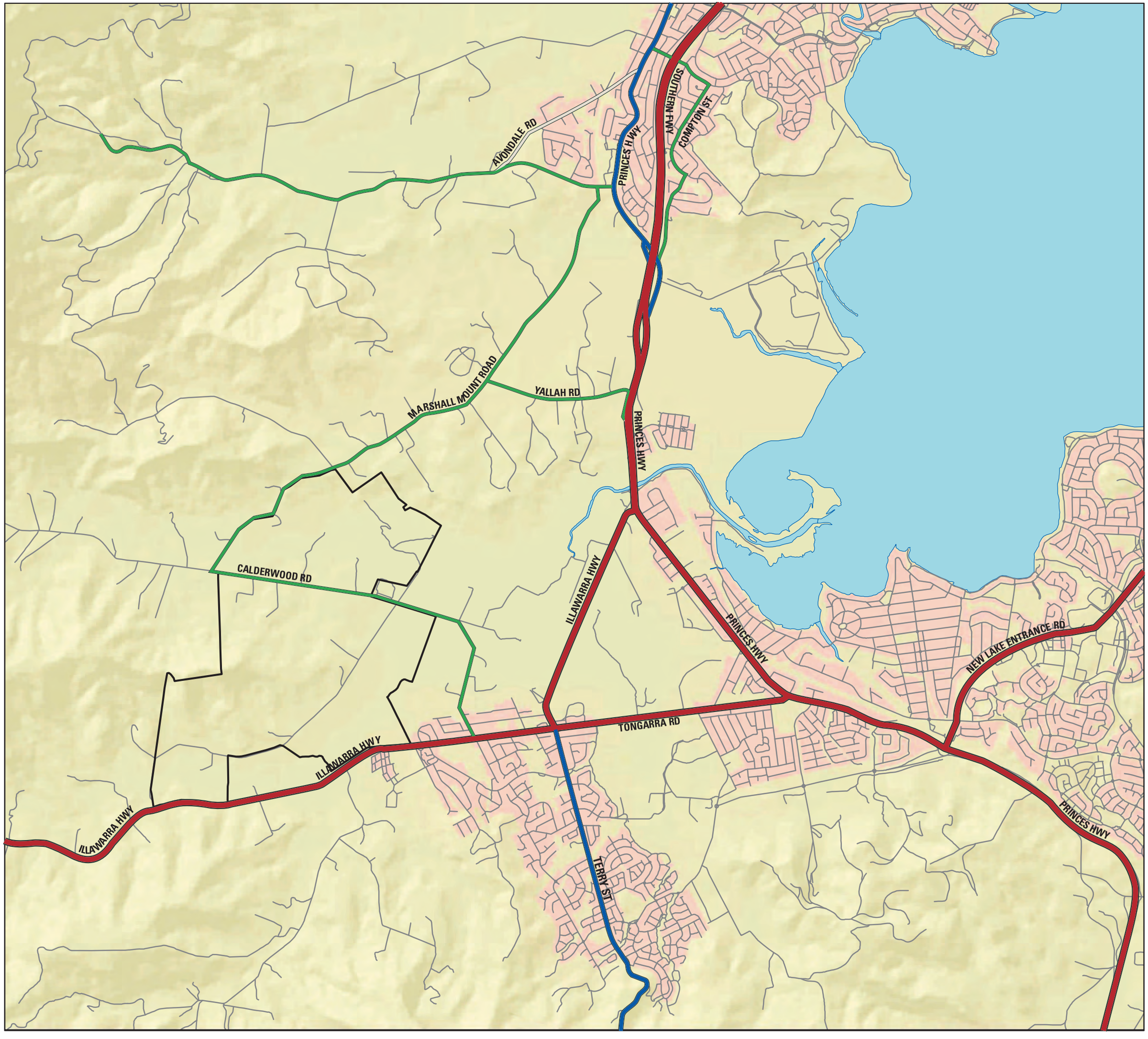
- Site Boundary
- Local Roads (LPMA)
- Watercourse (LPMA)
- Lake Illawarra (LPMA)
- Existing Built Up Areas (LPMA)
- State Roads
- Regional Roads

Scale 1:40,000 (at A3)

Metres
0 250 500 1,000 1,500 2,000 2,500

Cardno
Shaping the Future

Map Produced by Cardno Forbes Rigby Pty Ltd
Date: 03 December 2009
Coordinate System: Zone 56 MGA/GDA 94
GIS MAP REF: 110026-01_58007_TransportBaseMap_CEO.mxd 01



Delfin
Lend Lease

Figure 4.2

Calderwood Area Road Network - Functional Hierarchy

CALDERWOOD
URBAN DEVELOPMENT PROJECT

Legend

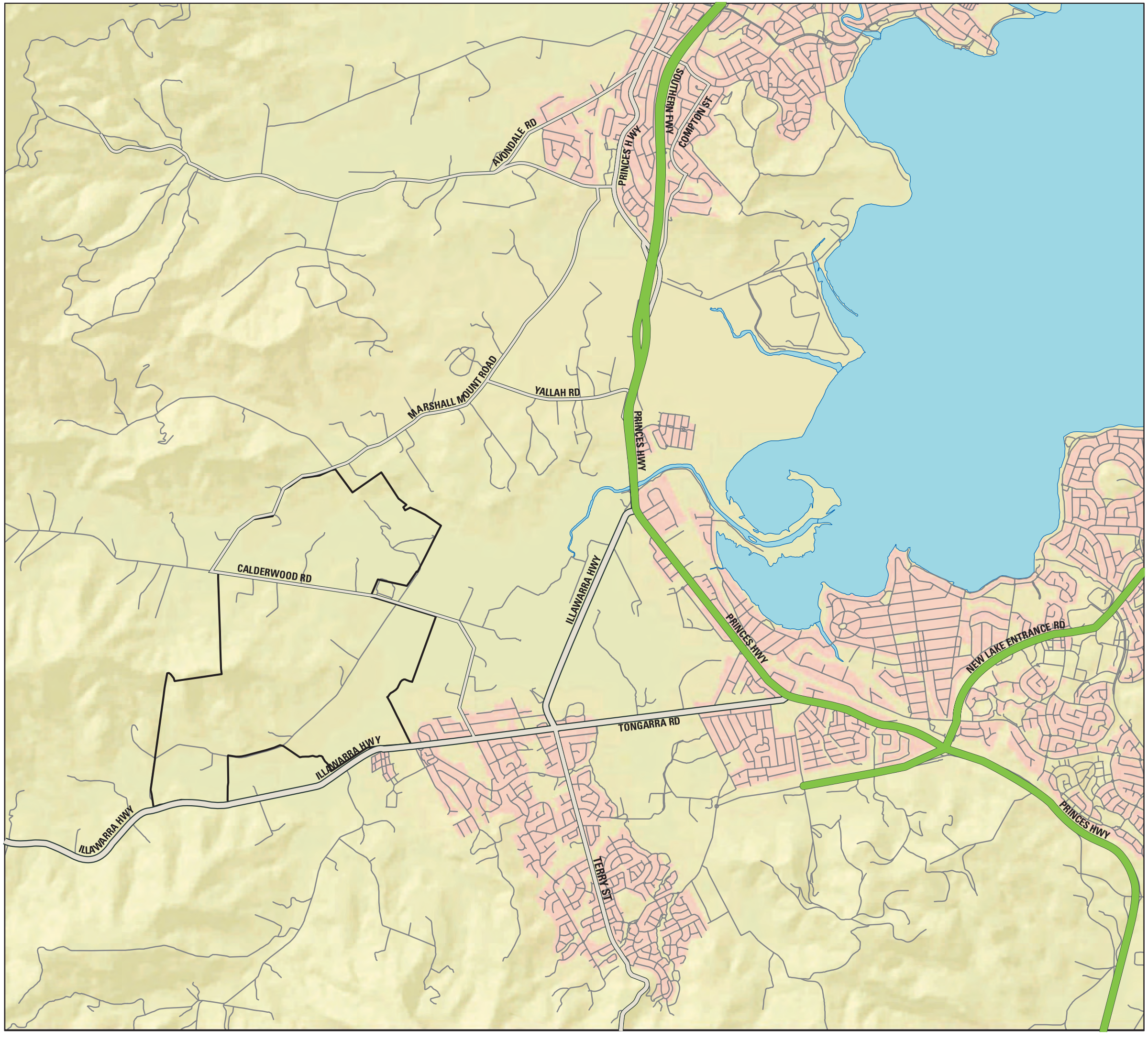
- Site Boundary
- Local Roads (LPMA)
- Watercourse (LPMA)
- Lake Illawarra (LPMA)
- Existing Built Up Areas (LPMA)
- Arterial
- Sub Arterial
- Collector

Scale 1:40,000 (at A3)

Metres
0 250 500 1,000 1,500 2,000 2,500

Cardno
Shaping the Future

Map Produced by Cardno Forbes Rigby Pty Ltd
Date: 03 December 2009
Coordinate System: Zone 56 MGA/GDA 94
GIS MAP REF: 110026-01_58007_TransportBaseMap_CEO.mxd 01



Delfin
Lend Lease

Figure 4.3
Calderwood Area Road Network - B-double Routes

CALDERWOOD
URBAN DEVELOPMENT PROJECT

Legend

- Site Boundary
- Local Roads (LPMA)
- Watercourse (LPMA)
- Lake Illawarra (LPMA)
- Existing Built Up Areas (LPMA)
- B-double Routes

Scale 1:40,000 (at A3)

Metres
0 250 500 1,000 1,500 2,000 2,500

Cardno
Shaping the Future

Map Produced by Cardno Forbes Rigby Pty Ltd
Date: 03 December 2009
Coordinate System: Zone 56 MGA/GDA 94
GIS MAP REF: 110026-01_58007_TransportBaseMap_CEO.mxd 01

4.1.3 ROAD NETWORK DESCRIPTION

The major road network in the CUDP area of influence is comprised of the following key routes:

- Southern (F6) Freeway
- Princes Highway (north of Tallawarra)
- Illawarra Highway
- Tongarra Road
- Huntley Road
- Marshall Mount Road
- Yallah Road
- Calderwood Road
- North Macquarie Road

Descriptions of these roads are provided in Appendix 4-B.

4.1.4 INTERSECTION CONTROLS

The form of intersection control at the junctions within CUDP area of influence is shown in Figure 4.4.

In addition, it is proposed that the intersections of Tongarra Road and Station Road, and Tongarra Road and the site access road, will be signalised as part of the Illawarra Regional Business Park ('Delmo' Albion Park) development (*Director General's Report*, November 2008).

The roundabout intersection at Princes Highway and Illawarra Highway includes part-time traffic signals. The intersection is monitored by RTA cameras and the signals are used to meter flows where unnecessary congestion is caused by one flow dominating another.

Delfin
Lend Lease

Figure 4.4
Calderwood Area Road Network - Intersection Controls

CALDERWOOD
URBAN DEVELOPMENT PROJECT

Legend

- Site Boundary
- Local Roads (LPMA)
- Watercourse (LPMA)
- Lake Illawarra (LPMA)
- Existing Built Up Areas (LPMA)
- Traffic Signal
- Roundabout
- Signalised Intersections proposed as part of Delmo Development

Scale 1:40,000 (at A3)

Metres
0 250 500 1,000 1,500 2,000 2,500

Cardno
Shaping the Future

Map Produced by Cardno Forbes Rigby Pty Ltd
Date: 03 December 2009
Coordinate System: Zone 56 MGA/GDA 94
GIS MAP REF: 110026-01_58007_TransportBaseMap_CEO.mxd 01

4.1.5 ROAD NETWORK CAPACITY & PERFORMANCE CRITERIA

Level of Service (LoS) is an index of the operational efficiency of a roadway or intersection. The analysis is essential in planning and design of the transport network and can influence the number of lanes provided or the arrangement of a traffic control system under study.

LoS can be measured at mid-block or at intersections. As a mid block measure, LoS is a qualitative measure describing the operational conditions on a road and their perception by a driver. At intersections, LoS is considered in terms of average delay experienced by drivers.

Mid-Block Carriageway Capacity

The capacity of major streets within an urban area can be based on an assessment of their operating Level of Service. Level of Service (LoS) is defined by AUSTROADS *Guide to Traffic Engineering Practice – Part 2 Roadway Capacity* (1988) as a qualitative measure of the effects of a number of features, which include speed and travel time, traffic interruptions, freedom to manoeuvre, safety, driving comfort and convenience, and operating costs. LoS is designated from A to F from best (free flow conditions) to worst (forced flow with stop start operation, long queues and delays) as follows[1]:

- A - Free flow (almost no delays).
- B - Stable flow (slight delays).
- C - Stable flow (acceptable delays).
- D - Approaching unstable flow (tolerable delays).
- E - Unstable flow (congestion; intolerable delays).
- F - Forced flow (jammed).

A detailed explanation of Carriageway Level of Service for urban and rural roads is located in Appendix 4-C.

Intersection Performance

The capacity of an urban road network is controlled by the capacity of the intersections within that network. Average delay is commonly used to assess the actual performance of intersections, with Level of Service used as an index. The operating performance of intersections has been assessed using the SIDRA software package to determine the Degree of Saturation (DS), Average Vehicle Delay (AVD in seconds) and LoS at each intersection. The SIDRA program provides LoS Criteria Tables for various intersection types. The key indicator of intersection performance is LoS, where results are placed on a continuum from 'A' to 'F', as detailed in Appendix 4-D.

4.1.6 EXISTING TRAFFIC DEMANDS

A variety of sources of traffic volume counts have been utilised in this study:

- Roads and Traffic Authority maintains a database of Annual Average Daily Traffic (AADT) volumes on key roads in New South Wales.
- Traffic counts undertaken for Cardno on 22 October 2009 at 15 key intersections within the CUDP area of influence.

[1] The colour shown for LoS are typically used throughout this report to highlight LoS

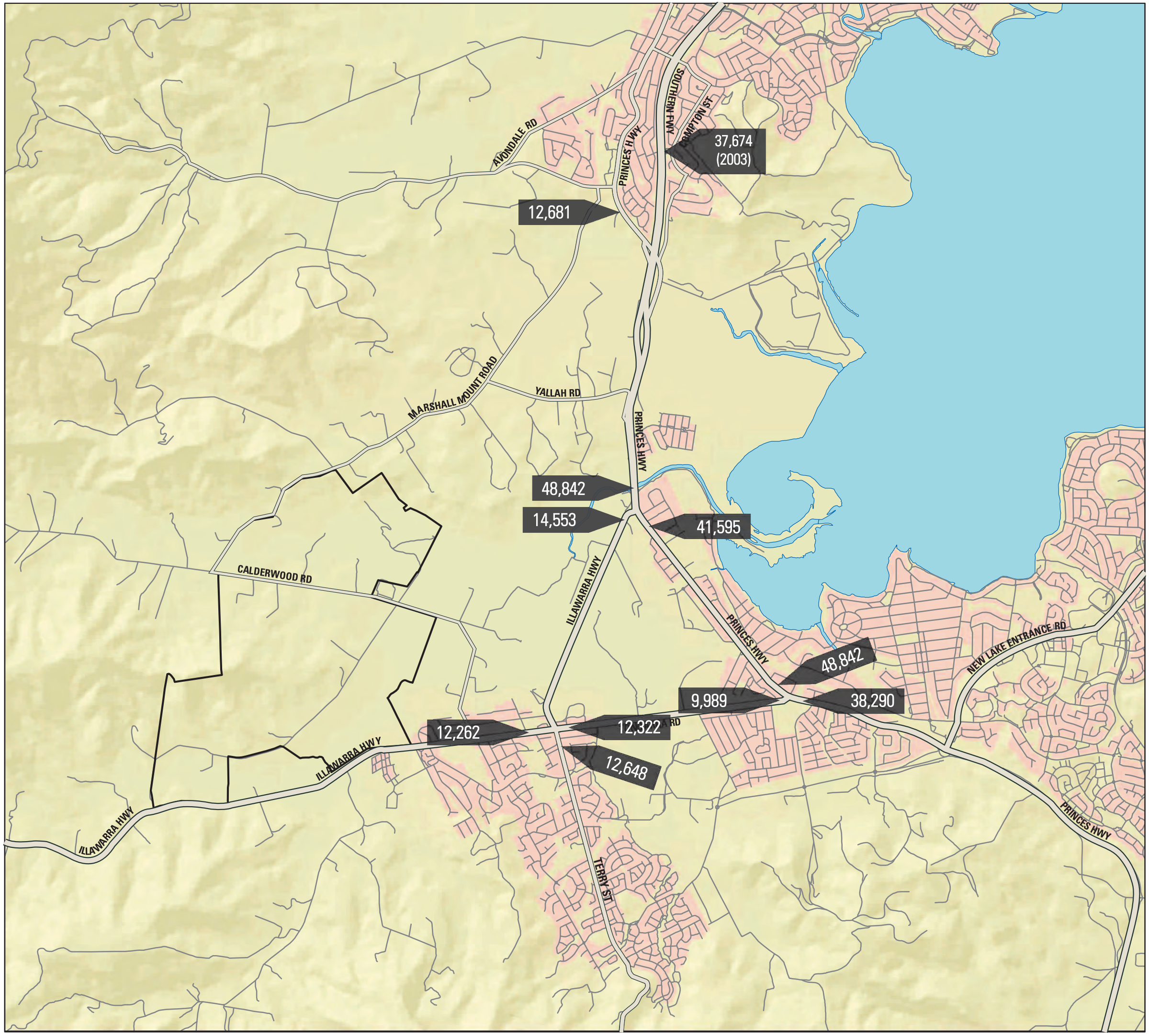
Historical AADT

The available 2005 annual average daily traffic (AADT) volumes are presented in Figure 4.5. Historical RTA published AADT volumes are provided in Appendix 4-E for key arterial roads within the CUDP area of influence for the years 1994 to 2005.

Between the early 1990s and 2003, the key through routes of Princes Highway and Southern Freeway grew at a steady rate; however between 2003 and 2005 only small growth was experienced. The opening of the East West Route in 2001 appears to have resulted in a significant drop in volumes on Princes Highway, east of Tongarra Road, and on Tongarra Road between 2000 and 2003. A significant drop in traffic volumes was also recorded on Illawarra Highway, west of Terry Street, between 2000 and 2003 which may have been the result of the implementation of right turn bans at the Illawarra Highway/Tongarra Road/Terry Street intersection.

Intersection Turning Volumes

Intersection turning counts were undertaken for Cardno on the 22nd October 2009 at 15 key intersections within the initial study area for the assessment of existing conditions. These peak hour traffic volume counts are summarised in Figure 4.6.



Delfin
Lend Lease

Figure 4.5
Calderwood Area Road Network - 2005 Average Annual Traffic Volumes (AADT)

CALDERWOOD
URBAN DEVELOPMENT PROJECT

Legend

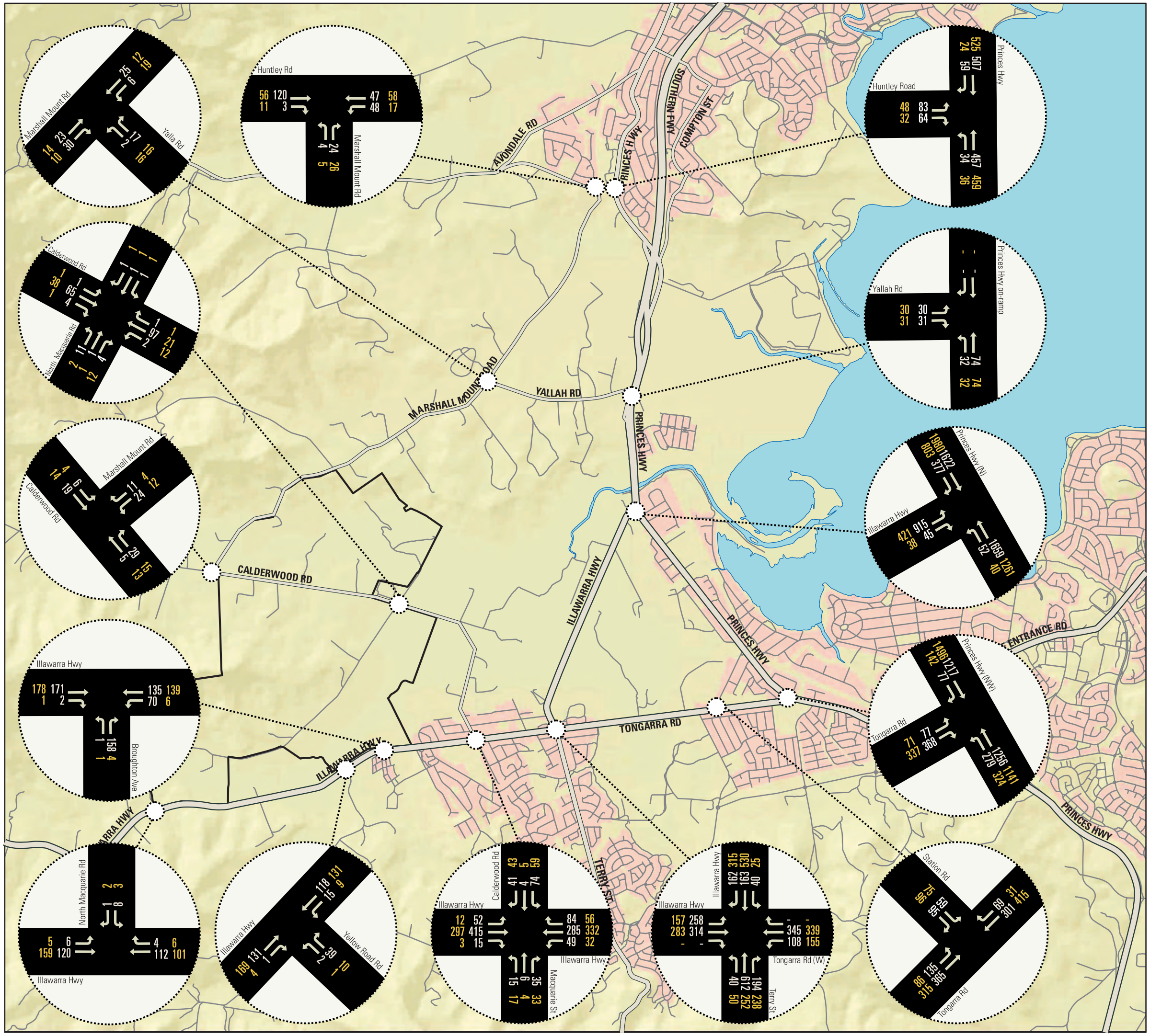
- Site Boundary
- Local Roads (LPMA)
- Watercourse (LPMA)
- Lake Illawarra (LPMA)
- Existing Built Up Areas (LPMA)

Scale 1:40,000 (at A3)

Metres
0 250 500 1,000 1,500 2,000 2,500

Cardno
Shaping the Future

Map Produced by Cardno Forbes Rigby Pty Ltd
Date: 03 December 2009
Coordinate System: Zone 56 MGA/GDA94
GIS MAP REF: 110026-01_58007_TransportBaseMap_CEO.mxd 01



Delfin
Lend Lease

Figure 4.6
2009 Existing Peak Turning Traffic Volumes

CALDERWOOD
URBAN DEVELOPMENT PROJECT

Legend

- Site Boundary
- Local Roads (LPMA)
- Watercourse (LPMA)
- Lake Illawarra (LPMA)
- Existing Built Up Areas (LPMA)
- XXX AM Peak Traffic Volumes
- XXX PM Peak Traffic Volumes

Scale 1:40,000 (at A3)

Metres
0 250 500 1,000 1,500 2,000 2,500

Cardno
Shaping the Future

Map Produced by Cardno Forbes Rigby Pty Ltd
Date: 03 December 2009
Coordinate System: Zone 56 MGA/GDA 94
GIS MAP REF: 110026-01_58007_TransportBaseMap_CEO.mxd 01

4.1.7 ROAD NETWORK PERFORMANCE ASSESSMENT

The performance of the existing road network has been assessed to consider the:

- Mid-block carriageway performance.
- Intersection performance.

Mid-block Carriageway Performance

An assessment of the mid-block traffic volumes and carriageway LoS for key links within vicinity of the site was undertaken. The overall existing level of service on key route sections is presented graphically in Figure 4.7 and Figure 4.8 for the AM and PM peak periods respectively. Appendix 4-F presents a summary of mid-block traffic volumes and carriageway level of service for key links within vicinity of the site.

The mid-block carriageway assessment shows that the road network sections within the area of influence currently provide an acceptable level of operation with the exception of:

- Princes Highway southbound between Southern Freeway and Illawarra Highway which operates at LoS F during the PM Peak.
- Princes Highway northbound between Southern Freeway and Illawarra Highway which operates at LoS E/F during the AM Peak.

Intersection Performance

A summary of the operating performance of critical intersections within the study area is provided in Appendix 4-G. The resulting intersection LoS is presented graphically in Figure 4.7 and Figure 4.8 for the AM and PM peak periods respectively.

The intersection performance assessment shows that all intersections operate satisfactorily at LoS D or better except:

- The intersection of Princes Highway and Illawarra Highway operates at LoS F during the AM Peak period. This is primarily to due to the heavy through traffic along Princes Highway which significantly limits how much time is available for Illawarra Highway traffic to enter the roundabout. This intersection operates satisfactorily in the PM peak, with the worst movement being the southbound through movement operating at a LoS C.

Although other intersections operate at or below LoS D it is worth noting the following:

- The intersection of Illawarra Highway, Tongarra Road and Terry Street operates at LoS C during the AM Peak, mainly due to the heavy northbound traffic flows from Terry Street. The worst movement at the intersection is the right turning movement from the northern approach, operating at the LoS D with a delay of approximately 43 seconds.
- The intersection of Princes Highway and Tongarra Road generally operates well with an average LoS B during both the AM and PM peak. It is important to note that the right turning movement at this intersection is operating at capacity (LoS D) in the peak periods.
- The intersection of Princes Highway and Huntley Road operates at LoS C in the AM Peak and PM Peak due to the difficulty in making uncontrolled right turns from Huntley Road into Princes Highway.
- The intersection of Illawarra Highway and Yellow Rock Road operates satisfactorily in the AM and PM periods with a maximum delay of approximately 15 seconds (LoS C) experienced for vehicles exiting Yellow Rock Road in the PM Peak period.