

New Richmond Bridge: Stage 1 – The Driftway



Urban Design, Landscape Character and Visual Impact Assessment

Review of Environmental Factors (REF)

Prepared for Jacobs Group (Australia) Pty Ltd

Quality Assurance

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Executive Summary

Transport for NSW proposes to upgrade about 3.6 kilometres of The Driftway between Londonderry Road and Blacktown Road (the proposal). The proposal is located in the suburbs of Richmond, Londonderry and South Windsor, NSW. The upgrade to The Driftway forms Stage 1 of the New Richmond Bridge and traffic improvements.

Stage 2 would include a new bridge over the Hawkesbury River and associated traffic improvements around Richmond and North Richmond. Stage 2 would be subject to a future, separate environmental approval assessment and is not included in this review of environmental factors (REF).

Key features of Stage 1 of the proposal would include:

- Upgrade of the intersection of Londonderry Road / The Driftway to a roundabout
- Upgrade of The Driftway intersections with Luxford Road and Reynolds Road to channelised right turn T-junctions
- Realignment of 230 metres of The Driftway at its eastern extent to create a four-leg roundabout with Blacktown Road and Racecourse Road
- A new 24 metre long bridge over a tributary of Rickabys Creek
- A new 30 metre long retaining wall along the north western corner of Racecourse Rd and Blacktown Road
- Pavement improvements to 3.6 kilometres of The Driftway including widening both shoulders to 1.5 metres
- Modifications to driveways and property adjustment works
- Removal of the redundant section of The Driftway and its intersection with Blacktown Road. Reshaping of this area for flood storage capacity
- Drainage improvements along The Driftway
- Relocation and/or adjustments to public utilities and street lighting
- Ancillary work including safety barriers, signage, line marking and environmental protection work
- Landscaping and rehabilitation work
- Temporary ancillary construction facility and laydown areas.

Design Guidelines

In developing the urban design, landscape character and visual assessment the design has been undertaken in accordance with a number of Transport (Formerly RMS) guidelines in order to inform the design process and its outcomes. These guidelines included:

- Road Design Guidelines
- Environmental Impact Assessment Practice Note: Guideline for Landscape Character and Visual Impact Assessment - EIA-N04. Transport for NSW, 2020.
- Beyond the Pavement: Urban design approach and procedures for road and maritime infrastructure planning, design and construction. Transport for NSW, August 2020
- Landscape Design Guideline, Roads and Maritime, December 2018
- Water Sensitive Urban Design Guideline- Applying water sensitive urban design principles to NSW Transport Projects, Roads and Maritime, 2017.
- Reconciliation Action Plan, Transport for NSW, 2019.

Context

An understanding of the roads context is essential to ensure the responses proposed are informed and reflect the planning and uses which occur within the vicinity of the corridor. A review of context was undertaken which encompasses:

- Land use
- Heritage
- Vegetation
- Topography and drainage

Urban Design Strategy

In developing a design response which addresses the impacts to landscape character and the visual environment a number of principles were developed derived from those in Beyond the Pavement.

Principle 1 – Contribute to the overall landscape structure and revitalisation of the region

Principle 2 – Respect the land uses and built form of the corridor

Principle 3 – Connecting modes and communities

Principle 4 – Fit the landform of the corridor

Principle 5 – Responding to natural pattern

Principle 6 – Protect and enhance the heritage and cultural values of the corridor

Principle 7 – Designing an experience in movement

Principle 8 – Creating self-explaining road environments

Principle 9 – Achieving integrated and minimal maintenance design

As part of the proposal concept design development, the urban design strategy developed responds to the:

- landscape treatment of the formation
- the nature and placement of roadside furniture, and
- the planting design required to integrate the proposal to achieve a contextually responsive design outcome, including in relation to the protected vegetation communities of the corridor.

Landscape Character and Visual Assessment

The landscape character assessment identified four character zones which are individually assessed within the report:

- LCZ1 – Rural residential
- LCZ2 – Woodland
- LCZ3 – Industrial Woodland
- LCZ4 – Riverine Woodland

Findings

The landscape character assessment reveals The Driftway currently exists as a rural road corridor with no kerbs. The northern side of the alignment is predominately remnant woodland and the southern side is characterised by rural residential housing. This context has been identified as sensitive to change with moderate rankings in relation to both character and visual impacts. However, key issues of impact can be effectively managed providing a safe and attractive route with minimal impact to the uses adjacent.

Contents

	Executive Summary	3
1	Introduction	11
1.1	Background	11
1.2	Project Description	11
1.3	Proposal overview	14
1.4	Purpose of Report	14
1.5	Report structure	14
2	Policy and Planning	15
2.1	Planning framework	15
	2.1.1 Strategic planning and policy framework	15
	2.1.2 Land use planning framework	15
2.2	Land Zoning	15
	2.2.1 RU4 Primary Production Small Lots	16
	2.2.2 SP1 Special Activities	18
	2.2.3 RE1 Public recreation	18
	2.2.4 Other land uses	19
2.3	Relevant standards and guidelines	19
	Beyond the Pavement: Urban design approach and procedures for road and maritime infrastructure planning, design and construction	19
	2.3.1	19
3	Methodology	21
3.1	Overview	21
3.2	Landscape Character and Visual Impact Assessment	22
3.3	Visual Impact Assessment	22

3.4	Landscape Character and Visual Assessment matrix	23
3.5	Mitigation strategy	24
4	Existing Environment	25
4.1	Introduction	25
4.2	Landform and Hydrology	25
4.2.1	Landform	25
4.2.2	Drainage	25
4.2.3	Vegetation	28
4.3	Heritage	30
4.3.1	Aboriginal Heritage	30
4.3.2	Non Aboriginal Heritage	30
4.4	Built environment	31
4.4.1	Residential	31
4.4.1	Industrial	31
4.4.2	Utility services	31
5	Landscape Character Assessment	32
5.1	Landscape Character Assessment	32
5.2	Landscape Character Zone Definitions	34
5.2.1	LCZ1 – Rural residential	34
5.2.2	LCZ2 – Woodland	35
5.2.3	LCZ3 – Industrial Woodland	36
5.2.4	LCZ4 – Riverine woodland	38
5.3	Landscape Character Impact Assessment Summary	39
6	Visual Impact Assessment	40
6.1	Visual Receptors and Viewpoints	40
6.2	Visual Catchment	40
6.3	Viewpoints	42
6.4	Key Viewpoints	44
6.4.1	VP1 – Racecourse Road Looking Northwest	44
6.4.2	VP2 – Blacktown Road	45
6.4.3	VP3 – The Driftway just beyond its intersection with Blacktown Road	46

6.4.4	VP4 – Reynolds Road	47
6.4.5	VP5 – The Driftway	48
6.4.6	VP6 – Luxford Road	49
6.4.7	VP7 – The Driftway	50
6.4.8	VP8 – Londonderry Road looking north	51
6.4.9	VP9 – Londonderry Road looking north	52
6.5	Visual Assessment Summary	53
7	Concept Design	54
7.1	Urban and Landscape Design Principles and Objectives	55
7.1.1	Contribute to the overall landscape structure and revitalisation of the region	55
7.1.2	Respect the land uses and built form of the corridor	55
7.1.3	Connecting modes and communities	55
7.1.4	Fit the landform of the corridor	56
7.1.5	Responding to natural pattern	56
7.1.6	Achieving integrated and minimal maintenance design	56
7.2	Proposal	56
7.3	Design Responses	57
7.3.1	Integration Strategy	57
7.4	Concept design	62
7.4.1	Alignment	62
7.4.2	Grading	67
7.4.3	Bridges	68
7.4.4	Vegetation	70
7.4.5	Landscape Treatments	72
	Other Structures	72
7.4.6	Overhead utilities	72
7.4.7	Signage	73
8	Mitigation Measures	74
8.1	Mitigation Measures	74

9	Conclusion	76
10	Bibliography	77
	Appendices	78

Figures

Figure 1 Regional Context Plan	12
Figure 2 Local Context Plan	13
Figure 3 View of rural production lands on the southern alignment of The Driftway corridor	16
Figure 4 Land Zoning	17
Figure 5 View of woodland vegetation community characterising the special activities precinct	18
Figure 6 View of public recreation area to the east of the proposal	19
Figure 7 Topography and Drainage Map	26
Figure 8 Existing table drain north of the road alignment	27
Figure 9 Floodplain of Rickabys Creek and former road alignment and bridge in background	27
Figure 10 Vegetation map	29
Figure 11 View of site vegetation	30
Figure 12 Landscape Character Zone Plan (Scale: 1:20,000 @ A4)	33
Figure 13 Rural residential properties on the southern alignment looking east along the The Driftway	34
Figure 14 View looking east along The Driftway showing woodland character	35
Figure 15 View showing the entry of Hawkesbury City Waste Facility (a) and its greater context from Reynolds Road (b)	36
Figure 16 View of rural / open pasture landscape from Richmond Road looking north	38
Figure 17 View catchment plan	41
Figure 18 Visual Impact Assessment Plan (Scale: 1:20,000 @ A4)	43
Figure 19 View from Racecourse Road looking west to The Driftway	44
Figure 20 View from Blacktown Road looking south from The Driftway	45
Figure 21 View from The Driftway adjacent Blacktown Road looking south along The Driftway	46

Figure 22 View from The Driftway adjacent Blacktown Road looking south along The Driftway	47
Figure 23 View along The Driftway looking west	48
Figure 24 View from Luxford Road looking west along The Driftway	49
Figure 25 View along The Driftway looking east	50
Figure 26 View from Londonderry Road looking west towards The Driftway/ Londonderry Road intersection	51
Figure 27 View from Londonderry Road looking north along Londonderry Road	52
Figure 28 Guideline Covers	54
Figure 29 Landscape Strategy	61
Figure 30 Richmond Road / The Northern Road Intersection, Berkshire Park	62
Figure 31 Cross section locations	63
Figure 32 View of section to be developed through the new roundabout at Londonderry Road / The Driftway	64
Figure 33 View of a section to be developed showing a typical portion of The Driftway between Blacktown Road and The Driftway	65
Figure 34 View of a section to be developed outside Hawkesbury City Waste Facility showing the extent of the works required by realignment of the proposal	66
Figure 35 View of a section to be developed showing the shift in alignment from the existing Driftway to the proposed realignment to Racecourse Road	67
Figure 36 Elevation and Section of the proposed bridge	69
Figure 37 View looking west of The Driftway illustrating the vegetated edges	70
Figure 38 View of overhead utilities aligning the southern side of The Driftway	73

1 Introduction

1.1 Background

Transport for NSW proposes to upgrade The Driftway including pavement, drainage and intersection improvements between Londonderry Road and Blacktown Road/Racecourse Road (the proposal). The works form Stage 1 of a broader upgrade to improve capacity by providing a new bridge over the Hawkesbury River and traffic improvements around Richmond and North Richmond. The total length of the proposal is approximately 4.0km.

1.2 Project Description

The proposal is located near Richmond, in Sydney's Northwest between Londonderry Road, Richmond and Londonderry to the west and Blacktown/Racecourse Road, South Windsor to the east. The Driftway generally forms the border between the Hawkesbury Local Government Area (LGA) to the north and the Penrith LGA to the south. The Western Sydney University (Hawkesbury Campus) and Hawkesbury City Waste Management Facility are located immediately north of the proposal.

Richmond Bridge is currently operating at capacity during the morning and evening peak periods resulting in congestion and increased travel times. Without improvements to the surrounding road network, forecast traffic demands show that travel times in the Richmond and North Richmond areas are expected to increase substantially. In addition, The Driftway has a poor crash history at major intersections. Improvements to The Driftway form Stage 1 of the New Richmond Bridge and traffic improvements and would deliver early safety benefits to the community. The Landscape character and visual assessment forms part of the REF prepared for the proposal, and assesses the proposals impacts of landscape character and its visual implications. Through this assessment process key areas of impact are defined and proposals for addressing the impacts are determined.

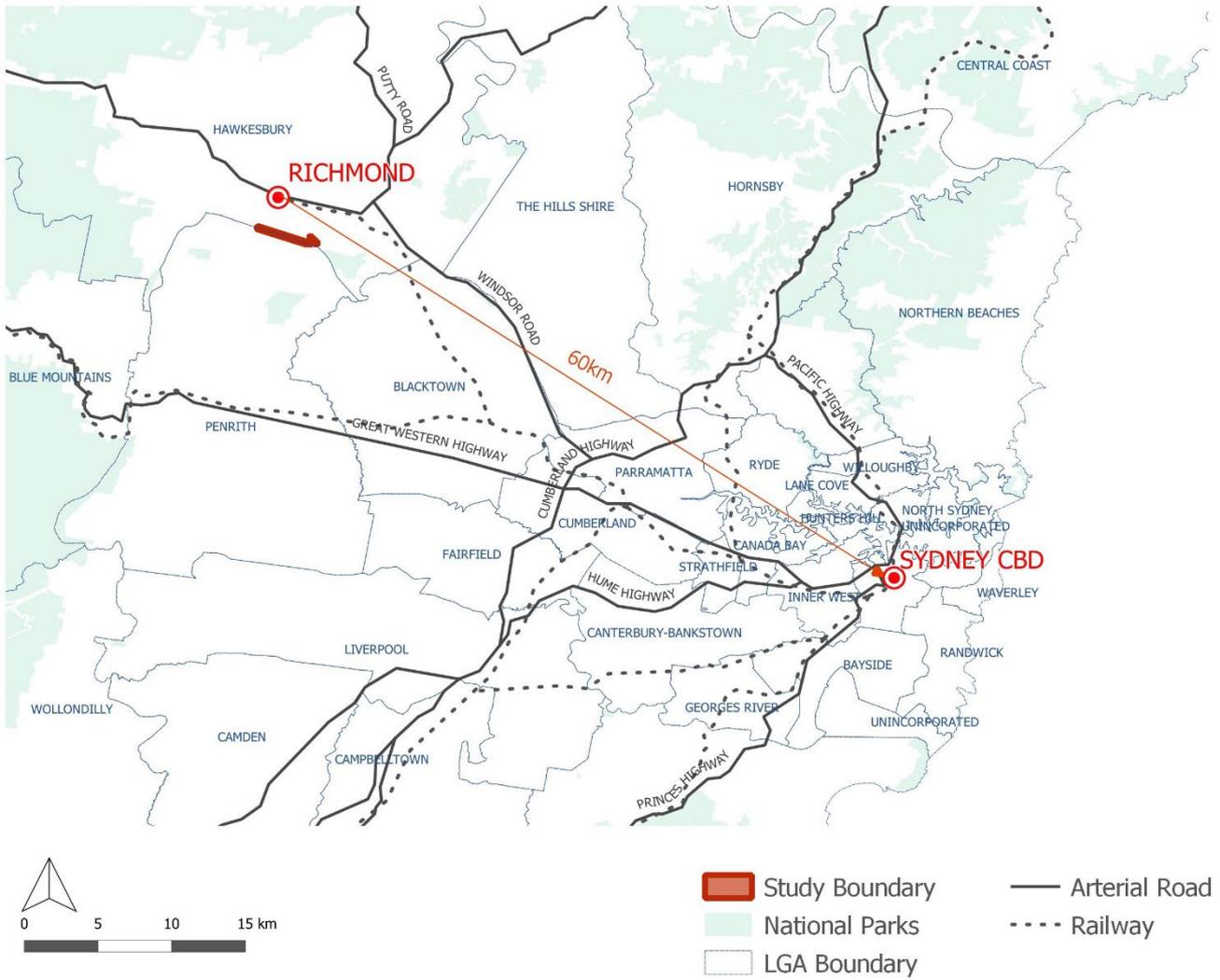


Figure 1 Regional Context Plan

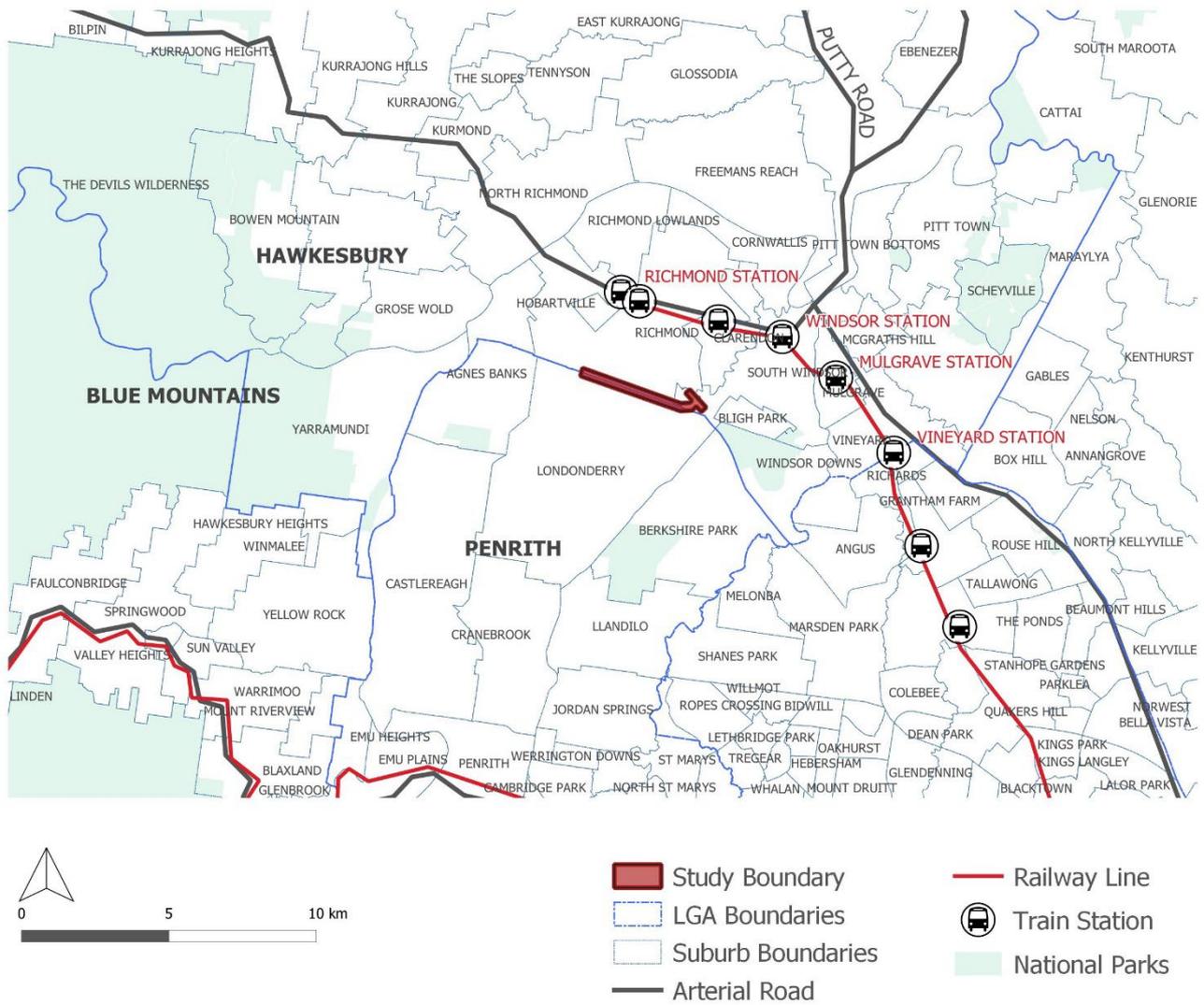


Figure 2 Local Context Plan

1.3 Proposal overview

Key features of Stage 1 of the proposal would include:

- Upgrade of the intersection of Londonderry Road / The Driftway to a roundabout
- Upgrade of The Driftway intersections with Luxford Road and Reynolds Road to channelised right turn T-junctions
- Realignment of 230 metres of The Driftway at its eastern extent to create a four-leg roundabout with Blacktown Road and Racecourse Road
- A new 24 metre long bridge over a tributary of Rickabys Creek
- A new 30 metre long retaining wall along the north western corner of Racecourse Rd and Blacktown Road
- Pavement improvements to 3.6 kilometres of The Driftway including widening both shoulders to 1.5 metres
- Modifications to driveways and property adjustment works
- Removal of the redundant section of The Driftway and its intersection with Blacktown Road. Reshaping of this area for flood storage capacity
- Drainage improvements along The Driftway
- Relocation and/or adjustments to public utilities and street lighting
- Ancillary work including safety barriers, signage, line marking and environmental protection work
- Landscaping and rehabilitation work
- Temporary ancillary construction facility and laydown areas.

1.4 Purpose of Report

Tract Consultants Pty Ltd has been commissioned by Jacobs to provide an Urban Design, Landscape Character and Visual Impact Assessment (LCVIA) for the upgrade of The Driftway in Londonderry. As part of this process a review of the design is to be undertaken and recommendations made as to its integration within the road corridor.

This assessment and recommendations will form part of the Review of Environmental Factors (REF) submission for the assessment of the works.

1.5 Report structure

This report is structured with the following sections:

- Section 1 – provides an introduction to the report
- Section 2 – describes the relevant planning and policies
- Section 3 – describes the methodology used to complete the assessment
- Section 4 – describes the existing environment
- Section 5 - provides the landscape character assessment
- Section 6 – provides the visual impact assessment
- Section 7 – provides the concept design and urban design strategy
- Section 8 - provides recommended mitigation measures
- Section 9 – provides the conclusions of the assessment

2 Policy and Planning

2.1 Planning framework

2.1.1 Strategic planning and policy framework

Several strategic planning and policy documents apply to the study area, including:

- National plans and policies:
 - *Australian Infrastructure Plan* (Infrastructure Australia 2016)
 - *Infrastructure Priority List* (Infrastructure Australia 2020)
 - *National Freight and Supply Chain Strategy* (Commonwealth of Australia 2019)
- State government plans and policies:
 - *Building Momentum: The State Infrastructure Strategy 2018-2038* (Infrastructure NSW 2018)
 - *Future Transport Strategy 2056* (Transport for New South Wales, 2018)
 - *NSW Freight and Ports Plan 2018- 2023* (Transport for New South Wales, 2018)
 - *Road Safety Plan 2021* (Transport for New South Wales, 2018)
 - *Greater Sydney Regional Plan* (Greater Sydney Commission, 2018)
 - *Western City District Plan* (Greater Sydney Commission, 2018)

2.1.2 Land use planning framework

Land use in the study area is regulated by the:

- Hawkesbury Local Environment Plan 2012
- Hawkesbury Development Control Plan 2002 (DCP)
- Penrith Development Control Plan 2014 (DCP)
- Penrith Local Environmental Plan 2010

The local environmental plans (LEPs) provide a statutory framework for the way that land is used through land use zoning, refer to Figure 4. Land use zones in the study area include:

- RU4 Primary Production Small Lots
- SP1 Special Activities
- RE1 Public Recreation

2.2 Land Zoning

The land use zoning of an area has the potential to influence the overall character and feel of the place.

The Driftway is located within an area of the Hawkesbury between rural residential properties and existing woodland adjacent the Western Sydney University Hawkesbury campus. Majority of the project is zoned for either special activities or production however there is a small wedge of public recreation space to the east of the project.

There are two dominant land uses one either side of the alignment, these are:

- RU4 Primary Production Small Lots, located on the southern side of the corridor, refer figure 6 is defined by residential properties on production lands which may also double as small businesses.
- SP1 Special Activities, the northern side of the corridor is predominately environmentally significant lands and the Western Sydney University (WSU) Hawkesbury campus.

In addition to these:

- RE1 Public Recreation provides a pocket of publicly accessible park space on the eastern corner of the proposal. The land however is not clearly identified as such and reflects the general overall character of disturbed bushland associated with the adjoining creek line.

The uses that are currently zoned adjoining the corridor have the following characteristics

2.2.1 RU4 Primary Production Small Lots

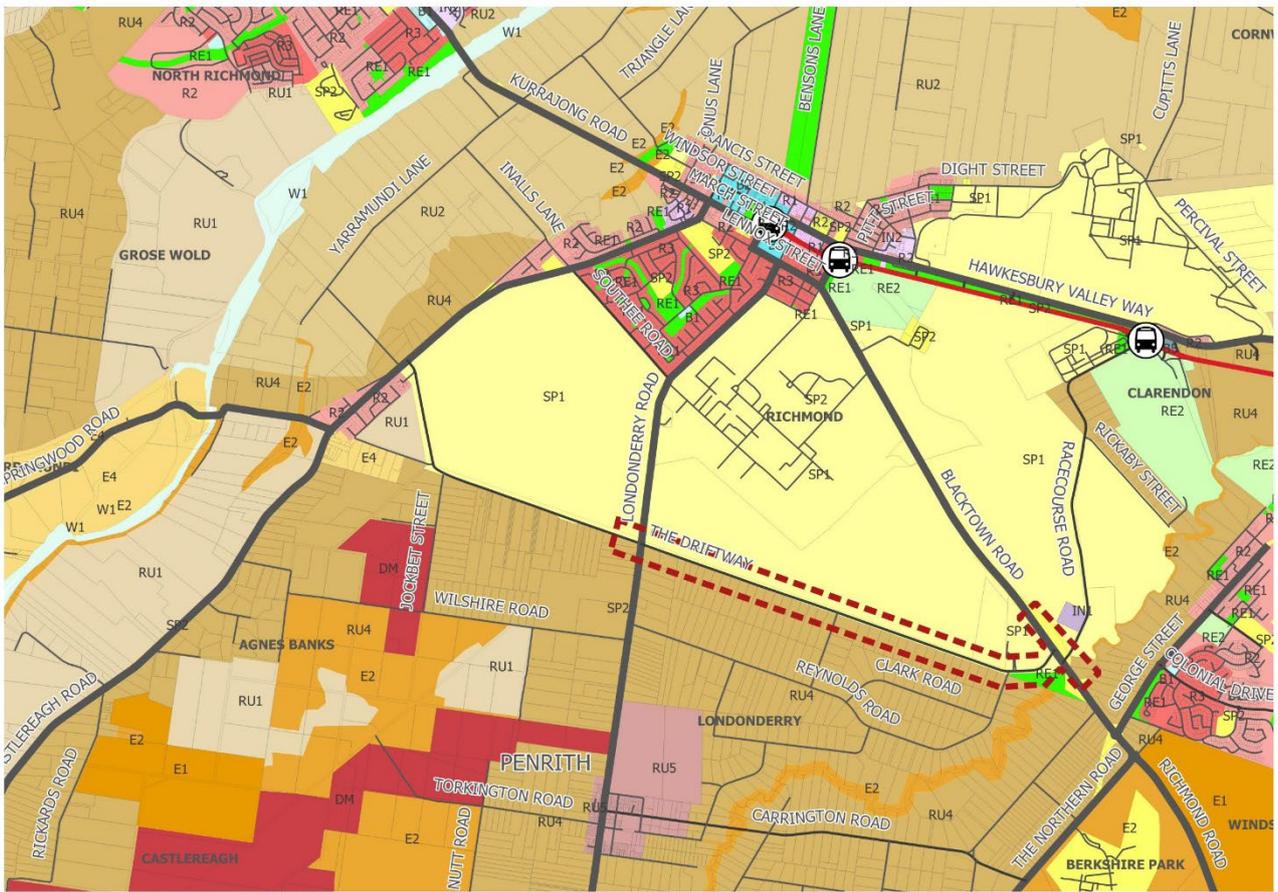
This rural interface currently forms the southern edge of the road corridor and provides a strong connection to the landscape.

Objectives of this zone as defined in Hawkesbury LEP, 2012 are:

- To enable sustainable primary industry and other compatible land uses.
- To encourage and promote diversity and employment opportunities in relation to primary industry enterprises, particularly those that require smaller lots or that are more intensive in nature.
- To minimise conflict between land uses within this zone and land uses within adjoining zones.
- To ensure that development occurs in a way that does not have a significant adverse effect on water catchments, including surface and groundwater quality and flows, land surface conditions and important ecosystems such as waterways.



Figure 3 View of rural production lands on the southern alignment of The Driftway corridor



- | | | | |
|---|---------------------------------------|--|-----------------------------------|
|  | Study Area |  | R1 General Residential |
|  | Arterial Road |  | R2 Low Density Residential |
|  | Local Road |  | R3 Medium Density Residential |
|  | Railway Line |  | R5 Large Lot Residential |
|  | Railway Station |  | RE1 Public Recreation |
|  | B1 Neighbourhood Centre |  | RE2 Private Recreation |
|  | B2 Local Centre |  | RU1 Primary Production |
|  | B5 Business Development |  | RU2 Rural Landscape |
|  | DM Deferred Matter |  | RU4 Primary Production Small Lots |
|  | E1 National Parks and Nature Reserves |  | RU5 Village |
|  | E2 Environmental Conservation |  | SP1 Special Activities |
|  | E4 Environmental Living |  | SP2 Infrastructure |
|  | IN1 General Industrial |  | W1 Natural Waterways |
|  | IN2 Light Industrial | | |

Figure 4 Land Zoning

2.2.2 SP1 Special Activities

The northern edge of the existing alignment is characterised by dense vegetation providing a unique visual character while screening of Blacktown Road and the university campus to the north. Objectives of this zone are:

- To provide for special land uses that are not provided for in other zones.
- To provide for sites with special natural characteristics that are not provided for in other zones.
- To facilitate development that is in keeping with the special characteristics of the site or its existing or intended special use, and that minimises any adverse impacts on surrounding land.

In this instance the special use relates to the use as university lands. The lands form part of the broader holdings of the University and are covered with remnant vegetation and cleared lands further to the north.

Also to the east of the university lands is an area of land used as a waste management site. Like the university lands this land is fronted by vegetation along the road edge.



Figure 5 View of woodland vegetation community characterising the special activities precinct

2.2.3 RE1 Public recreation

A small pocket of publicly accessible open space is located on the eastern edge of the project between The Driftway and Richmond Road, characterised by overgrown grasses and scattered trees. The area is devoid of programmed activities and features part of the former road alignment with bridge and pavement still evident.

Objectives of this zone are:

- To enable land to be used for public open space or recreational purposes.
- To provide a range of recreational settings and activities and compatible land uses.
- To protect and enhance the natural environment for recreational purposes.

- To protect and enhance the natural environment for environmental purposes.
- To restrict development on land required for future open space purposes.

The road design will cut through this space reducing its usability. However due to its limited development this will not result in a change in how the space is used.



Figure 6 View of public recreation area to the east of the proposal

2.2.4 Other land uses

Industrial lands are located to the east of Blacktown Road and relate to landscape material supplies including soils and gravels and other extractive industries. The site is set within a heavily wooded landscape.

2.3 Relevant standards and guidelines

This assessment has prepared in accordance with Transport's *Beyond the Pavement 2020 Urban Design Approach and procedures for road and maritime infrastructure planning, design and construction* (Beyond the Pavement) (Transport, 2020). In addition to the overarching principles established in Beyond the Pavement, Transport for NSW has a number of guidelines, dealing with specific issues and elements which have also formed the basis of the urban design principles for the overall proposal.

2.3.1 Beyond the Pavement: Urban design approach and procedures for road and maritime infrastructure planning, design and construction

In Beyond the Pavement, Transport defines best practice for road infrastructure projects in NSW, outlining the goals, expectations, process, and responsibilities for urban design for Transport projects.

Beyond the Pavement describes nine urban design principles that should govern the planning and design of road infrastructure in order to deliver safe, efficient and high-quality infrastructure:

1. Contributing to urban structure and revitalisation
2. Fitting with built fabric
3. Connecting modes and communities
4. Fitting with the landform
5. Responding to natural patterns
6. Incorporating heritage and cultural contexts
7. Designing roads as an experience in movement
8. Creating self-explaining road environments
9. Achieving integrated and minimal maintenance design.

The urban design for the proposal has been developed based on the above principles. This is elaborated further in Chapter 7 - Concept Design.

In addition to the overarching principles established in Beyond the Pavement, Transport for NSW has a number of guidelines, dealing with specific issues and elements which have also formed the basis of the urban design principles for the overall proposal. This is discussed further in Section 5 - Urban Design Strategy.

Other guidelines of particular relevance to this proposal are:

- NSW Sustainable Design Guidelines Version 3.0 (Sustainable Design Guidelines), (Transport, 2013)
- Urban Green Cover in NSW. Technical Guidelines (Urban Tree Cover), (Office of Environment and Heritage 2015)

3 Methodology

3.1 Overview

This section of the report outlines the methodology adopted, which is consistent with *Environmental Impact Assessment Practice Note: Guideline for Landscape Character and Visual Impact Assessment - EIA-N04* (TfNSW, 2020) (EIA-N04). The assessment differentiates between landscape character assessment - the overall impact of a project on an area's character and sense of place, and visual impact assessment - the project's impacts on views.

The assessment involved:

- a review of relevant guidelines, planning and policies
- a desktop review of existing conditions to allow for the contextual analysis
- site inspections in April 2021, to ground truth the study area, landscape character and views
- Consideration of the proposal's urban design strategy. The urban design strategy was used to develop the urban design concept to fit into the surrounding area, support local connections and contributes to communities and their natural, built and community setting
- Identification of landscape character zones and assessment of operational impacts on landscape character. Refer to Section 3 for further detail on the landscape character assessment methodology and Section 5 for the impact assessment
- assessment of visual impacts during operation. Refer to Section 3 for further detail on the visual impact methodology and Section 6 for the visual impact assessment
- development of a mitigation strategy

As per EIA-N04, the landscape character and visual impact assessment has several purposes:

- to measure and report on how well the design fits into the built, natural and community landscape and how well it responds to what people see
- to inform the development of the concept design so the proposal can avoid and minimise impact up front
- to inform Transport, other agencies and the community about the potential landscape character and visual impacts of the overall proposal
- to identify the avoidance, management, and mitigation strategies:
 - embedding mitigation measures within the design as part of the proposal
 - Implementing mitigation measures after achieving approval for the proposal.

3.2 Landscape Character and Visual Impact Assessment

To assess landscape character the local context of the site is divided into several unique units to assist in understanding the local context and the implications of the proposal. These include defining the landscape character zones (LCZ) which are zones of similar spatial or character properties, and the analysis of changes to these LCZ's as a result of the proposal.

The Guideline for landscape character and visual impact assessment defines landscape character:

"The combined quality of built, natural and cultural aspects which make up an area and provide its unique sense of place." (Transport, 2020).

The purpose of dividing the study area into LCZs is to make sure that the impacts assessed are representative for each zone based on its distinct characteristics. The LCZs identified for the study area are described in Section 5.

The proposal is assessed in terms of its impacts on these character zones and the impact ranked in terms of sensitivity to change. This assessment differs from a visual assessment in that it assesses the overall impact of a proposal on an area's character and sense of place.

3.3 Visual Impact Assessment

The visual impact assessment involves identifying an estimated visual catchment through desktop analysis and ground truthing to ascertain the theoretical area from where the proposal would be visible considering factors such as landform, direction of travel or direction of the view, built structures and vegetation. Vegetation, while often obscuring potential views, is not considered a permanent obstruction as it can be relatively easily removed. This area is known as the visual catchment or visual envelope.

Distance is also an important factor when assessing visual impacts. With increased viewing distance, the proposal may appear smaller, and less detail can be made out. For this reason, very large visual envelopes are often defined by zones or bands of proximity from the proposal.

Within the visual envelope several viewpoints were selected for assessment, located both within and outside the proposal's operational footprint.

Viewpoints were chosen to represent a range of views including views from residential properties, public spaces, businesses, and the existing road corridor. The visual impact of the proposal was assessed by considering the sensitivity of the view and the magnitude of change to the view because of the proposal:

- Sensitivity refers to the quality of the view. It is measured by assessing the composition of the view, its capacity to absorb change by identifying sensitive or visually valuable elements in the view, and the length of exposure to the view
- Magnitude refers to the physical character, size and scale of the proposed works and their proximity relative to the viewer. For example, a development situated one kilometre from the viewpoint would have a much-reduced visual impact relative to one 100 metres away. Magnitude also considers overshadowing during the day and lighting at night

The combination of sensitivity and magnitude provides the rating of the visual impact. Visual impact is calculated using the landscape character and visual impact grading matrix provided in the practice note and defined below.

3.4 Landscape Character and Visual Assessment matrix

Landscape character and visual assessment are equally important. The landscape character assessment helps determine the overall impact of a proposal on an area's character and sense of place including all built, natural, and cultural aspects, covering towns, countryside, and all shades between. The visual impact assessment helps define the day-to-day visual effects of a proposal on people's views.

To quantify these impacts, it is important to assess two qualities identified as sensitivity and magnitude in relation to a viewpoint. To enhance understanding a description is provided for both in order that the key issues are understood.

Sensitivity refers to the qualities of an area, the number and type of receivers, and how sensitive the existing character of the setting is to the proposed change. For example, a pristine natural environment will be more sensitive to change than a built-up industrial area.

Magnitude refers to the scale, form, and character of the proposal. For example, a large interchange would have a very different impact on landscape character than a localised road widening in the same area (Transport, 2020).

Table 1 summarises the ranking of the assessment of these two criteria and how they are combined to provide an overall impact assessment. This is supported by an accompanying description of the factors of both sensitivity and magnitude which have influenced the determination of the result. The assessment is supported by the methodology provided within the LCVIA Guidelines (Transport, 2020).

Table 1- Landscape Character and Visual Impact Assessment Matrix

		Magnitude			
		<i>High</i>	<i>Moderate</i>	<i>Low</i>	<i>Negligible</i>
Sensitivity	<i>High</i>	High	High – moderate	Moderate	<i>Negligible</i>
	<i>Moderate</i>	High – Moderate	Moderate	Moderate – Low	<i>Negligible</i>
	<i>Low</i>	Moderate	Moderate – Low	Low Impact	<i>Negligible</i>
	<i>Negligible</i>	<i>Negligible</i>	<i>Negligible</i>	<i>Negligible</i>	<i>Negligible</i>

The mitigation strategy comprises, principles or treatments recommended to manage the identified landscape character and visual impacts of the proposal. This includes:

- measures embedded in the proposal design that have already mitigated potential landscape character and visual impacts. They include a strategy and design principles that continue to provide guidance during future design and construction stages in order to minimise landscape character and visual impacts
- environmental management measures for further investigation during future stages of the proposal in order to manage landscape character and visual impact including:
 - safeguards and management measures to be implemented during detail design
 - aspects and details of the concept design to be further investigated in detailed design to improve urban design outcomes.

The mitigation measures for the overall proposal are described in Section 8.

4 Existing Environment

4.1 Introduction

The assessment and development of an urban design response to minimise impact of the proposal and maximise its integration with place involves an understanding of the present context, how this may change as a result of other projects or the impacts of the proposal itself. To understand this, a review of the physical and social context of the proposal is undertaken to understand the attributes of place.

4.2 Landform and Hydrology

The study area is located within the Hawkesbury - Nepean Terrace Gravels Mitchell Landscape as mapped by the NSW National Parks and Wildlife Service (2002) and described by the NSW Department of Environment and Climate Change (2008). The landform and hydrology are interconnected with the area comprising an alluvial plain of Hawkesbury River, refer Figure 7 for Topography and Drainage Plan.

4.2.1 Landform

The site is set beyond the flood terrace of the Hawkesbury Nepean with a typical elevation along the proposal's alignment ranging between 10 and 30 metres above sea level. The alignment presents as a largely level corridor with elevation rising marginally to the northwest. To the southeast a number of smaller ephemeral creeks cross the alignment via culvert and pipes with water flowing from the northern to southern side of the alignment. There are no significant landscape features within the corridor.

Significant modifications to the landform are occurring to the southeast of the alignment where the local landfill site, Hawkesbury City Waste Management Facility, is being operated. This facility has introduced earth bunding for containment and is resulting in an elevated form.

The flat nature of the site and limited scale of intervention should see the road fit relatively comfortably within this landform.

4.2.2 Drainage

The Driftway is located on the floodplain of the Hawkesbury Nepean River System to the west of the corridor. The site itself is set beyond the flood terrace of the Hawkesbury Nepean and so is not impacted by the main flood events of the River.

This section of The Driftway drains to the southwest away from the Hawkesbury River and into Rickabys Creek.

Drainage structures within the corridor consist of open swales and table drains, culverts and at the south-eastern end of the corridor a bridge structure.

Flooding is experienced in association with Rickabys Creek as it backs up south of Blacktown Road. The design of the bridge needs to consider this and the implication of flood waters.

Given the flat nature of the corridor and the flooding potential in the south-eastern end of the site, the design of drainage structure will influence how the alignment is managed particularly in relation to how the road responds to flood constraints and its resilience.

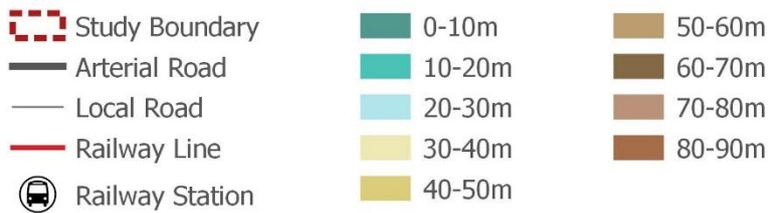


Figure 7 Topography and Drainage Map

The following image Figure 8 illustrates the nature of the existing drains north of the road alignment which are broad flat table drains. Some erosion is experienced along their edges which reflect the steep sides and nature of the soil properties within the alignment. Consideration needs to be given in the design of future drainage structures to ensure both the stability and erodibility of the proposed slopes and their treatment are appropriately managed.



Figure 8 Existing table drain north of the road alignment

The impacts of flooding are evident within the corridor with the figure below illustrating a flood level of approximately 2m (based on the height of dead leaves in response to flooding in March 2021). Flooding was also an influence in the change of alignment in the past as the new alignment responded to Blacktown Road and its elevation above the frequent flood levels.



Figure 9 Floodplain of Rickabys Creek and former road alignment and bridge in background

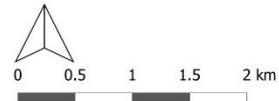
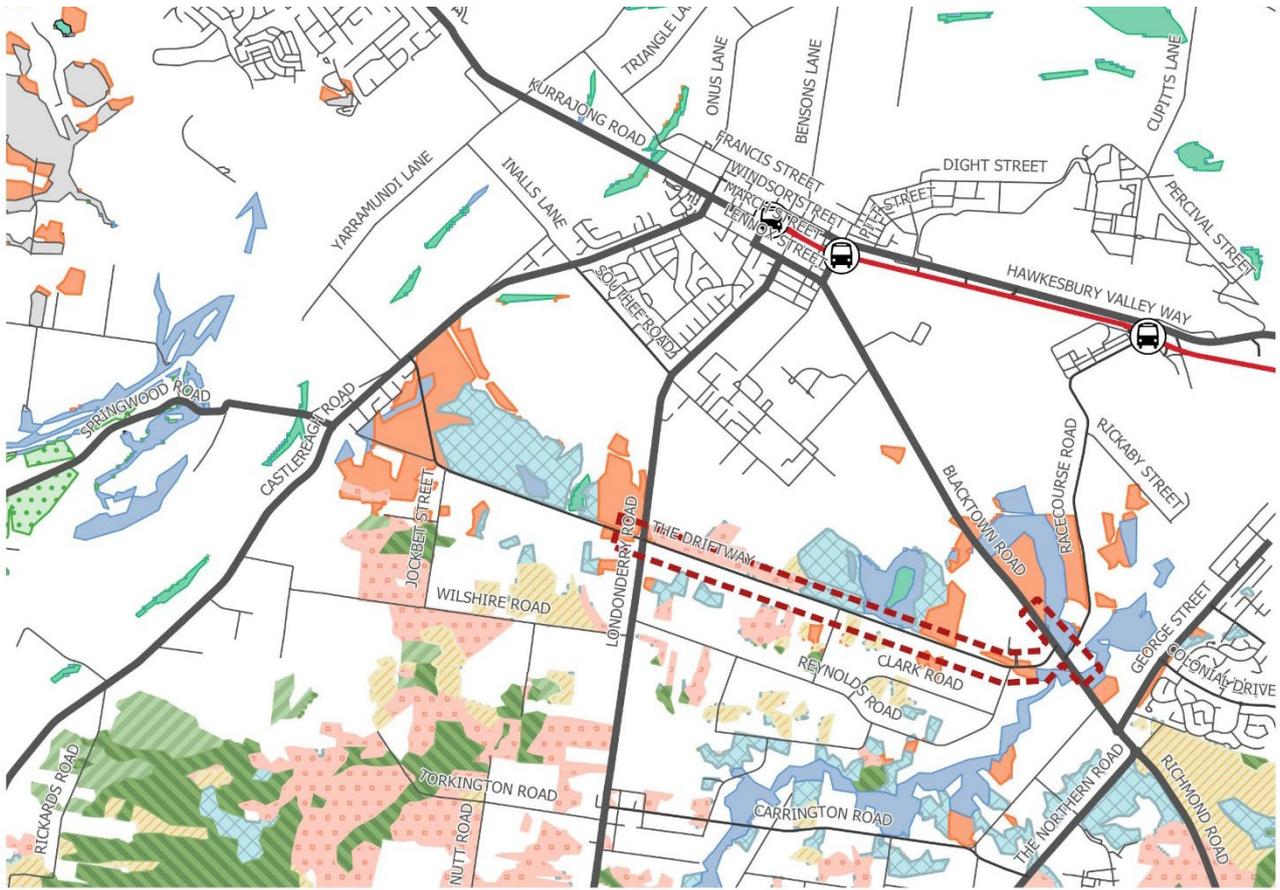
4.2.3 Vegetation

The site represents a mix of heavily vegetated lands to the north of approximately 150m width, before transitioning to cleared agricultural lands and largely cleared rural residential lands to the south.

Located on the western portion of the Cumberland Plain, the native vegetation in the study area is comprised of five plant community types (PCT), four of these vegetation communities are endangered, one critically endangered and one vulnerable, consistent with the EPBC Act. The communities found within the study area are:

- Shale Gravel Transition Forest (Endangered) (PCT 724),
- Castlereagh Ironbark Forest (Endangered) (PCT 725),
- River-Flat Eucalypt Forest (Endangered) (PCT 835)
- Cumberland Plain Shale Woodland (Critically endangered) (PCT 849) and
- Castlereagh Scribbly Gum Woodland (Vulnerable) (PCT 883).

Figure 10 shows the five vegetation communities within the study area and their proximity to the project.



- Study Boundary
- Arterial Road
- Local Road
- Railway Line
- Railway Station
- Agnes Banks Woodland
- Blue Mountains Heath
- Castlereagh Ironbark Forest
- Castlereagh Scribbly Gum Woodland
- Castlereagh Shale-Gravel Transition Forest
- Castlereagh Swamp Woodland
- Coastal Freshwater Lagoon
- Cumberland River Flat Forest
- Cumberland Shale Hills Woodland
- Cumberland Shale Plains Woodland
- Cumberland Shale Sandstone Transition Forest
- Sydney Hinterland Transition Woodland

Figure 10 Vegetation map

Twenty-five threatened flora species and one endangered population have been previously recorded or modelled as having potential to occur in the locality. Many of these species favour habitats that are represented in high condition native vegetation particularly north of the construction footprint where threatened flora have been recorded, including *Micromyrtus minutifolia*, *Dillwynia tenuifolia* and *Pultenaea parviflora*.

One threatened flora species was recorded in the construction footprint during the field survey undertaken for the proposal: *Dillwynia tenuifolia* listed as vulnerable under the BC Act. The habitats in the construction footprint are not considered optimal for any of the remaining threatened flora species listed due to historical land use change that has caused

vegetation degradation, disturbance to the soil, and introduction and spread exotic plant species.

The number of and nature of the vegetation communities and the role vegetation plays in defining the character and feel of the corridor needs to be carefully managed in relation to how the road is developed. Care needs to be taken to ensure revegetation strategies protect and enhance the values of the communities within or adjoining the corridor.



Figure 11 View of site vegetation

4.3 Heritage

4.3.1 Aboriginal Heritage

The original inhabitants of the Hawkesbury district were the Darug tribe of Aboriginals, also spelt as Dharug or Daruk. The Hawkesbury/ Nepean River, which they called Derrubbin was a focal point as a source of food, including fish, eels, water birds, & mussels: and transport, in the form of bark canoes. Yams, a staple food, grew along the banks of the river. The acquisition of these lands by settlers resulted in conflict lasting from 1789 to 1805. (Attenbrow 2010, p15).

While a number of Indigenous heritage items have been identified within the broader area, no specific items have been identified within the corridor. Acknowledgement of country should however form part of the overall response to the project.

4.3.2 Non Aboriginal Heritage

Settlement around the Hawkesbury River began in 1789 when Governor Arthur Philip explored the area searching for suitable agricultural land. In the 1790s, wheat and maize were grown in the area and shipped to Sydney via the Hawkesbury River, this would become a significant shipping lane between Macquarie Towns to Sydney Harbour.

The early 1800s saw property development occur along the Hawkesbury River to allow for farmers and ship builders working in the area to live closer to work. By the 1830s, population

had expanded in Richmond to 746 people and 147 houses. In 1891, the Hawkesbury Agricultural College is established, the 3,135 acres were allocated for the creation of the college, the land is in a natural state with a dense cover of forest and poor soil. Buildings were erected in 1900, the land was cultivated with a wide variety of crops, piggeries and orchards with established structural plantings of palms and park like features.

Development continues into the 1900s with Windsor and Richmond being established as residential communities, Richmond specifically achieving this in the 1960s by adding necessary infrastructure such as parks, schools and churches.

Several local and state heritage items exist within the Richmond Bridge Duplication project however, none are located within proximity of The Driftway improvements.

4.4 Built environment

The built environment in the study area is comprised of roads, residential and industrial infrastructure. Major built environment features in the study area are described below.

4.4.1 Residential

Residential properties exist along the southern alignment of The Driftway. These occur on small rural residential holdings and so present a discontinuous address along the corridor with housing setback from the frontage at irregular intervals. Most of the land appears to be unproductive with residential lifestyle appearing to be the primary function providing a parklike setting. Other uses involve small construction/ industrial enterprises.

Changes in the character and feel of the road have the potential to negatively impact the experience of residents within properties along the alignment.

4.4.1 Industrial

Industrial development uses are focused to the south-eastern portion of the project occurring either side of Blacktown Road.

These include:

- Hawkesbury City Waste Management Facility – presents a change in landscape through the presentation of grass mounding and largely removed canopy along the eastern edge frontage addressing the road.
- Turtle Landscape Supplies - presenting as warehouse type structures and large concrete block retaining walls within a cleared landscape setting dominated by car parking
- Rock and Dirt Recycling – dominated by carpark and stockpiles within the enclosed landscape of the tee lined corridor

The nature of these premises sees them have a greater visual prominence on the road than residential uses and detract in part from the overall feel and character of the corridor.

4.4.2 Utility services

The major utility constraint along the corridor is overhead powerlines along the southern verge. This has played a role in influencing the overall character and feel of the corridor as it limits the potential for trees within the southern verge leading to broken canopy and more open character when compared to the northern verge.

Consideration will need to be given to how future planting can be incorporated within this verge in response to this constraint.

5 Landscape Character Assessment

5.1 Landscape Character Assessment

This section of the report reviews the physical attributes of the character zones and the proposal's potential impacts. As part of the character assessment, the assessment has reviewed the alignment of the improvements and its context and classified it into a number of differing character zones.

The following differing character zones were identified.

- LCZ1 – Rural residential
- LCZ2 – Woodland
- LCZ3 – Industrial woodland
- LCZ4 – Riverine woodland

Figure 25 illustrates the distribution of these character zones and their relationship to the proposal.

A review of planning controls was also undertaken as part of the assessment. This identified that no listed cultural or visual landscape character units were identified under the LEP 2012.

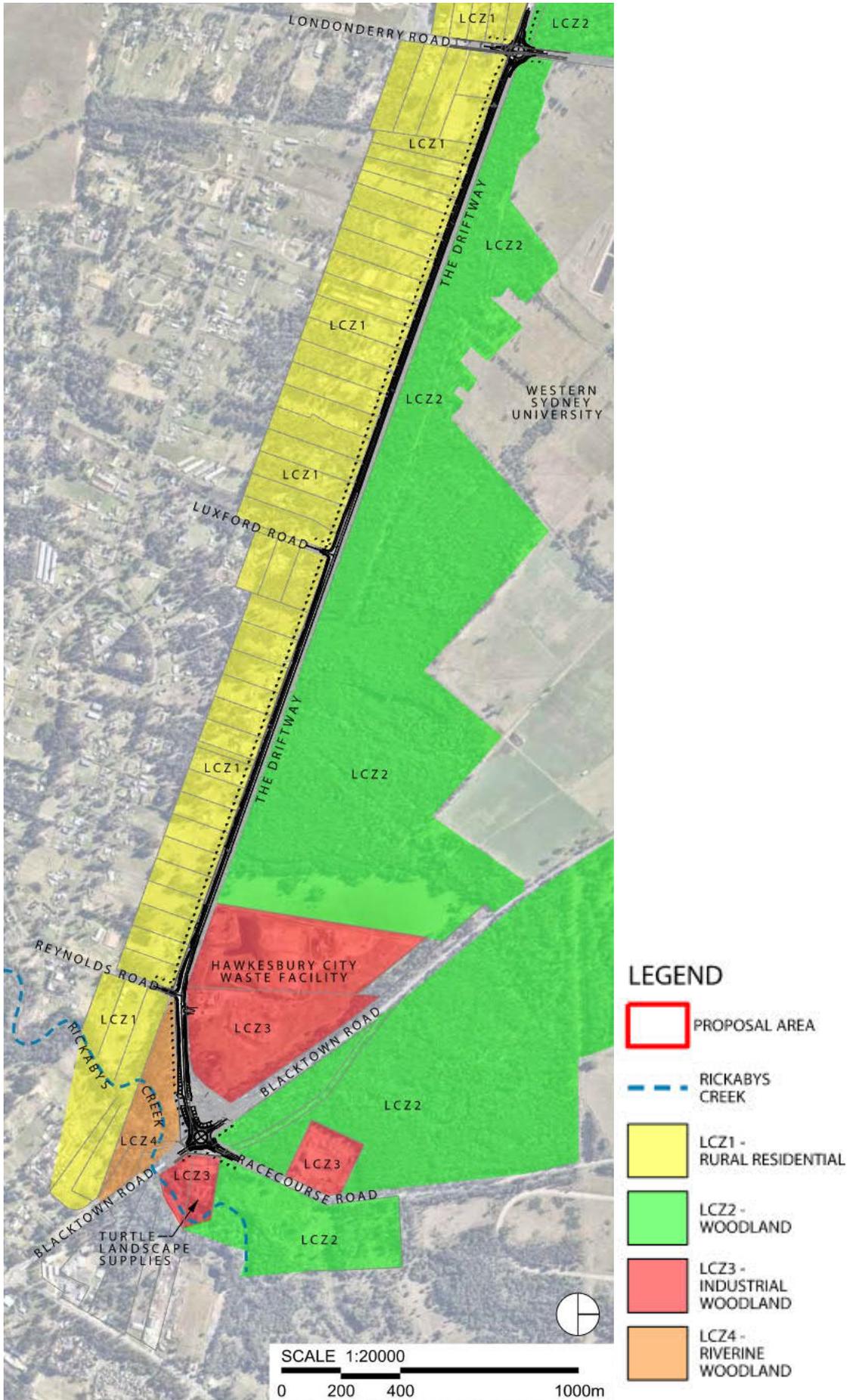


Figure 12 Landscape Character Zone Plan (Scale: 1:20,000 @ A4)

5.2 Landscape Character Zone Definitions

5.2.1 LCZ1 – Rural residential



Figure 13 Rural residential properties on the southern alignment looking east along the The Driftway

LCZ1- Rural residential is defined by residential properties on the southern side of The Driftway. The properties are set back a reasonable distance from the alignment within a parkland setting comprising cleaned pasture/grassland with patches of vegetation along the frontages of some properties.

Sensitivity: Moderate

The existing residential properties are set back a reasonable distance from the road alignment, with scattered vegetation along the alignment some properties are well screened from the context of The Driftway. In reviewing the extent of the proposed works the sensitivity is assessed as moderate. This reflects the sensitivity of residential properties which are generally high being mitigated by the distance from the road alignment and existing buffer plantings and vegetation between the properties and the alignment.

Magnitude: Low

Magnitude of change is considered to be low as the anticipated extent of works will largely be focused on the reconfiguration of the existing intersections, increasing the footprint at this point, and minor modifications to the pavement width, drainage and alignment along the corridor. The changes will see a reduction in canopy trees along the southern verge and minor increase in footprint.

Summary: Moderate to Low

Overall impact has been assessed as moderate to low reflecting the extent of works proposed, the locations in which these works will occur and the anticipated minor impacts on existing character.

5.2.2 LCZ2 – Woodland



Figure 14 View looking east along The Driftway showing woodland character

LCZ2- Woodland is defined by the well vegetated edge along the northern edge of the alignment and in some pockets of the southern edge. Vegetation in this zone is predominately in its original state, features trees, shrubs and grassland communities whilst providing screening from the University campus, commercial properties, and Blacktown Road.

Sensitivity: High

The vegetation communities within the woodland character are all listed as endangered or critically endangered. The presence of these endangered communities in such close proximity to the alignment presents a substantial constraint for the project which needs to be carefully considered and addressed. As the woodland community provides a strong sense of enclosure and screening of various elements beyond the study area, the sensitivity is considered High.

Magnitude: Low

The proposed works will mostly consist of intersection upgrades and improvements to pavements and drainage. The works are not considered to have a significant impact on the existing woodland character, and it is anticipated the existing character will be mostly retained as works will focus only on particular areas and are confined to the road corridor. The magnitude of change is considered low.

Summary: Moderate

The overall impact of the character of the woodland is considered to be moderate and will need careful integrated planning and solutions to ensure the works proposed along The Driftway are responsive to the existing character and consider the importance and contribution to the character of the corridor.

5.2.3 LCZ3 – Industrial Woodland



Figure 15 View showing the entry of Hawkesbury City Waste Facility (a) and its greater context from Reynolds Road (b)

LCZ3 – Industrial woodland occurs opposite Reynolds Road on the northern side of The Driftway. It is situated within a woodland corridor with a frontage of Cumberland Shale Plains woodland reflective of its former condition. Beyond the immediate footprint of the corridor vegetation has been cleared to make way for the Hawesbury City Waste Recycling Facility. The facility is still well screened from the road and highlights the need to consider impact of future developments.

Sensitivity: Moderate

The waste facility is currently well screened by remnant Cumberland Plain Woodland which limits views from the road alignment. The vegetation consequently provides a strong sense of definition to the corridor which would otherwise be sensitive to the presence of a waste transfer station. Vegetation within the corridor is considered a defining element of the corridors character and its relationship to the waste facility and consequently sensitivity is considered moderate.

Magnitude: High

The realignment of The Driftway as part of the project works will see the construction of a new raised formation just to the southeast of Reynolds Road. The nature of the work required will see the introduction of fill embankments and associated drainage to accommodate the change in level from The Driftway to Blacktown Road. It is anticipated this will have an impact on the vegetation currently existing within the northern edge resulting in the clearing of this buffer planting. The magnitude of change has been assessed as High.

Summary: Moderate to High

The overall impact on the industrial woodland is assessed as being Moderate to High due to the proximity of the location to the proposal and the expectation of impacts from proposal on the existing screening vegetation along the waste facility frontage which has the potential to expose the waste facility to the road environment.

5.2.4 LCZ4 – Riverine woodland



Figure 16 View of rural / open pasture landscape from Richmond Road looking north

LCZ4 – Riverine woodland occurs in the south eastern corner of the proposal. The zone has been cleared some time ago with vegetation regenerating within a grassland landscape adjoining a tributary of Rickabys Creek which runs through the centre of the character zone. In the background of this zone is an existing bridge from the former alignment of The Driftway. The proposed scope of works will see the riverine woodland zone split into two as The Driftway will be realigned to intersect with Blacktown Road and Racecourse Road along what is largely the former alignment.

Sensitivity: Moderate

The existing condition of the riverine zone reflects an altered landscape setting from prior clearing of vegetation and subsequent regeneration beginning to take place as the canopy develops within the grassland setting. Whilst visible from Blacktown Road, the character of the zone is largely a floodplain, prone to inundation in flooding with an open woodland character. Canopy vegetation is regenerating with scattered saplings throughout the area. The area is exposed to Blacktown Road and is transitioning to a natural character. As an environment in change its sensitivity has been assessed as moderate.

Magnitude: Moderate

The realignment of the corridor will see the riverine woodland zone split into two to allow for its intersection with Blacktown Road and Racecourse Road, resulting in the clearance of both remnant and regenerating canopy vegetation. This clearance will open a new alignment through the landscape creating a new visual connection between Blacktown Road and The Driftway.

The ground profile will need to be reshaped to accommodate flood storage from the new alignment. The reshaping of the ground profile will in turn lead to an emphasis on revegetation within this zone to restore the characteristics of this zone. While the margins of the zone remain intact, the scale of the footprint and new bridge are considered to result in a moderate change in character

Summary: Moderate

The overall impact of the landscape character is considered to be moderate, given the changing context and the scale of changes that are proposed.

Four landscape character units have been identified and assessed as part of the character study:

- LCZ1 – Rural residential
- LCZ2 – Woodland
- LCZ3 – Industrial woodland
- LCZ4 – Riverine woodland

The assessment summary is determined by two key factors, sensitivity, and magnitude. Sensitivity is assessed based upon exposure to the proposal, where exposure is more focused or for a longer duration the sensitivity rating will be higher. Magnitude is determined based upon the potential impact to the existing landscape by the proposal.

The ranking for character is generally moderate reflecting a combination of both sensitive receives but also a discernible level of change in character. This change in character is primarily the product of vegetation clearance with the overall road formation increasing by approximately 30% with larger increases occurring at intersections.

The landscape character assessment reveals The Driftway is defined by a vegetated edge which is of high importance as each vegetation zone is an endangered or critically endangered community. Some clearing has taken place over time to create the Western Sydney University Hawkesbury Campus and to provide low density rural residential properties along the southern edge of The Driftway. The vegetation which remains is highly sensitive to change and as such Landscape Character Zones (LCZ2) identified as woodland has also been assessed as of high sensitivity. Despite a high sensitivity the design has sought to minimise impacts and so magnitude of change is low leading to a moderate impact.

Industrial woodland is also assessed as high, this time in terms of magnitude this reflects the implementation of an elevated formation through this the lowest section of the site. Clearing of roadside vegetation results in the exposure of the Waste Management Facility and therefore a change in character. This results in a moderate to high assessment.

The rural residential properties were assessed as of moderate sensitivity due to their address to the road however the change in road form has been considered low and so change is considered moderate to low at this location.

The riverine landscape

A summary of the landscape character assessment is presented in the following Table 2.

Table 2 – Landscape Character Impact Assessment Summary

Character Definition	Sensitivity	Magnitude	Summary
LCZ1 – Rural residential	Moderate	Low	Moderate to Low
LCZ2 – Woodland	High	Low	Moderate
LCZ3 – Industrial woodland	Moderate	High	Moderate to High
LCZ4 – Riverine woodland	Moderate	Moderate	Moderate

6 Visual Impact Assessment

6.1 Visual Receptors and Viewpoints

The experience of the viewers varies according to the duration, field of view and nature of exposure to the proposal.

In assessing the visual impact, the visual range has been considered to be the effective distance where a viewer can be influenced by changes in traffic movement and discern individual details such as signage and planting elements. This distance varies in relation to the topography and effectiveness of screening vegetation however the quality of detail in the landscape typically deteriorates rapidly for distances greater than 200 metres.

Typically, the viewpoints have considered the impact of those overlooking the proposal. Of the adjoining observers it is the residential viewers who would be the most sensitive to change. These are generally the primary viewpoint assessed. In some instances, other viewers have been considered including the road user. Where differences in sensitivities of viewers exists, the worst case assessment is the stated value in terms of Sensitivity, Magnitude, and overall visual impact. The specific rating of the individual views is stated as part of the detailed assessment in Section 6.4.

6.2 Visual Catchment

The visual catchment (refer figure 17) of the proposal is well defined due to the topography of the site and clear barriers to sightlines, including vegetation, built form etc. To the north the existing vegetation contains the corridor minimise the potential for views. To the south there is a filtering of views a combination of the distribution of remnant vegetation and houses. Generally, from the south the corridor is only visible from the first row of housing.

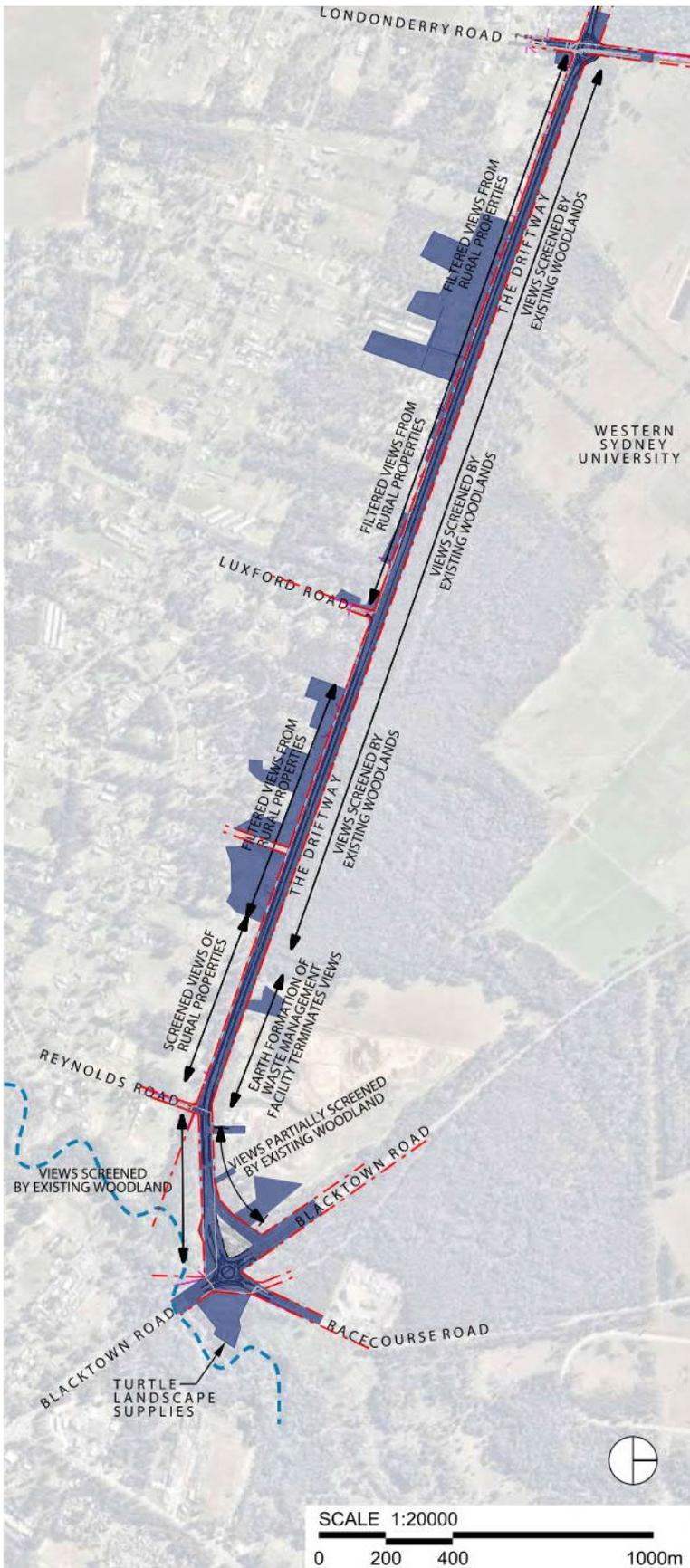


Figure 17 View catchment plan

Several viewpoints have been identified which capture the key areas of potential visual impact associated with the proposal. These relate to key residential or public areas which overlook the corridor.

In total nine viewpoints have been identified providing an overview of the level of impact and their nature, as shown in the Visual Impact Assessment Plan in Figure 18.

The assessment of these views provides:

1. An image of the outlook, including a tone indicating the approximate location of the proposal and its scale.
2. A brief description of the view and the proposal
3. An assessment of sensitivity
4. An assessment of magnitude
5. An assessment and explanation of impact

As part of the assessment the provision of an image provides the reader an understanding of the existing context. This has been overlaid by transparent graphics depicting differing elements of the proposal to provide an indication of the scale of the proposal and its impacts. Key elements identified are:

- Vegetation to be cleared – this provides an indication of the scale of clearance expected as a result of the proposal. Its purpose is to capture the immediate change that will be visible as a result of the works and does not indicate the mitigations which may occur including reinstatement of vegetation.
- Proposed Footprint – This captures the overall footprint of the road including verges and pavement and transitions.
- Revegetation area – This captures specific areas of revegetation such as the former road alignment or batters introduced as part of the road formation.



Figure 18 Visual Impact Assessment Plan (Scale: 1:20,000 @ A4)

6.4 Key Viewpoints

6.4.1 VP1 – Racecourse Road Looking Northwest

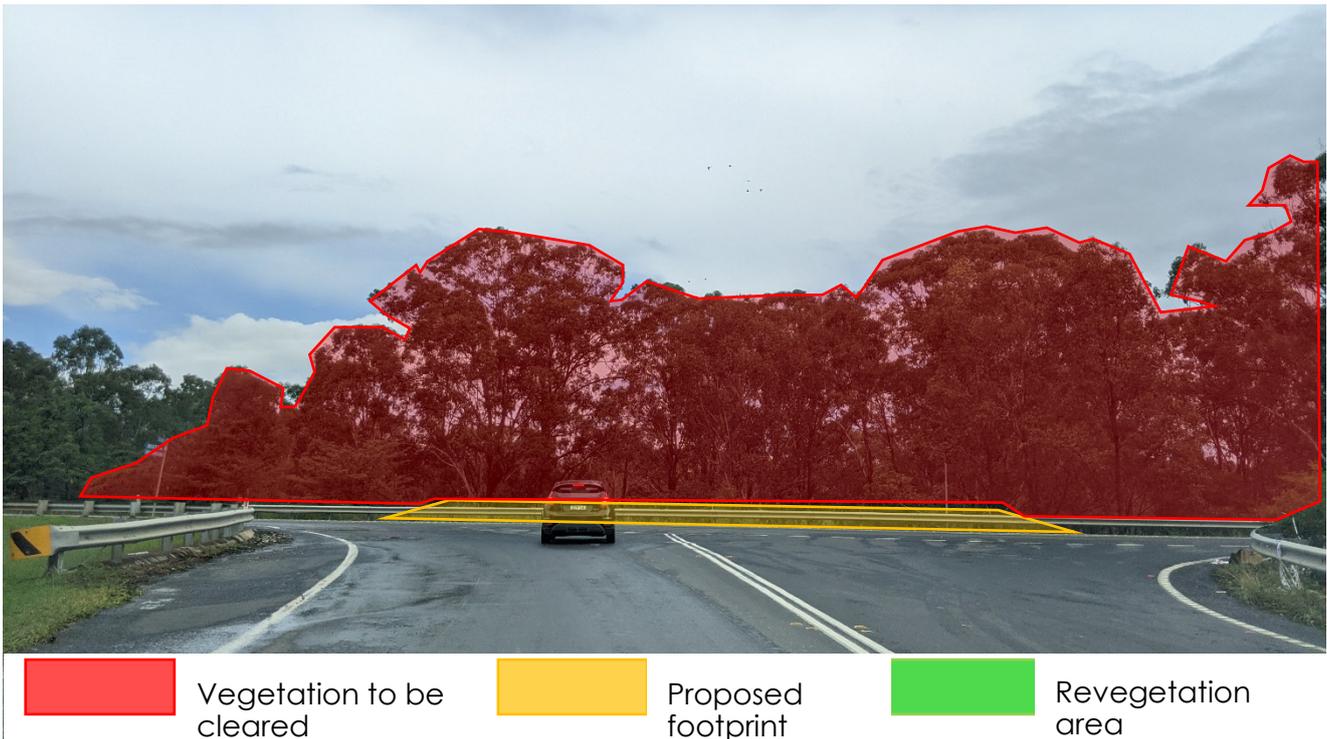


Figure 19 View from Racecourse Road looking west to The Driftway

View: Looking northwest from Racecourse Road across Blacktown Road to a cluster of trees which will be removed as part of the proposed realignment of The Driftway at its intersection with Blacktown Road.

Sensitivity: Low

View from Racecourse Road reveals a transitory experience for vehicles, whilst the bank of trees will be removed to create a roundabout at the intersection and the new alignment of The Driftway, the experience of the user is of the road at a point of decision and conflict and so the focus is distracted. The sensitivity is low.

Magnitude: Moderate

The proposal will see the removal of trees from the background and realignment of The Driftway will see an increase in the pavement footprint/ extent of clearing. The alignment of Blacktown Road is largely retained and number of through lanes maintained. The nature of this change sees the magnitude assessed as moderate.

Summary: Low to moderate

VP1 will see the cover of vegetation along the western edge removed and an expansion of the road footprint, the users experience is focused on the function of the road and despite the loss of vegetation cover the impact is assessed as moderate to low.

6.4.2 VP2 – Blacktown Road

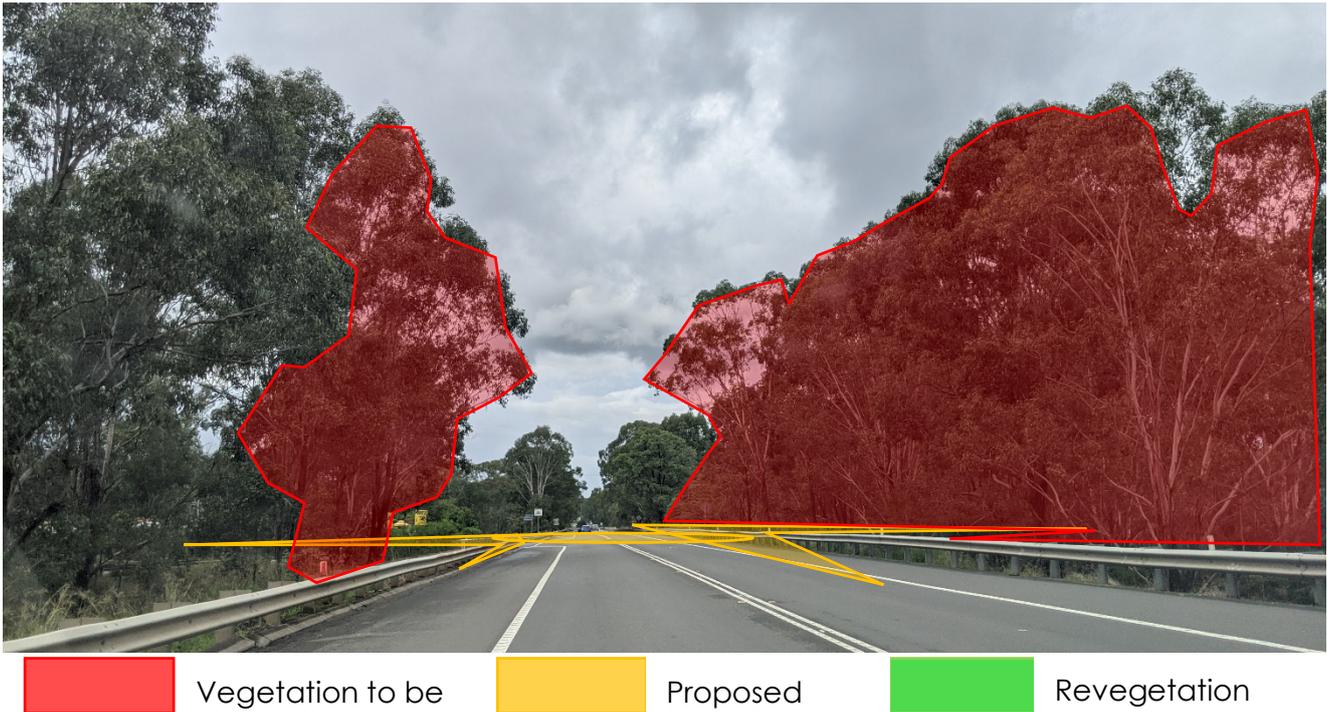


Figure 20 View from Blacktown Road looking south from The Driftway

View: Looking south from the intersection of The Driftway and Blacktown Road towards Racecourse Road.

Positioned atop a fill embankment the existing corridor is situated within a vegetated corridor providing a visual buffer to the Blacktown Road corridor restricting views in and out. The proposal will see the clearance of some vegetation on the western side (right) to allow for the realignment of The Driftway and the construction of a roundabout within the alignment.

Sensitivity: Low

The view is experienced predominately by vehicle users as they head east along Blacktown Road towards Marsden Park. The focus of the user within this view is on the road alignment, the new intersection and traffic entering and exiting the corridor. The sensitivity of viewers to the changes is considered low due to the temporary nature of the views and the users focus.

Magnitude: Low

A larger pavement footprint will be developed from the realignment of The Driftway and construction of the roundabout at Racecourse Road which will see the trees on the right of the image removed. While the footprint is relatively large the oblique nature of the viewer sees limited change because of the proposal. The magnitude to change is considered low.

Summary: Low

VP2 will see an increased footprint due to the realignment of The Driftway and construction of the new roundabout and the removal of trees. The angle of view and nature of viewer is considered to result in a limited overall impact. VP2 is consequently assessed as low.

6.4.3 VP3 – The Driftway just beyond its intersection with Blacktown Road

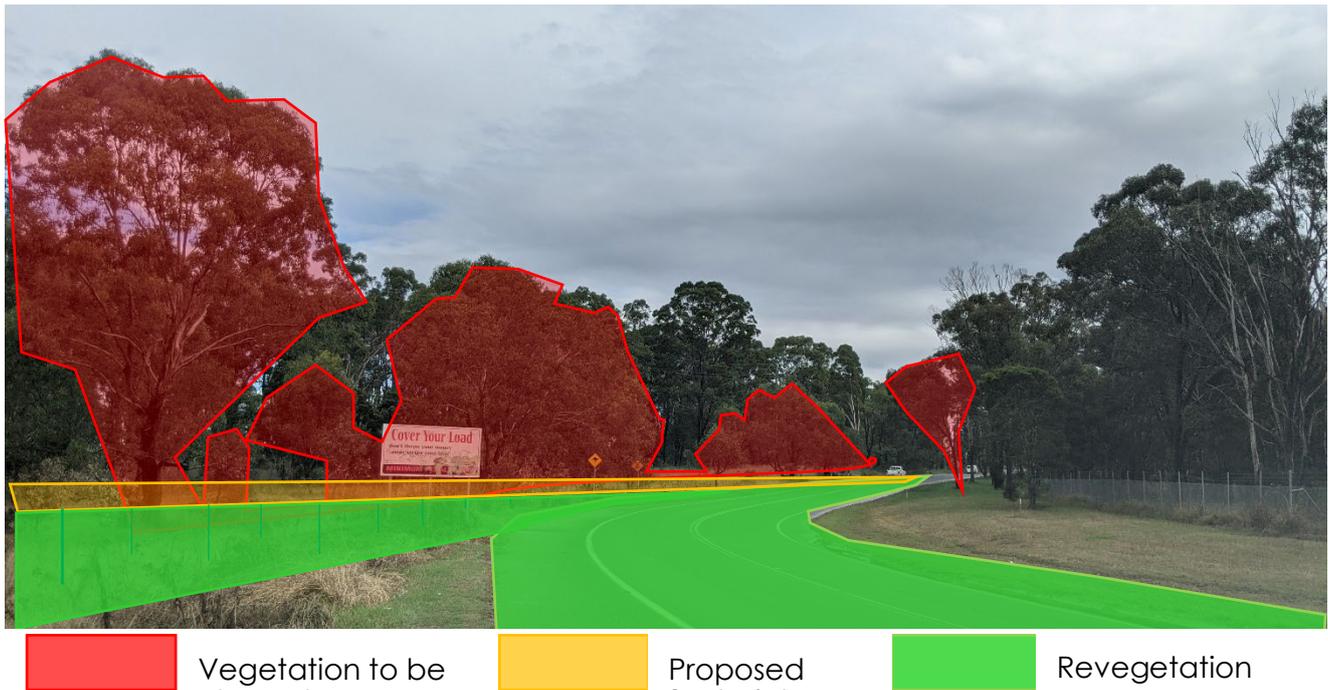


Figure 21 View from The Driftway adjacent Blacktown Road looking south along The Driftway

View: This view is taken from the existing Driftway alignment looking south-west just beyond its intersection with Blacktown Road.

The proposal will see the realignment and construction of a new formation in this location to facilitate the crossing of the waterway connecting to Rickabys Creek. This section of The Driftway would be removed and the area reshaped to maintain flood storage capacity.

Sensitivity: Low

The view is of a transitory vehicle along The Driftway. Their sensitivity to the changes within the alignment are considered low as their period of exposure is short and focused on the road itself.

Magnitude: High

This view will see a notable change as the alignment shifts from its current formation to the west. The realignment will see the open woodland vegetation cleared to allow for the alignment footprint, including the construction of new fill embankments splitting the vegetative character into two. The new elevated formation facilitates the construction of a bridge over the small tributary to Rickabys Creek and the connection to Blacktown Road. The existing alignment of the Driftway in this location will be removed and the area reshaped and revegetated to maintain flood storage capacity. The extent of works proposed and the anticipated impact on the existing riverine woodland is assessed as having a high magnitude of change.

Summary: Moderate

VP3 is that of a transitory vehicle engaging with The Driftway in a similar way as the current alignment however the nature of the change will see the riverine woodland zone split in two and existing vegetation removed to allow for the realignment of The Driftway and new elevated formation installed. The overall impact of these changes sees VP3 assessed as moderate.

6.4.4 VP4 – Reynolds Road

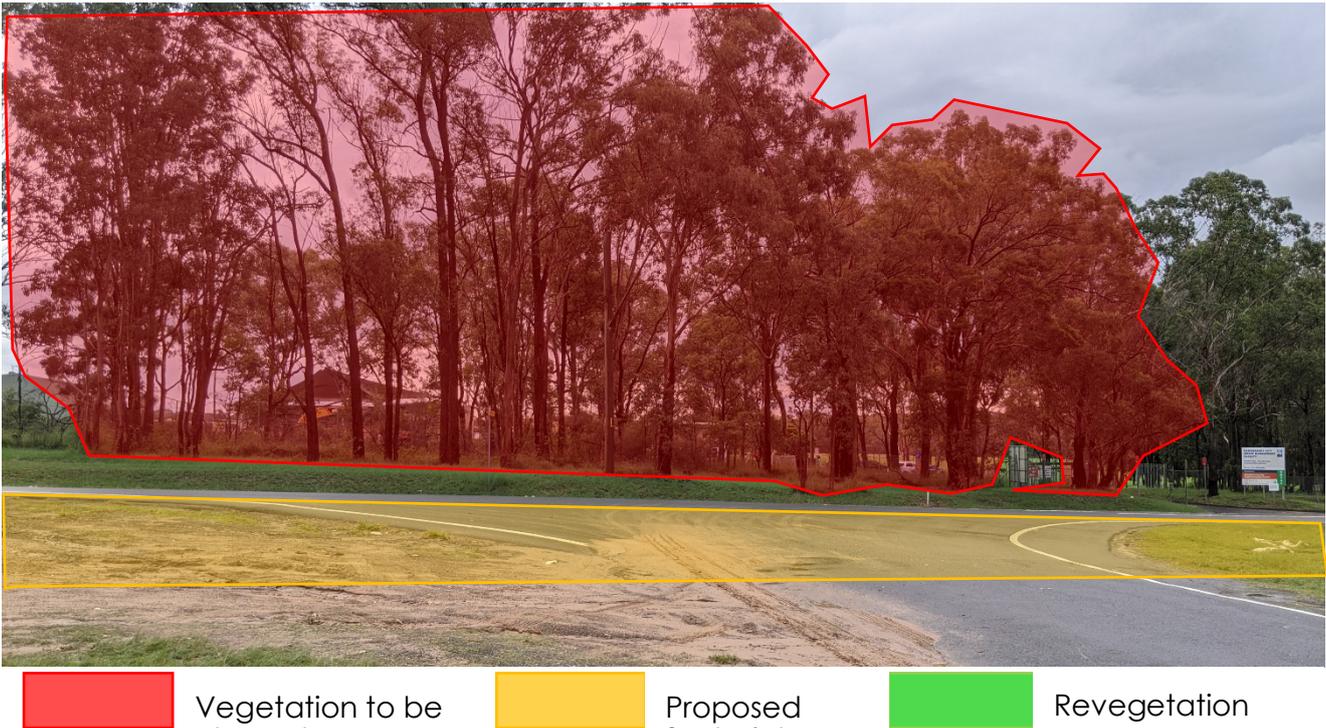


Figure 22 View from The Driftway adjacent Blacktown Road looking south along The Driftway

View: This view is taken from the intersection of Reynolds Road looking towards Hawkesbury City Waste Facility aligning The Driftway. The proposal sees an expansion in footprint, installation of new swales and narrowing grassed verges.

Sensitivity: Moderate

This view is from the perspective of a transitory vehicle approaching The Driftway from Reynolds Road. Due to the nature of the background, ie the waste transfer station, it is considered that the viewer would be sensitive to changes that have the potential to expose the waste transfer station. The sensitivity is consequently considered to be moderate.

Magnitude: High

The extent of works in this location will see the pavement footprint expanded which will impact the existing grass and tree lined verge. To the right of the image, the proposal will transition to fill embankments to facilitate the realignment of the road beyond this point. These elements in addition to new drainage swales will be installed in the existing verge and are likely to result in the removal of trees exposing the waste facility to road users changing the visual context. Due to these factors the magnitude is considered high.

Summary: Moderate to High

VP4 will see the road pavement expanded which will see tree planting removed along the waste facility boundary, this will impact the visibility of the waste facility and see a major change on the visual character. Due to these factors the impact is considered moderate to high.

6.4.5 VP5 – The Driftway



Figure 23 View along The Driftway looking west

View: This view is along The Driftway looking west between Reynolds Road and Luxford Road and shows a typical layout of The Driftway illustrating established tall trees along the corridor boundary. Scattered trees are located on the front verge adjoining the corridor are shown on the right of the image in the foreground and in the middle ground on the left.

Sensitivity: Moderate

The view is taken from the road alignment as a transitory vehicle heading south. The view is a heavily vegetated on both sides of the corridor with significant native vegetation. This vegetation provides a unique landscape which allows the user to feel enclosed by the canopy. The strength of the character of the road corridor is considered to present a view to which the viewer would be sensitive to changes. Due to this the sensitivity is moderate.

Magnitude: High

The extent of works will see the footprint expanded through road widening, reprofiling of swales and drains and will cause trees directly adjacent to the road corridor to be removed. Due to the impact anticipated on the existing vegetation the magnitude is considered high.

Summary: Moderate to High

VP5 is in a typical portion of the corridor which is highly vegetated along both verges. The extent of works will see the pavement footprint expanded which will see existing trees immediately adjacent to the road removed and as such will change the visual character for the user in this location. Due to these factors the impact is considered to be moderate to high.

6.4.6 VP6 – Luxford Road



Figure 24 View from Luxford Road looking west along The Driftway

View: This view is taken from a transitory vehicle approaching Luxford Road intersection heading west towards Londonderry Road. The alignment in this location is largely retained but will be widened as part of the works.

Sensitivity: Moderate

This view is from the road but also illustrates a residential property with a substantial setback on the southern side of the alignment and a densely vegetated verge on the northern side. It marks a decision point but also indicative of the type of view experienced from the residential property. The motorist would have limited sensitivity due to the focus being on the intersection and road and has been assessed as low. The residential property would have a higher sensitivity. Although accustomed to a road within the view its sensitivity has been assessed as moderate

Magnitude: Low

The works proposed in this view include an expanded footprint and drainage swales. The wide verge on the left side is largely cleared of vegetation in this current context and as such a widened footprint will not impact the road users experience or create any visual issues for the neighbouring property due to its setback and nature of change. The magnitude is assessed as low

Summary: Low to moderate

VP6 is assessed as having a low visual impact as the extent of works proposed are within the existing context and will see the visual characteristics retained. A minor increase is indicated for the residential property whose sensitivity has been assessed as moderate and so an overall ranking of low to moderate has been assessed.

6.4.7 VP7 – The Driftway

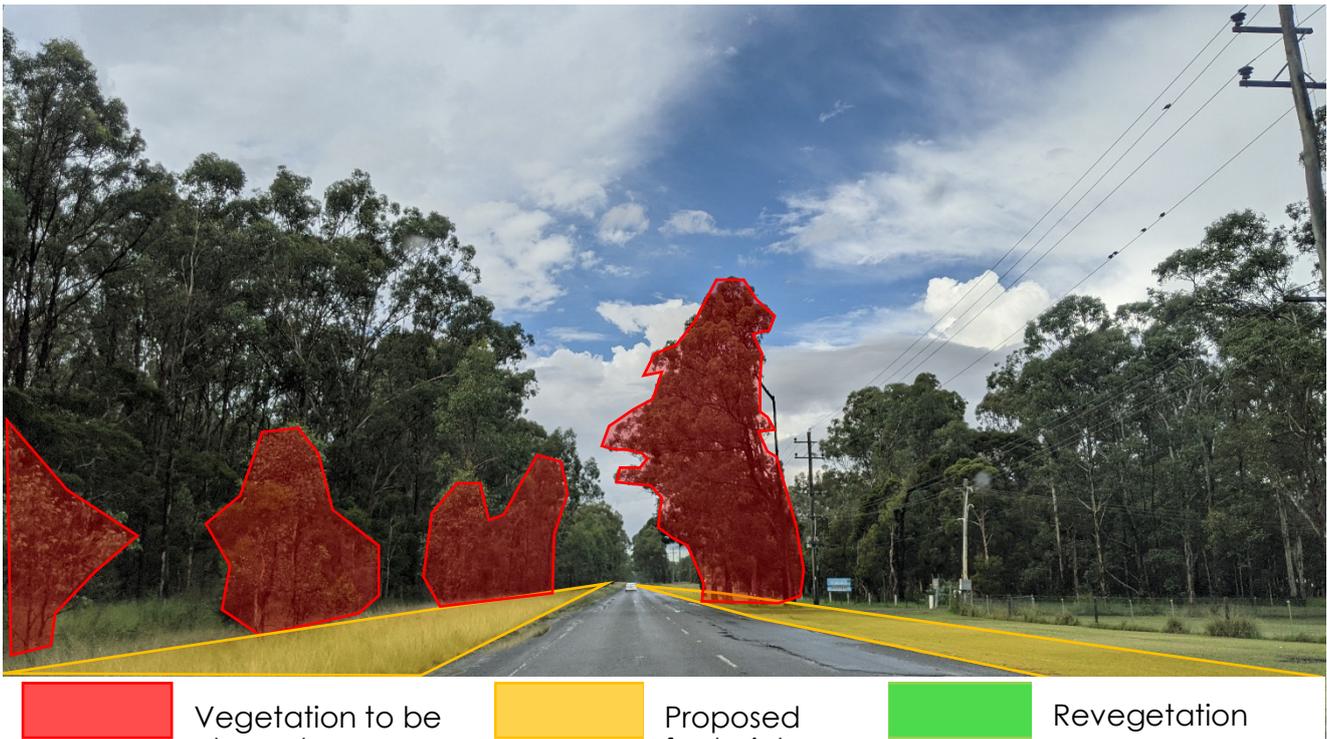


Figure 25 View along The Driftway looking east

View: This view looks east along The Driftway between Londonderry Road and Luxford Road. The view is from a transitory vehicle along The Driftway and illustrates the densely vegetated verge northern of the alignment with grasses and established native trees. South of the alignment a small cluster of existing trees aligns the road but is otherwise largely cleared.

Sensitivity: Low

The view reflects a transitory user of the corridor and while reflecting the overall character of the alignment does not offer a different experience, the sensitivity to change is considered low

Magnitude: Moderate

The extent of works will see the cluster of trees removed along the southern alignment as the footprint expands which will also impact any trees immediately adjacent the northern edge, however the impact on the northern side is considered to be limited. The removal of trees along the southern verge will result in a perceptible change of scale of the road corridor, which is not readily addressed due to utility constraints limiting the scale of any future planting. The magnitude is consequently considered moderate

Summary: Low to moderate

VP7 is assessed as having a low to moderate impact. This reflects the potential change in scale of the overall corridor because of clearing of the southern verge and the limited potential to reinstate trees of an equivalent scale.

6.4.8 VP8 – The Driftway / Londonderry Road looking northwest



Figure 26 View from Londonderry Road looking west towards The Driftway/ Londonderry Road intersection

View: This view is taken from the south-eastern verge on Londonderry Road looking northwest towards Richmond.

This intersection will see a change from a four-way stop controlled intersection to a roundabout. The roundabout provides an intersection design which reduces the speed of the road user and better manages the safety of the intersection reducing the potential for significant accidents. The roundabout will see the footprint expanded resulting in vegetation to be removed on the eastern verge and a realignment of the overhead powerlines.

Sensitivity: Moderate

This view would be experienced by an adjoining residential property. The sensitivity of the viewer is considered to be moderate as a residential view the viewer will be responsive to change. The sensitivity is moderated by the existing condition which includes a road and intersection environment and so is assessed as of moderate sensitivity.

Magnitude: Moderate

The extent of works for this view will see the movement of the intersection to the northeast and an increase in pavement involving the construction of a roundabout. Beyond this the works will tie into the existing corridor and retain the existing number of lanes. The roundabout is shifted to the north reducing the potential impact to the adjoining properties. Despite this there will be a marked change in the overall character and feel of the intersection. The magnitude of change is considered moderate.

Summary: Moderate

VP8 has been assessed from the perspective of a viewer from an adjoining residential property, the view is impacted due to expansion of the road footprint and construction of a roundabout. The impact is considered to be moderately sensitive to change and the scale of change has been assessed as moderate, as such the impact is considered moderate.

6.4.9 VP9 – Londonderry Road looking north



Figure 27 View from Londonderry Road looking north along Londonderry Road

View: This view is taken along Londonderry Road looking north towards Richmond.

The view illustrates the location of the proposed roundabout within a densely vegetated verge with established trees within the Western Sydney University lands aligning the corridor.

Sensitivity: Moderate

The view is from a transitory vehicle travelling north to Richmond, the view is densely vegetated on the northern and western verges with a significant setback between the road and the vegetation. The trees create a visual buffer from the road to properties beyond the corridor. The view is sensitive to change as the tree lined corridor is valued as part of the character and feel of the area. Sensitivity to change is consequently considered moderate.

Magnitude: Moderate

The view will see pavement increased due to the addition of the roundabout, this will see the setback reduced and vegetation removed on the eastern and western verges of Londonderry Road in addition to a realignment of the power poles. The removal of trees will provide a more open character although the sense of containment will be maintained due to trees beyond being retained. The magnitude of change is considered moderate.

Summary: Moderate

VP9 considers the impacts caused by the expansion of the proposed road footprint and addition of a new roundabout at the intersection of Londonderry Road and The Driftway which includes, the removal of several trees within the Western Sydney University Campus however dense vegetation would remain beyond the construction footprint. These changes have been assessed as moderate. The viewers sensitivity to change is also assessed as moderate as a result of its tree lined context. The overall impact is assessed as moderate.

A total of nine viewpoints have been assessed in relation to the proposal.

A range of viewpoints has been considered reflecting the nature of land-use and the likely interaction that will occur in relation to the proposal and existing development. The viewpoints selected provide a range of receptors including residents, road users, open space users which reflect a broader cross section of community who will experience changes as a result of the proposal.

Landscape and urban design mitigation strategies have been developed from the outcomes of the landscape character and visual assessments, as a way of mitigating the potential impacts, and have been incorporated into the Urban Design Strategy in Chapter 7. These mitigation measures, as well as those to be further considered in detailed design stage of the proposal are discussed in the following Chapter 8. As the landscape mitigation measures develop over time their effectiveness will be enhanced as the planting matures.

Views range in impact from Low to High to Moderate with the low and low to moderate views accounting for 4 of the viewpoints and those assessed as moderate to High to moderate accounting for 5 of the viewpoints. These higher rated viewpoints reflect an increase in footprint including expansion in paved surface often in relation to an intersection resulting in removal of trees and increased exposure of the road corridor or in the case of viewpoint 3 a new alignment and formation. Care needs to be taken in developing the design to address the increase in scale of the road infrastructure to integrate it with its surrounds and to low these impacts

Table 3 – Visual Assessment Summary below summarises these impacts.

Table 3 – Visual Assessment Summary

Viewpoint	Sensitivity	Magnitude	Summary
Viewpoint One	Low	Moderate	Low to Moderate
Viewpoint Two	Low	Low	Low
Viewpoint Three	Low	High	Moderate
Viewpoint Four	Moderate	High	High to Moderate
Viewpoint Five	Moderate	High	High to Moderate
Viewpoint Six	Moderate	Low	Low to Moderate
Viewpoint Seven	Low	Moderate	Low to Moderate
Viewpoint Eight	Moderate	Moderate	Moderate
Viewpoint Nine	Moderate	Moderate	Moderate

7 Concept Design

The development of the urban and landscape design response needs to consider several guidelines (figure 28) which inform the undertaking of the landscape character and visual assessment report as well as the development of the overall concept. These include:

- Road Design Guidelines
- Environmental Impact Assessment Practice Note: Guideline for Landscape Character and Visual Impact Assessment - EIA-N04. Transport for NSW, 2020.
- Beyond the Pavement: Urban design approach and procedures for road and maritime infrastructure planning, design and construction. Transport for NSW, August 2020.
- Reconciliation Action Plan, Transport for NSW, 2019.
- Landscape Design Guideline, Roads and Maritime, December 2018
- Water Sensitive Urban Design Guideline- Applying water sensitive urban design principles to NSW Transport Projects, Roads and Maritime, 2017.
- Bridge Aesthetics - Design guideline to improve the appearance of bridges in NSW - Centre for Urban Design February 2019



Figure 28 Guideline Covers

The design response for the proposal needs to reflect both the character of the landscape through which the proposals alignment passes, as well as the broader landscape, addressing environmental, visual and physical constraints as part of a holistic design solution. To achieve this, a number of principles and objectives have been developed to inform the design development of the corridor.

In addition to the Transport for NSW Guidelines, Hawkesbury and Penrith City Councils each have two planning instruments which relate to the development and its relationship and influence on the public domain and landscape precincts which are to be used to inform the design. These guidelines include:

- Hawkesbury Development Control Plan 2002 (DCP)
- Hawkesbury Local Environment Plan 2012 (the LEP)
- Penrith Development Control Plan 2014 (DCP)
- Penrith Local Environmental Plan 2010

To achieve the requirements of these guidelines, several principles and objectives have been developed to inform the design development of the corridor.

7.1 Urban and Landscape Design Principles and Objectives

The following objectives are derived from the nine urban design principles defined in the Transport for New South Wales urban design policy - Beyond the Pavement. They reflect both the unique character of the road, its rural context and key issues which adjoin it.

7.1.1 Contribute to the overall landscape structure and revitalisation of the region

Principles

- Design an alignment which is responsive to its landscape setting and does not detract from it
- Minimise negative physical impacts on drainage corridors and open space networks associated with these.
- Minimise effects of fragmentation on neighbourhoods and precinct areas
- Consider the potential for new uses of residual and underutilised areas impacted by the proposed project

7.1.2 Respect the land uses and built form of the corridor

Principles

- Minimise the footprint of the corridor to limit impacts to adjoining vegetation, communities, and property setbacks
- Respond to the ecological communities of the area and landscape character of the corridor
- Minimise the intrusion of road-related elements on the local landscape
- Improve connectivity around and through the proposed project area for all modes of transport and user groups
- Consider both transport and community needs in planning and designing road network connections

7.1.3 Connecting modes and communities

Principles

- Provide safe and efficient access to the existing residential communities and connectivity to future network expansion
- Provide access which is responsive to flood regimes and frequency

7.1.4 Fit the landform of the corridor

Principles

- Consider the relationship between road, and landscape minimising the overall scale of formation along the alignment
- Minimise the footprint of the corridor to limit impacts to adjoining vegetation communities
- Provide a formation which addresses local flood events and ensure spaces under and around the bridge are appropriately integrated into the adjoining precinct.

7.1.5 Responding to natural pattern

Principles

- Preserve existing cultural patterns within the landscape where evident within the corridor
- Vary the gradient of earthworks to provide visual interest and reflect characteristics of the surrounding landform and landscape.
- Maintain vegetation's relationship to alignment and density within the corridor.

7.1.6 Achieving integrated and minimal maintenance design

Principles

- Develop a consistent approach to the design of soft landscaping along the alignment which is responsive to the character and feel of the road environment with which it connects as well as the character of the corridor through which it passes. Planting design Principles to be consistent with those outlined in the 'Landscape Design Guideline: Design guideline to improve the quality, safety and cost effectiveness of green infrastructure in road corridors (Transport, 2020)''
- Provide plantings to frame views and guide the driver along the alignment, provide a backdrop and screen in part to the development that is adjacent
- Provide a landscape which is reflective of existing character
- Drainage design should provide effective free draining network based on the existing corridor drainage patterns which are manageable and maintainable

7.2 Proposal

The proposal involves upgrading approximately 3.6km of The Driftway between Blacktown Road and Londonderry Road. The scope of works includes pavement and drainage improvements and intersection improvements at Londonderry Road and Blacktown Road/Racecourse Road as well as Luxford Road and Reynolds Road. The works will improve safety for users and form part of a broader upgrade which increases capacity over the Hawkesbury River and provides a bypass of Richmond town centre.

Key features of the proposal include:

- Upgrade of the intersection of Londonderry Road and The Driftway to a roundabout
- Pavement and drainage improvements to 3.6 kilometres of The Driftway
- Construction of right turn bays at the intersections of The Driftway with Luxford Road and Reynolds Road.
- Realignment of 230 metres of The Driftway at its eastern extent to create a four-leg roundabout with Racecourse Road

The following design response is focused on the alignment and the urban and landscape design response to address its impacts and integration with the broader community.

In developing a design response for The Driftway Upgrade alignment, the fit of the road with its context has been considered as part of an integrated design solution for the project involving input from all disciplines.

As part of the proposal's concept design development, the urban design strategy has developed responses to the integration with the overall setting through the management of materials and forms (refer to appendix B for landscape concept plans). This has been achieved through a review of the:

- landscape treatment of the formation
- the nature and placement of roadside furniture, and
- the planting design required to integrate the proposal to achieve a contextually responsive design outcome.

As part of the development of the Urban and Landscape Design for the proposal an overall landscape strategy has been developed.

7.3.1 Integration Strategy

The following Landscape Strategy Plan, shown in Figure 29, develops the project principles and objectives to define the conceptual urban and landscape design response. This is broken down into several key elements:

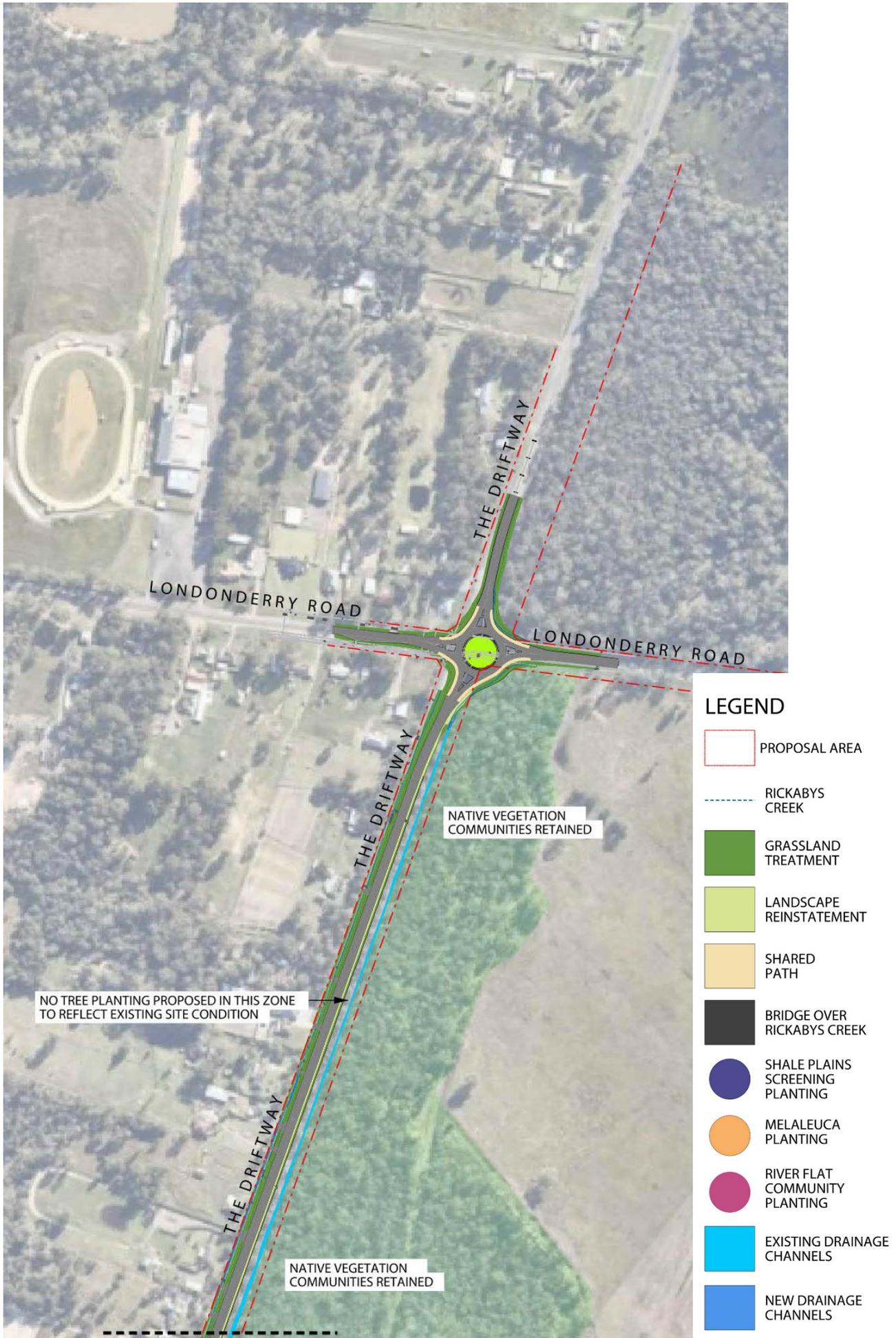
The woodland – primarily to the north of the alignment is retained due to its ecological and visual importance to the corridor. The design seeks to minimise disturbance within this section of the corridor to maintain the integrity of the communities. Works required within this zone are minor widening of the formation and maintenance type works of the existing channel to ensure effective drainage.

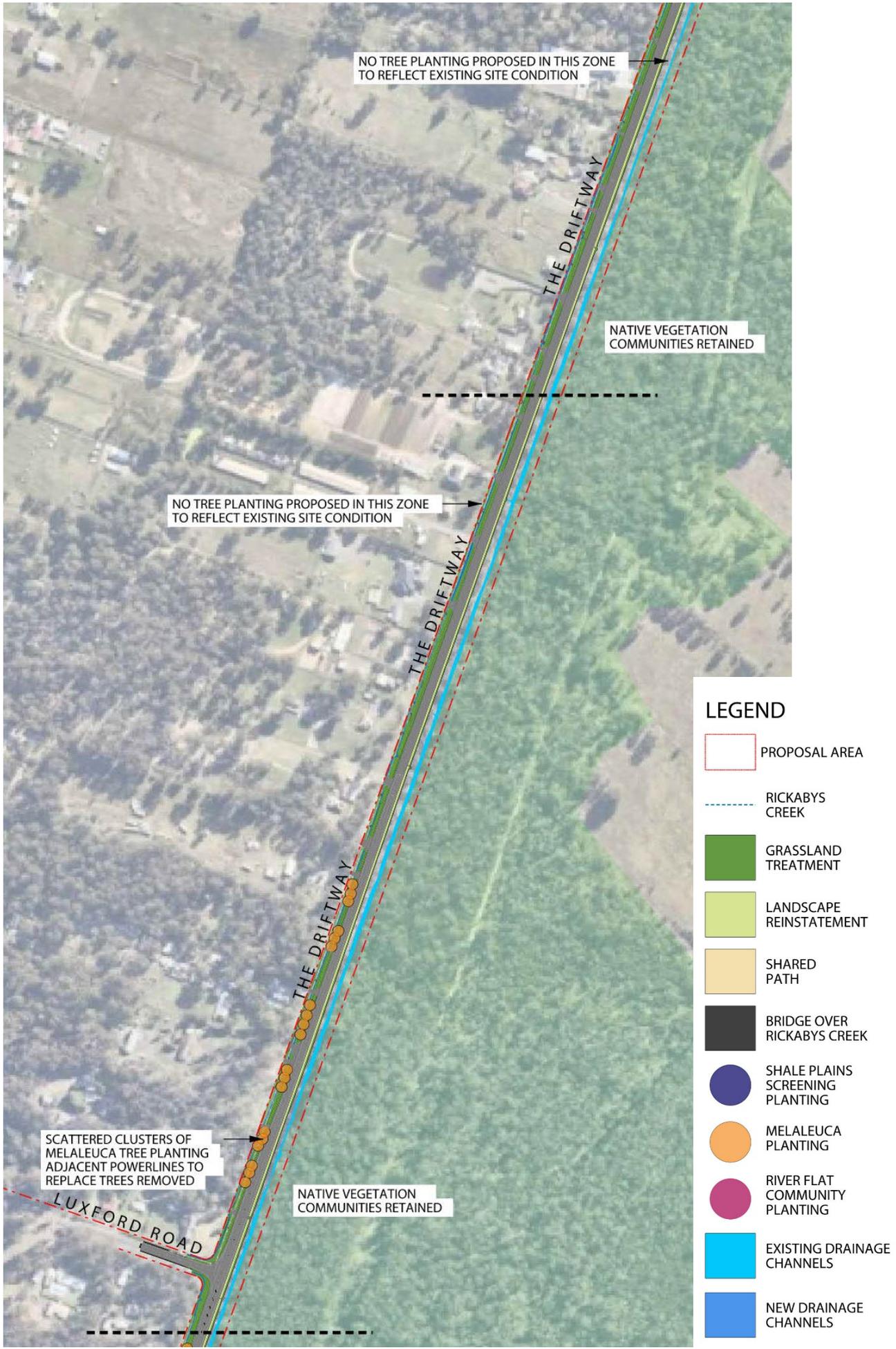
The rural residential edge – primarily south of the alignment seeks to maintain the overall character and feel of the rural interface of the alignment. This presents as a wide verge with houses set well back from the boundary and road. A natural canopy cover is scattered throughout this zoning forming a varied sequence of spaces and parklike setting. Existing trees within the corridor are removed reflecting expansion in footprint and changes in profile. The potential for reinstatement is excluded as a result of the overhead electrical utilities. Smaller tree/shrub planting is proposed to reinstate the screening that this element provided and to also assist in the definition of the corridor. This approach would maintain the enclosed and defined alignment that exists today.

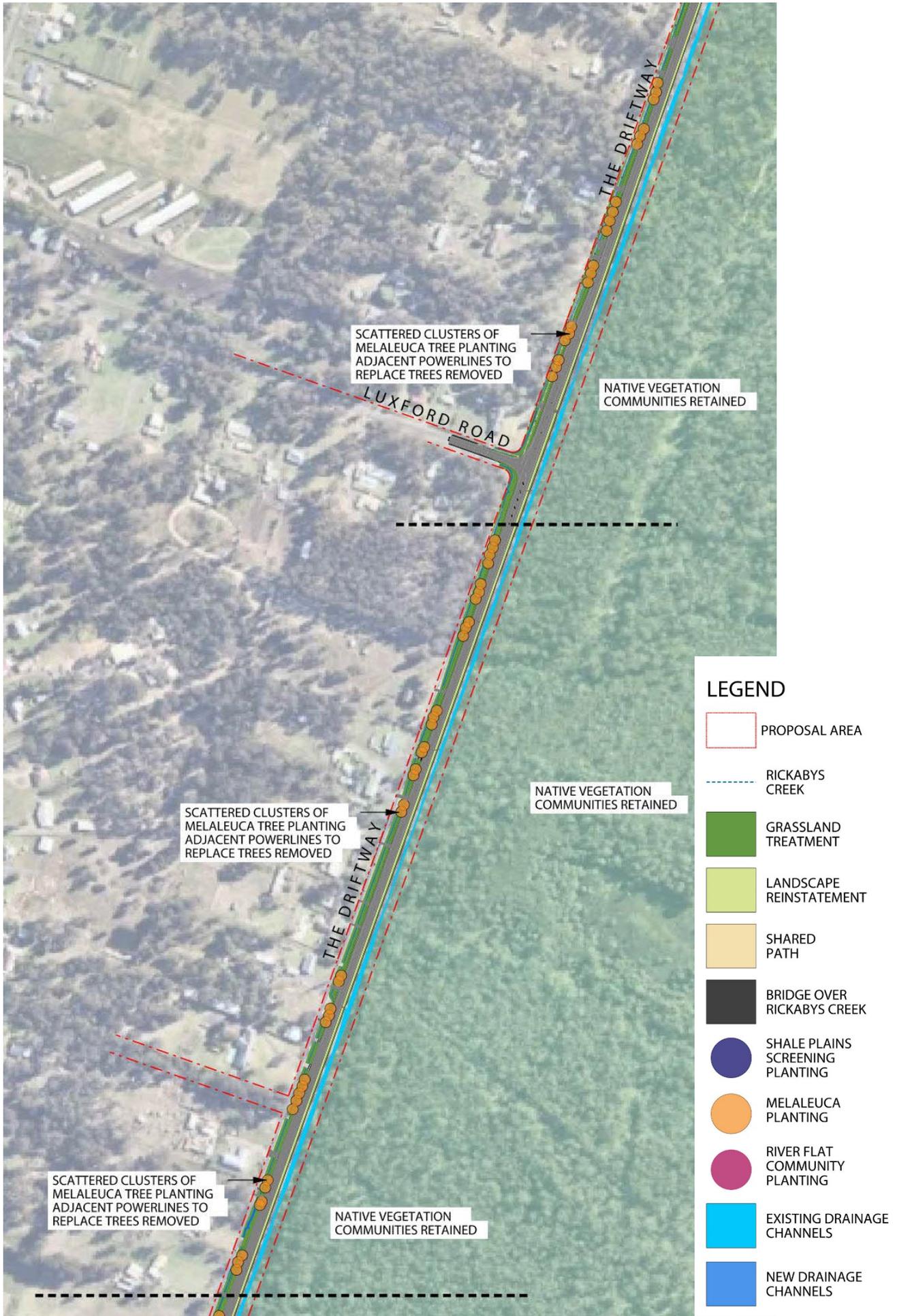
The riparian industrial edge – located at the south-eastern end of the corridor presents a change in interface but is still dominated by the natural setting. A key element will be the reinstatement of the riparian landscape both along the new alignment as well as the revegetation of the existing alignment. As part of this work the reshaping to address the flood regime and characteristics will be considered.

Screening to the waste management facility needs to be considered in the design. The reduced verge width reduces the level of screening that can be provided within the streetscape and additional screening with the facility may need to be considered.

North of Blacktown Road the impacts on character and interface with the industrial properties is unlikely to see substantial change with a focus on reinstatement as required.







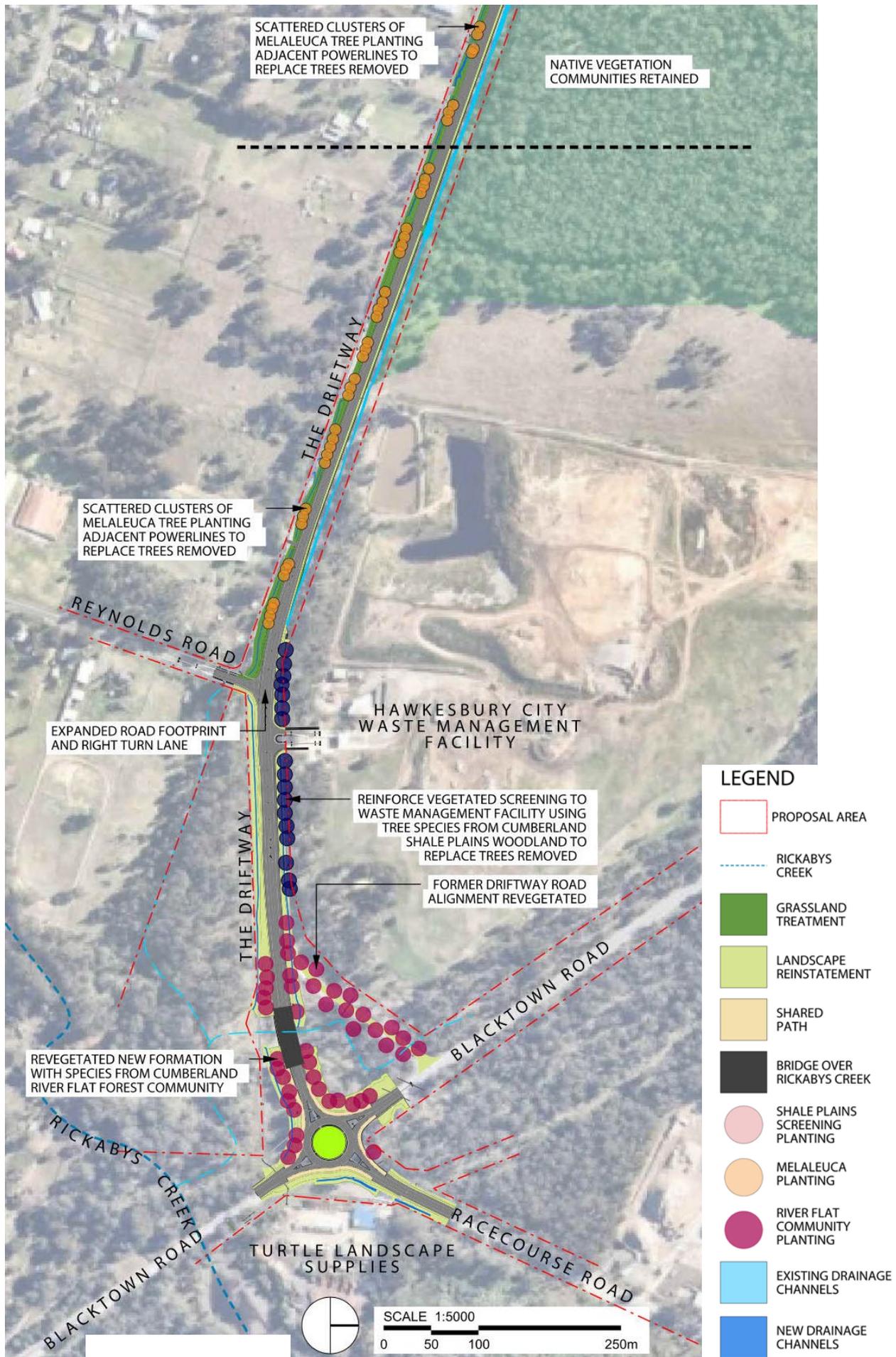


Figure 29 Landscape Strategy

7.4 Concept design

The strategy has defined the approaches to the varying character along the road corridor. The Concept design provides a more detailed response to the corridor and is responsive to the various interfaces of the alignment and its elements. It is informed by a desire to retain and strengthen the landscape identity of the corridor by reinforcing and reinstating the vegetated edges to the corridor.

The following outlines specific concept design approaches adopted within the corridor to the corridor itself but also the structures along it. Elements discussed include:

- Alignment
- Grading
- Bridges
- Vegetation
- Lighting
- Safety Barrier and Fences
- Signage

7.4.1 Alignment

The alignment addresses the corridors form and how this changes because of the proposal. Key alignment changes include the management and treatment of intersections.

- T intersections have included a turning lane enabling free movement of through traffic and enhancing safety.
- Roundabouts have been introduced at both Londonderry and Blacktown Roads to enable safe and efficient movement of traffic. The introduction of roundabouts has been a key response to address the safety issues of the corridor. These elements result in a substantial increase in the road footprint and care will need to be taken to minimise the overall scale and footprint of these when viewed along the road corridor. A number of existing roundabouts occur along Blacktown Road which are paved and do little to integrate the intersection with its surround. The rural residential interface of the roundabouts here particularly that of Londonderry Road should see a focus on vegetating the centre to provide a softer more integrated approach to the overall feel and character of this element. Such treatments will need to be developed to consider safety and ongoing maintenance.



Figure 30 Richmond Road / The Northern Road Intersection, Berkshire Park

Key changes as a result of the proposal and the concept design response are depicted in the following sections which highlight the increase in footprint. Four sections have been identified based upon key areas of potential impact of change.



Figure 31 Cross section locations

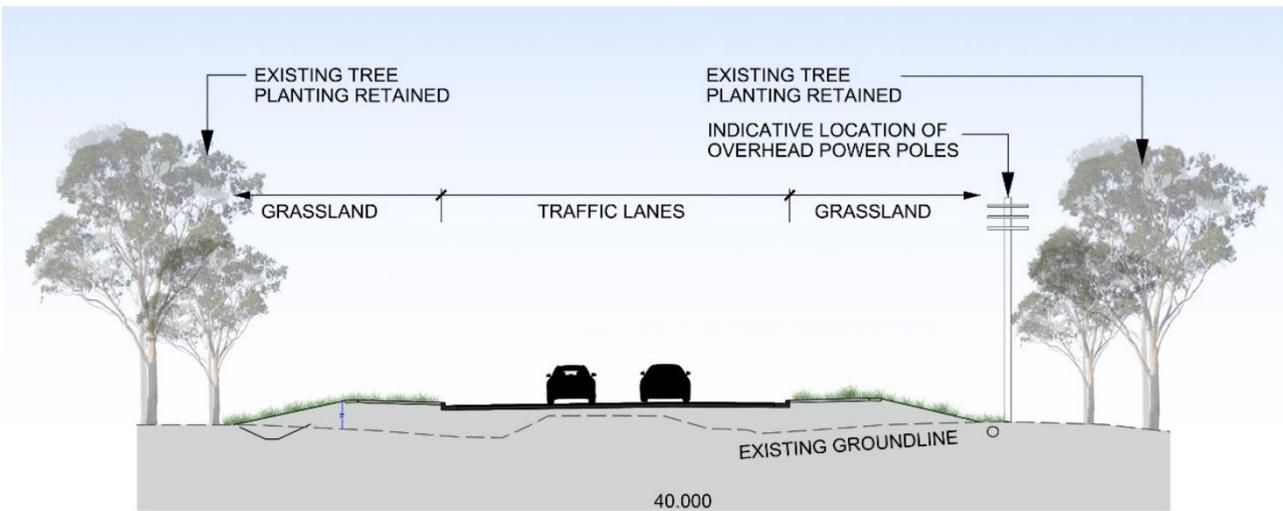
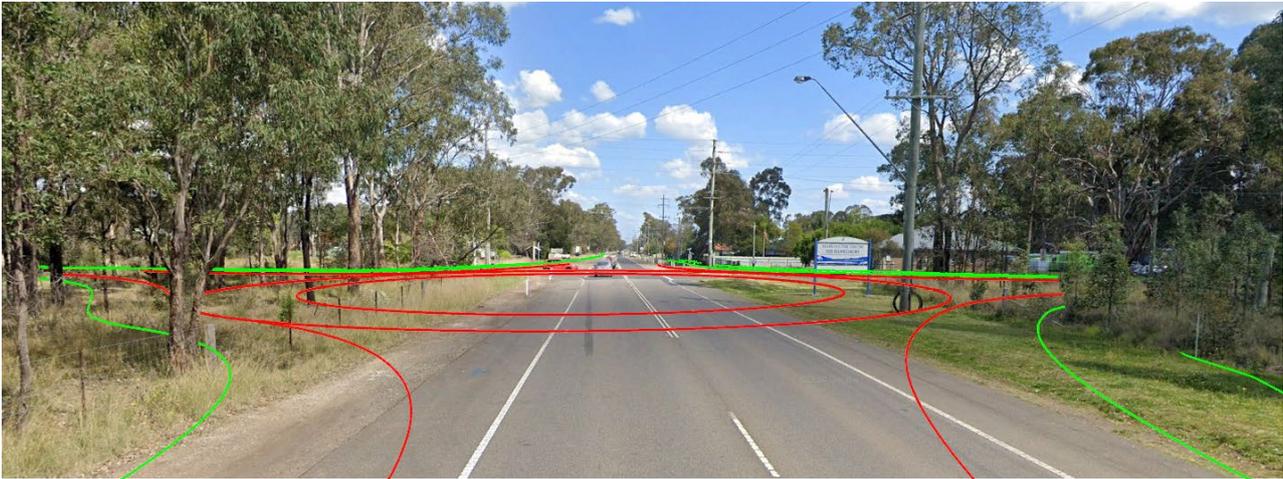


Figure 32 View of section to be developed through the new roundabout at Londonderry Road / The Driftway

Section 01 – This section will see the condition of the existing intersection between Londonderry Road and The Driftway changed from a four-way stop controlled intersection to a roundabout. The new roundabout will impact the western edge of Londonderry Road and will see vegetation removed to accommodate the expanding footprint.

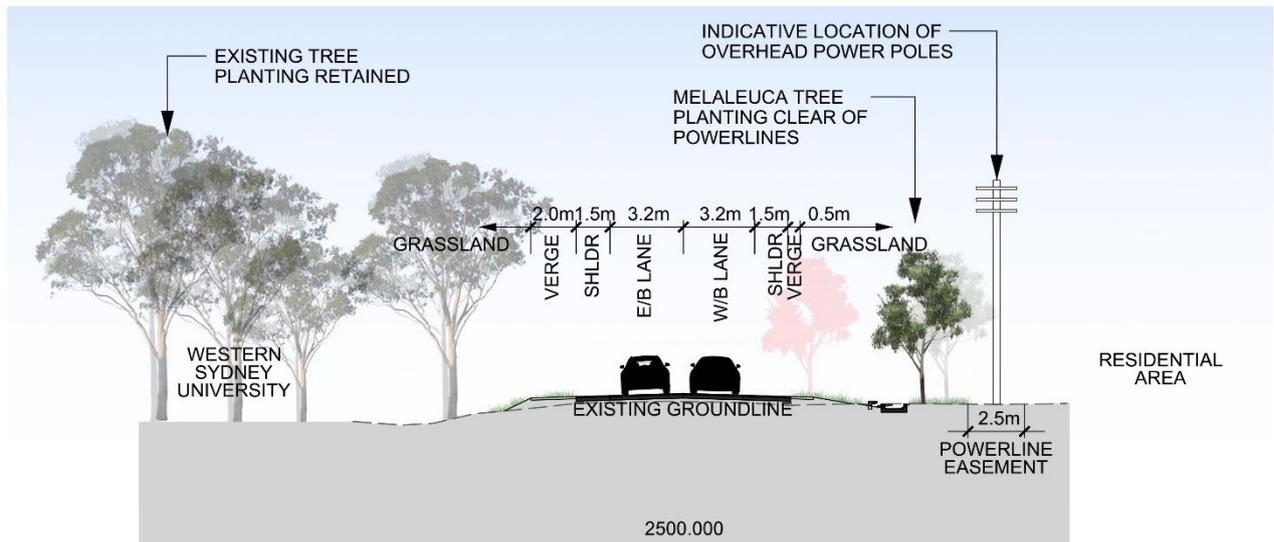


Figure 33 View of a section to be developed showing a typical portion of The Driftway between Blacktown Road and The Driftway

Section 02 – This section illustrates the typical layout of The Driftway, a highly vegetated corridor with established trees on either side. The existing condition provides a comparison with the proposed condition illustrating a change in scale of the corridor and its sense of enclosure. The addition of small trees/ shrubs to the south of the corridor will offset the impact on the overall spatial character to some degree and provide screening.

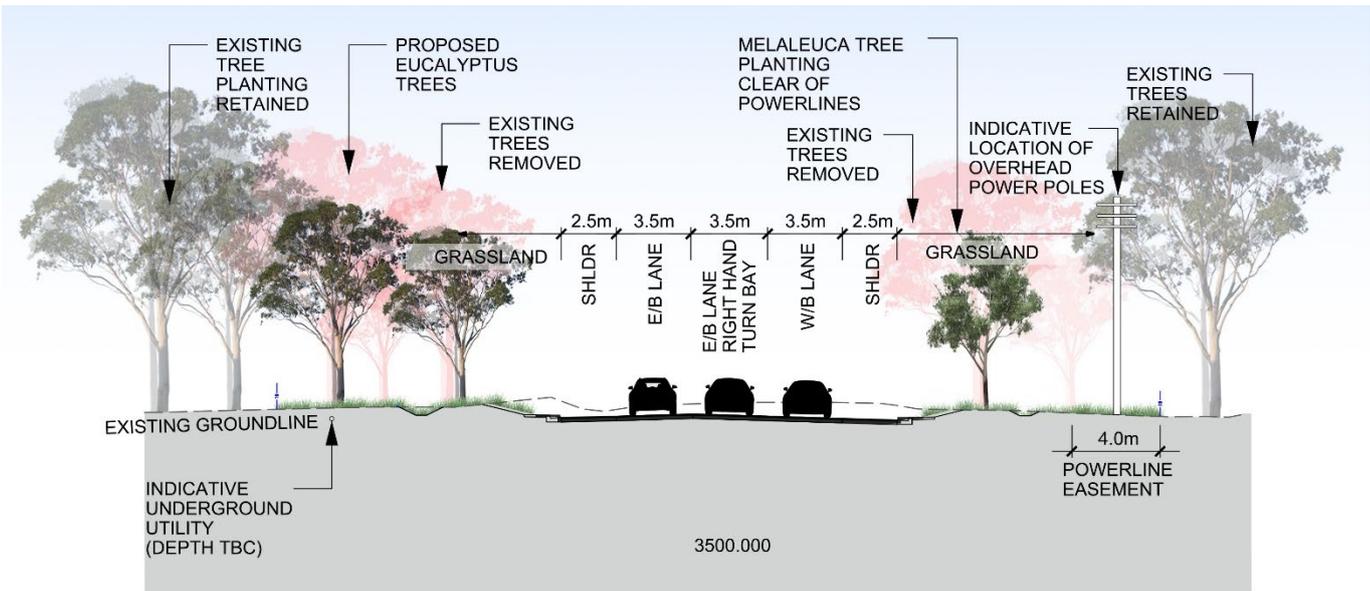


Figure 34 View of a section to be developed outside Hawkesbury City Waste Facility showing the extent of the works required by realignment of the proposal

Section 03 – This section is taken from the start of the realignment of The Driftway straightening its alignment to Blacktown Road. As part of this work the reprofiling of the embankment adjoining the Waste Management Facility along with introduction of drainage works will impact existing screening vegetation exposing the facility. Reinstatement planting is proposed to address this impact.

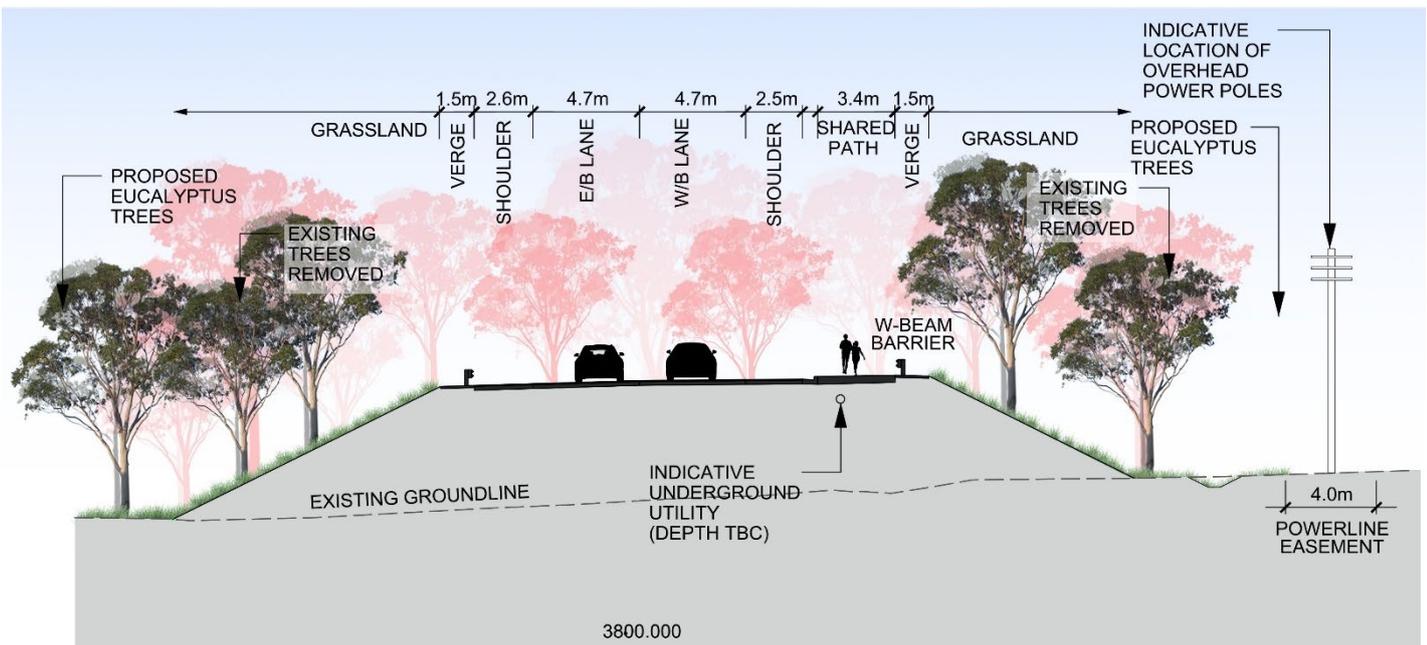


Figure 35 View of a section to be developed showing the shift in alignment from the existing Driftway to the proposed realignment to Racecourse Road

Section 04 – This section illustrates the shift from the existing alignment to the proposed alignment. The section illustrates the change in profile and extent of fill required to connect The Driftway to Blacktown Road. As part of this process the removal of existing canopy, earth shaping for both the alignment but also flood management is required. The design response seeks to reinstate the overall character and feel of the existing community.

7.4.2 Grading

Grading impacts of the project are limited with wholesale changes to the formation confined to the south-eastern end of the corridor where a new alignment is adopted.

Here an elevated formation is required. Batter slopes have been designed at a maximum slope of 2 horizontal to 1 vertical (2:1) minimising the footprint of the proposed formation and as a result limiting the clearing requirement to facilitate this change.

The remainder of the corridor is largely at grade with shallow slopes tying into the existing grades.

Drainage lines generally reflect that of the existing alignment. On the northern side of the corridor these are broad flat based channels with a side slope at 2:1 to natural ground. This configuration is maintained to limit impact on the existing landscape.

To the southern side of the corridor new drains are proposed to assist in moving the water away from the alignment to preventing ponding. These are recommended to adopt a flatter side slope to the channels to better integrate with the surrounding context as impacts to existing vegetation are limited due to the largely cleared nature of this verge. Maximum slope suggested should be 4:1. This would both visually integrate better with the broad flat verge in this zone but also remove any issues associated with abrupt changes in level in terms of safety and use of the space.

7.4.3 Bridges

The design of the bridge over a tributary to Rickabys Creek has been developed based on a number of principles. These are outlined below:

Bridge Design Principles

- avoid a central pier configuration for bridge structures crossing waterways to maintain free passage,
- minimise the visual mass of the bridge by providing a slender design that allows the bridge to blend into the landscape beyond
- design to achieve safe and efficient maintenance
- design to address flood impacts
- provide a simple clean structure which doesn't draw attention to itself and is subservient to context
- parapet should be designed to be self-cleaning

Span

- The proposed design consists of a single span of 24 metres which provides for clean uninterrupted passage of the water way below without the need for a pier.

Girder

- The structure proposes the use of bulb T girder – 1 m in depth, which addresses the flood issues of the site. The bulb 'T' has been used in preference to planks due to the requirement for a plank bridge to have a central pier within the waterway to accommodate their shorter span. Similarly Super T's have not been used as they do not meet the need for the flood requirements of the bridge.

Barriers

- Type "F" barriers with a double rail have been used to provide an open character to the bridge connecting to the broader context and enabling views out from the bridge. These are located at the edge of the road. A shared path is located to the south of the road and is enclosed by a Type 1 fence. This configuration enables the containment of the pedestrian space without the need for screens to prevent the structure becoming climbable.

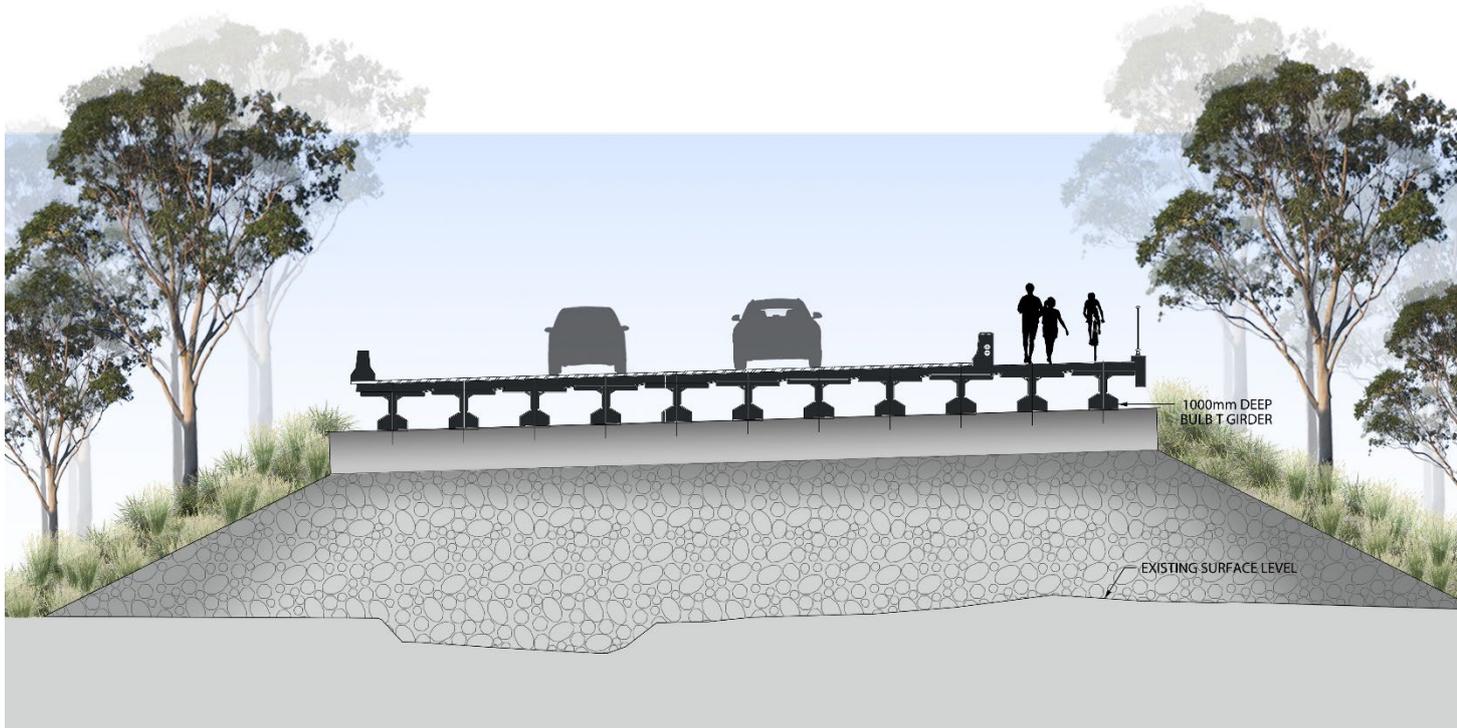
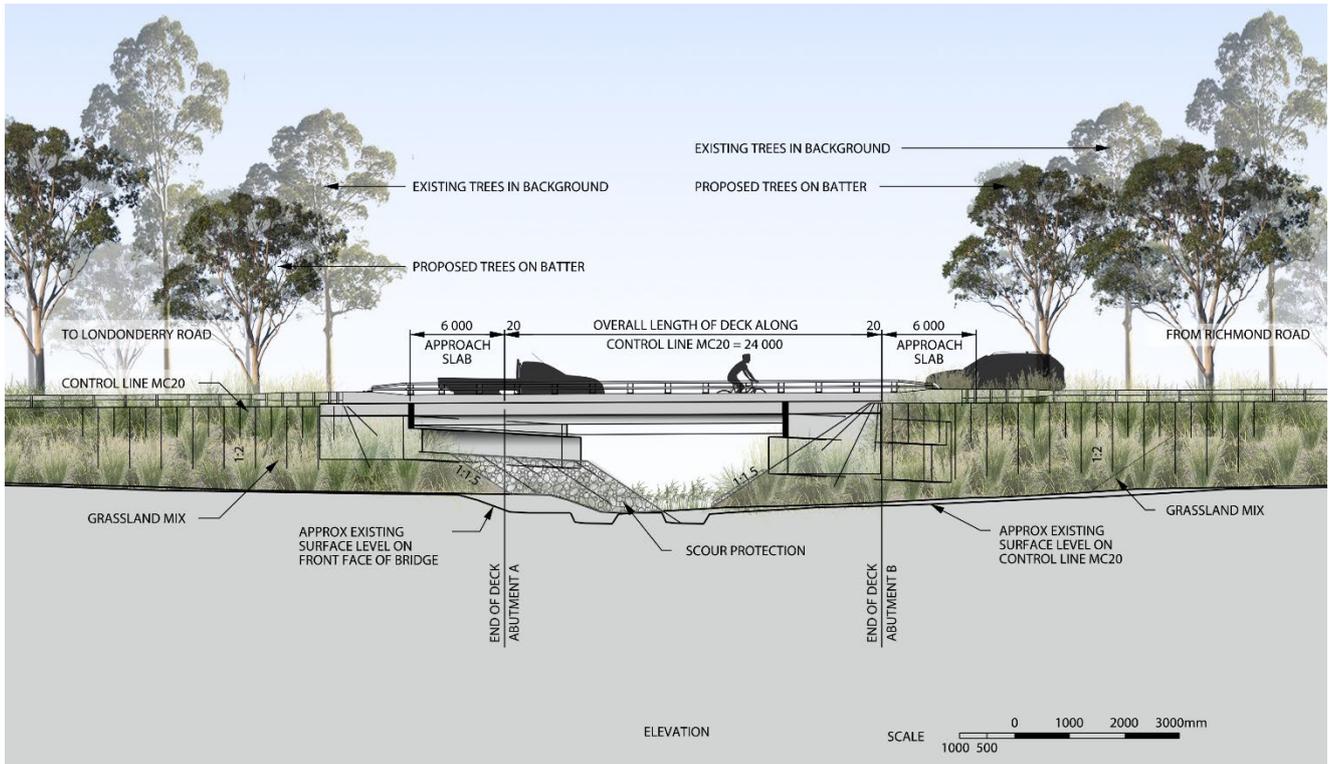


Figure 36 Elevation and Section of the proposed bridge

7.4.4 Vegetation

As indicated in the context assessment the environment along the corridor consists of native communities predominantly to the north of the corridor with altered landscapes to the south providing a parklike setting of trees and grass. In this instance, the canopy is reflective of the native communities to the north.

As part of the corridor development, the minimisation of impacts on the vegetation community to the north has been pursued with revegetation largely limited to stabilisation of the disturbed edges. A native grass mix is proposed for these works reflecting the grass types of the native community.

The southern verge has experienced a higher level of impact and so needs to consider the replacement of trees removed and the opportunities available as well as the stabilisation of the verge and the swales within them. The treatment of the verge is proposed to match the existing grassed verge however due to conflicts between the overhead powerlines and large trees the adoption of a small tree/shrub is proposed. While not providing the same level of enclosure it will provide both screening of the residential properties but also a level of containment similar to the existing character.



Figure 37 View looking west of The Driftway illustrating the vegetated edges

Finalisation of species mix will occur as part of the detailed design phase for the project, in consultation with Hawkesbury City Council and Penrith City Council. Species selection will be designed to be compatible/complementary with (but not necessarily part of) adjacent vegetation communities. While biodiversity will be a key consideration for the project operational requirements will also need to be considered. Additional considerations include:

- attraction of fauna into road corridor (roosting, foraging or refuge), although connectivity should be allowed for and designed appropriately where identified.
- vegetation groups have to be safely manageable along roadsides i.e. no large fruit/cone drop onto paths or carriageways, no dangerously thorned species along paths or congregation points (bus stops, schools), no threatened/vulnerable species in spray/mowing zones
- no species with aggressive adventitious traits eg invasive roots, weeping canopy that blocks sightlines/travel envelope etc.

- provision of appropriate transition of the roadside environment to the neighbouring landuse,
- Addresses the safety of all users.

The following table provides a list of species proposed to reflect the landscape strategy and design intent, responding to ecological communities located within the study area.

Table 4 – Potential Species List

<i>Common Name</i>	<i>Scientific Name</i>
SOUTHERN VERGE	
Canopy Trees (Street Trees)	
White feather honey myrtle	<i>Melaleuca decora</i>
Narrow-leaved paperbark	<i>Melaleuca linariifolia</i>
Grasses, Swales and Table Drains	
Wiry Panic	<i>Entolasia stricta</i>
Blady Grass	<i>Imperata cylindrica</i>
Weeping Grass	<i>Microlaena stipoides</i>
REVEGETATION WORKS - NATURAL AREAS	
Canopy Trees	
Broad-leaved Ironbark	<i>Eucalyptus fibrosa</i>
Grey Box	<i>Eucalyptus moluccana</i>
Forest Red Gum	<i>Eucalyptus tereticornis</i>
Understorey – Mid Storey	
Blackthorn	<i>Bursaria spinosa</i>
	<i>Daviesia ulicifolia</i>
Broad-leaved bitter pea	<i>Daviesia latifolia</i>
Grasses	
Wiry Panic	<i>Entolasia stricta</i>
Blady Grass	<i>Imperata cylindrica</i>
Weeping Grass	<i>Microlaena stipoides</i>

7.4.5 Landscape Treatments

A variety of landscape treatments will be adopted to enable the implementation of the overall Urban and Landscape Design Strategy. Landscape treatments need to be:

- Robust and durable to minimise ongoing maintenance inputs
- Cost effective, and
- Maintainable meeting operational and safety needs

Treatment types would include:

- Hydromulch as a surface application to establish permanent vegetation cover and prevent erosion. Hydromulch is the hydraulic application of mulch matrix, sprayed onto the soil as a slurry which sets to form a layer of protection from erosion.
- Turfing is the application of grass rolls as a verge or broader landscape treatment. Typically, turf will be used as the margin between shared path and road and at areas where amenity is high such as at intersections. The use of turf species needs to consider the potential impacts of its spread to the adjoining community and should be used sparingly or adopt a non invasive community
- Planting can be undertaken as individual specimen plantings such as street tree and broad scale tree planting or as garden beds consisting of a prepared mulched bed and the mass planting of shrub and grass species. The use of garden beds would be utilised in areas of high visual prominence, such as roundabouts and intersections; and where instant plant densities are required to provide stability and minimise weed growth such as in the median and/or drains.

Other Structures

7.4.6 Overhead utilities

The presence of overhead power lines is a significant constraint within the corridor and in part a determinant of landscape character as their presence limits the scale of vegetation that can be planted to define the corridor. Much of the vegetation which currently lines the corridor has been pruned back to achieve appropriate clearances. Selection of replacement plantings will consequently be restricted by the powerlines and limited to small trees rather than existing large eucalypts.



Figure 38 View of overhead utilities aligning the southern side of The Driftway

7.4.7 Signage

New signage to be installed will be minimal until stage 2 is delivered however, any signage which is installed is to be in accordance with the requirements of standards. Care needs to be taken to ensure the extent of signage is kept to a minimum and that the signage is integrated with the overall design of the alignment. The following strategies should be adopted:

- Avoidance of signage structures on the skyline and within key views and vistas by considering placement or the incorporation of landscape beyond the structure as a backdrop.
- Rationalise the number of signage structures.

8 Mitigation Measures

8.1 Mitigation Measures

Mitigation measures are treatments developed as part of an overall integrated design process that are recommended to reduce the impacts of a proposal. Mitigation measures are captured in the design to address environmental requirements such as protection of identified vegetation or fauna species; water quality issues; noise etc.

The mitigation measures discussed here address visual and landscape character impacts and those issues addressed as part of the overall urban design response. They may relate to specific viewpoints or address the overall impact of the proposal. Mitigation measures also aim to reduce impacts on the existing landscape character through consideration of existing site features, cultural and environmental heritage.

The urban design Objectives and Principles along with the overall landscape strategy identified in Chapter 7 incorporate several measures that are proposed and designed to reduce the impacts of the proposal. The key mitigation strategies are summarised below, (Table 4), and address both design and construction issues.

Table 5 – Mitigation Measures

Issue	Stage	Recommendation
General Design Integration - standard project safeguards	Design	Ongoing integrated project development will follow TfNSW integrated project development processes, including with urban designers as part of the project team.
	Design	TfNSW Urban Design guidance (Beyond the Pavement) ¹ and Urban Design Guidelines will be used to guide design development of the project.
	Design	The urban design objectives, principles and concept design strategy presented in the urban design report for the REF will form the basis for future design development and consultation with stakeholders.
Earthworks	Design	Integrate with adjoining landform through adoption of appropriate grades, avoiding sharp transition in profile
	Construction	Stabilise/revegetate as works progress to limit erosion and visual impacts through early integration with surrounding vegetation
Retention of Existing vegetation	Design	Design the proposal to avoid impact to prominent trees and vegetation communities where possible Existing threatened species will be retained and protected wherever possible Minimise clearance extent where possible
	Construction	Clearly define clearance limits and exclusion zones to protect vegetation cover

Table 5 – Mitigation Measures Continued

Issue	Stage	Recommendation
Revegetation	Design	Vegetation communities to respond to existing communities and landscape character Utilise local provenance material Provide screen planting within corridor to limit visibility of the proposal from adjoining residential properties
	Construction	Progressively implement revegetation works to limit erosion and to establish vegetation Utilise cleared material as part of revegetation works
Minimise road furniture and signage	Design	Provide minimum signage requirements and limit structural elements to provide an open and permeable setting
	Construction	Look for opportunities to minimise designed signage,
Lighting	Design	Limit extent of lighting and potential for light spill
	Construction	Limit night works and provide lighting which minimises spill
View management	Design	Provide visual screening within the road corridor to limit the visual impact of the proposal in areas identified as moderate or high impact Provide sense of space and openness associated with the agricultural landscape Provide small tree planting where street trees have been removed as a result of modification to alignment or expansion in footprint where space permits
	Construction	Retain vegetation beyond the footprint to retain any existing screening
Ancillary Facilities	Design	Setout compounds to limit impacts, consider screening and location of key structures which provide the greatest impact
	Construction	Maintain compound in a tidy and well-presented manner. Provide and maintain screening
	Construction	Progressively throughout the work, where feasible and reasonable, the ancillary facility sites will be returned to at least their pre-construction state

9 Conclusion

The proposal to upgrade The Driftway represents improvements to safety and traffic flow through the upgrading of intersections and provision of widened shoulders. Its setting is one of a rural residential precinct, with a strongly defined corridor, lined by vegetation.

The visual impact assessment of the works has identified 5 viewpoints of either moderate or moderate to high impact. These reflect both sensitive receivers and the scale of impact. The proposed concept design and mitigation measures have addressed the impacts through proposed landscape and revegetation strategies which would minimise the perception of the scale and how the increase in paved area is viewed.

Similarly, while the assessment has identified moderate impacts to character, mitigation measures have been identified which would reduce the potential impacts.

Mitigation strategies have been identified which impact the overall process of design for the project, ensure consideration is given to all aspects and ensures an integrated approach to the project's development. As part of this process Objectives and Principles have been developed to lead the design. From these, an overall strategy and concepts have been proposed which address and moderate the impacts.

The upgrade of The Driftway as a result of the proposed design strategies has addressed the key concerns of the project and should sit comfortably within the setting with minimal impacts, providing an efficient and safe route.

10 Bibliography

- Austrroads, 2017, *Guide to Road Design Part 6A - Paths for Walking and Cycling*
- Hawkesbury City Council (2012) Hakesbury Local Environmental Plan
- Commonwealth of Australia (2019) *National Freight and Supply Chain Strategy*
- Department of Planning and Environment (2016) *Hunter Regional Plan 2036*
- Infrastructure Australia (2016) *Australian Infrastructure Plan*
- Infrastructure Australia (2020) *Infrastructure Priority List*
- Infrastructure NSW, (2018), *NSW State Infrastructure Strategy 2018-2038*
- Roads and Maritime Services (2019) *Bridge Aesthetics - Design guideline to improve the appearance of bridges in NSW*
- Roads and Maritime Services (December 2018) *Landscape Guideline: Landscape design and maintenance guidelines to improve the quality, safety and cost effectiveness of road corridor planting and seeding.*
- Roads and Maritime Services, (May 2017) *Water Sensitive Urban Design Guideline- Applying water sensitive urban design principles to NSW Transport Projects,*
- Transport for New South Wales (TfNSW) (2020) *Beyond the Pavement 2020 Urban Design Approach and procedures for road and maritime infrastructure planning, design and construction*
- Transport for New South Wales (TfNSW) (2020) *Environmental Impact Assessment Practice Note: Guidelines for Landscape Character and Visual Impact Assessment. EIA-NO4.*
- Transport for NSW (2021) *Richmond Bridge duplication and traffic improvements – Stage 1 The Driftway Biodiversity Assessment*
- Transport for New South Wales (2018) *Road Safety Plan 2021*
- Transport for New South Wales (2018) *Future Transport Strategy 2056*
- Transport for New South Wales, (2018) *NSW Freight and Ports Plan 2018- 2023*
- Transport for New South Wales (TfNSW 2017) *NSW Sustainable Design Guidelines Version 4.0 (Sustainable Design Guidelines)*

Appendices

Appendix A Vegetation Species

724 Broad-leaved Ironbark - Grey Box - *Melaleuca decora* grassy open forest on clay/gravel soils of the Cumberland Plain, Sydney Basin Bioregion

	Botanical Name	Common Name
Trees		
	<i>Eucalyptus moluccana</i>	
Shrubs		
	<i>Acacia falcata</i> ,	
	<i>Bursaria spinosa</i> ,	
	<i>Indigofera australis</i>	
	<i>Melaleuca decora</i>	
	<i>Ozothamnus diosmifolius</i> ,	
Grasses		
	<i>Entolasia stricta</i>	
	<i>Microlaena stipoides</i>	
	<i>Panicum simile</i>	
Forbs		
	<i>Brunoniella australis</i>	
	<i>Dichondra repens</i>	
	<i>Einadia hastata</i>	

PCT 725 Broad-leaved Ironbark - Melaleuca decora shrubby open forest on clay soils of the Cumberland Plain, Sydney Basin Bioregion

	Botanical Name	Common Name
Trees		
	<i>Eucalyptus fibrosa</i>	
Shrubs		
	<i>Acacia falcata,</i>	
	<i>Bursaria spinosa,</i>	
	<i>Indigofera australis</i>	
	<i>Melaleuca decora</i>	
	<i>Ozothamnus diosmifolius,</i>	
Grasses		
	<i>Entolasia stricta</i>	
	<i>Microlaena stipoides</i>	
	<i>Panicum simile</i>	

PCT 835 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion

	Botanical Name	Common Name
Trees		
	<i>Acacia decurrens</i>	
	<i>Angophora floribunda</i> ,	
	<i>Angophora subvelutina</i>	
	<i>Eucalyptus tereticornis</i> ,	
Shrubs		
	<i>Acacia falcata</i> ,	
	<i>Acacia ulicifolia</i> ,	
	<i>Dillwynia tenuifolia</i>	
	<i>Daviesia ulicifolia</i>	
	<i>Exocarpos cupressiformis</i>	
	<i>Grevillea mucronulata</i>	
	<i>Kunzea ambigua</i>	
	<i>Melaleuca linariifolia</i> ,	
	<i>Melaleuca nodosa</i>	
	<i>Pimelea linifolia</i>	
Grasses		
	<i>Lomandra longifolia</i>	
	<i>Microlaena stipoides</i>	
	<i>Themeda triandra</i>	
Forbs		
	<i>Dianella longifolia</i>	

Botanical Name**Common Name**

Hypericum gramineum

Pomax umbellata

Solanum prinophyllum

PCT 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion

	Botanical Name	Common Name
Trees		
	<i>Acacia decurrens</i>	
	<i>Alphitonia excelsa</i>	
	<i>Angophora subvelutina</i>	
	<i>Eucalyptus tereticornis</i>	
Shrubs		
	<i>Breynia oblongifolia</i>	
	<i>Melaleuca decora</i>	
	<i>Melaleuca linariifolia</i>	
Grasses		
	<i>Microlaena stipoides</i>	
Forbs		
	<i>Brunoniella australis</i>	
	<i>Dianella longifolia</i>	
	<i>Tricoryne simplex</i>	

PCT 883 Hard-leaved Scribbly Gum - Parramatta Red Gum heathy woodland of the Cumberland Plain, Sydney Basin Bioregion

	Botanical Name	Common Name
Trees		
	<i>Eucalyptus parramattensis</i> <i>subsp parramattensis</i>	
	<i>Grevillea robusta</i>	
Shrubs		
	<i>Breynia oblongifolia</i>	
	<i>Melaleuca decora</i>	
	<i>Melaleuca linariifolia</i>	
Grasses		
	<i>Microlaena stipoides</i>	
Forbs		
	<i>Brunoniella australis</i>	
	<i>Dianella longifolia</i>	
	<i>Tricoryne simplex</i>	

Appendix B Landscape Concept Plans
