



Landscape Character & Visual Impact Assessment

**The Northern Road Upgrade between
Glenmore Parkway and Jamison Road**

Version 05 - 28 September 2016

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FINAL

Landscape Character and Visual Impact Assessment

Version 05 - 28 September 2016

Prepared for



Prepared By

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CONTENTS

1.	INTRODUCTION	1
1.1	PURPOSE	1
1.2	THE STUDY AREA	2
1.3	BACKGROUND	2
1.4	STUDY METHOD	3
1.5	REFERENCES	6
2.	CONTEXTUAL ANALYSIS	9
2.1	LOCATION	9
2.2	PLANNING CONTEXT	14
2.3	URBAN DESIGN GUIDANCE	21
2.4	EXISTING SITE CONDITIONS	22
3.	PROJECT DESCRIPTION	33
3.1	OVERVIEW	33
3.2	PROPOSED CONCEPT DESIGN	35
4.	URBAN DESIGN OBJECTIVES	37
4.1	URBAN DESIGN VISION FOR THE NORTHERN ROAD	37
4.2	URBAN DESIGN OBJECTIVES AND PRINCIPLES	37
5.	URBAN AND LANDSCAPE CONCEPT	41
6.	LANDSCAPE CHARACTER IMPACT	42
6.1	LANDSCAPE CHARACTER ASSESSMENT	42
6.2	LCZ 1: RURAL SOUTH	44
6.3	LCZ 2: M4 INTERCHANGE	49
6.4	LCZ 3: PERI-URBAN AREA	53
6.5	LCZ 4: ESTABLISHED URBAN AREA	58
6.6	SUMMARY OF LANDSCAPE CHARACTER IMPACTS	64
7.	VISUAL IMPACT ASSESSMENT	65
7.1	OVERVIEW	65
7.2	VISUAL CATCHMENT	65
7.3	VISUAL ASSESSMENT	66
7.4	VISUAL IMPACT ASSESSMENT SUMMARY	94
8.	MITIGATION STRATEGY	95
9.	CONCLUSION	99
10.	APPENDIX	101
10.1	APPENDIX A (Urban and Landscape Concept)	

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1. INTRODUCTION

1.1 PURPOSE

This Landscape Character and Visual Impact Assessment (LCVIA) has been prepared by Spackman Mossop Michaels (SMM) for Roads and Maritime Services (Roads and Maritime). It serves as a technical working paper that supports the *Review of Environmental Factors* (REF) prepared by Jacobs for Roads and Maritime, as part of the planning process.

The LCVIA contains the Landscape Character and Visual Impact Assessment (LCVIA) and Urban and Landscape Concept Design for the proposed upgrade of The Northern Road between Glenmore Parkway in Orchard Hills and Jamison Road in Penrith, in the Penrith Local Government Area (LGA).

In the preparation of the LCVIA, SMM has worked in conjunction with Roads and Maritime road network planners and designers, the Centre for Urban Design (CFUD), other Roads and Maritime specialist advisors, and engineers and technical staff from Jacobs.

The purpose of the LCVIA is to facilitate an integrated urban design and engineering outcome for the proposed upgrade. Integration of the findings of the landscape character and visual impact assessment in the refinement of the concept design provides an opportunity to minimise or avoid potential impacts where possible.

The LCVIA is therefore an integral component of both the planning approval and the design process, providing guidance for the further development concept design to ensure good urban design outcomes.

1.1.1 Report Structure

Consistent with Roads and Maritime Practice Note EIA-N04: *Environmental Impact Assessment Practice Note. Guideline for Landscape Character and Visual Impact Assessment*, the structure of the LCVIA is as follows:

1 Introduction

2 Contextual analysis

An overview of the study area and surrounding context, including a brief overview of relevant planning documents and physical and urban design aspects of the area.

3 Project description

The description summarises the key features of the proposed upgrade, including key design parameters. The concept design for the proposed upgrade complements the project description and is contained in Appendix A.

4 Urban design objectives

An urban design vision, objectives and corresponding principles developed to guide the proposed upgrade.

5 Urban and landscape design concept

A brief overview of the proposed urban and landscape design concept. The full urban and landscape design concept report is contained in Appendix A.

6 Landscape character impact assessment

The landscape character impact assessment determines the likely impact on the landscape character as a result of the project, giving regard to the magnitude of the proposed upgrade

INTRODUCTION

and of the sensitivity of the landscape to change. It also considers how the area is used and how it functions.

7 Visual impact assessment

The visual impact assessment identifies the area from which the proposed upgrade is likely to be seen, followed by an assessment of the likely impact of the proposed upgrade on a number of key views.

Visual impact is the combination of the magnitude or scale of the proposed upgrade and the sensitivity rating of the view. Sensitivity indicates the visual importance of the view and is dependent on the viewing distance, the category of viewer (that is the activity viewers are engaged in) and the elements of the proposed upgrade visible.

8 Mitigation strategy

The mitigation strategy identifies a series of measures to avoid or reduce the identified visual and landscape character impacts. They may also include recommendations towards better realisation of the project urban design objectives.

Mitigation measures are provided for consideration and to guide the future design stages for the proposed upgrade to achieve maximum integration between the engineering design and the urban and landscape setting.

9 Conclusion

1.2 THE STUDY AREA

The study area comprises an approximately four kilometre section of The Northern Road between Glenmore Parkway in Glenmore Park and Jamison Road in Penrith. It includes the intersection of The Northern Road with the M4 Motorway, approximately one kilometre north of Glenmore Parkway - refer Figure 2-2.

1.3 BACKGROUND

The Northern Road is located in the west of the Sydney Metropolitan Region, extending for some 35 kilometres from Camden Valley Way in Narellan to Richmond Road in Penrith. It has been identified as a principal arterial road in several key planning documents including the *South Western Sydney Urban Design Strategy* (Cox 2015), the *South West Growth Centre Road Network Strategy* (SMM 2011), and the *Growth Centres Road Framework* (RTA 2011).

The Northern Road provides an important link road orbiting the extents of the Sydney Metropolitan area. It caters for traffic from existing and planned residential and commercial developments in Sydney's south-west and north-west. Historically, it formed part of a link Road from Singleton in the Hunter Valley to Wollongong in the Illawarra, via Windsor, Campbelltown and Appin (refer Figure 2-1).

The upgrade of the Northern Road has been identified in the Western Sydney Infrastructure Plan, a 10 year, \$3.6 billion road investment program funded by Australian and NSW governments, aimed at integrating transport in the region to capitalise on the economic benefits from the planned western Sydney airport at Badgerys Creek.

INTRODUCTION

To support future growth in the region, Roads and Maritime proposes to widen The Northern Road from currently generally four lanes to three travelling lanes plus a continuous bus lane in each direction. The upgrade would also provide new traffic lights and turning lanes at some intersections, a central median and a new shared path for pedestrians and cyclists.

1.4 STUDY METHOD

Typically the LCVIA is being undertaken in conjunction with the development of the urban and landscape concept design through an iterative design process with the engineering design team.

For this project Roads and Maritime has elected to tender the proposed works for design and construction in parallel with the preparation of the environmental assessment. As a consequence, this LCVIA has been prepared independently from the concept design for the proposed upgrade.

Prior to developing design proposals, tenderers were issued with a reference design and a *Preliminary Urban and Landscape Design Paper (PULP)*. The paper was designed to provide guidance on urban and landscape design outcomes, including the project urban design objectives.

The assessment of the landscape character and visual impacts of the proposed upgrade contained in this LCVIA are based on the reference design provided to the tendering parties, the PULP and the preferred tenderer's design.

The method used to assess landscape character and visual impacts follows Roads and Maritime *Guideline for Landscape Character and Visual Impact Assessment EIA-N04* (RMS, 2013). It involved the following:

- Undertaking site visits and field investigations, reviewing relevant literature, analysing aerial photographs, and topographic maps to understand the study area
- Reviewing the reference design and supporting material to gain an appreciation of the project
- Defining landscape character through a contextual analysis
- Identifying and describing landscape character zones and evaluating the likely impact on them
- Identifying the visual catchment of the proposed works
- Selecting viewpoints within the visual catchment representing a range of different land uses
- Evaluating the visual impact of the proposed upgrade by comparing the sensitivity of viewpoints and the magnitude of the impact of the upgrade upon them
- Identifying urban design and landscape opportunities and methods of mitigating adverse visual impacts for consideration in the detail design phase of the project.

The method used to assess the landscape character and visual impacts of the proposed upgrade is described in the following sections.

INTRODUCTION

1.4.1 Landscape Character Impact Assessment

A number of Landscape Character Zones (LCZ) were identified during the Contextual Analysis. They are generally based on the study area’s surrounding land use, vegetation cover and topography. The purpose of dividing the study area into character zones is to make the assessment process easier to undertake and understand.

Within each LCZ the works are assessed as follows:

- The impact of the proposal on each LCZ based on the sensitivity of the zone, and the magnitude of the proposal’s impact in that zone
- Sensitivity refers to how sensitive the existing character of the setting is to the proposed change, or its inherent capacity to absorb change. For example, a pristine natural environment will be more sensitive to change than an industrial area
- Magnitude refers to the physical size and scale of the project. For example, a large interchange will have a greater magnitude than a localised road widening, and therefore have a greater impact on the landscape character
- The combination of sensitivity and magnitude provides the rating of the landscape character impact for each LCZ (refer to *Table 1-1*).

		MAGNITUDE			
		High	Moderate	Low	Negligible
SENSITIVITY	High	High impact	High to Moderate	Moderate	Negligible
	Moderate	High to Moderate	Moderate impact	Moderate to Low	Negligible
	Low	Moderate	Moderate to Low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible
		Negligible	Negligible	Negligible	Negligible

Table 1-1: Impact Assessment Grading Matrix

INTRODUCTION

1.4.2 Visual Impact Assessment

The extent of area from where the proposed works would be able to be seen is referred to as the visual catchment. It is largely defined by the landform of the study area. Direction of travel or of the view is another factor influencing visibility of the proposal. Factors such as built structures or vegetation need to be considered where they limit or obscure views. However, vegetation, whilst often blocking potential views, is not considered as a permanent obstruction as it can be removed or destroyed.

As distance is a key factor in how the works are perceived, very large visual catchments are typically defined by zones of proximity from the proposed works are described, for example zones of 100 metres, 300 metres and beyond.

Within the LCZ's, a number of viewpoints and groups of viewpoints will be identified at key locations and directions. The impact of the proposed upgrade has been assessed by considering both the sensitivity of the view and the magnitude of the proposed works within that view.

- Sensitivity refers to the quality of the view and how it will be affected by the proposed works. It is measured by assessing the chosen view's composition, its inherent capacity to absorb change and the type and number of viewers such as road users and local residents
- Magnitude refers to the physical character, size and scale of the change and its proximity relative to the viewer. For example, a development situated one kilometre from the viewpoint will have a much reduced visual impact than one 100 metres away
- The combination of sensitivity and magnitude provides the rating of the visual impact (refer to *Table 1-1*).

1.4.3 Qualitative Assessment

For the purposes of this environmental assessment, existing landscape character and the likely magnitude and sensitivity of viewers have been described in a qualitative manner.

This has been based on the authors' experience in the field of landscape character and visual assessment and work on projects of a similar nature. While these methods aim to provide a consistent and unbiased approach to the landscape character and visual impact assessment, the highly individualistic perception of landscape character and scale of proposed works still often leads to differing opinions with regards to the likely impact of a proposed works.

1.4.4 Mitigation Measures

Mitigation measures are a series of strategies, principles or treatments recommended to mitigate the landscape character and visual impacts of a proposed development. They include ways to lessen the magnitude or visual effect of the proposed works to achieve integration with its setting and surroundings, or treatments near critical view areas to reduce the visual impact.

Where the exact locations of features, such as noise barriers, sedimentation basins and retaining walls is not known, proposed treatments for consideration during detailed design and construction are provided.

INTRODUCTION

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INTRODUCTION

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2. CONTEXTUAL ANALYSIS

2.1 LOCATION

The study area for this Landscape Character and Visual Impact Assessment report is for the approximately four kilometre section of The Northern Road between Glenmore Parkway in Glenmore Park and Jamison Road, Penrith (refer to *Figure 2-1*).

2.1.1 Metropolitan Context

The Northern Road is an important arterial link between Camden and Windsor. It is an historic route that dates back to the early settlement of the Hawkesbury and Macarthur areas. It forms the western boundary of the South West Priority Growth Centre which, together with the North West Growth Centre, is earmarked to accommodate the majority of Sydney’s residential growth over the next 25 years.

Major urban growth will also occur between the two growth centres. The planned western Sydney airport, will be a major catalyst for growth. Located between The Northern Road and Elizabeth Drive, it will be the anchor in a major corridor of existing and new employment lands stretching from Bringelly to Minchinbury.

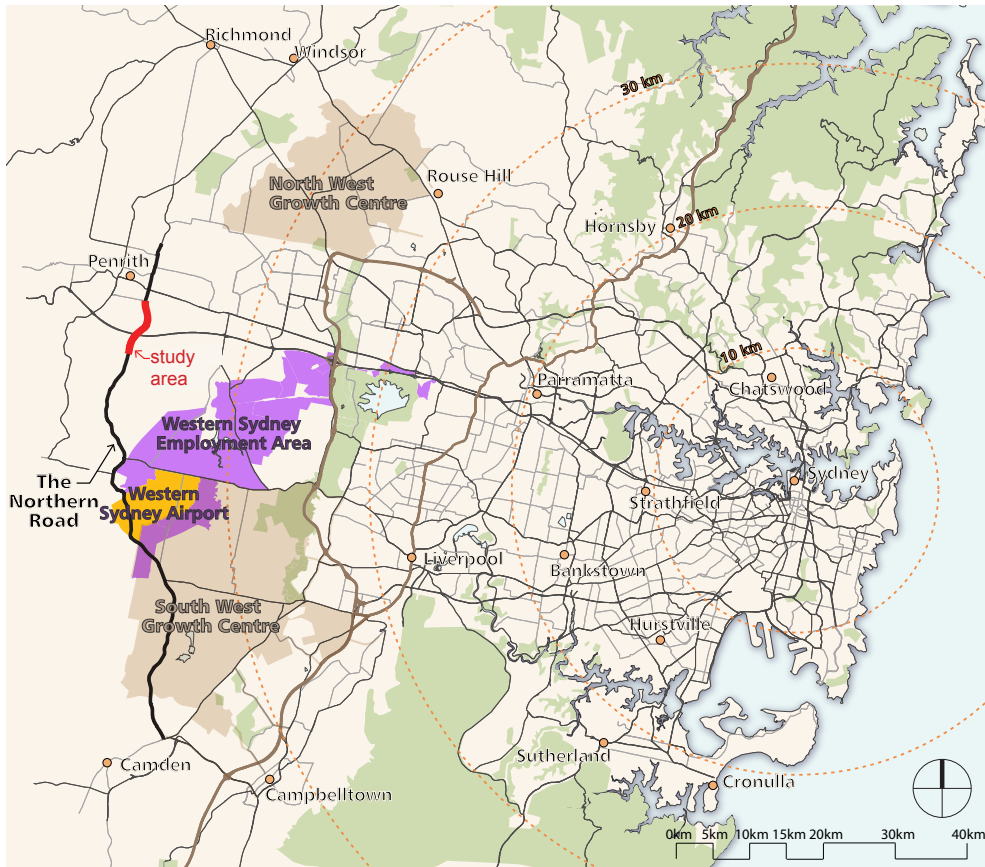


Figure 2-1: Metropolitan context of the proposed upgrade

CONTEXTUAL ANALYSIS

2.1.2 Local Context

Located around the M4 Motorway interchange, the study area is an important gateway to the Penrith LGA. Together with Mulgoa Road further west The Northern Road is a key route providing access to Penrith from the M4 Motorway. It connects the M4 to a number of regionally important destinations to the north including the Penrith CBD - a major regional centre, the University of Western Sydney Kingswood Campus, Wianamatta Regional Park and Penrith Lakes Regional Park including the Penrith Lakes International Regatta Centre (refer *Figure 2-2*).

It also provides access to are a number of emerging residential communities and a number of nature reserves further north, as well as a gateway to the Hawkesbury.

South of the M4 The Northern Road is the primary access route into traditional agricultural and rapidly urbanising areas in the South Creek and Mulgoa Creek catchments, as well as the Defence Establishment at Orchard Hills (DEOH). Major community destinations include the Penrith Golf and Recreation Club, as well as the Orchard Hills Golf Club.

CONTEXTUAL ANALYSIS

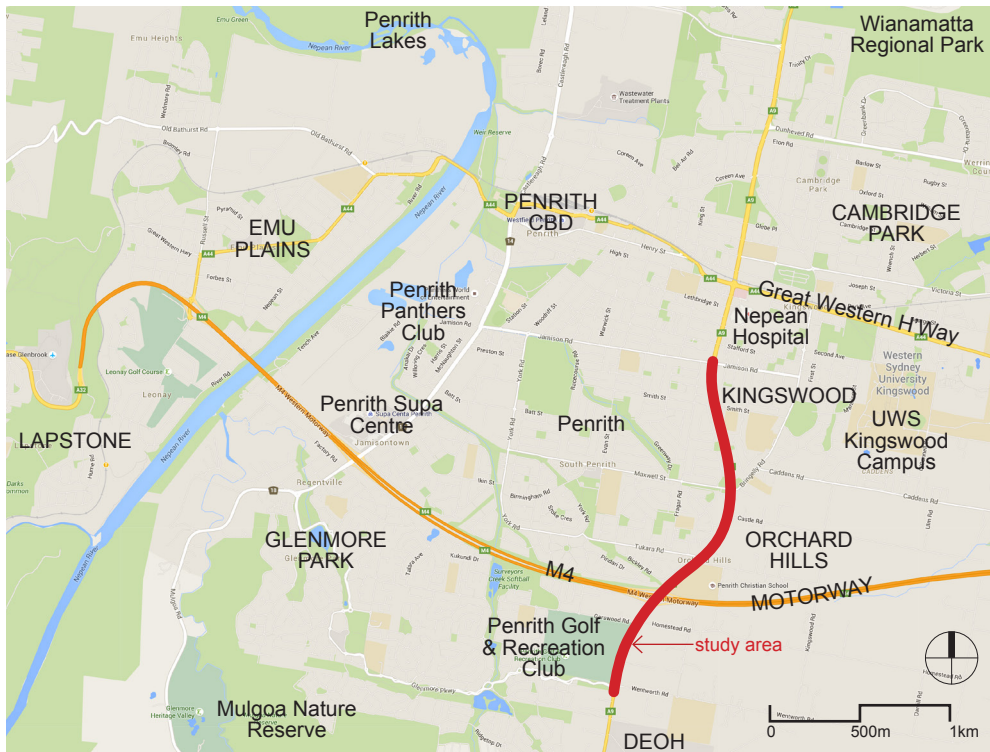


Figure 2-2: Local context of the study area (source: Google maps)

CONTEXTUAL ANALYSIS

2.1.3 Places of Interest

Particular features and places of interest that provide destinations for the local community within and adjoining the study area include (refer *Figure 2-3*):

1. Penrith Anglican College
2. Penrith Golf & Recreation Club
3. Surveyors Creek Public School
4. Surveyors Creek Softball Facility
5. Produce Direct & Pet Centre
6. Church of Jehovah's Witnesses
7. Penrith Christian School
8. Flower Power Garden Centre
9. Mary Mackillop Primary School
10. A small commercial/ retail strip in Aspen Street
11. Jamison High School and York Public School
12. Southlands Shopping Centre
13. Montgrove College
14. Nepean Baptist Church
15. Kingswood High School
16. Kingswood South Public School
17. Western Sydney University Kingswood
18. Penrith South Public School
19. A number of open space areas including linear open space systems providing pedestrian and cycle connections across the LGA
20. Sydney Water Reservoir

CONTEXTUAL ANALYSIS

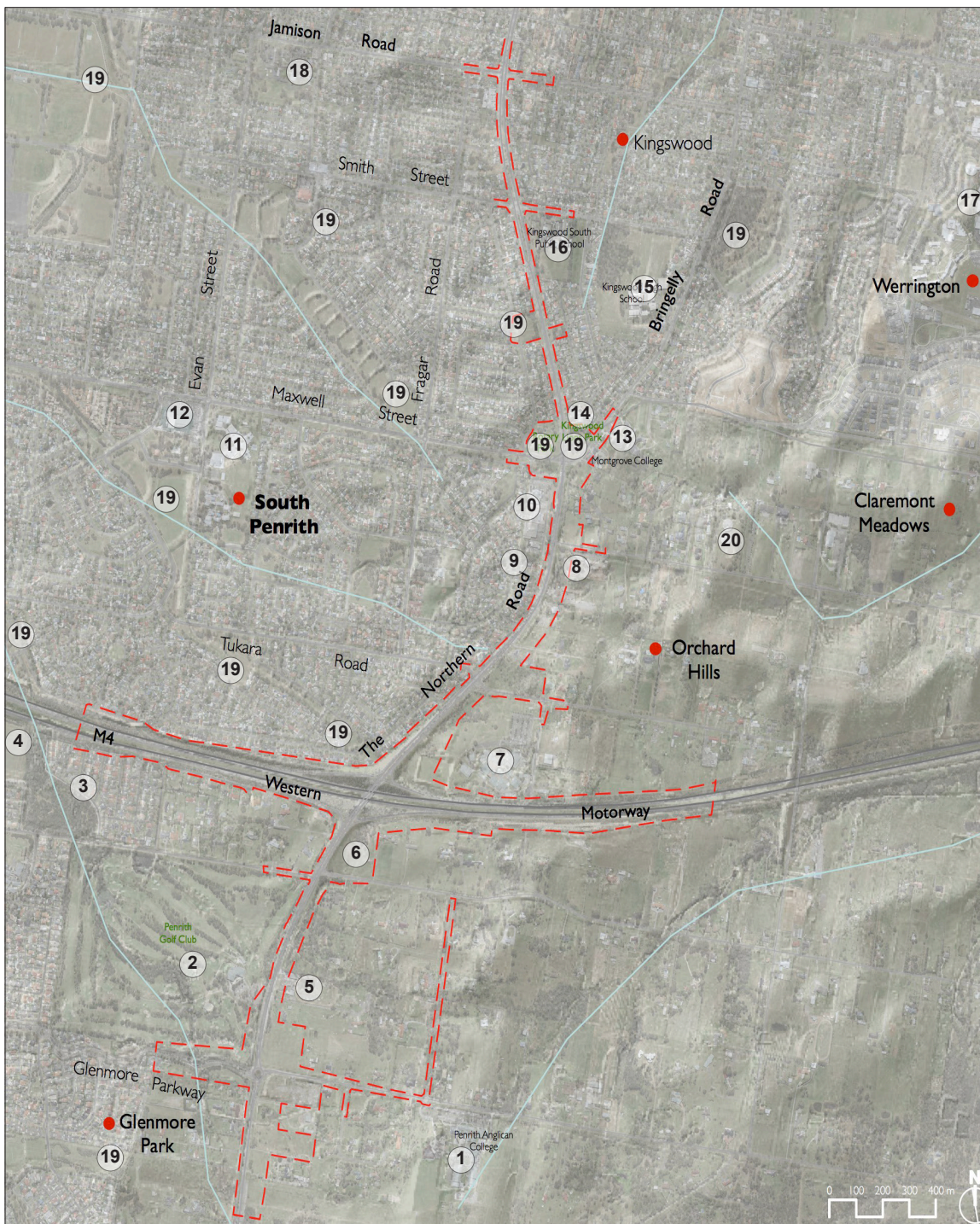


Figure 2-3: Aerial photograph of the study area

CONTEXTUAL ANALYSIS

2.2 PLANNING CONTEXT

2.2.1 A Plan For Growing Sydney

The Sydney Metropolitan Strategy - "A Plan for Growing Sydney" (the Plan) sets the metropolitan planning context. It provides the framework for Sydney's future over the next 20 years, directing growth as well as land use planning decisions.

It outlines a vision for Sydney to be a strong global city and a great place to live, with a competitive economy, world-class services and transport and housing choice within communities that are strong, healthy and well connected.

The Plan identifies western Sydney as the 'key to Sydney's success'. Given likely significant growth over the next 20 years, western Sydney will likely be the driver of future productivity of Sydney and NSW.

Particular opportunities for western Sydney identified by the Plan include (refer *Figure 2-4*):

- Investment in a sports, hospitals and education precincts including the Penrith Education and Health Precinct around the University of Western Sydney
- Investment in transport infrastructure, such as the South West Rail Link, Western Sydney Rail Upgrade Program and the Outer Sydney Orbital
- Growing strategic centres such as Penrith to provide for jobs and services including manufacturing and industrial and a new knowledge economy
- Development of the Western Sydney Priority Growth Area as a major employment area to support manufacturing and industrial activity, particularly the freight and logistics sectors
- Development of the planned western Sydney airport at Badgerys Creek and associated investment in road and rail infrastructure related as a major stimulus to the western Sydney economy and broadening employment opportunities
- Improving transport connections between centres including upgrades to The Northern Road, Elizabeth Drive and Bringelly Road.

The proposed upgrade of The Northern Road is therefore a direct result of strategic planning as outlined in the metropolitan strategy.

CONTEXTUAL ANALYSIS

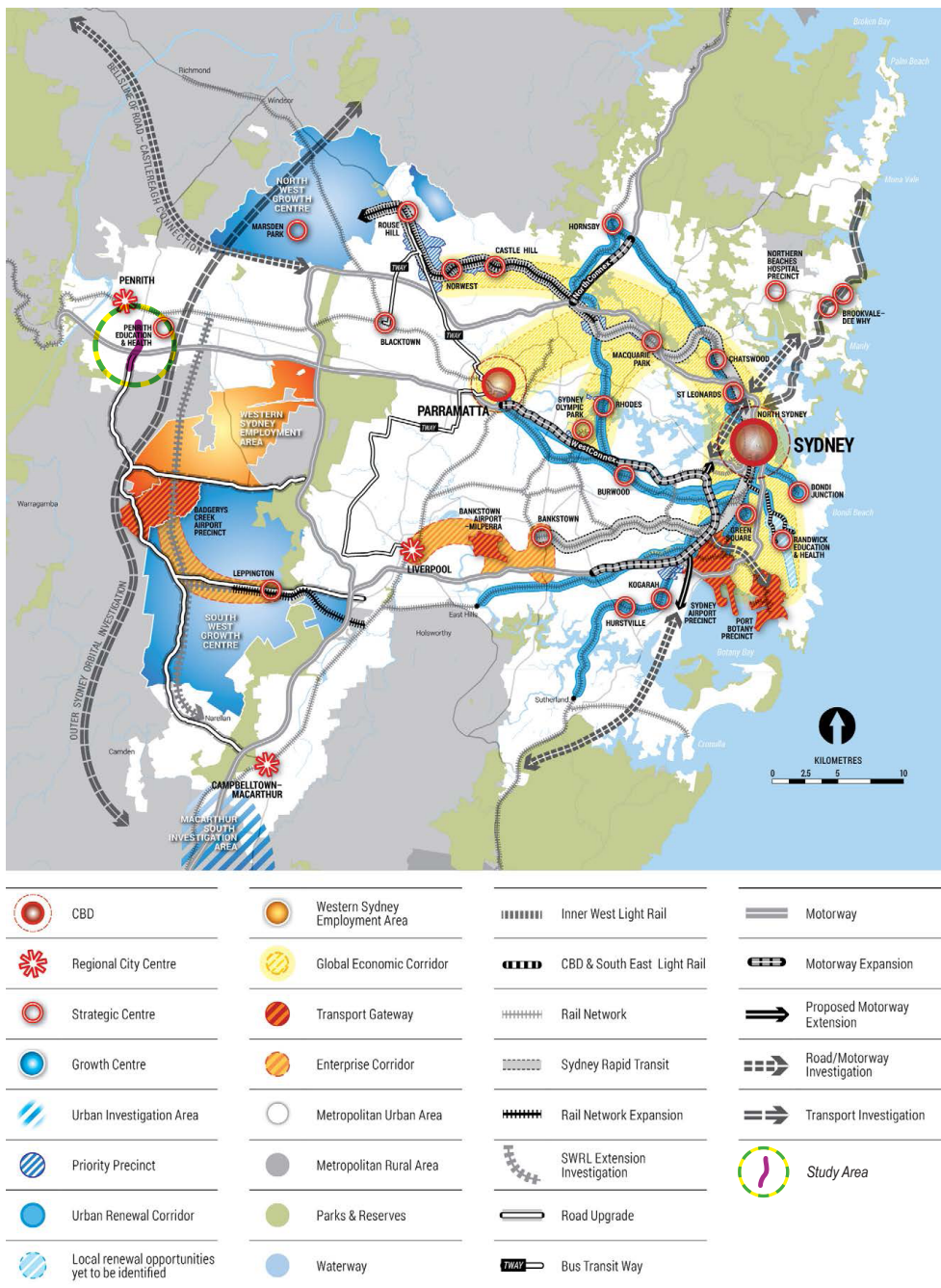


Figure 2-4: A Plan for Growing Sydney: Connecting Jobs and Homes (source: DP+E 2014, p. 15)

CONTEXTUAL ANALYSIS

2.2.2 Western Sydney Infrastructure Plan

The Western Sydney Infrastructure Plan (WSIP) is a joint initiative by the Australian and NSW governments aimed at building a stronger and more prosperous western Sydney, transforming the region's economy through major infrastructure upgrades and making western Sydney an even better place to live and do business.

Building on 'A Plan for Growing Sydney', The WSIP will invest \$3.6 billion over 10 years to deliver major road infrastructure in western Sydney to capitalise on the economic benefits from developing a planned western Sydney airport and to support an integrated transport solution for the region.

The WSIP seeks to provide improved road transport capacity ahead of future traffic demand resulting from residential and employment development in Sydney's growth centres and the Western Sydney Priority Growth Area. Key projects include the upgrade of The Northern Road and Bringelly Road, a new Werrington Arterial and M12 Motorway, and a number of intersection and local road upgrades in the Fairfield, Penrith, Camden, Campbelltown and Blacktown LGAs (Refer *Figure 2-5*).

2.2.3 Penrith City Council

Penrith Local Environmental Plan (LEP) 2010 is the document controlling land use and development in the Penrith LGA. It defines land use zones and the types of development that are permitted with or without consent.

As can be seen from *Figure 2-6*, a number of land uses adjoin the project area. They include

North of the M4

- Predominantly low density residential areas west of The Northern Road
- Primary production areas on small lots east of The Northern Road in Orchard Hills
- Low density residential areas on both sides of the road corridor north of Bringelly Road.

South of the M4

- Environmental living areas west of The Northern Road
- Primary production areas on small lots east of The Northern Road in Orchard Hills
- Private open space within the Penrith Golf & Recreation Club.

There is also a commercial strip along Aspen Street and a number of special uses including The Northern Road itself.

CONTEXTUAL ANALYSIS

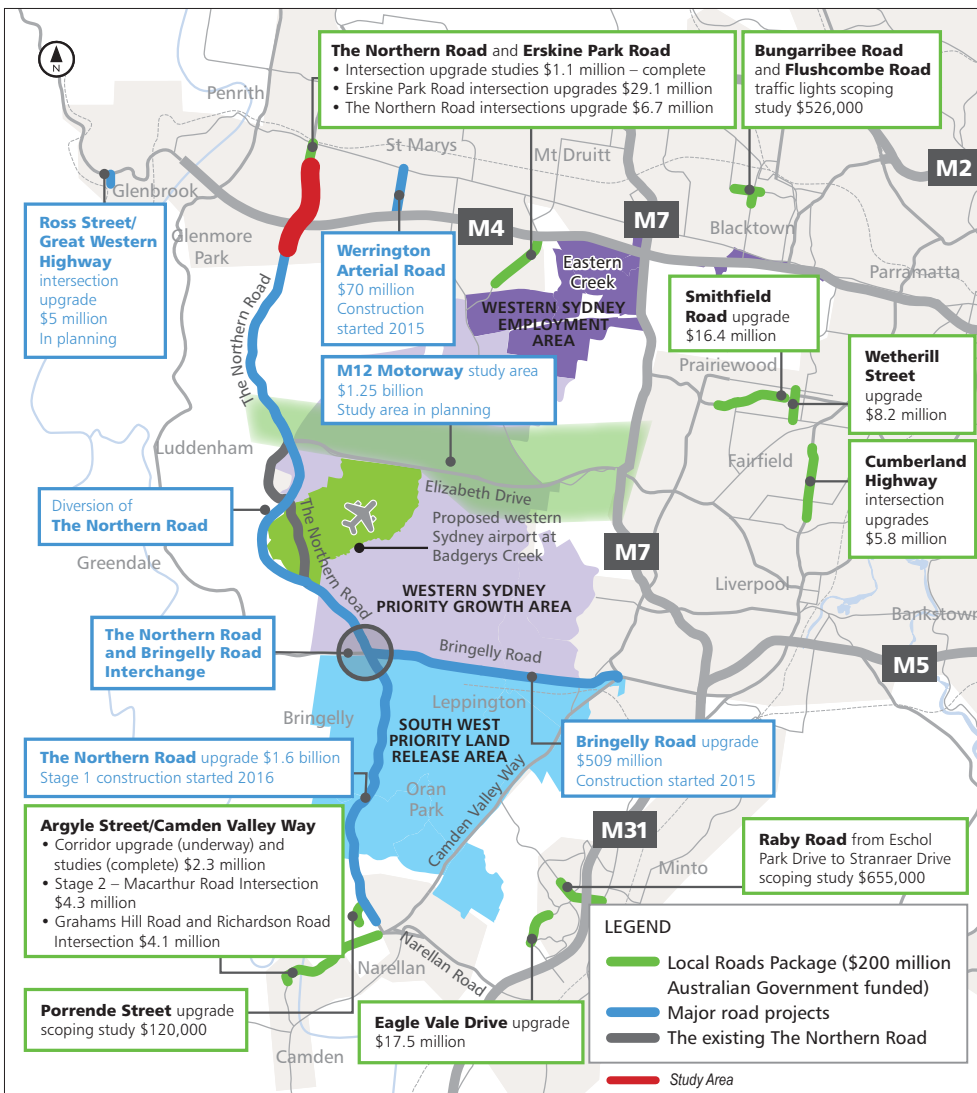


Figure 2-5: Western Sydney Infrastructure Plan (source: RMS 2015, p. 3)

CONTEXTUAL ANALYSIS

Public Open Space Network

There are a number of public open space areas, including open space directly fronting onto the Northern Road.

They include Rotary Park and Kingswood Lions Park and a reserve separating Aspen Street from The Northern Road. These three park are prominently located at the intersection with Maxwell Street and Bringelly Road. They connect with an extensive interlinked open space system along a tributary of Peach Tree Creek, linking to Penrith Showground, the Nepean River and Penrith Lakes. The system is important as it provides a provide a continuous open space and landscape link between Orchard Hills and Penrith Lakes Regional Park.

A second point of entry to the catchment open space network is at Bickley Road. An open space corridor extends from The Northern Road parallel to Bickley Road and meets Surveyor's Creek at the western end of Maxwell Street.

Finally, there are two smaller open space areas adjoin The Northern Road about half way between Maxwell Street and Smith Street.

Scenic and Landscape Values

It is noted that land in Orchard Hills and Glenmore Park adjoining the project area has been identified as possessing scenic character and landscape values - refer *Figure 2-7*. These values were previously captured by *Sydney Regional Environmental Plan (SREP) No 25 - Orchard Hills*. SREP 25 was repealed and replaced by the *Penrith LEP 2010*.

Particular objectives for land identified as having scenic character and landscape values are provided by clause 7.5 of Penrith LEP 2010. They include

- To identify and protect areas that have particular scenic value either from major roads, identified heritage items or other public places, and
- To ensure development in these areas is located and designed to minimise its visual impact.

Orchard Hills Precinct

In addition to the LEP planning overlay, Section 'E10 Orchard Hills' of the *Penrith Council Development Control Plan (DCP) 2014* provides further guidance in respect of the values of and desired outcomes for the Orchard Hill Precinct bound by The Northern Road, the M4, Caddens Road and South Creek.

Key DCP objectives of relevance for the proposed works are:

- To ensure that development does not adversely affect the scenic qualities, character and amenity of this precinct
- To promote the continuation of the open, semi-rural character and regionally significant landscape setting of Orchard Hills and minimise the visual impact of development from major roads and public places
- To recognise that Orchard Hills forms part of an important entry to the residential areas of Penrith, and that careful management of development in this location is critical to conserving the values of this City.

CONTEXTUAL ANALYSIS

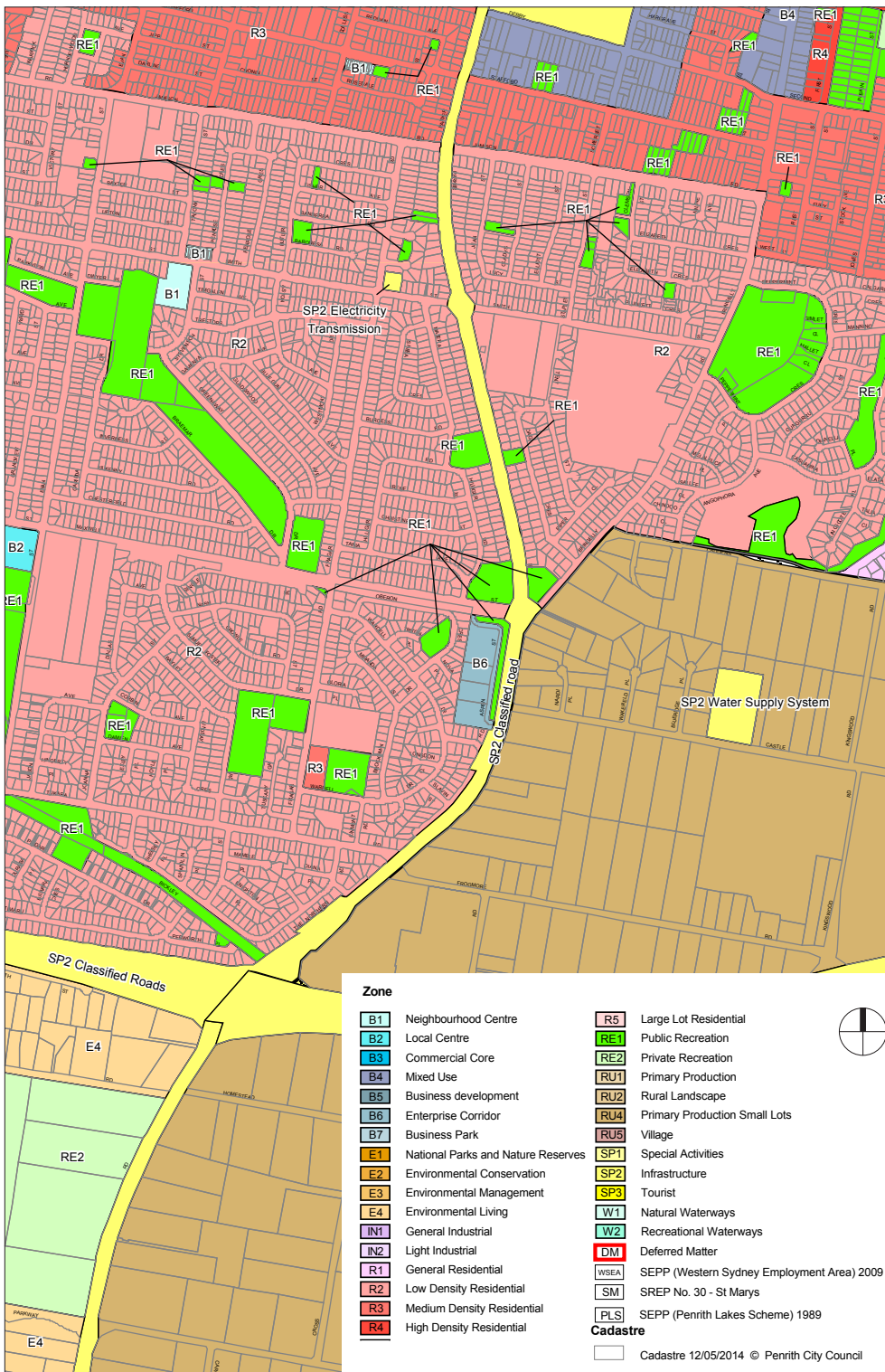


Figure 2-6: Land Zoning Map - Extract from Sheet 13, Penrith LEP 2010

CONTEXTUAL ANALYSIS

The key implications for the proposed works, and for the development of the urban and landscape design are:

- The landscape setting is considered to be regionally significant
- Conversion of rural lands to residential land uses are unlikely in the foreseeable future
- There is a need to protect existing landscape and scenic values
- There is a need to carefully consider and manage the visual impact of the proposed works
- There is a need for the proposed works to enhance the entry values and importance of the site as a gateway to Penrith’s residential areas.

Further, translation of scenic and landscape values into statutory and planning instruments indicates that these values are both significant and widely held. This suggests a high level of visual sensitivity to changes in the landscape.

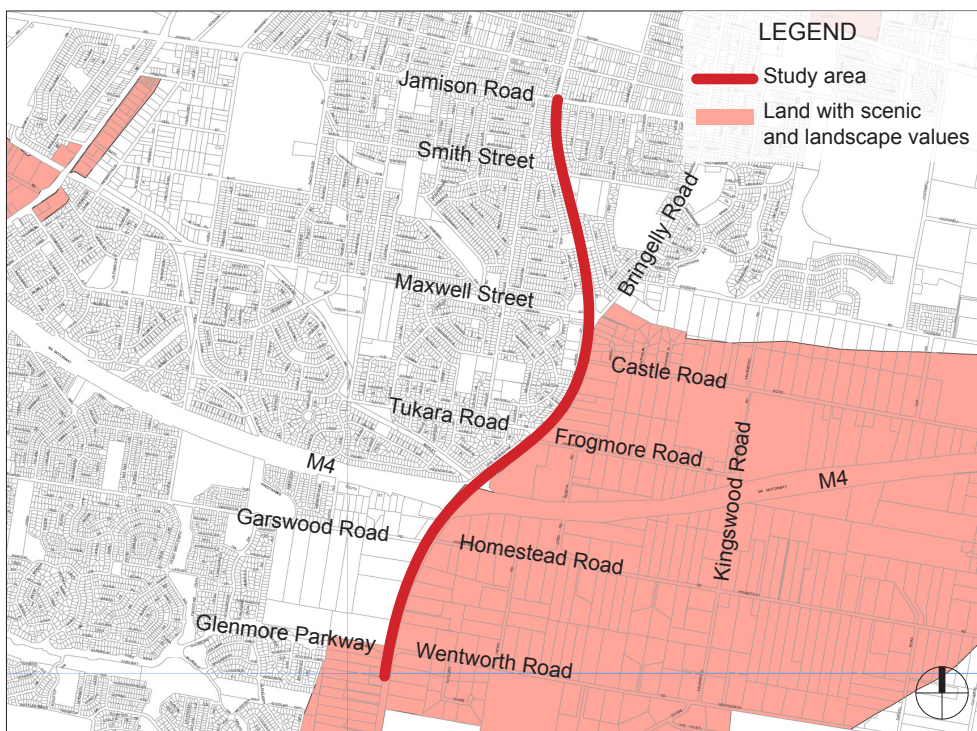


Figure 2-7: Land with Scenic and Landscape Values - Extract from Sheets 6, 7, 13 and 14, Penrith LEP 2010

CONTEXTUAL ANALYSIS

2.3 URBAN DESIGN GUIDANCE

The following provides a brief overview of documents relevant to the proposed works.

2.3.1 Beyond the Pavement

Beyond the Pavement. Urban Design Policy Procedures And Design Principles is the Roads and Maritime urban design policy. It provides guidance in terms of expected urban design outcomes, and how to integrate urban design into the infrastructure design process. It identifies the Roads and Maritime's urban design principles for its projects and provides relevant case studies.

Through *Beyond the Pavement* Roads and Maritime commits to providing excellent outcomes for the people of NSW, governed by 9 overarching urban design principles that include both physical outcomes and performance based principles including *Noisewall Guidelines*, *Bridge Aesthetics Guidelines*, and *Water Sensitive Urban Design Guidelines*.



2.3.2 South West Growth Centre Road Network Strategy

The *South West Growth Centre Road Network Strategy* was prepared in 2011 to guide the road network planning for the South Western Sydney, with a focus on the South West Growth Centre, loosely defined by the F5 Freeway, Elizabeth Drive and The Northern Road.

The Strategy built on and further developed earlier work such as the *Growth Centres Road Framework*, to integrate land use and transport by guiding the future planning and design of both the road network and adjoining land uses. It has since been superseded by the *Draft South Western Sydney Urban Design Strategy* that considers a larger study area extending to the M4 Motorway.



2.3.3 South Western Sydney Urban Design Strategy

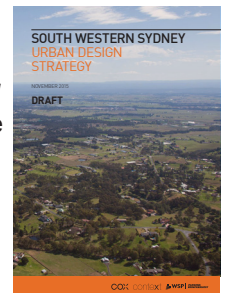
The *Draft South Western Sydney Urban Design Strategy* (SWSUDS) was published in November 2015, in response to the WSIP. Building on the *South West Growth Centre Road Network Strategy* it aims to realise a clear character and identity for the region bound by the M4, M7 and the Hume Highway by providing urban design direction for the development of the road network.

The SWSUDS is built on the premise that the road network holds significant potential to shape and define the character of an area. A fundamental landscape element in Western Sydney is its Cumberland Plain ecology. Its retention and integration into the road network hierarchy is seen as the defining character element of South Western Sydney.

Based on other Roads and Maritime policies including *Beyond the Pavement*, the SWSUDS outlines urban design and road planning principles and recommendations to achieve urban design integration and the desired landscape and urban design outcomes.

The SWSUDS further defines the road hierarchy for the region and provides design guidelines for different types of roads and intersections. This is refined by a 'corridor approach' for major routes that identifies unique issues and values for each road. It considers the corridors' existing character in the context of likely future development to identify an appropriate response.

The SWSUDS is a key document for consideration in the assessment of the potential landscape character impacts of the proposed works, as well as in the development of mitigation measures and the urban and landscape concept design.



CONTEXTUAL ANALYSIS

2.4 EXISTING SITE CONDITIONS

2.4.1 Landform & Views

The landscape of the study area is typical of the Cumberland Plain and defined by its situation between the South Creek catchment with its predominantly north-south aligned ridge lines and valleys, and the Nepean River floodplain.

For the most part of the study area The Northern Road runs approximately parallel and west of a ridge line that delineates the South Creek catchment from the Mulgoa Creek catchment the south of the study area, and from the Nepean River floodplain within the study area. At its highest point this north-south ridge is about 45 metres above the road corridor, constituting a notable landform.

The ridge extends from the Orchard Hills Water Filtration Plant and continues north parallel to Cross and Simeon Roads to a high point on Castle Road where the Sydney Water Reservoir is located (refer *Figure 2-8*). From here the main ridge continues parallel to Bringelly Road to Dunstan Avenue within the University of Western Sydney Campus, while The Northern Road continues along a minor spur.

South of the study area, there are a number of ridge lines west of The Northern Road blocking views of the Blue Mountains. At the southern extents of the study area these ridges give way to the gentle valley around Surveyor's Creek and its tributaries that drain towards the Nepean River in a north-westerly direction. As a result of this landform, views open up towards the Blue Mountains.

Brief glimpses of the Mountains can be seen near the entrance to the DEOH south of the study area. They best views are around Penrith Golf and Recreation Club at Garswood Road and when crossing the M4. Near Bronsgrove Close views become enclosed by residential dwelling west of The Northern Road. They open up again around Aspen Close and the intersection with Maxwell and Bringelly Roads, near Kingswood South Public School and the intersection with Smith Street, and to a lesser degree near Payne Street and the intersection with Jamison Road. North of Jamison Road, only limited glimpses of the Mountains are possible, due to the combination of topography, urban development and vegetation.

The more open views towards the Blue Mountains within the study area relative to adjoining sections of The Northern Road mark a visually important change in character for users of the road corridor. Because of motorists' limited opportunities for long distance views north and south of the study area, sections of the study area providing views to the Mountains represent memorable moments along the route and help connect the traveller to the larger landscape setting.

There are no long-distance views towards the east from the study area, due to the north-south ridge parallel to the road corridor, and tree planting along the M4 blocking any long-distance views from the over-bridge. Mostly, views are confined along the road corridor. The exception are areas around the Penrith Christian School and around Wentworth and Orchard Roads, where more expansive mid-distance views to the east are possible over currently agricultural and rural residential lands. As for views towards the west, these more expansive views are memorable as they allow the motorist to look beyond the road corridor and appreciate the wider landscape setting.

CONTEXTUAL ANALYSIS

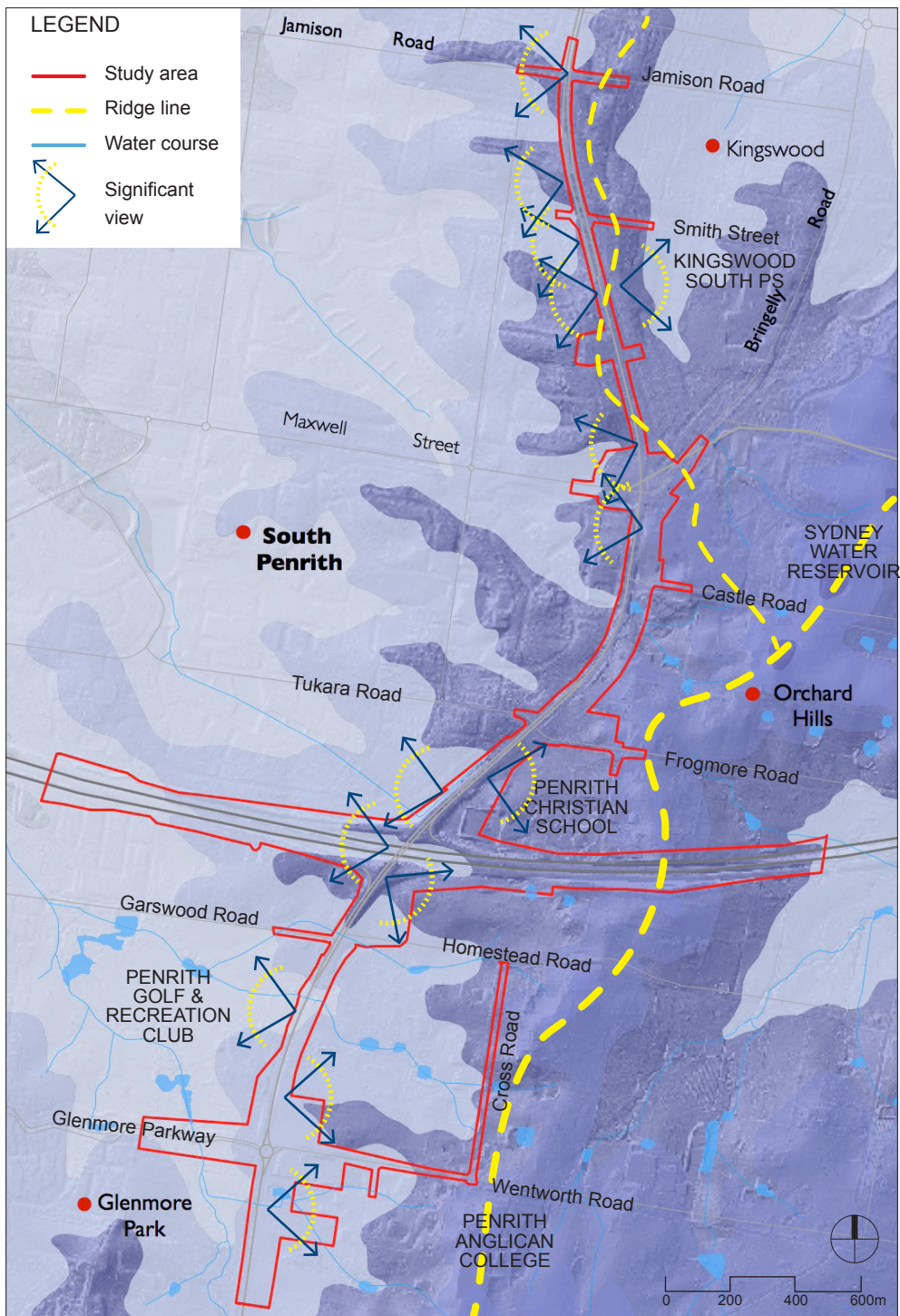


Figure 2-8: Topography, water courses and views

CONTEXTUAL ANALYSIS

2.4.2 Vegetation

The native vegetation within the study area generally consists of Cumberland Plain Woodland. It is highly modified as a result of past and current land uses, including agricultural uses and residential development both of which have resulted in significant clearing.

There are a number of ecologically significant remnants within the study area that are outlined in the biodiversity report, *The Northern Road Upgrade between Glenmore Parkway and Jamison Road: Biodiversity Assessment* (Jacobs, July 2016).

Cumberland Plain Woodland within the study area is predominantly of open-forest structure with a limited shrub layer. It has been widely cleared and remaining areas are heavily disturbed by fragmentation, tracks, clearing, weeds invasion and soil disturbance. It is at risk of becoming extinct in New South Wales. Remnants formally identified as Cumberland Plain Woodland occur in the following locations within the study area (refer *Figure 2-9*):

1. The frontage of the Penrith Golf & Recreation Club, both within the Club's land and the road corridor
2. In a strip along the eastern side of The Northern Road on currently private land, between the Produce Direct and Pet Centre and the Jehovah's Witnesses
3. Near the west-bound off ramp from the M4
4. Along the Penrith Christian School frontage
5. On vacant land between Frogmore Road and The Northern Road
6. Along the eastern side of The Northern Road on currently private land in the Flower Power Garden Centre and the Truck Driving School
7. In open space between Aspen and Maxwell Streets
8. In Rotary Park
9. On undeveloped land between The Northern Road, Oag Crescent and Uren Street
10. In open space between Oag Crescent and The Northern Road
11. Along Glenmore Parkway.

Other remnant vegetation is found in scattered clumps and individual specimen in open space areas adjoining the road corridor and along the edge of the road corridor. The latter are generally located on the eastern side of the corridor and south of Bringelly Road, as well as on both sides of the road south of the M4 interchange. Some of these remnants are interspersed with cultural plantings of non-native species including in Kingswood Lions Park. Due to their fragmented and dispersed nature they are unlikely to offer much potential for wildlife links.

The M4 corridor including the M4 interchange features extensive relatively recent plantings of native vegetation.

Other vegetation in the study area includes cultural plantings associated with residential homes (both within and outside of the road corridor). There is limited planting in the existing median strip. There is a loose avenue of small eucalypts between Jamison Road and Smith Street, and a fairly formal avenue of predominantly Crepe Myrtle trees north and south of the intersection with Frogmore and Tukara Roads.

CONTEXTUAL ANALYSIS

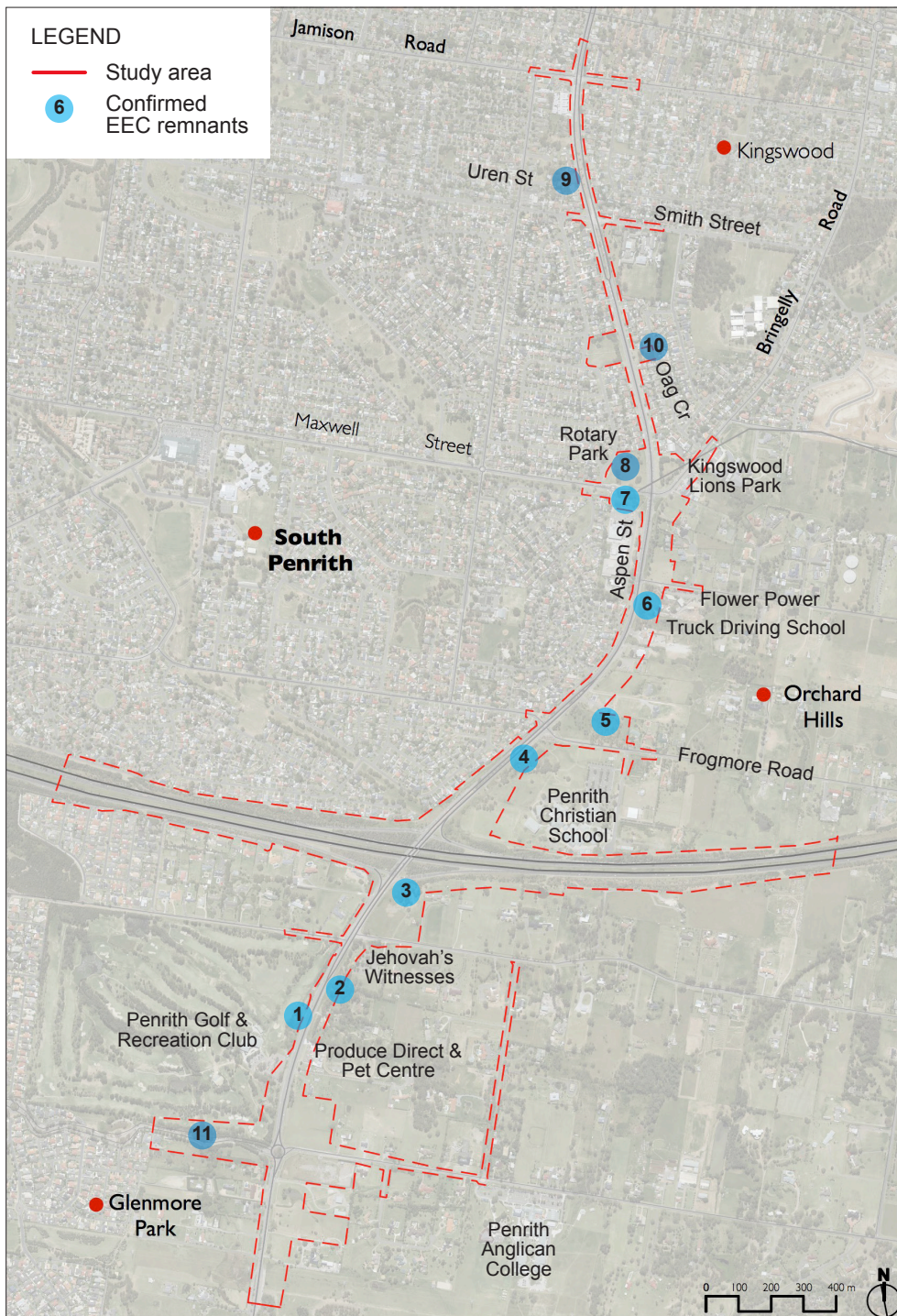


Figure 2-9: Aerial photograph showing distribution of remnant vegetation including confirmed EEC remnants

CONTEXTUAL ANALYSIS

2.4.3 Land Use and Settlement Pattern

The study area is located in the peri-urban area, the interface between developed urban or suburban areas and areas that retain their rural uses and character. As a result, different land uses and settlement patterns are found along this section of The Northern Road. The transition from rural to increasingly urban land uses is reflected in the current land use zoning (refer *Figure 2-10*).

The southern extent of the study area is characterised by relatively low levels of development. Current land uses include small farms and rural or environmental living areas, as well as open space within the Penrith Golf and Recreation Club. As a result, the landscape retains a rural character of open countryside interspersed with remnant vegetation and occasional dwellings and ancillary structures. This is reinforced by the nature of intersections which are currently unsignalised. The scale of the road changes from a single two-lane carriageway south of Glenmore Parkway to a generally four-lane dual carriageway north of Glenmore Parkway. The width of the carriageway increases to three lanes in each direction, plus turning lanes, around the M4 interchange.

North of the M4, The Northern Road forms the boundary between ongoing rural land uses on small rural lots in Orchard Hills to the east and the established residential suburb of Penrith to the west. Residential developments consists of predominantly single-storey low density detached housing. In Penrith south of Maxwell Street there is a small commercial strip fronting The Northern Road behind a landscaped strip. It includes fast food outlets, a furniture warehouse, a service station and extensive car parking areas. Access is provided via Aspen Street, off The Northern Road. The different types of land uses adjoining the road corridor result in a strong character contrast between the two sides of the road.

North of the M4 interchange, the character of the road corridor also becomes more urban. There are limited sections of landscaped medians, including around Frogmore Road and around Smith Street.

North of Bringelly Road, the settlement pattern changes again, with established residential suburbs adjoining both sides of The Northern Road. They include Penrith to the west and Kingswood to the east. This pattern is interrupted by a number of small open space areas adjoining the road corridor, as well as by the Kingswood South Public School. Open spaces consist mostly of turf with tree planting, including remnant vegetation, but remain otherwise undeveloped. The exception is the park between Mazepa Avenue and The Northern Road which features a children's playground.

2.4.4 Heritage

There are no heritage items within the project area. The closest heritage item is the locally significant Water Reservoir located on top of the ridge at 197-207 Castle Road, Orchard Hills (Item 657, Schedule 5, Part 1, Penrith Local Environmental Plan 2010) (refer *Figure 2-8*). Due to the topography and vegetation, the reservoir is not visible from within the study area, nor can the road corridor be seen from the reservoir.

There are a small number of Aboriginal artefact sites located along the southern boundary of the M4 corridor and in the Transgrid easement at the southern end of the study area - refer archaeological report for more information.

CONTEXTUAL ANALYSIS

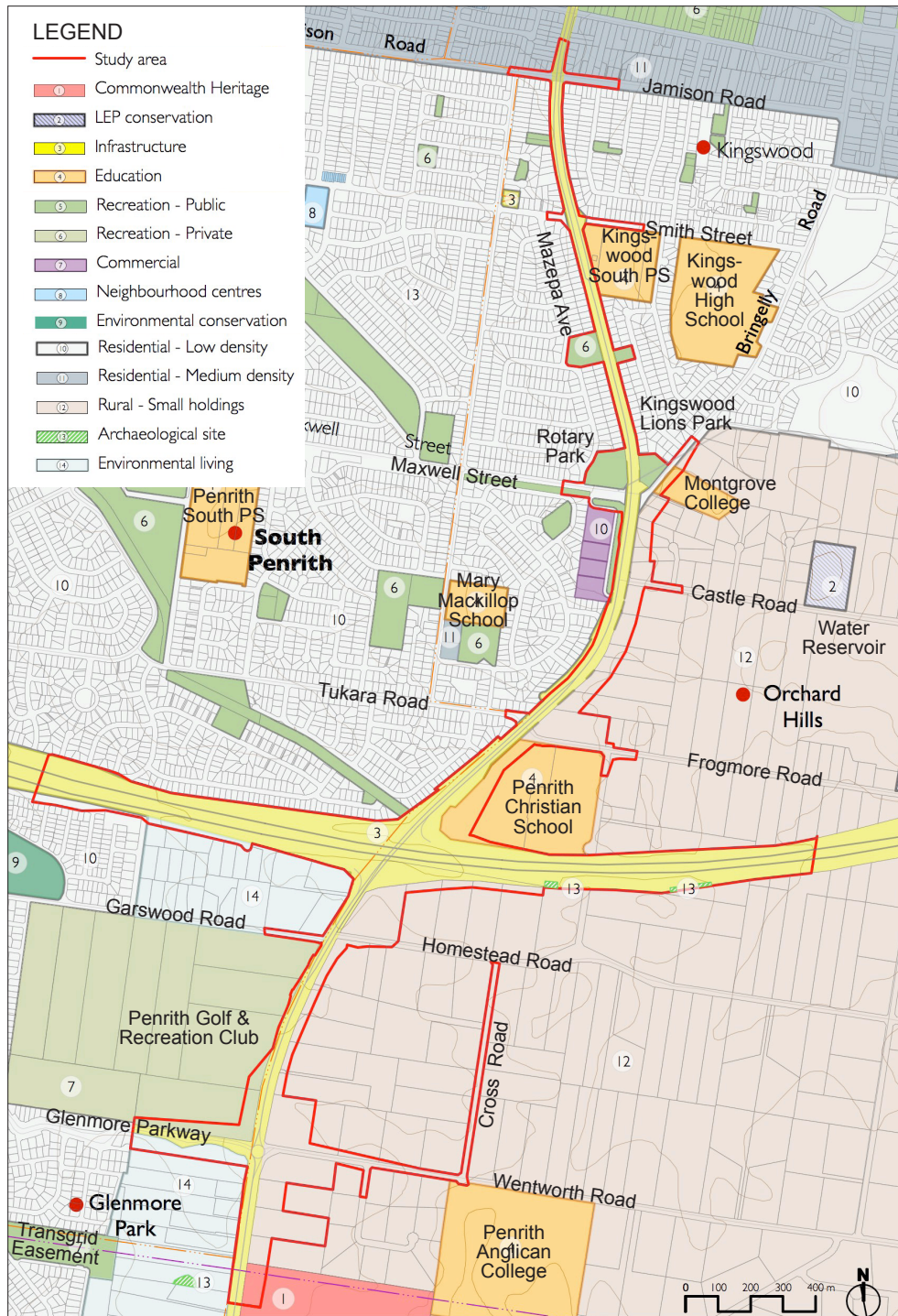


Figure 2-10: Land Uses and Heritage Items surrounding the proposed upgrade

CONTEXTUAL ANALYSIS

2.4.5 Utilities

A major Transgrid easement with a 330kV transmission line crosses the road corridor near the southern extent of the study area (refer *Figure 2-11*). In addition, continuous overhead cables line the western edge of the road corridor and are a dominant element within the study area. They include communications lines as well as high voltage (33kV) electricity cables south of Tukara Road. Utility lines also frequently cross the road corridor.

CONTEXTUAL ANALYSIS

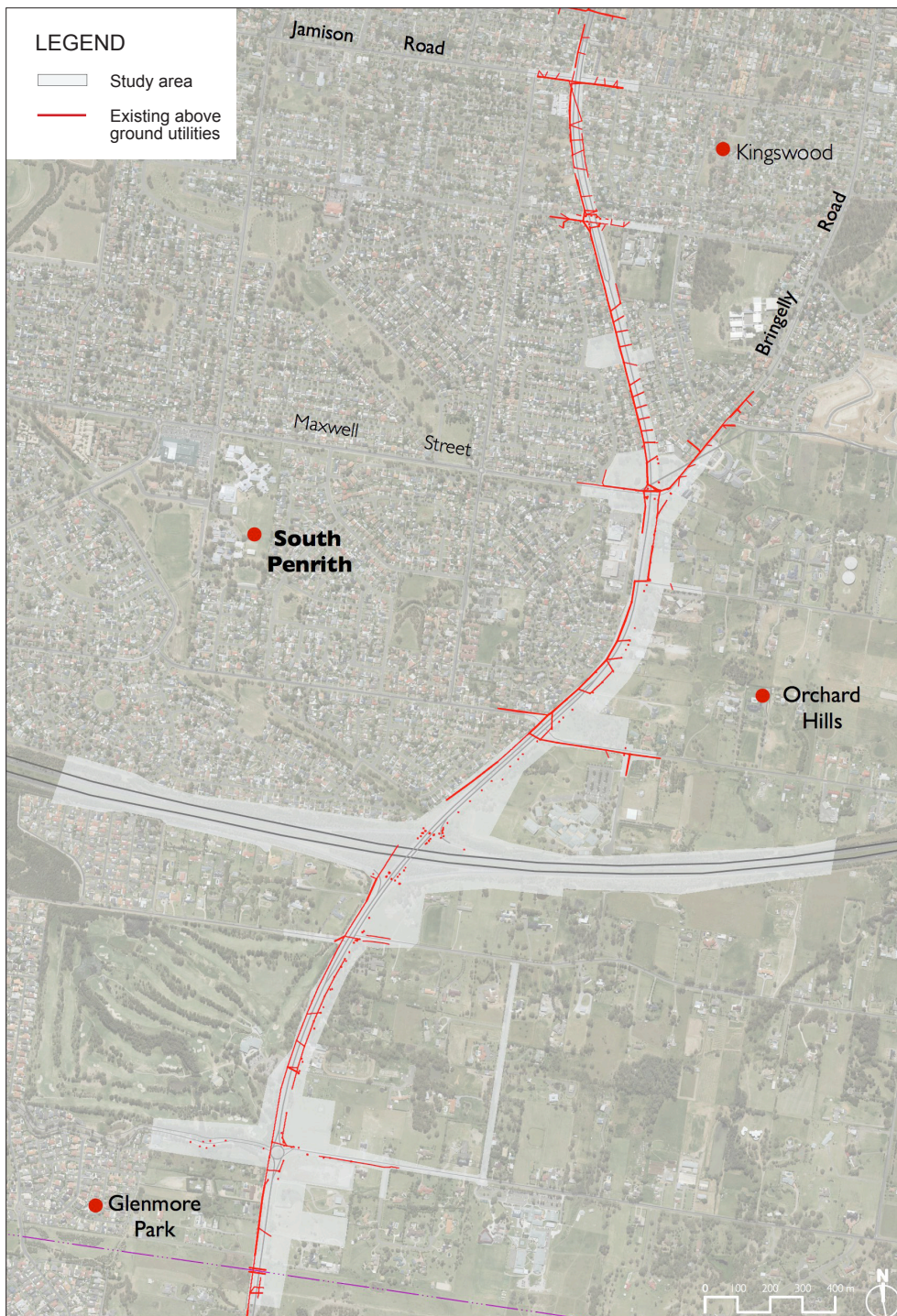


Figure 2-11: Above-ground Utility Services

CONTEXTUAL ANALYSIS

2.4.6 Movement Network and Public Transport

The Northern Road is an important arterial road. Orbiting the western edge of the Sydney Basin it links the Camden and Campbelltown areas with Penrith and Windsor. It will become increasingly important with progressive development of the South West and North West Growth Centres, as well as the Western Employment Lands and the planned western Sydney airport. Together with Appin Road and Putty/Singleton Road, it provides a regional link from the Illawarra to the Hunter.

The Northern Road provides an important approach to and entry point into the Penrith Local Government Area (LGA). Within the LGA, it is an important north-south connecting route, as it is one of a limited number of roads that facilitate crossing of the Western Rail Line. The nearest rail crossing opportunities are Evans Street about 900 metres to the west or Werrington Road 4.5 kilometres to the east.

There are currently a number bus routes that follow or cross The Northern Road (TNR) within the study area, namely

- 770 between Penrith and Mt Druitt
- 781 between Penrith and St Marys
- 789 between Penrith and Luddenham
- 794 between Penrith, Mulgoa Rise and Glenmore Park.

Respective public bus routes are shown in *Figure 2-12*.

In addition to public buses, there are a large number of school bus routes that use the project area. It is noted that schools in the area use a combination of public buses and school buses to facilitate access from Penrith Station as well as other suburbs in the region. Current important bus movements are as follows:

North-bound movements	Southbound movements
<ul style="list-style-type: none"> • Right turn from TNR onto Wentworth Road • Right turn from Wentworth Road onto TNR • Left turn from TNR onto Garswood Road • Left from Glenmore Parkway onto TNR • Right turn from Frogmore Road onto TNR • Left turn from TNR onto Maxwell Street • Right turn from TNR onto Bringelly Road. 	<ul style="list-style-type: none"> • Left turn from TNR onto Jamison Road • Left turn from TNR onto Smith Street • Right turn from Maxwell Street onto TNR • Left turn from Bringelly Road onto The Northern Road • Left turn from TNR onto Frogmore Road • Left turn from Frogmore Road onto TNR • Left turn from the M4 onto TNR • Right turn from TNR onto Glenmore Parkway
<p>Movements across TNR</p> <ul style="list-style-type: none"> • From Glenmore Parkway across TNR to Wentworth Road. 	<ul style="list-style-type: none"> • Left turn from TNR onto Wentworth Road • Left turn from Wentworth Road onto TNR.

It is important that the proposed works retain ease of pedestrian access to bus stops from surrounding areas, including access across the road corridor.

CONTEXTUAL ANALYSIS

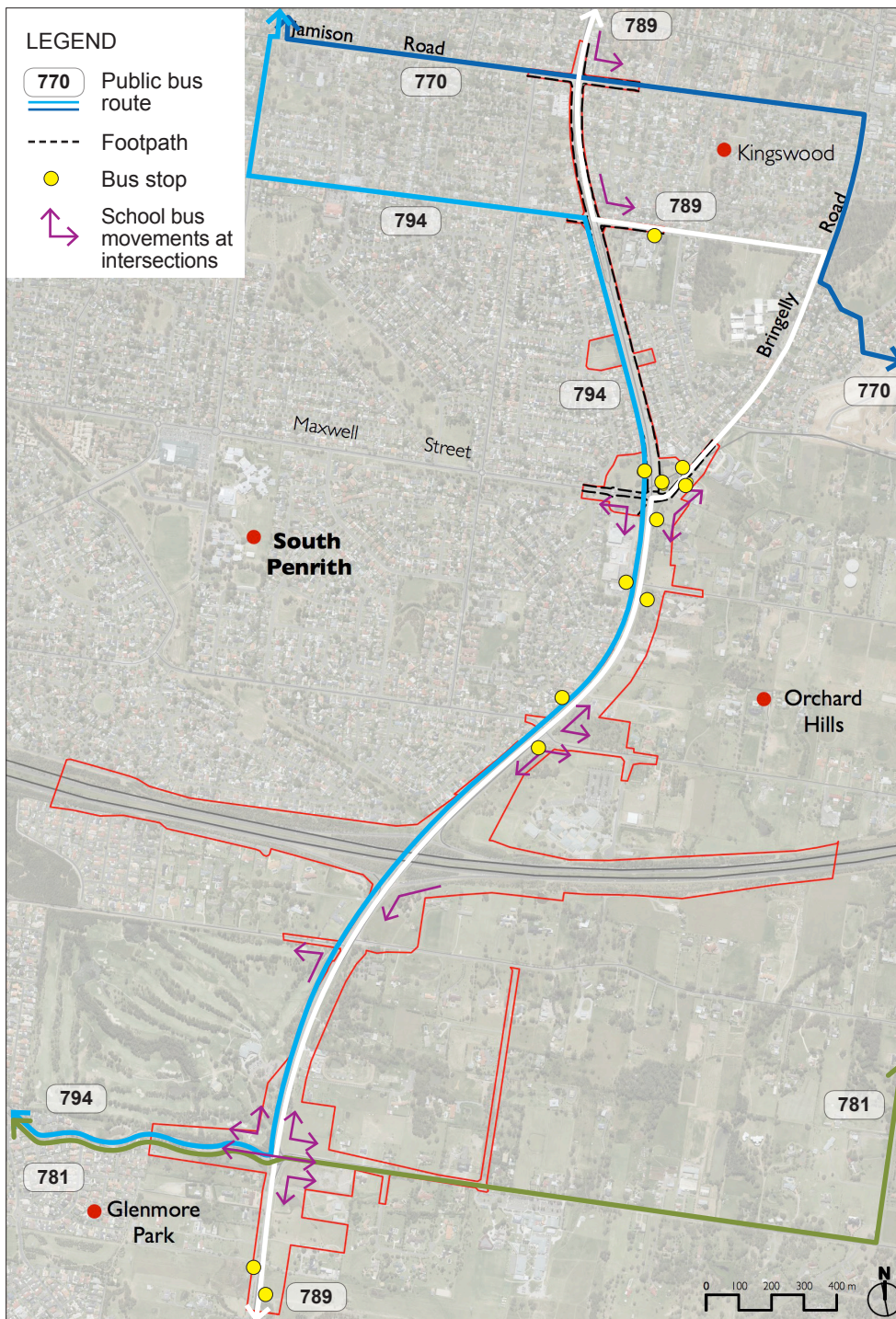


Figure 2-12: Movement Network and Public Transport

CONTEXTUAL ANALYSIS

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3. PROJECT DESCRIPTION

3.1 Overview

Roads and Maritime proposes to upgrade about four kilometres of The Northern Road between Glenmore Parkway, Glenmore Park and Jamison Road, Penrith. The proposal is shown in Figure 2-3, and illustrated in greater detail on the design drawings in Appendix A. The main features of the proposal assessed in this REF are:

- An eight-lane divided road (three general traffic lanes and a kerbside bus lane in each direction) from just south of Glenmore Parkway, Glenmore Park to Jamison Road, Penrith
- An upgrade to the M4 Motorway interchange, including:
 - Construction of a new two-span bridge over the M4 Motorway, located to the east of the existing bridge alignment
 - Replacement of the existing two sets of traffic signals at the M4 Motorway interchange, with a single set of traffic signals to control all movements at the interchange
 - Widening of ramps to accommodate future Smart Motorway requirements
 - Demolition of the existing bridge over the M4 Motorway.
- New traffic signals on The Northern Road at:
 - The Northern Road intersection with Glenmore Parkway and Wentworth Road
 - The Northern Road intersection with Frogmore Road and Tukara Road
- Altered intersection arrangements at:
 - The Northern Road and Homestead Road (left-in, left-out only)
 - The Northern Road and Castle Road (left-in, left-out only)
 - Maxwell Street and Aspen Street (a new four-leg roundabout realigned to include direct access to Hilliger Road)
- Upgrade of The Northern Road and Glenmore Parkway / Wentworth Road intersection, comprising:
 - Traffic signals to replace the existing roundabout, allowing all movements
 - Separate left-turn lanes on all approach roads to the intersection
 - Additional left-turn and right-turn capacity from both approach roads onto The Northern Road
 - A new dedicated access road into the Penrith Golf and Recreation Club, accessed off Glenmore Parkway
 - A new single-lane roundabout on Glenmore Parkway located to the west of the proposed new access road to facilitate U-turn movements for eastbound and westbound traffic on Glenmore Parkway
- Increased right-turn capacity (dual right-turn lanes) at all signalised intersections, except for:
 - The Northern Road and Frogmore Road (all right turns)
 - Right turns out of Bringelly Road
 - Right turns into Maxwell Street
 - The Northern Road and Smith Street (all right turns)
 - The Northern Road and Jamison Road (all right turns)

PROJECT DESCRIPTION

- Dedicated left-turn lanes in and out of The Northern Road at all intersections, except for left turns out from:
 - Garswood Road
 - Homestead Road
 - Aspen Street
 - Castle Road
 - Smith Street
- Changes to local roads, including:
 - Extension of Cross Road to provide a new local connection between Wentworth Road and Homestead Road
 - A new roundabout on Frogmore Road, west of the existing intersection with Simeon Road providing access to Penrith Christian School
 - Removal of the existing roundabout at Maxwell Street and Aspen Street, and replacement with a new four-leg roundabout realigned to include direct access to Hilliger Road, with traffic signals on the Aspen Street leg only
- New pedestrian and cyclist facilities, including:
 - A three-metre wide shared path along the western side of The Northern Road between Glenmore Parkway and Jamison Road
 - A three-metre wide shared path along the eastern side of The Northern Road between Wentworth Road and Bringelly Road
 - A 1.5 metre wide footpath on the eastern side of The Northern Road between Bringelly Road and Jamison Road
- New or additional pedestrian signals at:
 - The intersection of Glenmore Parkway and Wentworth Road
 - The M4 Motorway interchange
 - The intersection of Frogmore Road and Tukara Road
 - The intersection of The Northern Road and Jamison Road
- New retaining walls along:
 - The eastern side of The Northern Road, south of Homestead Road
 - Both sides of the M4 Motorway beneath the proposed bridge (reinforced soil walls)
 - The northern side of the eastbound M4 on-ramp, towards the eastern end of the ramp
 - The western side of The Northern Road, south of Tukara Road
 - The eastern side of The Northern Road, south of Bringelly Road
 - The eastern and western side of The Northern Road at numerous locations between Maxwell Street / Bringelly Road and Smith Street
 - The southern side of Smith Street, west of the intersection with The Northern Road
 - The eastern and western side of The Northern Road at numerous locations between Smith Street and Jamison Road
- Upgrade of drainage infrastructure, including:
 - New or upgraded cross-drainage structures to replace existing cross-drainage where required

PROJECT DESCRIPTION

- A water-retaining earth bund would be constructed at the inlet of the relocated culvert C8960 to protect the adjacent pond at the Flower Power Garden Centre
- New longitudinal drainage including open concrete or grass-lined catch drains, grassed swales, pits and pipes
- New noise barriers at the following locations:
 - A noise mound along the northern side of the eastbound M4 Motorway off-ramp (the mound would be about 670 metres long and six metres high)
 - A noise wall along the eastbound M4 Motorway off-ramp from the end of the noise mound, continuing north along the western side of The Northern Road to Aspen Street (the wall would be about 1.2 kilometres long and 5 metres high)
- Two permanent variable message signs (VMS) on The Northern Road approaches to the M4 Motorway interchange
- New street lighting
- Landscaping
- Relocation of utility services and construction/installation of new utility services
- Relocation of some bus stops and construction of new bus stops
- Changes to property accesses along The Northern Road to left-in, left-out only
- Adjustments to private properties to accommodate the proposal, including driveways and fencing
- Establishment and use of temporary site compounds during construction.

It is anticipated that construction of the proposal would start during 2017 and is expected to be completed by the end of 2019.

3.2 Proposed Concept Design

The proposed concept design is included in Appendix A of this report.

3.2.1 A note on Landscape Character and Visual Impacts

As a result of the road design parameters and the physical manifestation of that design, it can be expected that there will be an impact on the existing landscape character and views.

All works associated with the proposed upgrade are assessed as part of the Landscape Character and Visual Impact Assessment, including permanent and temporary works.

Temporary impacts are short term direct and indirect impacts during the construction phase of the proposed works. Examples include construction site compounds, daily construction activities and material disposal or stockpile sites.

Construction site compounds would comprise offices and material laydown areas and will be fenced and generally covered in hardstand. Offices would typically be prefabricated and material storage areas would include purpose built temporary structures as required. Construction site establishment would involve the placement of temporary concrete safety barriers and fencing to create a safe work zone.

Temporary works and structures have the potential to have lasting impacts. An example would be the clearing of mature vegetation to allow establishment of a construction compound.

PROJECT DESCRIPTION

The impact from the loss of established vegetation would persist following removal of the compound.

The landscape design prepared for the proposed upgrade does not currently include adequate provision for the revegetation of construction compound sites post-construction. Remediation of these sites will be a gradual improvement in the visual quality and amenity for the community over time as the areas revegetate and the trees mature.

The landscape character and visual impacts of the proposed works are described in Sections 6 and 7 of this report.

4. URBAN DESIGN OBJECTIVES

In any road upgrade project, the experience of the road user and viewer is significantly improved through careful consideration of all design disciplines and elements.

There are a number of elements that require careful design consideration to ensure maximum integration of the engineering design with the existing natural and built environment. These elements include cut and fill batters, walling, drainage structures, bridges, fences and barriers, planting and landscaped surfaces.

To guide the design development and implementation of these design elements, urban design objectives are developed.

The objectives define the most important outcomes to be achieved as a result of the proposed upgrade, taking into account both the road corridor and its relationship with surrounding areas. Urban design objectives are implemented in accordance with the performance themes of safety, cost effectiveness and sustainability as outlined in *'Beyond the Pavement'*.

4.1 URBAN DESIGN VISION FOR THE NORTHERN ROAD

The following vision statement articulates the desired outcome for The Northern Road within the study area.

"The Northern Road will provide safe and efficient travel for motorists, public transport and active transport, both within, to and across the corridor. The planning and design of the road corridor will respond to the adjoining landscape and built context and enhance the transition from rural to urban areas. It will enhance the study area as a major gateway to Penrith while providing a driving experience that facilitates the appreciation of existing significant scenic and landscape values in Orchard Hills".

4.2 URBAN DESIGN OBJECTIVES AND PRINCIPLES

Based on the contextual analysis including the existing landscape character, the following urban design objectives and corresponding principles for The Northern Road upgrade were identified to inform the development of the integrated engineering and urban design for the proposed upgrade:

1. **Protect and enhance existing views, character and cultural values of the corridor.**
 - Maintain and enhance the landscape experience of the drive
 - Retain and reinforce the diverse character of the route, in particular the distinction between urban and rural areas
 - Maximise opportunities to enhance the driver experience through the borrowed landscape outside of the road corridor, to foster a sense of place for the journey along The Northern Road
 - Draw on existing vistas and views to create a sequence of opening and enclosed views for the motorists including intermittent views to the Blue Mountains
 - Design structures such as noise walls and throw screens to maintain existing views and solar access

URBAN DESIGN OBJECTIVES

- Realise the objective of the SWSUDS for the road network to shape and define the character of the area through the retention and integration of Cumberland Plain Woodland remnants as a key character element of Western Sydney
 - Minimise tree clearing. Wherever possible retain and protect existing trees as important features defining the future character of the road
 - Control the placement of utilities in the corridor. Where possible underground utilities to enhance the visual amenity of the road corridor. Locate utilities in a way that maximises planting opportunities, particularly at the interface with the Orchard Hills Scenic Landscape Area.
2. **Provide a flowing road alignment that is responsive to, and integrated with the natural and built landscape.**
- Protect the scenic and landscape values of Orchard Hills by minimising median widths where possible in order to reduce the footprint of the road and associated earthwork
 - Minimise median widths as much as possible in order to maximise
 - Pedestrian/ cyclist amenity through greater setbacks of paths from the carriageways
 - Revegetation opportunities on the outsides of the corridor
 - Maximise opportunities to complement the scenic and landscape character of Orchard Hills with intermittent tree planting in the verges
 - As much as possible, use the median to mitigate level changes in order to limit cut and fill embankments on the outsides of the carriageways
 - Devise a planting/ revegetation strategy that is consistent with the landscape character adjoining the road corridor, including existing uses and settlement patterns
 - Protect creeks and creek banks by maximising tree retention and planting at creek crossings
 - Enhance creeks as ecological corridors through native vegetation restoration and by maximising light access to the creeks.
 - Within the M4 corridor maximise tree planting to visually separate carriageways and reduce the extent of continuous hard pavements
 - Where safety barriers are required such as on bridge approaches or around piers, extend barriers to maximise the potential for tree planting to reduce the perceived scale of the infrastructure
 - Minimise the size of sedimentation basins. Locate permanent basins so that they do not impact on the quality, amenity and usability of open space. Design stormwater management and sedimentation basins to contribute to a positive landscape and visual outcome
 - Limit temporary sedimentation basins during construction. Where possible provide temporary basins in locations where they will remain as permanent basins post construction.

URBAN DESIGN OBJECTIVES

3. **Facilitate the provision of good urban design outcomes for areas adjoining the road.**
 - Ensure the provision of safe, convenient/direct and enjoyable pedestrian and cycle connections within and across the road corridor, to enhance connectivity, encourage active transport of walking and cycling and promote public transport use through ease of access to public transport
 - Ensure bus stops are well located, easily accessed and safe spaces with high levels of amenity
 - Ensure good passive surveillance of shared paths
 - Integrate the principles of Crime Prevention Through Environmental Design (CPTED) and ensure good passive surveillance of all publicly accessible areas
 - Enhance public open space adjoining the corridor to provide a positive landscape experience along the journey, and to deliver amenity benefits for the local community to compensate for the partial loss of open space and other potential amenity impacts associated with the proposal
 - Take advantage of available land at intersections to create a series of landscape features and landmark plantings that provide rhythm and interest along the journey, act as a reminder of the natural landscape and provide relief from the infrastructure environment
 - Minimise noise walls to enhance the sense of well-connected, visually transparent and safe neighbourhood.

4. **Develop a simple and unified palette of road design elements and details that are attractive and easily maintained.**

URBAN DESIGN OBJECTIVES

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5. URBAN AND LANDSCAPE CONCEPT

The urban and landscape design for the proposed upgrade is contained in Appendix A to this report.

6. LANDSCAPE CHARACTER IMPACT

6.1 LANDSCAPE CHARACTER ASSESSMENT

6.1.1 Overview

Landscape character assessment helps determine the overall impact of a project on an area's character and sense of place, including its built, natural and cultural aspects. It is one way of measuring how well the proposed works fit into the built, natural and community landscape and how well it responds to what people see.

The landform and vegetation, views and vistas, settlement pattern and built structures within and adjoining the study area combine to define its landscape character. Shaping the motorists' experience of the drive along The Northern Road, the landscape character defines a set of visual values associated with the project area.

The method to measure impact is based on the combination of the *sensitivity* of the existing area to change and the *magnitude* (scale, character, distance) of the proposed works within that area.

For the purposes of assessment, the basic design proposal is assessed, including location, the vertical and horizontal alignment of the road, heights of cuttings and fill embankments and the location and form of bridges and other structures. The assessment considers the landscape at an early stage of growth, as it would appear immediately following completion of the works.

The assessment also considers other similar recent projects and the Roads and Maritime urban design guidelines. Where possible the impacts identified in the assessment would be avoided and minimised through refinement of the concept design prior to its finalisation.

6.1.2 Landscape Character Zones

Based on the contextual analysis, the study area has been divided into four Landscape Character Zones (LCZ) (refer *Figure 6-1*).

LCZs allow for a more detailed discussion of the character of each precinct, of the proposed works within it, and of the likely impact on the landscape character to be experienced as a result of the proposed works.

The LCZs are defined based on the interplay of natural and built features (refer *Figure 6-1*):

1. The rural landscape south of the M4 interchange
2. The M4 interchange
3. The peri-urban area between the M4 interchange and Bringelly Road/ Maxwell Street
4. The established urban area north of Bringelly Road/ Maxwell Street.

The following section provides a discussion for each LCZ, including the existing character, the proposed works, the likely landscape character changes and an assessment of the landscape character impact.

LANDSCAPE CHARACTER IMPACT

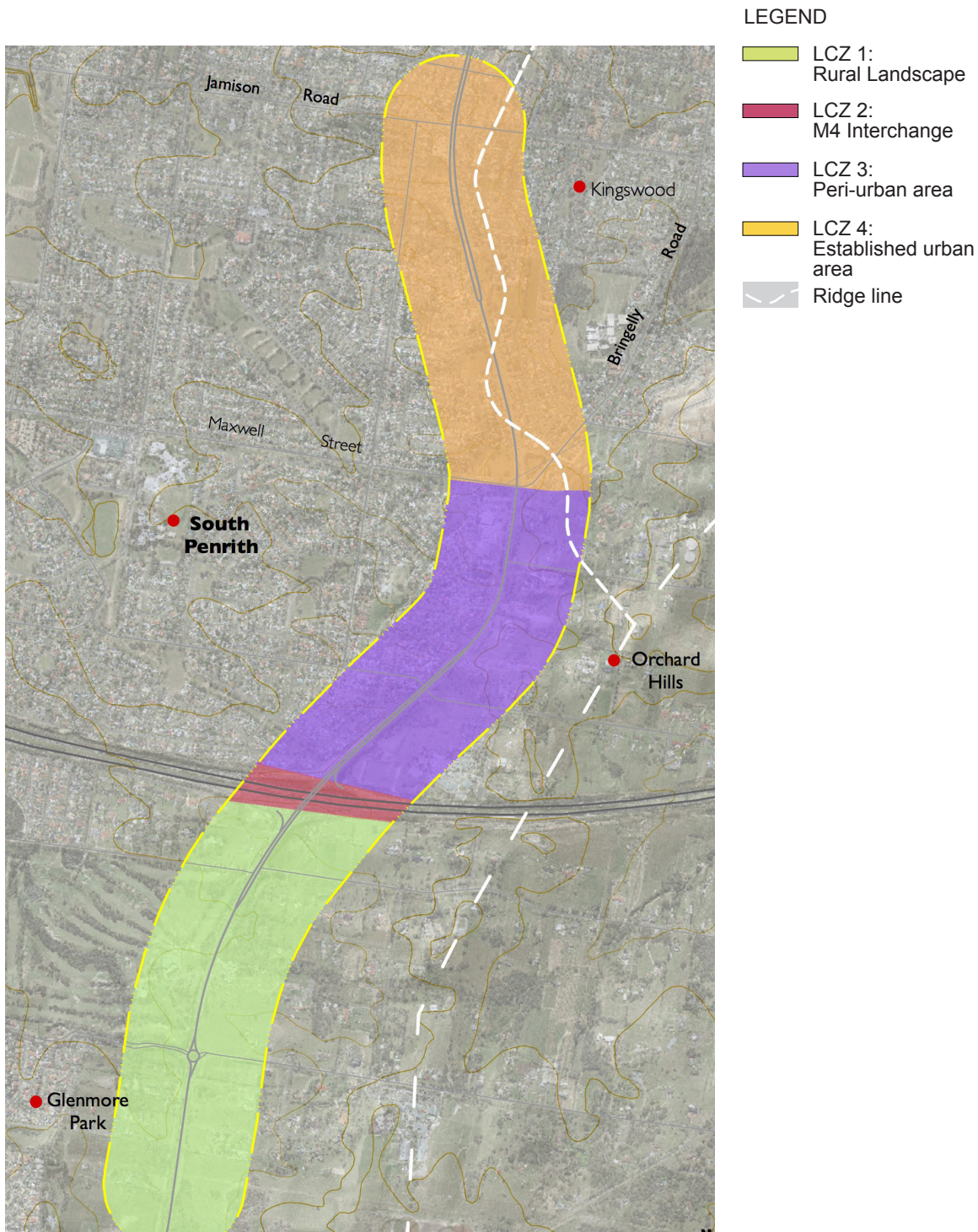


Figure 6-1: Landscape Character Zones

LANDSCAPE CHARACTER IMPACT

6.2 LCZ 1: RURAL SOUTH

6.2.1 Landscape Character Description

The Rural Landscape

The visual character of this zone is characterised by a mix of rural, rural residential, open space and institutional uses that retain a generally open landscape character interspersed with remnant vegetation. Buildings are generally well set back from the road corridor. As a result they are of low visual prominence and the landscape itself is the visually most important element.

The character of The Northern Road at the southern end of the study area is consistent with this rural character. It consists of a two lane road (one lane for each direction) with a curving horizontal and gently rolling vertical alignment that creates a distinct “country road” character.

The character of The Northern Road changes at the current roundabout with Glenmore Parkway. North of Glenmore Parkway, the road is characterised by its approach to the M4 interchange. It features a divided carriageway with two lanes in each direction, plus turning lanes, representing a more urban arterial road character.

This zone provides for a visually pleasant driving experience with opening and closing mid-distance views into the undulating landscape. Much of the motorist’s experience relies on this ‘borrowed’ landscape outside the road corridor.

6.2.2 The Proposed Works

The proposal includes:

- Removal of the roundabout at the intersection of The Northern Road, Glenmore Parkway and Wentworth Road and replacement with a four way signalised intersection
- Widening of The Northern Road to provide for three lanes and a designated bus lane in each direction, separated by a central median varying in width from about 2.4 metres to 7 metres
- A continuous 3 metre wide shared path on both sides of the corridor
- Reconstruction of approximately 350 metres of Glenmore Parkway including
 - A straightened alignment on the approach to the intersection with The Northern Road
 - Removal of the tree-lined median
 - Widening to provide six west-bound lanes including three north-bound left-turning lanes and two south-bound right-turning lanes at the intersection
 - A new dedicated access road into the Penrith Golf and Recreation Club, accessed off Glenmore Parkway
 - A new single-lane roundabout on Glenmore Parkway located to the west of the proposed new access road to facilitate U-turn movements for eastbound and westbound traffic on Glenmore Parkway
- Reconstruction of approximately 350 metres of Wentworth Road to provide for six lanes including
 - Two east-bound lanes
 - Four west-bound lanes including two north-bound right-turning lanes and one south-bound left-turning lane at the intersection with The Northern Road

LANDSCAPE CHARACTER IMPACT



Figure 6-2: Current view east along The Northern Road facing South



Figure 6-3: Current view of remnant vegetation provides a visual frame along The Northern Road near the golf course

- Reconstruction of approximately 150 metres of Homestead Road
- Reconstruction of Cross Street including widening, re-grading and extension through the unmade road reserve to join Wentworth Road at the existing roundabout
- Cut and fill batters along The Northern Road, Glenmore Parkway, Wentworth Road and Homestead Road
- New retaining wall south of Homestead Road on the eastern side of the corridor.
- Upgrades to existing culverts
- Road drainage and water quality controls utilising water quality basis or swales, spill containment structures, drainage inlets and pipe networks
- Road-side furniture and elements such as barriers, fences and signs. Final locations for these elements are yet to be determined
- Three compound sites - refer to the following page.

LANDSCAPE CHARACTER IMPACT

Temporary Construction Activities

During the construction phase, three sites adjoining The Northern Road on the eastern side would be used for ancillary facilities. They are located south and north of Wentworth Road and north of Homestead Road. The majority of the land is currently cleared.

The sites would be surrounded by temporary fencing and may include activities such as site compounds, stockpile areas for materials, temporary storage of spoil and other major work activities.

Given the prominent location of the sites immediately adjoining the road corridor, the use of the sites would temporarily alter their use and visual qualities affecting the landscape character of LCZ 1.

6.2.3 Landscape Character Changes

Attribute	Description of existing condition	Description of changes
Topography	Located in gently undulating terrain west of a north-south ridge	Generally only minor cut and fill to achieve the desired cross falls and longitudinal gradients. Fill embankments in excess of 5 metres tall on the approach to the M4 Interchange to accommodate wider corridor.
Hydrology	Three tributaries to Surveyors Creek drain in a north-west direction across the golf course.	Existing watercourses would be maintained with new culverts constructed under The Northern Road. New detention basin on the northern side of Glenmore Parkway, west of the new golf course access road.
Vegetation	Generally open with pockets of remnant vegetation, in particular along property boundaries.	Large amounts of road-side vegetation will require removal, altering views and the spatial quality and character. Revegetation would be provided within the road corridor and in areas affected by major work activities. It would include a mix of native grass, shrub and tree planting, including low median planting and advanced tree planting at strategic locations.

LANDSCAPE CHARACTER IMPACT

Attribute	Description of existing condition	Description of changes
Built form and heritage	<p>The settlement pattern consists of predominantly rural residential lots within a rural setting. Glenmore Park consists of low density residential housing. It is well set back from the road corridor and not generally visible from The Northern Road. However, The Northern Road and Glenmore Parkway are a key part of the arrival sequence to residential areas.</p> <p>Continuous overhead electricity line the western edge of the road corridor. A Transgrid easement crosses the road corridor near the southern extent of the study area.</p>	No changes.
Key activity areas	Key activity areas include The Northern Road which carries large volumes of traffic. Other areas attracting larger number of potential viewers are the Penrith Anglican College and the Penrith Golf and Recreation Club.	No expected impact.
Public Domain	The public domain is generally limited to the public roads and associated verges. The Penrith Golf and Recreation Club is a private recreation area that may be perceived as forming part of the public domain.	<p>The provision of continuous paths on both side of The Northern Road would provide an improved public domain by facilitating continuous north-south access for pedestrians and cyclists.</p> <p>There would be impacts on the golf course as a result of the new access road. This would reduce recreation land within the golf course land and may require adjustments to tees and fairways.</p>
Spatial Quality	The combination of the gentle topography, open paddocks and remnant vegetation creates a visually diverse landscape with opening and closing mid-distance views towards the east.	The removal of road-side vegetation on both sides of the corridor along Glenmore Parkway and within the existing roundabout, will alter existing views and the spatial character, creating a more open and less diverse landscape.

LANDSCAPE CHARACTER IMPACT

Attribute	Description of existing condition	Description of changes
Connectivity and access	<p>The Northern Road is the main road providing access through LCZ 1, and to rural properties along the road corridor.</p> <p>Areas to the east and west are accessed via Garswood Road, Homestead Road, Glenmore Parkway and Wentworth Road.</p>	<p>The intersection with Homestead Road would change to left-in/ left-out only. North-bound access to The Northern Road would be via the extension of Cross Road and Wentworth Road.</p> <p>Penrith Golf and Recreation Club would no longer have direct access from The Northern Road. A new access road would be provided along the perimeter of the golf course, commencing at a new access road off Glenmore Parkway.</p> <p>All other traffic movements would be maintained.</p> <p>A continuous shared path along both sides of the road corridor would improve pedestrian and cycle access.</p>

6.2.4 Landscape Character Assessment

Magnitude

The project increases both the scale and the amount of the road-related infrastructure in this zone. The creation of additional travel bus and turning lanes, as well as a new golf course access road requires extensive removal of existing vegetation. Due to location of vegetation primarily along property boundaries, this would open up the landscape and notably change the landscape character.

The area required for major work activities would temporarily alter the open paddocks and would be highly visible to the general public.

Overall, the assessment indicates that the magnitude of the project would be **moderate**. This impact may somewhat reduce over time as revegetation becomes established and matures, returning the site to a similar visual appearance as the present condition.

Sensitivity

There are a large number of potential viewers within LCZ 1. They include motorists along The Northern Road and the surrounding road network, the school community of Penrith Anglican College, recreational users within the golf course and residents accessing residential estates.

The scenic and landscape values of LCZ 1 are well known and documented. Combined with the tourist road status of The Northern Road, its rural setting and the number and type of likely viewers, this indicates a **high** level of sensitivity to change.

LANDSCAPE CHARACTER IMPACT

Landscape Character Impact

The qualitative assessment indicates that the landscape character impact of the proposed works in LCZ 1 is likely to be **high to moderate**. This impact may reduce over time as revegetation establishes and matures.

Summary	Rating
Magnitude	Moderate
Sensitivity	High
Landscape Character Impact	High to moderate

6.3 LCZ 2: M4 INTERCHANGE

6.3.1 Landscape Character Description

The M4 interchange is unique in character and constitutes a separate character zone. It is characterised by an increase in the number of lanes to facilitate the full range of turning movements on to and off the motorway onto the The Northern Road. The closely spaced traffic lights and associated road lighting create a distinctly urban character that contrasts with the rural landscape to the south.

The bridge over the M4 is a major structure and another defining element. As roadside vegetation and transmission lines recede on The Northern Road bridge approach, the largely transparent safety screens allow for open views west towards the Blue Mountains. This is an important landmark moment providing a connection to the larger landscape setting.

Extensive plantings of native vegetation around the interchange are another important character element in this zone. They visually separate the motorway from entry and exit ramps and reduce the extent of visible infrastructure from any one view point. Together with tree planting in the median strip, they mediate the scale of the bridge when seen from the motorway, to make it appear smaller than it is. This is due to trees concealing the bridge abutments and piers to reduce the visible length of the bridge.

6.3.2 The Proposed Works

The proposal includes:

- Road widening to three lanes plus one bus lane in each direction
- Three additional lanes on the bridge and an additional lane on each exit and entry ramp
- Construction of a new bridge over the M4 motorway east of the existing bridge alignment, including new exit and entry ramps in both directions. They would meet at a single signalised intersection at the centre of the bridge
- Reinforced soil walls on both sides of the M4 Motorway where it passes underneath The Northern Road bridge supporting entry and exit ramps
- Installation of a approximately 1.2 kilometre long and 5 metre high noise wall along the east bound exit ramp and the western edge of the road corridor adjacent to the suburb of Penrith, extending to Aspen Street
- A substantial amount of fill to facilitate road widening and new ramp configuration
- A breakdown bay between the east bound entry ramp and Penrith Christian School

LANDSCAPE CHARACTER IMPACT

- A breakdown bay between the M4 Motorway and the east bound entry ramp
- Shared paths on both sides of the road corridor and including an east-west crossing at the traffic lights at the northern end of bridge
- Upgrades to existing culverts
- Road drainage and water quality controls utilising water quality basis or swales, spill containment structures, drainage inlets and pipe networks.
- Road-side furniture and elements such as barriers, fences and signs. Final locations for these elements are yet to be determined
- Extensive clearing of native vegetation
- Native grass to road islands, shrub and mixed canopy planting to roadside areas and cut and fill batters
- Noise mound with tree, shrub and grass planting, up to 6 metres in height, 18 metres in width and 670 metres in length, between the eastbound M4 and the east bound exit ramp and the suburbs of South Penrith.



Figure 6-4: Current view of west bound off ramp, M4 Motorway



Figure 6-5: Current view of north bound approach to the interchange

LANDSCAPE CHARACTER IMPACT

Temporary Construction Activities

During the construction phase, an area adjoining The Northern Road on the eastern side and Homestead Road would be used for ancillary facilities. This is located adjacent to the west bound off ramp of the M4 Motorway. The land currently has some remnant Cumberland Plain Woodland vegetation and tree species.

The sites would be surrounded by temporary fencing and may include activities such as site compounds, stockpile areas for materials, temporary storage of spoil and other major work activities.

Given the prominent location of the sites immediately adjoining the road corridor, the use of the sites would temporarily change the character of the area, affecting the landscape character of LCZ 2.

6.3.3 Landscape Character Changes

Attribute	Description of existing condition	Description of changes
Topography	Gently undulating terrain heavily modified by the existing interchange.	Major earthworks for new road alignment and interchange. 6 metre high, 670 metre long noise mound between the M4 eastbound and southern suburbs of Penrith.
Hydrology	Limited to stormwater drainage associated with the corridors.	No change
Vegetation	Extensive native plantings around the interchange and median strip tree planting.	Extensive removal of vegetation including existing buffer planting on the northern side of the M4 towards Penrith and the Penrith Christian School, and between the M4 corridor and rural properties in Homestead Road. Revegetation of disturbed areas.
Built form and heritage	The major built form is the M4 and the bridge over the M4, including interchange ramps.	A new bridge would replace the existing bridge. The new bridge is substantially larger than the existing bridge with the bridge deck about 2.2 metres higher than the existing and an increase in depth from about 30 meters to more than 70 metres. The noise wall along the east bound exit ramp would be a prominent new built element.

LANDSCAPE CHARACTER IMPACT

Attribute	Description of existing condition	Description of changes
Key activity areas	Key activity areas include The Northern Road and The M4 Motorway which carry large volumes of traffic.	No change
Public Domain	There are public domain areas.	Provision of shared pedestrian cycle path.
Spatial Quality	Vegetation frames views along the M4 and provides visual screening of the bridge and interchange. Due to the elevation of the bridge, the spatial quality along The Northern Road is expansive, with long distance views to the Blue Mountains.	<p>Removal of vegetation will change the natural qualities of the outlook and result in a more open setting along the M4, until revegetation becomes established.</p> <p>Views to the Blue Mountains may be improved as a result of the greater bridge elevation.</p> <p>Noise mounds and walls would redefine the road interface, blocking views from the east bound exit ramp over Penrith and towards the Blue Mountains, as well as reduce solar access.</p>
Connectivity and Access	<p>The M4 interchange allows for all vehicular movements.</p> <p>Cycle lanes are provided on the M4 shoulder in both directions.</p>	<p>No change to vehicular movements.</p> <p>Improved pedestrian and cycle access through the provision of shared paths on both sides of the corridor.</p> <p>Cycle lanes along the M4 will be maintained.</p>

6.3.4 Landscape Character Assessment

Magnitude

The proposed new bridge is substantially larger than the existing bridge, elevated about an additional 2.2 metres higher. It requires large reinforced soil walls up to seven metres in height, replacing currently landscaped embankments on the approaches and spill through batters under the bridge. The new road and bridge alignment combined with the increase in scale, would alter existing spatial relationships and views between LCZ 2 and adjoining areas. This would somewhat reduce over time as vegetation establishes and matures.

The magnitude would be the largest during the construction period when the new bridge would be built next to the existing bridge in order to maintain traffic flow.

Overall, the qualitative assessment indicates that the magnitude of the proposed works would be **moderate**.

LANDSCAPE CHARACTER IMPACT

Sensitivity

The character of LCZ 2 is currently defined by road infrastructure. While somewhat larger in scale, the upgrade would be consistent with the existing use and character. A higher level of sensitivity could be associated with changes to surrounding areas and it can be interpreted that residents and motorists will be less sensitive to changes associated with existing road corridor.

The sensitivity is likely to be **low**.

Landscape Character Impact

The qualitative assessment indicates that the landscape character impact of the proposed works in this zone is likely to be **moderate to low**. This impact may reduce over time as revegetation establishes and matures.

Summary	Rating
Magnitude	Moderate
Sensitivity	Low
Landscape Character Impact	Moderate to low

6.4 LCZ 3: PERI-URBAN AREA

6.4.1 Landscape Character Description

This zone represents the transitional area between the rural landscape zone and established urban areas. Its defining feature is two distinct landscape character types to the east and west of the road corridor.

Orchard Hills on the eastern side of the road corridor retains its rural character of small rural holdings and rural residential living. The Flower Power nursery, while a commercial use, complements the rural character. As discussed earlier, this area is considered to possess regionally important scenic and landscape values. Current planning instruments seek to retain and protect these values and urban development is unlikely in the foreseeable future.

Similar to the rural landscape in the south of the study area, buildings are generally well set back from the road corridor, creating a generally open landscape character, interspersed with predominantly remnant vegetation. Fences are generally low and visually transparent, allowing views beyond the road corridor. The intermittent mid-distance views into the undulating landscape are an important visual feature of this character zone, as much of the motorist's experience relies on this 'borrowed' landscape outside the road corridor.

This is in contrast to Penrith on the western side of the road corridor. This area is characterised by established suburban housing generally consisting of single storey detached dwellings and prominent visually opaque fencing that limits views. There is also a small commercial strip at Aspen Street.

The vegetation of this zone is consistent with the suburban nature of the area, comprising a mix of remnant vegetation and cultural plantings associated with local street corridors and private residential properties.

LANDSCAPE CHARACTER IMPACT



Figure 6-6: Current view along Tukara Road towards The Northern Road



Figure 6-7: Current view along Bickley Road towards the M4 interchange

6.4.2 The Proposed Works

The proposal includes:

- Road widening to provide three travelling lanes and one bus lane in each direction divided by a continuous median
- Cut and fill batters along The Northern Road, Frogmore Road, Castle Road, Aspen Street and Maxwell Street
- Intersection changes at Maxwell/ Bringelly Road (refer to LCZ 4 for details)
- Regrading of Frogmore Road
- New roundabout constructed about 65-70 metres west of existing Frogmore Road/ Simeon Road intersection

LANDSCAPE CHARACTER IMPACT

- Upgrade of the intersections with Frogmore and Tukara Roads to create a single four-way signalised intersection with traffic signals, dedicated right turn in and out lanes, traffic islands and new pedestrian signals to cross The Northern Road
- Changing Castle Road intersection to left in and left out only, removing the right turn from The Northern Road into Castle Road
- Construction of a roundabout at the Aspen and Maxwell Street intersection
- Construction of a retaining wall to facilitate road widening in cut, about 110 metres in length and up to 2 metres tall at its highest point on the east side of the road corridor between Castle Road and Bringelly Road
- Construction of a retaining wall to accommodate road widening in cut south of Tukara Road about 2 metres in height and 100 metres in length
- Reconfiguration of the intersection with Bringelly Road and Maxwell Street, including additional turning lanes - a right turn out of Bringelly Road onto The Northern Road and dedicated left turn lanes in and out of The Northern Road
- Installation of a continuous five metre high noise wall on the western edge of the corridor between the M4 Motorway Interchange and Tukara Road and between Tukara Road and Aspen Street. Possible pedestrian access through the noise wall at Flavel Street
- A continuous three metre wide shared path on both sides of the corridor
- Clearing of vegetation
- Upgrades to existing culverts
- Road drainage and water quality controls utilising water quality basis or swales, spill containment structures, drainage inlets and pipe networks
- Water detention structures in Rotary Park
- Road-side furniture and elements such as barriers, fences and signs. Final locations for these elements are yet to be determined
- Two compound sites - see below.

Temporary Construction Activities

During the construction phase, two areas adjoining The Northern Road on the eastern side and would be used for ancillary facilities. They are located:

- North of Frogmore Road: the land currently features a large stand of remnant Cumberland Plain Woodland
- North of Castle Road: a largely cleared open paddock with remnant trees along the boundary to The Northern Road.

The sites would be surrounded by temporary fencing and may include activities such as site compounds, stockpile areas for materials, temporary storage of spoil and other major work activities.

Given the prominent location of the sites immediately adjoining the road corridor, the use of the sites would temporarily alter the character of LCZ 3.

LANDSCAPE CHARACTER IMPACT

6.4.3 Landscape Character Changes

Attribute	Description of existing condition	Description of changes
Topography	Located in undulating terrain west of a north-south ridge and heavily modified in the M4 approach.	Earthworks with large fill batters near the M4, as well as new retaining walls to fit into the landscape.
Hydrology	A series of grassed overland flow channels within an open space corridor along Bickley Road.	No expected impact
Vegetation	Mix of remnant Cumberland Plain Woodland vegetation and cultural plantings associated with the road network, open space areas and private residential properties.	Extensive clearing for widening, construction compounds, earthworks, new medians, vegetation planting within the corridor and retaining and noise wall construction. Revegetation of disturbed areas.
Built form and Heritage	Rural residential living on the eastern side of the road corridor generally well set back from the corridor and with low, visually transparent fences. The established suburb of Penrith on the western side primarily single storey low density housing in cul-de-sacs. Small commercial strip at Aspen Street. The closest heritage item is the Sydney Water Reservoir in Castle Road.	The construction of the noise wall would introduce a substantial new built form. The retaining wall on the eastern side of the corridor would facilitate road widening in the cut, and would redefine the interface with scenic rural lands. There would be no impact on heritage items.
Key activity areas	Key activity areas include The Northern Road which carries large volumes of traffic, as well as the Penrith Christian School and Imagine Nations Church, Flower Power Garden Centre, a health centre in Bringelly Road and the commercial strip along Aspen Street.	No change.
Public Domain	The public domain is generally limited to the public roads, associated verges, footpaths and bus stops. There is a linear park separating Aspen Street from The Northern Road. The linear parkland along Bickley Road forms part of the larger open space network and can be seen from the M4 interchange approach.	The proposal would reduce the size of the Aspen Street Reserve. One bus stop south of Bringelly Road on the eastern side of The Northern Road would be removed.

LANDSCAPE CHARACTER IMPACT

Attribute	Description of existing condition	Description of changes
Spatial Quality	Largely open character with intermittent mid-distance views to the east. Urban development on the western side generally limits views to short distances except on the M4 approach where the elevation allows for long-distance views to the Blue Mountains.	<p>The construction of the noise wall would redefine the edge of the road corridor and its relationship to adjoining landscape, enclosing the western side of the road corridor and blocking views to the Blue Mountains. It would further enclose residential cul-de-sacs, altering their spatial character and outlook.</p> <p>Retaining wall at the interface with Orchard Hills would remove the sense of a seamless fit of The Northern Road into the adjoining rural landscape.</p> <p>Clearing of trees and woodland would result in a more open and less diverse landscape.</p>
Connectivity and access	<p>The Northern Road is the main road providing access through LCZ 3 and to rural properties to the east. Tukara Road, Frogmore Road, Castle Roads and Aspen Street provide access to suburban areas.</p> <p>There are no existing footpaths or cycle ways between the M4 interchange and Bringelly Road.</p>	<p>A continuous shared path on the both sides of The Northern Road would improve pedestrian and cycle access in a north-south direction. East-west crossing opportunities would be provided at Frogmore Road and Bringelly Road.</p> <p>A new footpath along Frogmore Road would improve pedestrian access to the school.</p> <p>Noise walls would reduce direct pedestrian access and connectivity from residential areas to The Northern Road, including the shared path and bus stops. A possible pedestrian access point at Flavel Street will provide for a more direct route in this area.</p> <p>All existing vehicular turning movements would be maintained with the exception of the right turn from The Northern Road northbound into Castle Road.</p>

LANDSCAPE CHARACTER IMPACT

6.4.4 Landscape Character Assessment

Magnitude

The proposed upgrade would substantially increase the scale of the road-related infrastructure in the LCZ. Noise walls would constitute major new built form altering the spatial character, closing off views and reducing pedestrian connectivity. Earthworks, retaining walls and the removal of vegetation would change the interface with scenic rural lands in Orchard Hills.

Overall, the qualitative assessment indicates that the magnitude of the proposed works would be **moderate**. This may somewhat reduce over time as planting and revegetation becomes established and matures.

Sensitivity

The LCZ possesses recognised scenic landscape values, indicating that the sensitivity to changes in the landscape character would be **high**. In addition, there are a large number of residential viewers who would be highly sensitive to things in their environment. Large numbers of viewers would be at Penrith Christian School and the Aspen Street commercial strip.

Landscape Character Impact

The qualitative assessment indicates that the landscape character impact of the proposed works in this zone is likely to be **high to moderate**. This impact may reduce over time as revegetation establishes and matures.

Summary	Rating
Magnitude	Moderate
Sensitivity	High
Landscape Character Impact	High to moderate

6.5 LCZ 4: ESTABLISHED URBAN AREA

6.5.1 Landscape Character Description

Rotary Park and Kingswood Lions Park represent the ‘gateway’ into the established suburban areas of Penrith and Kingswood. Similarly to Penrith. They are characterised by predominantly single storey detached dwellings.

A key point of difference in this zone is the access arrangements for adjoining residential properties. While properties in Penrith are generally accessed from a local road network that is separate from The Northern Road, The Northern Road provides the primary address and point of access to residences adjoining the corridor in Penrith. As a result, access driveways are a prominent feature spaced evenly along both sides of the carriageway.

The road itself currently consists of a single carriageway with two lanes in each direction. There are wide paved shoulders and kerb and guttering, as well as existing concrete footpaths separated from the carriageway by a generous nature strip.

LANDSCAPE CHARACTER IMPACT

There is a distinct change in the character of the road corridor between the southern boundary of Kingswood South Public School and approximately 130 metres south of the Jamison Road intersection. Here the corridor features a dual carriageway divided by a wide landscape median. Combined with borrowed views of the school landscape and views west towards the Blue Mountains, this section feels less intensely developed and is more open and expansive in character than the remainder of the zone.



Figure 6-8: Current view of The Northern Road facing south at approach to Bringelly Road



Figure 6-9: Current view west from The Northern Road through Rotary Park to the Blue Mountains

LANDSCAPE CHARACTER IMPACT

6.5.2 The Proposed Works

The proposal includes:

- Road widening to provide three lanes, plus one bus lane in each direction, separated by a variable width median
- Construction of retaining walls on both sides of the corridor between the northern edge of Rotary Park for approximately 80 metres and between Kingswood Lion Park and Smith Street and between Smith Street and Jamison Road. Retaining walls vary in height to a maximum of 2.5 metres
- A substantial amount of cut and fill batters along the southern side of Maxwell Street between The Northern Road and Aspen Street and along the southern boundary of Kingswood Lions Park
- Construction of retaining walls along the southern edge of Smith Street (west of The Northern Road)
- Upgrade of intersection with Jamison Road to have an additional pedestrian signal across The Northern Road
- Permanent Detention Basins in Rotary Park
- A 3 metre wide shared path on the western side and a 1.5 metre pedestrian only footpath on the eastern side of the corridor between Bringelly and Jamison Road
- Reduction in size of open space in Rotary Park and Kingswood Lions Park to accommodate road realignments, turning lanes and the new larger roundabout at Maxwell and Aspen Streets (refer LCZ 3).
- Realignment of approximately 75 metres of Hilliger Road to meet the new roundabout on Maxwell Street
- Upgrades to existing culverts
- Road drainage and water quality controls utilising water quality basis or swales, spill containment structures, drainage inlets and pipe networks.
- Road-side furniture and elements such as barriers, fences and signs. Final locations for these elements are yet to be determined
- New roadside planting of small scale street trees, low shrubs, native grasses and groundcovers
- Central wire rope barrier in medians between Bringelly Road and Jamison Road
- New tree plantings in Kingswood Lions Park to create a landmark at the intersection
- New shared access driveways for properties between The Northern Road and Bringelly Road
- Reconstruction of private property access driveways including retaining walls, re-grading and new front fences to replace existing (where applicable)
- Removal of vegetation including planted and remnant native trees in medians, along verges and in private properties for construction compounds and public open space areas
- Four compound sites - as follows.

LANDSCAPE CHARACTER IMPACT

Temporary Construction Activities

During the construction phase, four existing public open space areas adjoining The Northern Road would be used for ancillary facilities. They are:

- Kingswood Lions Park: a largely unembellished park featuring a central turfed area surrounded by perimeter tree planting of exotic and remnant trees
- Rotary Park: a largely unembellished park containing large remnant trees in turf
- A single residential property on The Northern Road adjacent the northern perimeter of Rotary Park, with a single storey detached residence
- The Mazepa Avenue Reserve: a neighbourhood open space featuring a large turfed area, playground and tree planting along the interface with The Northern Road
- A small open space on the western side of the corridor between Smith Street and Jamison Road: an unembellished park consisting of turf with remnant trees, surrounded by residential properties.

The sites would be surrounded by temporary fencing and may include activities such as site compounds, stockpile areas for materials, temporary storage of spoil and other major work activities that would limit the amount of local open space available for recreation

6.5.3 Landscape Character Changes

Attribute	Description of existing condition	Description of changes
Topography	Located in undulating terrain along a north-south ridge. The landscape drops towards the Nepean River in the west.	Generally only minor earthworks. A large cut south of Smith Street requiring a large retaining wall. Level changes result in a need for reconstruction of property access including retaining walls to most properties.
Hydrology	There are no natural creeks.	No change
Vegetation	Mix of remnant Cumberland Plain Woodland vegetation and cultural plantings associated with streets, parks and private residential properties.	Extensive clearing for widening, intersection realignment, compound sites and detention basins. Revegetation of disturbed areas.
Built Form and Heritage	Predominantly low-density, single storey housing with access from The Northern Road. There are no heritage items.	The need for retaining walls along private property boundaries would introduce a new built form that would extend for the majority of the LCZ,
Key Activity Areas	The major activity areas adjoining the corridor are Kingswood Public School, the Nepean Baptist Church next to Kingswood Lions Park and public parks and playgrounds.	There would be substantial area losses in public parks. In addition, the majority of existing tree cover would be removed, affecting the amenity of parks, as well as their recreation potential.

LANDSCAPE CHARACTER IMPACT

Attribute	Description of existing condition	Description of changes
Public Domain	Public domain areas include a number of open space areas along The Northern Road, as well as the verges of the public road network.	The proposed upgrade would result in a large reduction of the area of open space. Parks that would be reduced in size include Kingswood Lions Park, Rotary Park and Aspen Street/ Maxwell Street linear parkland. Public parks would also be changed through vegetation clearing and the construction of temporary and permanent basins.
Spatial Quality	More open between Kingswood South Public School and Jamison Road with views west to the Blue Mountains. More enclosed in other areas due to suburban development, with generally only short-distance views.	<p>The works will increase scale of the road infrastructure, but will not affect the overall spatial quality of the zone.</p> <p>Tree clearing will make the spatial character of parks more open and exposed. Views to the Blue Mountains from the Bringelly Road intersection will change from tree-filtered/ framed views to more open views.</p> <p>As the carriageways would be closer to residential dwellings, the corridor would have a more strongly defined edge, especially when combined with retaining walls. It would feel more enclosed as a result.</p>
Connectivity and access	<p>The Northern Road is the main road providing access, complemented by the network of local roads off Bringelly Road, Maxwell Street and Smith Street.</p> <p>Footpaths are provided on both sides of The Northern Road.</p> <p>Open space areas provide pedestrian links as shortcuts to residential areas..</p>	<p>Additional turning lanes at Bringelly Road and Maxwell Road to facilitate ease of vehicular circulation while retaining all existing movements.</p> <p>The provision of shared paths would improve north-south pedestrian and cycle access. Retaining walls would potentially obstruct pedestrian links through parks.</p> <p>Access to all private properties would be left-in and left-out only.</p>

LANDSCAPE CHARACTER IMPACT

6.5.4 Landscape Character Assessment

Magnitude

The increase in road width and new retaining structures would noticeably alter the interface between The Northern Road and adjoining residential properties. Due to their almost continuous nature, retaining walls would constitute a major new built form. Local road realignment and intersection modifications result in a large land take from public open space and there are further changes in character and amenity as a result of vegetation clearing, including existing medians. The reduction in the size of front gardens would further reduce the existing planted corridor edge.

Overall, the qualitative assessment indicates that the magnitude of the proposed works would be **High**. New tree planting may offset or reduce the magnitude of change over time as vegetation matures.

Sensitivity

There are a large number of residential viewers who would be sensitive to visual changes in this environment. At the same time, The Northern Road is already an important arterial road. Over time, appreciation of the infrastructure environment may change in response to potential future demand.

Overall, the sensitivity of this zone would be **Moderate**.

Landscape Character Impact

The qualitative assessment indicates that the landscape character impact of the proposed works in this zone is likely to be **High to moderate**. This impact may reduce over time as revegetation establishes and matures.

Summary	Rating
Magnitude	High
Sensitivity	Moderate
Landscape Character Impact	High to moderate

LANDSCAPE CHARACTER IMPACT

6.6 SUMMARY OF LANDSCAPE CHARACTER IMPACTS

The landscape character impact assessment of the proposed upgrade described above represents a qualitative assessment based on four Landscape Character Zones. The impact assessment ranges from **moderate to low** to **high to moderate** as indicated in Figure 6-9.

While The Northern Road is itself already an arterial road, it generally retains a rural quality along much of the route, with the exception of the M4 interchange and the northern section that are more urban in character. Therefore the proposed upgrade and widening of the road corridor and the extensive removal of vegetation, the overall impact on the existing landscape character along the length of the corridor would be considerable.

The proposed upgrade would impact on all LCZs, due to the scale of the proposed works and the high sensitivity of surrounding areas, in particular areas of identified scenic landscape values.

The moderate to low impact occurs in the M4 Motorway LCZ where the existing infrastructure environment is better able to absorb the changes resulting from the proposed upgrade.

Landscape Character Zone	Landscape Character Impact Rating
LCZ 1	High to moderate
LCZ 2	Moderate - Low
LCZ 3	High to moderate
LCZ 4	High to moderate

Table 6-1: Landscape Character Impact Assessment Summary

7. VISUAL IMPACT ASSESSMENT

7.1 OVERVIEW

The visual impact assessment seeks to determine the impact of the proposed upgrade on the following:

1. The impact on private properties or other locations likely to be accessed by viewers within the visual envelope; and
2. The impact on users of the road itself.

In measuring the impact of change, the following are taken into account:

- The distance between viewers and the proposed works
- The category of viewer (i.e. the activity the viewer is engaged in when viewing the proposed works)
- The elements of the proposal that are visible.

The potential visual impact of the proposed The Northern Road upgrade works has been assessed in relation to a number of key viewpoints. It is based on the existing pattern of land use and development adjoining the project area, the visual envelope of the proposed upgrade and the nature of the proposed changes.

The method involved:

- Assessing the visibility of the proposed works by defining a Visual Envelope Map (VEM)
- Defining the scale (magnitude) of the proposed works including temporary works
- Identifying key viewpoints from where the proposed works will be visible
- Rating viewpoints according to their sensitivity to change, considering direction and composition of the view
- Rating viewpoints based on the magnitude - or scale - of the proposed works, considering the extent to which they would alter the view; and
- Assessing the level of potential visual impact of the proposed works on viewers at these viewpoints, based on the magnitude of the proposed works and the sensitivity of viewers.

7.2 Visual Catchment

The extent from which The Northern Road is visible from adjoining areas varies along the length of the study area. It is influenced by topography, vegetation, buildings and land use patterns. A field and desktop assessment was undertaken to determine the area from where The Northern Road is visible. This is defined as the visual catchment or visual envelope and is illustrated in the VEM - refer Figure 7-1.

VISUAL IMPACT

7.3 Visual Assessment

A number of viewpoints within the visual envelope of the project area have been selected for the Visual Impact Assessment. Locations and directions of chosen viewpoints are representative of the range of viewpoints both within and beyond the road corridor, and are indicated on *Figure 7-1*.

The following pages comprise the assessment of the visual impact at each viewpoint.

For each viewpoint, the assessment discusses:

- Permanent elements of the proposal visible in the view
- Temporary elements of the proposal invisible in the view during the construction period
- The visual sensitivity of the view to change
- The magnitude of the proposed works or their visual effect on the view
- An overall rating of the visual impact.

The gradings for visual sensitivity and magnitude are measured on their impact relative to each other within the scope of the proposal rather than to an absolute scale covering all potential forms of impact.

Through this process, the visual impact of the proposal as a whole has been identified.

A note on 3d visualisations

3d visualisation have been provided to give an overall impression of the design and scale of the proposed upgrade. They have been overlaid with spatial data from the project area to give an indication of the project context and setting.

It must be noted that the base data used to generate the 3d visualisations does not include detailed three-dimensional and topographical information of either the study area or the proposed design. Therefore 3d views provide an approximation of the design in its setting rather than a fully resolved representation of the design.

All 3d visualisations have been provided by Spatial Media.

VISUAL IMPACT

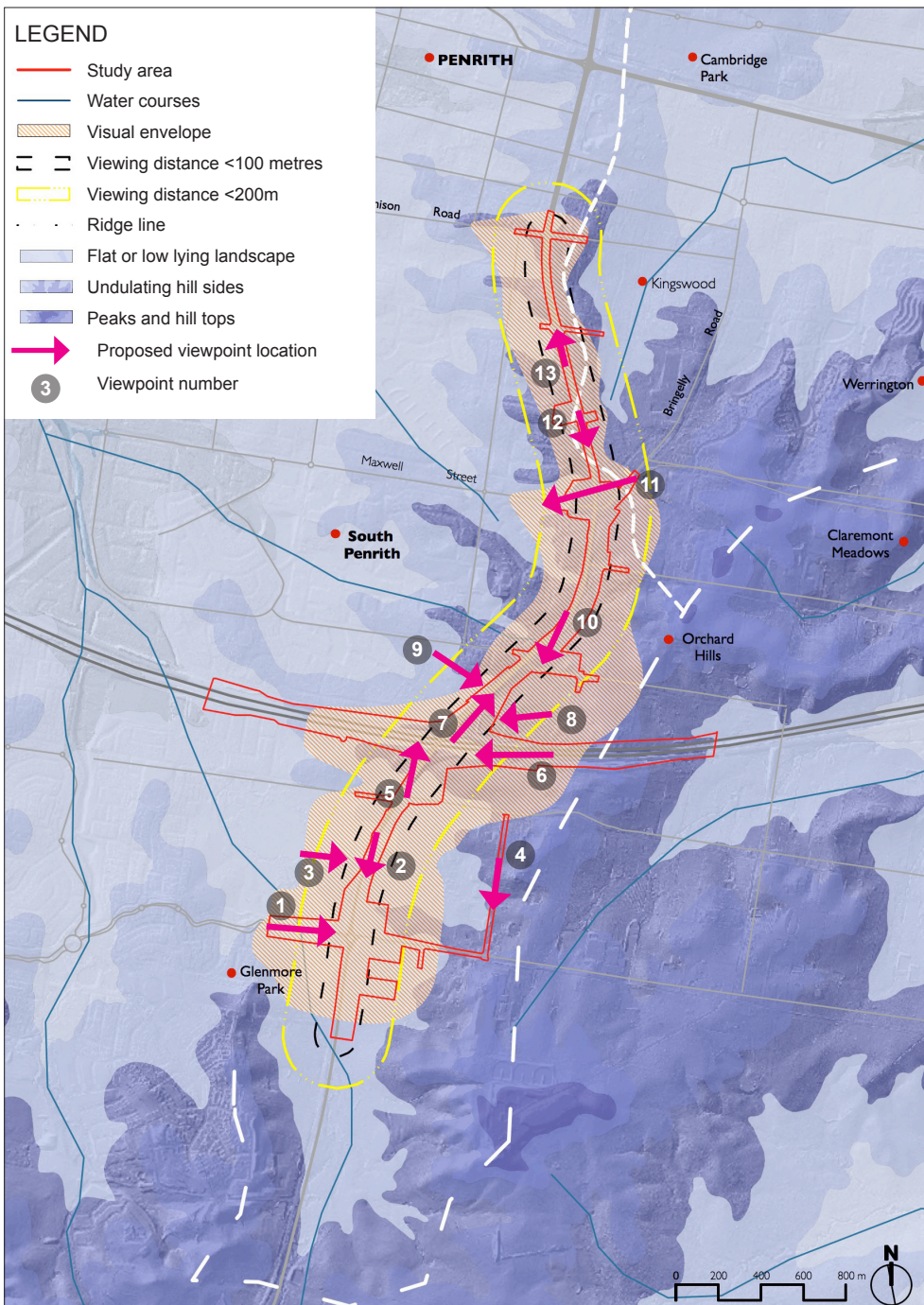


Figure 7-1: Visual Envelope Map and Viewpoint Locations for Visual Assessment

VISUAL IMPACT

7.3.1 Viewpoint 1

Viewpoint 1 is located on Glenmore Parkway (Station 210 approximately) and is looking east towards The Northern Road.

Potential viewers

Motorists, golfers and visitors to the golf club, residents of nearby residential estates

Changes to the view

Elements of the proposal that would be visible include:

- Upgraded intersection with The Northern Road including realignment and additional lanes, traffic islands and traffic lights
- New golf course access road
- Removal of landscaped median and roadside vegetation.
- Two works compounds east of The Northern Road.



Figure 7-2: Viewpoint 1

Visual Sensitivity

The sensitivity of this viewpoint to change is likely to be **high** as it offers limited potential to absorb proposed changes.

Magnitude Of Visual Effect

The scale and character of Glenmore Parkway will change substantially as a result of realignment, widening and tree removal.

The width of the carriageways would increase from 16 metres (including the tree lined median) to 30 metres at the view location, to over 45 metres wide at the intersection, including a 1.5 metre wide concrete median. The golf course road would further add to this increase. The latter will also change the interface with the golf course. The magnitude of visual impact is rated **high**.

VISUAL IMPACT

Visual Impact Summary

VISUAL SENSITIVITY	MAGNITUDE OF VISUAL EFFECT	OVERALL RATING OF VISUAL IMPACT
HIGH	HIGH	HIGH



Figure 7-3: Viewpoint 1 - Before



Figure 7-4: Viewpoint 1 - After, 3D visualisation (source: Spatial Media)

7.3.2 Viewpoint 2

Viewpoint 2 is located on The Northern Road south of Garswood Road and is looking south along The Northern Road.

Potential viewers

Motorists, golfers, residents.

Changes to the view

Elements of the proposal that would be visible include:

- New road configuration with a widened footprint and concrete median
- Golf course access road running parallel to The Northern Road
- Removal of vegetation on both sides of the corridor.



Figure 7-5: Viewpoint 2

Visual Sensitivity

A significant compositional element in the view is the tree cover on the eastern side. A large portion of the view is of the road corridor itself. The sensitivity to change is therefore considered to be **moderate**.

Magnitude Of Visual Effect

The width of the road will almost double from about 27 metres to about 51 metres, including the shared paths. This constitutes a significant increase in road infrastructure as a portion of the view. Combined with extensive tree removal, the magnitude of the change to the view is **moderate**.

Visual Impact Summary

VISUAL SENSITIVITY	MAGNITUDE OF VISUAL EFFECT	OVERALL RATING OF VISUAL IMPACT
MODERATE	MODERATE	MODERATE



Figure 7-6: Viewpoint 2 - Before



Figure 7-7: Viewpoint 2 - After, 3D visualisation (source: Spatial Media)

VISUAL IMPACT

7.3.3 Viewpoint 3

Viewpoint 3 is located at the Penrith Golf and Recreation Club, looking east towards The Northern Road from the main clubhouse car park. As a recreational destination, the viewers are likely to be more sensitive towards visual changes.

Potential viewers

Golfers, golf club members and staff and their visitors

Changes to the view

Elements of the proposal that would be visible include:

- The proposed road corridor configuration of The Northern Road
- The proposed access road to the Penrith Golf and Recreation Club and wire screen
- Removal of vegetation on both sides of the corridor.



Figure 7-8: Viewpoint 3

Visual Sensitivity

The sensitivity of this viewpoint to change is likely to be **low**. A large portion of the view is taken up by the golf course infrastructure including car parking, internal roads, fences and a mobile phone tower and associated sheds.

Magnitude Of Visual Effect

The Northern Road is set lower than the level of the golf course land and is not readily visible. The wider road would not be perceptible in this view. The major change would be the removal of vegetation in the background, making the view more open. The magnitude of change to this view is considered **low**.

VISUAL IMPACT

Visual Impact Summary

VISUAL SENSITIVITY	MAGNITUDE OF VISUAL EFFECT	OVERALL RATING OF VISUAL IMPACT
LOW	LOW	LOW



Figure 7-9: Viewpoint 3 - Before



Figure 7-10: Viewpoint 3 - After, 3D visualisation (source: Spatial Media)

7.3.4 Viewpoint 4

Viewpoint 4 is located on Cross Road (Station 200 approximately), looking south along Cross Road.

Potential viewers

Residents, motorists

Changes to the view

Elements of the proposal that would be visible include:

- The extension of Cross Road as an approximately 10 metres wide roadway including one lane in each direction plus shoulders
- Cut and fill embankments
- Removal of mature trees.



Figure 7-11: Viewpoint 4

Visual Sensitivity

The view is park-like with a mix of open grassed areas and trees. It would have a low capacity to absorb the proposed changes. The visual sensitivity is considered **high**.

Magnitude Of Visual Effect

The proposed upgrade would introduce a road in the currently unmade road reserve, significantly altering the existing outlook. The magnitude is considered **high**.

Visual Impact Summary

VISUAL SENSITIVITY	MAGNITUDE OF VISUAL EFFECT	OVERALL RATING OF VISUAL IMPACT
HIGH	HIGH	HIGH



Figure 7-12: Viewpoint 4 - Before



Figure 7-13: Viewpoint 4 - After, 3D visualisation (source: Spatial Media)

VISUAL IMPACT

7.3.5 Viewpoint 5

Viewpoint 5 is located on the The Northern Road (Station 1,075 approximately), looking north towards the M4 Motorway interchange.

Potential viewers

Motorists.

Changes to the view

Elements of the proposal that would be visible include:

- Realigned carriageways elevated above existing levels
- New west-bound entry ramp
- New bridge over the M4 Motorway, elevated two metres above the existing bridge deck
- New configuration of entry and exit ramps and of traffic lights
- Shared path on the eastern side
- Removal of vegetation
- New landscaping over areas of existing carriageway no longer used.



Figure 7-14: Viewpoint 5

Visual Sensitivity

The existing carriageway is a major compositional element in the view. The sensitivity of the view to the proposed changes is **low**.

Magnitude Of Visual Effect

The view will undergo significant change as areas of existing carriageway would be removed and re-landscaped, while existing vegetated areas would be cleared for the new road alignment that would be significantly wider as well as elevated up to two metres above

VISUAL IMPACT

the existing road surface. This would increase the prominence of the infrastructure in the view. The magnitude is considered to be **moderate**. It may reduce over time as vegetation establishes and matures.

Visual Impact Summary

VISUAL SENSITIVITY	MAGNITUDE OF VISUAL EFFECT	OVERALL RATING OF VISUAL IMPACT
LOW	MODERATE	MODERATE TO LOW



Figure 7-15: Viewpoint 5 - Before



Figure 7-16: Viewpoint 5 - After, 3D visualisation (source: Spatial Media)

VISUAL IMPACT

7.3.6 Viewpoint 6

Viewpoint 6 is located on the M4 Motorway looking west towards the interchange with The Northern Road.

Potential viewers

Motorists and cyclists.

Changes to the view

Elements of the proposal that would be visible include:

- M4 Interchange entry and exit ramps including reinforced soil walls
- New bridge in front of the existing bridge and elevated over two metres higher
- Removal of vegetation
- New planting.

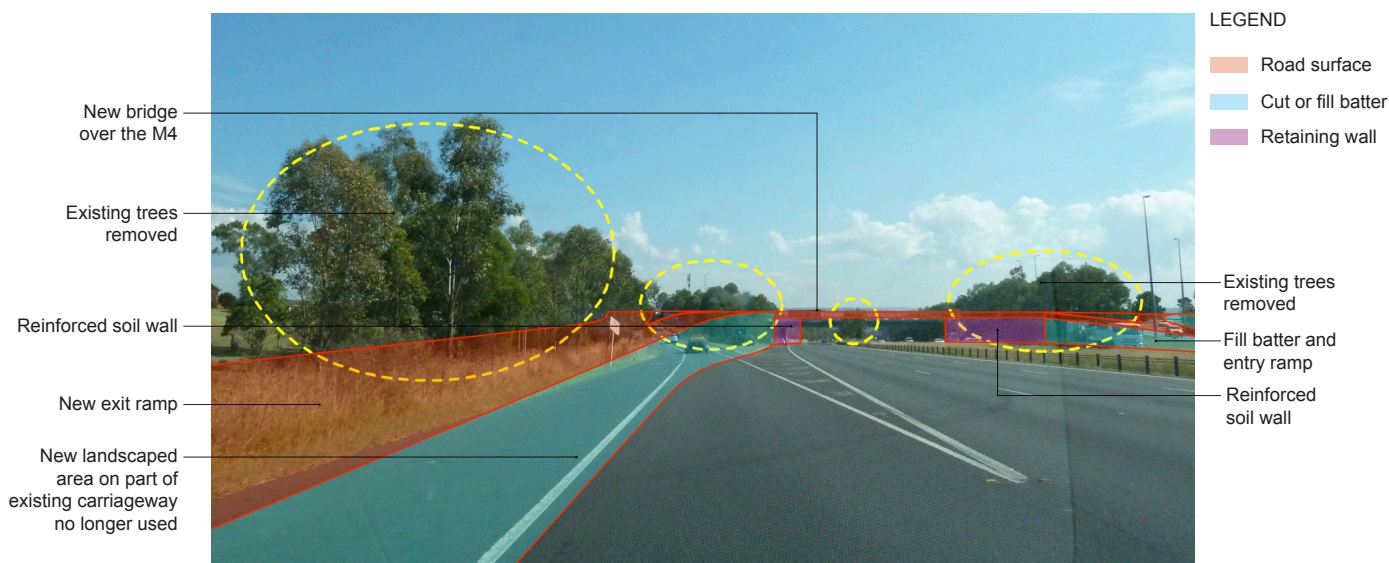


Figure 7-17: Viewpoint 6

Visual Sensitivity

Major compositional elements in the view are the existing motorway and exit ramp, together with roadside and interchange vegetation. Overall, the sensitivity of the view is considered **low**.

Magnitude Of Visual Effect

The footprint of the interchange will increase, resulting in a larger portion of the view being comprise of road infrastructure. The new bridge would be closer to the viewer. With an additional height of about two metres it would become more dominant. Reinforced soil walls would be highly exposed and prominent new items in the view. The magnitude would be considered **high**. This may reduce over time as vegetation establishes and matures.

VISUAL IMPACT

Visual Impact Summary

VISUAL SENSITIVITY	MAGNITUDE OF VISUAL EFFECT	OVERALL RATING OF VISUAL IMPACT
LOW	HIGH	MODERATE



Figure 7-18: Viewpoint 6 - Before



Figure 7-19: Viewpoint 6 - After, 3D visualisation (source: Spatial Media)

VISUAL IMPACT

7.3.7 Viewpoint 7

Viewpoint 7 is located on the The Northern Road north of the M4 interchange and looking north.

Potential viewers

Motorists.

Changes to the view

Elements of the proposal that would be visible include:

- New road alignment including additional lanes and changes to medians
- Five metre high concrete noise wall on the western side.

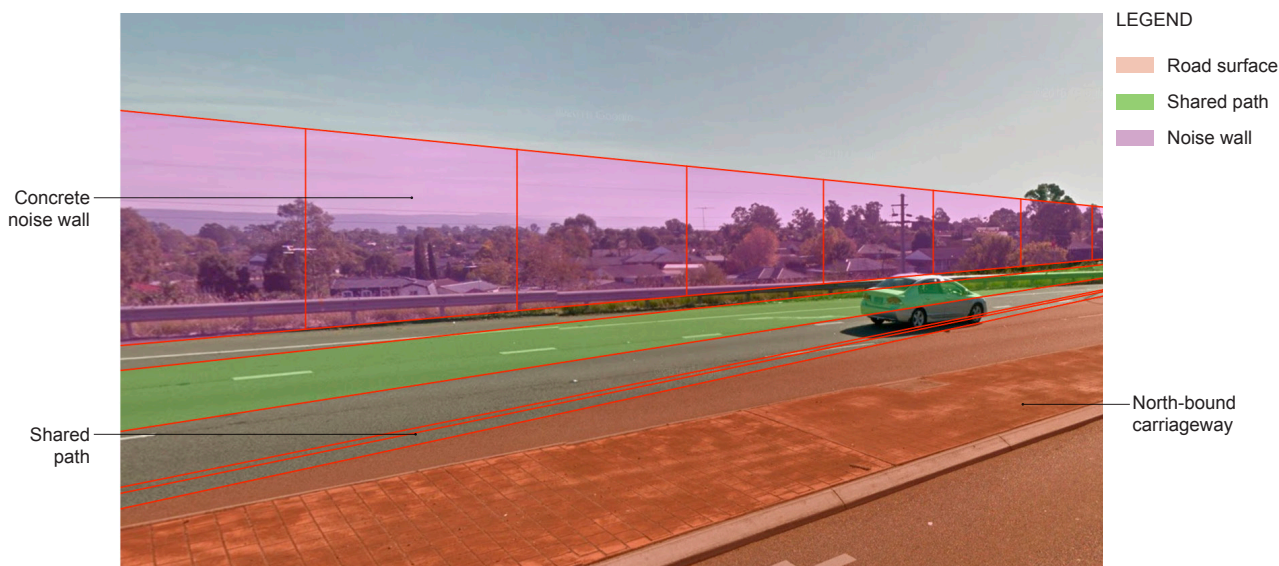


Figure 7-20: Viewpoint 7

Visual Sensitivity

The key element in the view is the elevated outlook over Penrith and, most importantly, to the Blue Mountains beyond. The infrastructure environment is visually subservient to the larger landscape. The sensitivity of the view to change is **high**.

Magnitude Of Visual Effect

The installation of the five metre high precast concrete noise wall would introduce a large built form in the currently open setting of the view. It would remove the significant views to the Blue Mountains that are a key aspect of the motorists' experience along the route. The magnitude is therefore considered **high**.

VISUAL IMPACT

Visual Impact Summary

VISUAL SENSITIVITY	MAGNITUDE OF VISUAL EFFECT	OVERALL RATING OF VISUAL IMPACT
HIGH	HIGH	HIGH



Figure 7-21: Viewpoint 7 - Before



Figure 7-22: Viewpoint 7 - After, 3D visualisation (source: Spatial Media)

VISUAL IMPACT

7.3.8 Viewpoint 8

Viewpoint 8 is located within the grounds of Penrith Christian School, looking south-west towards The Northern Road from the free play area.

Potential viewers

Students, guardians, staff and visitors to the school. Followers and attendees at Imagine Nations Church located within the school grounds.

Changes to the view

Elements of the proposal that would be visible include:

- New vertical alignment of The Northern Road, up to two metres higher than the existing alignment at the new M4 bridge
- New bridge at the M4 interchange, two metres higher than the existing bridge
- Large fill embankment extending over the existing turfed warm-up area west of the main playing field
- Clearing of vegetation to accommodate the new road alignment, widening, the new bridge and reconfigured interchange ramps.

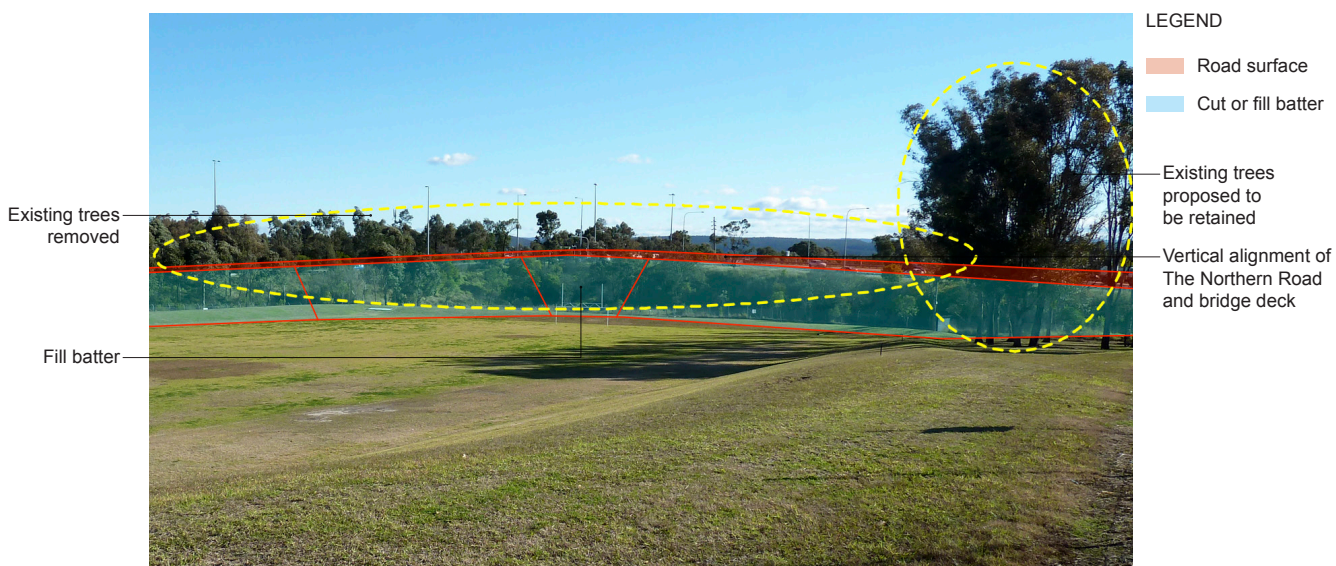


Figure 7-23: Viewpoint 8

Visual Sensitivity

The parklike setting and outlook makes this view highly sensitive to the proposed changes. The visual sensitivity is considered **high**.

Magnitude Of Visual Effect

Main changes to the view include extensive removal of vegetation, making The Northern Road and interchange ramps more prominent in the view, especially combined with the reduced proximity of the infrastructure and the increase in elevation above existing levels. The fill batter to accommodate the road widening would encroach on the north western corner of the existing playing field. The distance of the works from the viewpoint reduces the magnitude of the visual effect. Overall the magnitude is considered **moderate**.

VISUAL IMPACT

Visual Impact Summary

VISUAL SENSITIVITY	MAGNITUDE OF VISUAL EFFECT	OVERALL RATING OF VISUAL IMPACT
HIGH	MODERATE	HIGH TO MODERATE



Figure 7-24: Viewpoint 8 - Before



Figure 7-25: Viewpoint 8 - After, 3D visualisation (source: Spatial Media)

VISUAL IMPACT

7.3.9 Viewpoint 9

Viewpoint 9 is located on Powys Close at the intersection with Bickley Road, looking east towards The Northern Road.

Potential viewers

Motorists, residents, pedestrians and cyclists.

Changes to the view

Elements of the proposal that would be visible include:

- Five metre high concrete noise wall
- Clearing of vegetation east of The Northern Road
- Fill batters
- Landscape planting.



Figure 7-26: Viewpoint 9

Visual Sensitivity

The direction of the view perpendicular to the road corridor means that it has a relatively high capacity to absorb changes such as widening. However, the view has a significant landscape component with a low capacity to absorb change. Overall the sensitivity is considered **moderate**.

Magnitude Of Visual Effect

This view will change significantly as a result of the installation of the five metre tall noise wall, replacing existing shrub planting to terminate the view. Background trees currently providing a landscape backdrop and frame would also be removed. The magnitude of the visual effect is considered to be **high**. This may somewhat reduce over time as vegetation establishes and matures.

VISUAL IMPACT

Visual Impact Summary

VISUAL SENSITIVITY	MAGNITUDE OF VISUAL EFFECT	OVERALL RATING OF VISUAL IMPACT
MODERATE	HIGH	HIGH TO MODERATE



Figure 7-27: Viewpoint 9 - Before



Figure 7-28: Viewpoint 9 - After, 3D visualisation (source: Spatial Media)

VISUAL IMPACT

7.3.10 Viewpoint 10

Viewpoint 10 is located on Flavel Street, looking south along Flavel Street.

Potential viewers

Motorists, residents, pedestrians and cyclists.

Changes to the view

Elements of the proposal that would be visible include:

- Five metre high concrete noise wall
- Clearing of vegetation in the verge
- Fill batters.

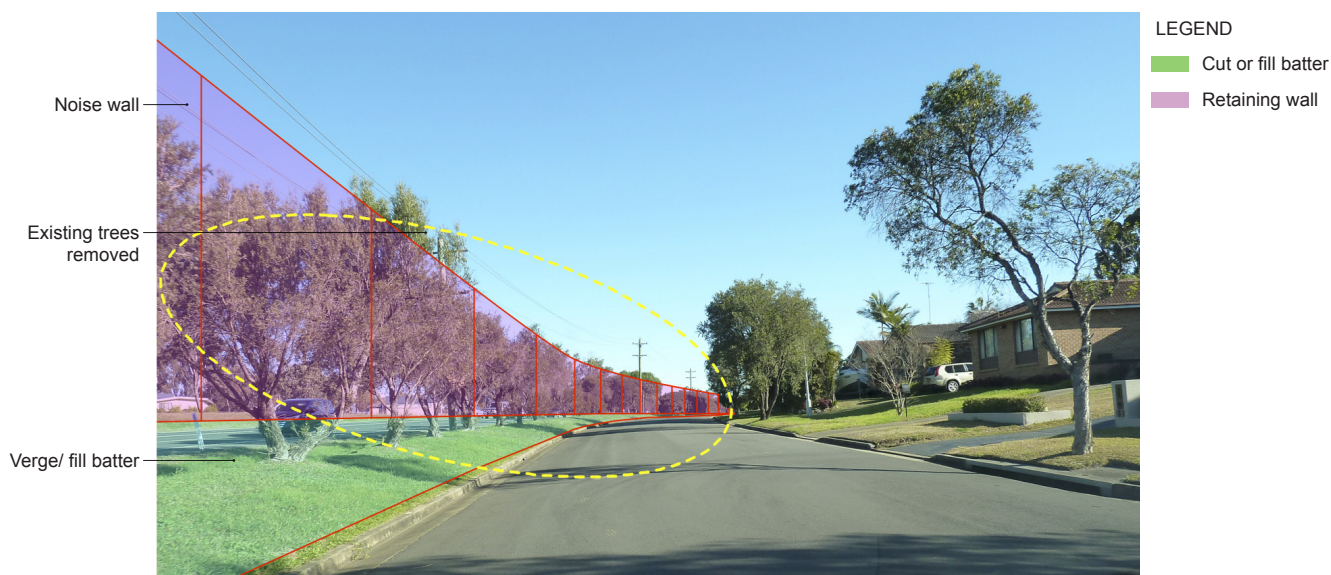


Figure 7-29: Viewpoint 10

Visual Sensitivity

This view is parallel to The Northern Road and changes such as widening would be relatively easily absorbed. However, the view has a significant landscape component with a low capacity to absorb change. Overall the sensitivity is considered **high**.

Magnitude Of Visual Effect

The removal of existing trees and the installation of noise walls would significantly alter the outlook along the street. The magnitude is considered to be **high**.

VISUAL IMPACT

Visual Impact Summary

VISUAL SENSITIVITY	MAGNITUDE OF VISUAL EFFECT	OVERALL RATING OF VISUAL IMPACT
HIGH	HIGH	HIGH



Figure 7-30: Viewpoint 10 - Before



Figure 7-31: Viewpoint 10 - After, 3D visualisation (source: Spatial Media)

VISUAL IMPACT

7.3.11 Viewpoint 11

Viewpoint 11 is located on Bringelly Road, looking south-west towards Maxwell Street.

Potential viewers

Motorists, pedestrians and cyclists.

Changes to the view

Elements of the proposal that would be visible include:

- Changes to road and intersection geometry including widened road surfaces for additional lanes and new traffic islands
- Conversion of public parkland to road
- Removal of trees
- Cut and fill embankments.



Figure 7-32: Viewpoint 11

Visual Sensitivity

While much of this view is of the existing infrastructure environment, existing parklands and tree cover are important elements framing and terminating the view. They would have low capacity to absorb the proposed changes. Overall the visual sensitivity is considered **moderate**.

Magnitude Of Visual Effect

Realignment and widening of Bringelly Road would replace the parkland landscape in this view with additional hard surfaces that would dominate the foreground of the view. The background would noticeably change as a result of tree removal on both sides of Maxwell Street. While this may open up views to the Blue Mountains, it would remove a visual buffer to commercial areas. Overall, the magnitude of visual effect is considered **high**.

VISUAL IMPACT

Visual Impact Summary

VISUAL SENSITIVITY	MAGNITUDE OF VISUAL EFFECT	OVERALL RATING OF VISUAL IMPACT
MODERATE	HIGH	HIGH TO MODERATE



Figure 7-33: Viewpoint 11 - Before



Figure 7-34: Viewpoint 11 - After, 3D visualisation (source: Spatial Media)

7.3.12 Viewpoint 12

Viewpoint 12 is located on The Northern Road, south of Smith Street and looking south.

Potential viewers

Motorists, residents, pedestrians and cyclists.

Changes to the view

Elements of the proposal that would be visible include:

- Road widening including new median with central wire rope safety barrier only, additional lanes, new shared path and new footpath
- Removal of existing vegetation including in private front gardens
- Property adjustments including splitface concrete block retaining walls, new driveways and replacement front fences
- New road level will be approximately 1.5 metres above the existing properties to the west and 0.5 metres below properties to the east of The Northern Road
- New planting including in the road corridor.



Figure 7-35: Viewpoint 12

Visual Sensitivity

The view illustrates The Northern Road as an existing infrastructure corridor with a residential interface providing an important landscape frame, and with tree cover terminating the view. Existing road surfaces have a high capacity to absorb the proposed changes, while existing verges and private front gardens would not easily absorb them. Overall the sensitivity of the view is considered **moderate**.

Magnitude Of Visual Effect

The proposed upgrade would increase the extent of hard surfaces in the view. The need to clear vegetation would remove the landscape frame along both sides of the view, as well as at its terminus, resulting in major changes to the view. The magnitude is considered **high**.

Visual Impact Summary

VISUAL SENSITIVITY	MAGNITUDE OF VISUAL EFFECT	OVERALL RATING OF VISUAL IMPACT
MODERATE	HIGH	HIGH TO MODERATE



Figure 7-36: Viewpoint 12 - Before



Figure 7-37: Viewpoint 12 - After, 3D visualisation (source: Spatial Media)

7.3.13 Viewpoint 13

Viewpoint 13 is located on The Northern Road, south of Smith Street, looking north along The Northern Road.

Potential viewers

Motorists, residents, pedestrians and cyclists.

Changes to the view

Elements of the proposal that would be visible include:

- Road widening including new median with central wire rope safety barrier only, additional lanes, new shared path and new footpath
- Concrete retaining wall on the eastern side of the corridor, in excess of 2.5 metres at its highest point
- Removal of existing vegetation including in private front gardens
- Property adjustments including splitface concrete block retaining walls, new driveways and replacement front fences
- New road level will be approximately 1.1 metres above the existing properties to the west and up to 2.5 metres below properties to the east of The Northern Road
- New planting including in the road corridor and replacement planting in private properties.



Figure 7-38: Viewpoint 13

Visual Sensitivity

Although the view is located along an arterial road, it has an essential landscape character, resulting from the wide park-like median and the heavily planted embankment on the eastern side. Due to the level change within the median, the south-bound carriageway is hardly perceptible. The sensitivity of the view is considered to be **high**.

Magnitude Of Visual Effect

Road widening including the removal of vertical separation between carriageways and the replacement of the heavily vegetated embankment with a concrete retaining wall will alter this view from a parkway to an urban arterial. Instead of the landscape, road infrastructure will become the dominant visual element. The magnitude is considered to be **high**.

Visual Impact Summary

VISUAL SENSITIVITY	MAGNITUDE OF VISUAL EFFECT	OVERALL RATING OF VISUAL IMPACT
HIGH	HIGH	HIGH



Figure 7-39: Viewpoint 13 - Before



Figure 7-40: Viewpoint 13 - After, 3D visualisation (source: Spatial Media)

VISUAL IMPACT

7.4 VISUAL IMPACT ASSESSMENT SUMMARY

A total of 13 viewpoints form the basis of the visual impact assessment. The viewpoints are generally focused on locations that will be commonly viewed by the local community. It also included views in destination areas that will be sought out by local residents and visitors such as the Penrith Golf and Recreation Club and the Penrith Christian School and Imagine Nations Church. It is generally anticipated that the viewpoints selected will provide for an even range of magnitude and sensitivity impact ratings. Refer to *Table 7-1* below summarising the visual impact assessment.

Out of the 13 selected viewpoints, the range of visual impact ratings were determined to be the following:

- Five viewpoints would have high visual impact
- Four viewpoints would have high to moderate visual impact
- Two viewpoints would have moderate visual impact
- One viewpoint would have moderate to low visual impact
- One viewpoint would have low visual impact.

Ratings of high and high to moderate impacts occur in areas where the landscape is the dominant or major element in the view resulting in a high level of sensitivity to change, and where the magnitude of the works will be readily noticed.

The moderate and low ratings occur in areas of lower sensitivity, for example in settings where infrastructure is already the predominant visual element.

Based on this assessment a series of visual impact mitigation measures have been identified. They are discussed in the following chapter.

Viewpoint	Visual sensitivity	Magnitude of visual effect	Overall rating of visual impact
1	High	High	High
2	Moderate	Moderate	Moderate
3	Low	Low	Low
4	High	High	High
5	Low	Moderate	Moderate to low
6	Low	High	Moderate
7	High	High	High
8	High	Moderate	High to moderate
9	Moderate	High	High to moderate
10	High	High	High
11	Moderate	High	High to moderate
12	Moderate	High	High to moderate
13	High	High	High

Table 7-1: Visual Impact Assessment Summary Table

8. MITIGATION STRATEGY

Roads and Maritime policy seeks to delivery positive design outcomes for all its projects, to deliver safe, efficient and high quality infrastructure. A key principle is for projects to fit into the built fabric and the avoidance of adverse visual impacts.

This working paper forms part of the environmental assessment of the proposed upgrade. Based on Roads and Maritime policy environmental impact assessment is part of the project design process. Assessment should result in ongoing design consideration that

- Produces concepts that inherently avoid or otherwise minimise environmental impacts, thereby reducing the need for 'add-on' mitigation
- Identifies opportunities to improve the corridor's built, natural and community environment and produce a high quality public domain that is fit for the purpose of the project.

Such opportunities are captured in mitigation measures.

Landscape character impact and visual impacts are equally important in the assessment of the proposal and its impacts. This dual assessment helps to define the impacts, improve road and urban design decisions, design outcomes and develop more specific mitigation measures.

The mitigation measures constitute the means to minimise or avoid the identified landscape character and visual impacts and maximise positive outcomes. These mitigation measures are also designed to improve environmental conditions or lessen the physical impacts on the environment.

The mitigation measures should be considered in the refinement of the design in future stages of the proposal to ensure a robust urban and landscape design solution that protects and enhances the existing landscape character and visual quality of surrounding areas. The following measures have been identified for the proposed upgrade of The Northern Road between Glenmore Parkway and Jamison Road.

Tree planting

Tree planting as identified in the urban and landscape design concept is critical in terms of mitigating the scale of the proposed infrastructure, reinstating the Cumberland Plain Woodland Character, framing views and providing amenity in public open space

- Ensure appropriate safety measures are provided (such as wire-rope barriers or the like) that will allow for the implementation of the landscape concept while meeting road safety requirements. This is especially critical in high speed environments such as along the M4 verges and medians which would need wide clear zones
- Reinstatement tree cover in public open space including along the golf course perimeter and on the landscaped street along Aspen Street and Maxwell Street
- Reinstatement visual buffer planting between the M4 and residents on the southern side, including in Homestead Road and South Street
- Reinstatement visual buffer planting between the M4 and the Penrith Christian School
- Review/ reduce tree planting between The Northern Road and the Penrith Christian School, to maintain the existing character of intermittent tree planting with filtered and open views into the landscape east of the corridor
- Review the design between The Northern Road and Penrith Christian School to retain more of the existing mature trees within the property

MITIGATION STRATEGY

- Maximise tree planting in the verges around intersections to maintain/ reinstate the character of a road corridor punctuated by landscape nodes
- Reinststate Cumberland Plain Woodland cover in all compound sites and areas of temporary detention basins. Compound sites that require re-instatement of native vegetation post-construction, not currently indicated in the proposed landscape design include:
 - Frogmore Road site
 - Castle Road site
 - The open space between The Northern Road and Mazepa Avenue
 - The site between The Northern Road and Fragar Road
 - Rotary Park site, particularly the central area proposed as a site compound
 - The compound site south east of the M4 Interchange.

Median planting

- Along The Northern Road maximise frangible median planting of low shrubs to provide headlight glare screening and to visually separate carriageways to create the sense of a landscape corridor, including medians proposed to have a wire rope safety barrier
- Along the M4, provide for tree planting behind safety barriers on the bridge approaches, to mitigate the bulk and scale of the new bridge, and to maintain the existing visual separation of carriageways.

Pedestrians and cyclists

- Maximise the visibility of paths and shared paths from adjoining residential and commercial areas for good safety and passive surveillance.

Bridge design

- Provide transparent throw screens and fences. Ensure that the design of all fences and barriers maximises opportunities for views from the bridge along the M4 and towards the Blue Mountains
- Review the need to elevate the bridge deck just about 2.2 metres higher than that of the existing overbridge. This has the potential to reduce the visual effect of the bridge itself and of associated batters. It would lessen the impacts on a number of views and LCZs, as well as reduce the land take and property impacts
- Reduce the visual bulk of the bridge when seen from the M4
Refer *Figures 8.1, 8.2 and 8.3* for examples.

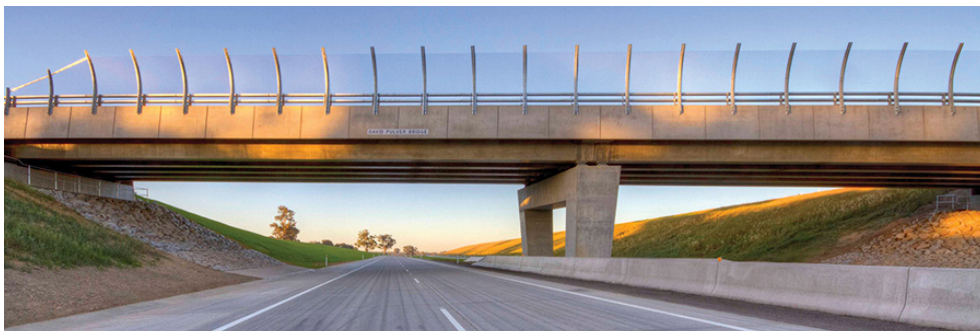


Figure 8-1: This bridge designed for the Hume Highway Duplication provides an example of visually transparent throw screens, as well as of how the sense of openness under the bridge can be increased through the use spill-through abutments that avoid a 'tunnel feel'. It further illustrates an example of a simple and bold pier design (source: <http://www.rms.nsw.gov.au/projects/planning-principles/centre-for-urban-design/achievements/images/>)

MITIGATION STRATEGY

Noise Walls

- Refine the design of noise walls between the M4 and Bronsgrove Close to incorporate transparent panels to retain existing views from the road corridor towards the Blue Mountains. Refer *Figures 8.2 and 8.3* for examples
- Refine the design of noise walls between the M4 and Aspen Street to incorporate transparent panels to maintain solar access to residential streets and properties. Refer *Figures 8.2 and 8.3* for examples
- Maximise planting to soften the appearance of noise walls, mitigate their scale and to relate to the residential character of adjoining areas
- Where there is insufficient space for shrub/ screen planting in front of the walls, they should be designed with an integrated high quality finish that does not rely on the successful establishment of climbing plants to mitigate their appearance or to produce a high quality visual outcome
- Provide a colour scheme and rhythm through colour that is consistent with/ reminiscent of the residential interface. The scheme should be a simple refined palette that draws on the greater Blue Mountains context as an appropriate theme
- Extend the length of patterned noise wall where there is insufficient space for shrub planting to provide visual screening. In particular, the noise wall between the M4 and Powys Close is highly exposed to views from residents including in Powys Close and Bickley Road, with limited space available to soften the appearance of the wall with planting between Powys Close and Bickley Road
- Refine the design of noise walls to provide for greater pedestrian connectivity between residential areas and the shared path along The Northern Road, while also considering passive surveillance and safety in it's configuration. Refer *Figure 8.4* for an example
- Refer to the *Noisewall Design Guidelines* principle and objectives.



Figure 8-2: (above left) An example of how transparent noise walls and throw screens can be integrated in a refined structure (source: <http://www.npkdesign.com/wp-content/uploads/2014/07/2150-Adam-geluidsscherm-1.jpg>)



Figure 8-3: (above right) Transparent horizontal panels in appropriate elevations are a means to provide for solar access, for passive surveillance or for motorists' views while reducing costs relative to fully transparent noise walls (source: https://upload.wikimedia.org/wikipedia/commons/c/cf/Geluidsscherm_Overschiet.jpg)



Figure 8-4: Noise walls designed for pedestrian scale and to facilitate connections to the local road network. Wall materials and finishes respond well to the residential context (source: CFUD 2016, p.27)

MITIGATION STRATEGY

Retaining Walls and Residential Interfaces

- Provide continuity of materials and finishes to retaining walls in cut, to provide a simple unified appearance where wall faces are visible from the road corridor. Where wall faces are visible from private properties (i.e. in fill situations), individual finishes may be appropriate in consultation with property owners
- Rake the tops of retaining walls to realise a smooth gradient to the top of wall, parallel to the rise and fall of the landscape
- Provide visually transparent front fences as separate structures to the top of retaining walls, to retain the sense of an open interface between the road corridor and private residences, and to reduce the perceived combined height of walls and fences (subject to negotiations with property owners)
- Maximise space for planting in front of new retaining walls to private properties, to soften the appearance of the new built form and reinstate a landscape interface with the road corridor For all wall faces in the public domain (including the road corridor and parks/ public open space) review proposed finishes and select finishes that are easily maintained and resistant to vandal attacks (including graffiti) to ensure good visual outcomes long-term
- Provide planting including replacement tree planting in residential properties that complements the existing landscape character of private front yards, including a mix of native and exotic species
- Review the design and location of the retaining wall between Kingswood South Public and Smith Street to provide a wider verge between the path and the tall west-facing wall. The verge should be sufficiently wide to successfully support tree or tall shrub planting. The aim would be to provide shade and reduce heat gain, glare and reflection off the wall, to increase pedestrian amenity and comfort in this area. Planting would also assist in mitigating the height of the wall.

9. CONCLUSION

The study area for the proposed upgrade of The Northern Road extends from Glenmore Parkway in Glenmore Park to Jamison Street in Penrith. The total length of the road corridor to be upgraded extends for about four kilometres and crosses four distinct landscape character areas.

The contrast between rural lands in the south and east and urbanised areas in the north and west is one of the defining features of the corridor, together with long-distance views to the Blue Mountains. They are significant for their contribution to the sense of place and orientation.

The character of the road itself reflects its surroundings. The northern part of the project area is currently an urban arterial consisting of generally four lanes that are separated by a central median in some sections of the corridor. At the southern end of the project area the road transitions to a two-lane rural road.

The proposed upgrade aims to support future growth in the region, in particular growth associated with employments planned within the Western Sydney Priority Growth Area and the planned western Sydney airport.

The upgrade would introduce a number of elements into the existing setting, including:

- Widened pavement surface and central medians, to provide a total of six travelling lanes plus two dedicated bus lanes
- Upgrades to existing intersections including new traffic lights and turning lanes
- Construction of a noise wall and retaining walls
- Earthworks including areas of significant fill and cut as well as construction of retaining walls
- A reconfigured M4 interchange including a new bridge and associated ramps over the M4, located to east of the existing bridge
- Residential property adjustments including retaining walls, reconstruction of drive ways and front fences and replacement planting
- Construction of new sedimentation basins and drainage works
- Construction of shared paths and new footpaths.

While The Northern Road is itself already an arterial road, it generally retains a rural quality along much of the route, with the exception of the M4 interchange and the northern section that are more urban in character. Therefore, with the proposed upgrade, introduction of new elements and extensive removal of vegetation, the overall impact on the existing landscape character would be considerable. The existing character of the road corridor, as well as adjoining urban, residential and rural areas would be adversely affected and altered as a result of the proposed upgrade.

The visual and landscape character impacts are high due to the scale of the proposed upgrade within a highly constrained corridor. The proposed upgrade would result in a significant increase in road infrastructure within a sensitive setting that includes both public and private open space, endangered Cumberland Plain Woodland remnants and rural lands that are recognised as possessing high scenic landscape values.

CONCLUSION

The scenic and landscape values of Orchard Hills are significant. They are well documented and reflected in current planning instruments and policies. There is therefore a need to ensure the proposed upgrade retains and contributes to these values through careful design that integrates the proposed upgrade with the existing environment.

The urban design objectives and principles for the project arise from the analysis of the project area. Key principles are:

- Protect scenic landscape values
- Enhance open space along the corridor
- Highlight the contrast between rural and urban
- Enhance intersections as landscape features along the route
- Protect significant views
- Protect remnant trees and reinstate tree over
- Maximise connections along and across the corridor including for active transport.

Analysing the identified impacts of the proposed upgrade against the urban and landscape design objectives and principles has identified a series of mitigation measures developed to maximise the fit of the design of the proposed upgrade within its natural, built and community context. The incorporation of these mitigation measures would assist with integrating the proposal into the existing landscape character areas.

In the case of revegetation as a mitigation measure to restore and enhance vegetation, lessen the perceived scale of road infrastructure and provide ecological and community amenity, its mitigating effects would be gradual. Therefore the overall impact on landscape character and visual quality would possibly be reduced over time as the vegetation establishes and matures.

Consideration of the mitigation measures in future design stages will be a critical aspect of maximising positive community outcomes.