Australian Government

BUILDING OUR FUTURE

NSW GOVERNMENT

M1 Pacific Motorway extension to Raymond Terrace

Environmental impact statement – Chapter 15: Urban design, landscape and visual amenity

Transport for NSW | July 2021

BLANK PAGE

Contents

List of figures

List of tables

15. Urban design, landscape and visual amenity

This chapter describes the potential landscape character and visual amenity impacts that may be generated by the construction and operation of the project and describes the environmental management measures that have been developed to manage these impacts. It also summarises the urban design and landscape strategy which has been developed to integrate and respond to findings from the Urban Design, Landscape Character and Visual Amenity Working Paper (**Appendix O**).

The desired performance outcomes for the project relating to urban design and visual amenity, as outlined in the SEARs, are to:

- Complement the visual amenity, character and quality of the surrounding environment
- Contribute to the accessibility and connectivity of communities
- Minimise the adverse impacts of the project on the visual amenity of the built and natural environment (including public open space) and capitalise on opportunities to improve visual amenity.

Table 15-1 outlines the SEARs that relate to urban design and visual amenity and identifies where they are addressed in this EIS. The full assessment of urban design and visual amenity impacts is provided in the Urban Design, Landscape Character and Visual Amenity Working Paper (**Appendix O**).

Table 15-1 SEARs (urban design and visual amenity)

Secretary's requirement	Where addressed
10. Urban design	
1. The proponent must	
(a) identify the urban design and landscaping aspects of the project and its components, including interchanges, bridge and viaduct structures, embankments, noise barriers (including walls and mounds), ancillary buildings, and road infrastructure facilities and services	The urban design and landscaping aspects of the project and its components are identified in **Table 15-4**.
(b) assess the impact of the project on the urban, rural and natural fabric, including residual land treatment, and demonstration of how the proposed hard and soft urban design elements of the project would be consistent with the existing and desired future character of the area traversed or affected by the project	The impact of the project on landscape character is provided in **Section 15.5**. Residual land treatment is discussed in **Section 5.3.19**, **Section 14.4.1** and **Table 15-4** **Section 15.3.3** describes the urban design approach, objectives and principles to maximise integration of the project with the character of the area. Consistency of hard project elements including bridges, retaining walls, noise barriers and roadside furniture with the existing and desired future character of the area is described in **Table 15-4** and **Section 15.3.4** Consistency of soft project elements such as earthwork formations, drainage and stormwater and landscape design is described in **Table 15-4** and **Section 15.3.4**.
(c) explore the use of Crime Prevention Through Environmental Design (CPTED) principles during the design development process, including natural surveillance, lighting, walkways, signage and landscaping	CPTED is discussed in **Section 15.3.4**.
(d) identify urban design strategies to enhance healthy, cohesive and inclusive communities directly impacted by the project	The urban design strategy plans are detailed in **Section 15.3.3**. Urban design treatments for project elements are described in **Table 15-4**.

Secretary's requirement	Where addressed
(e) describe urban design and landscape mitigation measures, having regard to the urban design and landscape objectives for the project.	The urban design and landscape concept is shown in **Section 15.3.4** and further described in the Urban Design, Landscape Character and Visual Amenity Working Paper (**Appendix O**). Urban design and landscape management measures are provided in **Section 15.6**.
11. Visual amenity	
1. The Proponent must assess the visual impact of the project and any ancillary infrastructure (including noise barriers) on:	
(a) views and vistas;	The visual impact of the project on views and vistas is assessed in **Section 15.5**
(b) streetscapes, key sites and buildings;	The visual impact of the project on streetscapes, key sites and buildings is assessed in **Section 15.5**
(c) heritage items including Aboriginal places and environmental heritage; and	The visual impact of the project on heritage items (including Aboriginal places and environmental heritage) is assessed in **Section 15.5** Visual impacts to Aboriginal places are also discussed in **Chapter 12** (Aboriginal cultural heritage) and environmental heritage in **Chapter 17** (non-Aboriginal heritage).
(d) the local community (including view loss and overshadowing).	The visual impact of the project on the local community (including view loss and overshadowing) is assessed in **Section 15.5**
2. The Proponent must provide artist impressions and perspective drawings of the project from a variety of locations along and adjacent to the route to illustrate how the project has responded to the visual impact through urban design and landscaping.	**Section 15.3.3** provides the strategy plans for the project. Indicative urban design concept are shown in **Figure 15-2** to **Figure 15-5**, and further described in the Urban Design, Landscape Character and Visual Amenity Working Paper (**Appendix O**). Indicative photomontages with the project and embedded design mitigation in place have been provided in **Table 15-9**.

15.1 Policy and planning setting

The urban design, landscape character and visual impact assessment was prepared to assess the potential impacts of the project in accordance with the following relevant legislation, policy and guidelines:

- Legislation:
  - Port Stephens Local Environmental Plan 2013
  - Newcastle Local Environmental Plan 2012
  - Maitland Local Environmental Plan 2011.
- Plans and policies:
  - Hunter Regional Plan 2036 (DPE 2016)
  - Hunter Regional Plan Vision (DPE 2016).

- Guidelines:
  - Beyond the Pavement – urban design policy, procedures and design principles (Transport for NSW 2020a)
  - Australian Standard AS4282-1997 Control of the obtrusive effects of outdoor lighting (AS4282), (Australian Standard 1997)
  - AS/NZS1158:2005 Lighting for roads and public spaces
  - Bridge Aesthetics: Design Guidelines to improve appearance of bridges in NSW (Transport for NSW 2019a)
  - NSW Sustainable Design Guidelines Version 3.0 (Sustainable Design Guidelines) (Transport for NSW 2013)
  - Crime prevention and the assessment of development applications (DUAP 2001)
  - Crime Prevention through Environmental Design (Queensland Government 2007)
  - Urban Green Cover in NSW. Technical Guidelines (Urban Tree Cover), (OEH 2015)
  - Healthy Urban Development Checklist (NSW Health 2009)
  - Pacific Highway Urban Design Framework 2013 (Pacific Highway Urban Design Framework), (Roads and Maritime Services 2013b).

Further detail on the above legislation, policies and guidelines, and how they apply to the project, is provided in **Section 3.1** and in the Urban Design, Landscape Character and Visual Amenity Working Paper (**Appendix O**).

15.2 Assessment methodology

The landscape character and visual impact assessment was completed in accordance with Roads and Maritime Services Practice Note – Environmental Impact Assessment Practice Note: Landscape Character and Visual Assessment EIA-N04 (Transport for NSW 2020d).

The assessment methodology included:

- A review of relevant guidelines, planning and policies
- A desktop review of existing conditions to allow for the contextual analysis of the existing environment
- Site inspections in 2015, 2016 and 2020, to ground-truth and confirm the study area existing conditions, landscape character and views
- Identification of landscape character zones
- Development of the project urban design strategy, including urban design objectives and principles, building on the overall project objectives and the contextual analysis. The urban design strategy was used to develop the urban design concept to fit into the surrounding area, support local connections and contribute to communities and their natural, built and community setting
- Assessment of landscape character impacts during construction and operation, including shadow analysis
- Assessment of visual impacts during construction and operation
- Development of a mitigation strategy and management measures.

Further detail on the assessment methodology is provided in the following sections. The urban design strategy is discussed in **Section 15.3**.

15.2.1 Study area

For the purpose of this assessment, the study area is based on views, topography and in consideration of where the project would be visible. The study area is shown in **Figure 15-1**.

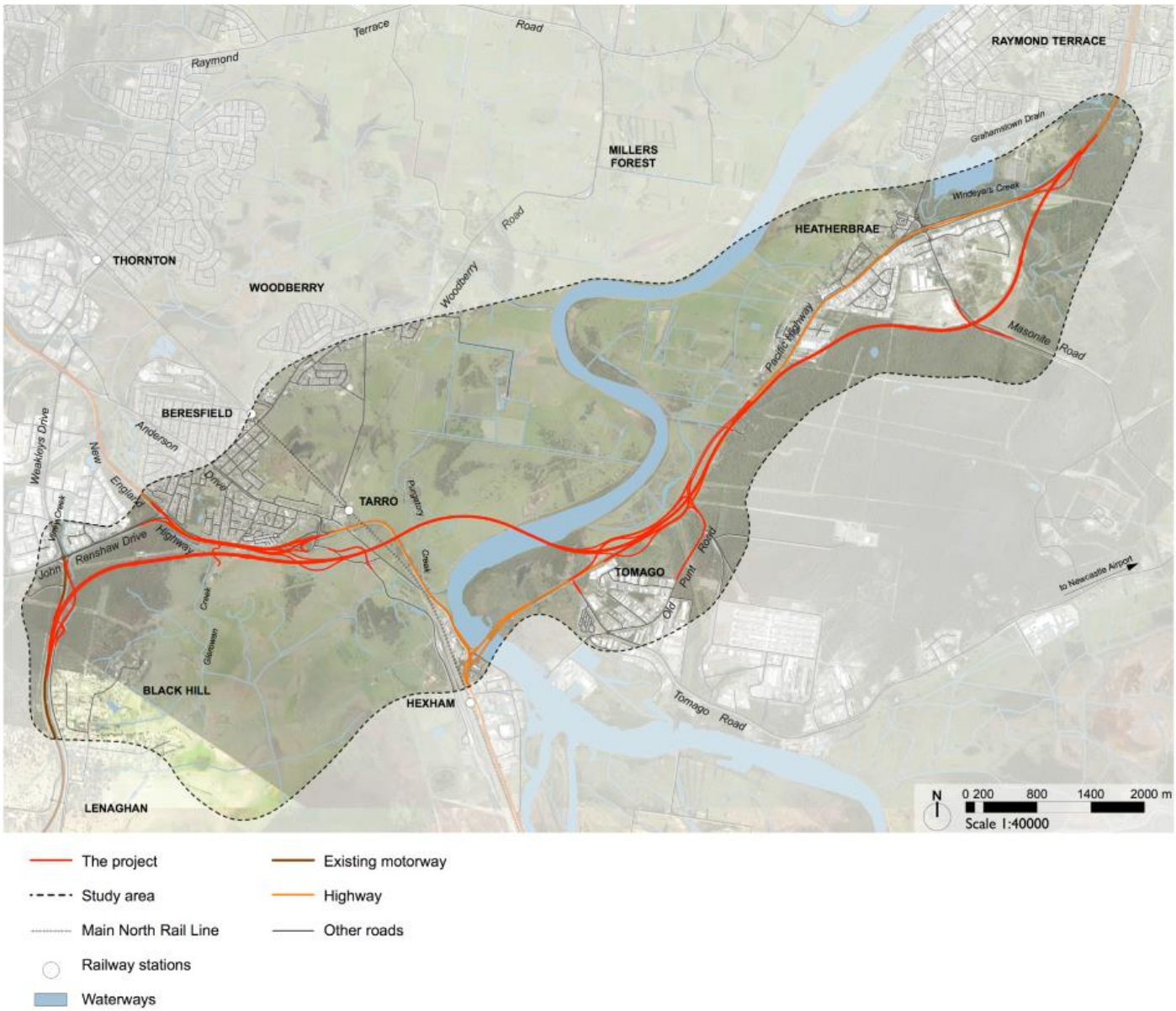


Figure 15-1 Urban design and visual amenity study area

15.2.2 Landscape character assessment

Landscape character refers to the combined quality of the built, natural and cultural aspects of an area which shape its unique sense of place. Landscape character zones (LCZ) were identified within the study area based on the existing environment and are defined as areas of distinct character, generally grouping together similar characteristics in terms of natural, built and community elements such as land use, vegetation cover, topography, heritage or scenic values.

Landscape character attributes that were considered as part of the urban design, landscape character and visual impact assessment include:

- Landform and views (refer to Section 16.3 and Section 15.4.2)
- Traffic and transport including public transport, walking and cycling networks (refer to **Section 7.3**)
- Biodiversity including vegetation and fauna habitat (refer to **Section 9.3**)
- Flooding and hydrology (refer to **Section 10.3**)
- Surface water and groundwater (refer to **Section 11.3**)
- Aboriginal and non-Aboriginal heritage (refer to **Section 12.3** and **Section 17.3**)

- Existing land use (refer to **Section 14.3**)
- Utility services (refer to **Section 5.3.15**).

Within each LCZ the landscape character impact is derived from the sensitivity of the zone and the magnitude of the project in that zone where:

- 'Sensitivity' refers to how easily affected the existing character of the setting is by the proposed change. This can also be understood as the setting's inherent capacity to absorb change. For example, a pristine natural environment would be more sensitive to change than an industrial area. Sensitivity is influenced by both professional judgement and objective measures. For example, an area's listing on a State level heritage register would mean a higher level of sensitivity
- 'Magnitude' refers to the physical size and scale of the project. For example, a large intersection would 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. Landscape character impact is calculated using the landscape character and visual impact rating matrix provided in EIA-N04 (**Table 15-2**).

Table 15-2 Landscape character and visual impact rating matrix

Sensitivity	Magnitude: High	Magnitude: Moderate	Magnitude: Low	Magnitude: Negligible
High	High	High-Moderate	Moderate	Negligible
Moderate	High-Moderate	Moderate	Moderate-low	Negligible
Low	Moderate	Moderate-low	Low	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

15.2.3 Visual impact assessment

The visual catchment is the extent or area where the project would be visible considering factors such as landform, direction of travel or direction of the view, built structures and vegetation. Vegetation, while often obscuring potential views, is not considered a permanent obstruction as it can be relatively easily removed.

The visual catchment for the project is illustrated in a Visual Envelope Map (VEM). Within the VEM a number of viewpoints were selected for assessment to represent a range of views including views and vistas from residential properties, public buildings, key sites and spaces, heritage items, businesses and the existing road corridor/ streetscapes (refer to **Figure 15-7**).

Visual impact is the measure of change that new interventions would have on existing views and impacts to the local community (including view loss and overshadowing). The visual impact of the project was derived from an analysis of the viewpoints and the magnitude of change. The severity of these impacts is a combination of the sensitivity and magnitude rating in accordance with the impact rating matrix (refer to **Table 15-2**).

Overshadowing impact assessment

The assessment of visual impact also addresses potential overshadowing impacts of the project during operation. Two main factors inform the degree of overshadowing impacts:

- The three-dimensional form of the project, that is the height of project elements relative to adjoining areas which would inform the extent of overshadowing
- The presence of sensitive users that may be affected by overshadowing.

The detailed shadow analysis was carried out using a three-dimensional model of the existing terrain. It was created from contours at one metre intervals with adjacent building footprints added. The assessment focussed on a 100 metre wide corridor extending either side of the operational footprint. Project elements including proposed landform and bridge structures were then modelled to determine the extent of overshadowing at 9am, noon and 3pm on the two equinoxes (20 March and 20 September) and the two solstices (20 June and 20 December).

15.2.4 Mitigation strategy

The mitigation strategy comprises principles or treatments recommended to manage the identified landscape character and visual impacts of the project. They include:

- Measures embedded in the project design that have already mitigated potential landscape character and visual impacts. They include a strategy and design principles that continue to provide guidance during future design and construction stages in order to minimise landscape character and visual impacts
- Environmental management measures for further investigation during future project stages in order to manage landscape character and visual impact.

15.3 Urban design and landscape strategy

15.3.1 Urban design vision

The urban design vision adopted for the project is:

> ‘Provide a flowing green corridor that integrates sensitively with the natural environment and community setting of the area. The project will capitalise on its setting with expansive views over the Hunter River floodplain with simple and well-designed project elements. The project will provide a clear and legible junction integrating the Pacific Motorway and the New England Highway that improves local, regional and interstate connectivity while contributing to the sense of places of communities along the corridor’

15.3.2 Urban design objectives and principles

Building on the project urban design vision, five urban design objectives and a sub-set of design principles were adopted for the project. These objectives and how they have been built into the urban design are detailed in **Table 15-3**.

The urban design approach for the project considers:

- The travel experience along the project as created by the various project elements and their interaction with the surrounding natural, built and community context
- The existing character and values of the surrounding natural, built and community context, specifically:
  - The project’s landscape setting, including the Hunter River, the contrast between the low-lying floodplain and elevated areas with their mix of urban areas and bushland remnants and the resulting differences in spatial character and available views
  - The road network context which facilitates an array of local and regional transport movements.
  - Local communities. The project seeks to value communities along the project and enhance healthy, cohesive and inclusive communities.
  - Providing buffers to sensitive receivers.

Table 15-3 Urban design objectives and principles

Objectives	Principles	Urban design application
Objective 1: Provide a flowing road alignment that is responsive and integrated with the landscape	Maintain and integrate the road corridor with existing landscape types and characters, considering different woodland, open floodplain and rural landscapes	• The project's alignment was designed to follow existing road and utility corridors as much as possible, in order to reduce the visual impacts of the project • The landscape design for the project maximises revegetation with local Plant Community Types (PCTs) to integrate the project with the existing landscape character • Vegetation has been used to mitigate project elements and provide visual buffers to reinforce the character of the area and avoid the appearance of project infrastructure incongruous with a regional setting • Bridges were designed to span across creeks, wetlands and floodplains, minimising impacts on these waterways and existing native vegetation communities
Objective 2: Provide a landscaped Motorway that integrates with the adjoining natural setting	• Integrate the road into existing vegetation patterns to maintain the sense of place and help maintain ecological and biodiversity values • Use vegetation strategically to guide motorists' views to contribute to and maintain the scenic quality of the route • Use planting to visually separate adjoining roadways and to maximise the character of the Motorway through the coastal hinterland landscape setting • Design cuttings and embankments to maximise opportunities for vegetation to be established	The landscape design for the project maximises revegetation with local PCTs to maximise biodiversity outcomes

Objectives	Principles	Urban design application
Objective 3: Provide an enjoyable, interesting motorway	• Use tree cover and other landscape treatments to provide an interesting sequence of open views and sections of motorway enclosed by vegetation, drawing on existing views, vistas and spatial patterns • Take advantage of the opportunities provided by the viaduct and other elevated road infrastructure to provide views of the surrounding landscape • Retain and where possible strengthen views to local landmarks including heritage items • Design the motorway, interchanges and local road connections to be self-explanatory, legible and easy to navigate • Identify opportunities for art and/ or interpretive elements to contribute to place-making, and strengthen local and cultural identities • Capitalise on the opportunities offered by the Hunter River bridge and viaduct that provides a positive legacy and a new landmark for both local communities and motorists travelling the length of the M1 Pacific Motorway	• Vegetation is used to guide views from the project, maximising opportunities for views of the landscape while screening detracting elements to enhance the experience of the project setting overall • The design for retaining walls maximises opportunities for landscaping to assist in the integration of the walls into the landscape setting, including through the design of batter slopes that maximise opportunities for successful vegetation establishment
Objective 4: Value the communities and towns along the road	• Provide an alignment that avoids community severance by skirting the edges of existing townships or settlements • Design the project to provide connectivity between the motorway and key populated areas and for ease of access to current and future residential, community, industrial and employment areas • Maintain the accessibility and connectivity of surrounding communities for all users including motorists, public transport users, cyclists and pedestrians and ensure connections are safe, convenient, logical and integrate the principles of Crime Prevention Through Environmental Design (CPTED) • Support the area's tourism industry by maintaining cultural and landscape values • Provide visual buffers to sensitive receivers to enhance the sense of privacy through landscaped areas • Design interchanges as attractive decision-making points that highlight the towns and other destinations along and beyond the route. Consider the potential of major project elements to integrate art, interpretation and other place-making features to celebrate local communities and provide contextual interest	• The project has been designed to maintain all existing access and connectivity, some with minor modifications including property access such as to the Glenrowan Homestead, the Aurizon access road and the Hunter Region Botanic Gardens access (refer to **Chapter 14** (land use and property) and to the Land Use and Property Working Paper (**Appendix N**)) • The project enhances opportunities for active transport by providing a more direct and continuous cycle route along the main alignment road shoulders between Black Hill and Raymond Terrace (refer to **Chapter 7** (traffic and transport) and the Traffic and Transport Working Paper (**Appendix G**).

Objectives	Principles	Urban design application
Objective 5: Provide a simplified and unobtrusive road design	• Endeavour to avoid placing road furniture in areas that may affect key views and vistas • Take measures to reduce lighting impacts to adjoining land use and the natural environment • Design bridges as simple and elegant structures of contemporary form • Maximise consistency of design and detailing for similar types of bridges	• The bridge design approach supports legibility and way-finding through the use of colour integrated into bridges • Consistency of substructure and materials was maximised for bridges of similar types • The bridges integrate contemporary bridge design approaches, are robust and avoid unnecessary visual clutter.

15.3.3 Urban design strategy

The urban design approach for the project considers the travel experience and the existing and desired future character and values of the surrounding area. To further illustrate this approach, four main inter-related strategy plans have been identified:

- Integration with existing features and vistas in the study area
- Spatial character and views
  - Long-distance views from the project would contribute to the motorists' experience and provide a connection to the study area
  - The existing spatial and landscape character would be enhanced and views over the Hunter River floodplain would be reinforced.
- Cycle connections
  - Connection points between the project and the surrounding road network would supplement the existing network and support active transport use in the study area, contributing to the accessibility and connectivity of communities.
- Place-making
  - Consistent approach to the design of bridges and potential place-making opportunities, such as the bridge (B09) and special "highlight" landscape treatments at the Hunter Region Botanic Gardens would provide an overall sense of place.

The consideration of the above strategy plans have informed the development of the urban design and landscape concept outlined in **Section 15.3.4**.

15.3.4 Urban design and landscape concept

The urban design and landscape concept for the project has been developed based on the urban design strategy outlined above. The concept is described in the four sub-sections that follow:

- Structural elements
- Landscape design
- CPTED
- Assessment of noise barriers.

The urban design and landscape concepts plans are included in the Urban Design, Landscape Character and Visual Amenity Working Paper (**Appendix O**). The urban design concept for bridges and typical sections indicating potential landscape treatments are shown in **Figure 15-2** to **Figure 15-5**.

Further consideration and review would be carried out during the detailed design to refine the urban design concept and ensure its the continued integration.

Structural elements

Table 15-4 describes and illustrates the relationship between the various project structural elements and the study area's built, natural and community context.

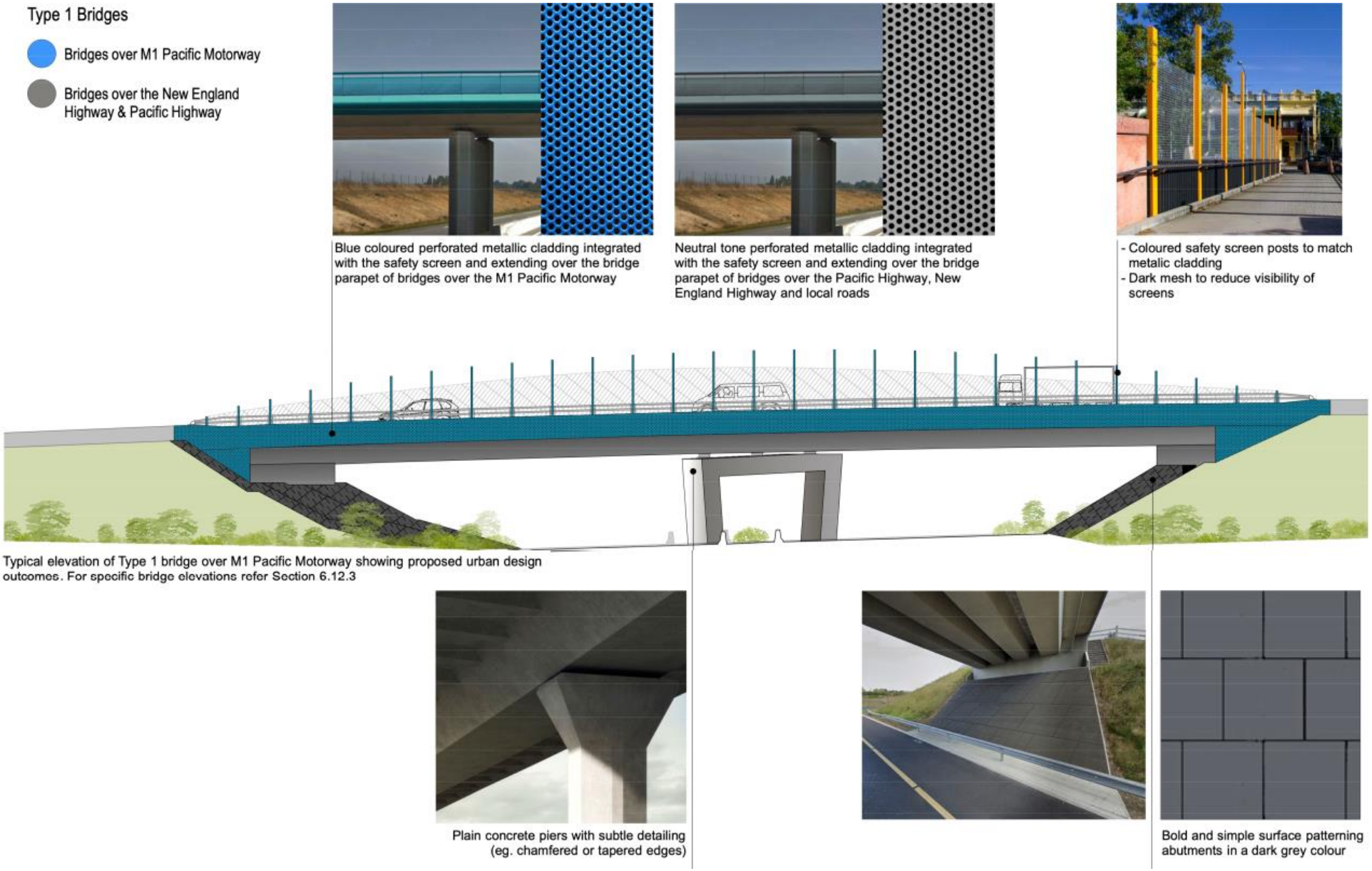


Figure 15-2 Urban design concept for Type 1 bridges

Type 2 Bridges

Bridges over wetlands

- Rip rap on bridge abutments for scour protection

- Plain concrete to substructure

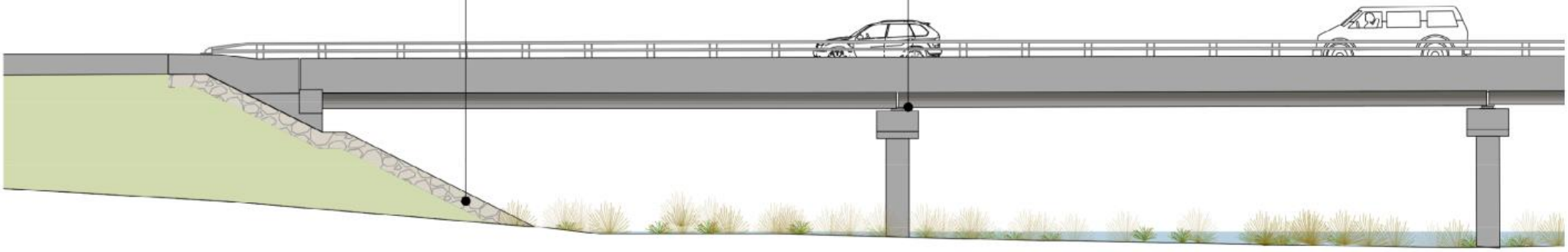


Figure 15-3 Urban design concept for Type 2 bridges

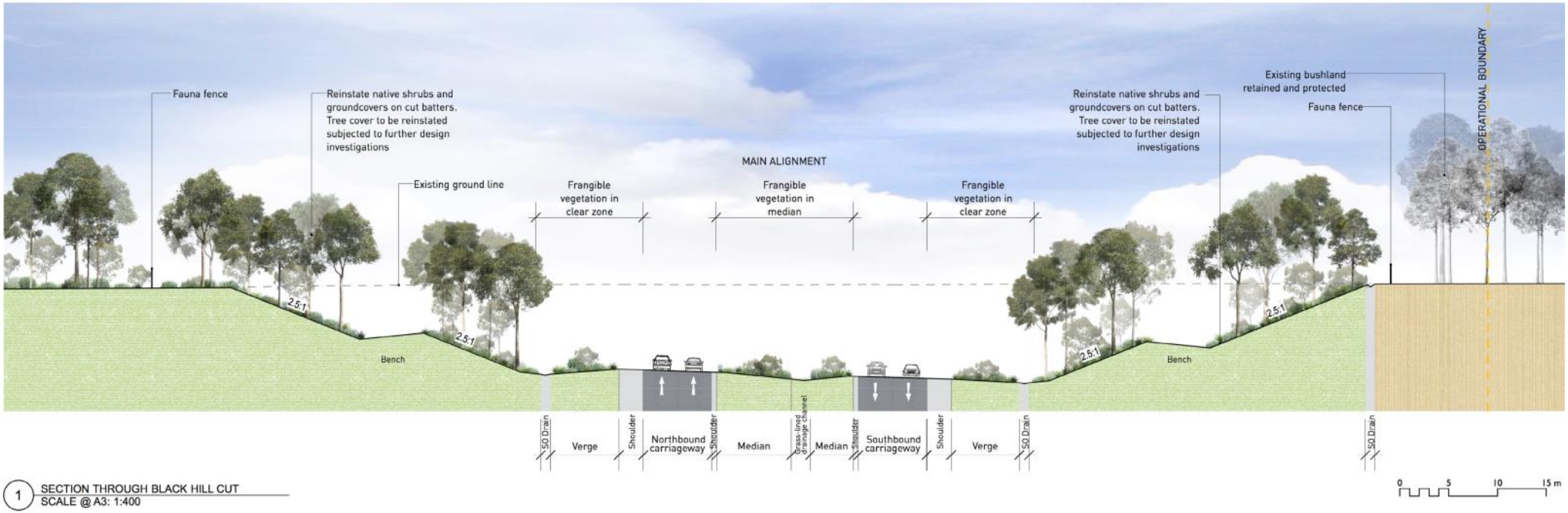


Figure 15-4 Cross section (indicative only) at Black Hill cut, about 700m east of the existing M1 Pacific Motorway at Black Hill

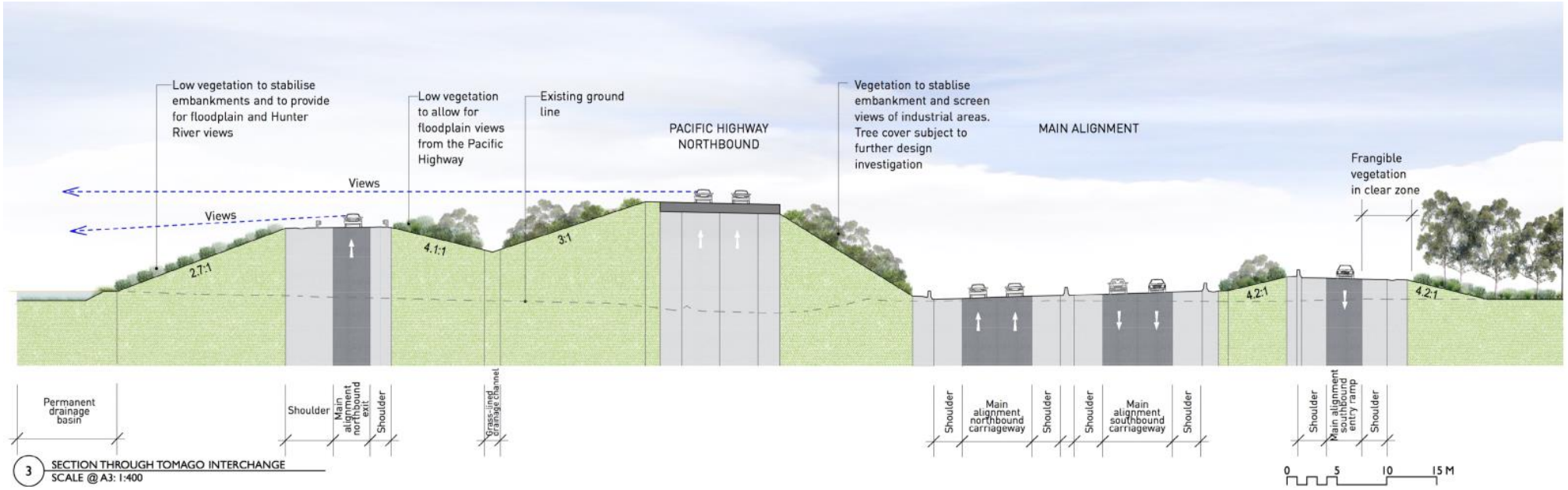


Figure 15-5 Cross section (indicative only) at Tomago Interchange, about 400m north of Tomago Road at Tomago

Table 15-4 Proposed urban design treatments for project elements

Project element	Description	Proposed urban design treatment
Interchanges	Four new interchanges to provide free-flowing connections for motorists travelling on the main alignment	• Interchanges would be of a type typical for motorway environments • Urban design surrounding the interchanges would be consistent with that of the main alignment and in accordance with respective standards and guidelines. • Major components of interchanges such as bridges and retaining walls are outlined further below
Bridges and viaduct structures (Refer to **Section 5.3.5**)	Twelve bridges to be designed as either: • Type 1 (over roads) – Considered design approach that can signal landmarks for orientation and wayfinding for the motorist. • Type 2 (over floodplains and wetlands) – Simple and refined structural design would be key to the creation of a new landmark that responds to the cultural and community context as well as the functional requirements.	**Type 1 bridges** • Perforated metallic cladding along bridge parapets that is integrated with the bridge safety screen. The design of the safety screen would reinforce the horizontal form of the bridges and help reduce visual bulk. The colour of safety screens and cladding serves to differentiate the respective road corridors and respond to the waterways and floodplains of the study area • The remaining visible elements of the superstructure and substructure would remain standard concrete colouring and exhibit subtle design detailing. Examples might include chamfered corners or tapered piers and headstocks with a smooth plain concrete finish • Safety screen posts would match the parapet cladding colour. Safety screen mesh would be of a type and colour that would maximise transparency • The spill-through bridge abutments would be a simple concrete paved finish in a dark grey colour to provide a restrained finish that visually recedes relative to the adjoining landscape. **Type 2 bridges** • Design bridges to be efficient and functional structures that exhibit simplicity of form and character. Standard details for the parapets and bridge rail barriers would maximise views for motorists to surrounding areas • Standard bridge detailing would be appropriate for the superstructure and substructure in order to maximise ease of construction and maintenance • The spill-through bridge abutment would be a simple rip-rap finish to meet scour protection requirements.
Retaining walls (Refer to **Section 5.3.6**)	Three retaining walls designed to maximise visually open arrangements under bridges	• Treated to ensure surfaces restrict glare, where appropriate • Where possible, well set back from traffic lanes to allow the use of vegetation to soften the wall façade and maintain a green outlook that corresponds to the project's setting.

Project element	Description	Proposed urban design treatment
Noise barriers (Refer to **Section 5.3.14**)	Three noise barriers in locations where there are either existing noise barriers present or on alignments that closely follow existing road corridors to minimise changes to the existing environment and the associated landscape character and visual impacts	• Use finishes and materials that are sympathetic to the immediate setting as well as the local environment, reduce the perceived scale of noise walls and contribute to the amenity and visual quality of the area • Integrate noise walls with project design, including road furniture and landscape elements, to ensure a considered composition of all elements • Where it is safe and feasible provide space for screening vegetation on both sides of noise barriers, in order to maintain the predominantly green landscape outlook, and to soften the perceived scale of walls
Earthworks, including cuttings and embankments (Refer to **Section 5.3.6** and **Section 5.4.5**)	A number of cuttings and embankments would be required along the main alignment due to the undulating topography	• All slopes would be revegetated to integrate the project with the surrounding landscape. **Cuttings** • Vegetation that incorporates trees is preferred outcome to maximise integration with surrounding bushland • Rounding of the top edges of the batters would be applied to transition from batter slopes to natural ground • Cut batters left in natural stone where stable and revegetation is not reasonable and feasible • Seek to avoid the use of shotcrete in cuttings. Shotcrete would only be used in locations where unstable geology unsuitable for vegetation is uncovered. **Embankments** • Project alignment has been developed to generally follow the edge of the floodplain where embankments would integrate with rising topography • Vegetation of embankments to soften their appearance and to reflect and integrate with the surrounding landscape • Installation of trees at the bottom of embankments, where feasible • Flattening out the toes of steep embankments would be flattened out to achieve better integration with the surrounding landform.

Project element	Description	Proposed urban design treatment
Drainage and stormwater (Refer to **Section 5.4.8** to **Section 5.4.11**)	Water quality controls such as 39 permanent water quality basins, vegetated swales and spill containment bunds at drainage outlets	**Water quality** • Use of vegetated swales on the approach to water quality basins would be maximised to assists in visually integrating swales with the landscape setting • Construction basins would be converted to operational wherever possible, to avoid extensive impacts from basin construction. **Creek adjustments** • Adjusted creeks would be rehabilitated with vegetation following construction of the project
Roadside furniture (Refer to **Section 5.3.11**)	A range of roadside furniture will be implemented to support safety in operation	• Roadside furniture would be of a type typical for motorway environments and would be placed in accordance with respective standards and guidelines
Pedestrians, cyclists and public transport (Refer to **Section 5.3.16** and **Section 5.3.17**)	The project would include a shared path and consistent widened shoulders for on road cyclist use	• Urban design would be consistent with that of the main alignment.
Property access and residual land (Refer to **Section 5.3.20** and **Section 14.4.1**)	A new access road into the Hunter Region Botanic Gardens would be required, as well as realignment of two existing access roads Following construction, land not required for the ongoing operation of the project would be reinstated to its original use or as agreed with affected property owners or disposed of	• Urban design treatments for the new and realigned access roads would be progressed during detail design • Land subject to temporary use will be rehabilitated as soon as practicable to an appropriate land use, taking into consideration the location, land use characteristics, area and adjacent land uses in consultation with the relevant council and/or the land owner.

Landscape design

The landscape design for the project provides specific direction for landscape work associated with the project, including to:

- Provide vegetative cover
- Stabilise the embankments and other disturbed areas
- Complement adjoining cultural and natural landscapes, helping to integrate the project with the local area and mitigating the landscape character and visual impacts associated with the project
- Restore native plant communities to maximise integration with existing PCTs.

Landscape design principles

The landscape design is based on the following principles:

- Retain existing vegetation where possible
- Vegetate all areas affected by the project and construction work to their existing condition, including appropriate weed management (refer to **Section 9.5**)
- Re-establish native PCTs where they would be disturbed in order to restore ecological and habitat values and help biodiversity protection and recovery, where feasible
- Provide distinct and/or larger plant stock in key locations such as urban interfaces and visitor destination to create visual landmarks or highlights
- Provide trees in verges and medians where it is safe and feasible to do so
- Use vegetation to visually separate travel lanes and road corridors, where it is safe to do so, in order to:
  - Reduce the visual and landscape character impacts of multiple parallel travel lanes
  - Maintain a green outlook consistent with the regional setting and floodplain location.
- Use vegetation to screen the project from nearby sensitive receivers, where appropriate and feasible
- Place vegetation with regard to the presence of existing utility services assets and in accordance with the requirements of the respective asset owner
- Use predominantly large-scale revegetation techniques such as seeding applications and/or bushland restoration
- Maximise the use of locally sourced plant material for all native vegetation including locally collected seed and plants grown from locally collected seed.

Crime prevention through environmental design

The project, through its urban design principles and objectives, has made a commitment to the provision of safe connections for all users through the integration of CPTED principles. These principles have been applied using design and place management principles as follows:

- Surveillance: People feel safe in public areas when they can easily see and interact with others. Would-be offenders are often deterred from committing crime in areas with high levels of surveillance. The project achieves deterrence by:
  - Clear sightlines between public and private places, ensuring passive surveillance by motorists
  - Vegetation that does not provide potential offenders with a place to hide or entrap victims by maximising sightlines and passive surveillance.
- Access control: Physical and symbolic barriers minimise opportunities for crime and increase the effort required to commit crime by channelling or restricting the movement of people. The project achieves effective access control through the use of fencing to create physical barriers that restrict access and are reinforced by signage provided as required in accordance with the relevant Transport guidelines and design standards.

- Territorial reinforcement: Community ownership recognises that people often feel comfortable in places which feel owned and cared for. The project achieves territorial enforcement and community ownership through:
  - The application of the urban design objectives and principles, to ensure the project constitutes an interesting an enjoyable motorway that integrates with surrounding communities
  - Project elements designs that allow for safe and cost-effective maintenance to ensure that the project maintains a well-cared for appearance, consistent with this principle.
- Space management: Ensures that space is appropriately utilised and well cared for and is linked to the principle of territorial reinforcement. Space management strategies include:
  - Site cleanliness
  - Rapid repair of vandalism and graffiti
  - Replacement of burned out lighting
  - Removal or refurbishment of decayed physical elements.

Note that there would be no need for the project to provide public space for good surveillance at night as the project would not provide any public places where people would be expected to gather.

Assessment of noise barriers

The project includes new and relocated noise barriers with a height of about 3.8 metres for noise barrier NB02 and about four metres for noise barrier NB03 (noise barrier locations are shown on **Figure 8.5**).

All noise barriers were assessed for changes to visual impact spatial character. While NB02 and NB03 were further assessed for visual and overshadowing impacts that may result from an increase in noise barrier height, NB01 would be relocated at its existing height and was not assessed for an alternative height.

15.4 Existing environment

15.4.1 Landscape character

Seven LCZ were identified within the study area as described in **Table 15-5** and shown on **Figure 15-6.** As discussed in **Section 15.2.2**, landscape sensitivity is a record of the inherent and intrinsic sensitivity of the landscape and the degree to which it can accommodate change. The sensitivity of each LCZ is also provided in **Table 15-5**.

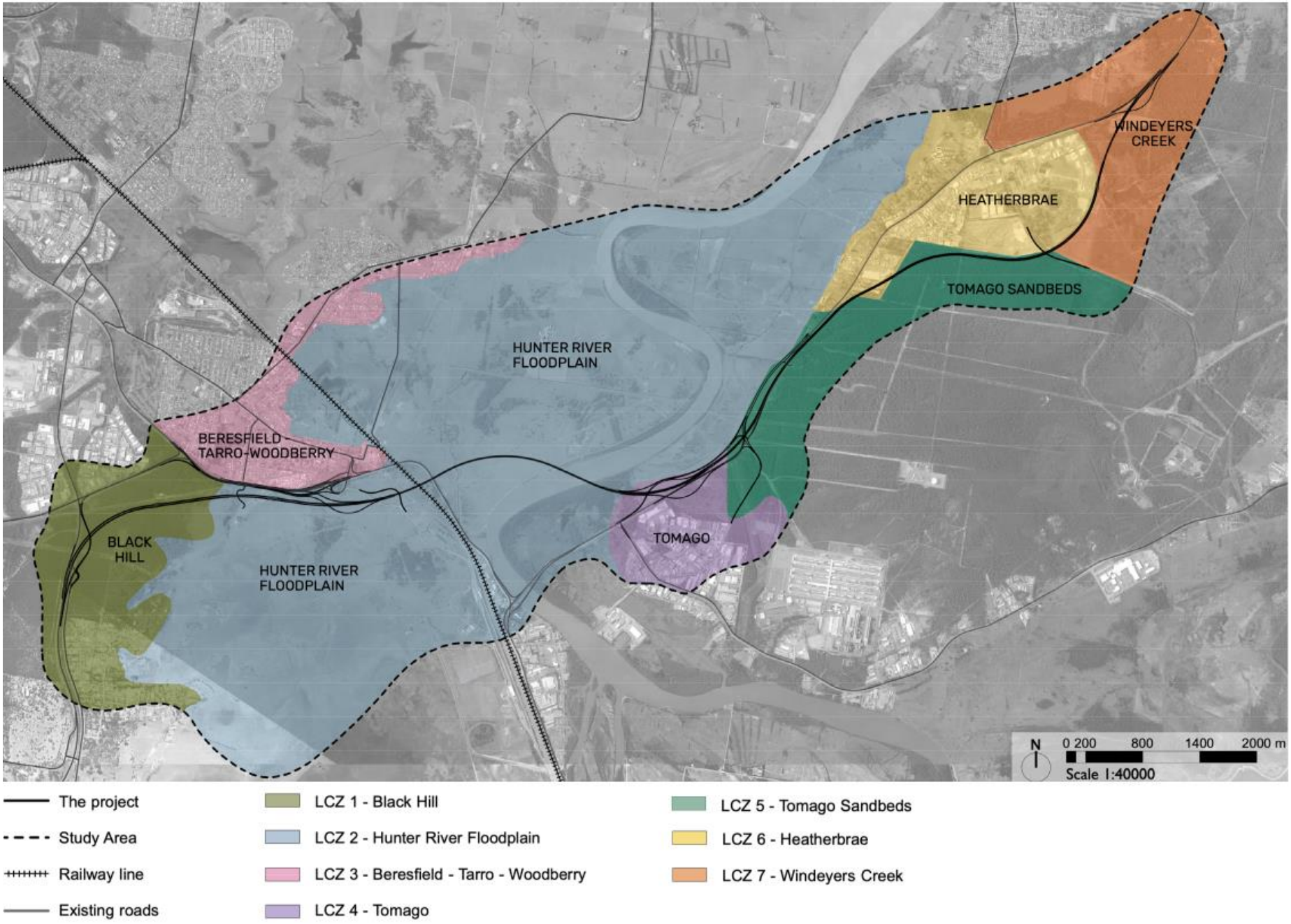


Figure 15-6 Landscape character zones within the study area

Table 15-5 Landscape character zones within the study area

LCZ	Imagery	Description	Sensitivity
LCZ1: Black Hill		The Black Hill landscape is characterised by dense native woodlands incised by clearings for the existing M1 Pacific Motorway, John Renshaw Drive and utility easements. The area is situated on elevated land adjacent the Hunter River floodplain and Hexham Swamp and includes rural residential properties in Black Hill. The topography is gently undulating.	**Moderate** Due to the undulating topography and extensive tree cover, changes within this LCZ would not be widely visible beyond the project's operational footprint. However, bushland in the LCZ is important as a visual backdrop to the open floodplain. Accommodating change of the order brought about by the project would not be possible without altering the spatial qualities and landform of the LCZ.
LCZ2: Hunter River Floodplain		The Hunter River Floodplain landscape is characterised by the low-lying and flat topography of the floodplain and its predominant grazing land use. There are also large areas of wetlands and natural swamps including Hexham Swamp. Intermittent stands and clumps of swamp and floodplain forests as well as stands of mangroves along the Hunter River provide a contrast with the low-growing vegetation cover associated with grazing and swampy and wetland areas.	**High** The predominantly greenfield setting and the open landscape character with expansive views in all directions result in a low capacity to absorb change of the order associated with the project.

LCZ	Imagery	Description	Sensitivity
LCZ3: Beresfield – Tarro – Woodberry		The Beresfield – Tarro – Woodberry landscape comprises the urban areas of Beresfield, Tarro and Woodberry. These areas are characterised by predominantly low-density residential areas located on gently undulating land on higher ground overlooking the floodplain. Each suburb has a small centre and incorporated public open space and recreation areas. A light industrial area/employment area is located in Beresfield north of and next to John Renshaw Drive.	**Moderate** The primarily residential urban areas of Beresfield, Tarro and Woodberry would be highly sensitive to changes that alter the character, function and built form of the setting such as would be associated a new motorway. This sensitivity would be somewhat reduced by the proximity of the existing New England Highway in the adjoining LCZ 2.
LCZ4: Tomago		The Tomago landscape is distinct from other urban areas surrounding the project, functioning primarily as an employment area with a diversity of industrial uses, the largest of which is aluminium smelting at Tomago Aluminium. Pockets of native open forests and woodland remain including along the road system and the edges of major power easements.	**Low** The LCZ is an existing urban area that would be compatible with the change of the nature involved with the project. Sensitive character elements include large stands of remnant bushland and long-distance views over the Hunter River floodplain from the edge of the LCZ.

LCZ	Imagery	Description	Sensitivity
LCZ5: Tomago Sandbeds		The Tomago Sandbeds landscape is characterised by dense native woodland cover into large blocks by power easements and associated access and management tracks. The western edge encompasses elevated land along the edge of and overlooking the Hunter River Floodplain including the existing Pacific Highway alignment.	**Moderate** The majority of the LCZ constitutes a greenfield site densely vegetated with remnant bushland. Due to extensive tree cover, changes within the bushland portion of the LCZ would not be widely visible beyond the project. However, bushland in the LCZ is important as a visual backdrop to both the open Hunter River floodplain and the urban areas of Heatherbrae. Accommodating change, of the order of the project, would not be possible without altering the spatial qualities of the LCZ.
LCZ6: Heatherbrae		The Heatherbrae Village landscape is characterised by the small urban centre of Heatherbrae, situated above the edge of the Hunter River floodplain and laid out along the existing Pacific Highway. The centre functions as a local residential, service and employment centre.	**Moderate** The LCZ is an existing urban area that comprises a wide range of uses including large industrial areas that would constitute the predominant land use interfacing with the project. Industrial areas would generally be compatible with the change of the kind associated with the project. Higher levels of sensitivity are associated with residential and community uses, as well as with remnant and heritage listed vegetation.

LCZ	Imagery	Description	Sensitivity
LCZ 7: Windeyers Creek		The Windeyers Creek landscape separates the urban area of Heatherbrae from the urban area of Raymond Terrace. The landscape character constitutes a highly modified landscape along Windeyers Creek and the Grahamstown Drain and incorporates associated wetlands and tributaries. It is characterised by a mix of native vegetation, wetlands, pastures and pine plantations. It also has important water management functions that include the Raymond Terrace water treatment works.	**Moderate** The majority of the LCZ comprises of dense vegetation including native bushland remnants and pine plantations. Changes in heavily vegetated areas would not be widely visible beyond the project but would be more difficult to absorb in open areas. The cemeteries and wastewater treatment works would be sensitive to change while the existing Pacific Highway and M1 Pacific Motorway would be able to absorb further road upgrades.

15.4.2 Existing views

Nineteen key viewpoints within the VEM were selected to represent the surrounding area and environment. The location and sensitivity of each viewpoint is provided in **Table 15-6** and **Figure 15-7**. Photographs of each of the viewpoints are provided in **Table 15-9**.

Table 15-6 Existing viewpoints within the VEM

Viewpoint	Description	Potential viewers	Sensitivity
1	Existing M1 Pacific Motorway near Lenaghans Drive at Black Hill, looking north-east.	Motorists travelling north on the M1 Pacific Motorway.	**Moderate** Existing road and utility infrastructure and the grassed median comprise a large portion of the existing view composition. However, a notable portion of the view consists of remnant bushland that frames and characterises this section of the existing M1 Pacific Motorway.
2	Existing M1 Pacific Motorway, about 150m south of the Weakleys Drive and John Renshaw Drive intersection, looking south-east towards the new Black Hill interchange.	Motorists travelling north along the existing M1 Pacific Motorway, south along Weakleys Drive, south onto the M1 Pacific Motorway and east or west along John Renshaw Drive	**Low** Existing road infrastructure comprises a large portion of the existing view composition. However, a portion of the view comprises remnant bushland that frames the M1 Pacific Motorway and John Renshaw Drive.
3	Eastern end of Walter Parade at Lenaghan looking north-east across the floodplain.	Residents in Black Hill overlooking the Hunter River floodplain.	**High** Residents have an open rural outlook over pastures and wetlands in the Hunter River floodplain.
4	Quarter Sessions Road, corner of the New England Highway, Tarro, looking south-west.	Residents of nearby properties, visitors to Palm Valley Village and motorists travelling south on Quarter Sessions Road.	**High** This viewpoint provides for open views from the edge of the Tarro urban area across the Hunter River floodplain, towards the wooded hills surrounding Hexham Swamp. The openness of the view would be sensitive to change. The New England Highway is in the foreground of the view but constitutes a relatively small portion of the composition of this view.
5	Tarro residential areas, looking in a south-easterly direction.	Residents and visitors at the Palm Valley Village and Caravan Park, motorists along the New England Highway and of views from nearby residences in Eastern Avenue including the historic residence at 29 Eastern Avenue.	**High** Sensitive elements in this view include vegetation such as mature trees that provide visual separation between the rear of residences in Eastern Avenue and the existing New England Highway exit ramp. Residential viewers would be highly sensitive to change in the outlook from their homes and private outdoor areas.

Viewpoint	Description	Potential viewers	Sensitivity
6	Eastern end of Anderson Drive, Tarro looking south.	Residents of Anderson Drive. Staff and visitors to the Pumping Station and Tarro Substation.	**Moderate** This viewpoint provides for open views across the Hunter River floodplain and towards the hills surrounding Hexham Swamp. The open view of grazing lands, wetlands and stands of trees would be highly sensitive to change. The foreground of the viewpoint is comprised of the New England Highway.
7	Rail station at Tarro, looking in a south-easterly direction from the southbound station platform.	Rail customers	**High** The viewpoint is comprised of the grazing landscape of the Hunter River floodplain. Detracting elements reducing sensitivity include existing low and high voltage power lines as well as degraded rural structures. However, the landscape is open to long-distance views and would not easily absorb change. It would be seen by rail customers for possibly extended periods of time while they wait for the train.
8	Open space in Redbill Drive, Woodberry, opposite the intersection with Eagle Close, looking south-east.	Residents of Woodberry	**High** This viewpoint is comprised of open space, grazing lands and wetlands in the Hunter River floodplain. It illustrates expansive views over the open landscape that would be sensitive to change
9	New England Highway in Tarro, looking north.	Motorists travelling along the New England Highway westbound and train passengers traveling on the Main North Rail Line.	**Moderate** A large portion of this viewpoint is comprised of the New England Highway road corridor and would have a low level of sensitivity towards change. This is balanced by highly sensitive elements in the view which include existing roadside tree cover and views across the open floodplain in the east
10	Pacific Highway Hexham Bridge over the Hunter River at Hexham, looking north-west.	Motorists travelling along the Pacific Highway towards Taree and view from the parallel, heritage listed Hexham Bridge where motorists travel towards Hexham.	**High** The elevated viewing position from the Hexham Bridge provides for open and panoramic views over the floodplain towards the hills and mountains beyond. The major visual element in the view is the Hunter River itself which would be highly sensitive to change. Despite the prominence of high voltage transmission lines, this viewpoint represents a memorable event along the route.
11	Tomago Road at the existing Pacific Highway intersection in Tomago, looking north-east.	Motorists travelling along Tomago Road, north along the Pacific Highway, industrial workers in Tomago and residents and visitors at the Tomago Village Van Park.	**Moderate** Located at an important intersection, predominately comprised of existing road infrastructure with a low level of sensitivity to change. Mature tree cover on the northern side of the Pacific Highway provides a strong visual frame to the road corridor and would be sensitive to change.

Viewpoint	Description	Potential viewers	Sensitivity
12	South side of the Hunter River, about 500m east of the Hunter River bridge (B05), near the confluence of a small drainage canal with the Hunter River in Tomago. View is looking west.	Water-based viewers, including tourists on river charter services and people engaged in commercial and recreational boating, as well as farmers on the adjacent land.	**High** The view is characterised by the natural setting of the Hunter River and its riverside forests. Views are expansive with the open sky above the wider river a second important, visually highly sensitive component of the view. High voltage transmission line stanchions are visual detractors but overall, the natural environment dominates the composition.
13	Bus stop and U-turn bay along the northbound Pacific Highway, opposite the Hunter Region Botanic Gardens in Heatherbrae, looking south-west.	Motorists travelling south along the realigned Pacific Highway and the main alignment, and the section of the Pacific Highway between Heatherbrae and Tomago generally that follows the edge of the floodplain.	**Moderate** This viewpoint provides for open views from the Pacific Highway across the Hunter River floodplain, towards the hills and mountains in the west. The open vistas, clumps of tree cover and the overall rural landscape character would be sensitive to change, despite the detracting presence of high voltage transmission lines. The Pacific Highway comprises the left portion of the view and would be much less sensitive to change.
14	Hunter Region Botanic Gardens entrance, looking west.	Visitors and staff at the Hunter Region Botanic Gardens.	**High** The Hunter Region Botanic Gardens is a tourism and local recreation destination. The entrance road currently looks out over the Hunter River floodplain with its combination of grazing lands and tree cover. This outlook would be highly sensitive to change. The existing Pacific Highway constitutes only a minor portion of the view.
15	Northern edge of the Pacific Highway near 2179 Pacific Highway, Heatherbrae, looking south-west.	Motorists on the Pacific Highway, adjoining residents and business in southern Heatherbrae and people waiting for the bus.	**Moderate** The view is at the southern entrance to Heatherbrae, an important centre for employment and services including schools and residential living. While the view is along the existing Pacific Highway road corridor which would have a low sensitivity to change, more sensitive elements in the view include the large stand of bushland on the southern side of the road corridor, the long vista along the road corridor and the avenue of mature trees on the northern side of the road corridor.
16	Masonite Road in Heatherbrae, looking south-east.	Motorists travelling along Masonite Road.	**Moderate** The view along Masonite Road is comprised of the two lane road formation, adjoining grass and gravel verges, cleared land in future employment areas framed by bushland within the project's operational footprint. A mix of tree cover is also present along the eastern side of the road.

Viewpoint	Description	Potential viewers	Sensitivity
17	South-eastern end of Camfield Drive, Heatherbrae (near Ivory Close) looking south-east.	Workers and visitors to the Camfield Drive industrial estate and the future Kinross industrial estate.	**Low** The view is located within the developing industrial estate. The vast majority of the view is composed of the subdivision under development and represents a visually poor outlook across future industrial lots and the project operational footprint which is already mostly cleared. Pine plantations are located beyond the project's operational footprint and provide a visual backdrop that would have higher level of sensitivity to change.
18	Pacific Highway north of the existing Windeyers Creek bridge north of Heatherbrae, looking north-east.	Motorists travelling north along the Pacific Highway.	**Moderate** The view is taken along the existing northbound Pacific Highway travel lanes. The Pacific Highway constitutes the major compositional element and would have a low level of sensitivity to change. Mature vegetation provides a consistent green and dense edge along both sides of the road corridor and would be sensitive to change.
19	Pacific Highway in Raymond Terrace, about 300m north of the proposed Raymond Terrace interchange, looking south-west.	Motorists travelling south along the existing Pacific Highway.	**Moderate** The view is located on the existing southbound Pacific Highway travel lanes. The Pacific Highway constitutes the major compositional element and would have a low level of sensitivity to change. Mature vegetation provides a consistent and dense green edge along both sides of the road corridor and would be highly sensitive to change.

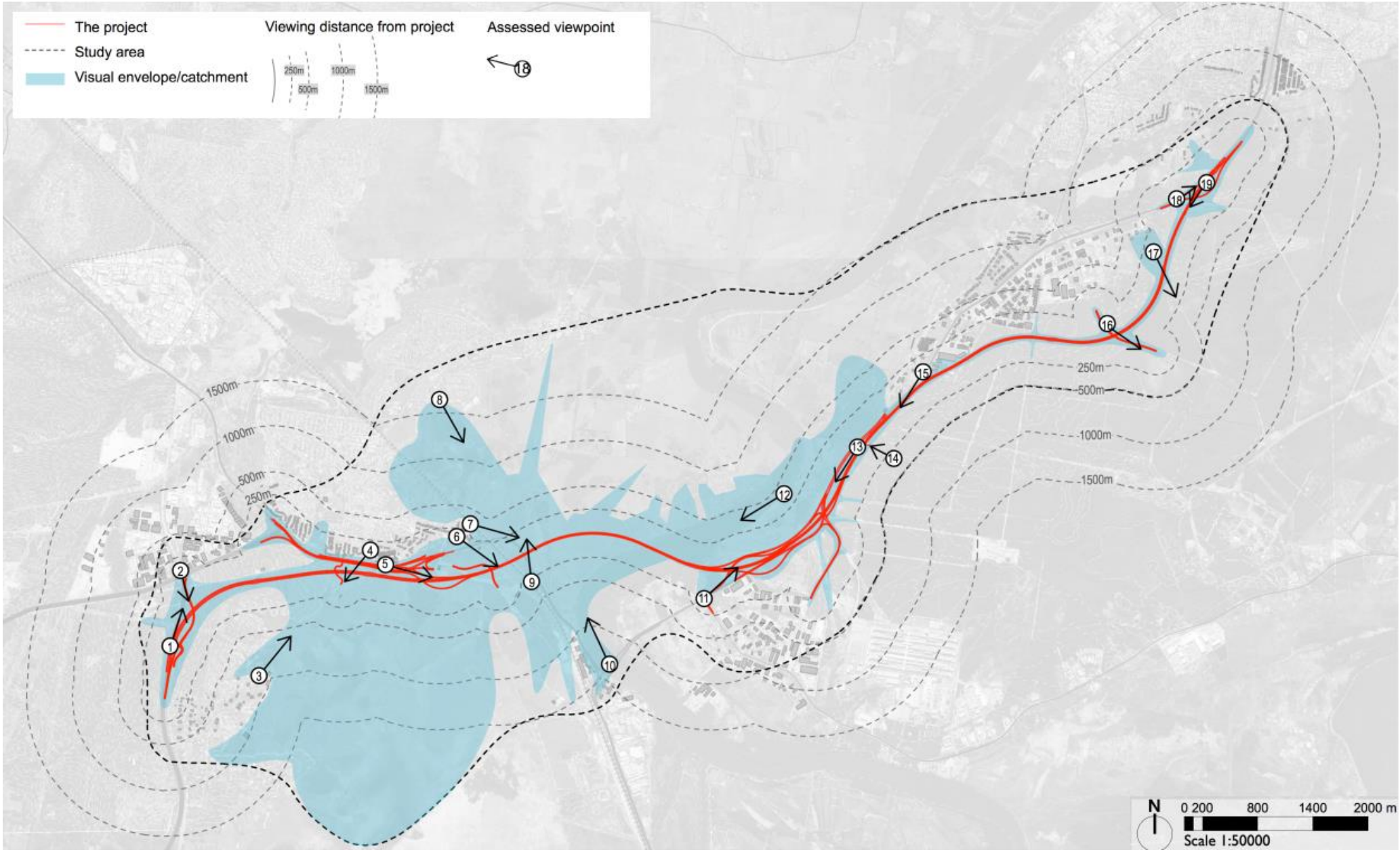


Figure 15-7 Visual envelope and viewpoint locations

15.5 Assessment of potential impacts

15.5.1 Construction

Landscape character

Construction-related landscape character impacts would vary across the construction footprint depending on the construction activities being carried out at the time.

The key construction activities that have the potential to result in landscape character impacts include:

- Establishment of the construction footprint including vegetation removal, fencing and hoarding
- Ancillary facilities establishment and operation including vegetation removal, fencing and hoarding
- Construction activities including the operation of plant and equipment
- Construction-related traffic movements including workforce movements
- Traffic management including temporary traffic changes and management measures
- Temporary lighting for night work and traffic management.

Construction activities would take place in all LCZs and result in temporary landscape character impacts within the respective LCZs.

LCZs that have a high sensitivity to change would experience greater landscape character impacts during construction. The landscape character impacts of the project during construction are expected to be:

- High for the Hunter River Floodplain (LCZ 2)
- High-moderate for Tomago Sandbeds (LCZ 5)
- Moderate for the Black Hill (LCZ 1), Beresfield-Tarro-Woodberry (LCZ 3), Heatherbrae (LCZ 6) and Windeyers Creek (LCZ 7)
- Moderate-low for the Tomago LCZ (LCZ 4).

Overall, impacts during construction are temporary in nature and would be managed, where possible, through appropriate siting of infrastructure, materials and finishes of sheds and hoardings, and management of traffic in the study area.

In order to prevent adverse impacts on the health and wellbeing of sensitive receivers in close proximity, all night work and lighting would be managed in accordance with statutory requirements and guidelines to ensure that there would be no unacceptable lighting impacts. Lighting procedures and management measures would be documented in the CEMP and carried out accordingly. This may include consideration of lighting levels, projection angles, direction, and length of frequency of exposure.

Visual impacts

Temporary visual impacts would result from general construction activities, the movement and operation of plant and machinery as well as the erection of temporary structures including fencing, hoarding, working platforms and ancillary facilities. Sources of visual impacts during construction typically include a combination of vegetation removal, the visibility of temporary structures, barriers, hoardings, signage and ancillary facilities including stockpiles, machinery and plant, buildings, lighting, construction work activities and increased vehicle movements.

During construction, partially constructed operational project elements would also result in changes to viewpoints. Therefore, project construction would result in at least the same amount of change to existing views as operation of the project, without the benefit of progressive vegetation and visual impact mitigation that would reduce the visual impacts of the project during operation. As a consequence, construction visual

impacts would generally be of equal or greater magnitude than operational visual impacts but for a limited length of time.

The visual amenity impacts of the project during construction are expected to be:

- Five viewpoints (VP4, 5, 7, 12, 14) would have a high visual impact
- Ten viewpoints (VP1, 3, 6, 9, 11, 13, 15, 16, 18, 19) would have a high to moderate visual impact
- Three viewpoints (VP2, 8, 10) would have a moderate visual impact
- One viewpoint (VP 17) would have a moderate to low visual impact.

The type and intensity of construction facilities and activities would vary throughout the duration of construction. As the nature and intensity of construction activities changes, temporary visual impacts would also vary. The above visual impact ratings would therefore constitute a worst case and may at times be lower than those identified. Further information on the visual amenity assessment for construction impacts is provided in the Urban Design, Landscape Character and Visual Amenity Working Paper (**Appendix O**).

Impacts during construction would be temporary in nature and would be mitigated where possible through appropriate siting of infrastructure, materials and finishes of structures and hoardings, the management of light spill and progressive rehabilitation of vegetation. Management measures are detailed **Section 15.6**.

15.5.2 Operation

Landscape character

Landscape character impacts would vary along its length as result of the different levels of landscape character sensitivity and magnitude of the project elements.

Beneficial landscape character impacts would be associated with:

- Enhanced access and connectivity within and between LCZs through improved flood immunity
- Reduced congestion and a reduction in freight movements in existing road corridors and urban centres
- A more direct and continuous cycle route option between Black Hill and Raymond Terrace along the project road shoulders
- Enhanced town centre amenity in Heatherbrae as a result of reduced traffic, in particular freight traffic
- Opportunities for new views over the open Hunter River floodplain landscape, enhancing the experience for motorists and cyclists with improved orientation and wayfinding.

Residual adverse landscape character impacts would be associated with:

- Built form changes including new motorway infrastructure duplicating existing road corridors in some areas and extending through greenfield sites in others
- Impacts on heritage items including removal of non-Aboriginal heritage and Aboriginal heritage items
- Clearing of remnant native vegetation resulting in changes to the spatial character, and increased fragmentation of bushland at Black Hill
- Changes to the spatial character altering the outlook and views including as a result of noise barriers in new locations.

Potential landscape character impacts are discussed in **Table 15-7** in relation to the landscape character zones identified in **Figure 15-6**.

Table 15-7 Summary of landscape character impacts during operation

LCZ	Sensitivity	Magnitude	Impact
LCZ1: Black Hill	Moderate	**Moderate** The project would increase the amount of the road-related infrastructure in this LCZ. It would require clearing of remnant bushland vegetation and result in changes to the natural landform to accommodate the project's geometric requirements, including the large Black Hill cut (C01). The changes would affect the spatial character of this LCZ. Beneficial outcomes from the project would be a reduction in traffic volumes on John Renshaw Drive and the New England Highway, reducing congestion and improving connectivity. The provision of a more direct cycle route along the project also delivers further connectivity improvements.	Moderate
LCZ2: Hunter River Floodplain	High	**Moderate** The project would increase the amount of the road-related infrastructure. Changes to the spatial qualities of the LCZ and its vegetation cover would be minor, with disturbed vegetation reinstated following project construction. The open spatial experience travelling along the New England Highway would be replaced with a similar experience along the main alignment. The project would impact on the heritage values and significance of the Glenrowan Homestead through removal of the weatherboard cottage and bisection of the curtilage, affecting the integrity, vistas and landscape setting of the complex. Beneficial outcomes from the project would be a reduction in traffic volumes on the New England Highway, reducing congestion and improving connectivity. The provision of a more direct cycle route along the project delivers further connectivity improvements.	High to moderate
LCZ3: Beresfield – Tarro – Woodberry	Moderate	**Low** The main project infrastructure introduced into LCZ would be new noise barriers along the New England Highway. New noise barriers would result in the loss of the open interface to the Hunter River floodplain in LCZ 2, changing the spatial character at the edge of LCZ 3. This would affect a relatively small portion of this LCZ and would provide other amenity benefits such as a reduction in noise impacts on residential dwellings in close proximity to the New England Highway. Due to the alignment of the project within existing major road corridors located outside the Beresfield-Tarro-Woodberry LCZ, the existing character of sensitive residential areas would not be altered.	Moderate to low
LCZ4: Tomago	Low	**Low** The project infrastructure would be consistent in character with existing industrial and road corridor uses in LCZ 4. The most notable changes would be associated with the new Tomago interchange including the realignment of the Pacific Highway north of the Tomago Road intersection, with separation of the northbound and southbound travel lanes. This would affect the spatial qualities in the northern portion of the LCZ and increase the amount of the road-related infrastructure in the zone. The spatial experience along the Pacific Highway would be replaced with a similar experience along the project. The project would remove one rural residential dwelling which would otherwise be removed as part of the proposed Newcastle Power Station. There would be no impacts on public domain and key activity areas. Improved traffic flow would benefit the functionality of industrial and employment areas. The provision of a more direct cycle route along the project delivers additional connectivity improvements.	Low

LCZ	Sensitivity	Magnitude	Impact
LCZ5: Tomago Sandbeds	Moderate	**High** The project would result in an increase in the amount of the road related infrastructure including a new cleared road corridor through remnant bushland areas. It would alter the bushland backdrop to Heatherbrae, replacing it with road infrastructure. It would require clearing of a large tract of remnant bushland and result in changes to the natural landform to accommodate the project's geometric requirements, resulting in a deep cutting. The changes would affect the spatial character of this zone. Beneficial outcomes from the project would be a reduction in traffic volumes on the Pacific Highway, reducing congestion and improving connectivity. The provision of a more direct cycle route along the project delivers active transport connectivity improvements. The shared path along Masonite Road provides the opportunity for future expansion of the cycle network by Port Stephens Council, should this be desired. The signalised intersection at the Hunter Region Botanic Gardens access road would improve pedestrian and cyclist access to the Hunter Region Botanic Gardens, including from the bus stop on the western side of the Pacific Highway.	High to moderate
LCZ6: Heatherbrae	Moderate	**Low** The project would result in a relatively minor increase in road related infrastructure in the Heatherbrae LCZ. It would alter the bushland backdrop to Heatherbrae through clearing in the adjoining Tomago Sandbeds and Windeyers Creek LCZs, although this change would be somewhat offset over time by landscaping provided as part of the project. Beneficial outcomes from the project would be a reduction in traffic volumes on the Pacific Highway, reducing congestion and enhancing town centre amenity for residential and community uses. The provision for cycling along the project's shoulders delivers active transport connectivity improvements. The shared path along Masonite Road provides the opportunity for future expansion of the cycle network by Port Stephens Council, should this be desired.	Moderate to low
LCZ 7: Windeyers Creek	Moderate	**Moderate** The project would result in a large increase in the amount of the road-related infrastructure including a new motorway through greenfield areas. However, much of the project's operational footprint is already cleared, with the exception of minor portions north-east of Heatherbrae. The spatial qualities within the Windeyers Creek LCZ overall would not be altered by the project and the project would be compatible with the character of the existing M1 Pacific Motorway as well as with the industrial area in the adjoining Heatherbrae LCZ. Beneficial outcomes from the project would be a reduction in traffic volumes on the Pacific Highway, reducing congestion and improving connectivity. The provision for cycling along the main alignment delivers active transport connectivity improvements. The shared path along Masonite Road provides the opportunity for future expansion of the cycle network by Port Stephens Council, should this be desired.	Moderate

Visual impact

Based on the sensitivity of the views to change and the magnitude of change to the view as a result of the project, the project's visual impacts would vary in intensity. Higher impacts would result where elements that are sensitive to change would be altered by the project, such as removal of remnant bushland for an interchange at Black Hill the loss of open views of the landscape such as at Tarro and the Hunter Region Botanic Gardens.

The visual impact of the project from the 19 viewpoints (identified in **Figure 15-7** and **Table 15-6**) are presented in **Table 15-8**. In summary:

- Two viewpoint would have a high visual impact
- Ten viewpoints would have a high to moderate visual impact
- Four viewpoints would have a moderate visual impact
- One viewpoint would have a low visual impact
- Two viewpoints would have a negligible visual impact.

Indicative photomontages with the project and embedded design mitigation in place have been provided in **Table 15-9**.

The introduction of elevated bridge and viaduct structures, noise barriers in new locations, removal and severance of remnant bushland, the introduction of embankments to negotiate interchanges and the creation of parallel road corridors adjoining each other with little visual separation result in moderate to high visual impacts. In addition, due to the open landscape setting of the Hunter River floodplain, project elements would potentially be seen from areas at a considerable distance from the project.

Where the project aligns with existing urban areas and road corridors, such as the Heatherbrae industrial area and Masonite Road, views would have a higher ability to accommodate change, reducing the overall level of impact within the moderate to low range. All but the largest project elements have substantially reduced visibility at viewing distances greater than about 1.5 kilometres. When seen from this distance, the project would have a low to negligible visual impact.

Light spill from the roadway and permanent operational lighting would add to changes to the visual environment at night however lighting would be designed in accordance with relevant Australian standards and illumination and light spill would be mostly confined within the operational footprint. Therefore, light impacts are considered to be low in the context of the project as a whole.

Table 15-8 Summary of visual amenity impacts during operation

Viewpoint	Sensitivity	Magnitude	Impact
1	Moderate	**High** The view would undergo a notable change with an increase in road infrastructure and associated bushland removal. Compensatory native vegetation between the project's southbound main alignment and the southbound entry ramp would mitigate changes to the view as vegetation matures over time.	High to moderate
2	Low	**High** The southbound entry would introduce a prominent new landform into this view, requiring the removal of bushland. Bushland would also need to be removed for drainage infrastructure including the adjustment to the drainage channel connected to Viney Creek, resulting in changes to a notable portion of this view. Vegetation installed as part of the project landscape design would somewhat reduce the visual effect of change over time.	Moderate

Viewpoint	Sensitivity	Magnitude	Impact
3	High	**Low** New road infrastructure would be visible from this viewpoint. However, the project would be at least about 1.3km from this viewpoint. Given this distance, only a minor portion of the view would change and the changes would be difficult to discern in detail.	Moderate
4	High	**Moderate** The upgrade of the New England Highway would result in the highway constituting a larger visual element in the eastern foreground of this view. The main alignment would also alter the midground of the view. The main alignment would be on embankments, which would close off much of the existing view across the floodplain and towards the distant hills.	High to moderate
5	High	**High** The major change to this view would result from noise barrier NB03 that would replace mature screening vegetation, notably altering the outlook for the residents. Project elements including the westbound New England Highway supported on a fill embankment on the approach to bridge B03 would be visible above the noise barrier and would notably alter the central part of the view.	High
6	Moderate	**Moderate** The project would alter the central portion of this view, replacing the low-lying open floodplain with a view of the main alignment on fill embankments. The effect of the project would be major new visual elements in the mid distance of the view and the loss of long-distance views across the floodplain. There would be no change to the foreground of the view. Traffic on the main alignment would be highly visible silhouetted against the sky, increasing the visibility of the project in the view. Vegetation provided as part of the project at the base of the embankments would somewhat compensate for the removal of existing stands of trees. Over time this would reduce the visual effect of the project through integration with the existing landscape setting.	Moderate
7	High	**Moderate** The viaduct over the Hunter River floodplain would introduce a large new structure, elevated above the ground, affecting the open views across the floodplain. In addition, trucks travelling along the viaduct would further increase visibility of the project in the view. The magnitude of these changes would be somewhat mitigated by the viewing distance of at least 700m. Mangrove forests currently terminating the view would be replaced with the viaduct and its substructure. The open sky would also be affected, with parts of the viaduct and traffic travelling along it visually exposed against the sky.	High to Moderate
8	High	**Negligible** The viaduct over the Hunter River floodplain would introduce a large new structure, elevated above the ground, interrupting views along the floodplain. In some areas, the viaduct would intrude into the open skyline above existing tree cover. Trucks and other vehicles travelling along the viaduct would increase the overall size of the project in the view, however, at a minimum distance of about 1.95km from the viewpoint, only a small portion of the view would be altered.	Negligible

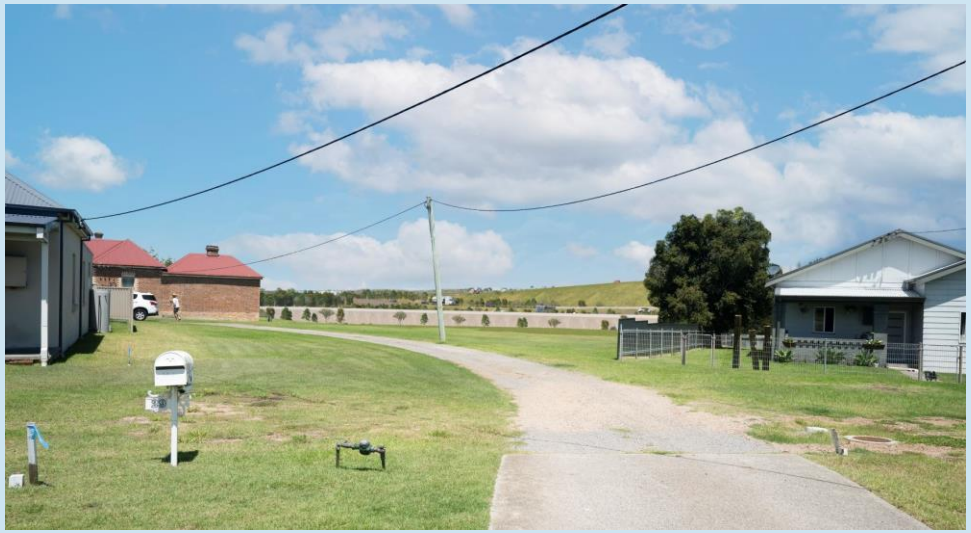
Viewpoint	Sensitivity	Magnitude	Impact
9	Moderate	**High** The viaduct above the open floodplain landscape and associated piers would introduce a new focal point into this view and alter the open outlook across the floodplain. The change to the view would be further amplified by the visual effect of traffic travelling along the viaduct including large trucks. Sensitive vegetation would be retained in the foreground, while some tree removal may be required close to the viaduct to enable construction.	High to moderate
10	High	**Negligible** The viaduct over the Hunter River floodplain would introduce a large new structure into this view. However, it would generally not protrude above the horizon line. As a result of the viewing distance (about 1.5km), the viaduct would comprise a relatively small portion of the view, being seen by viewers primarily in moving cars, and looking sideways. Tree cover and grazing lands in the floodplain, as well as the view of the hills in the background would not be affected.	Negligible
11	Moderate	**High** Clearing within the operational footprint and the construction of the new northbound Pacific Highway alignment and associated fill embankments would alter the bushland frame of the view, resulting in a high level of change.	High to moderate
12	High	**Moderate** The view is characterised by the natural setting of the Hunter River and its riverside forests. Views are expansive with the open sky above the wider river a second important, visually highly sensitive component of the view. High voltage transmission line stanchions are visual detractors but overall, the natural environment dominates the composition.	High to moderate
13	Moderate	**High** This viewpoint provides for open views from the Pacific Highway across the Hunter River floodplain, towards the hills and mountains in the west. The open vistas, clumps of tree cover and the overall rural landscape character would be sensitive to change, despite the detracting presence of high voltage transmission lines. The Pacific Highway comprises the left portion of the view and would be much less sensitive to change.	High to moderate
14	High	**High** The project would almost completely alter this view as a result of the fill embankments required to bridge the main alignment over the access road. The embankments, bridge abutments and bridge superstructure would become the main compositional items in the foreground. In the background of the view, vegetation would be removed and replaced with the realigned Pacific Highway including its intersection with the modified Hunter Region Botanic Gardens access road.	High
15	Moderate	**High** The main alignment would result in the removal of bushland on the southern side of the road corridor. Bushland would be replaced with a second road corridor within the view, resulting in change to a large portion of the view. Due to space constraints, there would be limited opportunity for vegetation to visually separate the road corridors which might contribute to reducing the visual effect over time.	High to moderate

Viewpoint	Sensitivity	Magnitude	Impact
16	Moderate	**High** The project would relocate the road corridor further to the right in the view and increase the amount of road-related infrastructure, primarily as a result of the widened footprint of Masonite Road and a fill embankment. Part of the existing road infrastructure would be able to be removed and vegetation provided to integrate with the adjoining landscape. Another change to the view would be the removal of bushland vegetation to facilitate project construction along Masonite Road. Vegetation provided as part of the project landscape work along the main alignment would partially reduce this effect over time, as vegetation matures.	High to moderate
17	Low	**Low** The project would introduce a new motorway in the middle ground of the view. Given the minor embankments, the project itself would not be obvious and alter only a minor portion of the view. The visibility of the project and changes to the outlook would primarily result from traffic along the project' main alignment. Vehicles would take up a small portion of the view and would be partially obscured by vegetation provided as part of the project landscape design between the view and the main alignment. Project vegetation would make a positive contribution to the view over time, especially as trees mature. The backdrop of plantations would not be affected by the project. The view would be subject to notable change as a result of the continuing development of the industrial area as part of the Kinross Industrial Estate/Weathertex. This will involve construction of industrial buildings that will likely block a large part of the view and would likely exceed and conceal the changes to the view brought about by the project.	Low
18	Moderate	**Moderate** The major new element in the view would be the southbound exit ramp onto the existing Pacific Highway. The fill embankments required for the exit ramp as well as removal of vegetation along the eastern side of the existing road corridor would further alter this portion of the view. Removal of the existing southbound travel lanes and replacement with vegetation provided as part of the project landscape design would over time reduce the amount of road infrastructure in the view and provide a visual buffer between the northbound Pacific Highway travel lanes and the southbound exit ramp of the interchange.	Moderate
19	Moderate	**High** The project would involve the removal of mature vegetation on both sides of the view, altering this view to a large extent. Bridge 12 would be located over the main alignment. Together with its associated fill embankments, it would change the centre of the view. Vegetation provided as part of the project landscape design would over time reduce the amount of road infrastructure in the view. It would also create a visual buffer and a green frame to the view, somewhat compensating for removal of mature vegetation.	High to moderate

Table 15-9 Operational visual impacts at each viewpoint

VP	Existing viewpoint	Viewpoint during project operation (artist impression)
1		
2		

VP	Existing viewpoint	Viewpoint during project operation (artist impression)
3		
4		

VP	Existing viewpoint	Viewpoint during project operation (artist impression)
5		
6		

VP	Existing viewpoint	Viewpoint during project operation (artist impression)
7		
8		

VP	Existing viewpoint	Viewpoint during project operation (artist impression)
9		
10		

VP	Existing viewpoint	Viewpoint during project operation (artist impression)
11		
12		

VP	Existing viewpoint	Viewpoint during project operation (artist impression)
13		
14		

VP	Existing viewpoint	Viewpoint during project operation (artist impression)
15		
16		

VP	Existing viewpoint	Viewpoint during project operation (artist impression)
17		
18		

VP	Existing viewpoint	Viewpoint during project operation (artist impression)
19		

Overshadowing

The analysis of potential shadowing impacts focused on large three-dimensional project elements (such as interchanges and bridges) with the potential to cause shadowing that are located in areas with sensitive receivers such as Tarro urban area and the Hunter Region Botanic Gardens.

The analysis of shadow impacts in these areas indicates that there would be no overshadowing impacts on sensitive receivers as a result of project elements. Overshadowing impacts of the project are further discussed in the Urban Design, Landscape Character and Visual Amenity Working Paper (**Appendix O**).

15.6 Environmental management measures

The environmental management measures that will be implemented to minimise the landscape character and visual impacts of the project, along with the responsibility and timing for those measures, are presented in **Table 15-10**.

Table 15-10 Environmental management measures (urban design, landscape and visual amenity)

Impact	Reference	Management measure	Responsibility	Timing
Landscape character and visual impacts including during construction	UD01	An Urban Design and Landscape Plan (UDLP) will be prepared to support the project. The plan will present an integrated urban design for the project, providing practical detail on the application of design principles and objectives identified in the EIS. The plan will include: • Location and identification of existing vegetation and proposed landscaped areas, including species to be used • Built elements including retaining walls, bridges and noise barriers • Walking and cyclist elements including footpath locations, paving types and pedestrian crossings • Fixtures such as lighting, fencing and signs • Details on the staging of landscape work including related environmental controls such as erosion and sedimentation controls and drainage • Procedures for monitoring and maintaining landscaped or rehabilitated areas • The project will consider CPTED principles during detailed design to minimise safety and security risks to all users and communities in the study area. The project will carry out CPTED reviews at each milestone by a qualified professional. Additional recommendations as a result of reviews will be implemented where reasonable and feasible • Water sensitive urban design solutions. The plan will be prepared in accordance with Transport urban design policy guidelines including: • Beyond the Pavement – Urban design approach and procedures for road and maritime infrastructure planning, design and construction (Transport for NSW 2020a) • Landscape design guideline: Design guideline to improve the quality safety and cost effectiveness of green infrastructure in road corridors (Roads and Maritime Services 2018a) • Bridge Aesthetics: Design Guidelines to improve appearance of bridges in NSW (Transport for NSW 2019a) • Noise wall design guideline: Design guideline to improve the appearance of noise walls in NSW (Transport for NSW 2016a) • Shotcrete Design Guideline: Design guidelines to avoid, minimise and improve the appearance of shotcrete in NSW (Transport for NSW 2016b) • Water sensitive urban design guideline, Applying water sensitive urban design principles to NSW transport projects (Transport for NSW 2017b)	Contractor	Prior to construction

Impact	Reference	Management measure	Responsibility	Timing
	UD02	Disturbed areas outside the operational footprint and within the construction footprint will be revegetated following completion of construction activities.	Contractor	Construction
	UD03	Cut batters and fill embankments for the project will be designed to allow revegetation to assist with the integration of the project into the surrounding landscape where possible depending on site conditions.	Contractor	Construction
	UD04	Project construction elements such as fencing and hoardings will be designed to minimise impacts to landscape character and visual amenity where practicable	Transport/ Contractor	Prior to construction/ construction
	UD05	Temporary and permanent lighting will be installed and operated in accordance with AS/NZS1158 Lighting for Roads and Public Spaces.	Transport/ Contractor	Prior to construction/ construction
Aboriginal cultural heritage	UD06	The project detailed design will incorporate relevant Aboriginal cultural heritage elements of Beyond The Pavement (Transport for NSW 2020a) and Designing With Country (GANSW 2020), where practical.	Transport/ Contractor	Prior to construction/ construction