

## 7.5 Urban design, landscape character and visual amenity

This chapter provides an assessment of the urban design, landscape character and visual amenity associated with the project. As part of the design and construct tender process, the preferred tenderer carried out a technical working paper: urban design which is provided in **Appendix I**. This chapter provides a summary of that technical working paper and an assessment of the potential impacts of the preferred tender design.

**Table 7-115** sets out the Director-General's Requirements as they relate to urban design, landscape character and visual amenity and where in the environmental impact statement these have been addressed.

**Table 7-115 Director-General's Requirements – urban design, landscape character and visual amenity**

Director-General's Requirement	Where addressed
A consideration of the urban design and visual amenity implications of the project, including supporting infrastructure, during construction and operation. The assessment must identify urban design and landscaping objectives to enhance the northern and southern interchanges and tunnels, and must demonstrate how the proposed urban design elements of the project would be consistent with the existing and desired future character of the area;	Potential impacts to visual amenity during the construction and operation phase are provided in <b>Section 7.5.5</b> . Urban design and landscaping objectives are provided in <b>Section 7.5.4</b> and <b>Appendix I</b> . Consideration of the existing and desired future character of the area is provided in <b>Section 7.5.2</b> and <b>Section 7.5.5</b> .
Identification and evaluation of the visual impacts and urban design aspects of the project (and its components) on surrounding areas;	Consideration and assessment of potential visual impacts is provided in <b>Section 7.5.5</b> .
A consideration of impacts on views and vistas, streetscapes, key sites and buildings;	Consideration and assessment of potential visual impacts is provided in <b>Section 7.5.5</b> .
Measures to manage lighting impacts both during construction and operation; and	Management and mitigation measures for lighting during construction and operation are provided in <b>Section 7.5.6</b> .
Artist's impressions and perspective drawings of the proposal from a variety of locations along the route.	Artist's impressions of the project are provided in <b>Section 7.5.5</b> and <b>Appendix I</b> .

### 7.5.1 Assessment methodology

The urban design, landscape character and visual amenity impact assessment within this chapter has been undertaken in accordance with the Environmental Impact Assessment Practice Note: Guidelines for Landscape Character and Visual Impact Assessment (Roads and Maritime, 2013a). In accordance with these guidelines, the following assessments have been carried out:

- Construction:
  - Visual impact assessment.
  - Assessment of night lighting impacts.
- Operation:
  - In-tunnel urban design.
  - Landscape character impact assessment.
  - Assessment of consistency with the desired future landscape of the area.
  - Visual impact assessment.
  - Assessment of night lighting impacts.

The visual impact assessment evaluates the impact of the construction and operation of the project on receiver views, including potential impacts associated with lighting. The visual impact assessment considers views from residential areas and those of passing motorists for each site during both construction and operation. Potential night lighting impacts of the project on the surrounding landscape and receivers have been assessed for both construction and operation.

The landscape character assessment evaluates the potential impacts of the operation of the project on the combined quality of the built, natural and cultural aspects that make up an area and provide its unique sense of place. The landscape character assessment also includes an assessment of the consistency of the project in relation to the desired future character of the area.

Key steps in the landscape character and visual impact assessment include:

- Analysis of the landscape and visual context, including:
  - Assessment of the existing landscape character and visual environment.
  - Definition of landscape character zones.
  - Identification of potential views to the project during construction and operation.
- Summary of the policy and planning setting.
- Identification of urban design and landscape objectives.
- Assessment of potential impacts during construction and operation.
- Identification of reasonable and feasible mitigation measures.

Further detail regarding the assessment methodology is provided in the following sections.

## **Analysis of the landscape and visual context**

### ***Assessment of the existing environment***

The existing landscape and visual environment along the project has been assessed through a desktop review of aerial photography, geographic information system (GIS) mapping of topography and vegetation, land use mapping and site inspections. A description of the existing landscape and visual environment is provided in **Section 7.5.2**.

An assessment of the theoretical visibility of key project elements from surrounding areas has been facilitated through the use of a visual envelope model. The visual envelope model uses geographic information system (GIS) mapping to plot areas which would be able to see the highest point of the major portion of each project element. The GIS map contains landform, generally without consideration of land cover such as trees or houses, with the exception of key patches of vegetation within proximity of the project element that would clearly have an impact on screening of the project.

### ***Definition of landscape character zones***

In order to assess potential landscape character impacts, the project has been divided into five landscape character zones as shown in **Figure 7-32**. These landscape character zones relate to the existing environment prior to the undertaking of works and are summarised in **Table 7-116**.

The landscape character zones have been identified based on areas of landscape with similar properties or strongly defined spatial qualities, visually distinct from adjoining areas. As the majority of the project comprises underground infrastructure, the landscape character zones have been broadly focused around the Hills M2 Motorway integration works, the southern interchange, the northern interchange and M1 Pacific Motorway tie-in works. Separate landscape character zones have been identified around the tunnel support facilities at Wilson Road and Trelawney Street.

**Table 7-116 Landscape character zone components**

<b>Landscape character zone</b>	<b>Operational components</b>
Hills M2 Motorway landscape character zone	<ul style="list-style-type: none"> <li>• The Hills M2 Motorway integration works.</li> </ul>
Southern landscape character zone	<ul style="list-style-type: none"> <li>• The southern interchange, including on and off-ramps.</li> <li>• The motorway operations complex, including the motorway control centre, the southern ventilation facility at the Hills M2 Motorway interchange, covered service yard and workshop.</li> <li>• The electricity switching station to the south of the Hills M2 Motorway.</li> </ul>
Wilson Road landscape character zone	<ul style="list-style-type: none"> <li>• The Wilson Road tunnel support facility.</li> </ul>
Trelawney Street landscape character zone	<ul style="list-style-type: none"> <li>• The Trelawney Street tunnel support facility.</li> </ul>
Northern landscape character zone	<ul style="list-style-type: none"> <li>• The M1 Pacific Motorway tie-in works.</li> <li>• The northern interchange, including on and off-ramps.</li> <li>• The northern ventilation facility at Bareena Avenue.</li> </ul>

Operational components of the project are described in detail in **Section 5.2**. The potential impacts on landscape character as a result of the operation of the project are assessed in **Section 7.5.5**. Temporary works undertaken as part of the construction stage are not assessed for landscape character impacts.



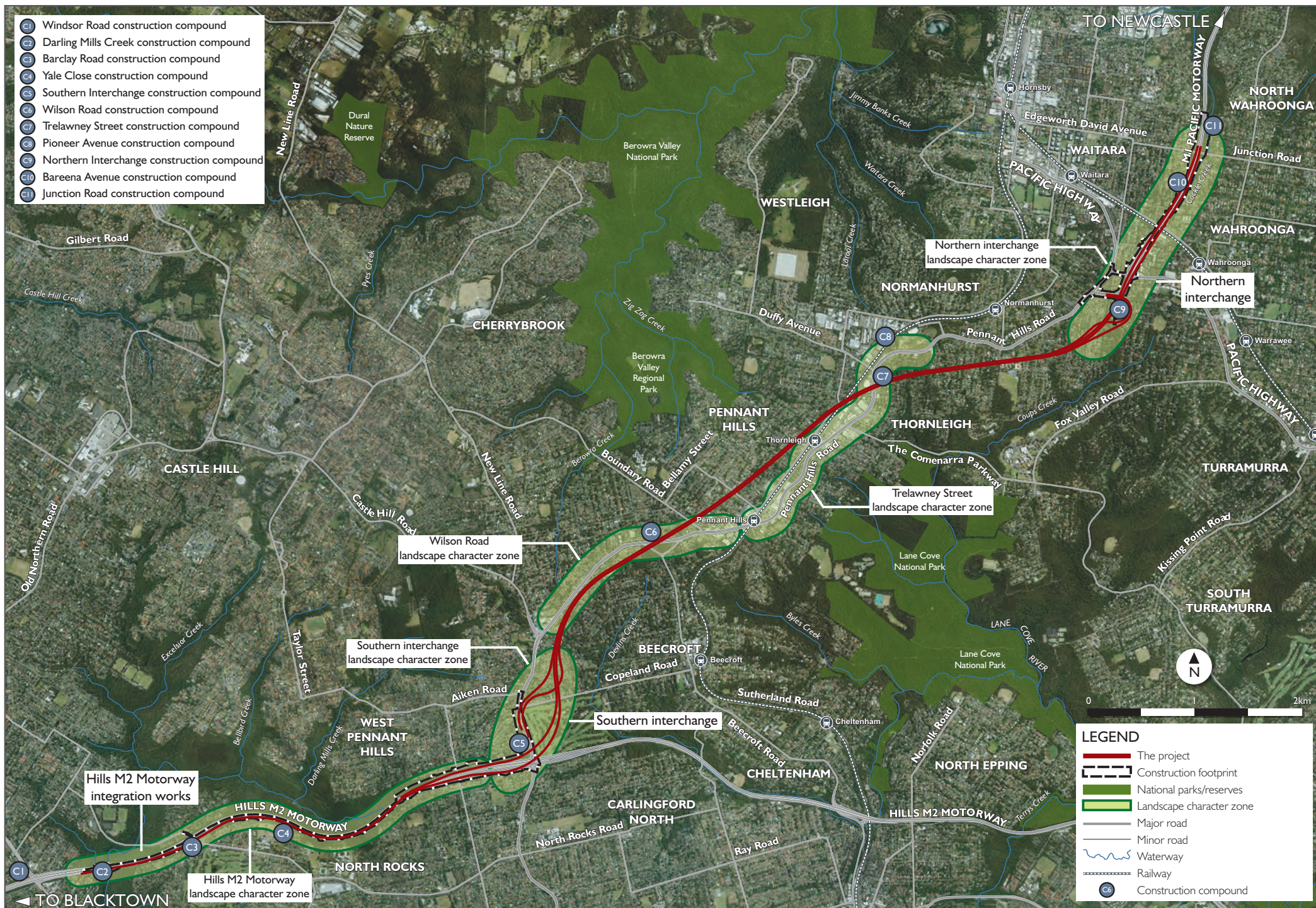


Figure 7-32 Landscape character zones



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### ***Identification of potential views to the project***

The assessment of visual impacts is based on viewpoints or the viewshed within which project components may be seen. Key project components which may be visible during construction and operation include:

- Construction:
  - Construction activities and construction disturbance areas.
  - Construction ancillary facilities, such as temporary construction compounds.
- Operation:
  - Motorway operations complex.
  - Wilson Road tunnel support facility.
  - Trelawney Street tunnel support facility.
  - Northern ventilation facility.

Given that the majority of the project comprises underground infrastructure, visibility of the project during operation has been identified around the surface infrastructure components.

The visual impact assessment and night lighting assessment in **Section 7.5.5** have been carried out with regard to potential views of these key project components for both construction and operation.

### **Assessment of potential impacts during construction and operation**

#### ***Assessment of landscape character and visual impacts***

The method to assess both landscape character and visual impacts has been based on a combination of the 'sensitivity' of the existing landscape character zone or view subject to change, and the 'magnitude' of change on that zone or view. The definitions of these concepts, as applied to this assessment, are summarised in **Table 7-117**.

For the purpose of this impact assessment, potentially most affected visual receivers have been identified through a GIS mapping system taking into account topography and potential screening by vegetation and existing development.

To assist in the assessment of potential visual impacts, a series of photomontages of key project elements has been produced. These artists' impressions present 'before' and 'after' visualisations to aid in the visual assessment process. Artists impressions presented in this chapter provide a typical view of project elements at a period of around 12 to 18 months after opening. Additional artist's impressions of selected project elements are provided in **Appendix I**. Artists impressions have been based on the preferred tender design and the appearance of project components and features may differ slightly as a result of the design development, finalisation of materials and colours and the surrounding landscape, as well as local weather conditions on any particular day.

**Table 7-117 Sensitivity of landscape and magnitude of change definitions**

Concept	Definition
Sensitivity of landscape / view	<p>The sensitivity of the landscape / view relates to the extent to which it can accept change of a particular type and scale without adverse impacts on its character. Sensitivity varies according to:</p> <ul style="list-style-type: none"> <li>• Inherent landscape value (eg its condition, perceptual qualities, and cultural importance).</li> <li>• Extent to which the project may fit or be 'visually absorbed' into the landscape.</li> </ul> <p>The sensitivity of visual receivers and views depends on:</p> <ul style="list-style-type: none"> <li>• Location, context and importance of the viewpoint.</li> <li>• Expectations or activity of the receiver.</li> </ul> <p>Sensitivity refers to the qualities of an area, the number and type of receivers and how sensitive the existing character of the setting is to the proposed change. For example a pristine natural environment will be more sensitive to change than a built up industrial area (Roads and Maritime, 2013a).</p> <p>The most sensitive receivers typically include occupants of residences with direct views of project elements, users of outdoor recreational facilities, and communities where the project would result in changes in the landscape setting or valued views enjoyed by the community.</p>
Magnitude of change	<p>The magnitude of change affecting a landscape or visual receiver relates to the nature, scale and duration of the particular change that is expected to occur. In the landscape, the magnitude of change depends on factors such as the extent of loss, change or addition of any feature, or any change in the backdrop to, or outlook from a landscape that affects its character.</p> <p>The impact on a view depends on factors such as the extent of visibility, degree of obstruction of existing features, degree of contrast with the existing view, angle of view, duration of view and distance from the project (Roads and Maritime, 2013a).</p>



Assessed sensitivities of the landscape / view and magnitudes of change have been combined according to the matrix shown in **Table 7-118** to establish a potential visual impact.

**Table 7-118 Landscape character and visual impact grading matrix**

Potential landscape/ visual impact		Magnitude of change				
		High	High to moderate	Moderate	Moderate to low	Low
Sensitivity of landscape / view	High	High	High	High to moderate	High to moderate	Moderate
	High to moderate	High	High to moderate	High to moderate	Moderate	Moderate
	Moderate	High to moderate	High to moderate	Moderate	Moderate	Moderate to low
	Moderate to low	High to moderate	Moderate	Moderate	Moderate to low	Moderate to low
	Low	Moderate	Moderate	Moderate to low	Moderate to low	Low

The technical working paper: urban design and landscape (provided in **Appendix I**) provides shadow diagrams for the operational ancillary facilities for 9 am, 12 pm and 3 pm for two representative days during the year, being March 22 and June 21. The operational visual impact assessment within this chapter provides discussion of these shadow diagrams.

### ***Assessment of night lighting impacts***

The assessment of the impacts of night lighting considers the change from existing using the visual impact grading matrix in **Table 7-118**. An assessment has been carried out for each site, for both construction and operation phases. Residents and motorists are considered to be the key receptors and are separately assessed.

The following assumptions are made with regard to the assessment process:

- The assessment is not based on a lighting design, but rather assumptions have been made with regard to the types and extent of lighting likely to be installed for both the construction and operation phases.
- There is no assessment of existing or proposed luminance levels.
- Construction lighting does not include construction vehicles entering and leaving the sites and is assumed to be:
  - In place over a period of up to four years.
  - In operation seven days a week.
  - At levels sufficient to meet occupational health and safety levels, and security levels.
- Operational lighting is assumed to be:
  - In operation seven days a week.
  - At levels sufficient to meet occupational health and safety levels, and security levels.

### 7.5.2 Existing environment

Visibility of the project would largely be determined by the surrounding topography, vegetation and the existing built environment. Views along, across and to / from the project corridor would predominantly be obscured as a result of:

- Patches of relatively dense vegetation associated with recreational / open space areas, residential properties and associated landscaping, and street tree plantings.
- Local and regional topography, including the ridgeline along which Pennant Hills Road is aligned.
- Development patterns and built form, particularly along the Pennant Hills Road corridor.

The following sections describe the existing visual environment which is likely to influence views of the project and identifies areas which may be sensitive to views of the project.

#### **Open space and vegetation**

There are significant areas of open space around the project corridor, including:

- Lane Cove National Park and Pennant Hills Park to the east.
- Berowra Valley Regional Park to the west.
- Bidjigal Reserve to the north of the Hills M2 Motorway integration works.
- Ku-ring-gai Chase National Park to the north of the project.

As well as regional scale open space there are a number of smaller public parks including Observatory Park and Brickpit Park, and private recreation facilities such as Pennant Hills Golf Course, along the length of the corridor.

Outside of open spaces and parks, the Pennant Hills Road corridor remains generally well vegetated with mature trees.

Further details of land use, including open space, and vegetation are provided in **Section 8.1** (Land use and property) and **Section 7.6** (Biodiversity).

#### **Topography**

The project corridor generally follows the alignment of Pennant Hills Road which is situated along a ridge line running roughly in a north-east to south-west direction. The ridge line forms the boundary of several local drainage catchments, with steep-sided valleys present on either side of Pennant Hills Road. A number of elevated peaks occur along the project corridor, with terrain generally falling to the south-east and to the north-west away from the Pennant Hills Road ridge line.

## **Infrastructure environment**

The visual environment of the project area is predominantly influenced by the existing transport infrastructure and commercial and residential development. Existing road corridors and straight road alignments, including sections of Pennant Hills Road, the Hills M2 Motorway and the M1 Pacific Motorway, provide long range views along road corridors, with views enclosed by the surrounding commercial and residential developments.

The Hills M2 Motorway is a divided carriageway motorway consisting of either two or three lanes in each direction. The Pennant Hills Road / Hills M2 Motorway interchange comprises a grade separated four way signalised intersection. Topography and the extent of existing infrastructure of the interchange make this area notable in terms of its visual prominence. Due to the elevation of the Hills M2 Motorway west of the interchange with Pennant Hills Road, motorist's views are enclosed by noise walls and mature vegetation. The area surrounding the Hills M2 Motorway integration works consists predominately of low density residential developments, where buildings are generally one or two storeys in height with generous setbacks, and a high density of mature trees. Views of the Hills M2 Motorway from these surrounding areas are obscured by the high density of vegetation, noise walls and the surrounding residential developments.

Between the Hills M2 Motorway and the M1 Pacific Motorway, Pennant Hills Road operates as a major arterial route, providing access for commuters and freight vehicles between the Hills M2 Motorway and Epping Road in the south to the M1 Pacific Motorway and Pacific Highway in the north. The central section of the project, along Pennant Hills Road, passes through the suburbs of West Pennant Hills, Thornleigh and Normanhurst. Development in this area comprises substantial commercial and retail use with taller buildings and larger building footprints fronting Pennant Hills Road. Views to and from Pennant Hills Road are largely obscured by the topography of the area, which falls away from the Pennant Hills Road ridgeline, and the presence of the commercial developments adjacent to the road corridor.

At the northern extent of the project, Pennant Hills Road intersects with two major corridors: the M1 Pacific Motorway and the Pacific Highway. Views within this area are enclosed by a higher density of residential and mixed use developments and a scattering of vegetation including mature trees. Extending north of the northern interchange along the M1 Pacific Motorway, the road is flanked with heavy forest and vegetation leading to the Ku-ring-gai Chase National Park. Noise walls and retaining walls comprising sandstone outcrops also enclose views of the M1 Pacific Motorway within the road corridor.

## Key heritage sites

Even where heritage items may not be directly affected by the project, they may be indirectly impacted through physical and visual encroachment into curtilage areas and changes to the heritage landscape context. Assessment of impacts on the heritage values of heritage items and heritage conservation areas is provided in **Section 7.10** (Non-Aboriginal heritage).

Heritage conservation areas in and around the project corridor include:

- Beecroft-Cheltenham Heritage Conservation Area (Hornsby local government area), which is located towards the south of the project and includes Observatory Park. There are also a number of listed commercial properties and domestic dwellings in this area. The Wilson Road compound (C6) and tunnel support facility would be located within this conservation area.
- The Crescent Pennant Hills Heritage Conservation Area (Hornsby local government area), which is located to the south of Pennant Hills Road, around Pennant Hills town centre. No project elements would be located within this area.
- The Wahroonga Conservation Area (Hornsby local government area), which is located to the west of the M1 Pacific Motorway, north of the Pacific Highway and south of the North Shore Railway Line. There would be no aboveground works within this conservation area, although a main alignment tunnel would cross under the eastern edge of the area. Road widening works at the intersection of Pennant Hills Road and the Pacific Highway would be conducted adjacent to the conservation area.
- The Wahroonga North Heritage Conservation Area (Hornsby local government area), which is located to the west of the M1 Pacific Motorway and north of the North Shore Railway Line. The northern ventilation facility at Bareena Avenue would be located within this area. This area includes domestic dwellings and other structures of local significance. Two heritage properties are located immediately opposite the proposed northern ventilation facility. The M1 Pacific Motorway tie-in works would encroach into the eastern edge of this heritage conservation area.
- The Wahroonga Heritage Conservation Area (Ku-ring-gai local government area), which is located to the east of the M1 Pacific Motorway. No project elements would be located within this conservation area, although road infrastructure would be brought closer to the conservation area boundary.

In addition to these heritage conservation areas, several individual heritage items lie within and around the project. The location of these items and an assessment of potential impacts are provided in **Section 7.10** (Non-Aboriginal heritage).



## Landscape character zones

The existing landscape character of the landscape character zones identified in **Section 7.5.1** and shown in **Figure 7-32** is discussed in **Table 7-119** relative to the location of proposed project surface infrastructure.

**Table 7-119 Description of landscape character zones**

Landscape character zone	Description
Hills M2 Motorway integration landscape character zone	<p>This zone is characterised by the linear, sinuous and predominantly enclosed form of the Hills M2 Motorway, which exhibits high levels of naturalness. Key character elements of the zone include tall bushland and steep rock batters periodically associated with visually prominent new feature noise walls of bright orange, dark grey and dark green, integrated with the original mid-green noise walls.</p> <p>The Windsor Road and Pennant Hills Road interchanges are characterised by major interchange roadwork and tall associated masonry walls, cuttings, bridges and glimpse views to adjoining suburbs with a moderate landcover of cultural tree plantings (refer <b>Figure 7-33</b>).</p> <p>The landform for the major part of this landscape character zone is moderately rolling, with landcover comprising extensive tracts of remnant bushland. This bushland is experienced as tall corridor edges at the higher parts of the landscape where the motorway cuts into and exposes the sandstone geology, and views through the canopy of a tall closed forest landscape where the motorway crosses Darling Mills Creek and runs alongside Blue Gum Creek (refer <b>Figure 7-33</b>).</p> <p>The edges of the corridor are flanked by substantial areas of low density residential development, but this is not particularly apparent except within the vicinity of the two interchanges.</p>
Southern landscape character zone	<p>This landscape character zone is primarily visually characterised by the Hills M2 Motorway / Pennant Hills Road interchange. The Hills M2 Motorway is flanked by high shotcrete faced retaining walls to the east of the Pennant Hills Road interchange and dense screening vegetation to the west. The Pennant Hills Road corridor travelling north of the interchange is characterised by a dense canopy of tree plantings, from the edge of the Pennant Hills Golf Course on the eastern side, and vacant land / low density residential development to the western side of the road. Pennant Hills Road is a minimum of six lanes wide and climbs steadily from the Hills M2 Motorway interchange to both the north and the south. The driver experience is one of confined visual corridors, focused on the road as shown in <b>Figure 7-34</b>.</p> <p>Adjacent housing typically comprises one and two storey dwellings on substantially vegetated properties with mature tree cover and single driveway access. The landform is sloped away from Pennant Hills Road to the west as shown in <b>Figure 7-34</b>.</p>

Landscape character zone	Description
Wilson Road landscape character zone	<p>This landscape character zone is visually characterised by low density residential development fronting Pennant Hills Road, with tight building setbacks, substantial mixed exotic and native tree cover and enclosed views within the Pennant Hills Road corridor.</p> <p>Within the vicinity of Wilson Road, the tall remnant forest of Observatory Park, flanks Pennant Hills Road and Beecroft Road. These main roads are surrounded by low density residential development with substantial mixed exotic and native plantings within residential lots as shown in <b>Figure 7-35</b>. Observatory Park contains a remnant tall native forest with both low native understorey and areas of mown grass. Mount St Benedict College Catholic high school is located across Pennant Hills Road to the south. The Wilson Road site is within the Beecroft-Cheltenham Heritage Conservation Area. The driver experience along Pennant Hills Road is primarily influenced by views of the road.</p> <p>The residential development along Wilson Road and Killaloe Avenue comprises contrasting, distinctly quieter, low density residential, tree-lined streets and substantial garden plantings with low traffic volumes as shown in <b>Figure 7-35</b>.</p>
Trelawney Street landscape character zone	<p>This landscape character zone is visually characterised by commercial areas and motorist dominated uses, larger land parcels and enclosed views within the Pennant Hills Road corridor.</p> <p>Within the vicinity of Trelawney Street medium to large scale retail and commercial premises front Pennant Hills Road, with adjacent areas of low density residential development. A church is located on the southern corner of Loch Maree Avenue and Pennant Hills Road. The road corridor is intermittently flanked by substantial tree cover. The landform slopes away from Pennant Hills Road to the east.</p> <p>The driver experience is one of visually confined corridors, focused on the road, with the retail and commercial development being visually prominent as shown in <b>Figure 7-36</b>. Residential areas adjacent to the development site generally contain moderate to high levels of tree cover both within the streets and gardens as shown in <b>Figure 7-36</b>.</p>

Landscape character zone	Description
Northern landscape character zone	<p>This landscape character zone is characterised by the strongly linear experience of the M1 Pacific Motorway, edged by either noise walls, retaining walls or small scale sandstone outcrops, behind which lies dense native forest remnant bushland and some cultural and native tree plantings. Alexandria Parade crosses the M1 Pacific Motorway near this location as shown in <b>Figure 7-37</b>.</p> <p>Adjoining the M1 Pacific Motorway are areas of residential development, much of which falls within heritage conservation areas. These residential areas are generally characterised by substantial street and garden plantings, and low traffic volumes. The built form typology is generally one and two storey structures on large blocks with mature tree cover as shown in <b>Figure 7-37</b>.</p> <p>Within this zone, the northern ventilation facility would be located at the intersection of Bareena Avenue and Woonona Avenue North. Adjacent land uses comprise detached residential dwellings with two heritage listed properties located across from the site on Woonona Avenue North. The street trees along the western edge of Woonona Avenue North are also heritage listed. The North Shore Railway Line runs just to the south of the site. The landform can be characterised as gently to moderately rolling.</p>

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*Travelling east along the Hills M2 Motorway taken from the Windsor Road Interchange*



*Travelling east along the Hills M2 Motorway*

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*Looking north along Pennant Hills Road*



*Typical residential area looking east along Hillside Place*

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*Looking east along Pennant Hills Road (Observatory Park on the right)*



*Typical residential setting on Wilson Road*

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*Looking south along Pennant Hills Road*



*Looking west towards Pennant Hills Road*

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*Looking south on the MI Pacific Motorway*



*Typical residential setting around Bareena Avenue*

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### 7.5.3 Policy and Planning Setting

The policy and planning setting for the project and its potential landscape and visual impacts has been established with regard to the following regional planning documents and relevant local environment plans:

- The Draft North Subregional Strategy (Department of Planning, 2007).
- *Ku-ring-gai Planning Scheme Ordinance 1971* (Ku-ring-gai Planning Ordinance).
- *Draft Ku-ring-gai Local Environmental Plan 2013* (Draft Ku-ring-gai LEP 2013).
- *The Hills Local Environmental Plan 2012* (The Hills LEP 2012).
- *Hornsby Local Environmental Plan 2013* (Hornsby LEP 2013).
- Your Community Plan 2013-2023 (Hornsby Shire Council, 2013).

The desired future character of the area has been determined based on the strategic direction provided in these documents.

The Draft North Subregional Strategy (Department of Planning, 2007) provides strategic planning direction at a regional level. This strategy identifies the need for an additional 21,000 homes within the region to provide for existing and future population growth. In order to protect the existing character of the broader subregion, such as low density housing and outlying rural lands, future development is planned to be focused around the existing centres, particularly those along major transport routes such as rail lines and major roadways.

The Strategy implies that the desired future character of the broader region is to maintain the existing low density residential nature of the area. However, there is also a desire to encourage medium and high density developments around the existing centres. In the vicinity of the project, this would include areas around railway stations and generally along the Pennant Hills Road corridor. This would result in a shift towards developments such as mixed use (commercial and residential) and multi-storey apartment buildings.

Hornsby Shire Council has recently released Your Community Plan 2013-2023 (Hornsby Shire Council, 2013), a community plan providing information on the 10 year plan for the local government area. The development for the plan included community consultation and provides a good indication of the desired future character at a community level. This plan identifies that the community value the existing characteristics of the area and have a desire for these to be maintained in the future. These characteristics include the bushland, sense of space, the sense of community and the village atmosphere of the local shops.

The desired future character of areas specific to key project components has been inferred from the land zoning provisions under the relevant environmental planning instruments. Existing land use zonings and the desired character of these zonings are summarised in **Table 7-120**. Details of potential land use and property impacts are provided in **Section 8.1** (Land use and property).

**Table 7-120 Land use zonings within landscape character zones**

Landscape character zone	Description of land use zoning
Hills M2 Motorway integration works landscape character zone	<p>The Hills M2 Motorway is zoned SP2 Infrastructure under the Hills LEP 2012. This zoning reflects the desire to maintain accessibility, supporting economic activity and efficient freight movement.</p> <p>The land surrounding the Hills M2 Motorway integration works is zoned R2 Low Density Residential under The Hills LEP 2012, with large tracts of bushland areas zoned as E2 Environmental Conservation and RE1 Public Recreation. This zoning reflects the desire to maintain the existing low density character and bushland setting of the area.</p>
Southern landscape character zone	<p>Major roads in the area, including Pennant Hills Road, are zoned SP2 Infrastructure under both The Hills LEP 2012 and the Hornsby LEP 2013. This zoning reflects the desire to maintain accessibility, supporting economic activity and efficient freight movement.</p> <p>At the motorway operations complex, the majority of land is zoned as R2 Low Density Residential under The Hills LEP 2012 and Hornsby LEP 2013 with pockets of RE1 Public Recreation. This zoning reflects the desire to maintain the existing low density residential character of the area.</p>
Wilson Road landscape character zone	<p>Pennant Hills Road is zoned SP2 Infrastructure under the Hornsby LEP 2013 which reflects the desire to maintain access and connectivity between local centres of employment and economic activity. The area immediately surrounding the Wilson Road site is zoned R2 Low Density Residential zone under the Hornsby LEP 2013. The area to the east along Pennant Hills Road includes R4 High Density Residential, B6 Enterprise Corridor, B5 Business Development and B2 Local Centre. The surrounding zoning identifies the desired future character of the broader area to retain the existing low density nature of development. The zoning in the area to the east reflects the regional strategy and desired future character to provide business development and higher density residential developments around existing local centres, including the development of buildings with a maximum height of 26.5 metres.</p>
Trelawney Street landscape character zone	<p>Pennant Hills Road is zoned SP2 Infrastructure under the Hornsby LEP 2013 which reflects the desire to maintain access and connectivity between local centres of employment and economic activity. The area surrounding the Trelawney Street northern tunnel support facility site is generally zoned R2 Residential Development under the Hornsby LEP 2013, with the area immediately across Pennant Hills Road zoned B6 Enterprise Corridor. Further north are areas zoned IN1 General Industrial. The surrounding zoning under the LEP identifies that the desired future character of the broader area is to retain the existing low density development, whilst also continuing to encourage business development within the enterprise corridor and industrial development contained within the existing industrial precinct. This includes development of buildings with a maximum height of 12 metres within the enterprise corridor.</p>



Landscape character zone	Description of land use zoning
Northern landscape character zone	<p>Major roads in the area, including the Pennant Hills Road, the M1 Pacific Motorway and the Pacific Highway are zoned SP2 Infrastructure under the Hornsby LEP 2013 and the Draft Ku-ring-gai LEP 2013. This zoning reflects the desire to maintain accessibility, supporting economic activity and efficient freight movement.</p> <p>The majority of the areas around the northern interchange are zoned R2 Low Density Residential under the Hornsby LEP 2013 and the Draft Ku-ring-gai LEP 2013. The Draft Ku-ring-gai LEP 2013 identifies E2 Environmental Conservation adjacent to the M1 Pacific Motorway tie in works, with E1 National Parks and Reserves mapped north of this area.</p> <p>The Hornsby LEP 2013 identifies R3 Medium Density Residential extending along the Pacific Highway to the north of the intersection with Pennant Hills Road. The Draft Ku-ring-gai LEP 2013 identifies R4 High Density Residential to the north of the Pacific Highway and north of the North Shore Railway Line. The surrounding zonings under the LEPs identifies that the desired future character for the majority of the area is to retain the existing low density development. The zoning in the areas along the Pacific Highway to the north and the east, and north of the North Shore Railway Line reflects the regional strategy and desired future character to provide for business development and higher density residential developments around existing local centres and along major transport routes. This includes development of buildings with a maximum height of 10.5 metres within Hornsby LGA and 17.5 metres within Ku-ring-gai LGA.</p>

#### 7.5.4 Urban and landscape design

A set of objectives was developed to address key issues that underlie the strategic need for the project, in line with strategic objectives of State and national planning and policy documents. The project objectives, which incorporate environmental, social and economic considerations, are discussed in **Section 3.4**.

As part of the design and construct tender process, and in line with the broader project objectives, detailed urban and landscape designs were developed for the project. As a basis for these designs, overarching design objectives and an urban design and landscape concept were developed.

## Urban design and landscape objectives

The principal overarching urban design objective for the project is to provide an environment that recognises the driver experience as the key determinant of urban form (refer to **Appendix I**).

This principal overarching urban design objective is supported by specific urban design objectives. Specific urban design objectives and their consideration in the design of the project are detailed in **Table 7-121**.

**Table 7-121 Specific urban design objects and their application to the project**

Objective	Application to project
Provide a safe facility for traffic, pedestrians, cyclists and disabled persons.	<p>The project has been designed to provide a safe environment for road users including the provision of breakdown bays, median separated carriageway, fire and life safety and vehicle cross passages. The provision of a motorway standard connection would provide an improved road safety environment than the existing situation on Pennant Hills Road. <b>Section 7.1</b> (Traffic and transport) provides further details on the improvements in road safety from the project.</p> <p>The design of the project has included specific provision for grade separated cycle infrastructure on the Hills M2 Motorway and the M1 Pacific Motorway at the main alignment tunnel connections. This would provide a safe cycling environment by removing the need to cross two traffic lanes.</p> <p>All existing pedestrian functionality and available movements would be retained during the operational phase of the project. In-tunnel emergency facilities have been provided for pedestrians including pedestrian cross passages between the two main alignment tunnels at 120 metre intervals, including provision for disabled persons.</p>
Provide landmarks at selected places as a contribution to legibility.	<p>In-tunnel landmarks or 'events' have been provided at around third points through the tunnel to reduce driver fatigue, provide a sense of place and a connection to surface features.</p> <p>The surface infrastructure has been designed as a 'family of forms' to provide legibility and branding to the buildings.</p>
Maintain existing neighbourhood connectivity and local access for local traffic.	<p>Changes to local roads have been avoided and minimised as far as feasible and reasonable. As a tunnel project, neighbourhood connectivity would not be impacted by the main alignment tunnels. Surface facilities and infrastructure have been located within the existing road corridor and the project has been designed to reduce land acquisition requirements. The reduction in heavy vehicle use along Pennant Hills Road provided opportunities to improve cross connectivity between residential areas.</p>
Aesthetically enhance the road facility and associated works and structures.	<p>Surface facilities and infrastructure have been designed with a refined and integrated edge that considers surrounding residential development. Designs incorporate plantings that would be visually consistent with the existing environment.</p>

Objective	Application to project
Integrate new elements with existing work in as seamless a way as possible to meet the urban design requirements.	Materials for the project have been chosen to be longitudinally consistent and provide a 'family of forms' of project elements when associated with the road and its infrastructure. These have been laterally integrated with the surrounding precinct through the material or colour choices to reflect local areas.
Improve existing environmental sustainability wherever possible.	<p>Environmental sustainability has been considered as part of the design of the buildings, design of the road and landscaping elements.</p> <p>The ancillary operational buildings have incorporated elements such as:</p> <ul style="list-style-type: none"> <li>• Solar panel installation.</li> <li>• Low water use fixtures.</li> <li>• Use of natural light and LED lighting.</li> <li>• Rainwater harvesting.</li> <li>• Natural ventilation;</li> </ul> <p>The landscaping has been designed to be low maintenance and robust. The design has included the use of drought resistant indigenous plantings and restoration of disturbed landscapes.</p> <p>The landscape design also incorporates water sensitive urban design features.</p> <p>The provision of a more efficient, motorway standard link would result in long term reductions of greenhouse gas emissions. Further details are provided in <b>Section 8.4</b> (Greenhouse gas a climate change).</p>
Enhance existing landscape and integrate new landscape both across and into the corridor.	New landscaping elements, and rehabilitation of temporary sites have considered existing landscaping features where practical. For example, the proposed landscaping around the northern ventilation facility has considered the presence of heritage listed street trees in the area..
Continue the family of road elements and built forms already established.	Materials for the project have been chosen to be longitudinally consistent 'family of forms' of project elements when associated with the road and its infrastructure. These have been laterally integrated with the surrounding precinct through the material or colour to achieve a contextual harmony.
Enhance driver experience and the visual contribution to the built environment.	The driver experience has been built around the concept of the project as a transition element from the city to northern coastal areas. This concept has been articulated in the urban design, architecture and landscape of the project through development of a signature patterning system of the tunnel walls. The in-tunnel 'events' have been designed to replicate the surface experience within the tunnel and to reduce driver fatigue.

## **Urban design and landscape concept**

A narrative for the journey reflecting the transition from the city to northern coastal areas has been applied to the design of the project. Major decision points for users of the project have been identified and the importance of legibility has been recognised as a key design driver. Guiding principles for the design include:

- Creation of a safe and functional interface for all users.
- Integration of the project laterally with the surrounding context.
- Creation of a consistent linear identity.
- Enhancing road experience and orientation through diversity.
- Identification of place through landmarks.
- Consideration of views to and from the project.
- Consideration of the natural environment and ecological systems.
- Natural physical characteristics of the environment as a design driver.
- Consideration of lighting.
- Transformation of residual land to open space.
- Incorporation and interpretation of heritage elements.

These principles have been applied at the southern and northern interchanges, the main alignment tunnels including on and off-ramps, and surface elements of the project.

The urban design and landscape along the Hills M2 Motorway integration works would be consistent with the recently completed Hills M2 Motorway Upgrade project.

## 7.5.5 Assessment of potential impacts

### Construction

The following sections provide an assessment of the potential construction visual impacts and the construction night lighting impacts of the project. Potential visual and lighting impacts associated with construction would be temporary for the duration of the works at each site and works would be undertaken to revegetate and rehabilitate each site on completion of construction.

#### *Construction visual impacts*

Potential visual impacts during the construction stage may result from the introduction of construction activities and construction ancillary facilities into existing landscapes. For the purpose of assessing these potential visual impacts, temporary construction compounds and construction disturbance areas have been grouped depending on landscape and receiver contexts:

- Windsor Road compound (C1).
- Darling Mills Creek compound (C2).
- Barclay Road compound (C3).
- Yale Close compound (C4).
- Hills M2 Motorway integration works.
- Southern interchange compound (C5) and associated construction works.
- Wilson Road compound (C6).
- Trelawney Street compound (C7).
- Pioneer Avenue compound (C8).
- Northern interchange compound (C9) and associated construction works.
- Bareena Avenue compound (C10).
- Junction Road compound (C11).
- M1 Pacific Motorway tie-in works.

The location of each of the construction compounds is shown on **Figure 5-24** to **Figure 5-32** and **Section 5.3.12** provides a description of the duration and scope of works to be carried out at each site.

The potential visual impacts at each of these sites are assessed in the following sections. A summary of assessed visual impacts based on evaluation of landscape / view sensitivity and magnitude of change (refer to **Table 7-118**) is provided for residential receivers and motorists surrounding construction sites in **Table 7-122**.

**Table 7-122 Construction visual impacts summary**

<b>Receiver No.</b>	<b>Receiver / construction area</b>	<b>Sensitivity of receivers</b>	<b>Magnitude of change</b>	<b>Overall rating</b>
<b>Windsor Road compound (C1)</b>				
1	Residents – Livingstone Avenue	Moderate	Moderate	Moderate
2	Motorists – Windsor Road	Low	Low	Low
<b>Darling Mills Creek compound (C2)</b>				
1	Residents – Williams Road	Moderate	Low	Moderate to low
2	Walking track along Darling Mills Creek	Moderate	Moderate to low	Moderate
3	Motorists – Hills M2 Motorway	Low	Low	Low
<b>Barclay Road compound (C3)</b>				
1	Residents – Perry Street	Moderate to low	Low	Moderate to low
2	Motorists – Barclay Road / Perry Street intersection	Moderate to low	Low	Moderate to low
<b>Yale Close compound (C4)</b>				
1	Residents – Yale Close	Moderate to low	Moderate	Moderate
2	Motorists – Hills M2 Motorway	Low	Low	Low
<b>Hills M2 Motorway integration works</b>				
1	Residents	Moderate to low	Low	Moderate to low
2	Motorists – Hills M2 Motorway	Moderate to low	Moderate	Moderate
<b>Southern interchange compound (C5) and associated construction works</b>				
1	Residential – Gum Grove Place	High to moderate	High to moderate	High to moderate
2	Residential Karloon Road / Eaton Road intersection	High to moderate	High to moderate	High to moderate
3	Residential – Coral Tree Drive	Moderate	High to moderate	High to moderate
4	Motorists – Pennant Hills Road / Hills M2 Motorway interchange	Low	High to moderate	Moderate
5	Motorists – Pennant Hills Road / Copeland Road intersection	Low	High to moderate	Moderate
<b>Wilson Road compound (C6)</b>				
1	Residential – Killaloe Avenue / Wilson Road intersection	High to moderate	High to moderate	High to moderate
2	Residential – receivers which adjoin the site to the west	High	High	High
3	Motorists – Pennant Hills Road / Beecroft Road intersection	Low	Moderate to low	Moderate to low

Receiver No.	Receiver / construction area	Sensitivity of receivers	Magnitude of change	Overall rating
<b>Trelawney Street compound (C7)</b>				
1	Residential – Loch Maree Avenue	High to moderate	High to moderate	High to moderate
2	Residential – receivers which adjoin the site to the east	High	High	High
3	Residential – Trelawney Street	High to moderate	Moderate	High to moderate
4	Motorists – Pennant Hills Road / Phyllis Avenue intersection	Low	Moderate to low	Moderate to low
<b>Pioneer Avenue compound (C8)</b>				
1	Residential – Pennant Hills Road	Moderate to low	Low	Moderate to low
2	Train passengers – Northern Railway line	Low	Low	Low
3	Motorists – Pioneer Avenue	Low	Low	Low
<b>Northern interchange compound (C9) and associated construction works</b>				
1	Residents – Kingsley Close	High to moderate	High to moderate	High to moderate
2	Motorists – M1 Pacific Motorway	Low	Low	Low
<b>Bareena Avenue compound (C10)</b>				
1	Residents – Woonona Avenue and Bareena Avenue	High	High	High
2	Motorists – M1 Pacific Motorway	Low	Moderate	Moderate to low
<b>Junction Road compound (C11)</b>				
1	Residents – receivers which adjoin the site to the east	Moderate to low	Moderate to low	Moderate to low
2	Motorists – M1 Pacific Motorway	Low	Low	Low
<b>M1 Pacific Motorway tie-in works</b>				
1	Residents	Moderate to low	Low	Moderate to low
2	Motorists – M1 Pacific Motorway	Moderate to low	High to moderate	Moderate

### *Windsor Road compound (C1)*

The Windsor Road compound would be located immediately adjacent to both the Hills M2 Motorway and Windsor Road. The site was formerly utilised as a compound for the recently completed Hills M2 Motorway Upgrade project and currently comprises vacant open space. The following structures, equipment and construction activities are likely to be visible from surrounding receiver locations:

- Hoarding and / or fencing surrounding the site.
- Car parking.
- Heavy and light vehicle access and egress from Torr Street. Vehicle movement may occur up to 24 hours per day and seven days per week.
- Site offices.
- Lunch rooms and staff amenities.
- Storage laydown area.

The Windsor Road compound would be substantially elevated above and visible to adjacent residential development through a partially filtered screen of vegetation along the adjoining residential boundary. As such, much of the compound infrastructure may be visible above the perimeter hoarding.

One representative receiver location has been identified for views from residential properties (receiver location 1), and one for motorists (receiver location 2) as shown in **Figure 7-38**.

**Table 7-123 Windsor Road compound construction visual impact assessment**

No.	Receiver location	Visual impact assessment
1	Residents – Livingstone Avenue	Provides a representative view for residences around the compound. The sensitivity of nearby residents is considered to be moderate, due to it being upslope and moderately visible to residential properties, however this is somewhat mitigated as the site has previously been utilised as a compound for recently completed Hills M2 Motorway upgrade project. The magnitude of the visual impact is considered to be moderate, providing an overall visual impact rating of moderate.
2	Motorists – Windsor Road	Provides a representative view for motorists using Windsor Road. The sensitivity of motorists would be low and the magnitude low, providing an overall rating of low.





Figure 7-38 Representative receiver locations - Windsor Road construction compound



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### *Darling Mills Creek compound (C2)*

The Darling Mills Creek compound would be located below the bridge within the road reserve adjacent to the Darling Mills Creek viaduct. Primary site access would be provided from the Hills M2 Motorway westbound carriageway at the eastern bridge abutment by construction of a new access track. Limited access would also be provided from Ventura Road along an existing fire trail for the delivery and removal of drill rigs and excavation equipment. The following structures, equipment and construction activities are likely to be visible:

- Temporary security fencing.
- Heavy and light vehicle access and egress to and from the Hills M2 Motorway. Vehicle movement may occur up to 24 hours per day and seven days per week.
- Basic amenities for the local workforce.
- Minor storage laydown area.

The Darling Mills Creek compound would be screened from adjacent residential properties by existing bushland.

The access track and works areas down to beneath the bridge may be visible to recreational users of a walking track that runs up the Darling Mills Creek valley. The walking track would be closed during the construction period to ensure the safety of the public. Despite this, options would be investigated to erect safety fencing and open the walking track on weekends or at other times when works are not actively occurring in the area. During times of closure, alternate routes would be identified and signage would be erected to alert the community of any changes in access.

One representative receiver location has been identified for views from residential properties (receiver location 1), one for users of the bush walking track (receiver location 2) and one for motorists (receiver location 3) as shown in **Figure 7-39**.

**Table 7-124 Darling Mills Creek compound construction visual impact assessment**

No.	Receiver location	Visual impact assessment
1	Residents – Williams Road	Provides a representative view for residences around the compound. The sensitivity of nearby residents to the compound is considered to be moderate in light of their existing bushland outlook, but also their proximity to the Hills M2 Motorway. The magnitude of the visual impact from residences would be low given the extent of screening, providing an overall rating of moderate to low.
2	Walking track along Darling Mills Creek	Provides a representative view for user of the bush walking track adjacent to Darling Mills Creek. The extent of the works would be substantial within the immediate locality of the bridge only, however the number of walkers is likely to be relatively few. As such, the sensitivity of bushwalkers to the works is considered to be moderate, and the magnitude of the works to be moderate to low, providing an overall rating of moderate.
3	Motorists – Hills M2 Motorway	Provides a representative view for motorists using the Hills M2 Motorway. The sensitivity of motorists would be low and the magnitude low, providing an overall rating of low.

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Figure 7-39 Representative receiver locations - Darling Mills Creek viaduct construction compound



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### *Barclay Road compound (C3)*

The Barclay Road compound would be located on the southern side of the Hills M2 Motorway adjacent to Barclay Road and Perry Street. The site was formerly used as a construction compound for the recently completed Hills M2 Motorway Upgrade project. The following structures, equipment and construction activities are likely to be visible:

- Hoarding and / or fencing surrounding the site.
- Heavy and light vehicle access and egress to and from Perry Street. Vehicle movement may occur up to 24 hours per day and seven days per week.
- Machinery associated with laydown and storage of materials.

One representative receiver location has been identified for views from residential properties (receiver location 1), and one for motorists (receiver location 2) as shown in **Figure 7-40**.

**Table 7-125 Barclay Road compound construction visual impact assessment**

No.	Receiver location	Visual impact assessment
1	Residents – Perry Street	Provides a representative view for residences around the compound. The sensitivity of nearby residents to the compound is considered to be moderate to low given the extent of vegetation around the residences, but taking into account that the compound site is already cleared and has previously been used for this purpose. The magnitude of the visual impact would be low given the extent of retained screening vegetation to the compound, providing an overall rating of moderate to low.
2	Motorists – Barclay Road / Perry Street intersection	Provides a representative view for motorists using the local roads. The sensitivity of motorists would be moderate to low given that this intersection is the only point of access and egress from the area of residential development to the south, and the magnitude low, providing an overall rating of moderate to low.

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Figure 7-40 Representative receiver locations - Barclay Road construction compound



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#### *Yale Close compound (C4)*

The Yale Close compound would be located within the road reserve adjacent to the Yale Close Bridge. Vehicle access and egress would be to and from the westbound carriageway of the Hills M2 Motorway and Duncan Place. The following structures, equipment and construction activities are likely to be visible:

- Hoarding and / or fencing surrounding the site.
- Heavy and light vehicle access and egress to and from the Hills M2 Motorway and Duncan Place. Vehicle movement may occur up to 24 hours per day and seven days per week
- Machinery associated with laydown and storage of materials.

One representative receiver location has been identified for views from residential properties (receiver location 1), and one for motorists (receiver location 2) as shown in **Figure 7-41**.

**Table 7-126 Yale Close compound construction visual impact assessment**

No.	Receiver location	Visual impact assessment
1	Residents – Yale Close	Provides a representative view for residences around the compound. The sensitivity of nearby residents to the Yale Close compound is considered to be moderate to low given some setback of the compound from the rear property boundaries of a relatively few residences, and the magnitude of the visual impact to be moderate given the relative lack of screening between immediately adjacent residences and the compound, providing an overall rating of moderate.
2	Motorists – Hills M2 Motorway	Provides a representative view for motorists using the Hills M2 Motorway. The sensitivity of motorists would be low and the magnitude low, providing an overall rating of low.

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Figure 7-41 Representative receiver locations - Yale Close construction compound



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