Spring Farm Parkway

STAGE 1

Review of Environmental Factors

Urban Design Landscape Character and Visual Impact Assessment Report

Prepared by Tract Consultants for Jacobs

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Executive Summary

Roads and Maritime Services is proposing to build Spring Farm Parkway at Menangle Park, an east-west arterial link road that would ultimately service several future residential land releases within the Greater Macarthur Priority Growth Area. It would provide an alternative connection to Spring Farm, Elderslie, Menangle Park, and Mount Gilead. Ultimately, this east-west link would connect Camden Bypass, the M31 Hume Motorway and Menangle Road in Sydney’s south west.

The landscape character and visual impact assessment forms part of the REF prepared for the proposal, and assesses the proposals impacts of landscape character and its visual implications. Through this assessment process key areas of impact are defined and proposals for addressing these impacts determined.

Key features of Stage 1 of Spring Farm Parkway include:

- A new four lane divided road extending approximately 0.9 kilometres from Menangle Road west to Menangle Park development area.
- Capacity for widening on the southern side to an ultimate six lanes in the future.
- Inclusion of a shared use path.
- Provision of access to the Menangle Park land release area.
- A grade separated interchange to connect Spring Farm Parkway with the M31 Hume Motorway with north facing entry and exit ramps designed to be compatible for future implementation of Smart Motorway. The length of the entry and exit ramps would be approximately 1.6 kilometres.
- A four-lane, 76-metre-long bridge over the M31 Hume Motorway with provision for future widening on the southern side to six lanes.
- Four intersections including:
  - an intersection between Spring Farm Parkway and Menangle Road.
  - a north facing exit ramp from the M31 Hume Motorway onto Spring Farm Parkway.
  - a north facing entry ramp from Spring Farm Parkway to the M31 Hume Motorway.
  - an intersection providing access to the proposed Menangle Park land release area at the western end of Spring Farm Parkway (Stage 1).
- Upgrade of Menangle Road including widening and tie-ins to suit the new intersection with Spring Farm Parkway to cater for forecast traffic demand.
- The delivery of the project will be by a construct only package.

Design Guidelines

In developing the urban design, landscape character and visual assessment the design has been undertaken in accordance with a number of Roads and Maritime Service Guidelines in order to inform the design process and its outcomes. These guidelines included:

- Road Design Guidelines
- Environmental Impact Assessment Practice Note: Guideline for Landscape Character and Visual Impact Assessment - EIA-N04
- Beyond the Pavement, Urban Design Policy, Procedures and Design Principles, Roads and Maritime January 2014
- Landscape Guidelines, Roads and Traffic Authority, April 2008
- Bridge Aesthetics - Design Guidelines to improve the aesthetics of bridges in NSW, 2012
- Noise wall design guideline Design guideline to improve the appearance of noise walls in NSW, Roads and Maritime, March 2016
- Water Sensitive Urban Design Guideline, Roads and Maritime, May 2017
Context

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

- Land use
- Heritage
- Vegetation
- Topography and Drainage

Urban Design Strategy

In developing a design response which addresses the impacts to landscape character and the visual environment a number of principles were developed.

Objective 1 - Contribute to the overall landscape structure and revitalisation of the region
Objective 2 – Respect the land uses and built form of the corridor
Objective 3 – Connecting modes and communities
Objective 4 – Fit the landform of the corridor
Objective 5 – Responding to natural patterns
Objective 6 – Protect, maintain and enhance existing views, heritage, cultural, and roadside landmarks and values
Objective 7 – Designing an experience in movement
Objective 8 – Creating self-explaining road environments
Objective 9 – Achieving integrated and minimal maintenance design

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

- landscape treatment of the formation to fit sensitively within the landscape
- surface treatment to paths, medians and bridge elements to achieve a consistent design language throughout the proposal
- the nature and placement of roadside furniture, and
- the planting design required to integrate the proposal to achieve a contextually responsive design outcome and provide visual guidance at the entrances to Pitt Town.

Landscape Character and Visual Assessment

The landscape character assessment identified four character zones:

- LCZ1 – Woodland on foot slope / Broughton Anglican College landscape,
- LCZ2 – Woodland on high point / Tourism (Steam and Machinery Museum landscape),
- LCZ3 – Open pasture/grassland landscape (typically grazing land and open grassland with some trees),
- LCZ4 – Woodland Riparian Landscape; and
- LCZ5 – M31 Hume Motorway corridor landscape.

Findings

Landscape Character Assessment

Landscape character impacts of the proposal were found to generally be of negligible to moderate-low level. This reflects that the changes associated with the proposal do not have a complete or holistic impact on the character of the setting.

Visual Impact Assessment

The visual impacts of the proposal have been assessed at a higher level of impact ranging between negligible to high-moderate. These higher impact values reflect the proximity of Broughton Anglican...
College as well as two separate residential receptors, and the proposal for new infrastructure within the rural landscape setting over which these properties look.

Where impacts are high-moderate, mitigation measures will be needed to screen or soften the impacts of the proposal.

A number of key mitigation measures are summarised which will assist in mitigating the impacts. These impacts will be taken forward into the detailed design to ensure impacts are minimised. Mitigation measures include:

- Integration of earthworks profiles with surrounding landscape
- Refinement of built elements to reduce visual prominence and visual bulk of bridge
- Retention of existing vegetation
- Provision of screen planting to control and limit views to the new alignment.
Contents

1 Introduction 9
   1.1 Background 9
   1.2 Purpose of Report 9

2 The proposal 11
   2.1 Location 11
   2.2 Project Description - The Proposal 13

3 Context 15
   3.1 Setting 15
   3.2 Vegetation 16
      3.2.1 Threatened ecological communities 16
      3.2.2 Threatened and migratory fauna 18
   3.3 Topography and Drainage 19
      3.3.1 Landform 19
      3.3.2 Drainage 21
   3.4 Land Zoning 24
      3.4.1 R2 Low Density Residential 24
      3.4.2 R5 Large Lot Residential 24
      3.4.3 RE1 Public Recreation 26
      3.4.4 E3 Environmental Management 26
      3.4.5 RU2 Rural Landscape 27
      3.4.6 RU6 Transition 27
      3.4.7 Land use Summary 27
   3.5 Heritage 28
      3.5.1 Aboriginal Heritage 28
      3.5.2 Non-Aboriginal Heritage 28
   3.6 Existing Highway Elements 31
      3.6.1 Existing Bridges 31

4 Concept Design 33
   4.1 Urban design Objectives and Principles 34
      4.1.1 Objective 1 - Contribute to the overall landscape structure and
      revitalisation of the region 34
      4.1.2 Objective 2 – Respect the land uses and built form of the surrounding
      land and highway corridors 34
      4.1.3 Objective 3 – Connecting modes and communities 34
      4.1.4 Objective 4 – Fit the landform of the corridor 34
4.1.5 Objective 5 - Responding to natural pattern
4.1.6 Objective 6 - Protect, maintain and enhance existing views, heritage, cultural and roadside landmarks and values.
4.1.7 Objective 7 - Designing an experience in movement
4.1.8 Objective 8 - Creating self-explaining road environments
4.1.9 Objective 9 - Achieving integrated and minimal maintenance design
4.2 Design Response
4.2.1 Urban Design Strategy
4.2.2 Bridges
4.2.3 Piers
4.2.4 Safety Screens
4.2.5 Landscape Adjoining Bridges
4.2.6 Retaining Walls and Culverts
4.2.7 Safety Barriers and Fencing
4.2.8 Signage and Lighting
4.2.9 Grading
4.2.10 Vegetation
4.2.11 Landscape Treatments
4.2.12 Shared Paths

5 Assessment Methodology
5.1 Landscape character and impact assessment
5.2 Visual Impact Assessment
5.3 Landscape character and visual assessment matrix

6 Landscape Character Assessment
6.1 Landscape Character Assessment
6.2 Landscape Character Zone Definitions
6.2.1 LCZ1 – Woodland on foot-slope / Broughton Anglican College
6.2.2 LCZ2 – Woodland on high point / Tourism (Steam and Machinery Museum landscape)
6.2.3 LCZ3 – Open pasture / grassland landscape
6.2.4 LCZ4 – Woodland riparian landscape
6.2.5 LCZ5 – M31 Hume Motorway corridor landscape
6.3 Landscape Character Assessment Summary

7 Visual Impact Assessment
7.1 Viewers and viewpoints
7.2 Visual Catchment
7.3 View Points
7.4 Key Viewpoints
7.4.1 VP1 – Glenlee Road (Mark Evans) Bridge over M31 Hume Motorway
7.4.2 VP2 – Menangle Road – Private rural residential property
7.4.3 VP3 – Menangle Road – Road verge and agricultural land
7.4.4 VP4 – Menangle Road – Verge opposite Broughton Anglican College
7.4.5 VP5 – Existing Menangle Road Bridge over M31 Hume Motorway
7.4.6 VP6 – Mount Pleasant farm access road
7.4.7 VP7 – Mount Pleasant farm - Woodland facing east to M31 Hume Motorway
7.4.8 VP8 – Mount Pleasant farm facing north to private residential property
7.4.9 VP9 – Mount Pleasant farm facing west to Spring Farm Parkway
7.4.10 VP10 – View heading north on M31 Hume Motorway to Spring Farm Parkway

7.5 Compound Sites
7.5.1 Compound 1 - Southern Menangle Road Site
7.5.2 Western Termination Spring Farm Parkway
7.5.3 Compound 3 – Northbound Hume Motorway On-Ramp

7.6 Visual Assessment Summary

8 Mitigation Measures

8.1 Mitigation Measures

9 Conclusion

10 Bibliography
<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Regional and Local Context Plan, (Source: Jacobs 2018)</td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>Stage 1 Spring Farm Parkway Proposed Layout (Source: Jacobs, 2018)</td>
<td>14</td>
</tr>
<tr>
<td>3</td>
<td>View to M31 Hume Motorway, Looking west towards proposal from Menangle Road</td>
<td>15</td>
</tr>
<tr>
<td>4</td>
<td>New growth open woodland, located within the riparian corridor to the south of the proposal, Mount Pleasant farm</td>
<td>16</td>
</tr>
<tr>
<td>5</td>
<td>Biodiversity Impact Assessment Map (Source: Niche 2018)</td>
<td>17</td>
</tr>
<tr>
<td>6</td>
<td>Remnant Cumberland Plain Woodland vegetation, located within the riparian corridor to the south of the proposal, Mount Pleasant farm</td>
<td>18</td>
</tr>
<tr>
<td>7</td>
<td>Looking west across Hume Hwy to Blue Mountains from Menangle Road</td>
<td>19</td>
</tr>
<tr>
<td>8</td>
<td>Eastward panoramic view across Sugarloaf Horse Centre from Menangle Road opposite private dwelling</td>
<td>19</td>
</tr>
<tr>
<td>9</td>
<td>Topography and Drainage Plan</td>
<td>20</td>
</tr>
<tr>
<td>10</td>
<td>Open drainage channel. Looking west from Menangle Road opposite Broughton Anglican College</td>
<td>21</td>
</tr>
<tr>
<td>11</td>
<td>View of riparian vegetation margin around farm dam located south of proposal, Mount Pleasant farm</td>
<td>21</td>
</tr>
<tr>
<td>12</td>
<td>Flooding and Drainage Investigation Report – Location and Catchment Plan (Lyall and Associates (2017)</td>
<td>22</td>
</tr>
<tr>
<td>14</td>
<td>Land use – Zoning Plan (One Map 2018, based on Campbelltown LEP 2015)</td>
<td>25</td>
</tr>
<tr>
<td>15</td>
<td>View of Sugarloaf Farm, looking east from Menangle Road (Jacobs 2018)</td>
<td>29</td>
</tr>
<tr>
<td>16</td>
<td>View of entry to Sugarloaf Horse Centre, looking southeast from Menangle Road (Google 2017)</td>
<td>29</td>
</tr>
<tr>
<td>17</td>
<td>View of Upper Canal System, looking south from Glenlee Road canal bridge</td>
<td>30</td>
</tr>
<tr>
<td>18</td>
<td>Glenlee Road (Mark Evans) Bridge – Looking north from M31 Hume Motorway</td>
<td>31</td>
</tr>
<tr>
<td>19</td>
<td>Menangle Road Bridge – Looking north from M31 Hume Motorway</td>
<td>32</td>
</tr>
<tr>
<td>20</td>
<td>Pier and deck structure of Menangle Road Bridge</td>
<td>32</td>
</tr>
<tr>
<td>21</td>
<td>Guideline Covers</td>
<td>33</td>
</tr>
<tr>
<td>22</td>
<td>Landscape Strategy Plan</td>
<td>38</td>
</tr>
<tr>
<td>23</td>
<td>Typical section of Spring Farm Parkway Bridge structure over M31 Hume Motorway</td>
<td>39</td>
</tr>
<tr>
<td>24</td>
<td>Proposed north elevation (southbound view) of Spring Farm Parkway Bridge structure over M31 Hume Motorway.</td>
<td>40</td>
</tr>
<tr>
<td>25</td>
<td>M31 Hume Motorway looking north at proposed location of proposed Spring Farm Parkway Bridge in foreground</td>
<td>40</td>
</tr>
<tr>
<td>26</td>
<td>Proposed pier form indicating ability to incorporate future widening</td>
<td>41</td>
</tr>
<tr>
<td>27</td>
<td>Tumbarumba Bridge Pier incorporating art work</td>
<td>41</td>
</tr>
</tbody>
</table>
Figure 28 – Inspirational themes a) harness racing; b) Mountains; c) light horserman

Figure 29 – Illustrative concepts of how themes may be incorporated as a relief element on the pier:

Figure 30 – Safety Screens – a) Glenlee Road (Mark Evans Bridge) looking east along bridge showing treatment of safety screens and barriers; b) Menangle Road Bridge looking west along bridge showing treatment of safety screens and barriers

Figure 31 – Curved screen on Falcon Street Pedestrian Bridge

Figure 32 – Safety Screen Proposal Section and Elevation

Figure 33 – Culverts extending beyond the headway on an off ramp of the M5 South West Motorway

Figure 34 – Typical Section of proposed Spring Farm Parkway road formation

Figure 35 – Landscape Character Zones

Figure 36 – LCZ1 Broughton Anglican College frontage – Menangle Road exit

Figure 37 – LCZ1 Broughton Anglican College frontage – Menangle Road main entrance

Figure 38 – LCZ2 Campbelltown Steam and Machinery Museum entry looking from access road west off Menangle Road.

Figure 39 – LCZ2 Woodland area beyond Campbelltown Steam and Machinery Museum looking north from Menangle Road.

Figure 40 – LCZ3 Open pasture / grassland landscape character looking west towards Hume Motorway from Menangle Road.

Figure 41 – LCZ3 Open pasture / grassland landscape, looking north to Campbelltown Steam and Machinery Museum, west of Menangle Road.

Figure 42 – LCZ4 Woodland Riparian Landscape, looking north-west towards the proposal from the northern extent of Mount Pleasant farm.

Figure 43 – LCZ4 Woodland Riparian Landscape, looking west from Mount Pleasant farm along drainage corridor.

Figure 44 – LCZ5 – M31 Hume Motorway corridor landscape looking south from Glenlee Road (Mark Evans) bridge

Figure 45 – LCZ5 – View from northbound M31 Hume Motorway showing Mount Pleasant farm and riparian corridor to left of view (west)

Figure 46 – Key Viewpoint Locations

Figure 47 – Viewpoint 1 - Looking south from Glenlee Road (Mark Evans) bridge along M31 Hume Motorway corridor towards the proposal.

Figure 48 – Viewpoint 2 - Looking west from Menangle Road towards existing residential dwelling.

Figure 49 – Viewpoint 3 - Looking north from the western verge of Menangle Road towards existing dwelling and M31 Hume Motorway.

Figure 50 – Viewpoint 4 - Looking north along western verge of Menangle Road opposite Broughton Anglican College exit.

Figure 51 – Viewpoint 5 - Looking north along M31 Hume Motorway corridor towards proposal from Menangle Road bridge. (Source: Google Streetview June 2017)

Figure 52 – Viewpoint 6 - Looking east towards M31 Hume Motorway from Mount Pleasant farm access road.
Figure 53 – Viewpoint 7 - Looking east towards M31 Hume Motorway from woodland adjacent to riparian corridor south of proposal. 

Figure 54 – Viewpoint 8 - Looking north towards residential dwelling from Mount Pleasant farm boundary. 

Figure 55 – Viewpoint 9 – Looking northwest from Mount Pleasant farm boundary within proposal alignment. 

Figure 56 – VP10 – View heading north on M31 Hume Motorway to Spring Farm Parkway. 

Figure 57 – Proposed Compound Sites. 

Figure 58 – View from south eastern corner of the proposed compound facility.
List of Tables

Table 1 – Landscape Character and Visual Impact Assessment Matrix 52
Table 2 – Landscape Character Assessment Summary 66
Table 3 - Visual Assessment Summary 81
Table 4 – Mitigation Measures 84
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1 INTRODUCTION

1.1 Background

Roads and Maritime Services is proposing to build Spring Farm Parkway at Menangle Park, an east-west arterial link road that would ultimately service several future residential land releases within the Greater Macarthur Priority Growth Area. It would provide an alternative connection to Spring Farm, Elderslie, Menangle Park, and Mount Gilead. Ultimately, this east-west link would connect Camden Bypass, the M31 Hume Motorway and Menangle Road in Sydney’s south west.

Stage 1 of Spring Farm Parkway, subject of the proposal, is needed to support the development of the Menangle Park Urban Release, which is part of the Greater Macarthur Priority Growth Area. Stage 1 would provide access to a new housing subdivision being developed by Dahua Pty Ltd on the western side of the Hume Motorway, which consists of 1,500 lots proposed for completion in 2022. Access would be provided to/from the Hume Motorway and Menangle Road.

1.2 Purpose of Report

Tract Consultants Pty Ltd has been commissioned by Jacobs to provide an Urban Design, Landscape Character and Visual Impact Assessment for the proposed Spring Farm Parkway road link between Spring Farm and Menangle Road. As part of this process a review of the design is to be undertaken and recommendations made as to its integration within the landscape context.

This assessment and recommendations will form part of the Review of Environmental Factors (REF) submission for the approval of the works. The strategy developed will respond to the future urban development aspired to by the Department of Planning and Environment.
2 THE PROPOSAL

2.1 Location

The proposal is located 50 kilometres south-west of the Sydney Central Business District in the local government area (LGA) of Campbelltown; refer Figure 1 - Regional Context Plan.

It forms part of the Greater Macarthur Priority Growth Area and is supported by the Department of Planning and Environment as part of the critical infrastructure required to address the proposed population growth in the region and the need for new and improved transport links.

The proposal lies approximately 11km to the southwest of Campbelltown, in the suburb of Menangle Park.

Menangle Park has a population of 257 (ABS Census, 2016) and is largely a rural area. Harness Racing plays an important role within the community and has become synonymous with references to Menangle Park having given the suburb its name. The Racecourse was established in 1914 and many of the residences have a clear association with Harness Racing.

Menangle Park residential precinct is located to the south west of the proposal west of the M31 Hume Motorway. East of the motorway the nearest residential communities are Glen Alpine and Rosemeadow to the north east and east respectively. None of these residential communities are visible from the proposal.

The proposal is for stage 1 of Spring Farm Parkway, a new east-west link road connecting Menangle Road with a future residential development at Menangle Park. The link is achieved via a new bridge over the M31 Hume Motorway, and northerm ramped connections to the Hume Motorway.
Figure 1 – Regional and Local Context Plan. (Source: Jacobs 2018)
2.2 Project Description - The Proposal

Key features of Stage 1 of Spring Farm Parkway include:

- A new four lane divided road extending approximately 0.9 kilometres from Menangle Road west to Menangle Park development area.
- Capacity for widening on the southern side to an ultimate six lanes in the future.
- Inclusion of a shared use path.
- Provision of access to the Menangle Park land release area.
- A grade separated interchange to connect Spring Farm Parkway with the M31 Hume Motorway with north facing entry and exit ramps designed to be compatible for future implementation of Smart Motorway. The length of the entry and exit ramps would be approximately 1.6 kilometres.
- A four-lane, 76-metre-long bridge over the M31 Hume Motorway with provision for future widening on the southern side to six lanes.
- Four intersections including:
  - an intersection between Spring Farm Parkway and Menangle Road.
  - a north facing exit ramp from the M31 Hume Motorway onto Spring Farm Parkway.
  - a north facing entry ramp from Spring Farm Parkway to the M31 Hume Motorway.
  - an intersection providing access to the proposed Menangle Park land release area at the western end of Spring Farm Parkway (Stage 1).
- Upgrade of Menangle Road including widening and tie-ins to suit the new intersection with Spring Farm Parkway to cater for forecast traffic demand.
- The delivery of the project will be by a construct only package.

Refer to Figure 2 – Stage 1 Spring Farm Parkway Proposed Layout.
Figure 2 – Stage 1 Spring Farm Parkway Proposed Layout (Source: Jacobs, 2018)
3 CONTEXT

3.1 Setting

The proposal is located 50 kilometres south-west of the Sydney Central Business District in the local government area (LGA) of Campbelltown, refer Figure 1 - Regional Context Plan.

The study area is defined, and cut by a number of road corridors. The M31 Hume Motorway, the main route running northeast to southwest from Southwestern Sydney to Canberra, which both bisects the study area and the western side of Campbelltown LGA. The Hume Motorway, shown in Figure 3 below is classified as a state road and is dual lane in each direction with a 110 km/h speed limit.

The proposal will intersect with Menangle Road immediately to the east of the Hume Highway. Menangle Road is classified as a regional road MR179 and currently provides the only direct road connection between Campbelltown and Menangle Park to the southwest, before connecting through to Picton to the south.

The current setting of the proposal is a rural landscape with remnant and riparian vegetation corridors punctuating the landscape.

Figure 3 – View to M31 Hume Motorway, Looking west towards proposal from Menangle Road
3.2 Vegetation

Vegetation in the study area mostly comprises cleared exotic grassland and disturbed native vegetation with some remnant or regrowth stands of native woodland trees occurring predominantly along drainage corridors and on steeper slopes. The vegetation structure of this area is predominantly fragmented and also contains a mixture of introduced planting as well as invasive woody and herbaceous agricultural weeds and wetland species around watercourses.

Niche Environment and Heritage Pty Ltd (Niche) have been commissioned by Roads and Maritime (RMS) to undertake a biodiversity impact assessment of the proposal. Many of the vegetative elements within the study area potentially contribute to a broader structure of threatened ecological communities of Cumberland Plain Woodland and Swamp Oak Floodplain Forest, as outlined in the Biodiversity Impact Assessment undertaken by Niche (2018).

Despite the highly fragmented structure and presence of weedy growth, these vegetation elements contribute significantly to the broader landscape character of the study area. Many of these vegetative structures give visual cues as to the historical land use of the area, and through their presence and form, highlight the relationship between landform and drainage throughout the adjacent flood plain and upper catchment. Figures 4 and 6 indicate the Cumberland Plain Woodland community.

The following sections summarise the condition of plant communities and fauna species assessed as part of biodiversity impact assessment undertaken by Niche.

3.2.1 Threatened ecological communities

Cumberland Plain Woodland is listed as critically endangered under the Biodiversity Conservation (BC) Act 2016. Swamp Oak Floodplain Forest is listed as endangered under the BC Act. Therefore, an assessment of significance under the BC Act (Five Part Test) was undertaken by Niche for Cumberland Plain Woodland and Swamp Oak Floodplain Forest.

The assessments of significance concluded that the condition of these ecological communities was generally poor and fragmented. The plant species that contribute to these communities and their potential to be impacted by the proposal are illustrated in Figure 5 – Biodiversity Impact Assessment Map (Niche 2018).

Figure 4 – New growth open woodland, located within the riparian corridor to the south of the proposal, Mount Pleasant farm
Figure 5 – Biodiversity Impact Assessment Map (Source: Niche 2018)
3.2.2 Threatened and migratory fauna

Three threatened fauna species were recorded within the study area during surveys undertaken by Niche in February 2018 (Biodiversity Impact Assessment, Niche 2018):

- Two Grey-headed Flying Foxes (*Pteropus poliocephalus*) were recorded along the Nepean River tributary in the south of the study area
- Eastern Freetail-bat (*Mormopterus norfolkensis*) were recorded at all five songmeter locations in the study area
- Greater Broad-nosed Bat (*Scoteanax rueppellii*) (probable) was recorded along the Nepean River tributary in the south of the study area.

The analysis of subject threatened fauna species resulted in fifteen threatened species being rated as having a moderate likelihood or better of occurring within the study area. These species and their potential to be impacted by the proposal are detailed in Table 3 of the *Biodiversity Impact Assessment (Niche 2018)*.

Figure 6 – Remnant Cumberland Plain Woodland vegetation, located within the riparian corridor to the south of the proposal, Mount Pleasant farm
3.3 **Topography and Drainage**

3.3.1 **Landform**

As shown in Figure 10 – Topography and Drainage Plan, the landform is flat to moderately undulating and falls to the west and the Nepean River.

The northern edge of the study area is undulating and elevated with slopes up to 10 to 18 degrees. A gentle ridge runs east to west. Glenlee Road traces the alignment of the ridge from Menangle Road to the location of the historic Glenlee Estate. The land falls to the south to an existing watercourse which drains in a westerly direction to the Nepean River.

At the southern edge of the study area is the Mount Pleasant farm complex constructed in the 1970’s, and which possesses broad views across much of the study area, limited to an extent by vegetation cover.

*Figure 7 – Looking west across Hume Hwy to Blue Mountains from Menangle Road*

*Figure 8 – Eastward panoramic view across Sugarloaf Horse Centre from Menangle Road opposite private dwelling.*
Figure 9 – Topography and Drainage Plan
3.3.2 Drainage

A flooding and drainage investigation was undertaken by Lyall & Associates (2017) for the proposed Spring Farm Parkway project. The following section outlines the existing relevant drainage structures and elements located within the study area as investigated and described in the flooding and drainage report.

The proposal is located on the floodplain of the Nepean River system. The main arm of the Nepean River runs in a northerly direction, located approximately one kilometre to the west of Spring Farm Parkway. The in-bank area of the creek and its immediate overbank area are densely vegetated, while the broader floodplain has typically been cleared for agricultural purposes.

The proposal runs immediately adjacent and to the north of an ephemeral creek tributary which forms part of a broader riparian corridor that drains the open pasture/grassland catchments to the east of Menangle Road. Several drainage structures control runoff as it flows westward via Menangle Road and M31 Hume Motorway corridor towards the Nepean River. Several farm dams also connect on-line with the system, figure 10 and 11 depict these elements. (Lyall and Associates 2018)

Figure 10 – Open drainage channel. Looking west from Menangle Road opposite Broughton Anglican College

Figure 11 depicts a farm dam also set further west along this drainage line located to the south west of the proposed alignment.

Figure 11 – View of riparian vegetation margin around farm dam located south of proposal, Mount Pleasant farm.
Figure 12 – Flooding and Drainage Investigation Report – Location and Catchment Plan (Lyall and Associates (2017))
Figure 13 – Flooding and Drainage Investigation Report – Existing Drainage System (Lyall and Associates (2017))
### Land Zoning

The land use of an area has the potential to influence the overall character and feel of it. The proposal and adjacent Menangle Park fall under the Campbelltown Local Environmental Plan 2015 refer to Figure 14 for land-use zoning.

There are six dominant land use areas to either side of the alignment and connecting roads, these are:

- **R2 Low Density Residential** – occurs along the north-western boundary of the proposal and further south.
- **R5 Large Lot Residential** – occurs along the north side of the proposal either side of M31 Hume Motorway and west of Menangle Road.
- **RE1 Public Recreation** – occurs adjacent to the proposal, west of M31 Hume Motorway.
- **E3 Environmental Management** – occurs to the east of the proposal adjacent to Menangle Road.
- **RU2 Rural Landscape** – occurs to the east and south of the proposal adjacent to Menangle Road.
- **RU6 Transition** – occurs to the south of the proposal between M31 Hume Motorway and Menangle Road.

In addition to these, two more land use areas are located to the north between the proposal and Glenlee Road however these are not part of the land directly impacted by the proposed works:

- **SP2 Infrastructure**
- **E4 Environmental Living**

#### 3.4.1 R2 Low Density Residential

This is the dominant land use surrounding the proposal but is yet to be reflected in the built form. This change in zoning, supported by the Department of Planning and Environment, is the impetus for the project. The area also contains the existing residential development of Menangle Park, along with some existing scattered rural dwellings to the north. This zone has the following objectives as listed in the Local Environment Plan are:

**Objectives of zone**

- To provide for the housing needs of the community within a low density residential environment.
- To enable other land uses which provide facilities or services to meet the day to day needs of residents.
- To enable development for purposes other than residential only if that development is compatible with the character of the living area and is of a domestic scale.
- To minimise overshadowing and ensure a desired level of solar access to all properties.
- To facilitate diverse and sustainable means of access and movement.

#### 3.4.2 R5 Large Lot Residential

Located adjoining the western edge of the M31 Hume Motorway corridor, to the north and south of the proposal, is zoned as larger holdings composed of cleared pasture and regenerated woodland communities. This land use is located in the higher lying portions of the study area towards Glenlee Road and for a small section just north of Menangle Park Bridge. The objectives as listed in the Local Environment Plan are:

**Objectives of zone**

- To provide residential housing in a rural setting while preserving, and minimizing impacts on, environmentally sensitive locations and scenic quality.
- To ensure that large residential lots do not hinder the proper and orderly development of urban areas in the future.
- To ensure that development in the area does not unreasonably increase the demand for public services or public facilities.
- To minimise conflict between land uses within this zone and land uses within adjoining zones.
Figure 14 – Land use – Zoning Plan (One Map 2018, based on Campbelltown LEP 2015)
To enable development for certain purposes other than residential only if that development is compatible with the character and scale of the living area.

To minimise overshadowing and ensure a desired level of solar access to all properties.

3.4.3 RE1 Public Recreation

The large corridor of riparian woodland and open grassland adjoining the proposal to the south is zoned RE1 Public Recreation. Objectives for RE1 lands as listed in the Local Environment Plan are:

Objectives of zone
- To enable land to be used for public open space or recreational purposes.
- To provide a range of recreational settings and activities and compatible land uses.
- To protect and enhance the natural environment for recreational purposes.
- To provide for land uses compatible with the ecological, scientific, cultural or aesthetic values of land in the zone.
- To facilitate the multiple use of certain open space areas.
- To facilitate development that is ancillary or incidental to the special land uses provided for in this zone.
- To provide for the sufficient and equitable distribution of public open space to meet the needs of the local community.
- To preserve and rehabilitate bushland, wildlife corridors and natural habitat, including waterways and riparian lands, and facilitate public enjoyment of these areas.
- To provide for the retention and creation of view corridors.
- To protect and enhance areas of scenic value and the visual amenity of prominent ridgelines.
- To preserve land that is required for public open space or recreational purposes.

3.4.4 E3 Environmental Management

There is a broad swathe of land immediately to the east of the proposal study area zoned E3 Environmental Management, which corresponds to the general alignment of the state heritage registered water canal to running north-west to south-east of the proposal. The Local Environmental Plan defines the objectives of these lands as:

Objectives of zone
- To protect, manage and restore areas with special ecological, scientific, cultural or aesthetic values.
- To provide for a limited range of development that does not have an adverse effect on those values.
- To enable development for purposes other than rural-residential only if that development is compatible and complementary, in terms of design, size and scale, with the character of land in the zone.
- To allow cellar door premises, restaurants and cafes only where they are directly associated with the agricultural use of the land.
- To protect, and maintain the environmental, ecological and visual amenity of, the Scenic Hills, the Wedderburn Plateau and environmentally sensitive lands in the vicinity of the Georges River from inappropriate development.
- To preserve the rural heritage landscape character of the Scenic Hills.
- To protect and enhance areas of scenic value and the visual amenity of prominent ridgelines.
- To protect bushland, wildlife corridors and natural habitat, including waterways and riparian lands.
- To ensure the preservation and maintenance of environmentally significant and environmentally sensitive land.
3.4.5 RU2 Rural Landscape
The land to the east and south of Menangle Road and M31 Hume Highway is zoned RU2 and incorporates the hilly vegetated land within and surrounding Broughton Anglican College. Objectives for RU2 lands as listed in the Local Environment Plan are:
- To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.
- To maintain the rural landscape character of the land.
- To provide for a range of compatible land uses, including extensive agriculture.
- To preserve and enhance bushland, wildlife corridors, natural habitat and water resources, including waterways, ground water and riparian land.
- To protect and enhance areas of scenic value, and the visual amenity of prominent ridgelines, by minimising development and providing visual contrast to nearby urban development.

3.4.6 RU6 Transition
The narrow strip of land located between Menangle Road and M31 Hume Highway to the south of the proposal is zoned RU6 transition and currently contains open pasture grassland and a storage facility for highway management. Objectives for RU6 lands as listed in the Local Environment Plan are:
- To protect and maintain land that provides a transition between rural and other land uses of varying intensities or environmental sensitivities.
- To minimise conflict between land uses within this zone and land uses within adjoining zones.
- To enable the orderly and productive use of land within this zone.
- To ensure that development does not have a detrimental visual impact when viewed from surrounding land and roads.

3.4.7 Land use Summary
The western edge of the Hume Motorway is zoned to accommodate residential land uses, replacing what to date is a rural landscape. These changes are supported by the Department of Planning and Environment as part of the development of the Greater Macarthur Priority Growth Area.

The proposals design development needs to consider the underlying intent and objectives of these adjoining land uses in order that it may be informed by and developed in response to them. By responding to the areas planned land-use the roads design can be made relevant both for current and future uses in the short to medium term.
3.5 Heritage

3.5.1 Aboriginal Heritage

Three different Aboriginal linguistic groups were recorded by Mathews (1897) in the Camden region near Menangle Park, including the Darkingung, Gandangarra (including Darug language families) and Dharawal. The Dharawal people have been identified as the dominant aboriginal group of the area. The Dharawal people covered an area stretching from the east coast (i.e. Botany Bay) to as far west as Camden and south as far as the Shoalhaven River (Liston 1988:49). The Dharawal people have been divided into two groups the Sweet (fresh) Water Dharawal and the Salt Water Dharawal, alluding to inland or coastal peoples respectively. It is the inland clans that lived in the proposal. Their food was focused on small animals and plant food rather than fish.

European settlement began in the early 1800’s and the increasing settlement of the area by the British colonists led to conflict during the drought of 1814 – 1816, by which time many traditional Aboriginal resource-gathering areas had been engulfed by farmland and pasture. A spate of retaliatory killings between Aboriginal groups and settlers across Sydney eventuated in the dispatch of a punitive expedition to capture or kill those Aboriginal people involved in the skirmishes (Brook and Kohen 1991:23).

Contact with Europeans introduced diseases, such as smallpox, that drastically altered the size and structure of the Aboriginal population, whilst the expansion of settlements and establishment of farmland subsumed the traditional areas used to meet subsistence needs (Attenbrow 2002).

Archaeological sites in the region generally occurred as surface artefact scatters and isolated artefacts which were concentrated on prominent ridgelines or adjacent to the Nepean River. The survey of the site revealed identified three areas of potential archaeological deposit within the Stage 1 area. Excavation of test pits was undertaken which revealed the sites to be of low archaeological significance due to disturbance from previous land use and flooding impacts. No further mitigation was recommended.

3.5.2 Non-Aboriginal Heritage

The study area was settled by early colonists who farmed the land on large grants. There is a remarkably high retention of physical evidence relating to these early land grants in the form of heritage homesteads and outbuildings. The largely rural land use and character has also been retained, enhancing the visual heritage values of these items. (Non-Aboriginal Heritage Study – Jacobs 2018)

Three non-aboriginal items of State heritage significance identified in the vicinity of the proposed Parkway’s alignment are as follows:

- Glenlee, outbuildings, garden and gate lodge (SHR 00009)
- Sugarloaf Farm (SHR 01389)
- Upper Canal System (Pheasants Nest Weir to Prospect Reservoir) (SHR 01373)

In addition to the listed heritage sites, the cultural heritage of the Hume Highway - as part of the Remembrance Driveway - should be acknowledged.

Glenlee Estate

As part of the land grants in the Cowpastures area, Governor Macquarie granted 3,000 acres to a Scottish free settler, William Howe in 1818. Howe named his grant “Glenlee” after his birthplace and began farming sheep. In 1857 the Main Southern Railway line was surveyed, which ran through the Glenlee property, to the west of the main house. A portion of the Glenlee estate was resumed by the State Government, and in 1866 the railway was constructed through this corridor. (Jacobs 2018)

Significance of Glenlee to the State Heritage Register and the Proposal

“...The landscape of the estate is of exceptional aesthetic value as a rare reminder of the former pastoral industry which once characterised the area. The mid-19th century Southern Railway, though sited close to the homestead site, was constructed to maintain this visual relationship. The siting of the homestead group in a context of undulating land form is an outstanding example of colonial landscape planning to form a picturesque composition with direct sightlines to the neighbouring Camden Park Estate and the Great Dividing Range” (NSW State Heritage Register)

The existing curtilage of the Glenlee homestead is confined to the homestead and outbuildings, which are located to the west of the adjacent ridge with a south-west aspect. The proposal is largely concealed by this ridge from the homestead and curtilage and so is considered to not have an impact.
Sugarloaf Farm

Sugarloaf Farm was made up of a number of separate small grants and consolidated over a period of time dating from 1818. Sugarloaf Farm was named after a nearby hill known as Sugarloaf Hill. It is also known as Mount Huon, after one of the earliest grantees, Paul Huon. In 1881, the land passed to James Fitzpatrick, thus becoming part of the Glenlee Estate. (Jacobs 2018)

Significance of Sugarloaf Farm to the State Heritage Register and the Proposal

“The farm has a continuity of pastoral use over 160 years representing a pattern of use that is becoming rare in the area due to urban expansion… The contrast between areas of naturally regenerating woodland and open paddocks has been comprised by later land uses but is still evident and reflects some of the early character of the farm.” (NSW State Heritage Register)

The proposal will utilise part of the current alignment of Menangle Road for its entry/exit to the Hume Motorway, a section of which is to be widened as part of the proposal and follows the western boundary of Sugarloaf Farm. The landscape treatment of the proposal, particularly the interface of Spring Farm Parkway with Menangle Road and widening works would consider the sensitivity of the rural heritage aesthetic of Sugarloaf Farm and aim to preserve the continuity of the historic pastoral setting. The present landscape setting is depicted in Figures 15 and 16.

Figure 15 – View of Sugarloaf Farm, looking east from Menangle Road (Jacobs 2018)

Figure 16 – View of entry to Sugarloaf Horse Centre, looking southeast from Menangle Road (Google 2017)
Upper Canal System (Pheasants Nest Weir to Prospect Reservoir)

The Upper Nepean Scheme has functioned as part of the main water supply system for Sydney since 1888. Apart from the augmentation and development in supply and other improvements, the Upper Canal and Prospect Reservoir portions of the scheme have changed little and in most cases operate in essentially the same way as was originally envisaged and is depicted, Figure 17.

"The Upper Nepean Scheme is unique in NSW, being the only extensive canal, reservoir and dam network to supply a large city and its population with fresh water from a distant source in the hinterland." (NSW State Heritage Register)

Significance of Upper Canal System to the State Heritage Register and the Proposal

On the eastern side of Hume Motorway, the Upper Canal System bisects the curtilage of Sugarloaf Farm. Located approximately 450 metres from the proposed intersection with Menangle Road on the eastern side of the Hume Motorway, it is not physically affected by the proposal. Despite its relative proximity to the proposal it is largely an invisible element within the landscape when viewed from Menangle Road.

Remembrance Drive

The Remembrance Driveway is located along the Hume and Federal Highways between Sydney and Canberra.

The development of the idea of planting trees as a memorial appears to have developed in Great Britain in 1918 when the office of the King’s Highway issued a pamphlet titled Roads of ‘Remembrance as War memorials’.

The objective of this program was to transform existing highways “to the dignity of Roads of Remembrance adorned with trees” and to organise the building of highways “of exceptional dignity and beauty with open spaces at intervals as special memorials to the Great War”.

The concept of the living memorial was promoted by Mrs Margaret Davis, Founding President of the Garden Clubs of Australia with the view of remembering those who served in the Second World War. The project was launched by The Premier of NSW, the Hon. J.J. Cahill in December 1953 and on the 5 February
1954 the Queen and Prince Philip each planted a Plane tree in Macquarie Place, Sydney, marking the beginning of the Driveway. It stands as a living memorial honouring all those who served in the Australian Defence Forces in World War II and subsequent wars or conflicts.

The development and management of the Remembrance Drive continues today with a focus on development of rest areas for Victoria Cross recipients, improvement of existing plantings and development of new ones.

Summary of Non-Aboriginal Heritage Study

The historical context and remaining heritage items demonstrate the early colonial pastoral history. The largely rural landscape character of the past has also been retained, strengthening the links of the built form.

The proposal would acknowledge the rural heritage aesthetic of the remaining farm holdings and heritage structures within the study area. Proposed landscape treatments and structures would be sympathetic and aim to maintain the continuity of pastoral character and use that helps to preserve the integrity of these heritage listed features. The potential to incorporate the Remembrance Drive will also be considered.

3.6 Existing Highway Elements

3.6.1 Existing Bridges

There are two bridge structures traversing the Hume Motorway in the vicinity of the proposed new Spring Farm Parkway Bridge. Glenlee Road (Mark Evans) Bridge shown in Figure 18 below is located approximately 1.1km to the north of the proposal and Menangle Road Bridge shown in Figures 19 and 20 is located approximately 1.1km to the south of the proposal.

There is no pedestrian or cycle access across either of the existing nearby bridges, and there are no lighting or advertising structures. Signage on the structures is limited to name plates mounted on the outside of the barriers below the screens and visible only from highway traffic below.

Existing Glenlee Road (Mark Evans) Bridge

Glenlee Road (Mark Evans) Bridge comprises the following:
- Four span structure, comprising 2 X short approach spans, and 2x long main spans
- Low profile box-girder superstructure
- Small deck overhang
- Circular twin piers and no headstock
- Low tapered parapet kerb up-stand with no skirt overhang to superstructure
- Twin rail barriers painted white
- Low angle spill-through concrete unit paved abutments with minimal visible headwall
- Vertically mounted flat mesh panel safety screens with low-profile twin curved post supports; and
- Plain galvanised finish to screens. Plain concrete finish to structure.
Existing Menangle Road Bridge

Menangle Road Bridge comprises the following:

- Four span structure, comprising 2 X short approach spans, and 2x long main spans
- Deep profile box-girder superstructure, at a skew to the Motorway below
- Large deck overhang
- Single circular pier per span
- No headstock
- Low tapered parapet kerb up-stand with no skirt overhang to superstructure
- Twin rail barriers painted white
- Spill-through concrete unit paved abutments with 1-2m of abutment wall visible
- Vertically mounted flat mesh panel safety screens with low-profile twin curved post supports; and
- Plain galvanised finish to screens. Plain concrete finish to structure.

Figure 19 – Menangle Road Bridge – Looking north from M31 Hume Motorway

Figure 20 – Pier and deck structure of Menangle Road Bridge
CONCEPT DESIGN

The design response for the proposal needs to reflect both the character of the landscape through which the proposals alignment passes, as well as the broader landscape, addressing environmental, visual and physical constraints as part of a holistic design solution. To achieve this, a number of objectives and principles have been summarised in Section 4.1 to inform the design development of the corridor.

The development of the urban design response needs to consider a number of guidelines (Figure 21) which inform the undertaking of the landscape character and visual assessment report as well as the development of the overall concept. These include:

- Road Design Guidelines
- Environmental Impact Assessment Practice Note: Guideline for Landscape Character and Visual Impact Assessment - EIA-N04
- Beyond the Pavement, Urban Design Policy, Procedures and Design Principles, Roads and Maritime January 2014
- Landscape Guidelines, Roads and Traffic Authority, April 2008
- Bridge Aesthetics - Design Guidelines to improve the aesthetics of bridges in NSW, 2012
- Noise wall design guideline Design guideline to improve the appearance of noise walls in NSW, Roads and Maritime, March 2016
- Water Sensitive Urban Design Guideline, Roads and Maritime, May 2017

Figure 21 – Guideline Covers
4.1 Urban design Objectives and Principles

The following objectives are derived from the nine urban design principles defined in the Road and Maritime Services urban design policy - Beyond the Pavement. They reflect both the unique character of the road, its rural residential context and key issues which adjoin it.

4.1.1 Objective 1 - Contribute to the overall landscape structure and revitalisation of the region

Principles:

- Reinforce the road’s role as a Link Road within the Greater Macarthur Growth Area, connecting Campbelltown and Menangle Park via the M31 Hume Motorway and Menangle Road to Spring Farm, Elderslie and Narellan via Liz Kernohan Drive and Camden Bypass in accordance with the Growth Centre Road Framework and Greater Macarthur Growth Area Road Network Strategy.
- Develop an alignment which permits Menangle Park to function as an urban centre without the disruption of through traffic.
- Design an alignment which is responsive to its landscape setting and does not detract from it.
- Minimise negative physical impacts on parklands, open space, the creeks and aquatic environments which drain Menangle Park and the nearby rural and residential areas to the north and east.
- Design an alignment which is compatible with a possible future east-west link road extending eastwards to Appin Road.

4.1.2 Objective 2 – Respect the land uses and built form of the surrounding land and highway corridors

Principles:

- Minimise the footprint of the corridor to limit impacts to adjoining vegetation, communities, Broughton Anglican College and farm holdings including Sugarloaf Horse Farm.
- Design an alignment which minimises fragmentation of farm holdings or the loss of connections between paddocks.
- Maintain the ecological integrity of the vegetated sections and landscape character of the corridor.
- Minimise the intrusion of road-related elements (fencing and water quality control measures) on the local landscape.

4.1.3 Objective 3 – Connecting modes and communities

Principles:

- Provide safe and efficient pedestrian access to Menangle Park residential development both along and across the proposed corridor.
- Provide active transport opportunities both within the alignment and connecting to the broader local context and networks.
- Provide a design response which acknowledges the wider population centres of Spring Farm, Mount Annan, Menangle Park and Campbelltown. Facilitate movement of people within this context providing an environment which reflects this human scale.

4.1.4 Objective 4 – Fit the landform of the corridor

Principles:

- Consider the relationship between road and landscape minimising the overall scale of fills and cut along the alignment.
- Minimise the footprint of the corridor to limit impacts to adjoining vegetation communities and farm holdings including Sugarloaf Farm and Broughton Anglican College.
- Provide a formation which addresses local flood events.
- Vary the gradient of earthworks where practicable to provide visual interest and reflect characteristics of the surrounding landform and landscape.
- Integrate cut and fill embankments with surrounding terrain by grading out and varying slopes.
4.1.5 **Objective 5 - Responding to natural pattern**

**Principles:**
- Respond to the grain of the landscape and avoid, where possible, the disruption of patches of vegetation, both natural and cultural
- Preserve existing cultural patterns within the landscape
- Utilise a combination of trees and understorey treatments which respond to the existing adjacent context.
- Ensure planting reinforces the landscape character zones described within this report within an overall structure.
- Maximise tree planting opportunities.

4.1.6 **Objective 6 - Protect, maintain and enhance existing views, heritage, cultural and roadside landmarks and values.**

**Principles:**
- Preserve the integrity of existing heritage items and areas of cultural importance to the local community
- Avoid, where possible areas of identified historic and Aboriginal heritage and cultural value
- Acknowledge and respond to the heritage and cultural values of Glenlee Homestead, Sugarloaf Farm and Mount Annan and its surrounding area
- Acknowledge and respond to Aboriginal values and places in the broader landscape
- Consider the interpretation of the heritage areas along the corridor, including the potential to interpret and add to the character of the Remembrance Drive
- Protect, maintain and enhance views to existing prominent landscape features, heritage, cultural and roadside landmarks and to define a sense of place along Menangle Road and Spring Farm Parkway.
- Identify opportunities to incorporate landscape elements or sculptural elements that help create a unique identity for Spring Farm Parkway and Menangle Park.

4.1.7 **Objective 7 - Designing an experience in movement**

**Principles:**
- Minimise disruption to the visual qualities of the land use
- Maximise the opportunities for high quality and varied views
- Use landscape to frame views from the road
- Improve pedestrian and cyclist amenity along and across the corridor, especially by providing connecting shared paths between residential areas and employment zones

4.1.8 **Objective 8 - Creating self-explaining road environments**

**Principles:**
- Provide a landscape design that defines the edge of bends and leads the driver through the landscape
- Provide a distinctive, legible and visible gateway setting for Menangle Park.
- Provide plantings that reinforce the reduced speed zones and initiate a strong sense of arrival and connection with the adjoining proposed town centre of Menangle Park.
- Provide a landscape design which reflects the needs and performance requirements of intersections along the corridor
- Provide a simple and unified suite of road and roadside elements and details that contribute to establishing a desired future character for Springs Farm Parkway and that are easily maintained.
4.1.9 Objective 9 - Achieving integrated and minimal maintenance design

Principles:

- Develop a consistent approach to the design of bridges along the project. Urban design principals to be consistent with those outlined in 'Bridge Aesthetics: Design Guidelines To Improve The Appearance of Bridges in NSW' (RTA, 2003).

- Develop a consistent approach to the design of soft landscape works along the route. Planting design principles shall be consistent with those outlined in the 'Landscape Guidelines: Landscape Design and Maintenance Guidelines to Improve the Quality, Safety and Cost Effectiveness of Road Corridor Planting and Seeding' (RTA, 2008).

- Provide a landscape which is self-reliant and regenerating with minimal maintenance input requirements.

- Provide plantings to frame views and guide the driver along the alignment.

- Provide planting to screen views from/to residences.
4.2 Design Response

In developing a design response for the Spring Farm Parkway, the fit of the road with its context needs to be considered. As part of the proposal’s concept design development the urban design strategy needs to develop responses to the landscape treatment of the formation; the nature and placement of roadside furniture, and the planting design required to integrate the proposal to achieve a contextually responsive design outcome.

As part of the development of the urban design for the proposal an overall urban design strategy has been developed.

4.2.1 Urban Design Strategy

The following Urban Design Strategy Plan, Figure 22, develops the project objectives and principles to define the overall urban design intent.

The strategy illustrates the establishment of this new link across the M31 Hume Motorway corridor and its interfaces at either end; need to maintain connections of the natural drainage system and the use of landscape to both define the corridor but also integrate it with its surrounds.

The plan illustrates the design intent for a tree lined corridor, with structured planting along the roads edge defining the road. Planting is proposed as a formal avenue of eucalypts, which link with the overall character of the precinct but provide a level of formality to provide a sense of arrival and a strong relationship to the proposed urban development.

Beyond the immediate road verge and its formal planting the adoption of a naturalistic plant palette is proposed integrating with the adjoining riparian corridor. The adoption of such a strategy will assist in the overall mitigation of the impacts of the proposed formation.

The impact of the construction of on and off ramps will be similarly managed by the provision of naturalistic screen planting which will both moderate the impact of the new structure while providing definition to the new alignment.

In order to provide greater definition to the strategy, the strategy is then broken down in to its elements to outline the particular issues and responses adopted within the corridors design development. Elements discussed include:

- Bridges
- Piers
- Safety Screens
- Retaining Walls and culverts
- Safety Barriers and Fencing
- Signage and Lighting
- Landscape Adjoining Bridges
- Grading
- Vegetation
- Landscape Treatments
- Shared Paths
Figure 22 – Landscape Strategy Plan
4.2.2 Bridges

Spring Farm Parkway Bridge over M31 Hume Motorway

The design of the bridge over the Hume Motorway would be undertaken in accordance with Bridge Aesthetics: Design guidelines to improve the appearance of bridges in NSW, RMS, January 2012. The bridge would be a simple structure which is subservient to its context. The design detail would:

- Be simple and refined with minimal detailing and clean lines and a rational order and rhythm
- Minimise visual clutter
- Generally reflect the design language of nearby structures along the Hume Motorway, where possible
- Incorporate barrier structures integrated with the overall design composition
- Integrate abutments with the adjoining landform with similar finish to existing nearby abutments
- Provide a substructure that is slim and low profile, minimising height and maximising openness of the structure. The ratio of pier width to superstructure depth would also be considered carefully to achieve a visually balanced form that reflects the existing bridges
- Provide simple and elegant structural elements with minimal environmental footprint
- Optimise visual and physical amenity both on top of and below the bridge
- Maximise the use of precast / prefabricated construction methods for better quality control, faster construction, optimum use of materials, re-use of moulds and less waste material
- Maximise natural light levels beneath bridges
- Carefully design bridge transitions and parapet elements; and
- Incorporate safety screens as an integral element of the design.

Proposed Bridge Design

As illustrated above in Figures 23 and 24, the proposed bridge structure is a twin span Super T bridge on a conventional headstock and pier substructure with spill-through abutments. Abutments are to be concrete paving units to match existing nearby bridges.

![Figure 23 – Typical section of Spring Farm Parkway Bridge structure over M31 Hume Motorway.](image-url)
Parapet

The proposed bridge parapets would consist of a double steel rail and post traffic barrier system mounted on top of a concrete barrier kerb. The use of this type of parapet is consistent with similar motorway Super-T bridge designs and provides the advantage of providing views from the road and reduces the visually perceived height of structure in elevation in comparison to a solid barrier, therefore assisting in reducing the visual impact of the bridge on the surrounding context.

The parapet treatment is proposed to be an integral element of the safety screen structure. The lower half of the safety screen is proposed to incorporate a curved cladding which extends from top of the barrier kerb to the underside of the bridge concealing underslung services. This provides a smooth profile to the leading edge of the bridge and softens its form through the gradation of the shadow line.

Shared path access is proposed across the bridge adjacent to the westbound lanes. The location of the path and barrier system and their placement needs to consider fall height and safety of pedestrians and cyclists along with the crash compliance requirements. The shared path treatment on the bridge needs to be carefully considered to address the differing spatial parameters between the alternate sides of the bridge, including the operational envelop of vehicles where adjacent the road and climbability where adjoining the shared path. The barrier design would consider its design as an integral element of the whole structure and not only address the needs of the interface between shared path users and vehicles.
4.2.3 Piers

The design of the bridge piers needs to consider both the proposals bridge form as well as its ability to be expanded in the future in order to provide a design that is flexible to change, refer Figure 26.

![Figure 26 – Proposed pier form indicating ability to incorporate future widening](image)

The proposal is to adopt a tapered blade pier which is repeated. The adoption of such a structure has enabled the provision of a partially open structure as well as the opportunity to incorporate interpretative art, to assist in creating identity along the corridor and ability to connect to the community beyond. A similar example of how piers have been used to relate to context are illustrated below, refer figure 27.

![Figure 27 – Tumbarumba Bridge Pier incorporating art work](image)
The treatment of the blade is proposed to incorporate surface texture to the blade to differentiate the varying surfaces and provide a back drop for a relief to be applied to the pier. Potential themes to be explored include the connection to:

- Menangle Park and its association with Harness Racing
- The Blue Mountains to the west of the proposal
- Connection to Remembrance Drive through the connection to the light horsemen of Bethsheba

Figure 28 – Inspirational themes a) harness racing; b) Mountains; c) light horseman
The following concept studies illustrate how these themes may be incorporated into the overall structural form.

Figure 29 – Illustrative concepts of how themes may be incorporated as a relief element on the pier: a) harness racing; b) Mountains; c) light horseman
4.2.4 Safety Screens

Existing Safety Screen Treatment

As illustrated in Figures 30, the existing safety screens on nearby bridges, these represent a consistent form and style that creates a specific visual language along this portion of the motorway, the design also creates a strong and enclosing spatial effect for traffic using these bridges.

The screens are mounted vertically, and offset slightly behind barrier rails. They are constructed from a lightweight steel mesh with a high transparency that expresses the lightweight steel support frames. These supports are a twin-frame steel hollow section frame connected by short horizontals to form a space frame. They have a vertical front supporting flat mesh panels facing toward the bridge traffic and a curved back facing outwards, the later forming a distinctive semi-circular silhouette with a pointed top when viewed from traffic lanes below. This generally reads as a series of elegant vertical structures spaced approximately 3 metres apart when viewed from the motorway below.

Traffic crossing these bridges generally experiences a greater sense of enclosure created by the mesh screen, which appears more opaque from an oblique angle, creating a semi-transparent rectangular corridor on approach as shown in Figure 30.

Design Principles for New Safety Screens

- Provide screens that have a similar curved support frame form and height that reflects the proportions and style of the screens on existing bridges along the M31 Hume Motorway.
- Ensure the screens would be constructed to be non-climbable.
- Consider the option to incorporate lighting into the form and structure of the screen supports.
- Ensure screens extend the full length of the bridge (on both sides) to match the extent of the bridge parapets.
- Ensure the ends of the screen are tapered and provide a neat termination to the beginning of the road safety barrier.
- Ensure safety screens and posts are integral with the shape and form of the bridge parapets, including the traffic barrier railing system and any skirt details hiding services or drainage pipes.

As part of the development of a concept examples of similar curved screen profiles were reviewed to refine the proposal and proposed construction methodology. A similar structure to the proposal is the Falcon Street Pedestrian Bridge as depicted in the following figure 31.
The following concept reflects these principles and ensures the screen is integrated into the overall bridge form through the incorporation of cladding to the substructure, refer Figure 32.
4.2.5  Landscape Adjoining Bridges

The landscape design at the bridge is responsive to the nature and context of the bridge, and has adopted the following strategy:

A 10 metre offset for trees is adopted. The offset of trees is an important consideration, which needs to be considered in order to minimise ongoing maintenance inputs and not compromise safety during maintenance activities and future damage to structures.

4.2.6  Retaining Walls and Culverts

The following objectives have been developed in relation to the use of retaining walls either as free standing element or as a culvert headwall:

- Minimise the use of retaining walls as far as practicable. However in some situations it may be better to have a low retaining wall if this permits existing vegetation to be retained
- In residential contexts, for less visible locations facing away from the road, and below the road level, use a colour that recedes visually
- For more natural contexts/riparian woodland areas utilise gabions or natural rock walling systems
- For more visible retaining walls facing the road utilise materials appropriate to the context which reflect the character and materials of other built elements.

Culverts form the main structures other than the bridge. Typically these should be aligned perpendicular to the slope enabling them to be easily fitted in to the profile of the embankment minimising the scale and complexity of the associated headwall.

A number of culverts are proposed at a skew to the embankment. This makes the integration of the resultant structure more difficult as units either need to be cut parallel to slope face or protrude beyond the face as illustrated below, figure 33.

![Figure 33 – Culverts extending beyond the headway on an off ramp of the M5 South West Motorway](image)

In order to address the miss alignment of the culvert head wall with the slope face a number of strategies are proposed:

- The landform adjoining the culvert is manipulated by adjusting profile to relate to the culvert form
- The exposed culvert wall be treated in a manner which enables its visual prominence to be reduced. This may include staining/ painting to make the structure visible recede.
4.2.7 Safety Barriers and Fencing

Safety barriers would be provided where required along the main alignment, service roads, and local roads to give protection from hazards including steep slopes and drops, and physical hazards including non-frangible signs, street lighting columns, power poles, headwalls, and non-traversable table and catch drains.

Pedestrian fencing would be proposed adjoining shared paths where a level change exists. Opportunities to reduce the need for this would be explored to reduce the number of structural elements within the landscape. Where required, a pedestrian fence with a cyclist rail would be included on adjacent retaining walls. Where cyclist rails are not required, ensure fencing details avoid misalignments, steps, protruding elements and similar hazards.

In general, the design has been carried out with a preference for the adoption of 4H:1V or flatter batters where possible and thereby reducing the need for safety barriers. The need to limit footprint and cross the existing highway alignment has seen much of the approach road alignment associated with the bridge proposed at 2H:1V.

4.2.8 Signage and Lighting

Signage

Signage is largely to be installed in accordance with the requirements of relevant standards. Care needs to be taken to ensure the extent of signage is kept to a minimum and that the signage is integrated with the overall design of the alignment. The following strategies would be adopted:

- Avoidance of signage structures on the skyline by considering placement or incorporation landscape beyond
- Rationalise the number of signage structures

Lighting

The current roads in the area are unlit, including Menangle Road, Glenlee Road and the M31 Hume Motorway. Similarly bridges to the north of the proposal along the M31 also appear to have limited lighting affixed to the bridge. The introduction of Spring Farm Parkway Bridge over the motorway is likely to see lighting utilised for the shared path and traffic lanes.

The use of lighting and its extent needs to be reviewed and actively considered as part of the design to determine extents of lighting as this will introduce lighting into a setting where previously it has not previously existed. This needs careful management in terms of light spill and intensity that may potentially affect nearby residential properties. The design of lighting is to ensure that light spillage into residential properties is minimised or avoided as per AS4282-1997.

The design of lighting should ensure the placement of lighting beyond the footprint of the structure in order to provide a clean elevation of the structure.

4.2.9 Grading

Development of the design would seek to grade the batters of the formation to integrate and blend with the adjoining landform. The topography of the landscape is flat to undulating and so significant or abrupt changes in grade would create an awkward setting along the corridor.

The embankment for the bridge formation and approaches forms a significant structure up to 12 metres in height. This is required in order to achieve sufficient clearance over the M31 Hume Motorway. In order to minimise footprint a 2h:1v batter is adopted for the main Spring Farm Parkway alignment. The height of the formation requires the construction of a bench and this has been located in the middle of the embankment to provide a more balanced formation. The treatment of this embankment is indicated in the following section, Figure 34.

Opportunities to vary the lower batter slope and transitional slopes should where possible, adopt a maximum slope of 4H:1V in order to minimise the need for road barriers and to provide a smooth transition enabling the ground to flow over the alignment. Where space is not critically limited, the grade would typically be between 6H:1V and 10H:1V enhancing visual integration of the formation, particularly in the vicinity of Menangle Road.
4.2.10 Vegetation
The proposal has been identified to be in immediate proximity of a number of vegetation communities. The Spring Farm Parkway proposed main alignment lies alongside a partially vegetated riparian corridor which provides a series of linked or partially fragmented vegetation reserves and communities and enhances fauna connectivity in what is a highly modified landscape setting.

The revegetation response for the proposal has been to distribute the vegetation in proportion with the various communities.

Key opportunities explored include:

- Re-establishment of the endemic vegetation communities including:
  - Screening of properties overlooking the road corridor using Cumberland Plain woodland species on the elevated embankments of the formation
  - Revegetation/regeneration of the Riparian Corridor where realigned or disturbed by the works on the floodplain

- Use of strongly defined landscape margin of street trees to the edge of the Spring Farm Parkway verge to provide a strong linear identity to this arrival road for the proposed future subdivision and the Parkways connection to the adjoining suburbs in future stages.

  A distinct clean trunk, upright, eucalypt species is proposed in a formal layout to distinguish it from the adjoining natural communities.

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

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

Treatment types could include:

- Hydromulch as a surface application to establish permanent vegetation cover and prevent erosion. Hydromulch is the hydraulic application of mulch matrix, sprayed onto the soil as slurry which sets to form a layer of protection from erosion.

- Planting would be undertaken as individual specimen plantings such as street tree and broad scale tree planting or as garden beds consisting of a prepared mulched bed and the mass planting of shrub and grass species.
4.2.12 Shared Paths

It is NSW Government policy to make appropriate provisions for cyclists on all new major roads constructed by or for Roads and Maritime Services (NSW Bicycle Guidelines, 2004). In order to give direction to the placement of the shared path and to maximise its functionality for the community at large, the design of the shared path would seek to maximise its usability and be designed to reflect the experience of the user. Its configuration needs to consider the following:

- Connection to adjoining land uses and the community
- Environmental conditions which encourage use including separation from traffic, safety, shade, etc
- Purpose of path – what is its function: is it for commuters, recreational or sport?
- Minimise conflict at points such as where the path is bounded by walls or railings by providing markings designating cyclist versus pedestrian zones.
- Where a shared path is less than 1.0 metre from the back of kerb incorporate the area between the shared path and kerb into the shared path rather than having a narrow planting strip.
- Vary vertical and horizontal alignment to provide interest and amenity and retain remnant vegetation.

The concept design illustrates an off-road shared path extending from the proposed Menangle development intersection, along the south side of the main alignment and crossing to the east side of Menangle Road southward to terminate at the existing entry to Broughton Anglican College.

The 2.5 metre wide shared path will have a raised kerb separation from the road shoulder. The road itself incorporates a 2.0 metre shoulder within the main alignment and along Menangle Road. The shared path clear width will increase to 3.0 metres wide and be separated from the road carriageways by a twin rail vehicle barrier where located on the proposed bridge structure over the M31 Hume Motorway.
5 ASSESSMENT METHODOLOGY

This section of the report outlines the methodology used to review the proposal and assess the impacts and effects of the proposed road alignment on the road user (primarily motorists), and any potential properties with views to the road.

5.1 Landscape character and impact assessment

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

Landscape character is defined as:

“The combined quality of built, natural and cultural aspects that make up an area and provide its unique sense of place.” (Roads and Maritime, 2013).

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

5.2 Visual Impact Assessment

The Visual Impact Assessment involves the assessment of the visibility of the project. For the purposes of the study, visibility is considered in the following way:

Visibility

The view field of a corridor or object is composed of static receptors, i.e. those that adjoin the road corridor and mobile receptors which are those that travel along the corridor or adjacent to it. The impacts of the two groups are unique in that the time and frequency of the exposure differ. The extent from which views would be obtained is referred to as the ‘view catchment’.

Static Receptors

Static receptors occur within the visual catchment of the corridor i.e. they are points, which have a view of or can be viewed from the corridor. The corridor of the proposal is visually defined by both the topography and vegetation and built structures of the corridor including noise walls, which adjoin the corridor.

Mobile Receptors

Mobile receptors are the users of the corridor; in this instance the vehicles, pedestrians and cyclists that travel along part or the whole alignment. Their experience of the space is short term. Mobile receptors constitute the main visual receptors of the proposed works.

5.3 Landscape character and visual assessment matrix

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

To quantify these impacts it is important to assess two qualities in relation to a view point. These are: -

Sensitivity and Magnitude

Sensitivity refers to the qualities of an area, the type number and type of receivers, and how sensitive the existing character of the setting is to the proposed change. For example a pristine natural environment will be more sensitive to change than a built up industrial area.
Magnitude refers to the nature of the project. For example a large interchange would have a very different impact on landscape character than a localised road widening in the same area (Roads and Maritime, 2013).

Table 1 summarises the ranking of the assessment of these two criteria and how they are combined to provide an overall impact assessment.

**Table 1 – Landscape Character and Visual Impact Assessment Matrix**

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<thead>
<tr>
<th>Sensitivity</th>
<th>Magnitude</th>
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<tr>
<td></td>
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<td></td>
<td>Moderate</td>
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<td></td>
<td>Negligible</td>
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<td>High</td>
<td>High Impact</td>
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<td></td>
<td>High - Moderate</td>
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<td></td>
<td>Moderate</td>
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<td></td>
<td>Negligible</td>
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<td>Moderate</td>
<td>High - Moderate</td>
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<td>Moderate - Low</td>
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LANDSCAPE CHARACTER ASSESSMENT

6.1 Landscape Character Assessment

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

The following five differing character zones were identified.

- LCZ1 – Woodland on foot slope / Broughton Anglican College landscape,
- LCZ2 – Woodland on high point / Tourism (Steam and Machinery Museum landscape),
- LCZ3 – Open pasture/grassland landscape (typically grazing land and open grassland with some trees),
- LCZ4 – Woodland Riparian Landscape; and
- LCZ5 – M31 Hume Motorway corridor landscape.

Figure 35 illustrates the distribution of these character zones and their relationship to the proposal.

This assessment is based on the existing character of the area. It is noted that much of the pasture/grassland landscape to the west of the M31 Hume Motorway is zoned for residential development and will ultimately present a very different character to that of the present site. Where relevant a comment as to the implications of this changing landscape has been provided.
Figure 35 – Landscape Character Zones
6.2 Landscape Character Zone Definitions

6.2.1 LCZ1 – Woodland on foot-slope / Broughton Anglican College

Description

LCZ1 – Woodland on foot-slope / Broughton Anglican College, as shown in Figures 36 and 37, is located to the east of the M31 Hume Motorway and immediately to the south of the proposed widening of Menangle Road. The landform of the zone ranges from relatively flat with gentle undulations closer to Menangle Road, to steeper slopes and enclosing ridges further to the east and south.

The college campus that forms part of LCZ1 is characterised by clusters of low rise buildings set back from Menangle Road behind scattered native woodland trees. The built form relates to the rural surroundings with generally minimal screening and openness to the broader landscape. The natural landform largely encloses the built elements and limits views from the north and west.

The site has a mixture of mature cultural plantings and native canopy trees within open grass areas extending out into the surrounding hilly backdrop of scattered remnant woodland and pasture land rising to the south and east.

Sensitivity: Moderate

The landscape character of LCZ1 presents a relatively open frontage to Menangle Road with a diversity of existing built elements set back from the road and some partial vegetative screening to boundaries. This landscape is considered to be relatively robust and able to accommodate some change without impact on its character, and consequently has been assessed as having a moderate sensitivity to the proposal.

Magnitude: Negligible

The proposal adjoins this landscape to the north and west and will not impose a significant physical change on the overall landscape character. The proposal involves widening of Menangle Road to the north of LCZ1 on approach to the proposed intersection with Spring Farm Parkway. This will have minimal impact on the college frontage as the ground rises along the north-western frontage of the campus, obscuring the proposal.

The widened alignment of Menangle Road sits relatively easily within the landscape without creating significant cuttings and fills. The scale of change on LCZ1 is considered negligible.

Summary: Negligible

The overall impact on the landscape character of LCZ1 is considered negligible and reflects a moderate sensitivity combined with an anticipated negligible magnitude of change.
Figure 36 – LCZ1 Broughton Anglican College frontage – Menangle Road exit

Figure 37 – LCZ1 Broughton Anglican College frontage – Menangle Road main entrance
6.2.2  LCZ2 – Woodland on high point / Tourism (Steam and Machinery Museum landscape)

Description

The landscape of LCZ2 is defined as the woodland area covering the raised landform to the north of the Campbelltown Steam and Machinery Museum and the area encompassing this tourist facility, Figures 38 and 39. The zone is contained by the M31 Hume Motorway to the west, Glenlee Road to the north and Menangle Road to the east. The zone is also situated to the northwest of the proposed widening of Menangle Road and adjacent to the tie-in of the proposed south-bound exit ramp from the motorway.

In the higher lying portions of LCZ2 to the north, the zone consists of a dense patch of native woodland that abuts and screens the Hume Motorway from the museum grounds. The southern portion of LCZ2 is mainly comprised of an enclosed and relatively flat open space of mown grass. The built structures are mainly grouped together and set back into the adjacent wooded hillside to provide screening on three sides, with typically a southern aspect. Several overhead electricity easements run north to south across the landscape, having a strong presence in the landscape when viewed from Menangle Road.

Sensitivity: Moderate

The character of the woodland and manicured grass of the museum grounds is distinctive and consistent in scale and density of vegetation cover, particularly when compared to the predominant surrounding pasture land. Despite the presence of the overhead lines and clearance of their easements below, the level of screening of the road corridors provided by the woodland creates a distinctive obstruction in the view catchment and sets it apart from the wider landscape character. This structure provides less robustness to accommodate change within the landscape and its sensitivity is assessed as moderate.

Magnitude: Negligible

The magnitude of the change as a result of the proposal sees the removal of a section of vegetation along the motorway corridor to the southwest of LCZ2 to accommodate the proposed southbound motorway exit ramp. This vegetation currently provides minimal screening of the motorway traffic on the elevated road formation to the west of LCZ2 however this does not form part of the woodland within LCZ2. Despite the removal of the trees along the motorway, the overall visibility of motorway traffic and the presentation of LCZ2 to the east of the motorway corridor would be maintained. Its impact is consequently considered negligible.

Summary: Negligible

The proposal has been assessed as having an overall negligible impact on the landscape character of LCZ2. This reflects the moderate sensitivity of LCZ2 and distance of the main alignment of Spring Farm Parkway and the existing visible presence of the Hume Motorway traffic across the zone from Menangle Road. This results in a general continuation of the overall existing landscape character within this zone.
Figure 38 – LCZ2 Campbelltown Steam and Machinery Museum entry looking from access road west off Menangle Road.

Figure 39 – LCZ2 Woodland area beyond Campbelltown Steam and Machinery Museum looking north from Menangle Road.
6.2.3 LCZ3 – Open pasture / grassland landscape

Description

LCZ3 – Pasture / grassland landscape as shown in Figures 40 and 41, forms the main character of the proposal study area. It is typically comprised of open grazing land bisected by the Hume Motorway running generally north-south, as well as the elements of other landscape character zones. These include significant patches of woody weeds, remnant native woodland and screening vegetation along the Hume Motorway corridor. LCZ3 is also fragmented by utility easement corridors containing HV overhead electricity lines and meandering overland drainage channels with well-established riparian vegetation.

In the broader context, the pasture/grasslands are loosely defined by the Broughton Anglican College campus and hilly woodland landscape to the south and east, the infrastructure of Glenlee Road and the canal system to the north and east, and the existing residential area of Menangle Park to the west.

This landscape character zone is generally bisected east to west by the proposal. The Hume Motorway and several existing smaller roads that cross and wind through this landscape also contribute to its overall character as their traffic flows are visible from a significant portion of the zone as shown in Figure 40.

Sensitivity: Low

This landscape presents a relatively open vista with a diversity of existing elements, including the motorway, canal and major overhead infrastructure easements. This landscape is considered robust and consequently has been assessed as having a low sensitivity.

Magnitude: Low

As LCZ3 open pasture / grassland landscape is extensive throughout the study area and is currently highly fragmented by other landscape character elements, the proposal will not create a significant change in the visual balance between built form and natural character elements of this character zone. The alignment will introduce a large elevated road formation within the pastoral landscape, however the overall potential magnitude of change is considered to be low.

Summary: Low

The overall impact of the proposal on the character of LCZ3 – pasture / grassland landscape is considered low and reflects a low sensitivity combined with low magnitude of change.

It should be noted the area west of the Hume Motorway are to become a residential subdivision. This will impact the overall extent of the character of the zone with the western edge of the highway alignment becoming a residential precinct.

The impacts of the proposal on the future landscape character are largely indirect with impacts largely contained to LCZ4. No change in the assessment values is considered necessary to reflect this change in land use.
Figure 40 – LCZ3 Open pasture / grassland landscape character looking west towards Hume Motorway from Menangle Road.

Figure 41 – LCZ3 Open pasture / grassland landscape, looking north to Campbelltown Steam and Machinery Museum, west of Menangle Road.
6.2.4 LCZ4 – Woodland riparian landscape

Description

LCZ4- Riparian landscape character zone is typically defined by tall woodland vegetation and lower weedy margins that follow the drainage corridors meandering from east to west throughout the proposal study area as shown in Figures 42 and 43.

Sensitivity: Moderate

The woodland riparian landscape is particularly well defined by its vegetative structure, the scale and distribution of which is inconsistent but generally continuous throughout the low-lying drainage corridors within the pastoral landscape. Changes to this vegetative structure would have a significant impact on the overall character of the drainage corridor therefore the sensitivity of these areas to the proposal has been considered to be moderate.

Magnitude: Low

The alignment of the proposal lies partially within the boundaries of the woodland riparian character zone, requiring the removal of some peripheral areas of vegetation. Therefore, the magnitude of change on woodland riparian landscape character has been assessed as low.

Summary: Moderate-Low

The sensitivity of LCZ Woodland riparian landscape has been assessed as Moderate. The magnitude of change to the character zone itself has been determined to be Moderate. Consequently, the overall impact of the proposal on the character of the LCZ4 woodland riparian landscape is moderate-low.
Figure 42 – LCZ4 Woodland Riparian Landscape, looking north-west towards the proposal from the northern extent of Mount Pleasant farm.

Figure 43 – LCZ4 Woodland Riparian Landscape, looking west from Mount Pleasant farm along drainage corridor.
6.2.5  LCZ5 – M31 Hume Motorway corridor landscape

Description

LCZ5 - M31 Hume Motorway corridor landscape character zone is defined by the existing motorway infrastructure and heavy traffic flow it accommodates. The motorway contains two lanes of traffic in each direction with a hard shoulder and narrow grass verges. A wide grass median separates the carriageways, adding significant clear width to the corridor, while also allowing some central vegetation. The Menangle Park Road and Glenlee Road bridges define the limits of the study area.

Sensitivity: Low

The motorway presents a landscape character zone defined by its contrasting linearity within the undulating rural landscape and adjacent dense screening vegetation, as well as built form and traffic. The scale and bulk of vegetation and hard surface within the corridor is relatively consistent and homogenous. The motorway corridor and its scale are similar in nature to the proposed Spring Farm Parkway, therefore its sensitivity to the proposal has been considered to be low.

Magnitude: Moderate

The proposal bisects the view shown in Figure 44, approximately 1.1 kilometres further south along the motorway. The proposal introduces an elevated bridge structure across the motorway corridor and an embankment either side of the corridor to facilitate access to and from the motorway.

The proposed bridge due to the topography of the site will be viewed below the horizon by traffic at distance and is in keeping with existing broader motorway context of large infrastructure and built interventions in the corridor. The on and off ramps proposed introduce a new formation which will alter the spatial qualities of the motorway corridor. This will result in a moderate overall magnitude of change on the motorway character.

Summary: Low to Moderate

While sensitivity has been assessed as low for the motorway character zone, the magnitude of visual change to the motorway’s character has been assessed as moderate. Consequently the overall impact of the alignment on the motorway landscape character is low to moderate reflecting a continuation of the overall highway character.
Figure 44 – LCZ5 – M31 Hume Motorway corridor landscape looking south from Glenlee Road (Mark Evans) bridge

Figure 45 – LCZ5 – View from northbound M31 Hume Motorway showing Mount Pleasant farm and riparian corridor to left of view (west)
6.3 Landscape Character Assessment Summary

Five landscape character zones have been identified and assessed as part of the character study:

- LCZ1 - Woodland to foot-slope / Broughton Anglican College landscape
- LCZ2 - Woodland on high point / Campbelltown Steam and Machinery Museum landscape
- LCZ3 - Open pasture / grassland landscape
- LCZ4 – Woodland riparian landscape
- LCZ5 - M31 Hume Motorway landscape

Three character zones, LCZ1, LCZ2 and LCZ4 are identified as having moderate sensitivity to the proposal, due their typically more private use and presence of extensive woodland vegetation. The remaining two landscape character zones LCZ 3 and LCZ5 have been assessed as having low sensitivity due to the vehicular dominance of the motorway and highly modified nature of the open agricultural land.

Due to the relatively simple tie-ins of the proposal with existing roads and minimal required widening of Menangle Road, as well as the existing dominance in the landscape of the M31 Hume Motorway, the magnitude of change has been assessed as low to negligible across all of the landscape character zones, with the exception of the motorway character zone itself which is assessed as moderate.

The woodland zones within LCZ1 and LCZ2 were identified as experiencing no immediate physical impacts and so change to character was deemed to be negligible.

A low impact on LCZ3 open pasture/grassland character zones was identified. A moderate-low impact on the character of LCZ4 woodland riparian landscape and LCZ5 the motorway landscape will result from the proposal.

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

Table 2 – Landscape Character Assessment Summary

<table>
<thead>
<tr>
<th>Character Definition</th>
<th>Sensitivity</th>
<th>Magnitude</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCZ1 – Woodland on foot-slope / Broughton Anglican College</td>
<td>Moderate</td>
<td>Negligible</td>
<td>Negligible</td>
</tr>
<tr>
<td>LCZ2 – Woodland on high-point / Campbelltown Steam and Machinery Museum</td>
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<td>Negligible</td>
<td>Negligible</td>
</tr>
<tr>
<td>LCZ3 – Open pasture / grassland landscape</td>
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<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>LCZ4 – Woodland riparian landscape</td>
<td>Moderate</td>
<td>Low</td>
<td>Low to moderate</td>
</tr>
<tr>
<td>LCZ5 – M31 Hume Motorway corridor landscape</td>
<td>Low</td>
<td>Moderate</td>
<td>Low to moderate</td>
</tr>
</tbody>
</table>
7 VISUAL IMPACT ASSESSMENT

7.1 Viewers and viewpoints

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

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

Typically the viewpoints have considered the impact of those overlooking the proposal. Of the adjoining observers it is the residential users who would be the most sensitive to change. These are generally the primary viewpoint assessed. In some instances other viewers have been considered including the road user. Where differences in sensitivities of viewers exists the worst case assessment is the stated value in terms of Sensitivity, Magnitude and overall visual impact. The specific rating of the individual viewpoints is stated as part of the detailed assessment in Section 7.4.

7.2 Visual Catchment

The visual catchment of the proposal is well defined due to the topography of the site and clear barriers to sightlines, including vegetation, built form etc. Generally the visual catchment is contained below the ridgelines and is bisected by the screening vegetation and woodland vegetation adjacent to the M31 Hume Motorway corridor. This is depicted in the following visual catchment plan in Figure 46.

7.3 View Points

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

In total nine viewpoints have been identified which provide an overview of the level of impact and their nature. These viewpoints are identified in the following visual catchment plan shown in Figure 46.
Figure 46 – Key Viewpoint Locations
7.4 Key Viewpoints

7.4.1 VP1 – Glenlee Road (Mark Evans) Bridge over M31 Hume Motorway

View:

Viewpoint 1, Figure 47 presents an open view along the motorway corridor. The viewpoint location provides an unlimited view of the M31 Hume Motorway which runs from north to south and will potentially provide a view corridor to the proposal from this vantage point. Vegetation to the left and right of the motorway restricts views to a broader exposure to the adjacent landscape character.

Sensitivity: Low

Glenlee Road is a relatively low traffic local access road that crosses the Hume Motorway with no existing amenity for cyclists or pedestrians. The proposal has little potential to impact on the experience of users of Glenlee Road as they navigate across the bridge as the bridge is defined by safety screens and user focus is on the road. Sensitivity to change has been assessed as low.

Magnitude: Moderate

The proposal introduces motorway overbridge into the far distance of the view, some 1.1 kilometres from the vantage point and a road formation which intends northwards towards the view point. As part of this process some vegetation will be removed and a new elevated structure with entry and exit ramps introduced which will potentially reduce the linear continuity of the form of the Hume Motorway carriageways from this viewpoint.

The extent of impact associated with the on and off ramps increases the magnitude of the change over and above that of the bridge itself and so the magnitude of change is considered moderate.

Summary: Moderate - Low

The proposal is likely to have a low magnitude of change on this outlook by the introduction of road infrastructure into a field of view already dominated by the motorway. When combined with a low sensitivity this results in a low visual impact.
7.4.2 VP2 – Menangle Road – Private rural residential property

View:

Viewpoint 2, Figure 48, presents an open view across a mown grass frontage of a large two-storey rural residential property. The dwelling is oriented towards Menangle Road, with existing trees immediately to the west partially restricting views further west towards M31 Hume Motorway. The lack of screening vegetation along the frontage would allow largely uninterrupted views of Menangle Road.

Sensitivity: Moderate

The view is from the verge of the existing Menangle Road. The view is largely devoid of infrastructure and captures the qualities of the adjoining rural residential property.

Canopy vegetation dominates views to the west with the foreground dominated by the rural residential property. The impacts of the widening of Menangle Road are not easily absorbed in the foreground but are better addressed in the background where the vegetation provides a backdrop which the proposal is seen against. The varied manner in which the view is able to absorb impacts has been considered in assessing the sensitivity and this has consequently been assessed as moderate.

Magnitude: High

The proposal introduces a widened road formation into the foreground of the view, reducing the proximity of Menangle Road to the dwelling by bringing the carriageways and traffic approximately 21 metres closer.

Summary: High-Moderate

Viewpoint 2 provides a clear indication of the view of the proposal that would be experienced by the residential dwelling receptor. The proposal is likely to have a high impact on the outlook of the property by the introduction of road infrastructure and potentially increased volumes of heavy traffic into the foreground of the outlook view from the dwelling. When combined with a moderate sensitivity this results in a high-moderate impact. Mitigation measures would be included along the Menangle Road verge to minimise the effect of the proposal.
7.4.3 VP3 – Menangle Road – Road verge and agricultural land

View:
Viewpoint 3, Figure 49, presents an open view across a broad, mown grass verge to the west of Menangle Road and immediately to the north of Broughton Anglican College. The lack of screening vegetation along the verge provides broad views of traffic along the nearby highway to the west.

Sensitivity: Low
Northbound vehicles using Menangle Road will be the most common receptor at Viewpoint 3. Periodically, this will include large numbers of vehicles and students leaving the school at certain times of day. The viewpoint currently has open views of nearby traffic along the Hume Motorway, and so sensitivity to change has been assessed as low.

Magnitude: Moderate
The proposal introduces a widened road formation into the foreground of the view, extending into the western verge of Menangle Road. The proposed 12m high batters and bridge structure across the highway would be visible to the left of the view, partially screened by existing vegetation along the edges of the highway corridor. Traffic flows would become heavier and significantly more noticeable from this location. As Viewpoint 3 currently has an open view of traffic along Menangle Road the magnitude of change is considered moderate.

Summary: Moderate-Low
Receptors at Viewpoint 3 would experience a broad view of the proposal, including the main alignment of Spring Farm Parkway and widening tie-in with Menangle Road. The proposal will introduce a moderate magnitude of change on the outlook from Viewpoint 3. When combined with a low sensitivity this results in a moderate-low visual impact from Viewpoint 3.
7.4.4 VP4 – Menangle Road – Verge opposite Broughton Anglican College

Figure 50 – Viewpoint 4 - Looking north along western verge of Menangle Road opposite Broughton Anglican College exit.

View:

Viewpoint 4, Figure 50, presents an open view across a broad, mown grass verge to the west of Menangle Road and immediately opposite Broughton Anglican College. There is some screening vegetation along the property boundary to the west which allows partial views of traffic along the nearby highway to the west.

Sensitivity: Low

Northbound vehicles using Menangle Road will be the most common receptor at Viewpoint 4. Periodically, this will include large numbers of vehicles and students leaving the school at certain times of day.

The viewpoint currently experiences movement of vehicles along the existing Menangle Road and the adjoining Hume Motorway. The presence of road infrastructure and traffic are part of the overall views composition already and so sensitivity to change has been assessed as low.

Magnitude: Low

The alignment of Spring Farm Parkway will be located approximately 600 metres north of Viewpoint 4. The proposed 12 metre high batters and bridge structure across the highway would be largely screened by adjacent trees and existing vegetation along the edges of the highway corridor. However, a partial view of the new road formation and east-west bound traffic would be possible from this location. Widening of Menangle Road into the western verge as well as heavier traffic flows would be noticeable from this location. As Viewpoint 4 currently has views of traffic along the M31 Hume Motorway the magnitude of change is considered low.

Summary: Low

Receptors at Viewpoint 4 would experience a limited view of the proposal, including some views of traffic along the main alignment of Spring Farm Parkway and widening tie-in with Menangle Road. The proposal will introduce a low magnitude of change on the outlook from Viewpoint 4. When combined with a low sensitivity this results in a low visual impact from Viewpoint 4.
Figure 51 – Viewpoint 5 - Looking north along M31 Hume Motorway corridor towards proposal from Menangle Road bridge. (Source: Google Streetview June 2017)

**View:**

Viewpoint 5, Figure 51, presents an open view along the M31 Hume Motorway corridor. The viewpoint location provides an unlimited view of the motorway which runs from north to south and will potentially provide a view corridor to the proposal from this vantage point. Vegetation to the left and right of the highway restricts views to a broader exposure to the adjacent landscape character.

**Sensitivity: Low**

Menangle Road is a busy road with no existing lanes for cyclists or pedestrian paths. The proposal has little potential to impact on the experience of users of Menangle Road as they navigate across the bridge. The visual quality of the view from the bridge is impacted by the safety screens fixed to the bridge. The Motorway pavement creates a strong built form within the view which is otherwise dominated by the canopy of remnant and regenerating vegetation. Sensitivity to change has therefore been assessed as low.

**Magnitude: Low**

The proposal introduces a road formation and highway overbridge into the far distance of the view, some 1.1 kilometres from the vantage point. As part of this process some vegetation will be removed and a new elevated structure introduced which will potentially reduce the linear continuity of the form of the Hume Motorway carriageways from this viewpoint. Due to the elevated view and the distance to the proposal, the magnitude of change is considered low.

**Summary: Low**

The proposal is likely to have a negligible magnitude of change on Viewpoint 5 by the introduction of road infrastructure into a view field already dominated by the highway and at a significant distance from the proposal. When combined with the low sensitivity rating of the vehicles using Menangle Road this results in a low visual impact.
7.4.6 VP6 – Mount Pleasant farm access road

View:

Viewpoint 6, Figure 52 presents a view across open pasture / grassland towards the M31 Hume Motorway corridor. The viewpoint location has a partial view of traffic using the highway which runs from left to right across the view, limited by vegetation along the edges of the highway corridor.

Sensitivity: Low

As Viewpoint 6 is restricted to private access only, the receptors are generally limited to workers accessing the nearby gas well, property owners and/or people authorised to access the land for grazing.

The view presents a unified and strong composition with low grassland dominating the foreground of the view and natural vegetation to sides and back providing a strong back to the view. The ability of the view to absorb changes in the background is good due to its colour and texture. This determines the outlook from this location as being of low sensitivity to the proposal.

Magnitude: Negligible

The main alignment of the proposal is situated approximately 450 metres north of Viewpoint 6. Views of the proposed Spring Farm Parkway and entry exit ramps onto the M31 Hume Motorway will be screened by existing woodland/riparian vegetation, visible to the left of the image.

The proposed widening of Menangle Road may be partially visible across the highway corridor from Viewpoint 6. Its distance from the viewer of 450m will see its impact be largely negligible as a result of distance and context.

A proposed deceleration lane, during the construction phase of the works, is likely to be visible and the transition between grassland and shrubby woodland. It distance of over 250 metres from viewer would see this construction impact assessed as low.

Summary: Negligible

The permanent works of the proposal are considered to have a negligible impact on the view point with the main works screened by the existing riparian vegetation and other works set a substantial distance from view.

Construction impacts associated with the construction of a deceleration lane for site access are considered to pose a low impact.
7.4.7 VP7 – Mount Pleasant farm - Woodland facing east to M31 Hume Motorway

View:

Viewpoint 7, Figure 53, presents a filtered view through woodland vegetation towards the M31 Hume Motorway corridor which runs from left to right across the view approximately 300 metres to the east. Visible in the background across the M31 Hume Motorway is an elevated area of the Broughton Anglican College and playing fields.

Sensitivity: Moderate

As Viewpoint 7 is restricted to private access only, the receptors are generally limited to workers accessing the nearby gas well, property owners and/or people authorised to access the land for grazing. In the future the land will form part of the proposed road alignment/open space network.

The view is a naturalistic view compromised by the presence of both the Hume Motorway and Broughton Anglican College visible in the background. As an altered landscape setting it has the ability to accommodate change. Sensitivity to change has been assessed as moderate.

Magnitude: High

The main alignment of the proposal is situated to the north with the batters of the 12 metre high road formation extending southwards to immediately adjacent the view, requiring the removal of vegetation. The proposed bridge structure across the highway will be located to the north-east of the viewpoint, but would be partially obscured by the road formation, as will traffic crossing on Spring Farm Parkway. Due to the significant height and immediate proximity of the proposal and the loss of adjacent screening vegetation, the magnitude of change is considered high from Viewpoint 7.

Summary: High-Moderate

The proposal is likely to have a high magnitude of change on this viewpoint due to the immediate proximity of the proposal and loss of existing vegetation located within the adjacent riparian corridor and more distant highway corridor. When combined with a moderate sensitivity this results in a high-moderate visual impact on views from Viewpoint 7.
7.4.8  VP8 – Mount Pleasant farm facing north to private residential property

Figure 54 – Viewpoint 8 - Looking north towards residential dwelling from Mount Pleasant farm boundary.

View:

Viewpoint 8, Figure 54 presents an open view across pasture land towards an existing residential dwelling elevated on a ridgeline immediately to the west of the Hume Motorway and north of the proposal. The viewpoint location provides a partial view of the residential property, largely obscured by the rising landform and scattered remnant vegetation. Vegetation to the right of the view and extending to the highway corridor restricts views eastwards.

Sensitivity: High

The typical receptors at this location are limited to property owners and/or people authorised to access the land for grazing, maintenance of gas wells.

The view is an altered agricultural landscape with remnant vegetation and creek line visible. The composition of the view with rolling hills and creek line bisecting the view present a pleasing outlook. The view is considered to have a high sensitivity to change.

The future nature of the view is like to become residential subdivision transforming the outlook and reducing the sensitivity due to its high concentration of built form present.

Magnitude: High

The proposal introduces a wide road formation up to 12 metres above existing ground which will pass across the immediate foreground of the view from east to west. This will result in the removal of nearby vegetation and obscure existing views to the north. Due to the low elevation of the viewpoint and close proximity of the proposal, the magnitude of change is considered high from Viewpoint 8.

Summary: High

The proposal is likely to have a high magnitude of change on this viewpoint due to the immediate proximity of the large proposed road formation batters, and loss of existing vegetation located within the adjacent riparian corridor and screening the Hume Motorway corridor. When combined with a high sensitivity this results in a high visual impact.

The visual quality of this will change however with the establishment of proposed residential development.
7.4.9 VP9 – Mount Pleasant farm facing west to Spring Farm Parkway

View:

Viewpoint 9, Figure 55, presents an open view across pasture land and along an existing drainage corridor extending east to west through the study area and immediately south of the proposal. The viewpoint location provides an extensive view of the drainage corridor, with limited long distance views to the Blue Mountains on the horizon beyond framed by nearby riparian vegetation.

Sensitivity: Moderate

The typical receptors at this location are limited to property owners and/or people authorised to access the land for grazing.

The view presents a scenic outlook across rolling farm lands. Its capacity to absorb change is low. This however is enhanced by the presence of creek line vegetation and the woodland backdrop this provides a buffering capacity to absorb changes.

Magnitude: High

The proposal introduces a wide road formation up to 12 metres above existing ground which will pass across the immediate foreground of the view entering from the right side of the image. The road alignment would then gradually curve away to the north, back towards the right of the image. This will result in the removal of nearby vegetation, altering the landform in the foreground and obscuring of the existing views to the northwest. Due to the low elevation of the viewpoint and close proximity of the proposal, the magnitude of change is considered high from Viewpoint 9.

Summary: Moderate - High

The proposal will have a high magnitude of change on this viewpoint due to the immediate proximity of the large proposed road formation batters, realignment of the drainage channel and loss of existing vegetation located within the adjacent riparian corridor and screening along the Hume Motorway corridor. When combined with a moderate sensitivity this results in a moderate-high visual impact.
7.4.10 VP10– View heading north on M31 Hume Motorway to Spring Farm Parkway

Figure 56 – VP10– View heading north on M31 Hume Motorway to Spring Farm Parkway

View:
Viewpoint 10, Figure 56, presents a view looking north along the Hume Motorway in the general vicinity of the Spring Farm Parkway overbridge. The view is defined by roadside vegetation which limits visibility to the broader landscape. Occasional plantings within the median restrict view to the adjoining carriageway.

Sensitivity: Moderate
As a major transport corridor the view is experienced by many. The experience however is transitory and experienced at speed with attention focused on driving.

Road infrastructure forms a dominant part of the view. This creates a strong linear character reinforced by the vegetation lining its edges. It sensitivity to change is considered moderate due to its strong structure.

Magnitude: High
The proposal introduces an elevated embankment within the verge and bridge across the alignment. On ramps will extend adjacent the alignment into the background and much of the median vegetation is likely to be cleared as part of the construction process.

The construction of a bridge constitutes a substantial built element within the view, with the top of structure approximately 12m above the road. The magnitude of such an intervention is considered high.

Summary: Moderate – High
The proposal will have a high magnitude of change on this viewpoint due to the immediate proximity of the large proposed road formation batters, and bridge structure crossing the motorway alignment. When combined with a moderate sensitivity of the view results in a moderate to high visual impact.

7.5 Compound Sites
This section assesses the Construction stage impacts associated with the proposed compound sites. These are interim elements, present only for the extent of the construction period. These sites may be used for material processing including batch or crushing plant; stockpiles site for materials; and site compound including offices, sheds for the storage of equipment and plant.

Three sites have been identified as potential construction compounds. These include the:
- Compound 1- located on Menangle Road on a block of land opposite the Broughton Anglican College
- Compound 2- located at the western end of the Spring Farm Parkway development
- Compound 3- located adjacent to the proposal on the proposed northbound entry ramp
7.5.1 Compound 1 - Southern Menangle Road Site

This compound site is located on Menangle Road on a block of land opposite the Broughton Anglican College. The site comprises an open grassland site set between Hume Motorway and Menangle Road and is visible to both. The proposal is south of works on the Hume Motorway and adjacent to the southern limits of Menangle Road works. Its location exposes the Hume Motorway to an extended construction footprint. The impact is considered to be moderate in the short term.

7.5.2 Compound 2 - Western Termination Spring Farm Parkway

Located at the western end of the proposed Spring Farm Parkway - stage one, at its termination. The location of the proposed site is set within the centre of agricultural lands which are not within the view field of any adjoining residences. It is removed from the motorway and screened by the proposed construction, its impact is considered low due to its distance from the highway, buffer of existing vegetation and development of the road formation which will protect the site from view.

7.5.3 Compound 3 – Northbound Hume Motorway On-Ramp

Located adjacent the proposal to the north of the proposed northbound entry ramp to the existing Hume Motorway, this compound site is immediately adjacent the project footprint. This will see the compound viewed from the highway, and with a backdrop of construction works when viewed from the west. The proposal is for a facility consistent with construction operations and will be screened by the formation as it develops. Its impact is considered to be low as it occurs within the immediate environs of the proposed construction.
7.6 Visual Assessment Summary

A total of ten viewpoints have been assessed in relation to the permanent works associated with the proposal.

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

The overall magnitude of the proposal has been assessed as low to high-moderate. This reflects the establishment of a major new road alignment within a rural residential landscape and a pastoral landscape with an extensive existing vegetative structure.

Of the ten viewpoints the range of visual impact ratings determined is as follows:

- Four viewpoints have been assessed as having a high-moderate visual impact
- One viewpoint has been assessed as having a high visual impact
- Two viewpoints have been assessed as moderate-low visual impact
- Two viewpoints have been assessed as low visual impact; and
- One viewpoint has been assessed as negligible visual impact.

The following Table 3 further summarises these impacts.

### Table 3 - Visual Assessment Summary

<table>
<thead>
<tr>
<th>Viewpoint</th>
<th>Sensitivity</th>
<th>Magnitude</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>VP1</td>
<td>Low</td>
<td>Moderate</td>
<td>Moderate-Low</td>
</tr>
<tr>
<td>VP2</td>
<td>Moderate</td>
<td>High</td>
<td>High-Moderate</td>
</tr>
<tr>
<td>VP3</td>
<td>Low</td>
<td>Moderate</td>
<td>Moderate-Low</td>
</tr>
<tr>
<td>VP4</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>VP5</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>VP6</td>
<td>Low</td>
<td>Negligible</td>
<td>Negligible</td>
</tr>
<tr>
<td>VP7</td>
<td>Moderate</td>
<td>High</td>
<td>High-Moderate</td>
</tr>
<tr>
<td>VP8</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>VP9</td>
<td>Moderate</td>
<td>High</td>
<td>High-Moderate</td>
</tr>
<tr>
<td>VP10</td>
<td>Moderate</td>
<td>High</td>
<td>High-Moderate</td>
</tr>
</tbody>
</table>

Impacts associated with construction facilities have been assessed as having limited impacts over and above the impact of the overall construction process. Compound site one is located in open grassland between Hume Motorway and Menangle Road and will have a moderate visual impact during construction. Compound sites two and three are located to the west of the proposal and Hume Motorway. They are not anticipated to add to the overall visual impact of construction.
8

MITIGATION MEASURES

8.1 Mitigation Measures

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

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

The urban design Objectives and Principles along with the overall landscape strategy identified in Chapter 4 incorporate a number of measures that are proposed and designed to reduce the impacts of the proposal. The mitigation measures presented in Table 4 are recommended to address the key visual and landscape character impacts (Chapter 6 and 7) and measures identified as part of the overall urban design response which has included consideration of the existing site features and land use (Chapter 3). These mitigation strategies address both design and construction stages.
<table>
<thead>
<tr>
<th>Issue</th>
<th>Stage</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structures – limit visibility of built</td>
<td>Design</td>
<td>Bridge Design - simple, refined, integrated structure which sits comfortably</td>
</tr>
<tr>
<td>elements</td>
<td></td>
<td>within the landscape</td>
</tr>
<tr>
<td></td>
<td>Construction</td>
<td>Minimise structural depth</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Minimise footprint and disruption to creek lines</td>
</tr>
<tr>
<td>Earthworks</td>
<td>Design</td>
<td>Integrate with adjoining landform through adoption of appropriate grades,避免</td>
</tr>
<tr>
<td></td>
<td></td>
<td>sharp transition in profile</td>
</tr>
<tr>
<td></td>
<td>Construction</td>
<td>Stabilise/revegetate as works progress to limit erosion and visual impacts</td>
</tr>
<tr>
<td></td>
<td></td>
<td>through early integration with surrounding vegetation</td>
</tr>
<tr>
<td>Retention of Existing vegetation</td>
<td>Design</td>
<td>Design the proposal to avoid impact to prominent trees and vegetation communities</td>
</tr>
<tr>
<td></td>
<td></td>
<td>where possible</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Existing threatened species are to be retained and protected wherever possible</td>
</tr>
<tr>
<td></td>
<td>Construction</td>
<td>Minimise clearance extent where possible</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Clearly define clearance limits and exclusion zones to protect vegetation cover</td>
</tr>
<tr>
<td>Revegetation</td>
<td>Design</td>
<td>Vegetation communities to respond to existing communities and landscape</td>
</tr>
<tr>
<td></td>
<td></td>
<td>character</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Utilise local provenance material</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Provide screen planting within corridor to limit visibility of the proposal from</td>
</tr>
<tr>
<td></td>
<td></td>
<td>adjoining residential properties</td>
</tr>
<tr>
<td></td>
<td>Construction</td>
<td>Progressively implement revegetation works to limit erosion and to establish</td>
</tr>
<tr>
<td></td>
<td></td>
<td>vegetation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Utilise cleared material as part of revegetation works</td>
</tr>
<tr>
<td>Minimise road furniture and signage</td>
<td>Design</td>
<td>Provide minimum signage requirements and limit structural elements to provide</td>
</tr>
<tr>
<td></td>
<td></td>
<td>and open and permeable setting</td>
</tr>
<tr>
<td></td>
<td>Construction</td>
<td>Look for opportunities to minimise designed signage,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lighting</td>
<td>Design</td>
<td>Limit extent of lighting and potential for light spill</td>
</tr>
<tr>
<td></td>
<td>Construction</td>
<td>Limit night works and provide lighting which minimises spill</td>
</tr>
<tr>
<td>View management</td>
<td>Design</td>
<td>Provide visual screening within the road corridor to limit the visual impact of</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the proposal in areas identified as moderate or high impact</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Provide sense of space and openness associated with the agricultural landscape</td>
</tr>
<tr>
<td></td>
<td>Construction</td>
<td>Retain vegetation beyond the footprint to retain any existing screening</td>
</tr>
<tr>
<td>Construction Compounds</td>
<td>Design</td>
<td>Setout compounds to limit impacts, consider screening and location of key</td>
</tr>
<tr>
<td></td>
<td></td>
<td>structures which provide the greatest impact</td>
</tr>
<tr>
<td></td>
<td>Construction</td>
<td>Maintain compound in a tidy and well-presented manner. Provide and maintain</td>
</tr>
<tr>
<td></td>
<td></td>
<td>screening</td>
</tr>
</tbody>
</table>
CONCLUSION

The proposal for Stage 1 of the Spring Farm Parkway project involves constructing a new four lane divided road extending approximately 0.9 kilometres from Menangle Road west to the future Menangle Park development area.

The proposal also includes:

- A grade separated interchange to connect Spring Farm Parkway with the M31 Hume Motorway with north facing entry and exit ramps designed to be compatible for future implementation of Smart Motorway. The length of the entry and exit ramps would be approximately 1.6 kilometres.

- A four-lane, 76-metre-long bridge over the M31 Hume Motorway with provision for future widening on the southern side to six lanes.

- Four intersections including:
  - An intersection providing access to the proposed Menangle Park land release area at the western end of Spring Farm Parkway (Stage 1).
  - An intersection between Spring Farm Parkway and Menangle Road.

- Upgrade of Menangle Road including widening and tie-ins to suit the new intersection with Spring Farm Parkway to cater for forecast traffic demand.

- Provision of access to the Menangle Park land release area.

- Inclusion of a shared use path.

- Capacity for widening on the southern side to an ultimate six lanes in the future.

In developing an integrated design response for the proposal, the urban design and landscape objectives and principles respond to the landscape character and visual context of the study area. These objectives define a relationship between the proposal and the surrounding landscape character zones and uses.

The urban design, bridge and landscape concept has been developed to achieve an integrated outcome that helps fit the project as sensitively as possible into its context and to minimise the impacts of the proposal on the future character of the area, through the incorporation of a number of mitigation measures.

The urban design would:

- Ensure attractive views into the broader landscape are maintained by revegetating disturbed areas along the road edges

- Incorporate materials and finishes for new road elements that are site appropriate and reduce their prominence

- Ensure there is a visually complementary relationship between the proposed bridge and its local context

- Include a planting design intended to reduce the scale of the proposed road infrastructure by the provision of appropriate tree species in the road margins, using appropriate planting to integrate the proposal with the adjacent riparian zones and provide distinctive feature landscaping elements at entry points to Menangle Park and key precinct thresholds.

- Provide screening, through the use of native plant species, of the road infrastructure to residential areas
Landscape Character Assessment

Landscape character impacts of the proposal were found to generally be of negligible to moderate-low level. This reflects that the changes associated with the proposal do not have a complete or holistic impact on the character of the setting.

Visual Impact Assessment

The visual impacts of the proposal have been assessed at a higher level of impact ranging between negligible to high. These higher impact values reflect the proximity of Broughton Anglican College as well as two separate residential receptors, and the proposal for new infrastructure within the rural landscape setting.

Where impacts are above moderate, mitigation measures will be needed to screen or soften the impacts of the proposal.

A number of key measures are summarised which will mitigate the impacts. These impacts are to be taken forward into the detailed design to ensure impacts are minimised.
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Weblinks: