



Artist's Impression: View of parkland bridge integrated with the landscape design (Trees and landscaping shown at maturity)



## 9.0 PEDESTRIAN AND CYCLIST BRIDGES AND BOARDWALKS

**ACROSS THE PROJECT, THE SHARED PEDESTRIAN AND CYCLIST BRIDGES AND BOARDWALKS HAVE BEEN DESIGNED TO RECONNECT COMMUNITIES ALONG THE ACTIVE TRANSPORT CORRIDOR WITH EXISTING FRAGMENTED OPEN SPACE.**

The Project has developed a suite of shared pedestrian and cyclist bridges and boardwalks along the ATC to reconnect communities that have been physically separated by poor connectivity of north-south green spaces, and east-west linkages across the corridor.

The design of the bridges and boardwalks, therefore aims to serve the community at the highest level by providing comfortable, safe and enjoyable connectivity, while responding to considered alignments and desire lines.

Bridges and boardwalks have been designed as a consistent family of forms, detailing, materials and finishes, and where appropriate, be individually distinctive to act as visual markers and reflect their location.

The major structural elements, which include abutments, balusters, fences, anti-throw screens and road furniture, form an integrated suite of urban design elements that will remain timeless, contemporary and visually appealing in the landscape.

The Project has developed contextual, refined and elegant design solutions that benefit road users and the wider community and sets a new benchmark for infrastructure in southern Sydney.

The relationship of bridge/boardwalk elements is crucial to how the bridge/boardwalk is viewed from both near and far. Careful consideration of the inter-relationship of the bridge/boardwalk elements and the incorporation of subtle designed elements has been developed to unify the design, enhance views and create high legibility.

The design approach and details of the shared pedestrian and cyclist bridges and boardwalks are outlined in this section.



White Oak Reserve boardwalks

Bridge over Muddy Creek

Kings Wetland boardwalk

Bridge over Bicentennial Park Ponds

Bridge over President Avenue

Scarborough Ponds boardwalks

Bridge over Scarborough Ponds

Artist's impression: Aerial view north across the Project towards the CBD.

## 9.1 ATC improved connectivity

The ATC will provide new north-south shared pedestrian and cyclist connectivity as it links existing open spaces between Bestic Street in Rockdale and Chuter Avenue, Monterey.

The main shared pedestrian and cyclist improvements include:

- A new ATC link that connects Muddy Creek in the north to Scarborough Park in the south via several water body crossings and an elevated bridge connection over President Avenue
- Reinstatement of the existing east-west connection between Rockdale Ilinden Sports Centre and the Brighton Memorial Playing Fields over the Bicentennial Park Ponds
- New formalised pedestrian and cyclist entries into the community lawn via existing carparks off West Botany Street
- A secondary network of paths that promotes informal pedestrian circulation around the Rockdale Bicentennial Park.

A Pedestrian and Cyclist Implementation Plan (PCIP) has been prepared which outlines the connectivity between existing and proposed routes for local communities in accordance with the EIS. It provides detail of the shared pedestrian and cyclist routes which will be provided as part of the Project and is provided in *Appendix B* of the UDLP.

### LEGEND

- █ Separated pedestrian and cycle path via 1m (typical) wide median
- █ Separated pedestrian and cycle path via painted linemarking
- █ Separated pedestrian and cycle path - varied separation width
- █ Shared pedestrian and cycle path
- █ Pedestrian footpath
- █ Informal parkland path
- - - - Maintenance access path
- █ Shared pedestrian and cycle bridge
- █ Shared pedestrian and cycle boardwalk



Figure 9-1: ATC connectivity diagram. Refer to *Appendix B*

## 9.2 Approach to bridge and boardwalk design

The overall design intent for bridge and boardwalk designs is to create a refined design aesthetic. The structures have been designed as architectural elements that are attractive, welcoming and as signature items within the parkland experience, aiding in the overall network wayfinding and legibility.

There has been a considered attempt to avoid unnecessary embellishment in the design of bridges and boardwalks to ensure a timeless design, with a focus on designing the elements to fit within their context, emphasising the simple and consistent detailing within all materials and finishes.

The shared pedestrian and cycle bridges over watercourses have been designed with consideration of key guidelines such as Controlled activities – *Guidelines for watercourse crossings on waterfront land* (DPE) which formed part of the urban design outcomes for bridge and boardwalk design to minimise impacts to watercourse crossings.

Local Aboriginal design language and elegant touches of feature lighting has been integrated into the design of the bridge over President Avenue to accentuate key bridge features.

The design strategies are described in the following sections.



### Connecting and serving communities

- Bridges have been designed and placed at key locations, on natural desire lines to improve connectivity and provide the community with a lasting project legacy
- The design has improved on the connections shown in the EIS by providing simplified connections for people in neighbourhood areas into and through the parklands, with additional east-west connections, and improved north-south connections within Scarborough Park with lessened impacts to existing wetlands (refer following section on improved connections).



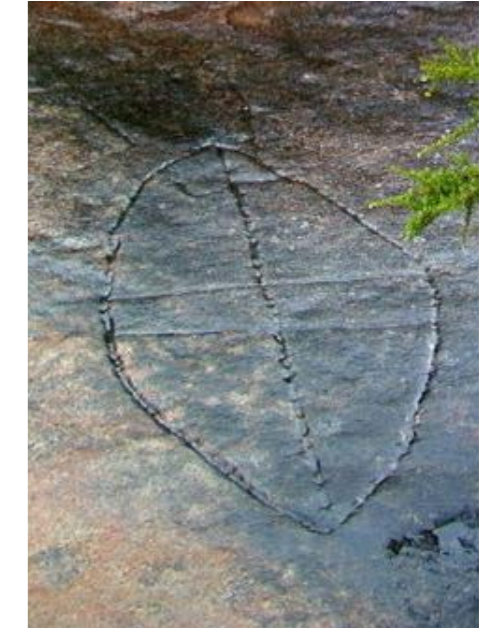
### A consistent family of bridges integrated with the Project-wide architectural language

- Bridges have been designed to complement the Project-wide architectural language including the bridge over President Avenue, Rockdale Motorway Operations Complex (MOC3), and various parkland elements
- Materiality, colour and overall simplicity and elegance of the designs will help tie together the overall project aesthetically.



### Simple, refined and elegant

- Bridge and boardwalk detailing has been designed to be simple, refined, and elegant, with slender profiles and accentuated forms connected to landscape
- Design of substructures, superstructures, lighting and barriers as an integrated suite of high-quality elements
- Finely detail and carefully integrate materials, structures and joints, providing a high-quality outcome and experience at a slower road speeds
- Ensure feature lighting subtly accentuates the key features, with no visible light fittings.



### Integrated with Aboriginal design language

- Incorporate embedded artwork on the bridge balustrades over President Avenue, with reference to the Aboriginal cultural heritage of the area
- Use lines and symbology to mark ceremonial and tribal boundaries to let everyone know that this is Bidjigal (Dharug) Country
- Adhere to Dharug line-based design, to ensure the historic design vernacular is continued and built upon.

### 9.2.1 Bridge design principles

The key design principles that have been adopted in the bridge design include:

- The design should present smooth, clean lines with minimum structural depth consistent with their spans, which will allow for a more refined transition to the shallower girders of the approach spans, while expressing a depth of structure appropriate for its span. It will reduce the depth of the main span girder, creating a slenderer superstructure and elegant solution
- Urban design elements including throw screens, lighting and fencing will all be considered as part of the overall composition and form, with a view to developing a slender, symmetrical, visually uncluttered and well-ordered profile. Signage requirements should be kept to a minimum
- The design will complement the surrounding built-form and natural environment
- Engaging with road users along President Avenue as an elegant form and an identifiable visual marker in the landscape
- Provision of generous and smooth radii to ramps to provide safe line of sight and easy transitions for cyclists and pedestrians
- Integration of Aboriginal design language on key bridge balustrade not only creates a distinct structural element but conveys Connection to Country storytelling
- Pier columns should be consistent in shape, emphasise its verticality and in line with the overall Project architectural language
- All accessible surfaces will be treated with a non-sacrificial, anti-graffiti paint coating
- All bridges shall be elevated and span over existing riparian corridors
- Bridge piers or foundations will not be located within the main channel of the watercourse
- The bridges and boardwalks should support the reinstatement of existing native vegetation
- Minimise the design and construction footprint and extent of proposed disturbances within the watercourse and riparian corridor
- Maintain existing or natural hydraulic, hydrological, geomorphic and ecological functions of the watercourse
- Protect against scour by providing any necessary scour protection, such as rock rip rap and vegetation
- The design of the bridge balustrades have been developed to reinforce Project identity through the consistency of material, colour selection and detail with other key Project elements such as the tunnel portals and MOC3.



Artist's impression - Bridge over Scarborough Ponds (existing condition shown indicatively). Trees and landscape shown at maturity.

### 9.3 Bridge and boardwalk locations

Along the ATC, there are a number of shared pedestrian and cyclist bridges and boardwalks proposed from north to south across the Project:

- White Oak Reserve boardwalks
- Bridge over Muddy Creek
- Kings Wetland boardwalk
- Bridge over Bicentennial Park Ponds
- Bridge over President Avenue
- Scarborough Ponds boardwalks
- Bridge over Scarborough Ponds.

### 9.4 Bridge widths and levels of service

The bridges and boardwalks have been designed to provide a suitable level of service prescribed along the ATC which is outlined in the Pedestrian and Cyclist Implementation Plan (refer *Appendix B*).

Generally, there are two standard widths that have been adopted for the bridges and boardwalks:

- Separated pedestrian and cycle path - 5.8m clear width overall
- Shared user paths - 3.6m clear width overall.

Item	Description	
01	White Oak Reserve boardwalks	<span style="color: blue;">█</span> Parkland boardwalks
02	Bridge over Muddy Creek	<span style="color: orange;">█</span> Parkland bridges
03	Kings wetland boardwalk	<span style="color: magenta;">█</span> Bridge over President Avenue
04	Bridge over Rockdale Ponds	
05	Bridge over President Avenue	
06	Scarborough Ponds boardwalks	
07	Bridge over Scarborough Ponds	



Figure 9-2: M6 Stage 1 - Bridges and boardwalk locations - not to scale

## 9.5 Bridge typologies

In defining a common theme and set of detailing, the bridges and boardwalks have been categorised based on:

- location within a landscape or roadside setting
- scale, form and height
- types of viewers and vantage points including speed and distance that it can be seen.

### Bridges over urban road environments

Bridges that span over roads are generally elevated structures and more visually prominent elements which are experienced by pedestrians, cyclists and motorists alike. The relationship of bridge elements from piers to anti-throw screens is viewed from both near and far. Careful consideration of the inter-relationship of the bridge elements and the incorporation of subtle designed elements has been developed to unify the design. In this Project, the bridge over President Avenue is the only bridge that crosses a road environment. Further details on this bridge can be found in *Section 9.7*.

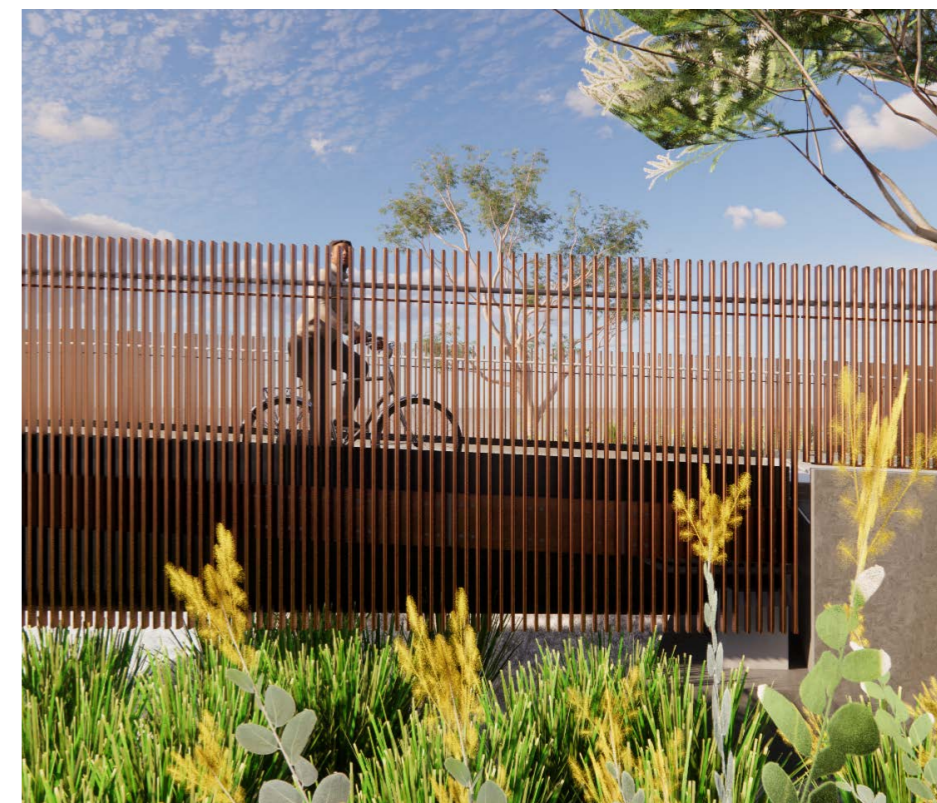
### Bridges and boardwalks within a parkland setting

These bridges are located within a parkland setting and are mainly view and experienced by pedestrians and cyclists only. They have been designed with consideration of their spans across existing waterways and wetlands. These include:

- White Oak Reserve boardwalks
- Bridge over Muddy Creek
- Kings Wetland boardwalk
- Bridge over Bicentennial Park Ponds
- Scarborough Ponds boardwalks
- Bridge over Scarborough Ponds.



Artist's impression - Bridge over President Avenue



Artist's impression - Parkland bridges



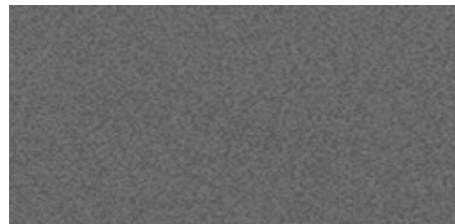
## 9.6 A unified aesthetic of materials and finishes

Bridge and boardwalk materiality is based on longevity, utility, beauty and value and is consistent with other key Project elements such as MOC3 and the tunnel portal at President Avenue.

A consistent palette of materials has been adopted across the two main bridge and boardwalk typologies to maintain a unified design language and visual aesthetic across the Project. A signature colour of copper / bronze has been adopted in reference to the earthy colours and textures of this Country to enhance the outcomes for integrated urban art elements and compliment the architectural design of the Project elements.



Anodised 'Copper' aluminium



Micaceous iron oxide paint coatings to steel elements



Stainless steel handrails and balustrade posts



### Vertical battens

Parkland bridges and boardwalk balustrades will feature a continuous, repetitive series of steel vertical battens painted in a copper metallic finish to match other Project elements.



### Anodised perforated balustrade

The shared pedestrian and cyclist bridge over President Avenue will incorporate a feature anodised balustrade panel, which will reference Connection to Country storytelling through Aboriginal art integration.



### Fibre reinforced polymer grating

Parkland bridges and boardwalks decking material will be fibre reinforced plastic (FRP) heelguard type micromesh.



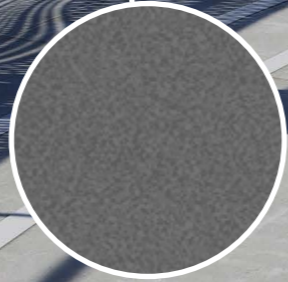
Light Grey steel girders and light posts



Stainless steel handrails and posts



Copper anodized, perforated balustrade panels and feature lighting



Light - Mid Grey (Bridge Grey) light posts & support structure



Integrally coloured pigmented concrete (mid grey)



Artist's impression: Road user view south toward President Avenue Bridge (trees and landscaping shown at maturity).

## 9.7 Bridge over President Avenue

The bridge over President Avenue provides a continuous separated pedestrian and cyclist path crossing between Scarborough Park and Rockdale Bicentennial Park.

The relationship of bridge elements is crucial to how the bridge is viewed from both near and far. Careful consideration of the inter-relationship of the bridge elements and the incorporation of subtle designed elements has been developed to unify the design.

The key design approach is to provide a simple and elegant structure, with a minimised structural depth that will create a slender appearance when spanning across President Avenue without any central piers. This has primarily been achieved by utilising twin steel fabricator girders to support the bridge deck and conceal the bridge substructure such as pier headstocks as much as possible.

The girders have been faceted to further enhance the slender appearance of the bridge, embedding the bridge into the broader parkland setting.

The design of the bridge is visually unobtrusive, optimises safety for all users, and provides ease of maintainability and contribute positively to the local built form character.

The bridge will incorporate a consistent balustrade comprising perforated aluminium panels embedded with Aboriginal design motifs, detailed with symbology specific to its place of 'water and sand' and cultural storytelling. The development of Bidjigal (Dharug) themes or design vernaculars for the Project evolved through workshops with the Project team as outlined in *Section 5* and *Section 6* of this UDLP.

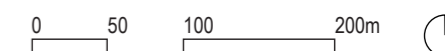
Anti-throw screens will be provided across the main span over President Avenue and have been designed to be visually permeable, maintaining the slender appearance.

The bridge is designed for universal access which includes pedestrians, cyclists and people with all levels of mobility (DDA compliance) including the use of line marking and the provision of handrails.

Details of the bridge and architectural elements are included on the following pages.



Figure 9-3: Bridge over President Avenue - Location plan



## 9.7.1 Bridge Features

### Piers

The pier design presents as a refined, elegant solution fitting with the overall Project architectural language.

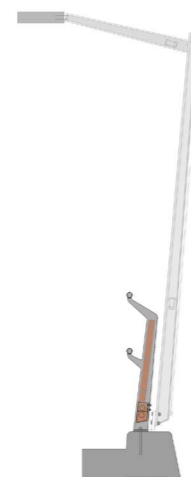
Tapered headstocks have been used to reduce the visual scale of the structural requirements. The lower section of the column maintains a constant width which allows for a variety of pier heights and maintains the proportions of the pier no matter its height.



Circular pier form and headstock

### Lighting

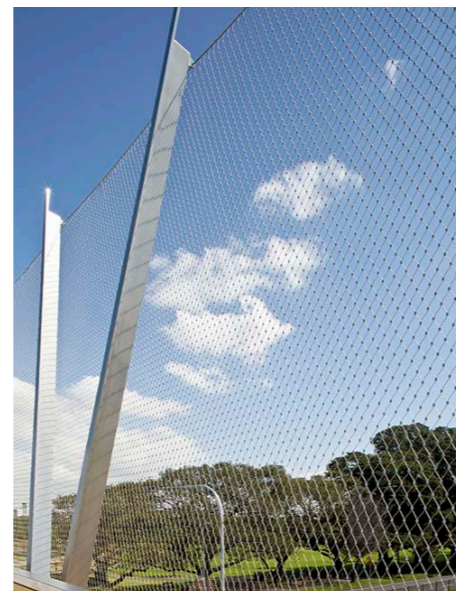
The bridge will be lit with post-top lighting neatly integrated with the anti-throw screen posts to minimise visual clutter. Lighting levels on the bridge achieves PP2 category to allow for facial recognition.



Integrated post top lighting for safety

### Anti-throw screen

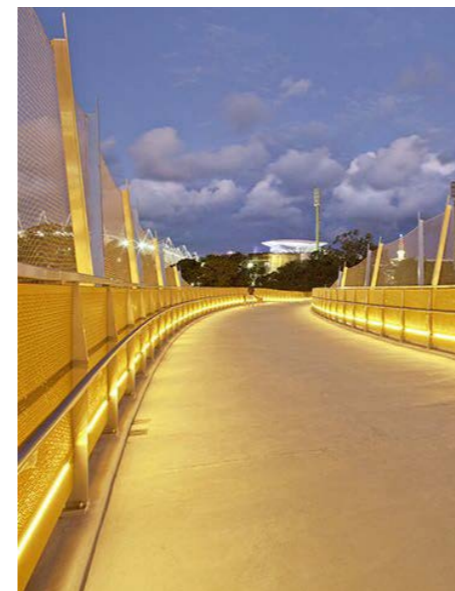
The safety screen will be made from a stainless steel tensile mesh, to achieve an unobtrusive and light appearance.



Anti-throw screen tensile mesh and steel posts

### Feature lighting

Integrated LED strip feature lighting used along the length of the bridge to increase safety, and provide a subtle, elegant wash of light down the integrated balustrade detail. This will reduce the visible bulk of the overall bridge, and provide a neat, clutter free appearance.



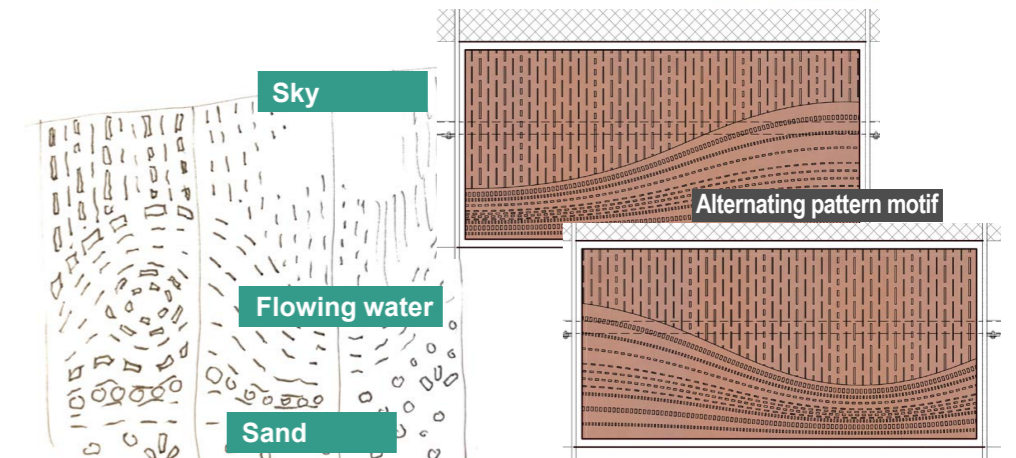
Anodized aluminium balustrade with integrated feature lighting

### Balustrade

The balustrades will be embedded with an Aboriginal design language, detailed with symbology specific to its place and cultural storytelling. The theme were developed through workshops with the Project team and the Knowledge Holders.

Dharug design is heavily line-based and holds significant meaning for Dharug people. Line-based design dominates this Country with parallel, crossing, single and multiple lines being used to express culture and Country.

The sketch highlights the development of this work, which was an iterative integration and translation of Aboriginal design concepts that would strongly tie the design of the tunnel portal to Dharug (Sydney based) design principles.



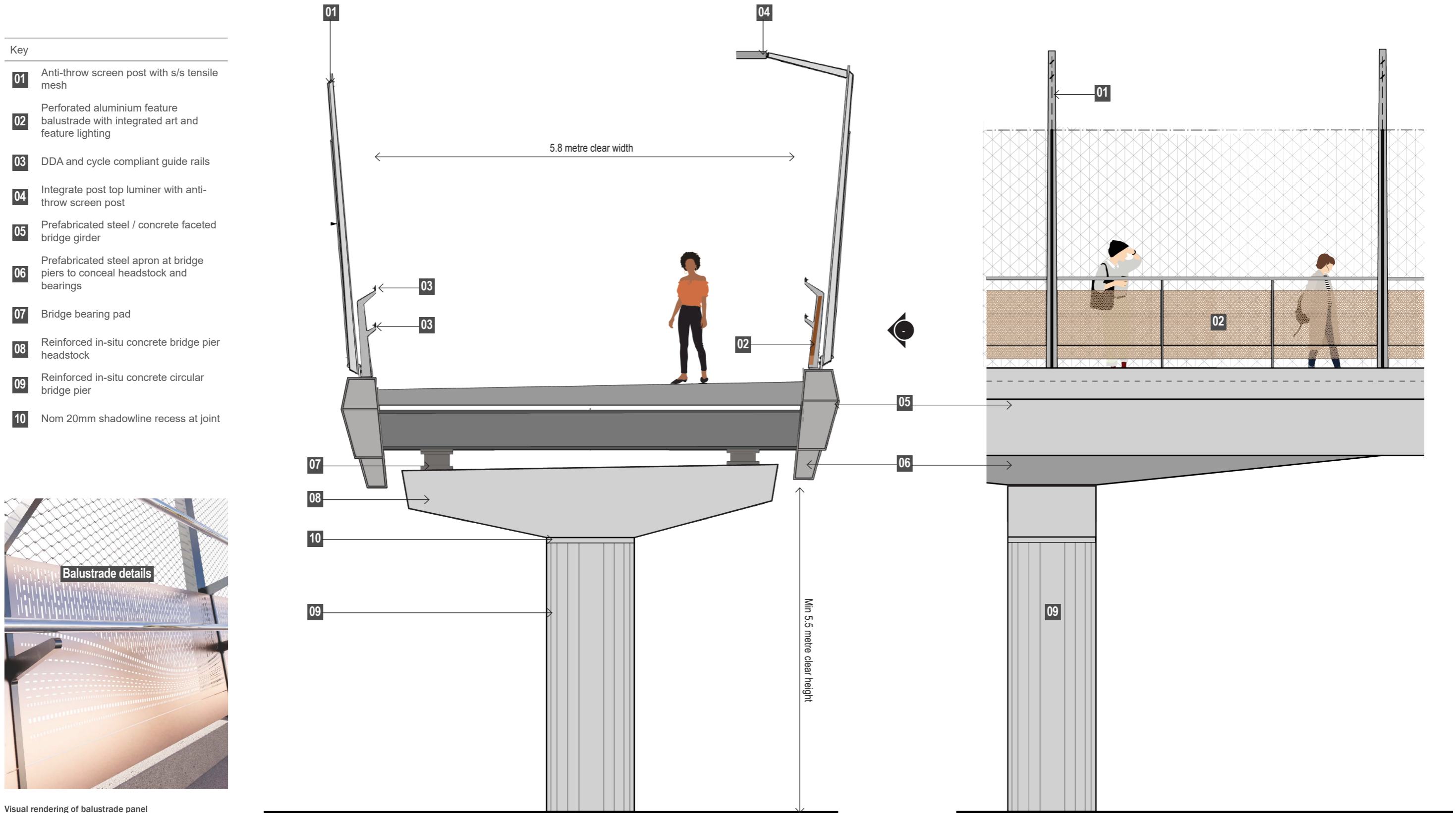
Indigenous patterning and balustrade details

The lines were carved into trees to make dendroglyphs (scar trees) to mark ceremonial, burial and tribal boundaries, and into shields, other tools and rock to let everyone know that this is Bidjigal (Dharug) Country.

The balustrade will feature free flowing bands of sand and water patterns within the laser cut aluminium anodised panels, that will create a sophisticated and elegant feature across the bridge, enhancing the user experience.

A Place of Sand and Water





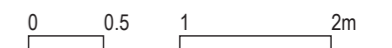
- Key
- 01** Anti-throw screen post with s/s tensile mesh
  - 02** Perforated aluminium feature balustrade with integrated art and feature lighting
  - 03** DDA and cycle compliant guide rails
  - 04** Integrate post top luminer with anti-throw screen post
  - 05** Prefabricated steel / concrete faceted bridge girder
  - 06** Prefabricated steel apron at bridge piers to conceal headstock and bearings
  - 07** Bridge bearing pad
  - 08** Reinforced in-situ concrete bridge pier headstock
  - 09** Reinforced in-situ concrete circular bridge pier
  - 10** Nom 20mm shadowline recess at joint



Balustrade details

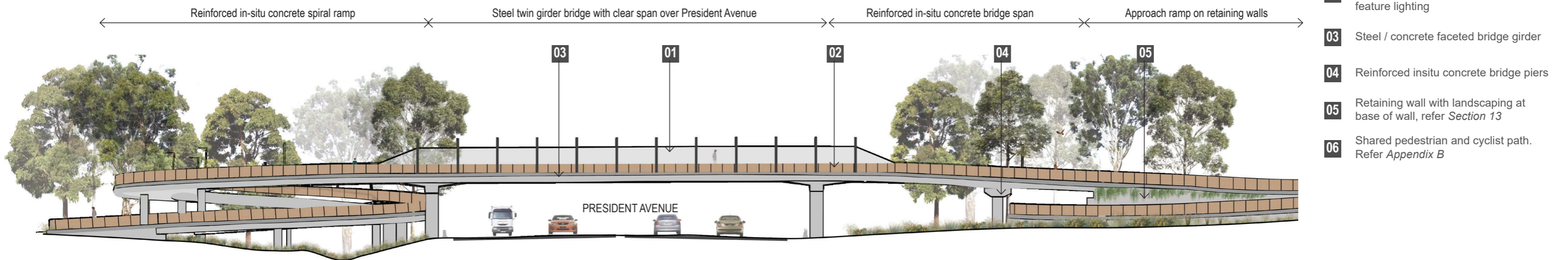
Visual rendering of balustrade panel

Figure 9-4: President Avenue Bridge - typical section and elevation. Scale 1:50



### 9.7.2 Bridge details

The following plans, elevations and sections provides illustrative cross section and elevations of the bridge design to demonstrate it's contextual fit.



Key	
01	Anti-throw screen
02	Perforated aluminium feature balustrade with integrated art and feature lighting
03	Steel / concrete faceted bridge girder
04	Reinforced insitu concrete bridge piers
05	Retaining wall with landscaping at base of wall, refer Section 13
06	Shared pedestrian and cyclist path. Refer Appendix B

Figure 9-5: President Avenue Bridge - long elevation AA. Scale 1:500

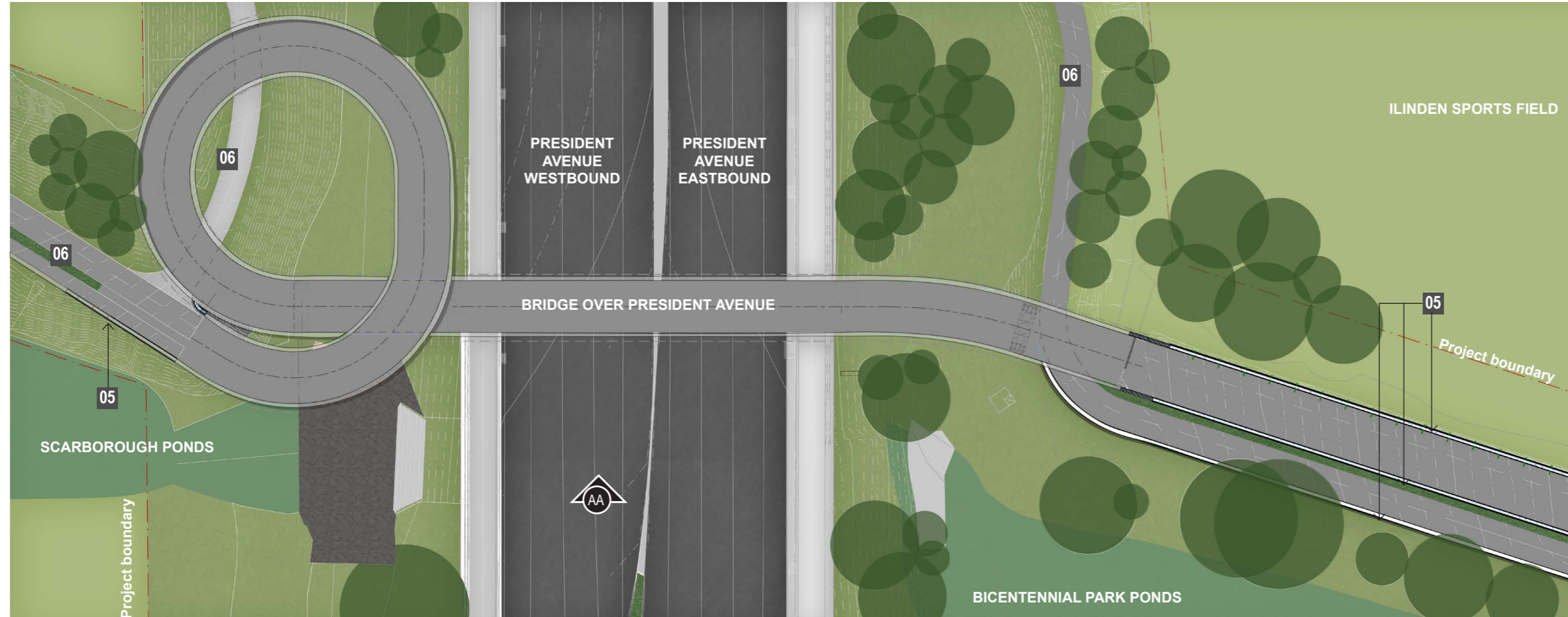
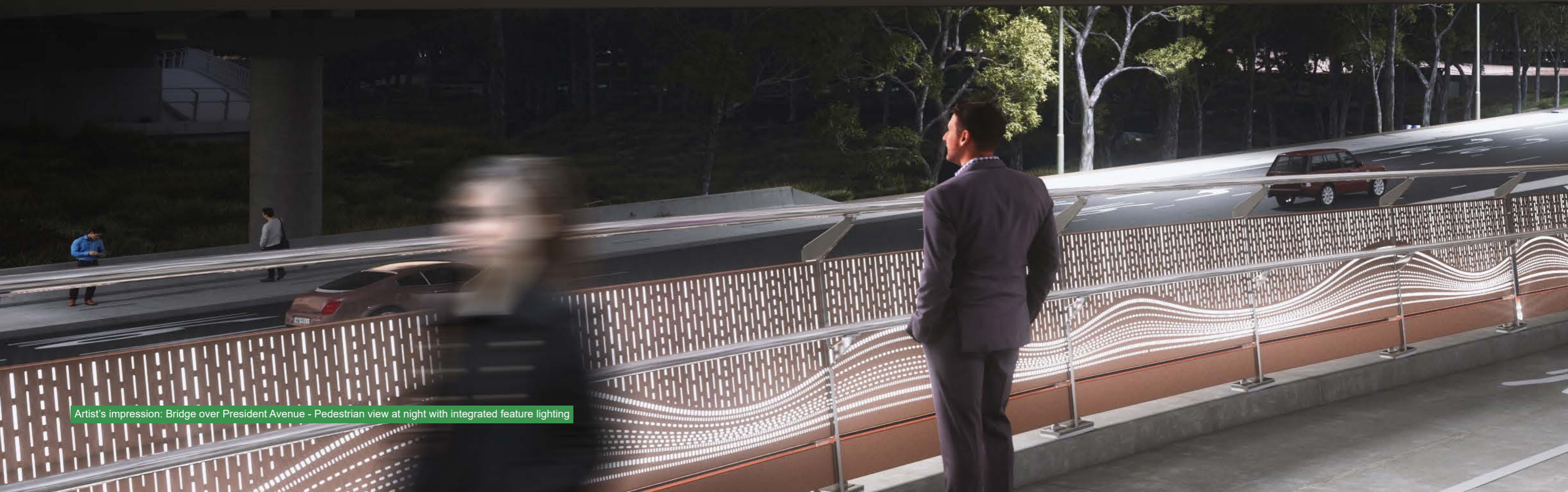


Figure 9-6: President Avenue Bridge - illustrative plan. Scale 1:500



Artist's impression: Pedestrian view along the bridge over President Avenue (trees and landscaping shown at maturity).





Artist's impression: Bridge over President Avenue - Pedestrian view at night with integrated feature lighting



Artist's impression continued.



Artist's impression: View over terraced wetlands at Rockdale Bicentennial Park (trees and landscaping shown at maturity).

## 9.8 Parkland bridges and boardwalks

The design of the parkland bridges and boardwalks have been developed as a sequence of elevated walkways that provide a continuous 'ribbon' across the waterways and parklands, consistent with the overall Project architectural language, and heightening the experience of the parkland user.

The structures are simple and elegant, integrating a series of repetitive vertical battens, fibre reinforced plastic (FRP) flooring, and handrails as required. Materials have been chosen for longevity, utility, beauty and value.

The bridge and boardwalk designs are based on a series of steel I-beam girders setback from the edge of the deck to create a 'floating' effect. The vertical battens have been designed to extend below the deck level to conceal the steel super-structure from view.

The key design principles include:

- The design presents smooth, clean lines with minimum structural depth accentuated by a simple and elegant balustrade detail
- Maintain visual continuity between all parkland bridges and boardwalks
- Urban design elements including lighting and fencing have been considered as part of the overall composition and form, with a view to developing a slender, symmetrical, visually uncluttered and well-ordered profile
- Signage requirements have been kept to a minimum
- The design complements the surrounding built-form and natural parkland environment
- All accessible surfaces will be treated with a non-sacrificial anti-graffiti paint coating
- For parkland bridges, feature lighting will be provided through LED strip uplighting, used to create a subtle and elegant wash of lighting to heighten the overall night-time experience and accentuate the balustrade as a 'ribbon'
- Abutments will be simple elements, kept as small as possible to mitigate areas for vandalism
- To minimise drainage elements and loads on the structure, an FRP micro mesh (heelguard type) deck is proposed. This material is maintenance friendly and light weight
- Planting zones to be provided in front of retaining walls and bridge abutments where possible, to minimise opportunities for vandalism.

## Parkland bridges and boardwalk locations

There are three parkland bridges and six boardwalks along the ATC as shown in Figure 9-7 which share a consistent set of details and visual characteristics.



Figure 9-7: Parkland bridges and boardwalks - aerial view with locations shown

Item	Description
01	White Oak Reserve boardwalks
02	Bridge over Muddy Creek
03	Kings wetland boardwalk
04	Bridge over Bicentennial Park Ponds
05	Scarborough Ponds boardwalks
06	Bridge over Scarborough Ponds

## 9.8.1 Bridge and boardwalk features

### Balustrade

Parkland bridge and boardwalk balustrades will feature a continuous, repetitive series of rectangular hollow section vertical battens. The balustrade will be discretely mounted with minimal fixings and supports to create a refined aesthetic.

The battens will be painted with a metallic paint coating to give an anodized appearance similar.

### Fibreglass reinforced polymer grating

Parkland bridge and boardwalk decking material will be fibreglass reinforced plastic (FRP) heelguard type micromesh.

The mesh will be charcoal in colour to be recessive.

### Lighting

Parkland bridges and boardwalks be lit with post-top lighting neatly integrated along the edge of the bridge deck where required to maintain a PP2 category level of lighting.

### Feature lighting

For parkland bridges, LED strip feature lighting will be provided along the edge of the bridge decks to provide a subtle, elegant wash of light down the integrated balustrade detail. This will reduce the visible bulk of the overall bridge, and provide a neat, clutter free appearance.



Vertical RHS batten balustrade



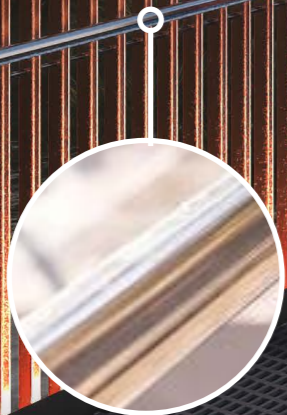
FRP Micromesh decking



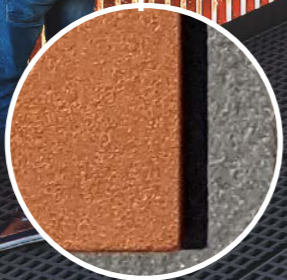
Parkland post top light fittings (example)



Integrated accent and feature lighting



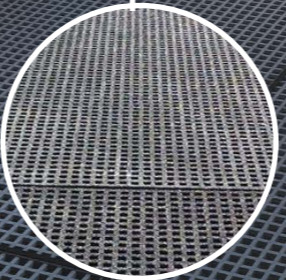
Stainless steel handrails and supports



Balustrade: Metallic copper finish



Steel support structure (Charcoal grey)



Micro mesh deck (charcoal grey)

Artist's impression: Bridge over Muddy Creek (trees and landscaping shown at maturity).

### 9.8.2 Bridge and boardwalk details

The following plans, elevations and sections provides illustrative cross section and elevations of the bridge design to demonstrate it's contextual fit. All parkland bridges and boardwalks share a consistent detail.

Key

- 01** 1400mm high steel RHS balustrade posts at with integrated feature lighting
- 02** Prefabricated steel structural frame setback behind the balustrade
- 03** Reinforced in-situ concrete bridge abutment and wing walls
- 04** Landscape areas (shown indicatively)
- 05** Anti-slip FRP micro mesh grating to bridge deck
- 06** ATC shared pedestrian and cyclist path. Refer *Appendix B*
- 07** Stainless steel cyclist rail set 1200mm above the deck

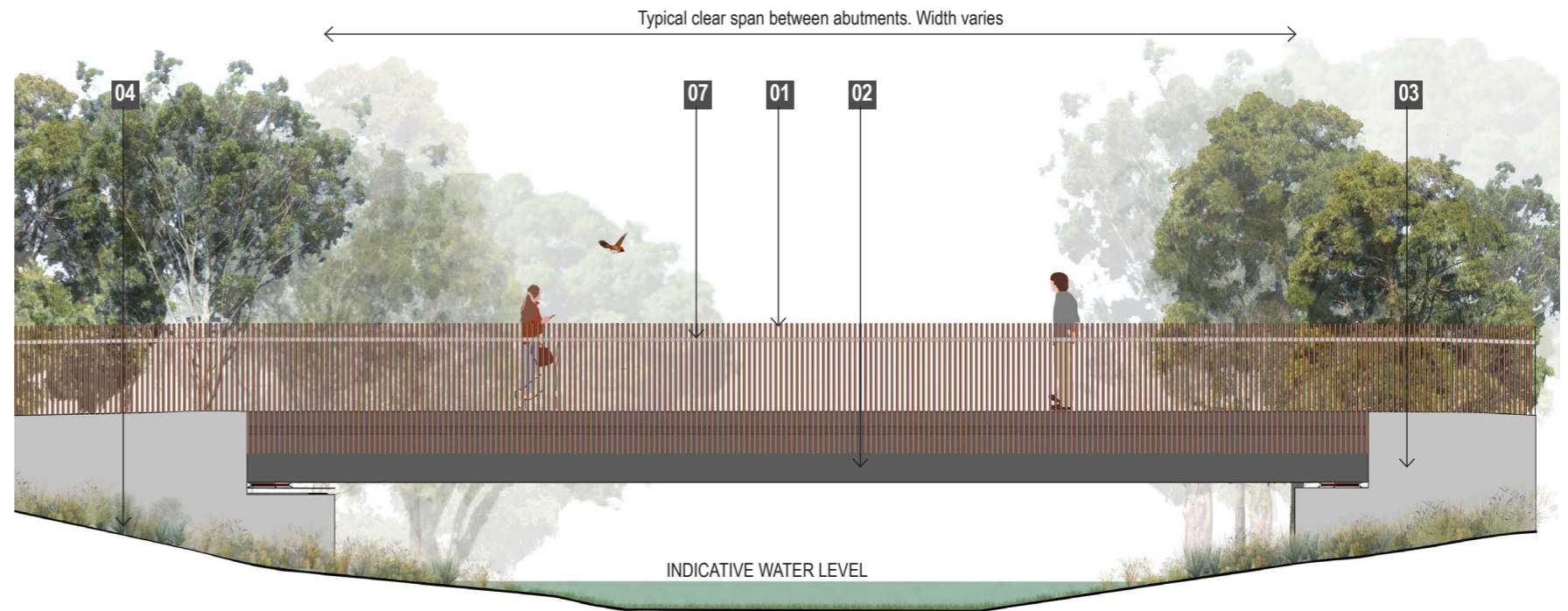
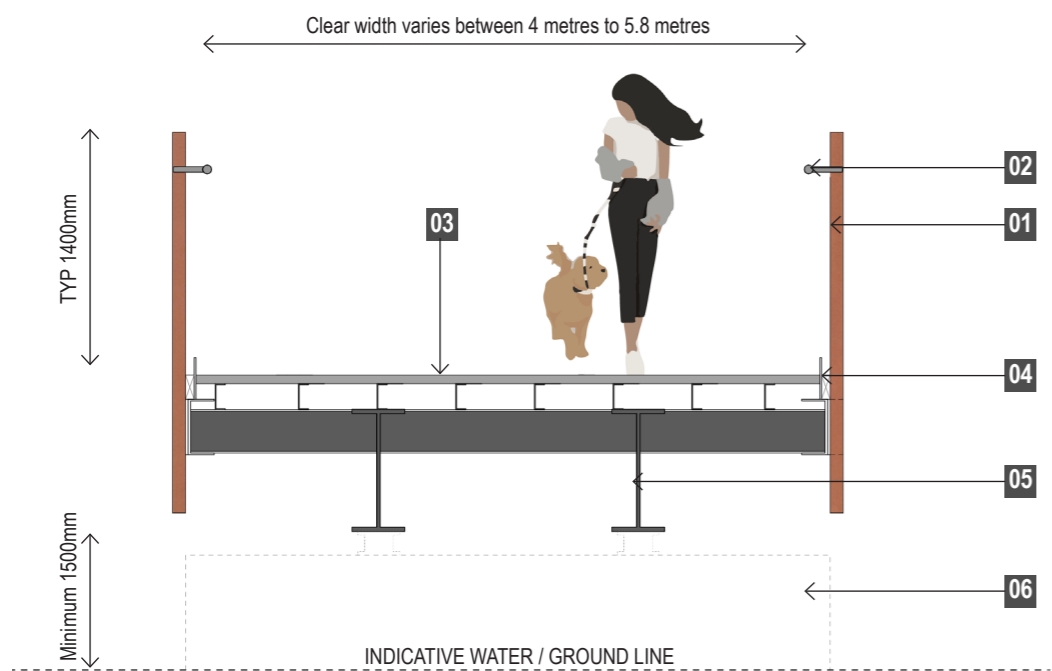


Figure 9-8: Typical elevation of parkland bridges - 1:200



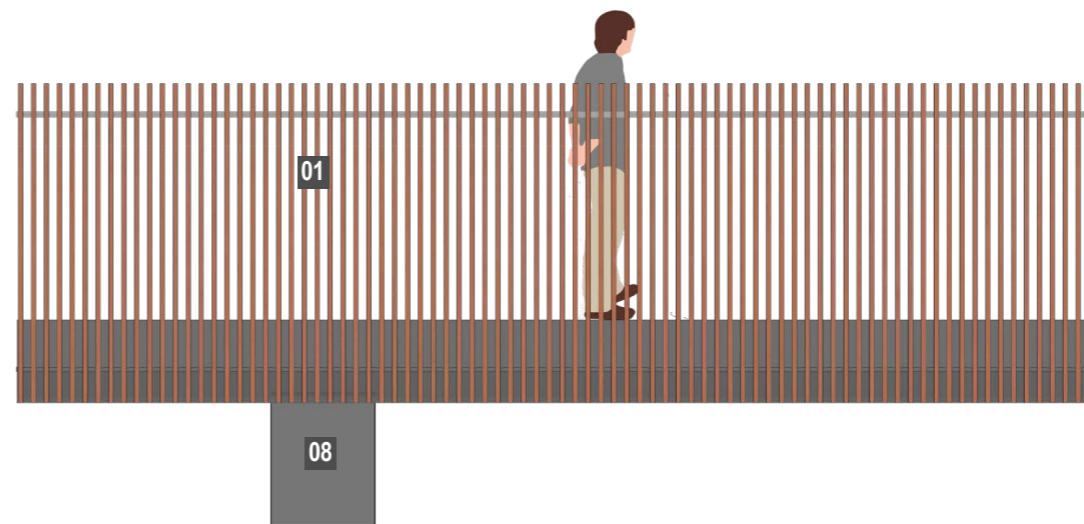
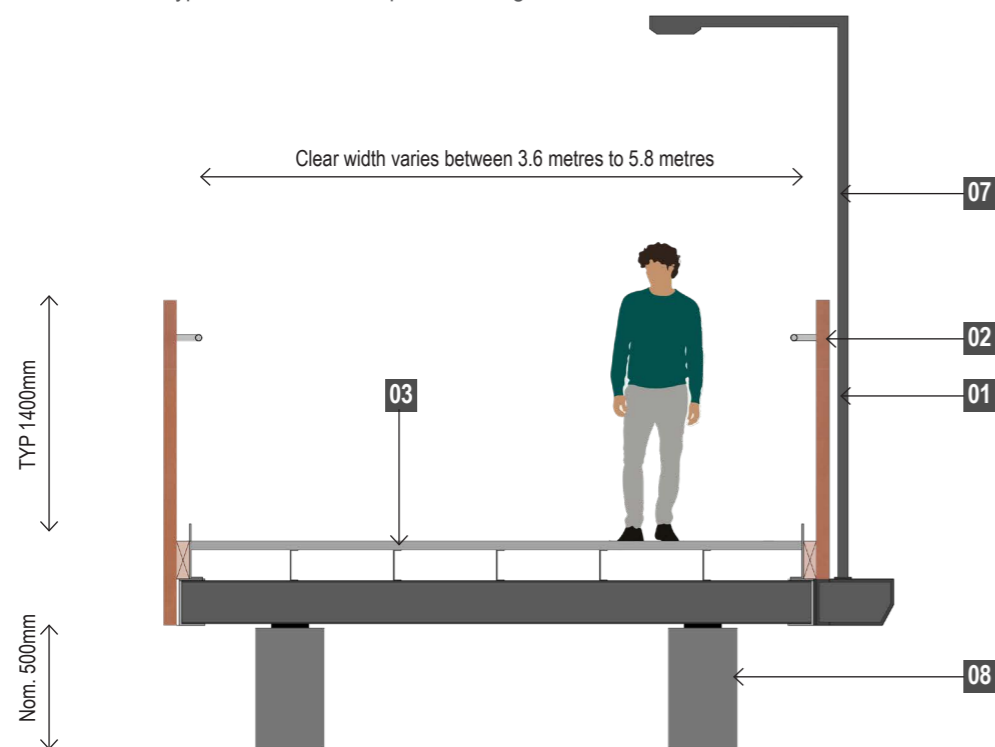
Figure 9-9: Typical plan of parkland bridges - 1:200





- Key
- 01** 1400mm high steel RHS balustrade posts
  - 02** Min 1200mm high cyclist safety rail
  - 03** Anti-slip FRP micro mesh grating to bridge deck
  - 04** Integrated LED strip lighting to accentuate balustrade at night
  - 05** Prefabricated steel structural frame setback behind the balustrade
  - 06** Reinforced in-situ concrete bridge abutment and wing walls (behind)
  - 07** Post top luminaire mounted to steel cross girder
  - 08** Reinforced in-situ concrete piers at nominal 6 metre spacing (boardwalks only)

Figure 9-10: Typical cross section of parkland bridges - 1:20



0 400 800 1600mm

Figure 9-11: Typical cross section and elevation of boardwalks - 1:20



THE ATC ALONG WITH THE NEW PARKLANDS WILL PROVIDE A NEW WAY TO COMMUTE AND EXPERIENCE THIS OPEN SPACE CORRIDOR, LEAVING AN ENDURING LEGACY FOR SYDNEY, THE LOCAL COMMUNITY WHO LIVE IN IT AND FOR FUTURE GENERATIONS.



Artist's impression - Bridge over Scarborough Ponds (existing condition shown indicatively). Trees and landscape shown at maturity.



Artist's impression continued.