





Appendix A

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October 2012

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Berry Bypass Urban Design Strategy

October 2012

Prepared for Roads and Maritime Services

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03	20/09/12	Final Report - Aecom comments	DA/ICT	EC	DC
04	30/10/12	Final Report - Update	DA	EC	DA



Glossary

Carriageway

Road surface used by vehicles, including both traffic lanes and shoulders.

CLD

Context Landscape Design

CRG

Community Reference Group.

CPTED

Crime Prevention Through Environmental Design - the design of the built environment which can lead to a reduction in fear of crime and incidence of crime.

CM⁺

Conybeare Morrison

Cycle Path

A path dedicated for cyclist use.

EA

Environmental Assessment.

Footpath

Pavement for use by pedestrians and the disabled.

Footway

Zone between road kerb and road reservation boundary, typically incorporating a footpath and/or nature strip.

LGA

Local Government Area.

Parapet

Traffic crash barrier at the edge of a bridge, viaduct or tunnel portal structure.

Road Reservation

Corridor for road carriageway, footways, batter slopes, etc.

RMS

Roads and Maritime Services, NSW

SCC

Shoalhaven City Council

Shared Path

Pathway shared by both pedestrians and cyclists.

Shoulder

The portion of a carriageway beyond the traffic lanes adjacent to, and flush with, the pavement surface.

The Proposal

Works associated with the proposed Foxground and Berry Bypass, including associated parks, local road, pedestrian and cyclist facilities.

Type F Barrier

Tapered, redirective, concrete traffic safety barrier.

Undercroft

Area under a bridge without access to direct sunlight and rain.

Verge

Part of a road formation, not sealed, with a carriageway, footpath or cycleway.

Visual Catchment

The area from which an object is viewed.

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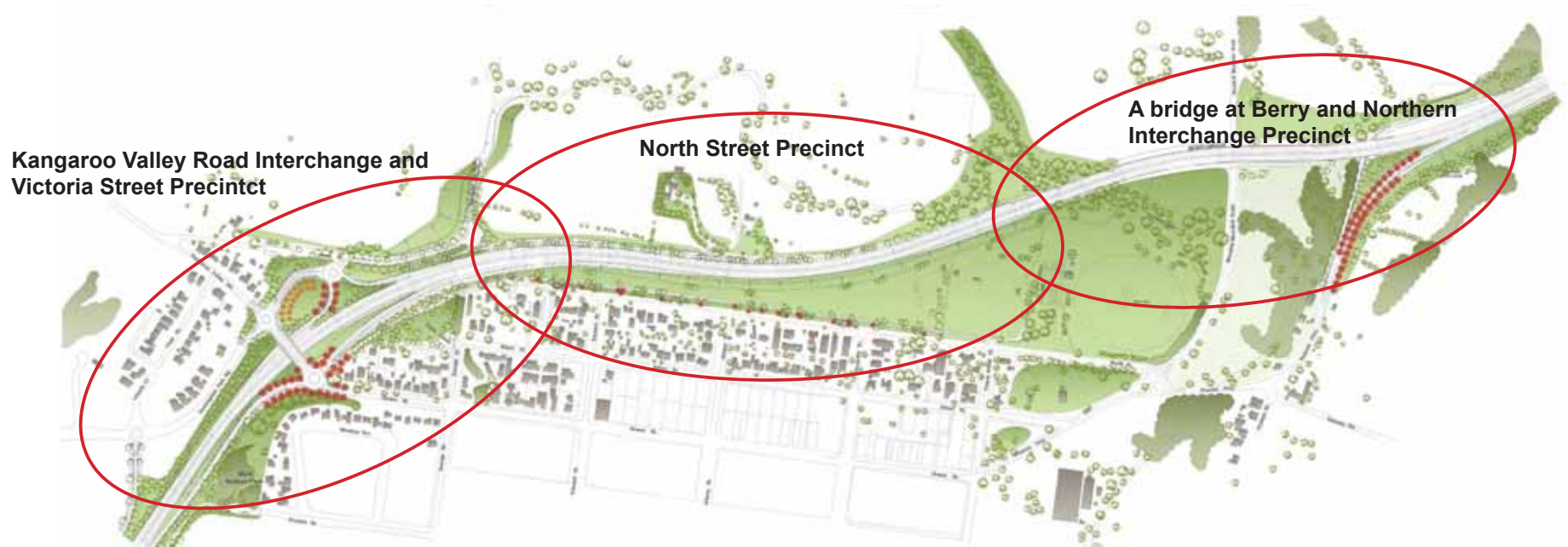


Figure 1: North Berry bypass route study precincts.

1.0 Introduction

1.1 Purpose

This report describes the Urban Design Strategy for the bridge at Berry and Northern Interchange Precinct, the North Street Precinct, and the Kangaroo Valley Road and Victoria Street Precinct, of the Foxground and Berry Bypass project. Refer to Figure 3.

1.2 Study objectives

The study objectives are to:

- Establish an integrated urban design vision for the Foxground and Berry Bypass.
- To develop an urban design strategy report for Berry that is consistent with and supports the overall Urban Design Report, Landscape Character and Visual Impact Assessment for the Foxground and Berry Bypass project.
- To identify urban design opportunities and concepts for adjoining Berry streets and interfaces that are consistent with community feedback and any existing pedestrian access and mobility plans (PAMP).
- To prepare a suite of preferred urban design mitigation measures that informs the setting of reference design parameters for future detailed design works.

1.3 Scope

The study focuses on the approximately 2.5km section of the Foxground and Berry Bypass (FBB) route that is proposed to the north of Berry, in the vicinity of the township, extending from the Northern Interchange to the northeast of Berry, to the Kangaroo Valley Road Interchange to the west.

The study area includes the bridge at Berry and Northern Interchange Precinct, the North Street Precinct, the Kangaroo Valley Road and Victoria Street Precinct, and all associated works required to integrate the project with the local street network, property access, pedestrian and cyclist connections, and includes the urban and landscape design of 'residual land parcels' that would be utilised for the agistment of stock or for public open space.

1.4 Consultation - a collaborative design process

The development of the Urban Design Strategy has involved an iterative working process - identifying urban design opportunities, developing concept design options, and testing these through 3D modelling and photomontage.

The urban design process has benefited from the feedback provided from a community engagement process commenced in 2011 and followed by a series of community workshops held in Berry in 2012. Also from meetings with key stakeholders such as Shoalhaven City Council (SCC) and through the review of fellow design professionals - a collaborative design process, working with the RMS Project Design Team, including the RMS Project Manager, Environmental Assessment (EA) Manager and Urban Design Manager, including the design engineers at Aecom and the specialist Bridge Designers of the Aurecon Group.

1.5 Study precincts

The Berry Bypass Urban Design Strategy encompasses three interconnected study precincts:

Refer to Figure 1.

- A bridge at Berry and Northern Interchange Precinct
- North Street Precinct
- Kangaroo Valley Road Interchange and Victoria Street Precinct

This report and the associated community consultation groups are structured, based on these three interconnected precincts.



Opportunities

1. Township street grid and North Street integrity
2. Berry north-south streets
3. Maximise views to the Cambewarra Escarpment
4. Recreational green space
5. Celebrate Berry arrival/departure
6. Minimise the visual prominence of the bypass and noise mitigation barriers
7. A new pedestrian/cycle circuit
8. Facilitate viable dairy farming
9. Preserve existing stands of trees
10. Improve Town Creek environment

Figure 2: Urban design opportunities.

2.0 Opportunities and constraints

2.1 Key Constraints

During the analysis phase of the project the following bypass urban design constraints were identified:

Flooding, drainage and water table

Drainage issues, due to the high water table, limit the potential for the bypass to be significantly depressed.

Homestead curtilage and farm viability

The bypass alignment and footprint has in part been guided by the need to establish a reasonable visual curtilage of the existing homestead and garden (to the north of North Street), to provide alternate vehicular access, and sufficient flood-free high ground for regular pastureland for a viable dairy farm.

Berry township urban integrity and legibility

The Berry township street grid and development blocks should be retained wherever possible, and the alignment of the Berry Bypass should respect the existing street and development pattern.

North Street streetscape integrity

The integrity of the North Street streetscape should be retained and strengthened through urban and landscape design improvements.

Bypass user safety (engineering geometry standards)

A safe Bypass roadway at 100km/hour speed limit is a mandatory design requirement. This includes ensuring minimum radius road curvatures and a horizontal rise and fall necessary to achieve sightline and safety requirements.

Construction factors

There would be a significant increase in road construction cost if the bypass alignment was to encroach north of Bundewallah Creek into flood prone areas.

Berry sports field

Berry sports field provides an important recreational facility for the Berry community. The field and surrounding landscape backdrop to the north should be protected.

Maintain escarpment views

The height of the Bypass road level and associated noise mitigation devices should be carefully designed, in order to maximise views from North Street to the Cambewarra Escarpment.

CRG agreed major road alignments

The bypass alignment, as agreed with the Community Reference Group (CRG) in 2011, is now established.

Noise attenuation requirements

Noise attenuation barriers would be necessary at various locations along the bypass alignment.

2.2 Opportunities

The following bypass urban design opportunities were identified: (refer to Figure 2)

(1) Township street grid and North Street integrity

Preserve existing street corridor and improve streetscape definition and amenity through the design of recreational green space and street trees.

(2) Berry north-south streets

Provide a fitting northern, physical and visual, resolution of the Berry township north-south oriented streets: George, Edward, Albany, Alexandra and Prince Alfred Streets.

(3) Maximise views to the Cambewarra Escarpment

Lower the alignment as much as drainage requirements would allow and explore noise mitigation measures that maximise views to the escarpment.

(4) Recreational green space

Provide an 'arc' of connected recreational green spaces along the southern edge of the bypass, extending from Berry sports field in the east to Mark Radium Park and potentially further to the southwest.

(5) Celebrate Berry arrival/departure

Kangaroo Valley Road Interchange (and Queen Street, west) and the Northern Interchange are opportunities to incorporate special feature planting and high quality overbridge design to mark the arrival in Berry.

(6) Minimise the visual prominence of the bypass and noise mitigation barriers

Incorporate 'Ha Ha' landforms and landscaped mounds to integrate noise mitigation devices in the landscape, and to screen the bypass roadway from view - retaining escarpment views.

(7) A new pedestrian/cycle circuit

There would be an opportunity to establish a new walking/cycle route along the bypass corridor, extending from Mark Radium Park and Kangaroo Valley Road in the west along North Street to Berry sports field in the east.

(8) Facilitate viable dairy farming

Maintain conditions for viable dairy farming - maintaining sufficient flood free, high ground and general pastureland to the north of the bypass alignment.

(9) Preserve existing stands of trees

Consolidate existing trees to the north of Berry sports field (along Connolly's Creek), at the Queen Street and Kangaroo Valley Road intersection and at Mark Radium Park.

(10) Improve Town Creek environment

Restore the upper reaches of Town Creek (to the south of the bypass), as the beginnings of a potential new recreational green space following the creekline.



Figure 3: Overall Berry Bypass plan.

3.0 Overall urban design strategy

The urban design approach has been one that pursues an integrated outcome. We understand there needs to be an overall urban design 'vision' for the future development of Berry (i.e. not simply a focus on the Bypass corridor in isolation). The design approach has been holistic in outlook, considering the urban design of the Berry Bypass in relationship to the urban structure, character and evolution of the Berry township as a whole. The strategy aims to achieve integrated urban planning outcome that would be forward looking, and serve Berry in the long term.

3.1 Overall urban design objective

The following overall urban design objective has guided the Urban Design Strategy:

3.1.1 A bridge at Berry and Northern Interchange Precinct

To integrate the bridge at Berry and Northern Interchange structures and earthworks within the picturesque rural landscape of northeast Berry.

3.1.2 Northern Precinct

To integrate the Berry Bypass within the northern township periphery and the picturesque rural landscape to the north of Berry.

3.1.3 Kangaroo Valley Road Interchange and Victoria Street Precinct

To integrate the Berry Bypass within the western edge of the township, including the Kangaroo Valley Road and Huntingdale Park communities, and within the picturesque rural landscape of Berry.

3.2 Coordinated project elements

The Urban Design Strategy seeks to realise a design outcome where all project elements are fully coordinated and contribute towards the overall project 'vision'.

Project elements include:

- Interchanges, bridges and throw screens.
- Cut and fill batters, retaining walls, noise walls/mounds.
- Lighting, township place making signage.
- Corridor endemic and cultural landscape.



Figure 4: Overall Berry Bypass photomontage.

3.3 Berry recreational circuit and key pedestrian/cycle links

3.3.1 Township recreational circuit

To understand the broader town planning context of the Berry Bypass project, an analysis of the Berry township urban structure was undertaken. This study identified a potential future recreational opportunity for those who live and work in the township.

The shared path and footpaths proposed as part of the Berry Bypass works, could in the future become part of a more extensive recreational circuit around the township that would link major destinations such as Berry Oval and sports area, the commercial Main Street, the Lawn Bowls Club, Berry Railway Station, Berry Showground, several retirement villages, Berry Primary School, Mark Radium Park and the Huntingdale Park residential community.

The shared path circuit could be designed with gradients and radii that accommodate retiree's motorised scooters, and would attract local families for recreational cycling, joggers, and school children. The recreational circuit would potentially be of community health and social benefit. Visitors to Berry may also be attracted to hiring a bike and sightseeing, if a well laid out and sign posted trail was established.

3.3.2 Key pedestrian links

The key pedestrian and cycle links proposed as part of the project include:

- Linking North Street to Kangaroo Valley Road.
- Linking the footpaths of the Berry Oval sports facilities, via North Street to the existing footpaths along Queen Street and in Mark Radium Park to provide access to an interconnected arc of green spaces.
- Linking the existing Queen Street footpaths to Kangaroo Valley Road and to the existing Huntingdale Park residential estate footpaths.



Figure 5: Recreation circuit and key links.

3.4 Interconnected green spaces

There would be an opportunity to utilise the residual open space that would remain following construction to establish a series of interconnected green spaces along the southern edge of the Berry Bypass. Current recreational open space includes the Berry Oval and sports facilities in the east and Mark Radium Park in the west. There would be potential to link these existing green spaces together, with a new strip of green space, as part of the Berry Bypass project.

These green spaces could be utilised as pastureland for agistment, for a relocated Riding School green, to establish a new local public park and for special event parking. SCC has stated that they do not wish to maintain in perpetuity large tracts of green space due to the maintenance costs involved. For this reason the proposed park (Town Creek Park) would be small in size and is envisaged as a simple low maintenance park landscape.



Figure 6: Arc of interconnected green space.

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3.5 Acoustic analysis outcomes

Acoustic analysis undertaken by Aecom consultants has established that two noise barriers would be necessary to achieve the NSW Environment Protection Authority (EPA) noise mitigation requirements. The extent of the two noise barriers is illustrated on the adjoining plan.



Figure 7: Acoustic analysis - noise barrier locations.



Figure 8: A bridge at Berry - in context.

4.0 A bridge at Berry and Northern Interchange Precinct

4.1 A bridge at Berry

4.1.1 A bridge at Berry - design process

In late 2011, Roads and Maritime Services engaged a number of industry specialists to critically review the concept design for the bridge at Berry and a number of community suggestions relating to the form and alignment of the bridge. The outcome of this review established the current concept design alignment for the Northern Route, including the bridge at Berry. The most significant change was the realignment of the northern section of the bridge by some 90metres away from the township at Woodhill Mountain Road and the lowering of the bridge by up to 6.4metres.

From February 2012 to May 2012, the design of the bridge at Berry was further developed through a collaborative process with the Berry community. Conybeare Morrison (CM+) and Aurecon were engaged by RMS to work with the community, RMS and AECOM to review in more detail the following aspects of the bridge:

- Overall appearance of the bridge in its urban design context including development of options for the pier and traffic barrier form.
- Pier spacing and orientation.
- Bridge deck depth and height.

Refer to Figure 8.

4.1.2 Setting and vantage points

The bridge traverses, on the whole, a rural landscape of pastureland, turf farming, rural residential homesteads and properties, densely vegetated creek lines; and to the south, Berry sports field, recreational precinct and Camp Quality.

Apart from those driving over the bridge, the bridge at Berry would only ever be seen in parts. There would be no single vantage point where one would overview the whole of the bridge. This is due to the existing landforms and landscape (that would be retained), that would break potential views of the bridge into smaller partial views.

The main vantage points are from Woodhill Mountain Road: looking north from Bundewallah Creek and looking south to Bundewallah Creek. It would also be seen in part from a limited number of adjoining rural properties, in part by northbound on-ramp users, and the south abutment would be seen up close by pedestrians utilising the parkland.

Refer to Figures 9 and 10.

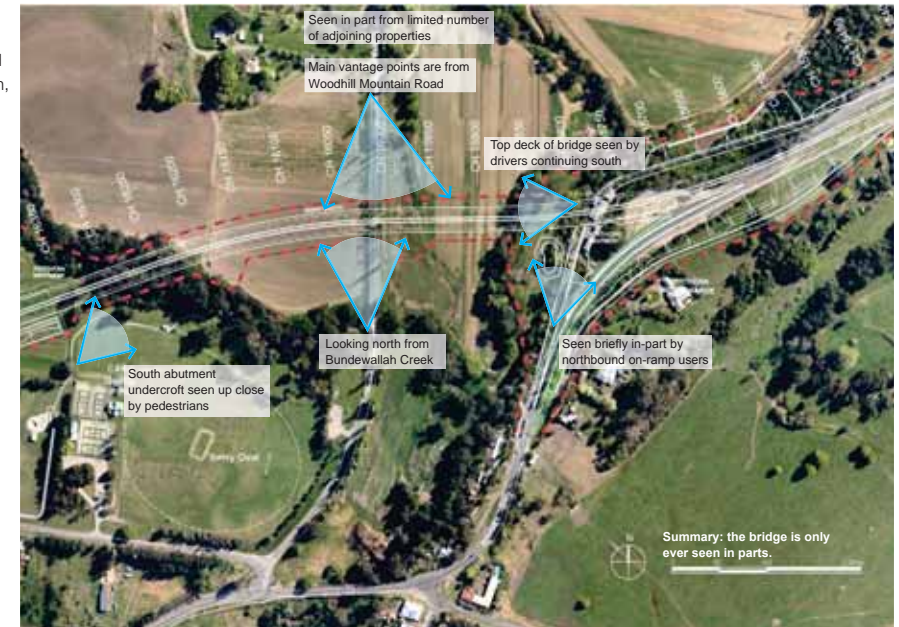


Figure 9: Vantage points.



Figure 10: A bridge at Berry - Aerial view from northeast.

4.1.3 Design philosophy

The following urban design philosophy has guided the design of the bridge at Berry:

- The bridge should be appropriate to its place – the picturesque rural setting.
- In scale with the township, landforms and existing landscape.
- Not draw attention to itself – a grand statement is inappropriate.
- Emphasis should remain on the picturesque setting: the dramatic backdrop of escarpment, the attractive pastoral valley/floodplain and creek-line vegetation.
- There should be no 'tack-on' decoration.
- The bridge should have clean lines and neat detailing – should not be fussy or cluttered.
- The architectural expression of the bridge should be one of simplicity and of straightforward structural expression: of spanning elements and support structures.
- The design should respond to the creek and floodplain environment.
- The bridge would be 'naturally' viaduct-like in character – a rhythm of piers/columns (not a forest) is an appropriate response.
- The design of the columns/piers needs to consider how they pick up the natural light and shadow – reading as an appropriate built form in the landscape.
- The bridge should age and weather well - minimising maintenance. Design for self cleaning surfaces, and designout opportunities for graffiti or vagrancy.
- Get the details right: articulation of surfaces - consider the bridge 'architecture' of light and shade to provide articulation of form.

4.1.4 Urban design principles

The following urban design principles have guided the bridge design:

- Develop bridge architecture that complements the pastoral setting.
- Maximise retention of existing screening landscape.
- Minimise bridge piers and elevation profile.
- Keep undercroft areas open, ventilated and with access to light.
- Maintain a consistent bridge profile without awkward junctions, steps or faceting.
- Explore opportunities to reflect the unique character of Berry and the Shoalhaven.
- Utilise locally sourced stone for abutment linings and scour protection wherever appropriate.

4.1.5 Cultural and heritage response

In the design of the bridge at Berry the following principles have guided the response to the important physical and cultural heritage of Berry and its rural setting:

- The bridge alignment has been relocated further north, away from the township to respect the town's heritage curtilage.
- The new bridge would be screened from Berry by the existing vegetation that follows Bundewallah Creek.
- The Alexander/David Berry Memorial would be relocated to a suitable new setting accessible to residents and visitors.
- Mark the turn off into Berry with appropriate signage.
- Draw inspiration for the project finishes palette from locally available materials – such as stone and timber.
- Incorporate endemic landscape themes and cultural plantings.

4.1.6 RMS Bridge Aesthetics Guidelines

As part of the 'family' of bridges of the Foxground and Berry Bypass Project, and to be consistent with other bridges on the Princes Highway, the design of the bridge at Berry has been prepared with reference to the *RTA Bridge Aesthetic Guidelines, 2004*.

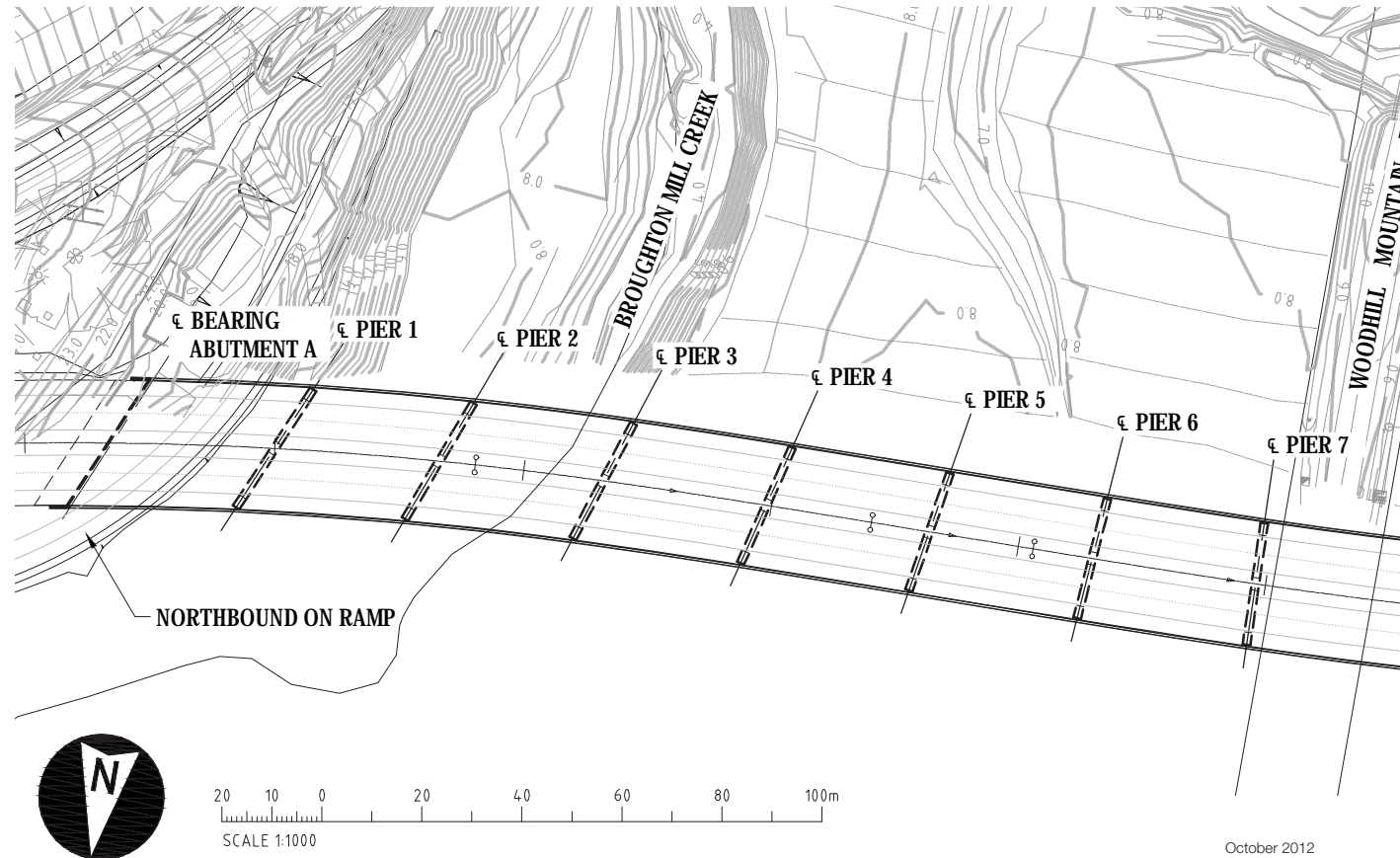
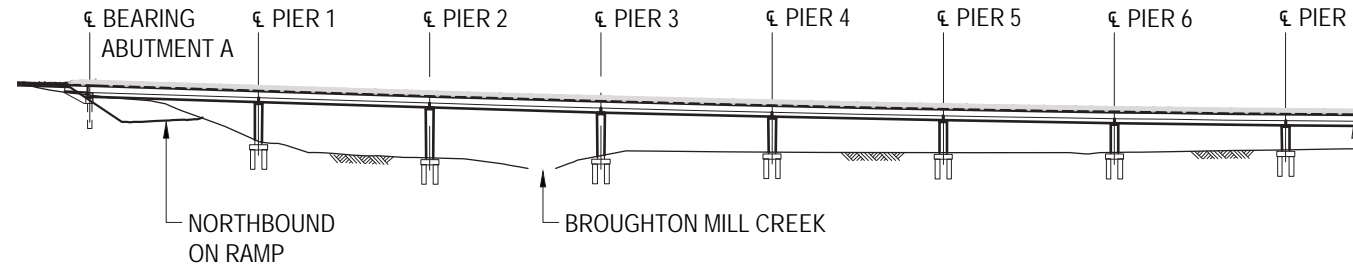
4.1.6 Bridge design overview

The bridge at Berry is designed to maintain 1:100 year flood free access to Berry. It is characterised by its overall gently sweeping, serpentine form. The bridge sweeps down off the ridgeline to then run almost parallel to the floodplain. The Super T primary structure provides a pleasing span and deck profile, leading to a sense of openness beneath the bridge, in keeping with the generally open pastureland along Woodhill Mountain Road.

The regular rhythm of support piers would provide a measured and refined architectural expression suited to the rural, floodplain context. The piers and abutments progressively vary in alignment to provide a comfortable relationship to the alignment of the northbound on-ramp, to Woodhill Mountain Road, and to the creeks and tributaries the bridge crosses. This 'fanning' effect should provide an attractive elevation when viewed from Woodhill Mountain Road, and a sense of openness when travelling beneath the bridge at the north abutment.

Refer to Figure 11.

FROM GERRIGONG



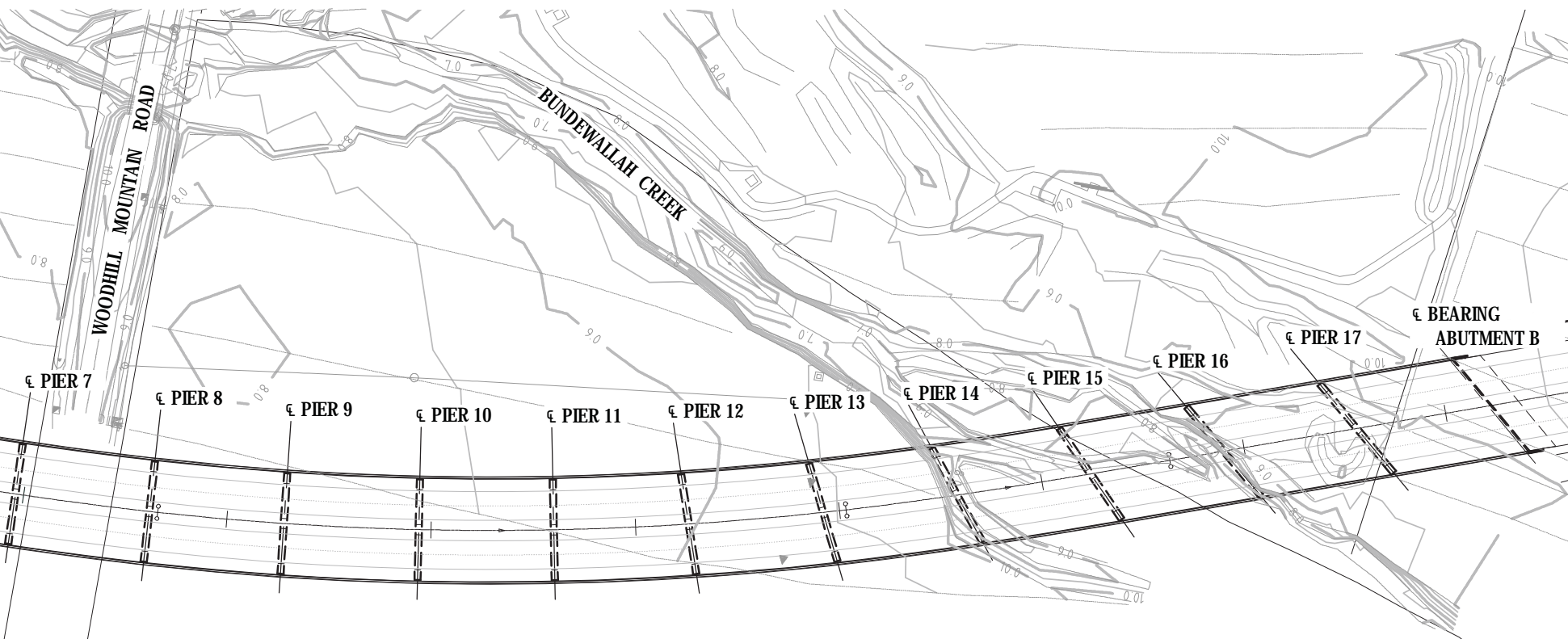
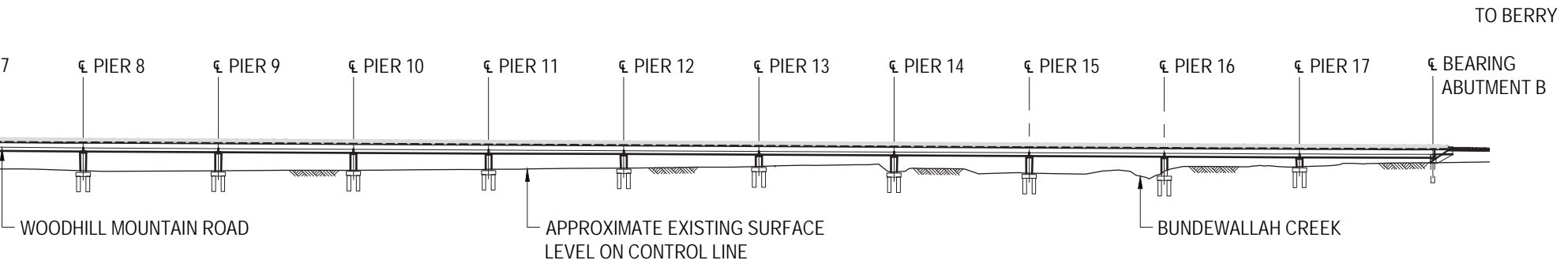


Figure 11: General arrangement

4.1.7 Technical criteria

Bridge Design Criteria	Parameter	Notes
Bridge length	600metres	Primary driver for the bridge length is to provide sufficient waterway opening in the event of a flood.
Overall bridge width	26.5metres	This width includes two traffic lanes for the northbound and southbound carriageways with provision to upgrade the bridge to carry three lanes in the future.
Bridge height from ground level to underside of bridge deck	5.3metres at Northern end 4.6metres at Woodhill Mountain Road 1.8metres to underside of deck	Driven by a 5.3metres clearance to the Bypass on-ramp that travels under the end span of the bridge. Minimum required road clearance to bridge structures. Minimum required clearance for maintenance
Distance between piers	33metres	This is a nominal dimension that changes across the length of the bridge to account for creek and road crossings. Maximising the spacing between piers creates a more open feel to the bridge structure. The 33metres bridge spans are also economical with regard to the supply and delivery costs of the Super-T girders.
Orientation of piers		Generally the piers are perpendicular to the road centreline, however in some locations the bridge piers are orientated parallel to the creeks and roads that pass beneath them.
Bridge deck type	Super-T girders	Super-T girders are precast bridge beams that are commonly used in Australia and provide a very high quality finish and durable product. A concrete deck slab is cast on top of the precast elements to enhance their strength.
Overall depth of bridge deck	1800millimetres	For the 33metres span length, 1500millimetres deep Super-T girders with a 225 concrete slab would be provided. The bridge would then be covered by a 75millimetres thick layer of asphaltic concrete.

Bridge Design Criteria	Parameter	Notes
Substructure type	Reinforced concrete pier elements	Four separate pier options have been presented to the community. Pier options that accommodate the changing height from existing ground level to the bridge deck without taking away from the aesthetic were chosen.
Foundations	Cast in-place concrete bored piles	The piers would be supported on cast in-place bored piles that would be socketed into rock. These piles would be buried in the ground.
No. of expansion joints	3 or 4	<p>Expansion joints would be a finger joint type in order to minimise joints across the bridge length. Finger joints have a better noise performance compared with compression seal type joints.</p> <p>The exact number of expansion joints would be determined at the detailed design stage following a detailed structural analysis. Typically a large spacing between the bridge expansion joints would result in a larger bridge bearing footprint to account for movements of the bridge due to transient load effects such as temperature changes. Larger bridge bearings also influence the width of the piers.</p>
Traffic barrier type	Concrete barrier with twin galvanised steel railing	<p>Height from road surface = 1300millimetres</p> <p>Overall height of concrete when viewed from ground level = ~ 1800millimetres.</p> <p>The geometry of the traffic barrier is driven by road safety on the inside face and aesthetics on the outside face. The overall height of the barrier on the outside is set to hide the longitudinal drainage pipes that run along the bridge deck to collect rainfall run-off from the road surface.</p> <p>The Northbound and Southbound Carriageways would be separated by a 1100millimetres high reinforced concrete barrier.</p>
Noise barriers	Nil	Noise modelling has shown that no noise walls are required across the bridge.

4.1.8 Bridge design elements

The development of the bridge at Berry concept design involved a series of specific studies into the bridge components.

Pier design study

Initially six generic bridge pier options were investigated to establish the most appropriate. The types are illustrated in Figure 12.

The six generic pier options and the reasons for the subsequent shortlisting of types for further development was presented to the Berry Bridge and Northern Interchange Precinct Community Working Group for feedback in March 2012.

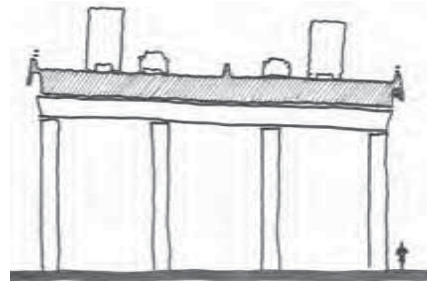
The three generic bridge pier types that showed the most promise for further development were:

1. Circular Columns – Integrated Headstock (developed as Option D)
2. Portal Frame – Integrated Headstock (developed as Options B and C)
4. Circular Columns – Expressed Headstock (developed as Option A)

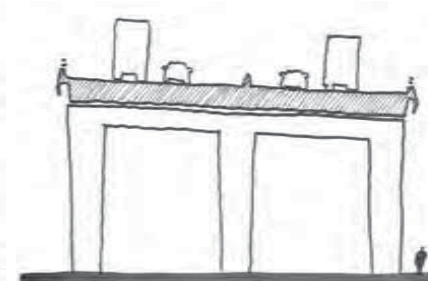
The reasons that generic bridge pier options 3, 5 and 6 were not developed further are as follows:

Double 'V' shaped piers

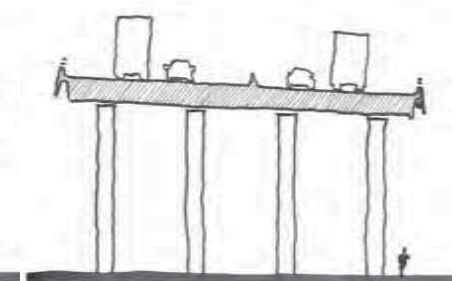
- A visually 'low key' expression in the environment was sought - a simple rhythm of piers and spanning elements (creating light and shade) as the bridge traversed the picturesque floodplain landscape. This pier type has an unnecessarily complex form, drawing attention to itself and was therefore seen as an inappropriate type to pursue.
- It did not address the need for a pier type that on an aesthetic level, could successfully transition from two or three meters of clearance height, at either end, to as much as twelve meters at Broughton Mill Creek.
- This option, due to the complexity of formwork involved, was likely to be the most expensive to pursue – the Working Group agreed that a simple, elegant solution, at moderate cost was preferred.



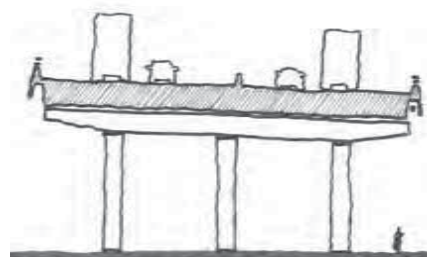
1. Circular columns - integrated headstock.



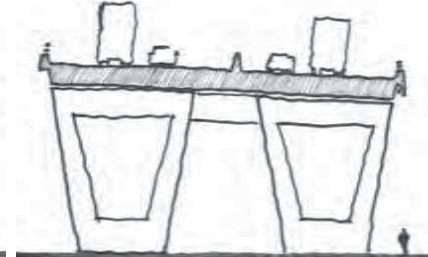
2. Portal frame ('m' shaped) – integrated headstock.



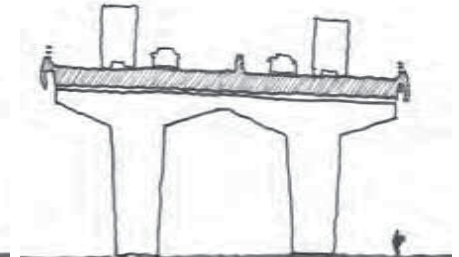
3. Circular columns – recessed headstock.



4. Circular columns - expressed headstock.



5. Double 'V' shaped piers.



6. Double 'T' shaped piers.

Figure 12: Generic pier types.

Double 'T' shaped piers

- This pier type did not address the need to transition from two or three meters of clearance, at either end, to as much as twelve meters at Broughton Mill Creek. Whilst the 'T' shape would have attractive proportions for the three to four highest pier locations, for the majority of the bridge length the clearance would be much less and the 'T' shape would look squat, as if sinking. For as much as half the length of the bridge the pier would end up simply as a beam/wall. The bridge should be considered in its totality, and the relatively low clearance required did not suit this pier type.

Circular columns – recessed headstock

- The Working Group did not respond well to this option. It was seen as a somewhat unrefined structure without any architectural character or design response to location.
- This pier type required the Super T beams to have a step in their ends, and the RMS had highlighted cracking problems with this arrangement on other bridges in NSW.
- The 'recessed' cross beam required would need to be very wide – the inverted 'T' shape end of the headstock would be clearly visible in elevation. The flush alignment of the headstock end and the Super T faces on a curved horizontal and vertical alignment like this would be difficult to achieve. This concern was illustrated with a photo of a flyover ramp at Sydney Airport of similar construction.

Study Outcome

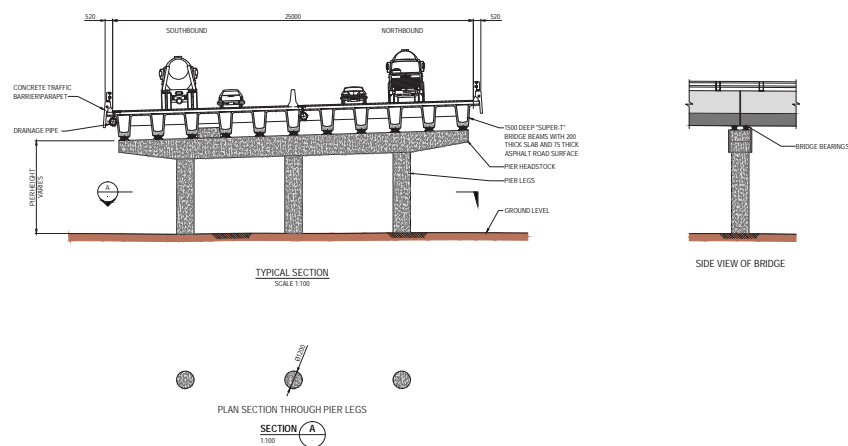
The three most promising generic pier type options were further developed into four shortlisted options that were then re-presented to the Working Group (and issued to the group in a draft report) and also published and exhibited to allow the broader community an opportunity to comment.

Short-listed bridge pier options

The following four pier types were short-listed for further consideration:

The short-listed bridge pier options were presented to the CRG for comment and were loaded onto the RMS website to provide an opportunity for further community feedback.

A - Original Pier Option – Refined



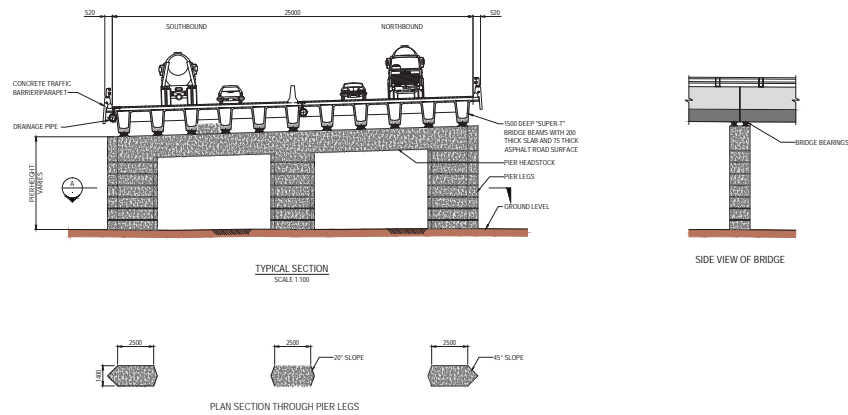
CM⁺ 2012



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Figure 13: A - Original pier option - refined.

B - Flood Plain/Expressed Coursing



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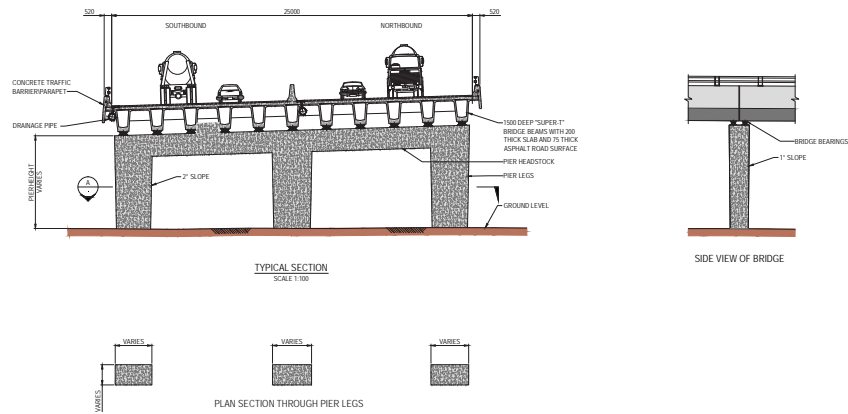
Figure 14: B - Flood plain/expressed coursing.

Example: Third Hunter River Crossing, Maitland.



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C - Contemporary Portal Frame



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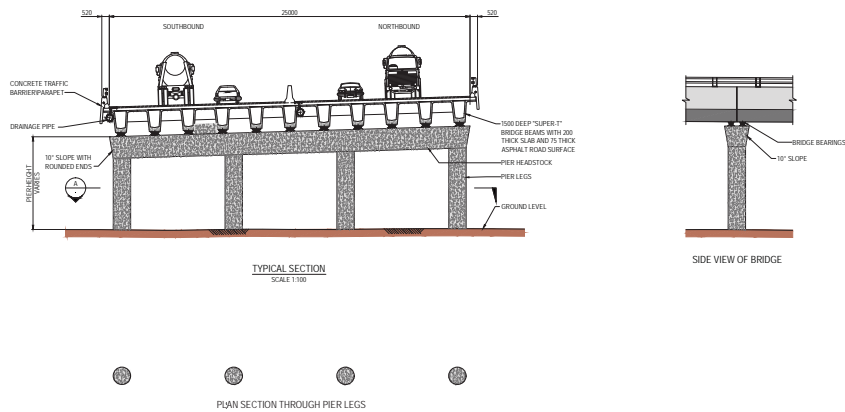
Figure 15: C - Contemporary portal frame.

Example: Mehri River Bridge, Moree.



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D - Flared Capital/Integrated Headstock



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Figure 16: D - Flared capital/integrated headstock.

Example: Pacific Highway, Bonville.



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Parapet options

Three parapet types were investigated. From a construction point of view, the selection of parapet type would be independent of pier type. However, some parapet types tend to suit the pier architecture more than others. The three pier types investigated were:

1. Straight Sloped Face

This option provides a simple, clean, modern expression.

2. Angled Face

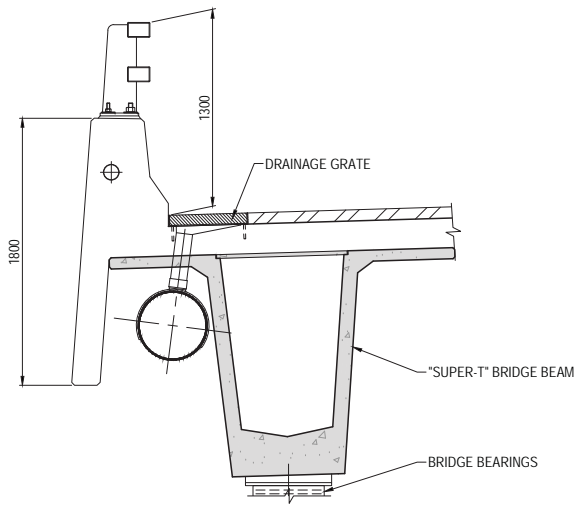
An angled parapet profile works well in conjunction with angled piers below.

3. Grooved Face

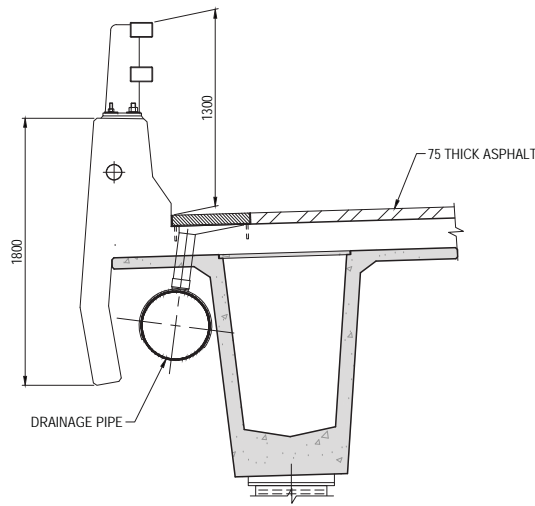
A horizontal groove introduces a 'false joint' shadow line, adding additional detail into the parapet panels.

All parapet types extend down the same length, on both north and south elevations, to screen the bridge drainage pipes when viewed from the side. They all incorporate twin rail safety barriers, provide an angled surface profile to catch the light and the top of the parapets slope away from the parapet face to avoid staining.

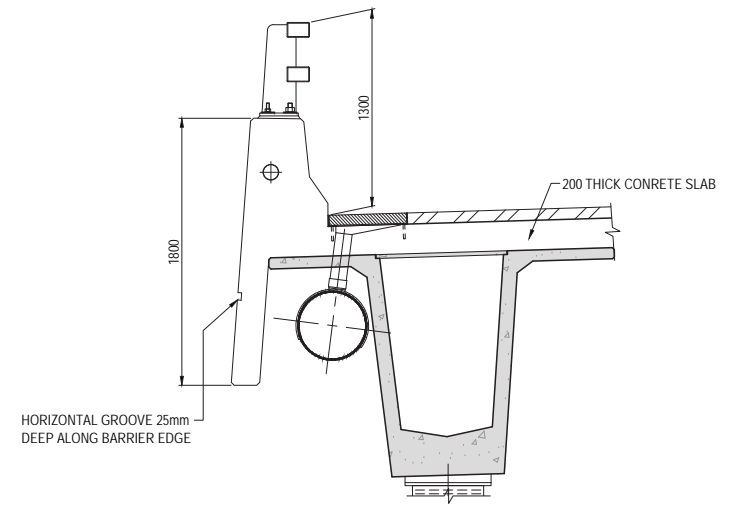
The three bridge parapet options were presented to the community working group for comment and were uploaded onto the RMS website to provide an opportunity for further community feedback.



BRIDGE BARRIER - OPTION 1



BRIDGE BARRIER - OPTION 2



BRIDGE BARRIER - OPTION 3

Figure 17: Parapet options.

Traffic barriers

Twin rail type safety barriers with a modified Type F concrete upturn arc are proposed for the outside edges of the bridge at Berry. This traffic barrier type:

- Reduces unnecessary parapet depth and heaviness.
- Provides a lighter and contrasting top profile.
- Emphasise the bridge's streamlining and horizontal lines.
- Provides a sense of openness and allows views.

An example of this barrier type in use, can be seen in the Sea Cliff Bridge, located at Stanwell Park/Coal Cliff.



Figure 18: Traffic barriers.

North abutment

The northern bridge abutment is proposed to be:

- A spill through type (this abutment type comprises a sloped embankment rather than a vertical wall).
- Is seen up close from the northbound on-ramp.
- Continues as a 2H:1V (a slope of the proportion two horizontal to one vertical) cut batter within the Northern Interchange.
- Would be rock faced in the bridge undercroft area (locally sourced stone).
- Would integrate maintenance access stair and landing in the abutment design.



Figure 19: Stone faced abutment.



Figure 20: View of north abutment from north bound on-ramp.

South abutment

The southern bridge abutment is proposed to be:

- A spill through type.
- Is seen close up by pedestrians using the adjoining sports/recreation precinct.
- Is angled to follow the creek alignment.
- Incorporates scour protection on embankment slopes (locally sourced stone).
- Would be rock faced in the bridge undercroft area (locally sourced stone).
- Would integrate maintenance access in the abutment design.

The southernmost bridge spans would maintain a clearance of 3.0metres (minimum 1.8metres for maintenance access), wherever possible, to:

- Deter graffiti.
- Deter vagrancy.
- Maximise light and rain penetration to undercroft and Connollys Creek.
- Properly ventilate.

If flood modelling necessitates the setbacks of the south bridge abutment from Connollys Creek, then bridge clearances may be achieved through local excavation, subject to an assessment of undercroft drainage levels.



Figure 21 : Stone faced abutment - showing maintenance access stair.



Figure 22: Aerial view of south abutment.

Lighting strategy

No lighting on the bridge at Berry is currently envisaged. The overhead power supply along Woodhill Mountain Road would need to be re-routed and local road lighting reassessed as the proposed alignment would interfere with the current service. Existing park lighting for the sport/recreation precinct to the south of the bridge at Berry alignment may need to be reassessed in light of the need to ensure pedestrian safety.

4.1.9 Landscape design strategy

Where the bridge crosses over existing creeks, suitable riparian vegetation would need to be re-established, following the completion of bridge construction, in order to maximise the continuity of the creek ecology and habitat.

The historic Woodhill Mountain Road avenue of Poplar trees could be strengthened through the replacement of lopped trees and the inter-planting of gaps in the avenue, with new trees. The localised realignment of the power supply would prevent future lopping of trees by power supply utilities.

The 26.5metres wide bridge deck, combined with the lower height sections of the bridge (as low as 3.0metres) would result in an undercroft middle-zone that would not support pasture grasses – due to the rain shadow and lack of sunlight. Surface treatment suited to this microclimate would be an important consideration in order to avoid a 'dead zone' beneath these lower southern sections of the bridge.

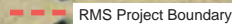


Figure 23: Northern Interchange - setting.

4.2 Northern Interchange

The Berry Northern Interchange is located approximately 500metres to the northeast of the township, and connects into the Princes Highway continuing north to Sydney. The existing Princes Highway sweeps to the southwest, crossing Broughton Mill Creek before heading into town. The northbound on-ramp and the southbound off-ramp connect into this existing road that leads to the Main Street (Queen Street) of Berry. The bypass alignment sweeps westwards down across the floodplain, becoming the bridge at Berry. Refer to Figure 23.

4.2.1 Setting

A series of rural residential homesteads are located to the southeast and northeast of the interchange and are nestled within the bush vegetation of the ridgeline. A new driveway passing beneath the bypass carriageways at its northern extent would maintain vehicular access to those properties located west of the alignment.

4.2.2 Urban design principles

The following urban design principles have guided the interchange design:

- Minimise the visual presence of interchange structures.
- Minimise impacts on existing properties and access.
- Minimise the interchange footprint.
- Retain mature trees along the highway.
- Consider the sequential views on the northern approach to Berry.
- Contribute to the township arrival/departure experience and to legibility.
- Develop Berry township entry signage strategy.
- Frame rural and township views from elevated vantage points.
- Relocate Berry memorial sculptures.

4.2.3 3D study

A 3D computer generated model was prepared of the Northern Interchange to develop a better understanding of the experience of driving through the interchange from various directions, including the arrival sequence from the north into Berry; and also for continuing south on the bypass travelling on the bridge at Berry. Six views are illustrated with accompanying view location key plans.



View 1- View from Berry Bypass South Bound





View 2- View from Berry Bypass South Bound Exit Lane





View 3- View from Berry Bypass South Bound Exit Lane looking West



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Berry Bypass Urban Design Strategy
 Northern Interchange Views
 March 2012
12001-SK029



View 4 - View from Berry Bypass North Bound Entry Lane Looking North





View 5- View from Berry Bridge South Bound Lane at Ch 15800





View 6- View from Berry Bridge South Bound Lane at Ch 15925



4.2.4 Interchange design elements

The Northern Interchange would comprise the following component elements.

Cut and fill batters

The interchange sits atop a local ridgeline, the main alignment cutting into the ridge to the south, extending the existing cut batter of yellow-orange coloured, exposed, rock face. A further cut batter would be required to the east of the northbound on-ramp. This batter would be at a slope of 1V:2H and can therefore be planted out with suitable grasses, shrubs and scattered trees.

Retaining wall

Although most of the interchange main alignment and ramps follow the contours of the ridge landform, the levels are such that to the north of the interchange the northbound on-ramp necessitates a significant fill embankment. To prevent the toe of this embankment impinging upon the Turf Farm operation below, an approximately 100metres long retaining wall structure would be proposed.

Lighting

Sections of the interchange roadway would need to be illuminated to ensure compliance with road safety standards. The final light pole design is yet to be confirmed.



Figure 24: Northern Interchange - Aerial view from the west.

4.2.5 Landscape design strategy

The landscape design of the interchange and northern approach to Berry will choreograph the arrival sequence into Berry township. The landscape design will capitalise upon the potentially expansive views that will be possible from the elevated location atop the ridge, looking south and west across the rural valley landscape and new bridge at Berry, and to the escarpment beyond.

Typical cross sections

Three cross sections illustrate the new landform profile compared to the existing, and illustrate the opportunities for landscaping of the corridor to frame views along the highway, and then across the valley to provide a fitting arrival experience at Berry.

Refer to Figure 23 for location of cross sections.

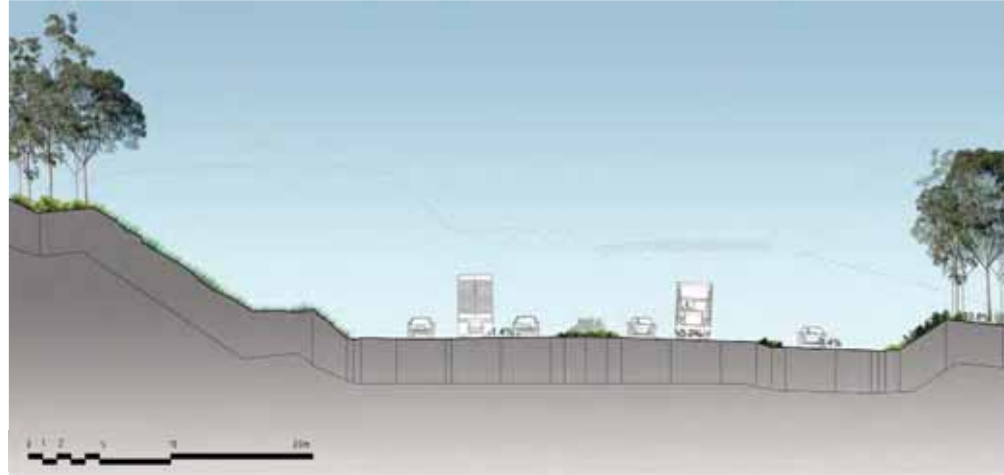


Figure 25: Section A



Figure 26: Section B

Typical planting selections

Plantings that are endemic to the region are proposed that would suit the climate, soils and provide appropriate fauna habitat. The planting palette would be selected with the objective of achieving a low establishment and maintenance regime.



Figure 27: Section C

Northern interchange

The design of the landscape at the northern interchange would reinforce the landmark location and feature endemic tree plantings, natural rock embankments, colourful signature trees at the gateway to Berry and elevated views of surrounding fields from the bridge structure.

On the approach towards the interchange, the roadside embankments would be planted with native grasses, shrubs and copses of endemic trees to blend with the existing rural landscape.

As the cut embankments become higher and steeper (refer to Section B) the underlying rock surface would be exposed as a feature, with native trees planted at the top of the cuts to create a green ridgeline. The road median would be planted with native grasses and shrubs strategically placed to screen headlights at critical areas.

The turnoff to Berry will be distinguished by a colourful mix of native and exotic low shrubs framed by an avenue of Claret Ash (*Fraxinus oxycarpa aurea*)

The use of exotic species, highlighting the former heritage plantings in the town, would be echoed in the southern entry into Berry.

Where unaffected by earthworks within the road corridor, the existing landscape adjacent to the current Princes Highway alignment will be retained and reinforced with similar indigenous tree and shrub plantings. Existing drainage areas and dams will be retained and highlighted with riparian species to blend with the rural landscape character.

Proposed species:

Eucalypt trees to reinforce existing trees, which would be retained.

Eucalyptus punctata (Grey Gum)

Eucalyptus globoides (White Stringybark)

Eucalyptus eugenoides (Thin Leaved Stringybark)

Hakea dactyloides

Melaleuca linariifolia

Possible exotic highlight trees:

Fraxinus oxycarpa aurea (Claret Ash)

Refer to Figures 28 to 30.



Figure 28: North Interchange typical landscape plan.

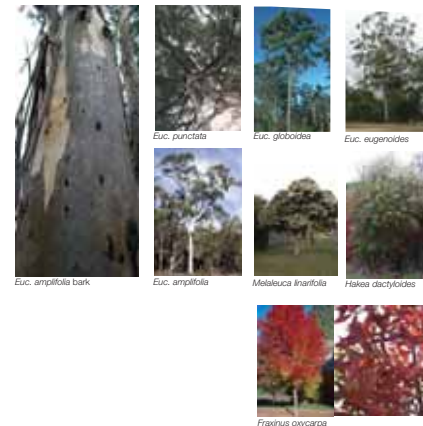


Figure 29: Species selection.



Figure 30: Typical cross section.



Figure 31: North Street - West.



Figure 32: North Street - Centre.



Figure 33: Rural character - pasture for agistment.



Figure 34: North Street - East.