

2 Need and options considered

This chapter describes the need for the proposal and the alternatives that were considered in the selection of the preferred route.

2.1 Strategic need for the proposal

The NSW Government established the South West Growth Centre (and the North West Growth Centre) in 2005 to streamline the supply of greenfield land for urban development, and coordinate the sustainable delivery of infrastructure through the DP&I over the next 25 to 30 years. The South West Growth Centre, comprising 18 precincts, is about 17,000 hectares and expected to accommodate about 110,000 new dwellings for 300,000 people (DP&I 2011).

The proposed upgrade of The Northern Road is being planned and developed in parallel with the development of the South West Growth Centre. The proposal would cater for the substantial traffic growth predicted along The Northern Road arising from increased residential and commercial development in the South West Growth Centre and nearby areas. The Oran Park precinct has been released for development and precinct planning is currently underway (Oran Park Drive)

The Northern Road is a State road within Sydney's road network and is a principal arterial road linking Narellan, Harrington Park, Oran Park, Bringelly, Luddenham and Orchard Hills in the Sydney's south western region. The section of The Northern Road proposed for the upgrade is currently a predominantly two-lane road, with occasional overtaking lanes and four lane sections and turning lanes in Narellan and Bringelly. The main intersections along The Northern Road, within the proposal, include Fairwater Drive/Porrende Street, Hillside Drive, Cobbitty Road (west), Cobbitty Road (east) (Oran Park Drive), Belmore Road, Bringelly Road and Badgerys Creek Road.

Based on future development growth and predicted increases in traffic volumes, a 'do nothing' scenario (the existing base road network) was modelled for 2016, 2026 and 2036. This modelling showed that the performance of intersections south of Badgerys Creek Road (that is within the proposal) were forecast to be unacceptable for 2016, 2026 and 2036. This indicated a deficiency in the road capacity which would cause high traffic volumes and extensive delays at intersections during both morning and afternoon peak periods (refer to section 6.1).

Overall, the proposal is needed to cater for increased traffic volumes from the planned development in the South West Growth Centre by improving road and intersection capacity.

A review of all relevant strategic planning documents was undertaken to identify whether the proposal would be considered consistent with the strategic aims and directions of those documents. The following provides a summary of the review.

2.1.1 NSW 2021: A plan to make NSW number one

NSW 2021 is a 10 year plan to rebuild the economy, return quality services, renovate infrastructure, restore accountability to government, and strengthen local environment and communities (NSW Government 2011). It replaces the *NSW State Plan: Investing for a Better Future* (State Plan) as the NSW Government's strategic business plan.

NSW 2021 sets immediate priorities for action and guides NSW Government resource allocation in conjunction with the NSW Budget. It includes 32 goals and 180 targets relating to services such as transport, health, family and community services, education and police and justice.

NSW 2021 has identified a number of goals to improve the transport network including the goals of reducing travel times and improving road safety. The Northern Road would provide adequate road capacity for projected population growth and improve road safety for commuters, cyclists and pedestrians by providing safe access into and out of future adjacent developments. As such, the proposal is consistent with *NSW 2021*.

2.1.2 NSW State Infrastructure Strategy

The State Infrastructure Strategy – New South Wales 2008-09 to 2017-18 (NSW Government 2008) is a rolling 10 year plan for infrastructure projects to support service delivery. The strategy recognises the importance of the South West Growth Centre in catering for future population growth in the Sydney region and identifies a number of projects to cater for this growth, including The Northern Road. The proposal would deliver on the infrastructure commitments made in the strategy to cater for bus services and for the projected population growth in the region.

2.1.3 Draft NSW Long Term Transport Master Plan

The government released the *Draft NSW Long Term Transport Master Plan* in September 2012. This plan provides a framework for addressing the transport challenges identified in NSW over the next 20 years. The plan will guide transport planning and policy documents to support the goals in *NSW 2012*. The plan will also guide the prioritisation of funds available for transport to deliver maximum benefits to NSW. The draft plan integrates transport with the wider economic, infrastructure, social, housing and land use planning strategies for Sydney to ensure NSW has a coherent overall approach. The Northern Road is identified in the strategy to be upgraded to sustain growth and improve accessibility in greater Sydney. The proposal is consistent with this plan as it would cater for predicted increases in traffic and provide accessibility into the South West Growth Centre.

2.1.4 Metropolitan Plan for Sydney 2036

The NSW Government released the *Metropolitan Plan for Sydney 2036* (NSW Government 2010a) in December 2010. The plan integrates land use, urban and funded-transport planning and provides a long-term framework for sustainable growth and development across the city to 2036. The plan builds on the *Metropolitan Strategy – City of Cities: A Plan for Sydney’s Future* (DoP 2005), and incorporates public feedback on the *Metropolitan Transport Plan – Connecting the City of Cities* (NSW Government 2010b) and the first five yearly review of the Metropolitan Strategy to form a single, integrated Metropolitan Plan for Sydney 2036.

The NSW forecasts show Sydney’s population is expected to grow by 1.7 million people to six million by 2036. The fastest population growth has been projected to occur in Western Sydney, and by 2036, it was predicted that half the city’s population would live in Western Sydney. These changes would require 770,000 additional homes by 2036, and in addition, Sydney would also need to generate and accommodate 760,000 additional jobs, with half of these needed in Western Sydney.

The plan commits to managing demand on the road network through measures such as investment in strategic road upgrades. The plan and associated draft South West Subregional Strategy (NSW Government unpublished) recognise that major arterial road networks would need to be upgraded and extended to service the South West Growth Centre. As such, a broad objective of these strategies is to ensure there is adequate access to infrastructure, such as roads, to support concentrated growth in the South West Growth Centre. The proposal addresses this objective by improving the capacity of the road network to support future growth. This would complement improvements made by other proposed projects in the region, such as the M5 South West Motorway, Camden Valley Way and Bringelly Road upgrades.

The plan also identifies the upgrade of The Northern Road to support the Oran Park Precinct in the South West Growth Centre. The proposal would be consistent with the Metropolitan Plan for Sydney 2036 as it aims to facilitate growth in the South West Growth Centre and improve connectivity between regions in Sydney.

2.1.5 Metropolitan Transport Plan

The *Metropolitan Transport Plan – Connecting the City of Cities* (NSW Government 2010b) was released in February 2010. The plan aims to effectively link Sydney's land use planning with its transport network in the long-term. It outlines a 25 year vision for land use planning in Sydney together with a 10 year fully funded package of transport infrastructure to support it.

The plan identifies that Western Sydney would experience substantial community and jobs growth in the future, requiring efficient, frequent and reliable public transport to the region's centres and dedicated freight routes to employment areas. The proposal is consistent with the *Metropolitan Transport Plan* as it would upgrade The Northern Road to meet the demands of the projected traffic growth associated with the development of the South West Growth Centre. It would also provide improved connectivity of freight routes while improving facilities for pedestrians, cyclists and public transport.

2.1.6 Draft South West Subregional Strategy

A number of draft subregional strategies have been prepared as planning tools to implement the *Metropolitan Plan for Sydney 2036* (NSW Government 2010a). The subregional strategies translate the objectives of the Metropolitan Plan to a local level and recognise that some issues extend beyond the local government boundaries and require a 'subregional' approach. The *draft South West Subregional Strategy* (November 2007) covers the Camden, Campbelltown, Liverpool and Wollondilly local government areas, including the proposal.

The draft South West Subregional Strategy recognises the need and importance of extending and upgrading transport networks to connect the South West Growth Centre to existing centres. It also recognises that the major contributor to growth in new dwellings is the development of the South West Growth Centre. The strategy identifies The Northern Road as one of the roads planned to be upgraded, to support the forecast 100,000 dwellings with almost \$2 billion to be spent on upgrading roads in the South West Growth Centre. The proposal would provide road capacity to support the forecasted dwellings in the South West Growth Centre.

2.1.7 NSW Bike Plan

The *NSW Bike Plan* (RTA and DECCW 2010) is a comprehensive plan to encourage people to ride more often and more safely in NSW. It details a 10 year plan for new bicycle infrastructure to be funded by the NSW Government commitment of \$158 million to improve cycling networks included in NSW in the *Metropolitan Transport Plan: Connecting the City of Cities* (NSW Government 2010b).

Actions included in the *NSW Bike Plan* to promote and improve cycling of relevance to the proposal include:

- Improving cycle networks in Sydney.
- Providing shared pedestrian and cycle off-road facilities in all appropriate locations as part of State road projects in the Greater Metropolitan Region.

Provision has been made for off-road pedestrian and cycle facilities along both sides of the proposal. Although this provision has been made, the design only includes an off-road shared pathway on the south bound (eastern) side of the road. The shared off-road pedestrian and cycle facilities along Bringelly Road and Camden Valley Way would also be connected to the proposal.

2.1.8 South West Growth Centre

The NSW Government established the North West and South West Growth Centres in 2005 to streamline the supply of greenfield land for urban development and to sustainably prepare for and manage Sydney's growth over the next 25 to 30 years.

The South West Growth Centre is about 17,000 hectares across the Liverpool, Camden and Campbelltown local government areas. The South West Growth Centre, comprising 18 precincts (including two dedicated employment precincts), has capacity for 110,000 new dwellings and 300,000 people. Precincts released for development include Edmondson Park, Oran Park, Turner Road, Austral and Leppington North.

The proposal would form one of the principal arterial transport corridors in the South West Growth Centre and would cater for the substantial traffic growth predicted due to increased residential and commercial development in the South West Growth Centre.

2.1.9 South West Growth Centre Road Network Strategy

The *South West Growth Centre Road Network Strategy* (Spackman Mossop Michaels 2011) has been commissioned to guide the future road network planning for the south west area and particularly the South West Growth Centre. The objective of the strategy is to establish a strategic level of integrated land use and road planning for the area, to help guide future detailed planning and design of both the road network and adjoining land uses.

Along with Camden Valley Way, The Northern Road has been identified in the strategy as a main north-south route running through the South West Growth Centre. It was also identified as a principal arterial road which would facilitate the movement of regional and subregional traffic into and through the South West Growth Centre area. The proposal is consistent with the strategy, as it would upgrade The Northern Road to meet the demands of the projected traffic growth associated with the

development of the South West Growth Centre while improving facilities for pedestrians, cyclists and public transport.

2.1.10 The Northern Road Corridor Strategy

The Northern Road Corridor Strategy (RTA 2009) sets out a vision for the upgrade of The Northern Road, as a principal transport corridor for the South West Growth Centre. This strategy provided the basis for the development of an access strategy, the preliminary concept design and subsequent concept design which are generally within the existing road corridor alignment. The proposed upgrade of The Northern Road has, therefore, been focused on using the existing road corridor and immediate surrounds to meet the design objectives. Alternative road corridor alignments for this principal transport corridor to the South West Growth Centre have not been considered (refer to section 2.4.1).

The access strategy for The Northern Road was prepared in consideration of the *draft South West Subregional Strategy* (November 2007), which also recognised that The Northern Road should function as a principal road in the arterial road network. This strategy showed the proposed location for intersections along the length of the proposal.

2.2 Existing road and infrastructure

The Northern Road within the area of the proposal is mainly a two-lane (one lane each way) undivided road, with 3.5 metre wide through lanes and 3.3 metre wide turning lanes and two metre shoulders. The road is signposted at 60 km/h from Old Northern Road to 500 metres past Hillside Drive and from Belmore Road to Badgerys Creek Road. From Hillside Drive to Belmore Road, and from Badgerys Creek Road to Mersey Road, the road is signposted at 80 km/h. In addition to the signposted speed limits, a 40km/h school zone exists at the Bringelly Road intersection.

Local roads connecting to The Northern Road include Porrende Street, Fairwater Drive, Hillside Drive, Cobbitty Road, Carrington Road, Belmore Road, Robinson Road, Loftus Road, Bringelly Road, Greendale Road, Thames Road, Solway Road, Lea Road, Dart Road, Badgerys Creek Road, Derwent Road, Avon Road and Mersey Road. Severn Road connects to Mersey Road 100 metres to the north-east of The Northern Road/Mersey Road intersection.

The existing road has the following characteristics:

- Roundabouts at Fairwater Drive/Porrende Street and Hillside Drive.
- T-intersections at Cobbitty Road (west), Cobbitty Road (east) (Oran Park Drive), Carrington Road, Robinson Road, Loftus Road, Thames Road, Solway Road, Lea Road, Belmore Road, Derwent Road, Mersey Road and Avon Road.
- Four-way signalised intersection at Bringelly Road/Greendale Road.
- Dedicated right turning lane from The Northern Road into Derwent Road, Cobbitty Road (east) (Oran Park Drive) and The Old Northern Road.
- Dedicated right turning lane into and out of Cobbitty Road (west).
- Dedicated left turning lane from The Northern Road into Cobbitty Road (west) and Badgerys Creek.
- Two lanes northbound from Hillside Drive for about 500 metres, from Cobbitty Road (east) (Oran Park Drive) for about one kilometre, from 60 metres north of Badgerys Creek Road for about 850 metres (in a northern direction) and from Cobbitty Road (east) (Oran Park Drive) for about 600 metres (in the northern

direction).

- Two lanes southbound for a section between Cobbitty Road (west) and Carrington Road for about 850 metres.
- A three span bridge over Narellan Creek with a pedestrian walkway on the eastern side of the bridge. The bridge was completed in 1977 and is 42.4 metres in length and 11.7 metres in width.
- A single span bridge over Thompsons Creek with a pedestrian walkway on the eastern side of the bridge. The bridge was completed in 1976 and is 21.8 metres in length and about 11 metres in width.
- There are no special provisions for pedestrians or cyclists on either side of the road.

2.3 Proposal objectives

The strategic objective of The Northern Road upgrade is to support the development of the South West Growth Centre. The main objectives of the proposal are:

- Improve the accessibility of The Northern Road to accommodate for the future traffic growth generated from the South West Growth Centres.
- Reduce future traffic congestion.
- Minimise the impact on the environment along the route.
- Improve accessibility and efficiency for public transport.
- Improve safety for pedestrians, cyclists and motorists.
- Minimise the project 'whole of life cost'.

2.4 Alternatives and options considered

2.4.1 Methodology for selection of preferred option

The following general methodology was used for the selection of a preferred option:

- The Northern Road Corridor Strategy (RTA 2009) was developed in response to the predicted increase in traffic growth in the South West Growth Centre.
- The strategy set the vision for the development of The Northern Road as a principal transport corridor for the South West Growth Centre. Alternative alignments for this principal transport corridor were not considered, therefore the proposal focused on using the existing road corridor and immediate surrounds.
- Three options, including the 'do nothing' option were developed in response to the strategy (refer to section 2.4.2). These options involve upgrading the existing road corridor as these provide the least impact to private properties, whilst being able to cater for the predicted future growth within the South West Growth Centre.
- These options were broadly assessed and compared on their economic, environmental and social performance and against the proposal objectives using the following assumptions:
 - Precincts in the South West Growth Centre would be released in the order that has been communicated by the Department of Planning and Infrastructure (then Department of Planning) at the time of this REF.
 - The Northern Road upgrade would be undertaken in stages to provide road capacity for the precinct releases.
 - Locations of intersections are based on the South West Growth Centre Road Network Strategy with typical cross sections confirmed in previous design and consultation phases.

- RTA Road Design Guidelines would be followed and statutory requirements would be complied with.
- The posted speed would be 80 km/h.
- There would be limited direct property access on the upgraded sections of the road (ie left in/left out).
- From this assessment a preferred option was selected.
- To further develop the preferred option an access strategy was developed. This access strategy showed the location of the proposed intersections.
- The access strategy was displayed in July 2010. Comments and suggestions were considered and as a result some of these were incorporated into the access strategy for the preferred option. The following changes were incorporated:
 - Maryland Link Road 2 was shifted about 250 metres north.
 - Maryland Link road 3 was changed to a T-intersection with traffic lights to a four-way intersection.
 - U-turn facilities were proposed on Belmore Road and Greendale Road.

2.4.2 Identified options

The following three options were considered:

- Option 1 – Do nothing (base case) option.
- Option 2 – Upgrade The Northern Road to a four-lane divided road from The Old Northern Road to Mersey Road.
- Option 3 – Upgrade The Northern Road to a six-lane divided road from The Old Northern Road to Mersey Road.

These options are described below.

Option 1: 'Do nothing' option (base case)

This option would result in The Northern Road remaining a two-lane single carriageway road between The Old Northern Road, Narellan and Mersey Road, Bringelly. This would mean that the road would not be able to cater for the predicted traffic growth in the South West Growth Centre. Normal road maintenance would continue to be undertaken.

Option 2: Upgrade The Northern Road to a four-lane divided road with a wide central median from The Old Northern Road to Mersey Road

This option would involve widening The Northern Road to a four-lane divided road, with a wide central median to allow future widening to six lanes, if required. This option would include a:

- Signposted speed at 80 km/h.
- Three metre wide off-road shared pedestrian/cyclist path on the eastern side of the proposal, with space provided on the western side of the proposal for the future construction of a path if required.
- Bus priority lane on the approach and indented bus bay on the departure side of signalised intersections on The Northern Road.

This option would also include the following main design features:

- Upgrade of signalised intersections.
- Installation of new signalised intersections
- Upgrade of unsignalised T-intersections.
- Installation of one new T-intersection.
- Realignment of local roads to align with the proposed new and upgraded intersections.
- Upgrade of local roads.
- Duplication of the bridges over the Narellan Creek and Thompson Creek.
- Increasing the capacity of the culverts within Lowes Creek.

Option 3: Upgrade The Northern Road to a six-lane divided road with a central median from The Old Northern Road to Mersey Road

This option would involve widening The Northern Road to a six-lane divided road. The main design features would be similar to option 2 however the median would be removed or reduced to cater for the additional two lanes. This impervious surface area, bridge duplications and major culvert upgrades would be of a larger magnitude compared with option 2 as required to cater for three lane carriageways in either direction instead of two-lane carriageways.

2.4.3 Analysis of options

Option 1: 'Do nothing' option (base case)

When considering this option against the proposal objectives, the following was found:

- Does not improve the accessibility of The Northern Road, as it would not accommodate for future traffic growth generated from the South West Growth Centre.
- Does not provide access to future precincts.
- It would not reduce future traffic congestion, as it would not cater for the increased traffic growth within the South West Growth Centre.
- It would minimise impact on the environment, as no disturbance to the environment would result from this option.
- It would not improve accessibility and efficiency for public transport as it would not provide for public transport.
- It would not improve safety for pedestrians, cyclists and motorists as it would not provide an off-road shared pathway,
- It would not minimise the project whole of life cost as maintenance costs would increase as the road deteriorates due to increase traffic.

This option would not meet the proposal objectives or the broad objectives of the South West Growth Centre development and was therefore not considered further.

Option 2: Upgrade The Northern Road to a four-lane divided road with a wide central median from The Old Northern Road to Mersey Road

When considering against the proposal objectives for this option, the following was found:

- Improves accessibility along The Northern Road, as it would accommodate for future traffic growth generated from the South West Growth Centre.

- Reduces future traffic congestion, as it would cater for the increased traffic growth within the South West Growth Centre.
- Impacts the environment by widening the road corridor. By using the existing road corridor it would minimise land acquisition, impacts to aquatic environments and Aboriginal and non-Aboriginal cultural heritage items. It would also be mainly located within a certified area.
- Improves accessibility and efficiency for public transport, as it would provide for public transport via the provision of indented bus bays.
- Improve safety for pedestrians, cyclists and motorists, as it would provide off-road shared pathways and signalised intersections.
- It would reduce maintenance costs as it is providing new infrastructure instead of maintaining existing infrastructure.
- Provides for future widening within the median to six lanes if required.

The traffic analysis showed that widening to four-lanes would give an acceptable level of service until 2026 (refer to section 6.1). This option would meet the proposal objectives. This option provides the same benefits as option 3 at a reduced cost.

Option 3: Upgrade The Northern Road to a six-lane divided road with a central median from The Old Northern Road to Mersey Road

When considering against the proposal objectives for this option, the following was found:

- Improves accessibility along The Northern Road, as it would accommodate for future traffic growth generated from the South West Growth Centre.
- Reduces future traffic congestion, as it would cater for the increased traffic growth within the South West Growth Centre.
- Impacts the environment by widening the road corridor. By using the existing road corridor it would minimise land acquisition, impacts to aquatic environments and Aboriginal and non-Aboriginal heritage items. It would also be mainly located within a certified area.
- Improves accessibility and efficiency for public transport, as it would provide for public transport via the provision of indented bus bays.
- Improve safety for pedestrians, cyclists and motorists, as it would provide off-road shared pathways and signalised intersections.
- It would reduce maintenance costs as it is providing new infrastructure instead of maintaining existing infrastructure.

This option meets the proposal objectives the same as option 2, however, would require additional costs. In addition, the traffic analysis showed that widening to six-lanes would not be required until after 2026 if traffic growth takes place as predicted and alternative transport is not provided (refer to section 6.1).

This option is not preferred for the reasons outlined above. It was, however, considered necessary that any upgrade of The Northern Road should be designed with the provision for widening to six-lanes in the future. Any future six-lane configuration would be subject to additional environmental impact assessment.

2.5 Preferred option

Option 2 is the preferred option, as it meets the proposal and broader South West Growth Centre objectives by:

- Increasing the capacity of the road to cater for the forecast traffic growth until 2026.
- Allowing for the future widening to six-lanes within the median, if and when required.
- Generally be located within the existing road corridor, thus minimising environmental and social impacts.
- More cost effective than option 3.

2.6 Design refinements

2.6.1 Methodology for design refinements

Following selection of the preferred option, the methodology below was used to refine the design:

- Field investigations were commenced in mid 2011 to develop the design. The investigations included survey, geotechnical, flora and fauna, noise monitoring and Aboriginal cultural heritage and non-Aboriginal heritage.
- A value engineering and constructability workshop was held in August 2011 and a risk management workshop was held in September 2011. A summary of the workshops outcomes include:
 - Ensuring that a road boundary wide enough to cater for a six-lane divided road is established.
 - Further consideration and incorporation (where possible) of some of the design options presented for intersections, bridges, the large culverts at Lowes Creek, link road configurations, local road configurations, service locations, batter slopes, access to private properties and commercial areas, cut and fill requirements, constructability and safety.
 - Identification of a number of risks related to the potential long timeframe before the construction of the proposal. These risks include potential changes to agency and planning requirements, community expectations, land use adjacent to the proposal and service location. In addition, risks associated with the erosion of soils into waterways during and after construction, the assessment of biodiversity in non-certified areas including at Harrington Park and OEH licensing requirements were discussed.
- Based on the outcomes from these workshops, the design underwent further development to consider and incorporate the outcomes, where possible, from both workshops.
- The design was refined as a result of the investigations and risk assessment.
- In November 2011 RMS released the preliminary concept design. The preliminary concept design was placed on display for community comment from 21 November 2011 to Friday 16 December 2011. Submissions received were considered during refinement of the concept design (refer to section 2.6).

The following provides a summary of the refinements made to the preferred option.

2.6.2 Main alignment

Main alignment between Marylands Link Road 1 and north of Marylands Link Road 3

The main alignment between Marylands link Road 1 and Lowes Creek Link Road (chainage 6100 to chainage 8800) was realigned (as outlined below) shifted to improve constructability and address urban design requirements:

- From chainage 6250 to chainage 6650 the alignment was shifted east six metres and the median narrowed to avoid impact to a dam wall and reduce impact to trees on the western side.
- From chainage 6650 to chainage 7000 the main alignment was shifted west by up to 23 metres to widen the median to retain trees.
- From chainage 7030 to chainage 7170 the main alignment was shifted east two metres to improve constructability and this also avoided the existing organic processing and recycling facility.
- From chainage 7250 to chainage 7650 the alignment was shifted west seven metres to improve constructability. The grade was lowered to reduce impact on the Maryland heritage listed gate at chainage 7430.
- From chainage 7650 to chainage 8600 the alignment was shifted east 6.5 metres to improve constructability and impact on locally listed heritage item (Maryland gatepost) at chainage 8230 was also removed.

Main alignment between north of Marylands Link Road 3 and Carrington Road

From chainage 8800 to chainage 9700 the alignment was shifted west 13 metres to avoid impacts to the Aboriginal heritage scarred tree (refer to section 6.3.3).

Main alignment near Lowes Creek

The main alignment was moved 13 metres to the west to avoid impacts to the scar tree at about chainage 9050.

Main alignment between Bringelly Road and Thames Road

The main alignment at Bringelly Road (chainage 11300 to chainage 12100) was shifted east 13 metres to clear existing shops and Bringelly Public school on the western side. The shift was localised to minimise impact on a local heritage cottage at 1186 The Northern Road and vegetation to the south east.

Main alignment between Badgerys Creek and Mersey Road

The main alignment between Badgerys Creek and Mersey Road (chainage 12700 to the end of the proposal) was moved 12 metres east to improve constructability of the alignment. The relocation of the alignment would also minimise impacts to the non-Aboriginal heritage item structures at Lot 3 DP 590913.

Temporary sedimentation basin adjacent to the main alignment

To avoid impacts to Commonwealth land the sedimentation basin near Badgerys Creek Road was moved about 100 metres north and 50 metres west.

2.6.3 Bridges

Narellan Creek

As part of the proposal, the existing bridge at Narellan Creek would be refurbished and used for southbound traffic. A new bridge would be constructed for northbound traffic. The following width and lane configurations were considered for the Narellan Bridge configuration (south and northbound):

- Width option 1 - Widening the existing bridge to accommodate a two-lane configuration and shared path (southbound) and building a new bridge structure (northbound) to accommodate a two-lane configuration.
- Width option 2 - Building a new northbound bridge structure to accommodate a three lane configuration and a new shared path that can provide four lanes reduced width during construction. This also includes widening the existing bridge to accommodate a three lane southbound and shared path.
- Width option 3 - Building a new northbound bridge structure to accommodate four lanes (three lanes northbound and one lane southbound) and keep the existing bridge to accommodate two lanes southbound.

Width option 2 is the preferred option as the bridges at Narellan Creek would be designed to facilitate the future widening to a six-lane configuration and include a shared pathway. Whilst width option 2 does require additional cost upfront compared to width option 1, it does have a decisive combination of advantages which includes:

- Minimal impact on traffic users during the transition (can maintain two lanes of traffic in each direction during construction).
- Constructability and safety – avoid working adjacent live traffic when widening southbound bridge which presents a substantial safety benefits.
- Less investment upfront in comparison to width option 3.

The refurbishment of the southbound bridge would include the construction of an additional third lane on the western side of the bridge.

Two options for the span arrangement and deck height for the new northbound bridge were identified and include:

- Span option 1 – Would be comprised of four spans with structural piers spaced at similar intervals to those found on the existing southbound bridge. The deck level for span option 1 would be constructed at the same level as the existing road way. Span option 1 would be cheaper to construct and from an urban design perspective would be consistent with the design and height of the existing bridge.
- Span option 2 - Would be comprised of three spans to minimise impacts to the creek and would require a thicker deck. The height of the deck would be raised about 400 millimetres above the existing road surface level to allow a minimum freeboard of 300 millimetres above the 100 year ARI flood level. Span option 2 would be more expensive to construct, but would have a better environmental outcome than span option 1 as the reduced number of structural piers in the creek would reduce the potential of creek bed scour during increased hydrological activity including flood events.

Span option 2, the three-span bridge was selected as the preferred northbound bridge option at Narellan Creek, as it would meet the proposal objective for minimising environmental impacts.

Lowes Creek

During the value engineering workshop held in September 2011, three options were considered for the crossing over Lowes Creek:

- Option 1 included the construction of a series of box culverts (eight x 2400 mm x 2100 mm) within the existing creek channel and a series of box culverts (25 x 1800mm x 900mm) over the floodplain with moderate upstream works.
- Option 2 included the construction of a series of box culverts (17 x 2400 mm x 2100 mm) within a newly formed channel, extensive upstream and downstream works, raising of the road level, diversion of the creek and the removal of trees.
- Option 3 included the construction of an 80 metre long bridge, which would require extensive works to the lower upstream and downstream left overbank levels, raising of the road level, diversion of the creek, the removal of trees, and would cost substantially more than the other two options.

Option 1 was selected as the preferred option as it would be less expensive than option 3, would have a moderate impact on the environment, meets the project objectives, does not require the removal of trees and does not require the road level to be raised.

Thompsons Creek

As part of the proposal, the existing bridge at Thompsons Creek would be refurbished and used for southbound traffic. A new bridge would be constructed for northbound traffic. As for the Narellan Bridge analysis, the following width, lane configuration and traffic options were considered for the Narellan bridge configuration (south and northbound):

- Width option 1 – Widening the existing bridge to accommodate a two-lane configuration and shared path (southbound) and building a new bridge structure (northbound) to accommodate a two-lane configuration.
- Width option 2 - Building a new northbound bridge structure to accommodate a three lane configuration and a new shared path that can provide 4 lanes reduced width during construction. This also includes widening the existing bridge to accommodate a three lane southbound and shared path.
- Width option 3 – Building a new northbound bridge structure to accommodate four lanes (three lanes northbound and one lane southbound) and keep the existing bridge to accommodate two lanes southbound.

Width option 2 is the preferred option as the bridges at Thompsons Creek would be designed to facilitate the future widening to a six-lane configuration and include a shared pathway. Whilst width option 2 does require additional cost upfront compared to width option1, it does have a decisive combination of advantages which includes:

- Minimal impact on traffic users during the transition (can maintain two lanes of traffic in each direction during construction).
- Constructability and Safety – avoid working adjacent live traffic when widening southbound bridge which presents a substantial safety benefits.
- Less investment upfront in comparison to width option 3.

The refurbishment of the southbound bridge would include the construction of an additional third lane on the western side of the bridge.

Two options for the span arrangement of the northbound bridge at Thompsons Creek were identified and include:

- Span option 1 – Would be comprised of a two span bridge that would be similar span in arrangement to the existing southbound bridge. The deck would be level with the existing road surface. Span option 1 would be cheaper to construct and from an urban design perspective would be consistent with the design and height of the existing bridge.
- Span option 2 – Would be comprised of a single span bridge to avoid the placement of structural piers in the creek. The deck would be thicker than required for the span and would be more expensive to construct. This option would require the surface road level to be raised by about 400 millimetres to allow a minimum freeboard of 300 millimetres above the 100 year ARI flood level. Span option 2 would be more expensive to construct, but would have a better environmental outcome than span option 1 as the reduction of structural piers in the creek would reduce the potential of creek bed scour during increased hydrological activity including flood events.

Span option 2, the single span bridge was selected by RMS as the preferred northbound bridge option at Thompsons Creek, as it would meet the proposal objective for minimising environmental impacts.

2.6.4 Intersection and link road refinements

Fairwater Drive and Porrende Street (chainage 600)

Slip lanes and traffic islands were initially proposed at Porrende Street and Fairwater Drive. As Harrington Park estate is fully developed, future traffic growth in this area is expected to be low. The benefits for the slip lanes on the western link therefore cannot justify the impact on the adjacent residential homes. After considering the preliminary concept design, the slip lanes and traffic islands were removed to minimise the impact on the Orielton state heritage register listed item.

Hillside Drive (chainage 1400)

Slip lanes and traffic islands were initially proposed both sides of the eastern link at Hillside Drive. The slip lanes and traffic islands on the southern side were removed as the Harrington Park estate is fully developed and future traffic growth in this area is expected to be low. This would minimise impact on adjacent residential homes.

Modification was also made to Hillside Drive future western link road to minimise the impact on the State listed Orielton heritage item and improve linkage with the Harrington Grove West precinct. Modifications include moving the alignment of this link road towards the south to avoid and minimise impacts to remains of the miller's cottage. This cottage is part of the Orielton State listed heritage item.

Bringelly Road/Greendale Road intersection (chainage 11600)

A number of constraints exist in the vicinity of the Bringelly Road and Greendale Road intersection. These include Aboriginal cultural heritage items, Bringelly Public School, a church, shops and Cumberland Plain Woodland. After considering the proposed design of the intersection, the size of the intersection was minimised as far as possible and moved seven metres to the west to minimise impacts on the aforementioned items.