1. Introduction

1.1 Proposal identification

The NSW Roads and Maritime Services (RMS) (formerly the NSW Roads and Traffic Authority) is proposing to upgrade and extend 3.6 kilometres of Schofields Road between Tallawong Road and Veron Road from a two-lane road to a four-lane divided road (the proposal) (Figure 1-1). The proposal is located within the suburb of Schofields. Key features of the proposal include:

- An upgrade from the existing two-lane road to a four-lane divided road with a wide central median allowing for further upgrade to six lanes if required in the future
- Extension of Schofields Road from Railway Terrace to Veron Road
- Provision of a tree lined transit boulevard road type to integrate pedestrians, bicycles, public transport and vehicles in an urban environment
- Signalise intersections at Hambledon Road, Boundary Road/Alex Avenue, Junction Road, Railway Terrace and Veron Road, including minor realignment of intersection approaches
- A road underpass at Richmond Railway Line including a seven metre deep cutting
- Relocate Railway Terrace intersection about 50 metres to the east and about 30 metres south of the existing intersection to allow the proposal to tie in with the Richmond Railway Line underpass
- Left-in/left-out only access at Schofields Farm Road and to the Schofields Precinct between Railway Terrace and Veron Road
- Five culverts across Schofields Road, two minor culverts across Junction Road and Veron Road, and one culvert connecting table drains east of Junction Road
- Diversion of the existing First Ponds Creek tributary channel around the proposed northern leg of the Hambledon Road intersection
- Stormwater swales between road drainage outlets and receiving watercourses
- Installation of about 40 metre long twin bridges at First Ponds Creek and about 50 metre long twin bridges at the Railway Terrace tributary of Eastern Creek
- A bridge overpass at Bridge Street to connect to the relocated Schofields Railway Station
- Designated right turn lanes at all signalised intersections
- An off-road shared path (for cyclists and pedestrians) each side of Schofields Road for the full length of the proposal
- Bus priority lane approaches at intersections with provision for bus-stops on the departure sides of intersection
- Indented bus stops would be provided midway between intersections together with pedestrian refuges in the median
- Signalised pedestrian/cyclist crossings would be provided at all intersections except Schofields Farm Road
- Improved flood immunity for a 100 year flood event
- Initial posted speed limit of 70 km/h, reducing to 60 km/h in the future as traffic increases
- Urban design elements, landscaping works and other ancillary items, as required
• Modifications to property access
• Retaining walls at four locations along Schofields Road
• Temporary site compounds and temporary construction sedimentation basins.

The proposal forms part of a broader plan to upgrade the entire eight kilometre length of Schofields Road from Windsor Road to Richmond Road, via South Street. The upgrade of Schofields Road is required due to the development of the North West Growth Centre. When extended to Richmond Road, Schofields Road would be a major east-west link between Windsor Road and Rouse Hill town centre in the east and the proposed Marsden Park and Marsden Park Industrial Precincts in the west. It would also service the Schofields Railway Station (opened in October 2011) and the Schofields town centre.

The broader upgrade of Schofields Road has been divided into three stages:

• Stage 1 The Ponds development between Windsor Road and Tallawong Road
• Stage 2 Tallawong Road to Veron Road
• Stage 3 Veron Road to Richmond Road via South Street.

The proposal forms Stage 2 of the Schofields Road upgrade. Stage 1 was displayed for community comment in 2007 and determined in May 2009. The detailed design for Stage 1 was completed in early 2012 and construction is set to commence in October 2012. The concept design for Stage 3 is currently being progressed by RMS. A separate REF for Stage 3 would be developed and would also be made available on public display.

The proposal is needed to:

• Facilitate development of the North West Growth Centre
• Provide additional road capacity to alleviate future traffic congestion and improve safety
• Cater for projected traffic growth that would result from North West Growth Centre development
• Provide multi-modal access to the recently completed Richmond Railway Line duplication and new Schofields Railway Station, and the proposed North West Rail Link and Cudgegong Station
• Improve flood immunity.

1.2 Location and context

The proposal is located in the Blacktown local government area in north-west Sydney and the RMS Sydney region. Figure 1-2 shows the location of the proposal in a regional context.

The study area largely consists of properties used for agricultural purposes or rural residential properties. The key non-residential properties located within the study area include St Josephs Primary School, Terra Sancta College, residential, commercial and recreational uses around the former Schofields Railway Station, and an electricity substation located on Schofields Road 400 metres west of Junction Road.

The new Schofields Railway Station is located adjacent to the proposal at the end of Railway Terrace (south) and is serviced by the City Rail Richmond Line which runs parallel to Railway Terrace.

The proposed North West Rail Link is programmed for construction to commence in 2013 and would run generally parallel, and to the north of Schofields Road. The North West Rail Link would include a rail stabling yard between the intersections of Tallawong Road and Hambledon Road as well as Cudgegong Station at the northern end of Cudgegong Road.

The historic and ongoing disturbance of the area has resulted in native flora and fauna being mainly confined to fragmented areas along the alignment, and to the four watercourses which cross the proposal.
site. The four watercourse crossings are Railway Terrace tributary of Eastern Creek 1, Railway Terrace tributary of Eastern Creek 2, First Ponds Creek and First Ponds Creek tributary.

Much of the study area surrounding the proposal is earmarked for future development as part of the North West Growth Centre. The North West Growth Centre, comprising 16 precincts, is about 10,000 hectares and will contain about 70,000 new dwellings for 200,000 people.

The proposal is located adjacent to four precincts within the growth centre (Riverstone, Riverstone East, Alex Avenue and Schofields) which are to be developed as mainly for residential purposes of varying densities.

For the purpose of this report, the ‘proposal site’ refers to the area that would be directly impacted by the proposal, including the construction footprint (refer Figure 1-1). The ‘study area’ encompasses the proposal site and a broader area surrounding the proposal site.

Construction of the proposal is anticipated to commence in 2014 and take about 24 to 30 months to complete.

1.3 Purpose of the report

This review of environmental factors (REF) has been prepared by GHD on behalf of RMS Sydney region. For the purposes of these works, RMS is the proponent and the determining authority under Part 5 of the Environmental Planning and Assessment Act 1979 (EP&A Act).

The purpose of the REF is to describe the proposal, to document the likely impacts of the proposal on the environment, and to detail protective measures to be implemented.

The description of the proposal and associated environmental impacts have been undertaken in context of clause 228 of the Environmental Planning and Assessment Regulation 2000, the Threatened Species Conservation Act 1995 (TSC Act), the Fisheries Management Act 1994 (FM Act), and the Australian Government’s Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). In doing so, the REF helps to fulfil the requirements of Section 111 of the EP&A Act, that RMS examine and take into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity.

The findings of the REF would be considered when assessing:

- Whether the proposal is likely to have a significant impact on the environment and therefore the necessity for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning and Infrastructure under Part 5.1 of the EP&A Act
- The significance of any impact on threatened species, populations or communities, or their habitats, listed under the TSC Act and/or FM Act, in accordance with Section 5A of the EP&A Act and therefore the requirement for a Species Impact Statement (SIS)
- The potential for the proposal to significantly impact on a matter of national environmental significance (NES) or Commonwealth land and the need to make a referral to the Australian Government Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the EPBC Act.
The proposal
Schofields Farm Road to Tallawong Road

Figure 1-1b

LEGEND
- Proposal site
- Alignment
  - New Schofields railway station and Richmond Line duplication
  - Drainage (approximate)
- Richmond railway line
- Cut
- Fill
- Compound sites
- Bus Stops
- Bus Lanes
- Retaining wall
- Approximate location of proposed culvert
- U-turn Facility

Figure 1-1b

Roads and Maritime Services
Schofields Road Upgrade:
Tallawong Road to Veron Road

The proposal
Schofields Farm Road to Tallawong Road

Data Source: NSW Department of Lands: Cadastre - Jan 2011; NSW Government LPMA Roads - March 2012; Created by: sdwoodger

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Figure 1-1b

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Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56

Figure 1-1b

Metres

1:5,000 (at A3)
2. Need and options considered

2.1 Strategic need for the proposal

The proposal forms part of a broader plan to upgrade Schofields Road between Windsor Road, Rouse Hill and Richmond Road, Marsden Park. The upgrade of Schofields Road is required due to the large amount of development proposed in the surrounding area as part of the North West Growth Centre.

The North West Growth Centre will comprise of 16 precincts covering an area of about 10,000 hectares and will contain about 70,000 new dwellings for 200,000 people. The North West Growth Centre has been divided into precincts to facilitate the orderly release of land over the next 25-30 years (refer Figure 2-1). The North West Growth Centre Structure Plan (Department of Planning, 2010) provides a blueprint for the detailed planning of individual precincts. Currently 11 precincts have been released, including three immediately adjacent to the proposal site, Riverstone, Schofields and Alex Avenue Precincts. Precincts adjacent to the proposal are discussed further in section 6.11.

A key element of the North West Growth Centre is to accommodate future transport needs and provide transport connections between precincts and town centres. Once the proposal and the other stages of the Schofields Road upgrade are complete, Schofields Road would provide a major east-west link across the growth centre between Windsor Road and Rouse Hill town centre in the east and the proposed Marsden Park and Marsden Park Industrial Precincts in the west. The proposal would also assist in providing improved access to the new Schofields Railway Station located to the south of Schofields Road and the proposed North West Rail Link and Cudgegong Railway Station.

Traffic volumes on Schofields Road between Tallawong Road and Hambledon Road are forecast to increase from 9725 annual average daily traffic (AADT) in 2011 to over 30,000 AADT in 2026 (assuming partial development and employment of the North West Growth Centre). Traffic volumes between Hambledon Road and Alex Avenue are forecast to increase from 6800 AADT in 2011 to over 25,000 in 2026 (assuming partial development and employment of the North West Growth Centre). The proposal is needed to cater for this predicted growth.

Based on accident analysis of Schofields Road, a total of 25 crashes occurred between Tallawong Road and Railway Terrace from 2005 to 2009. Schofields Road is currently a rural road that operates at a level of service B or better at all intersections, which is considered to be good with acceptable delays and spare capacity. More detailed traffic data is provided in section 6.7.2.

At present, Schofields Road does not provide an east-west link through to Richmond Road. This east-west link is currently provided by Garfield Road which is designed to cater for rural traffic volumes, not the traffic volumes anticipated to be generated by the North West Growth Centre.

Furthermore, provisions for cyclists and pedestrians are limited in the area and a number of road safety issues exist for motorists. The proposal is needed to address current and future road safety issues by providing a dedicated shared pathway for pedestrians and cyclists, establishing roadside clear zones, dividing carriageways and signalising intersections to meet current standards.
Source: Jackson Teece, 2011.

**Figure 2-1 North West Growth Centre**
2.1.1 Relevant strategies and plans

**National Road Safety Strategy 2011-2020**

The *National Road Safety Strategy 2011-2020* (Australian Transport Council, 2011) has a vision to have no person killed or seriously injured on Australia's roads. Aims of the strategy include reducing fatalities and crashes on our roads by at least 30 per cent in the period 2011 to 2020.

The proposal would assist in contributing to this aim as it would upgrade the existing road and intersections, and incorporate bus priority access and shared off-road paths for cyclists and pedestrians. This would improve the operation of the street network and remove the risk of conflict between cyclists, buses and other vehicles which has the potential to result in crashes and fatalities.

The proposal has been designed in line with RMS Design Guide and therefore is considered to produce a safe road network. During construction suitable traffic management, such as reduced speed limits, would be implemented to improve safety at the work site.

**NSW 2021**

*NSW 2021* (NSW Government, 2011a) is a 10 year plan that provides goals and targets to rebuild the economy, provide quality services, renovate infrastructure, restore government accountability, and strengthen the local environment and communities. It replaces the State Plan as the NSW Government’s strategic business plan, setting priorities for action and guiding resource allocation.

*NSW 2021* lists a number of goals to achieve five strategies including ‘return quality services’, ‘renovate infrastructure’ and ‘strengthen our local environment and communities’. Relevant goals within these strategies areas include:

- Reduce travel time
- Improve road safety
- Invest in critical infrastructure
- Protect our natural environment.

The proposal would provide additional road capacity to alleviate future traffic congestion which contributes to the goal of reducing travel times. This is one of the priority actions for improving the efficiency of the road network during peak times on Sydney’s road corridors.

The proposal would assist in improving road safety as it would upgrade Schofields Road to current safety standards. Safety would also be improved due to a reduction in future congestion along the road as a result of the proposal.

The proposal has also been designed to minimise impacts on local native biodiversity and other environmental factors.

The proposal is therefore consistent with *NSW 2021*.

**Metropolitan Plan for Sydney 2036**

The *Metropolitan Plan for Sydney 2036* (NSW Government, 2010b) released in December 2010 is an update of the *Metropolitan Strategy: City of Cities – A Plan for Sydney’s Future* (Department of Planning, 2005). The Metropolitan Plan integrates land use, urban and funded transport planning together with providing a framework for sustainable growth and development across the city to 2036.

Overarching aims developed as part of the Metropolitan Strategy relevant to the proposal include:
• Enhance liveability
• Strengthen economic competitiveness
• Protect the environment.

Within the five overarching aims from the Metropolitan Strategy, the Metropolitan Plan aims to:
• Mitigate and adapt to impacts of climate change
• Integrate infrastructure particularly transport, with land use as an integral part of managing growth, city efficiency and sustainability
• Respond to challenges of Sydney’s faster than previously expected population growth.

The Metropolitan Plan includes objectives and actions in relation to transport within Sydney. These objectives and actions are largely derived from those identified in the Metropolitan Transport Plan: Connecting the City of Cities (NSW Government, 2010c).

The Metropolitan Plan provides strategies, objectives and actions for the greater Sydney metropolitan region to meet these aims. The following objectives are considered to be relevant for the proposal:
• Deliver the rail expansion projects and road upgrades outlined in the Metropolitan Plan to provide additional capacity across the transport system
• Ensure that transport corridors are preserved for future growth.

These objectives would be met as the proposal, though not identified directly in the Metropolitan Plan, is a project which would upgrade a key arterial road. The proposal would also assist in providing road infrastructure to meet potential future growth in the North West Growth Centre. The proposal includes a wide median which would allow for future expansion of the corridor should demand require it in the future.

The Metropolitan Plan for Sydney 2036 identifies a need for 770,000 new homes in Sydney between 2006 and 2036. 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 supply land linked to key infrastructure, supported by parks, bushland, health and education facilities, shops, services and public transport.

The proposal would provide a key east-west link to improve access within the North West Growth Centre which would facilitate new residential, commercial and industrial development. The proposal would also result in a key bus corridor that would link the Richmond Railway Line and the proposed North West Rail Link with pedestrians and cyclists.

State Infrastructure Strategy

The State Infrastructure Strategy (NSW Treasury, 2008) outlines planned investment in infrastructure and commits the Government to record funding of capital expenditure during the period 2008/09 and 2017/18.

The strategy identifies that over $7.5 billion is required to be spent in the North West and South West Growth Centres for required infrastructure including roads. These works would be undertaken in line with the staged release of the new areas. The proposal would form part of this expenditure.

The strategy also identifies the projects to be coordinated by the Growth Centres Commission to 2017-18. The upgrade of Schofields Road is listed as one of these projects.

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 in NSW in the *Metropolitan Transport Plan: Connecting the City of Cities*.

The *NSW Bike Plan* includes a number of actions to promote and improve cycling which are relevant to the proposal. One of these actions is to provide shared pedestrian and cycle off-road facilities in all appropriate locations as part of State road projects in the Greater Metropolitan Region.

The proposal would include shared off-road pedestrian and cycle facilities.

**RTA Blueprint 2008-2012**

The *RTA Blueprint* defines RTA’s (and now RMS’) objectives and goals for the 2008 to 2012 period (RTA, 2008a). The Blueprint anticipates an increase in traffic volumes over the next two to three decades, resulting in an increased demand across NSW on road and public transport efficiency and capacity (RTA, 2008a).

The proposal is designed to provide additional capacity along Schofields Road which is required due to future development within the North West Growth Centre. This increased capacity would result in Schofields Road being more efficient both in the present and into the future. The proposal also provides a wide median to expand the proposal to six lanes at a later date.

**Draft North West Subregional Strategy**

To supplement the Metropolitan Strategy, a number of subregional strategies have been prepared. Some of these are currently in draft form. The subregional strategies translate the objectives of the Metropolitan Strategy (Department of Planning, 2005) to the local level. These subregional strategies are to be revised to meet the strategic directions identified in the Metropolitan Plan discussed above. This revision has not yet occurred and therefore the subregional strategies are still considered relevant.

Although the *Draft North West Subregional Strategy* (Department of Planning, 2007) does not identify the proposal as a key project, the proposal would support the strategic directions identified in the subregional strategy by expanding transport networks to serve growth in the North West Growth Centre and also providing an improved road system for bus services.

**The Growth Centres and North West Growth Centre Road Frameworks**

The *Growth Centres Road Framework* (RTA, 2008) established a broad framework to guide the appropriate development of the major roads in the North West and South West Growth Centres. The subsequent *North West Growth Centre Road Framework* (RTA, 2011) focuses on the North West Growth Centre and incorporates the most recent proposals in transport and precinct planning in the area. It sets out to provide the design objectives and strategies which would be developed in subsequent design reports that would guide the design of each road project during their strategic design phase.

The framework developed a functional road hierarchy for the major roads in the North West Growth Centre, based on predicted and existing traffic volumes, as well as on the precedent and lessons provided by Sydney’s existing road network. This hierarchy consists of the following three categories of major road, each offering a different balance between transport and adjacent land uses and areas being served:

- Principal arterials
- Transit boulevards
- Sub-arterials.

These different road types are distinguished through their road design standards, clear zones, footpath and cycle provisions, and median widths. Further, their character is defined by variations in the corridor...
cross section and tree planting. For example the identity of transit boulevards is associated with formal tree planting on the median and outer edges of the corridor.

The Schofields Road corridor is identified as a future transit boulevard suggesting it may have a four or six lane ultimate configuration, may include space for parking in built up commercial or retail areas, and would generally have a 70 km/h speed limit. Access to main traffic lanes would generally be limited to main intersections.

**Precinct planning**

The North West Growth Centre has been divided into precincts which will be released in stages to meet the need for future urban land. The precincts are indicated in Figure 2-1.

When a precinct is released, the NSW Government works with the relevant Council to decide the future zoning and development controls for that precinct by looking at issues such as conservation, where town centres should be placed and key transport routes.

Adjacent to the proposal, precinct planning is well underway, with the Riverstone, Alex Avenue and Schofields precincts already rezoned.

The Blacktown City Council Growth Centre Precincts Development Control Plan (DCP) (Blacktown City Council, 2010) outlines aims, objectives, controls and design principles for precinct development of the North West Growth Centre and is discussed further in section 4.2.1.

A key proposal objective is to ‘complement precinct development of the North West Growth Centre by developing a road corridor that is consistent with the aims, objectives, controls and design principles of the Blacktown City Council Growth Centre Precincts Development Control Plan 2010’.

The streetscape objectives and principles of the DCP encourage dwellings that front Schofields Road. The DCP prohibits the use of noise walls and rear fences along roads.

RMS commissioned a landscape and urban design strategy for the Schofields Road corridor (refer Appendix L) that demonstrates how future residential developments could achieve these streetscape objectives relative to Schofields Road.

**Riverstone Precinct**

The precinct plan for Riverstone indicates that future land use along Schofields Road is to be medium density residential which would generally extend 100 to 200 metres north of Schofields Road. Beyond these medium density developments are the existing Schofields residential area and also some low density residential uses. At the western end of Schofields Road, along the Railway Terrace tributary of Eastern Creek, are areas designated as parks and drainage. Land along First Ponds Creek is also identified as parks and drainage.

**Alex Avenue Precinct**

The precinct plan for Alex Avenue indicates that future land use east of the Schofields Farm Road intersection is to be low density residential. Some parks and drainage reserves would be located along First Ponds Creek and to the east of Hambledon Road.

West of the Schofields Farm Road intersection residential densities are to increase to medium density between the intersection and Junction Road. Land use at the corner of Schofields Road and Railway Terrace would be for drainage purposes associated with Railway Terrace tributary of Eastern Creek. Away from the road frontage are further park land areas, a school and retail and commercial development adjacent to the new Schofields Railway Station.
**Riverstone East Precinct**
The Riverstone East Precinct Plan has not yet been released for precinct planning. The precinct is to include about 6000 new dwellings and house a population of about 16,800. The precinct would contain about four to six neighbourhood centres and also some employment lands. The proposed North West Rail Link would also terminate within the precinct at the proposed Tallawong Stabling Yard. The proposed Cudgegong Railway Station would provide commuter access to the North West Rail Link.

**Schofields Precinct**
Schofields Precinct was rezoned for urban development on 11 May 2012. It is bounded by Eastern Creek to the north and west, Quakers Hill Parkway to the south and the Richmond Railway Line to the east.

Schofields is a 465 hectare precinct and is expected to accommodate around 2950 dwellings and a population of 8000 people. The precinct will be supported by a new town centre in the adjoining Alex Avenue Precinct and the recently constructed Schofields Railway Station as part of the Quakers Hill to Richmond duplication project.

### 2.2 Proposal objectives
The key objectives of the proposal are to:

- Contribute to the development of a direct link between Windsor Road and Richmond Road
- Complement precinct development of the North West Growth Centre by developing a road corridor that is consistent with the aims, objectives, controls and design principles of the Blacktown City Council Growth Centre Precincts Development Control Plan (Blacktown City Council, 2010)
- Provide a transit boulevard road corridor that would optimise pedestrian and cyclist access and integrate public transport access and travel with other transport modes
- Facilitate a fit-for-purpose urban landscape beyond the road corridor
- Provide for additional future road capacity to accommodate the projected traffic growth including the potential upgrade of Schofields Road to six lanes
- Develop an appropriate local access strategy and facilitate traffic flow around and through the study area
- Enhance road safety for all road users
- Minimise the social and environmental impacts of the development including minimising the need for property acquisition.

### 2.3 Alternatives and options considered

#### 2.3.1 Background - Windsor Road to Richmond Road strategic corridor
The Blacktown Local Environmental Plan 1988 identified the first corridor alignment for the upgrade of Schofields Road as a route along Townson Road. Following release of the State Environmental Planning Policy (Sydney Region Growth Centres) 2006 and the North West Growth Centre Structure Plan 2010, a second revised corridor alignment was identified which utilised Grange Avenue.

Subsequently, further investigation in 2010 by the Department of Planning and Infrastructure (then Department of Planning), Blacktown City Council and RMS (then RTA) identified a third corridor alignment, Schofields Road to Richmond Road via South Street. The Schofields Road/South Street corridor was considered the better performing corridor alignment for the following reasons:
- It was the most direct link between the Rouse Hill regional centre in the east, the new Schofields Railway Station and adjacent new Schofields West precinct, the Marsden Park Industrial Precinct and proposed new Marsden Park Town Centre in the west, and ultimately provides for a future connection to the reserved Werrington Arterial corridor.

- It was consistent with the now rezoned Marsden Park Industrial, Alex Avenue and Riverstone precincts, and the North West Growth Centre Structure Plan 2010.

- It was supported by Department of Planning and Infrastructure (then Department of Planning) and Blacktown City Council.

- The preliminary technical environmental investigations did not identify any major constraints.

The Schofields Road/South Street corridor alignment and strategic concept design for the upgrade of Schofields Road was first presented to the community for comment in April 2010.

Following the April 2010 community display period, RMS (then RTA) prepared a Preferred Corridor Options Report (NGH, 2010) that documented the preferred corridor planning and selection process. It detailed how RMS considered comments from the community and undertook further consultation with key stakeholders including Department of Planning and Infrastructure, Transport for NSW (then Transport Construction Authority), Landcom, Endeavour Energy (then Integral Energy), Blacktown City Council, The Hills Shire Council, Riverstone Chamber of Commerce and CSI Sport and Recreation Club. This further stakeholder consultation included a value management study in July 2010 to evaluate the community input and to decide on a preferred corridor.

The value management study confirmed the Schofields Road/South Street alignment as the preferred corridor with only minor changes to the alignment displayed in April 2010.

The preferred corridor alignment and strategic concept design identified above is between Richmond Road and Windsor Road and relates to Stages 1, 2 and 3 of the Schofields Road upgrade. This proposal only includes Stage 2 (and therefore the following sections of this REF discuss the options within the Stage 2 section of the preferred corridor between Tallawong Road and Veron Road).

### 2.3.2 Methodology for selection of preferred proposal option

A number of proposal options within the preferred corridor were identified by RMS including the ‘do nothing option’. Each option was then assessed against the proposal objectives and a number of selection criteria. The options that were considered are outlined in section 2.3.3 and the criteria used to evaluate each option are listed below:

- Consistent with the project objectives for developing a transit boulevard
- Extent of property acquisition and impacts to landowners
- Improvements to road safety and traffic efficiency along Schofields Road
- Accommodates existing and future utilities infrastructure including the recently constructed major underground high voltage electricity cables
- Allows for potential future upgrade of Schofields Road to six lanes should it be required
- Consistency with North West Growth Centre precinct planning.

The advantages and disadvantages of each option are discussed in section 2.3.4.

RMS also broadly explored three options to cross the Richmond Railway Line. A value management study was undertaken in 2009 with relevant stakeholders to assess the merits of each option and to
collaboratively reach a consensus on the preferred option. Each option was assessed against the following criteria:

- Optimum accessibility and integration with future land use and local roads
- Visual impact
- Noise impact
- Constructability and interference with railway
- Personal safety and security
- Land acquisition requirements
- Cost of maintenance (including landscaping and drainage)
- Environmental impacts (creek crossings, flora, fauna and heritage).

Weightings and subsequent scoring were allocated to each of the criteria through a workshop.

### 2.3.3 Identified options

The alignment between Railway Terrace and Veron Road is common to all options discussed in the options assessment below (excluding the do nothing option). This is due to the rail overpass at the Richmond Railway Line already being constructed, which determines the alignment through this section of the proposal. The following options were considered.

**Option 1 - Do nothing**

The do nothing option involves not undertaking the proposal, and retaining the existing road arrangement along Schofields Road.

**Option 2 - Expand evenly either side of the existing centre line**

The alignment of Option 2 is essentially a straight line and would expand Schofields Road evenly either side of the existing road centreline. Under this option the existing road would become the future central median with the east and westbound carriageways on either side.

**Option 3 - Varying widening to the north and south of existing road alignment**

Option 3 is a curved version of Option 2. This option would:

- Widen the road on the northern side of the existing road alignment between Tallawong Road and Hambledon Road
- Widen the road on the southern side of the existing road alignment between Hambledon Road and Junction Road
- Widen evenly either side of the existing road centre line between Junction Road and Railway Terrace.

**Option 4 – Expand to the south between Alex Avenue and Junction Road**

Option 4 generally follows the alignment of Option 2 however it shifts the alignment south of the existing Schofields Road between Alex Avenue and Junction Road (refer Figure 2-2).
Figure 2-2  Option 4 between Alex Avenue and Junction Road

Option 4a – Refined alignment of intersection approaches
This option proposes the same alignment as Option 4 however contains a number of variations in the layout of intersections.

Hambledon Road
This option involves shifting the Hambledon Road/Schofields Road intersection further west than the alignment presented to the community in the April 2010 public display (refer Figure 2-3).

Figure 2-3  Realignment of Hambledon Road intersection
**Schofields Farm Road**
This option involves shifting the Schofields Farm Road intersection from that presented in the April 2010 public display, so it would generally follow the existing alignment (refer Figure 2-2).

**Railway Terrace**
This option would slightly realign Railway Terrace to accommodate future potential four lanes to service the Schofields Railway Station and Schofields town centre (refer Figure 2-4).

![Realignment of Railway Terrace intersection](image)

*Note: Red indicates alignment presented to the community in April 2010. Blue represents Option 4a.
Source: Schofields Road Preferred Corridor Options Report, (RMS, 2010)*

**Figure 2-4 Realignment of Railway Terrace intersection**

**Richmond Railway Line crossing options**
In order for Schofields Road to be extended to Richmond Road, it must cross the Richmond Railway Line. The following crossing options were considered:

- Crossing option 1 - Railway crossing with a road underpass
- Crossing option 2a - Railway crossing using a road bridge structure about 100 metres long
- Crossing option 2b - Railway crossing using a road bridge structure about 200 metres long.

**2.3.4 Analysis of options**

**Option 1 - Do nothing**
The ‘do nothing’ option was not considered appropriate as it would not meet the proposal objectives for developing a transit boulevard and would not result in any improvement to the existing road network which is needed to cater for the projected future growth of the area. The ‘do nothing’ option is not consistent with precinct planning and would not satisfy the RMS obligation to provide a safe road environment.

This option would not require any property acquisition and would not impede existing or future utilities infrastructure.
Option 2 – Expand evenly either side of existing road centre line

Option 2 is consistent with the project objectives for developing a transit boulevard and would improve road safety and traffic efficiency along Schofields Road. This option also accommodates existing and future utility infrastructure such as power and water, and therefore does not require utility easements beyond the road corridor.

This option would have a comparatively greater impact to properties on the north side of the alignment compared to Options 3, 4 and 4a. Option 2 would impact a total of 15 dwellings.

This option would not prohibit the future upgrade of Schofields Road to six lanes and is consistent with North West Growth Centre precinct planning.

Option 3 – Varying widening to the north and south of the existing road alignment

This option would require Integral Energy utilities to be located within the median. The future upgrade of Schofields Road to six lanes would be difficult as result of the utilities and no trees would be permitted in the median. Accordingly, this option is not consistent with the urban design framework for a transit boulevard. There would also be a comparatively greater impact on land to the south of the alignment compared to Option 2. A total of seven dwellings would be affected as a result of this option.

Road safety and traffic efficiency would be improved along Schofields Road and the alignment is broadly consistent with the North West Growth Centres precinct planning.

Option 4 – Expand to the south between Alex Avenue and Junction Road

Option 4 would not prohibit the upgrade of Schofields Road to six lanes in the future should it be required and would also provide opportunity for major utilities to be accommodated within the road corridor. This option is broadly consistent with the North West Growth Centre precinct planning, would achieve the project objective of developing a transit boulevard, and would improve road safety and traffic efficiency along Schofields Road.

A total of 12 dwellings would be impacted as a result of this option. There would also be some impact to the developable area of four land parcels south of the alignment.

RMS (then RTA) representatives met with the owners of the four land parcels to the south of the Schofields Road alignment where Option 4 would result in an additional encroachment onto their land. The owners of three of the land parcels, which comprised nearly all of the proposed additional encroachment, raised no objection to Option 4. The owners of the remaining parcel, which represented a comparatively minor additional encroachment, did not respond.

Option 4a – Refined alignment of intersection approaches

Option 4a has the same alignment as Option 4 and therefore would result in the same benefits in terms of not prohibiting the future upgrade of Schofields Road to six lanes, providing opportunity for major utilities within the road corridor, improving road safety and traffic efficiency on Schofields Road and achieving the objective of developing a transit boulevard. Option 4a offers a number of alternative intersection layouts that would improve the operational performance of the proposal. The benefits of the alternate intersection layouts are discussed below.

Hambledon Road intersection realignment

Shifting the Hambledon Road/Schofields Road intersection about 50 metres to the west would reduce impacts to the property east of the existing intersection.

This change is not expected to have any greater environmental impact than the alignment presented to the community in April 2010.
**Schofields Farm Road intersection realignment**

The Schofields Farm Road intersection, as presented in April 2010, would see the intersection moved 100 metres to the west of its current location. However, adjusting the intersection alignment to generally follow its existing location would reduce impacts to property to the west of the intersection. This change is not expected to have any greater environmental impact than the alignment presented to the community in April 2010.

**Railway Terrace**

The option to slightly realign Railway Terrace would accommodate four potential future lanes to service the new Schofields Railway Station and the town centre. This change is not expected to have any greater environmental impact than the alignment presented to the community in April 2010.

**Richmond Railway Line crossing options**

Each of the Richmond Railway Line crossing options were assessed and scored against criteria and workshop participants unanimously agreed that crossing option 1 (railway crossing with a road underpass) performed best against the criteria as a whole.

Concurrently, the then Transport Infrastructure Development Corporation (now Transport for NSW) commissioned a feasibility study. The study was prepared in collaboration with relevant stakeholders including RMS, RailCorp, Transport for NSW and the Richmond Line Rail Alliance. The report confirmed the feasibility of integrating an underpass into the Richmond Line Alliance project.

### 2.3.5 Analysis of options against proposal objectives

Table 2-1 provides a summary of whether each option meets the objectives of the proposal.

<table>
<thead>
<tr>
<th>Objective</th>
<th>Does option meet the objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contribute to the development of a direct link between Windsor Road and Richmond Road.</td>
<td>No Yes Yes Yes Yes</td>
</tr>
<tr>
<td>Complement precinct development of the North West Growth Centre by developing a road corridor that is consistent with the aims, objectives, controls and design principles of the <em>Blacktown City Council Growth Centre Precincts Development Control Plan</em> (2010).</td>
<td>No Yes Yes Yes Yes</td>
</tr>
<tr>
<td>Provide a transit boulevard road corridor that would optimise pedestrian and cyclist access and integrate public transport access and travel with other transport modes.</td>
<td>No Yes No Yes Yes</td>
</tr>
<tr>
<td>Facilitate a fit-for-purpose urban landscape beyond the road corridor.</td>
<td>No Yes Yes Yes Yes</td>
</tr>
<tr>
<td>Provide for additional future road capacity to accommodate the projected traffic growth including the potential upgrade of Schofields Road to six lanes.</td>
<td>No Yes No Yes Yes</td>
</tr>
<tr>
<td>Develop an appropriate local access strategy and facilitate traffic flow around and through the study area.</td>
<td>No Yes Yes Yes Yes</td>
</tr>
<tr>
<td>Objective</td>
<td>Does option meet the objective</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>Enhance road safety for all road users.</td>
<td>No</td>
</tr>
<tr>
<td>Minimise the social and environmental impacts of the development</td>
<td>Yes, No, No, Yes</td>
</tr>
<tr>
<td>including minimising the need for property acquisition.</td>
<td></td>
</tr>
</tbody>
</table>

### 2.4 Preferred option

The preferred option, Option 4a, would widen the existing Schofields Road evenly either side of the existing Schofields Road centre line along the current road alignment. This is with the exception between Boundary Road and Junction Road intersections where the road is widened slightly to the south to reduce property impacts.

The preferred option meets the objectives of the proposal. Specifically, the preferred option would:

- Contribute to the development of a direct link between Windsor Road and Richmond Road that is consistent with the aims, objectives and design principles of precinct planning in the North West Growth Centre
- Facilitate for a potential future upgrade into the wide median
- Minimise the social and environmental impacts of the development including comparatively less property acquisition
- Be consistent with the requirements of a transit boulevard road corridor to optimise pedestrian and cyclist access and integrate public transport access and travel with other transport modes.

### 2.5 Design refinements

A value engineering study at early concept stage included refinements to determine a preferred option for the bridge structures at First Ponds Creek, Railway Terrace tributary of Eastern Creek 1 and Bridge Street overpass.

A Structures Concept Option Report (Parsons Brinckerhoff, 2011) developed a number of design refinements and recommend preferred bridge arrangements. This included consultation with relevant stakeholders as outlined within section 5.6.

The bridge options were assessed against the following key criteria:

- Cost
- Urban design
- Property impacts
- Hydrology
- Environment
- Constructability.

For the Bridge Street overpass, hydrology and environment were not considered key criteria as the overpass does not cross a water course.
First Ponds Creek bridge

Three bridge options to span First Ponds Creek were investigated and are described below:

- Option 1 is a single 37 metre span prestressed concrete bridge
- Option 2 is a two span prestressed concrete bridge. This option considers spanning the creek using two equal spans with an overall length of 42 metres
- Option 3 (preferred option) is a three span spaced prestressed concrete plank. This option considers spanning the creek using three 13 metre spans with an overall length of 39 metres.

All three options considered have the same total width, alignment, similar scour protection requirements and would provide for potential future upgrading from four to six lanes.

Option 1 is the most expensive option with the least clearance above the 100 year flood level (350 millimetres). This option also results in the highest road alignment, causing the greatest environmental footprint and impacts to property in terms of acquisition extent and access. The single span would result in no piers in the creek zone but would result in the greatest girder mass and undesirably deep girders relative to the depth of the creek crossing.

Option 2 is less expensive than option 3 but more expensive than Option 1. It has the greatest clearance above the 100 year flood level (1150 millimetre), however would result in a high road alignment causing greater property impact, in terms of acquisition extent and access, when compared to option 3. This option would have a central pier located within the creek zone and the structural thickness was considered to be relatively deep in comparison to the creek crossing.

Option 3 was selected as the preferred option due to it having the least construction costs, a lower road alignment, slimmer deck profile, least environmental impact and constructability advantages. The pier arrangement was selected to avoid placing piers within the creek and the superstructure arrangement allows construction of the deck from above, eliminating the need for temporary scaffolding beneath the deck and hence reducing construction impact on the creek.

Railway Terrace tributary of Eastern Creek bridge

Two bridge options to span the Railway Terrace tributary of Eastern Creek 1 were investigated and are described below:

- Option 1 is a two span prestressed concrete bridge. This option considers spanning the creek and riparian zone using two equal spans with an overall length of about 55 metres
- Option 2 (preferred option) is a four span spaced prestressed concrete plank. This option considers spanning the creek and riparian zone using four 14 metre spans with an overall length of about 55 metres. To reduce the impact of the construction works on the creek, it is proposed to skew the substructure of the westbound bridge by about 10 to 15 degrees.

The two options considered have the same total width, alignment, similar scour protection requirements and would provide for future upgrading from four to six lanes. All options are located outside of the existing Schofields Road boundary and are sufficiently offset to the south to not pose any major constructability constraints.

Option 1 is the most expensive option with the least clearance above the 100 year flood level (350 millimetres). This option results in the highest road alignment causing the greatest environmental footprint and property impact in terms of acquisition extent and access. The two-span design would result in no piers in the creek zone but would result in the greatest girder mass and undesirably deep girders relative to the depth of the creek crossing.
Option 2 was selected as the preferred option due to its positive effects of having the least construction cost, a lower road alignment, slimmer deck profile, least environmental impact and constructability advantage. This option would have the greatest clearance above the 100 year flood level (520 millimetres), and the lower alignment would provide improved road geometry into the railway underpass. The pier arrangement and skewed bridge design was selected to avoid placing piers within the creek and the superstructure arrangement allows construction of the deck from above, eliminating the need for temporary scaffolding beneath the deck and hence reducing construction impact on the creek below.

**Bridge Street overbridge**

Five bridge options to carry Bridge Street over Schofields Road were investigated and are described below:

- **Option 1** is a three span prestressed concrete bridge. This option considers a three span structure with an overall length of 42 metres consisting of a central 30 metre span and two end spans of six metres each
- **Option 2** is a two span structure with an overall length of 42 metres, consisting of two 21 metre spans with a pier in the middle
- **Option 3** is a three span structure with an overall length of 62 metres, consisting of two 21 metre end spans and a central span of 20 metres
- **Option 4** is a two span structure with an overall length of 59 metres, consisting of a 36 metre and 23 metre span
- **Option 5** (preferred option) is a two span structure with an overall length of 52 metres, consisting of two equal 26 metre spans with a central pier in the median.

There were no environmental constraints driving the design arrangement of the Bridge Street overbridge. A key urban design outcome was to achieve a slim line design that related to the already constructed railway underbridge structure located 80 metres to the east. All options provide one lane in each direction, a shared user path on one side of the bridge, and follow a similar alignment. All options are pre-cast Super-T design providing for future upgrading of Schofields Road from four to six lanes. While an alternative void structure was considered, the Super-T design would not require support scaffolding resulting in vastly improved access for excavating the underpass and optimisation of construction staging.

The location of the piers in Option 1 is similarly arranged to the already constructed railway underbridge, adjacent to Railway Terrace. This option provides a symmetrically balanced structure however the short end spans with retaining walls create a confined passage for the shared user path. The pier footings constrain the utility allocation and the structure depth offers a less slimline design and an undesirably higher level road alignment for Bridge Street. The vertical walls would reduce light and the potential for planting.

Option 2 offers the smallest structure depth but cost savings and urban design benefits are offset by inclusion of high retaining walls adjacent to both the southern and northern boundaries of Schofields Road. The vertical walls would reduce light and the potential for planting.

As with option 2, option 3 also offers the smallest structure depth. For this option cost savings and urban design benefits are offset by a substantially longer bridge structure, a high retaining wall adjacent to the southern boundary of Schofields Road and an unsymmetrical bridge span arrangement. This option would result in additional property impacts adjacent to the northern bridge approach.
Option 4 has the greatest structure depth and substantially longer and unsymmetrical bridge structure, offering the lowest cost savings and urban design benefits. This option would result in additional property impacts adjacent to the northern bridge approach.

Option 5 was selected as the preferred option due to it having the least construction cost, a comparatively low level road alignment for Bridge Street and providing a slim line bridge structure with reduced structure depth. This option also provides a symmetrical span arrangement that eliminates the use of retaining walls by using steep rock cuttings into high strength shale/sandstone which in turn is also expected to reduce the likelihood of graffiti.