

## 5 Alternative routes considered and the selected route

### 5.1 Northern Expressway

#### 5.1.1 The 'No Northern Expressway' option (maintaining the status quo)

Without the Northern Expressway, Main North Road would require substantial upgrading and widening to six lanes between Mawson Lakes and Gawler to cater for the future traffic volumes.

It is not feasible to upgrade Main North Road to expressway standard considering the number of existing controlled and uncontrolled intersections already along this section and the level of development, both commercial and residential, that exists on both sides of the road. To upgrade to expressway standard would be a prohibitive cost (probably in the range of \$1.5 billion to \$2.5 billion), and involve extensive local roadworks, cause significant social and environmental effects relating to land acquisition, and seriously reduce community accessibility and increase noise. Realistically, any upgrade will only achieve arterial road standard. A Main North Road upgrade could not provide the same level of service as an expressway and would not meet AusLink objectives.

For similar reasons, Angle Vale Road and Heaslip Road could not be upgraded to expressway standard.

A number of other arterial roads in the study area would also need upgrading to improve safety and access including Womma Road between Heaslip Road and the Adelaide–Gawler/Barossa rail line, Waterloo Corner Road from Port Wakefield Road to Heaslip Road, and the access roads from the Gawler Bypass into Gawler. In addition, Heaslip–Angle Vale Road would also require upgrading and widening (including duplication) to improve safety and cater for the expected traffic volumes.

Some changes to the local road network could be expected with increased development in the region, for example:

- continued upgrading of Wyatt Road to a divided four-lane road to service the rapidly growing Edinburgh Parks development
- upgrading of Taylors Road to service the horticultural area surrounding Virginia
- upgrading of a number of north–south roads that service the Munno Para area
- some requirement to provide additional or upgraded connections to Main North Road and Angle Vale Road from the future residential development of the Evanston Gardens area
- upgrading of Curtis Road and other major local roads as part of the Playford North development. At this time, the exact nature of the upgrade for Curtis Road is unknown but could involve widening to four lanes and the installation of roundabouts at key intersections.

Without the construction of the Northern Expressway, it is predicted that noise, air quality and water quality effects are likely to increase along or adjacent to the National Network road links and urban arterial roads on the existing network due to the expected increases in traffic volumes.

Visual impact, cultural heritage, vegetation, fauna, geology and soils are unlikely to be further adversely affected by the expected increase in traffic volumes on the existing road network.

### 5.1.2 Previous studies

A number of studies and investigations, before the consultant consortium was engaged in October 2005, developed and assessed many routes. The current study has further investigated a short list of options, and selected the preferred route.

#### 1998 – SKM report

A strategic planning study by SKM in 1998, in response to increasing concern about the suitability of the existing National Network route into Adelaide via Main North Road, concluded that there was a need to provide additional capacity for traffic movement from the outer northern suburbs.

The study area extended from the Two Wells Road in the north, Main North Road in the east, Grand Junction Road–Gepps Cross in the south and Port Wakefield Road in the west. Various routes were identified and broadly investigated for the highway from the Gawler Bypass to Gepps Cross as follows:

- existing network, the upgrade of Main North Road
- Salisbury Highway–Main North Road
- Port Wakefield Road–Bolivar Road–Andrews Road
- Port Wakefield Road–Heaslip Road–Angle Vale Road
- Port Wakefield Road–Taylors Road–Angle Vale Road
- Port Wakefield Road–Angle Vale Road.

The Port Wakefield Road–Heaslip Road–Angle Vale Road option was considered to be preferable to all other options, and the best option for the National Network in the study area, because it:

- provided a sound alternative route and greater travel choice in the network
- had the lowest overall cost
- had the lowest overall environmental and social effects.

The preferred route started in the north at the Two Wells Road interchange on the Gawler Bypass, followed Jack Cooper Drive, bypassed Hillier Park, then followed Angle Vale Road, formed a bypass around the south-east side of Angle Vale, then followed mainly the existing alignments of Heaslip Road and Port Wakefield Road to Salisbury Highway.

Initial development of this new route centred on using as much of the existing Angle Vale Road–Heaslip Road corridor as possible.

#### 2002 – QED initial consultation

In late 2001, QED was commissioned by the then Transport SA to undertake initial consultation with key stakeholders which aimed to identify issues and constraints for the later investigations and discussed possible options with a range of stakeholders (primarily local elected members of Australian Government, South Australian Government and local government, and representatives from South Australian Government agencies).

## 2003–2004 – Transport Services Division

Transport Services Division (TSD) began investigations in early 2003 aimed at developing and broadly assessing route alignment options and their effects on the adjacent road structure for the Expressway. This study used existing background knowledge and internal expertise, and was the main input and starting point for the current more detailed investigations by the consultant consortium. The study was not intended to provide a preferred concept as an output of the investigation due to a lack of data available at the time. Its main objective was to provide a range of broad concepts and evaluation criteria which would influence the further development of more refined concepts.

It was found that the SKM route was not appropriate for the Northern Expressway because:

- it was planned to a lower standard than required for an expressway with an insufficient road reserve (45 m), a number of at-grade intersections and direct access allowed at some locations
- the northern access to the Gawler Bypass was not developed sufficiently but was located at the existing Two Wells Road junction, where the high cost solution would have significant environmental effects.

As part of this investigation, TSD commissioned Parsons Brinckerhoff Australia Pty Ltd to develop a discussion paper that could be used to develop a preferred form and function for the Expressway. The discussion paper gave:

- a context for the development of the new route and how it could be funded via AusLink
- an overview of the outcomes of preliminary consultation with key stakeholders
- a brief description of key issues influencing the role and functionality of the new route.

Five broad concepts and a number of alternatives were developed to an appropriate standard so that their effects could be assessed. Figure 5.1 shows the alternative routes considered. This assessment and the broad concepts were documented in an interim draft report *Broad Concepts* in July 2004.

## 2005 – TSD

In 2005, TSD began stakeholder consultation with key government and local stakeholders, as well as continuing with route and concept planning of alternative alignments, through two stakeholder reference groups: one for government agencies and one with local councils and other representatives. A number of workshops held with these reference groups identified issues, constraints and possible opportunities.

TSD background environmental studies of the area addressed noise monitoring and modelling, air quality investigation and modelling, and vegetation and fauna assessments. Other investigations include an initial broad traffic assessment, pavement and geotechnical analyses, and property assessments for the routes identified to this time.

## 2005 – SMEC

Snowy Mountains Engineering Corporation Pty Ltd (SMEC) was engaged to review and provide advice on current and previous work (from an informed interstate perspective), including constraints mapping, feasibility assessment and, in particular, the location and design of interchanges as well as route identification.

### 5.1.3 Overview of the route selection process

In the concept planning phase the consultant consortium investigated a number of alternative routes for the Northern Expressway from these earlier studies. The routes were developed and assessed and a preferred route/corridor selected with refinements to optimise alignment, connections, costs and benefits.

The investigations have been carried out to achieve the underlying Australian Government, AusLink and South Australian Government objectives.

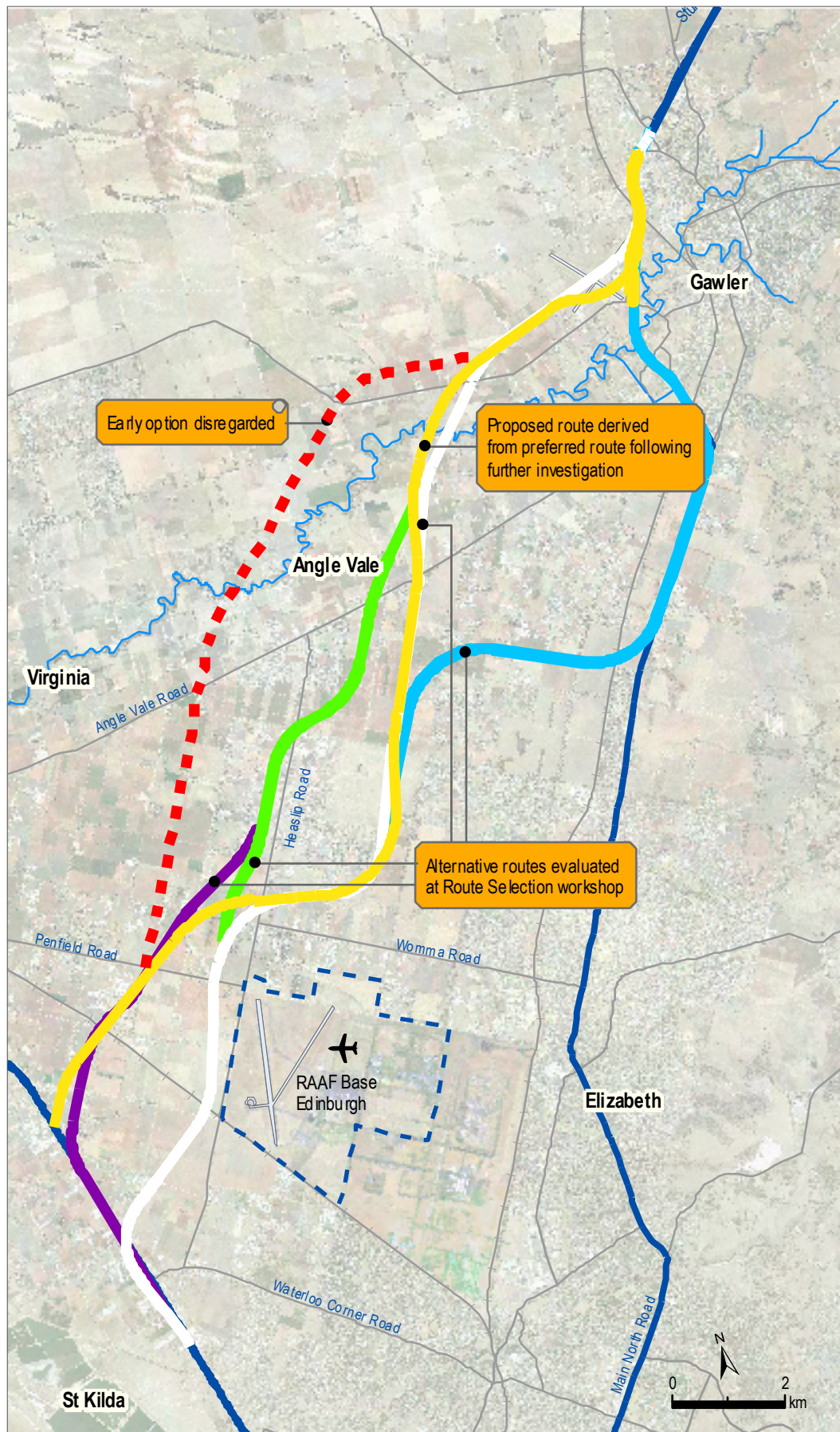
The investigations have been rigorous and comprehensive and involved all facets of route appraisal and selection. A detailed economic and non-monetised evaluation assisted with the selection of the preferred route. The preferred route, interchanges and general concept design approach has been undertaken by the project team comprising the consortium and DTEI staff and has been subject to peer reviews and independent specialist advice.

This project process has taken the following broad steps:

- preliminary concept planning study, July 2004 (DTEI 2004), following the 1998 SKM Strategic Planning Study
- initial Project Proposal Report, October 2005 (DTEI 2005)
- consultation with stakeholders and governments
- review, validation and refinement of early concept planning
- development of assessment criteria
- assessment of alternative routes and route selection workshop
- preliminary economic assessment
- development and sensitivity testing of alternative scope and staging variations to the preferred route
- refinement of preferred route and development of proposed route
- community consultation and engagement (ongoing)
- updated economic assessment
- concept design.

Five routes were broadly assessed by the consortium in late 2005 (refer Figure 5.1). The outer north-western (red) route, traversing north of the Gawler River and to the west of Angle Vale, was eliminated early in the assessment process after it was found to have a number of significant disadvantages compared the other expressway routes investigated (including the proposed route). These disadvantages are:

- low user benefits resulting from predicted/modelled low traffic demand due the greater distance from the major traffic generation areas making the road relatively unattractive to users
- relatively poor accessibility to the City of Adelaide, Port of Adelaide and the surrounding commercial and industrial areas due to its greater distance from the connections at Curtis, Heaslip and Womma Roads to the urban areas of Elizabeth, Salisbury and Munno Para resulting in lower economic, social and environmental benefits to the region



Proposed Northern Expressway route

Figure 5.1 Alternative routes considered

Note: Route paths may be obscured by other routes

- land use: advice from PIRSA has indicated that the further the Expressway route is from the existing urban area, the greater effect it will have on the health and viability of the Virginia horticultural district. Any weakening of the Virginia horticulture cluster may, in turn, jeopardise wider social and environmental benefits that rely on the presence of irrigated horticulture. Continual encroachment and incursions will not just mean that good land is excised, but the region will be less prosperous.
- effect on freight: a shift further away from the proposed route to the west increases the risk that the existing freight route, Angle Vale and Heaslip Roads will continue to be used by a proportion of the freight traffic, thus not achieving one of the project key objectives.
- Main North Road effects: as indicated above, the transfer of traffic to the Expressway from Heaslip/Angle Vale roads and Main North Road would be significantly less. This would also result in the need for improvement to Main North Road in the future.

Therefore, the outer north-western route would not meet the objectives of the project and would result in insufficient economic benefits.

The remaining four routes were further developed and assessed against a common set of evaluation criteria (Section 5.1.4). These routes were presented to a workshop to select a preferred route through a thorough investigation of each route included physical and land use characteristics, operational performance and environmental effects.

The workshop participants (government and consortium members) focused on assessing the routes, using qualitative and quantitative criteria, building on the outputs of the Government and Stakeholder reference groups (including council officers). A summary of the information and issues identified and a discussion on the decision-making process were followed by an examination of the route options and assessment criteria.

Following the workshop and selection of the preferred route, three scope variations of that route (white) were further investigated and refined, and assessed in terms of functionality, accessibility, scope, costs, economic benefits, and social and environmental effects. The least cost variation did not meet the project objectives as it did not provide sufficient access and functionality and consequently was rejected.

Of the two remaining variations, the favoured route had the lowest costs, the highest net present value (NPV) and benefit cost ratio (BCR) and overall ranked highest.

DTEI then undertook more detailed concept development, assessment and economic analysis, taking into account further stakeholder views, including the review of the connection points of the new road with the existing network, clearance constraints required by the RAAF Base Edinburgh (for security and the potential runway extension) and the potential road–rail intermodal at Waterloo Corner. The outcome of this comprehensive process was the recommendation of the proposed route located close to Taylors Road at the southern end.

#### **5.1.4 Initial route assessment and selection using non-monetised criteria**

The approach used non-monetised criteria selected to best evaluate the various route options for land use, social, environmental and development factors:

- community accessibility
- horticultural effect
- business development

- visual impact
- noise
- property.

These criteria, chosen from a large range of criteria, were considered to reflect the most likely measurable effects on the communities in the region and were used to determine a value for the effects of the route options on the community.

To avoid double counting, these criteria focused on the benefits and costs not used in the monetary benefit cost analysis. At the time of the workshop, the capital costs and economic analysis had not been finalised and were not available to assess the route options. These were later included in the evaluation (refer Section 5.1.5). Table 5.1 summarises the criteria used for the assessment.

Table 5.1  
**Route selection criteria**

<b>Selection criterion – Community accessibility</b>	
Definition	Maintaining access to local shops, schools, places of employment and community services
Indicator	The number of discrete residential communities whose accessibility to major communal, public and/or commercial activities is significantly impeded
<b>Selection criterion – Horticultural effect</b>	
Definition	The viability of existing horticultural/agricultural industry is maintained or improved
Indicator	Annual dollar value of production plus the dollar value of agricultural capital (e.g. irrigation systems, greenhouses, fences, sheds) located within the 100 m corridor and potentially lost to the State
<b>Selection criterion – Business development</b>	
Definition	Improve overall access for business and economic development nodes and not constrain future development opportunities
Indicator	Supports local economic development initiatives and transport-related activities, including the development of an intermodal, Edinburgh Parks, RAAF Base Edinburgh and agricultural processing
<b>Selection criterion – Visual impact</b>	
Definition	Integrate road into the surrounding landscape by minimising dramatic alterations to the natural landform
Indicator	Impacts on the view of individuals and communities based on proximity impact, view corridor impact, place impact Identification of opportunities at gateways, places and along the corridor
<b>Selection criterion – Noise</b>	
Definition	Minimise effect of noise on the community
Indicator	Number of houses that cannot achieve the noise criteria – between the road reserve and the 63 dB(A) contour; number of houses that can achieve the noise criteria with acoustic treatments – between the 63 dB(A) contour and 50 dB(A) contour
<b>Selection criterion – Property</b>	
Definition	Minimise the effect of acquisition on property owners (titles) and houses
Indicator	Total number of properties (titles), number of whole properties affected, number of properties partially affected, and number of houses under threat

The route selection workshop used a rigorous weighted evaluation methodology to select and recommend a preferred route.

The selection criteria were then paired and a route selection team with a variety of experience and backgrounds was asked to make a judgement about the relative importance of one selection criterion against the other. The final decision was based on the majority view of attendees about the relativity of the criteria. Table 5.2 is a summary of the weighted outcomes of the paired comparisons process in which each criterion was rated against each of the other criteria to determine the relative standings of the set of criteria.

Table 5.2 shows clearly the high significance of noise for the workshop participants, and moderate significance of community accessibility, business development and horticultural effects.

**Table 5.2**  
**Paired analysis**

Selection criteria	Weighted score*
Community accessibility	4
Horticultural effects	5
Business development	5
Visual impact	1
Noise	10
Property	2

\* Highest represents most significant effect.

The routes were ranked first on the weighted criteria score and then, to check the sensitivity of the results, against the unweighted criteria scores. Both the weighted analysis and an unweighted analysis resulted in the selection of the same route.

### 5.1.5 Initial route assessment and selection using monetised criteria

The economic evaluation method used is briefly described in Section 6.2.

The broad results of the benefit cost analysis for the four route options are summarised in Table 5.3.

**Table 5.3**  
**Cost estimates and economic analysis for alternative routes**

Factor	Costs and economic parameters for alternative route <sup>1, 2</sup>			
	White	Green	Blue <sup>3</sup>	Purple
Total cost (undiscounted) <sup>4</sup>	-554	-602	-588	-583
Net present value (NPV) <sup>4</sup>	161	153	-221	130
Benefit cost ratio (BCR) <sup>4</sup>	1.3	1.3	0.6	1.3

Notes:

1. All figures are in \$ million, except BCR which is a ratio. Positive values represent benefits.
2. Based on traffic forecasts pre-March 2006. Forecasts assume high standard link Port Wakefield Road to Salisbury Highway as part of the No Expressway case.
3. Excludes any reconstruction of Main North Road and the Gawler Bypass north of Tiver Road.
4. The costs and benefits of these routes are based on the costs and traffic forecasts at the time of the assessment. However, if updated costs and traffic forecasts were used it would be expected that their relative NPV and BCR ranking for each route would not change.

The results of this assessment show that the white route has the lowest cost, highest NPV and equal highest BCR.



The route selection workshop strongly concluded and recommended that the preferred white route be subject to more detailed investigation and assessment. This was confirmed by the economic analysis of the four routes. The white route was refined further to seek an optimum route configuration for the concept design, and later developed further as the proposed route and became the basis for public consultation and environmental assessment.

#### 5.1.6 Why the proposed Northern Expressway route was chosen

A triple bottom line (TBL) appraisal on both the route selected at the workshop and the proposed Northern Expressway route showed that they would:

- meet *South Australia's Strategic Plan* targets for economic growth, exports, strategic infrastructure and road safety
- meet the AusLink objectives of a strategic route, predominantly for freight traffic, of national and regional significance and producing national and regional economic growth
- although having a relatively high capital expenditure would provide positive economic returns with a positive BCR and relatively high NPV
- provide positive non-monetised economic benefits overall, although with some impact on horticultural production and investment
- provide neutral or slightly positive social effects overall, although with a large effect on property (as would be expected for a new route through a fringe urban area), but less than other routes
- provide marginally negative environmental effects overall, although with both negative and positive specific effects.

The proposed route better caters for long-term potential business and employment opportunities that could be created through an expansion of industrial development, a potential intermodal to the west of the RAAF Edinburgh Base, and a satisfactory buffer to the RAAF Edinburgh Base and potential runway extension. Furthermore, the proposed route optimises access to and from rapidly expanding residential areas such as Andrews Farm.

Some constraints to the project's successful achievement were identified as a result of further investigations and consultation with the Department of Trade and Economic Development (DTED), City of Salisbury, City of Playford and the Department of Defence.

Concerns were raised about the preferred Northern Expressway route being located south of the proposed intermodal, north of RAAF Base Edinburgh close to Heaslip Road. These concerns were also based on the need to recognise the long-term potential business and employment opportunities that could be created through an expansion of industrial development over land north of RAAF Base Edinburgh.

There is potential for new business expansion in the northern region because of the co-location advantages of being near defence, motor vehicle, food value-adding and electronics industries. This trend is expected to continue and further shifts can be expected towards areas such as the Cities of Salisbury and Playford as the population in these areas continues to grow and there is continued investment in infrastructure.

Resulting from these investigations and the additional consultation, the proposed Northern Expressway route was developed as a refinement and partial variation to the 'workshop selected' preferred route. Figure 5.1 shows the routes considered and highlights the proposed Northern Expressway.

It varies, from the original option, at the reconnection points at Gawler and Port Wakefield Road. In addition, it diverts around the northern end of the potential intermodal site, also increasing its separation from RAAF Base Edinburgh, enabling any proposed runway extension and maintaining three-dimensional flight path clearance requirements of the Department of Defence.

It was found that a feasible and beneficial Northern Expressway from Gawler to Salisbury Highway was practicable with some upgrading of Port Wakefield Road and a signalised junction where it connects with Port Wakefield Road. Upgrades would be required to Port Wakefield Road, particularly at major junctions, to cater for the substantial increase in traffic that is attracted to the route when the Northern Expressway is constructed – up to an extra 17,000 vehicles per day in 2011 over existing traffic volumes. Without some improvement, Port Wakefield Road would be very congested by 2011.

The Port Wakefield Road Upgrade component of the overall project proposal will provide adequate, fit for purpose capability to 2016 when further improvement to the link between the Northern Expressway and Salisbury Highway will be required. This link will be the subject of a further planning study.

## 5.2 Port Wakefield Road Upgrade

Planning investigations have addressed the issues associated with increased traffic flow on Port Wakefield Road in the short to medium term up to 2016. Upgrade works are proposed to address safety issues, particularly for vehicles making right-turn entries, and provide additional capacity at its junctions, particularly at Bolivar, Ryans and Martins roads.

The general principles used to develop the upgrade works on Port Wakefield Road are to:

- maintain and/or improve safety on Port Wakefield Road to cater for the increased traffic volumes
- reduce uncontrolled right-turn movements where possible to reduce conflict with the high through volumes on Port Wakefield Road
- reduce side friction by removing direct property access where possible, and by construction of service roads
- increase capacity at the signalised junctions to achieve Level of Service E (LOS E) or better and queue lengths that do not interfere with the operation of adjacent signalised junctions.

While the proposed Northern Expressway will be assessed in terms of its effects projected through to 2026 (15 years of operations from commencement in 2011), the Port Wakefield Road Upgrade component will only be assessed until 2016.

The Port Wakefield Road Upgrade component of the overall project will provide adequate, fit for purpose capability to 2016 when further improvement to the link between the Northern Expressway and Salisbury Highway will be required. This improvement is to be the subject of a further planning study and environmental assessment. Therefore, future arrangements with respect to Port Wakefield Road (post-2016) will not be assessed as part of this Environmental Report.