2. Updated concept design

2.1 Introduction

To open new opportunities and realise economic development the State Government has announced its intention to create a free-flow north–south corridor between Gawler and Old Noarlunga.

The 78 kilometre free-flow transport corridor will consist of four strategic road links:

- Northern Expressway from Gawler to Port Wakefield Road
- Northern Connector from Port Wakefield Road to Port River Expressway
- South Road corridor from Port River Expressway to the Southern Expressway
- Southern Expressway from Darlington to Old Noarlunga.

The Southern Expressway Duplication project will replace the existing reversible roadway with a non-stop, two-way carriageway which meets the needs of its emerging strategic role within the north-south corridor. A new carriageway, to be built to the west of the existing roadway, will provide the northbound lanes while the existing roadway will be utilised for the dedicated southbound lanes.

At a later date, this will be followed by further upgrades to South Road identified within the South Road Planning Study and including the Darlington Transport Project.

2.2 Design overview

The concept design released in May 2011 through the Project Impact Report was based on an early design for the duplication of the expressway. Following further planning, design and investigation work and evaluation of feedback from the community, the concept has been further developed. The current configuration of the new carriageway is based on the predicted traffic volumes in 2031.

The updated concept, shown in Figures 2.1–2.6 includes:

- an additional fourth, northbound lane in the section between the Reynella Interchange and Marion Road
- western alignment through the escarpment at Darlington
- details of the arrestor bed north of Seacombe Road
- a re-introduction of access to Brodie Road to and from the northbound on-ramp at Sherriffs Road Interchange
- duplication of Beach Road from east of the expressway to Goldsmith Drive
- rehabilitation works on the existing expressway by relaying the asphalt surface
- modifications to the existing Intelligent Transport System (ITS) infrastructure that controls the reversible expressway and signage converting the expressway to dual direction
- median breaks at select locations along the expressway for emergency service vehicles
- location of new or upgraded detention basins, and
- noise walls.

At the southern end of the expressway, traffic will be able to enter the duplicated expressway from Old Noarlunga Interchange, Beach Road and Sherriffs Road interchanges. Two lanes of traffic from Old Noarlunga to the Reynella Interchange will increase to four lanes to Marion Road, meeting the predicted traffic volume for this section. From Marion Road three lanes will carry traffic to the northern end of the expressway at Bedford Park Junction, where traffic signals will control the exit to Main South Road.
2.3 Traffic volumes and access

Overall access to and from Adelaide’s southern metropolitan area is predominantly serviced by three major arterial roads: Main South Road, Southern Expressway and Ocean Boulevard / Lonsdale Road / Dyson Road. These three arterial roads meet traffic demands for travel to and from the region as well as local trips. The expressway predominately caters for long distance trips, with the other two arterial roads catering for shorter, local trips.

The importance of the expressway duplication as part of the north-south transport corridor has necessitated a review of access. Additional turning movements will be provided as part of the duplication at the Marion Road Interchange, allowing for all movements to and from the expressway. Formalisation of the left turn onto Main South Road at the southern end will be provided. However, no additional access will be provided as part of the duplication but the design of this project will enable future southbound access at the Reynella Interchange to be constructed at a later time should traffic demand justify it.

2.3.1 Additional lane

The demand for travel to and from the region is forecast to increase by over 20 per cent by 2031 and the quality of travel (level of service) currently experienced along Main South Road, Southern Expressway and Ocean Boulevard / Lonsdale Road / Dyson Road will gradually decline. In the area south of Patpa Drive and Lander Road the capacity of these roads is sufficient to maintain an acceptable level of service. However, the level of service to the north will become unacceptable, particularly in the morning peak period, without further improvements.

Detailed modelling has indicated that the traffic volumes in the northbound morning peak between the Reynella Interchange and Marion Road are 25 per cent higher than those in the southbound afternoon peak. Consequently, a three lane northbound carriageway will be at capacity in the morning within two years of completion of the duplication. Therefore, an additional fourth traffic lane from the Reynella Interchange to Marion Road will be constructed as part of the duplication works also providing cost savings by integrating the work with the duplication.

For the southbound direction (Marion Road to Reynella Interchange), the existing three traffic lanes on the expressway can adequately cater for the forecast southbound afternoon peak traffic. This is discussed further later in this report.

2.3.2 Alignment

The land to the western (and northern) side of the expressway through Darlington and Bedford Park was reserved by the State Government for the duplication at the time of Stage 1 and Stage 2 construction, in 1997 and 2001. The existing expressway was located as far east and south as possible (south of Marion Road Bridge) to provide the maximum available space in the road reserve for the future duplication.

Therefore, the new northbound carriageway will be constructed to the west of the existing expressway, with the existing expressway becoming southbound travel only.

The alignment option from Seacombe Road through the escarpment to north of Majors Road has also been revised. The first concept suggested building this section of the new carriageway to the east to avoid the rock on the western side. However, feedback from construction contractors suggests there are advantages in continuing the carriageway to the west through the escarpment, with access and processing of the high-grade rock for the use in construction of the road. This shift also avoids building...
near the 2.1 metre diameter water pipe located in this area, and complex road matching between the
new and the existing carriageways.

The existing expressway (including the Patrick Jonker Veloway) and the Marion Road on-ramp is
located adjacent to businesses and the large storage tank. Therefore, it would be difficult to fit the new
carriageway within the existing road reserve without impacting the businesses on Main South Road
that back onto the expressway and relocating water infrastructure. Constructing the new carriageway
on the eastern side of the expressway would also require the signals at the Marion Road Interchange
to be relocated closer to the Main South Road intersection, resulting in poor operation of these signals
and the signals at the intersection of Main South Road and Marion Road due to reduced capacity,
increasing queues and traffic delays. The expressway would also have to be closed for extensive
periods during construction.

2.3.3 Interchanges

Interchange design will ensure safe and efficient access for all users of the Southern Expressway.

New ramps, on and off, will be built to enable north and southbound traffic to enter the expressway
while ensuring traffic already on it can maintain travelling speeds safely.

The issue of additional access and egress was investigated as part of the planning study for the
duplication project. The investigations showed the southern arterial road network of Main South Road,
Southern Expressway and Ocean Boulevard / Lonsdale Road / Dyson Road has the traffic capacity to
cater for predicted traffic volumes up to 2031. The expressway will cater for longer distance trips,
leaving shorter more 'local' trips on the adjacent arterial road network.

Given the high speed environment of an expressway, safety is also a critical concern. Additional
access points along the expressway introduce additional traffic weaving manoeuvres, which have
consequential effects on traffic safety.

2.3.3.1 Bedford Park Junction

The initial announcement of the project indicated that the Southern Expressway Duplication would be
combined with an interchange at South Road Darlington as part of the proposed Darlington Transport
Project. The Darlington project also included grade separation of the junction of South Road and
Flinders Drive and the intersection of South Road and Sturt Road. The complexity of traffic movements
off the Southern Expressway merging with traffic on South Road combined with manoeuvring to
access Flinders Drive and Sturt Road in under a kilometre means these three interchanges cannot be
considered in isolation. The final design of each has a major impact on the design of the others.

Lack of Federal funding has delayed the Darlington project and the concept design is being reviewed.
Consequently, the junction treatment of Southern Expressway with South Road at Darlington has to be
an interim solution. The Darlington Transport Project will determine the options for the final grade
separated interchange at the junction of Main South Road and the Southern Expressway at Darlington.
The lowest cost interim solution is the provision of traffic signals which can be relatively easily removed
during future grade separation works.

Refer Figure 2.1 Bedford Park Junction.
2.3.3.2 Marion Road Interchange

Access to and from Marion Road will see the addition of a left turn onto and right turn from the expressway controlled by traffic signals. Three northbound lanes on the expressway will be maintained across Marion Road.

Residents of Flagstaff Hill and the surrounding suburbs can access the expressway by Flagstaff Hill Road at the Marion Road Interchange.

Refer to Figure 2.2 Marion Road Interchange.

2.3.3.3 Reynella Interchange

The new on-ramp will have two lanes to enter the northbound carriageway of the expressway from the intersection of Panalatinga Road and Main South Road. The expressway will be four lanes from the interchange to accommodate northbound traffic entering at this point.

The existing ramp at the Reynella Interchange will be modified to become the off ramp for southbound traffic and a new structure will be constructed to take traffic above the expressway enabling it to merge with northbound traffic on the expressway (from the left hand lane).

The Reynella Interchange design will enable future southbound access and northbound exit access to be constructed at a later time should traffic demand justify it.

An upgrade to the intersection of Panalatinga Road and Main South Road is also required to provide additional capacity for the operation of the duplicated expressway (to be finalised as part of the final design).

Refer to Figure 2.3 Reynella Interchange.

2.3.3.4 Sherriffs Road Interchange

The duplicated carriageway will overpass Sherriffs Road. Two new signal-controlled off ramps will cater for north and southbound traffic.

The earlier proposal to remove the roundabout from the northbound on-ramp at Sherriffs Road Interchange and provide a new service road connected to Sherriffs Road has been reviewed. A number of alternative configurations for access into the Lonsdale industrial precinct were considered and it is now proposed to retain access with a signalised T-Junction connected to the road. However, the actual on-ramp itself does not commence until after these signals.

Pedestrian and cycling movements will be modified to suit.

Refer to Figure 2.4 Sherriffs Road Interchange.

2.3.3.5 Beach Road Interchange

Beach Road will pass over the duplicated expressway. Access on and off the duplicated Southern Expressway will be provided in all directions at the Beach Road Interchange with a new entry and exit ramp constructed on the eastern side. The existing ramps on the western side will be modified to complement the new design of the interchange. Turning movements at each set of signals will be provided in all directions.

Traffic analysis indicates that the capacity of the existing Beach Road adjacent the expressway is insufficient to cater for the demand from a duplicated expressway, and that extra capacity will need to
Figure 2.1 Bedford Park junction
Figure 2.2 Marion Road interchange

- New Right Turn
- Marion Road off-ramp
- Marion Road on-ramp
- New Left Turn

Legend:
- Purple: Concept Design Off-ramp/On-ramp
- Green: Updated Concept Design
Figure 2.3 Reynella interchange
Figure 2.4 Sherriffs Road interchange
be provided from east of the expressway interchange to Goldsmith Drive. Without additional capacity on Beach Road, traffic from the off ramps is likely to back-up onto the expressway causing delays and safety concerns.

The concept includes widening of Beach Road on either side of the expressway and extends to Goldsmith Drive. The concept design for the Beach Road Interchange shows:

- the new duplicated carriageway, comprising two lanes, located on the western side of the existing expressway
- new entry and exit ramps on both the western and eastern sides
- two through lanes heading west along Beach Road to Goldsmith Drive
- two right turn lanes from Beach Road onto the expressway (heading north)
- two through lanes heading east from the Goldsmith Drive / Beach Road intersection
- right turn lanes from Beach Road onto the expressway (heading south)
- a dedicated left turn (north-bound) lane from Beach Road onto the expressway.

Pedestrian and cycling movements will be modified to suit the new interchange arrangement.

Refer to Figure 2.5 Beach Road Interchange.

2.3.3.6 Old Noarlunga Interchange

Northbound traffic will enter the expressway at Old Noarlunga Interchange via dedicated free-flow lanes. Traffic signals will control the southbound exit from the expressway to Main South Road and the left turn onto Main South Road will be formalised. Traffic analysis indicates this configuration will comfortably cater for projected volumes to at least 2031.

Refer to Figure 2.6 Old Noarlunga Interchange.

2.3.4 Arrestor bed

The existing arrestor bed north of Seacombe Road will be relocated as part of the construction works. The location of the arrestor bed (at the base of the steep escarpment grade, after the last curve) and its alignment, needs to be as straight as possible as vehicle control in the arrestor bed is limited.

The arrestor bed will be filled with gravel stones, designed to bring a heavy vehicle entering at a speed of up to 130 km/h to a gradual stop.

The adjacent lane on the off ramp to Marion Road will be temporarily closed when errant vehicles that have entered the arrestor bed are removed.

The addition of the fourth lane and location of the arrestor bed will require the full width of the existing reserved road corridor, some of which is currently used as pedestrian paths. Further development of the design is progressing to determine the best alternatives for the pedestrian paths in this localised area, including linking them to existing inner-street walkways.

2.3.5 Emergency service access

In addition to the retention and improvement of the emergency service access point at Majors Road, turn-arounds in the median at select locations will also be constructed to enable emergency service vehicles to move from one carriageway to the other when responding to incidents in either direction.
These turn-around facilities will be controlled by electronic boom gates for exclusive use by emergency service vehicles only.

2.3.6 Pedestrian and cycling

At various locations along the expressway, the Veloway and Patrick Jonker (Shared) Pathway will need to be modified to suit the new duplicated expressway. The most significant changes occur around the Reynella Interchange where the Sea and Vines Pathway will be taken up and over the expressway to match into the Patrick Jonker Pathway. This pathway will also be modified to allow the new northbound on-ramp.

The expressway currently has many informal, unsealed pathways on the western side. Where possible, these pathways will be preserved or relocated as part of the works. Opportunities to extend or enhance these pathways will be investigated as part of the final design.
Figure 2.5  Beach Road interchange
Figure 2.6  Old Noarlunga interchange

- Current pavement to be removed
- Updated Concept Design