5. Project description

5.1 Context

The planning and concept development phase of the project has produced a concept design for the duplicated carriageway to enable the Southern Expressway to operate as a conventional two-way road at all times. A budget of $445.5 million has been allocated with construction due to begin in late 2011.

The concept design of the duplicated expressway combines preferred elements identified and developed in the planning stages of the project. The planning study identified alternative solutions for the main alignment and interchange locations that best met the project objectives. These alternatives were then assessed against a broad range of criteria to identify a preferred solution at each location. The concept design will be further developed and refined to resolve outstanding design issues and to respond to feedback from stakeholders and the community as appropriate.

A map illustrating the concept design along the length of the Southern Expressway corridor is attached at the back of this Project Impact Report.

5.2 Development of concept options

Development of alternative solutions at mid-block and interchange locations considered:

- engineering and environmental issues identified through pre-planning investigations
- comments and information from discussions with local councils, local communities and other government departments
- project constraints and objectives
- land acquisition
- safety to all potential user modes
- ease of construction including staging and traffic management during construction, earthworks, noise, vibration and duration
- cost.

The configurations of on-ramps and off-ramps with arterial and local roads at each upgraded interchange were determined to cater for predicted future peak hour traffic volumes.

Access to the Southern Expressway at the existing interchange locations will allow the additional movements of:

- left turn from Marion Road to travel southbound on the Southern Expressway
- right turn from Southern Expressway (northbound) to Marion Road
- formalised left turn from Southern Expressway (southbound) to Main South Road at Old Noarlunga.

Additional access to the Southern Expressway at Landers Road and Seacombe Road will not be provided due to their proximity to adjacent interchanges, and the consequential effects on traffic safety. Similarly, provision of additional access at Majors Road cannot be justified due to its impact on the expressways traffic flows and the generally good traffic conditions that will be available on parallel routes.

This project considers configurations for an interim upgraded interchange at Main South Road, Darlington only. Options for the final, fully grade separated interchange are still under development as
part of the Darlington Transport Study. The timing of construction is dependent on funding by the Australian Government and is currently unclear.

5.3 Concept design

Key features of the concept design include:

- a new carriageway along the full length of the Southern Expressway, located generally on the western side of the existing road but deviating to the eastern side for a 2-kilometre section between Darlington and Reynella, and in the main with three traffic lanes between Darlington and Reynella, and two traffic lanes between Reynella and Old Noarlunga

- new on-ramps and off-ramps at existing interchanges, improved signalised access at Marion Road interchange (via left turns onto and right turns from the expressway) and formalisation of the southbound left turn at Main South Road interchange at Old Noarlunga

- two-way traffic flow at all times

- various options for a compatible interim intersection of the Southern Expressway with Main South Road ranging from partial grade separated interchanges to a signal controlled junction

- two-way traffic flow at the Panalatinga Road interchange will require a new northbound on-ramp and utilisation of existing southbound off-ramp

- Sherriffs Road interchange including new northbound and southbound off-ramps, with traffic signal control at Sherriffs Road; a realigned Brodie Road (north) to connect directly into Sherriffs Road interchange, eliminating the need for the roundabout on the Southern Expressway on-ramp

- Beach Road interchange modified to include new on-ramp and off-ramp on the eastern side of the carriageway, with traffic signal controlled intersections on both sides of the Southern Expressway at Beach Road

- upgrading the junction at Main South Road at Old Noarlunga to include the duplicated carriageway

- lengthened or replaced pedestrian bridges across the Southern Expressway corridor

- existing road bridges supplemented by new bridges across the duplicated road

- sections of the Patrick Jonker Veloway and Bikeway adjacent to the Southern Expressway relocated to maintain access along and across the project corridor.

Figure 5.1 illustrates typical cross-sections of the concept design along the length of the Southern Expressway.

A map illustrating the concept design along the length of the Southern Expressway corridor is attached at the back of this Project Impact Report.
Darlington to Panalatinga cross section

Panalatinga to Old Noarlunga cross section

Note: Drawings are issued for comment only and are subject to detail design
5.4 Design standards and principles

The concept design has been developed in accordance with relevant Australian Standards, and guidelines and principles.

5.4.1 Road

- The duplication will be designed to relevant standards. At interchanges and intersections of the new Southern Expressway carriageway with arterial and local roads (i.e. on-ramps and off-ramps), the road will be designed to cater for the turning requirements of B-double vehicles.

- The design speed for the new carriageway will be 10 kilometres per hour (kph) above the intended posted speed limit: 110 kph with the exception of the downgrade (northbound) section from the Darlington escarpment and on Main South Road north of the Southern Expressway intersection at Old Noarlunga which will have design speeds of 90 kph corresponding to posted speed limits of 80 kph.

- Design speeds for all road crossings over or under the Southern Expressway will generally be 70 kph (i.e. 10 kph above the posted speed limit of 60 kph) except at Majors Road where the design speed will be 80 kph.

5.4.2 Advanced traffic management

The application of advanced traffic management and surveillance systems to manage the risks of road crashes and to enable effective response to incidents on the Southern Expressway has been investigated. The range of traffic management and surveillance tools that may be implemented include:

- variable and changeable message signage
- variable speed management
- emergency help telephones
- surveillance (CCTV camera, video detection, detection loops).
- connectivity and integration with STREAMS integrated intelligent transport system
- connectivity with, and monitoring and control functionality from the Department for Transport, Energy and Infrastructure (DTEI) Traffic Management Centre.

5.4.3 Landscape and urban design

Landscape and urban design for the project will be guided by the principles:

- integrate the new expressway infrastructure with the existing
- improve the environment in sensitive ecological and cultural areas such as Field River, Warrriparinga and artificial stormwater wetlands through best practice environmental design
- enhance the amenity of the expressway corridor, and formalise and improve strategic walking and cycling linkages.

New and existing Southern Expressway infrastructure can be integrated through good urban design enhancing the amenity for the surrounding landscape and the driver experience.
Landscape and urban design concepts for the duplication will complement the objectives of the project and have considered:

- **Landscape character** – create a memorable experience for users and local communities, and enhance the character of the unique natural qualities of the surrounding environment.

- **Environment** – minimise disturbance to areas of high conservation value, and protect and enhance biodiversity.

- **Access** – integrate existing pedestrian/shared use paths with the landscape.

- **Amenity** – incorporate crime prevention through design principles, public art, natural features and low maintenance treatments that improve the amenity of the local environment along the corridor.

The overall landscape and urban design strategy considers travellers, neighbours and the environment equally. **Figure 5.2** illustrates its key components.

Urban design elements link visually and physically to the cross roads and pedestrian/cycling paths.

Five landscape and urban design elements are proposed to be incorporated into the project.

**Noise mitigation treatments**

Noise mitigation treatments will be required along a number of sections of the Southern Expressway corridor. Two types of treatments are expected to be used: noise walls and landscaped earth mounds (**Figure 5.3**).

**Bridges**

The visual appearance of bridges has an impact on the visual amenity of the Southern Expressway. Existing bridges may be maintained and lengthened, or replaced depending on cost effectiveness. The design consideration for all bridges, either road or pedestrian, is to be visual consistent with existing bridges. **Figure 5.4** illustrates the conceptual drawings for various road bridges and the conceptual design of new pedestrian bridges, subject to detail design.

**Retaining walls and abutments**

Extensive retaining walls will be required in certain locations along the Southern Expressway corridor. New retaining walls will be designed to highlight natural geological features where possible and be consistent with the landscape character and noise wall treatments.

**Pedestrian and cycling paths**

The duplicated carriageway will impact on a number of pedestrian and cycling paths which currently cross or run adjacent to the Southern Expressway carriageway. The intention is to retain these linkages between communities.
Main South Road interchange at Darlington
- Improve pedestrian linkages

Open woodland planting to minimise visual impact of corridor

Panalatina Road interchange
- Maximise environmental rehabilitation and protection of Field River corridor
- Improve pedestrian/ bike linkages
- Maxmise pedestrian and cyclist views to Field River corridor

Reinforce character of Christies Creek corridor

Community linkages
- Improve east-west pedestrian connectivity and way finding
- Adopt screen planting to minimise visual impact on adjacent residences

Main South Road interchange at Old Noarlunga
- Improve pedestrian connectivity to new residential developments

Beach Road interchange
- Improve pedestrian linkages and general amenity

Southern Expressway Duplication
Major interchange
Minor interchange/bridge crossing

Overall urban design Strategy map
Figure 5.2
Conceptual plan - typical duplicated expressway

- Existing Veloway and batter treatment to be retained
- Revegetation
- Noise wall
- Pedestrian path

Conceptual plan - typical vehicle bridge

- Existing Veloway /Bikeway and batter treatment to be retained
- Crash barrier
- Bridge extension

Conceptual plan - typical pedestrian bridge

- Crash barrier
- Concrete column
- Throw screen shown dashed

Note: Drawings are issued for comment only and are subject to detail design

Typical plan view

Figure 5.3
Typical local road bridge and pedestrian bridge treatment

Figure 5.4
Landscaping

It is envisaged the majority of landscaping will be from seed collected on-site. Two overriding planting design strategies are proposed based on providing a sustainable, low maintenance, visually appealing and environmentally sensitive response:

- dense native planting at interchanges and local road crossings, in areas where buffer screening is required and in locations that enhance the local environment, will suppress weeds and could be more structured in layout than random plantings
- dryland grass and scattered tree plantings with sufficient access for weed spraying and slashing, would typically be located in mid-block sections along the corridor.

Figure 5.5 illustrates the proposed landscape planting palette.

Other opportunities

Through the course of developing conceptual urban design treatments for the project, some areas have been identified that would be suitable for integration of community and cultural development programs, such as community planting days – through avenues such as the Urban Forest Biodiversity Program and Greening Australia, local community groups can be supplied with plants and labour for additional planting in areas adjacent to the corridor to improve biodiversity and amenity

Conceptual landscape treatments

Figures 5.6 to 5.13 illustrate conceptual landscape treatments for Main South Road interchange at Darlington, Panalatinga Road interchange, Field River through to Young Street bridge, Sherriffs Road interchange, Beach Road interchange and Main South Road interchange at Old Noarlunga.

5.4.4 Surface water drainage

The standards adopted for the design of drainage systems in the project aim to mitigate effects on downstream systems, and provide safety to road users during operation of the Southern Expressway. Overall the basis for design proposes to incorporate the stormwater management considerations of:

- design of the stormwater infrastructure for the roadway, including pavement drainage, and culverts to DTEI’s service standards and design life requirements
- treatment of stormwater using, where possible, water sensitive urban design techniques such as vegetated swales, ephemeral wetland systems, vegetated detention and retention basins
- use of a risk-based management approach to address environmental impacts associated with stormwater to help address identified issues, particularly for sensitive receiving environments such as major watercourses
- provision of spill containment in stormwater treatment ponds.

5.4.5 Structures

Subject to detailed design existing road bridges that cross the Southern Expressway are likely to be retained and linked to new bridges constructed across the new carriageway. Pedestrian bridges across the Southern Expressway corridor will be either lengthened or replaced. This approach will be further investigated in detailed design. Minor structures to be modified and extended include drainage culverts and pedestrian accesses located under the Southern Expressway.
Bridge structures in the project corridor are to be designed in accordance with Australian Standard AS5100: Bridge Design.

Key criteria for bridge structures include:

- minimum vertical clearance requirements of 5.3 metres for bridges over local roads and the Southern Expressway in accordance with Part 1 of AS5100: Bridge Design
- bridges over creeks and rivers designed for a 100 year average recurrence interval flood event
- urban design considerations, in particular for bridges to be duplicated, to complement or match existing shapes and forms
- future provision for throw screens on new bridges over the Southern Expressway
- pedestrian bridges with throw protection screens
- minimising maintenance requirements.

The project will also include retaining walls and noise mitigation treatments designed to relevant Australian Standards.

5.4.6 Lighting

Roadway public lighting will be designed in accordance with Australian Standard AS1158: Lighting for roads and public spaces. Roads under the care and maintenance of DTEI are further subject to DTEI design and technical guidelines. Roads under the care and maintenance of local council are further subject to council design and technical guidelines.

Lighting will be provided at interchanges but not along road mid-block sections between interchanges.

The effects of lighting on the environment will be managed by the:

- using energy efficient lamps and equipment which have minimal demands and effects on the electricity supply system
- providing adequate but not excessive illuminances and luminances for the specific lighting category
- using specifically designed lighting infrastructure and installation geometry, which will confine most of the emitted light to the carriageway, minimise sky glow and reduce adverse effects on residential areas adjoining the road.

5.4.7 Utility services

Utility services will be affected in numerous locations along the Southern Expressway corridor. The precise nature of these effects will be determined through further investigation and consultation with service owners/operators. Appropriate design and management arrangements will be used to minimise impacts and avoid disruptions to the services.

5.5 Construction phase

In broad terms, events in the construction phase are likely to be conducted in the following sequence over a three year period to mid-2014:

- services relocation
- blasting and earthworks
- drainage relocation and installation
- bridge piling and pier erection
- bridge deck/superstructure erection
- main alignment road construction
- tying the alignment into existing and new interchanges.

This sequence should minimise disturbance to traffic flows along the Southern Expressway and local roads. Some disruption to traffic flow will be necessary for safety and construction access and to reduce construction time at locations requiring complex activities and in close proximity to traffic. It is expected some sections of the Southern Expressway may need to be closed to expedite certain construction phases.

The construction of the project, including the associated interchanges, requires a well-considered construction environmental management plan. The precise nature of this plan will be determined with further investigation and through appropriate design and management arrangements to minimise disruption.
Trees
Acacia melanoxylon  Blackwood
Allocasuarina verticillata Drooping Sheoak
Callitris preissii  Native Pine
Eucalyptus porosa  Mallee Box
Eucalyptus camaldulensis River Red Gum
Eucalyptus leucoxylon South Australian Blue Gum
Eucalyptus microcarpa Grey Box
Eucalyptus viminalis Manna Gum
Pittosporum pylliraeoides Native Apricot
Santalum acuminatum Quandong

Shrubs
Acacia acinacea  Wreath Wattle
Acacia dodonaeifolia Hop Bush Wattle
Acacia ligulata Umbrella Bush
Acacia paradoxa Kangaroo thorn
Acacia pycnantha Golden Wattle
Acacia retinodes Wirilda
Acacia victoriae ssp. victoriae Elegant Wattle
Atriplea suberecta Lagoon saltbush
Banksia marginata Silver Banksia
Bursaria spinosa Bursaria
Callistemom sieberi River Bottlebrush
Calytrix tetragona Common Fringe Myrtle
Goodenia ovata Hop Goodenia
Leptospermum lanigerum Silky Tea Tree
Melaleuca decussata Tolem Poles
Melaleuca lanceolata Dryland Tea Tree
Myoporum montanum Native Myrtle
Myoporum viscosum Sticky Boobialla
Nitraria billardierei Native Plum
Olearia ramulosa Twiggy Daisy Bush
Pittosporum phylliraeoides Native Apricot
Rhagodia parabolaic Mealy Saltbush
Xanthorrhoea australis Grass Tree

Groundcovers
Astroloma humifusum Native cranberry
Billardiera cymosa Sweet Apple Berry
Carpobrotus aequiaterus Pigface
Carpobrotus rossii Pigface
Enchylaena tomentosa Ruby Saltbush
Hardenbergia violacea Native lilac
Kennedia prostrata Scarlet Runner
Kunzea pomifera Muntries
Myoporum parvifolium Creeping Boobialla

Clumping Plants
Carex bichenoviana Notched Sedge
Chrysocephalum apiculatum Yellow Buttons
Cyperus gymnocaule Spring Flat Sedge
Cyperus vaginatus Stiff Flat Sedge
Danthonia caespitosa Wallaby Grass
Dianella revoluta Black Anther Flax Lily
Ficinia nodosa Knobby Club Rush
Juncus kraussii Sea Rush
Juncus pallidus Pale Rush
Lomandra densiflora Soft Tussock Mat Rush
Lomandra longifolia Spiny Headed Mat Rush
Scaveola albida Pale Fan Flower
Themeda triandra Common Kangaroo Grass
Typha sp. Bulrush
Note: Drawing references Darlington Transport Study ultimate scheme consistent with Darlington Transport Study PIR and are not part of this project. Drawings are issued for comment only and are subject to detail design.
New alignment of Veloway under bridge with rest point.

New bridge northbound entrance ramp. New shared use path to be at grade with bridge.

Possible of filtration basin

Existing Veloway and culvert retained

Rehabilitation planting

Possible new pedestrian boardwalk crossing

Rest point

Realigned basin

Creek modification

Formalised pedestrian path

Shared use path realigned and connected to Coast to Vines Trail

Note: Drawings are issued for comment only and are subject to detail design

Figure 5.7

Landscape concept plan- Panalatinga Road interchange with Northbound on ramp

Batter planting

River/creek corridors

Paths

Dryland grass

Native grass planting
New bridge
Bridge abutment

Conceptual abutment elevation

Built up landscape to new bridge
New bridge
Expressway

Conceptual site section/elevation

Shared path to be at grade with Northbound on ramp over existing expressway
Node where Veloway meets shared path.
New abutments
Concrete piers

Conceptual site plan

Note: Drawings are issued for comment only and are subject to detail design

Panalatinga Road Interchange on ramp concept

Figure 5.8
Conceptual Northern approach elevation

Conceptual Southern approach elevation

Conceptual pier section

Note: Drawings are issued for comment only and are subject to detail design

Panalatinga Road Interchange on ramp concept

Figure 5.9
Formalised pedestrian path. Potential for future path connection to residential areas

New basin and modified creek. Basin to slow down water movement reducing erosion.

Modification to existing basin and creek.

Possible new sedimentation basin

Possible new filtration basin

Rehabilitation planting

Batter planting

Rock armouring (Stabilisation)

Panalatinga Creek

Rehabilitation planting

Culvert extension

Young Street Bridge over Expressway

SOUTHERN EXPRESSWAY

Field River

Note: Drawings are issued for comment only and are subject to detail design

Landscape concept plan: Field River and Young Street Bridge

Figure 5.10
Landscape concept plan- Sherriffs Road interchange

- Formalised pedestrian path
- Realigned shared path
- Realigned grassed detention basin
- Existing Wetland to be retained
- Localised revegetation to improve pedestrian amenity
- New shared path alignment to connect to existing

Note: Drawings are issued for comment only and are subject to detail design
Localised mounding with revegetation to improve pedestrian amenity using excess spoil from site.

Revegetation (Grey Box woodland species) and retained vegetation (Grey Box woodland species).

Planting where possible to break up mass of retaining walls.

Significant native vegetation (Grey Box woodland) to be protected and retained.

Note: Drawings are issued for comment only and are subject to detail design.

Figure 5.12: Landscape concept plan-Beach Road interchange.
Note: Drawings are issued for comment only and are subject to detail design.