



Highway assessment: South Eastern Freeway

Report: May 2020

Motor | Home | Travel

RAA at a glance



South Australia's
largest
membership organisation



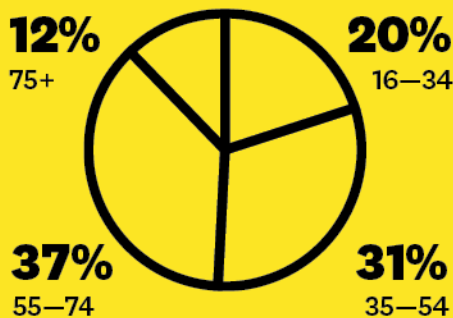
Advocating for South
Australians for over
115 years



750k+
current members
(55% of SA adults)



52%
Just over half our
members are women



Our members span
all adult age groups



1000+
staff employed
across SA



Largest
personal lines
insurer in SA



350k
roadside rescues
per year



450+
tourism providers
promoted on Experience SA



500+
businesses accredited
through RAA's Approved
Repairer network



27k
SA school students
educated on road safety
each year



23k+
free lessons delivered
to keep SA learner
drivers safe

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Executive summary

RAA is South Australia's largest member organisation, representing more than 750,000 South Australians – about half the state's population. Through our diverse range of motor, home and travel products and services, we engage with our members in a variety of ways. This has given us unique insights into transport infrastructure improvements that South Australians want and need.

RAA has had a trusted advocacy role in transport and mobility for more than 115 years, and through this we've developed an expert understanding of South Australia's transport infrastructure requirements. We ensure our advocacy is evidence-based by consulting with industry, government and our members and by utilising open source data and our own research to develop and test our recommendations.

RAA aligns its mobility advocacy with the following three themes:

- **Safe** – A safe mobility system can be defined as a system that not only achieves, but outperforms, national and international safety benchmarks. It encompasses safe people, using safe vehicles, on safe roads, at safe speeds.
- **Accessible** – To have a cost efficient, convenient and reliable transport network as an essential part of personal mobility.
- **Sustainable** - Sustainable mobility encompasses the needs of current and future generations, and considers financial, societal and environmental factors.

Through member feedback received as part of our Adelaide Hills regional road assessment, the South Eastern Freeway has been identified as the biggest pain-point in the Adelaide Hills Region. This piece of infrastructure is vital to the Adelaide Hills region, but also the whole state due to its significance to both freight and tourism in South Australia.

The methodology used to produce this report involved a review of member feedback prior to undertaking several days of field work to assess and review the issues raised. The findings and subsequent recommendations from this field work are presented throughout this report along with a review of open-source information including crash, traffic volume and expiation data.

RAA has outlined a series of recommendations aimed at improving safety on the South Eastern Freeway and improving connectivity with the future North-South Corridor.

RAA's key recommendations for the South Eastern Freeway



1. To encourage operators to use Higher Productivity Vehicles (HPVs) and alternative routes to the South Eastern Freeway:

Undertake road widening, shoulder sealing and intersection upgrades along the existing freight route between Murray Bridge and Truro, to encourage and support the safe and sustainable operations of HPVs.

2. If no alternative freight route is developed by the time the North-South Corridor is constructed:

In the interim, undertake improvements to safety and accessibility on Cross Road between the South Eastern Freeway and South Road, that will ensure safe travel for all road users, and sustainable travel for the freight industry. RAA considers this is an interim option only and that an alternative link must be provided to achieve a safe and sustainable connection between these two critical corridors.

3. To improve safety on the South Eastern Freeway descent:

3a. Invest income generated by the Crafers and Leawood Gardens speed cameras directly into improving safety on the South Eastern Freeway.

3b. Upgrade signage as part of an intelligent motorway upgrade between Crafers and Glen Osmond. This includes overhead gantries, with speed limit signs for each lane to better highlight the prevailing speed limit, particularly for vehicles travelling in the centre lane that may be less likely to observe speed limit signs obscured by other vehicles.

3c. Consider further intelligent transport systems, such as devices on the descent that can detect and display a vehicle's speed in real time. This isn't for enforcement purposes, but to direct an appropriate warning message to speeding vehicles, and direct heavy vehicles to use a safety ramp where needed. This could incorporate individual signs on a gantry above each lane, or overhead digital variable message signs located on the roadside, like those at the Crafers interchange and prior to entering the Heysen Tunnels. These signs could also be installed on the numerous bridges over the South Eastern Freeway between Crafers and Glen Osmond.

3d. Install additional advance warning signage, as well as a deceleration/entry lane for the truck parking area 450m west of the Heysen Tunnels.

3e. Install an additional safety ramp below the current lower ramp, that includes a dragnet system to stop runaway vehicles.

4. To improve pedestrian safety at the intersection with Portrush Road:

4a. Widen pedestrian refuges and set crossings further back from the intersection where possible.

4b. Stagger the staged pedestrian crossings to increase the spacing between pedestrians waiting in refuges and turning vehicles.

4c. Fully control the slip lane from the South Eastern Freeway into Cross Road along with a review of other turn movements and signal phasing at the intersection to ensure the capacity of the left turn lane is not exceeded. If no alternative freight route is implemented before the completion of the North-South Corridor, this slip lane will need to be converted to dual lanes and reviewed again.

4d. Fully control the slip lane from Glen Osmond Road into Portrush Road.

Continued >>

RAA's key recommendations for the **South Eastern Freeway** (continued)



5. To improve safety and efficiency on other sections of the South Eastern Freeway:

5a. Investigate and plan for the construction of a third lane between Stirling and Verdun, so that plans will already be available when this section of the South Eastern Freeway reaches levels of congestion that warrant construction of an extra lane.

5b. Install additional safety barriers to protect roadside hazards between Mount Barker and Monteith.

6. To improve safety, accessibility and consistency at South Eastern Freeway interchanges:

6a. (Mount Osmond) Install give way signs and line marking at the intersection of the westbound off-ramp and Mount Osmond Road.

6b. (Stirling) Extend the eastbound Stirling on-ramp by at least 100m to allow safer eastbound access to the South Eastern Freeway from Stirling and address the poor sight distance at this location.

6c. (Stirling) Install give way signs and line marking at the intersection with the westbound off-ramp and Mount Barker Road in Stirling.

6d. (Bridgewater) Install roundabouts at the Bridgewater interchange in conjunction with a lane reduction on Carey Gully Road, in line with safe system principles. This will improve safety by reducing impact angles and conflict points.

6e. (Bridgewater) Extend the westbound on-ramp acceleration lane to allow more time for vehicles to safely enter the South Eastern Freeway when heading towards Adelaide.

6f. (Verdun) Upgrade the Verdun interchange to provide full access to and from the South Eastern Freeway in each direction.

6g. (Verdun) Extend the westbound acceleration lane to allow more time for vehicles to safely enter the South Eastern Freeway when heading towards Adelaide.

6h. (Mount Barker) Explore the feasibility of installing channelised right-turn lanes to access the freeway on-ramps at the Mount Barker interchange.

6i. (Mount Barker) Upgrade the southern intersection at the Mount Barker interchange, which may include a roundabout or signalisation.

6j. (Mount Barker) Extend the westbound acceleration lane to allow more time for vehicles to safely enter the South Eastern Freeway from Mount Barker towards Adelaide.

6k. (Monarto South) Install give way signs and line marking on each of the off-ramp approaches to Ferries McDonald Road.

6l. (Murray Bridge) Review the speed limit on Jervois Road with consideration given to applying a 60km/h speed limit between the Swanport Hotel and Irena Court.

7. In terms of policy and regulatory improvements, RAA recommends:

7a. Clearly publicise that no fee is charged for extracting a heavy vehicle from the safety ramps, and that the cost of towing to a safe place is covered by DPTI.

7b. Consider adopting a GCM-based model for the classification of vehicles to which Section 45C of the Road Traffic Act 1961 applies, for vehicles travelling on the prescribed section of the South Eastern Freeway. This will require consultation with key stakeholders including industry groups and government agencies to determine how this model could operate effectively and to ensure no unintended consequences occur as a result of any changes.

Background

RAA's Safety and Infrastructure team systematically evaluates the state's regional road network through our Regional Road Assessment Program. As part of the current Adelaide Hills regional road assessment, a survey containing questions about the Adelaide Hills road network was sent to eligible RAA members within the Adelaide Hills region. This is defined by the boundary of the Adelaide Hills Council and Mount Barker District Council. Survey respondents raised issues with the South Eastern Freeway more than any other road infrastructure in the region.

Although the review of the South Eastern Freeway was initially part of the current Adelaide Hills regional road assessment, the issues identified through member and stakeholder feedback warranted a separate report. This was reinforced when the state government announced it wouldn't be proceeding with GlobeLink, which means the South Eastern Freeway will continue to be the principal road access to the Adelaide Hills and South East for the foreseeable future.

The South Eastern Freeway was reviewed in full through to its end point in Monteith, just east of Murray Bridge, where it becomes the Princes Highway. This included a review of each interchange, and the signalised intersection with Portrush Road, Glen Osmond Road and Cross Road, together with a review of current and potential future alternative freight routes.

Community perceptions

Adelaide Hills regional road assessment

A survey of Adelaide Hills Council and Mount Barker District Council residents was conducted in September 2019 as part of RAA’s regional road assessment of the Adelaide Hills. A total of 614 responses were received from residents of the Adelaide Hills region.

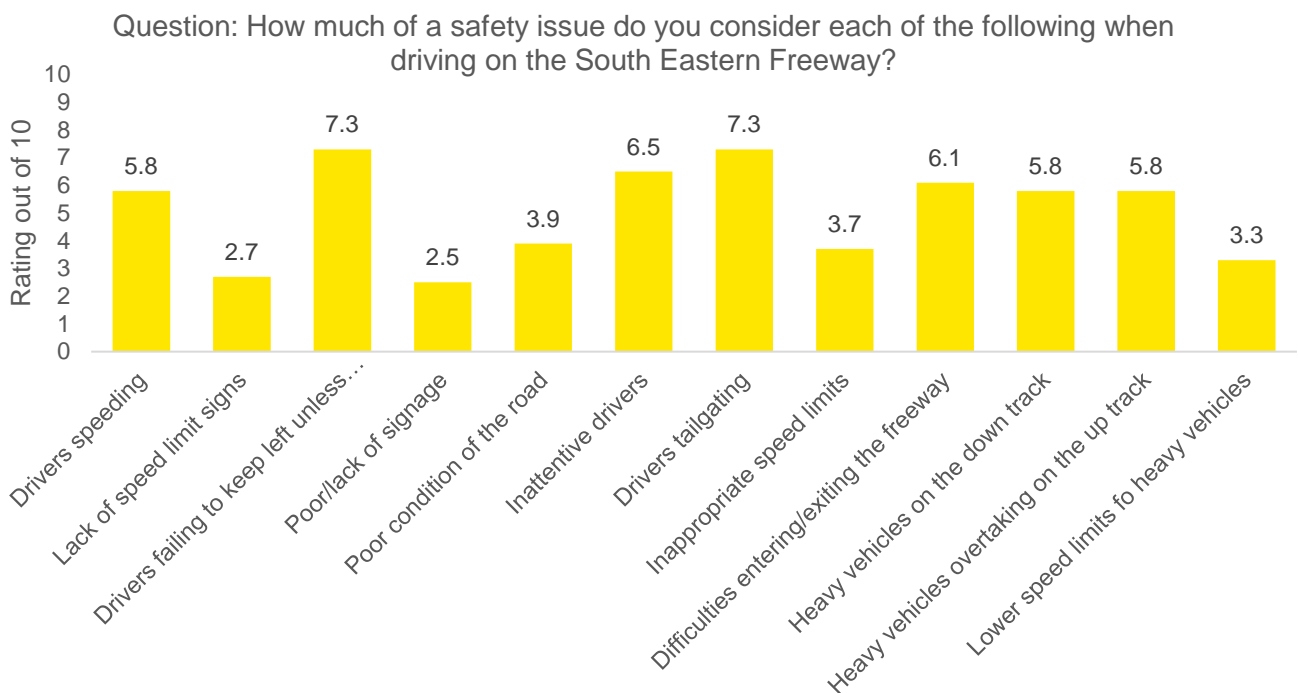
Safety issues on the South Eastern Freeway were the major concern for most survey respondents. It was the most frequently identified road in every relevant road-related question, including:

- In your opinion, are major road, mobility or transport improvements needed within the Adelaide Hills region?
- When thinking specifically about freight vehicles, are there any roads or intersections within the region where you have experienced or noticed challenging or unsafe interactions?
- Is there a specific location where speed zones/limits should be reviewed?

In addition to these open-ended questions where respondents could raise any road concern, RAA asked regular road users about their biggest safety concerns with the South Eastern Freeway.

Respondents were asked how often they travel on the South Eastern Freeway. 30% of respondents used the freeway 1-2 days per week, with a further 20% using it 3-4 days per week, and 28% used it most days or every day. 22% of respondents indicated they never or rarely use the South Eastern Freeway, with these respondents excluded from subsequent questions relating to the freeway.

When asked which road safety issues they consider most concerning on the South Eastern Freeway, 77% said the biggest issue was drivers tailgating, followed by 75% that said drivers failing to keep left was a major issue. Least concerning to hills’ residents was signage (75% said this was not a safety issue), followed by the lower speed limits in place for heavy vehicles (65% don’t feel this is a safety issue). Survey respondents were also asked to rate each issue out of 10, where a rating of 10 indicates a serious issue, and 0 indicates that it’s not an issue at all. Average ratings for each of the issues are showing in the graph below.



This issue of drivers failing to keep left on the South Eastern Freeway was investigated further by asking whether greater enforcement is needed for drivers who disobey this road rule. Almost two thirds of respondents agreed that more enforcement was required (64%), while 24% disagreed. The mean response for this question was 6.6 out of 10 (where a score of 10 is 'strongly agree'), which indicates moderate agreement overall.

Risky Roads 2019 survey

Between 6 November and 16 December 2019, RAA conducted its third *Risky Roads*¹ survey. Previous surveys were undertaken in 2013 and 2017. The purpose of the survey was to identify the pain points on South Australia's road network, by asking South Australians which roads they think are risky, and why. Survey respondents could nominate any South Australian road or intersection.

At the close of the survey, a total of 1343 nominations were received, with 921 nominating roads and 422 nominating intersections. Overall, almost 600 roads and intersections were nominated by survey respondents.

The South Eastern Freeway between Hahndorf and Glen Osmond received the fourth highest number of nominations of all roads, with road surface issues and difficulties overtaking other vehicles being the main raised issues. The intersection with Portrush Road received the fourth highest number of nominations of all intersections, with respondents citing lack of turning opportunities, absence of cycle lanes and inefficient traffic signal phasing.

¹ RAA, 2020, *Risky Roads 2019 Survey Results*, <<https://our.raa.com.au/about-raa/risky-roads>>.

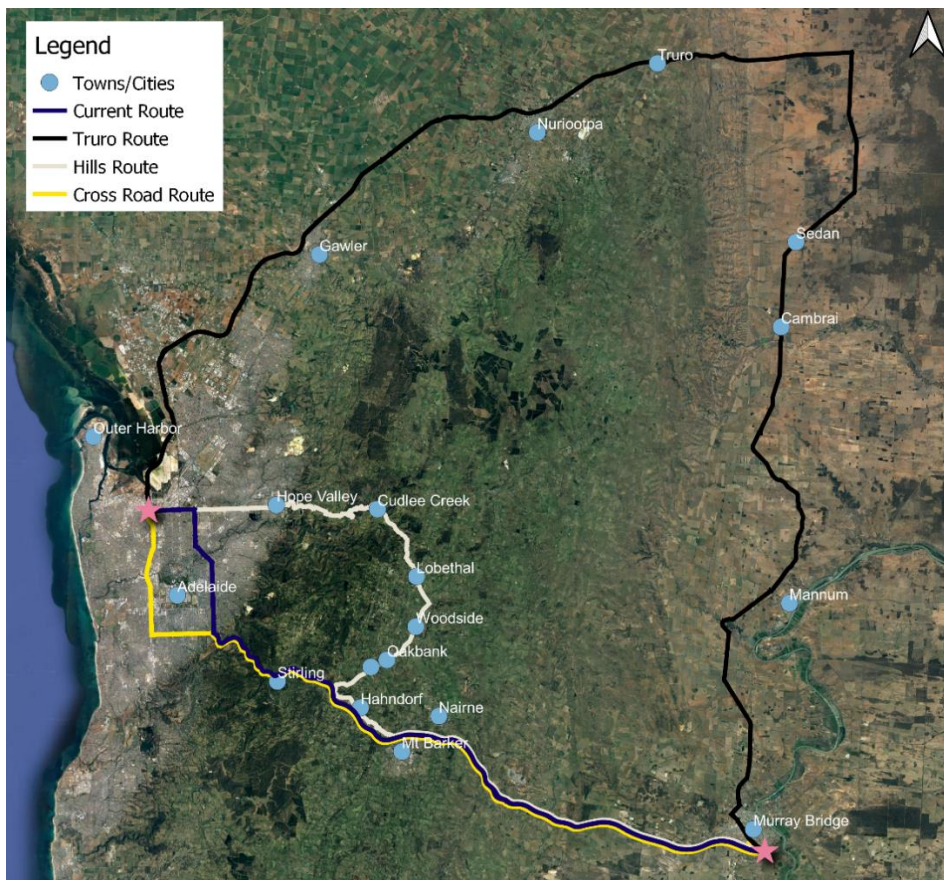
Alternative freight routes

Following the recent announcement that GlobeLink will not proceed, it's very important that freight alternatives to the South Eastern Freeway are still considered. Many recommendations made throughout this report assume that freight will continue to traverse the South Eastern freeway for the foreseeable future. However, implementing an alternative freight route has the potential to substantially alleviate many of the freight-related safety issues associated with the South Eastern Freeway descent. Careful consideration must be given to the safety issues presented by these alternative routes, as there's the potential to shift current issues and create new issues.

Two alternative routes were travelled by RAA, based on options discussed in the *KPMG GlobeLink Scoping Study Report*² and current freight routes.

The first of these is the existing route linking the South Eastern Freeway at Murray Bridge to the Sturt Highway east of Truro, at the intersection with Halfway House Road. This route currently allows road train and b-triple use, however it needs upgrading to safely carry higher volumes of freight.

The second traverses the Adelaide Hills, approximately following the 'short north' corridor discussed in the *KPMG GlobeLink Scoping Study Report*, but using the existing road network. This includes the length of Grand Junction Road to Hope Valley, and through the Hills, linking with the South Eastern Freeway at Mount Barker. The obvious challenge with any route through the Adelaide Hills is the topography.



Current and alternative freight routes

² KPMG, *GlobeLink, Scoping Study Report, Business Case – Stages 1 and 2*, 2019, pp81.

Travel times and distances for a passenger vehicle were recorded along these routes to compare with the current freight route linking the South Eastern Freeway and the Wingfield industrial area. The start and finish points used were the intersection of South Road and Grand Junction Road and the Swanport interchange on the South Eastern Freeway.

Route	Travel time	Travel distance*	Advantages	Disadvantages
Current freight route	1hr 9m	88km	Most direct existing route, requires lower investment in road infrastructure compared with alternatives.	Traverses busy metro arterials and residential areas, ongoing concerns due to steep SE Freeway descent, no HPV opportunities.
Via Truro (current b-triple route)	2hr 15m	202km	Uses upgraded N-S corridor infrastructure, avoids metropolitan area, relatively flat and straight roads, opportunity for HPVs, decreases freight volume on SE Freeway.	Increased travel times and distance, increased operational costs, risk of fatigue due to increased travel time.
Via Hope Valley	1hr 42m	104km	Fairly direct route, alternative to the SE Freeway descent that could potentially decrease freight volume on SE Freeway, potential to be the most direct route if new roads are constructed.	Steep hilly terrain. Requires substantial earthworks, traverses busy metro arterials and residential areas, no HPV opportunities, town bypasses required, steep descent into Hope Valley.
Via Cross Road (future)	1hr 5m (est.)	89km	Very direct route, utilises N-S corridor infrastructure, fastest route.	SE Freeway descent, requires upgrade of Cross Road including rail grade separation, intersection upgrades, median consolidation, right turn bans etc, traverses busy metro arterials and residential areas.

*using existing road corridors

While a route is already available that avoids the South Eastern Freeway descent, travel time results alone highlight why it's difficult for freight operators to consider alternative routes. An additional hour in travel time results in increased operating costs and reduces the viability of such a route. This could be offset by allowing the use of higher productivity vehicles (HPVs), which are typically described as vehicles that can carry a greater payload than a b-double. The national PBS scheme provides a framework for HPVs with a focus on safety, sustainability and accessibility.

Current freight route

The current freight route is not suitable for HPVs, mainly due to its passage through Adelaide's eastern and inner-northern suburbs, and geometric constraints on the South Eastern Freeway. While the South Eastern Freeway descent presents a high risk for heavy vehicles, PBS vehicles typically have far superior braking capacity and manoeuvrability than their non-PBS counterparts. Theoretically, their use could reduce the total number of heavy vehicle trips down the freeway. Notwithstanding, Major freight routes along busy urban corridors should be avoided wherever possible.

Freight via Truro

Detouring large freight through Truro instead of the South Eastern Freeway adds more than one hour of travel time and more than 100km in travel distance. The current b-triple route through Cambrai and Sedan would need to be improved geometrically to cater for higher traffic volumes and an increase in HPVs.

The *KPMG GlobeLink Scoping Study Report* shows that closures of the South Eastern Freeway result in additional operating costs of approximately \$230 per trip for each freight vehicle using this alternate route. If all the heavy vehicles that use the South Eastern Freeway every day, travelled this route as it currently exists, the daily cost to the freight industry would be approximately \$1m. Due to this, the route is really only economically viable for HPVs, and improvements to encourage and support the safe and sustainable use of HPVs along this route should be considered, with the goal of reducing freight volumes on the South Eastern Freeway.

RAA's review revealed that unsealed and narrow sealed shoulders make up much of this route and, together with narrow lane widths, make it less than ideal for safely carrying higher freight volumes. A number of intersection upgrades and realignments would be required to boost efficiency, along with the installation of a series of overtaking lanes between Murray Bridge and Truro. If heavy vehicle freight significantly increases on this route, duplication of the Sturt Highway through to Halfway House Road would be needed.

Recommendation 1:

Undertake road widening, shoulder sealing and intersection upgrades along the existing freight route between Murray Bridge and Truro, to encourage and support the safe and sustainable use of HPVs.

On 29 March 2020, it was announced that \$12m was being fast-tracked to provide a higher capacity north-south freight route bypass of Adelaide. It's expected that this investment will be able to substantially address the recommendation above.

Freight via Hope Valley

The current road network through the Adelaide Hills between Murray Bridge and Grand Junction Road, Hope Valley, isn't suitable for high volumes of freight traffic or larger freight vehicles. To improve freight accessibility, heavy vehicles could be directed from the freeway through the Adelaide Hills at an improved Bald Hills interchange, or an upgraded Verdun interchange that provides full access and egress from the South Eastern Freeway. Multiple town bypasses would be required and, given their geographic constraints, it would be very expensive to upgrade roads like Gorge Road and Lower North East Road, so that large freight combinations could descend into Hope Valley. Along its current alignment, the final three kilometres of Lower North East Road between Houghton and Hope Valley has an average gradient of about 6%, which is comparable to the average slope of the South Eastern Freeway between Crafers and Glen Osmond, but over a shorter distance.

For the travel time test, RAA exited the South Eastern Freeway at Mount Barker and travelled through Hahndorf. In practice, this wouldn't be a suitable solution – access to and from the freeway at the Verdun interchange would need to be provided to make this a viable route. Alternatively, freight access at Bald Hills could be improved, with a heavy vehicle bypass of Nairne and Woodside constructed to create a more direct route.

RAA considers that this option will require extensive investment in the existing road network. Given the limited potential benefits that a low-cost option would provide, a benefit cost ratio (BCR) analysis is likely to reveal that any route through this region couldn't be justified.

Freight via Cross Road

If no alternative route is developed by the time the North-South corridor is complete, it's likely that a substantial volume of freight traffic through Adelaide will shift from Portrush Road to Cross Road, to benefit from the non-stop motorway. This will be the most direct route to Adelaide Airport and Outer Harbor, but will require at least the following upgrades:

- intersection upgrade at the South Eastern Freeway (increase left turn capacity)
- intersection upgrade at Fullarton Road (currently funded)
- grade separation at the rail level crossing in Kings Park
- intersection upgrade at Goodwood Road
- road widening
- a series of median closures to reduce the number of right turns along Cross Road.

Upgrades at Waite Road, Duthy Street, Hilda Terrace and Winston Avenue may also be required. Interchanges with a completed North-South corridor should also provide road train access as a minimum to realise the full benefits of this corridor to the freight industry and account for any future changes to freight movements.

The *KPMG GlobeLink Scoping Study Report* indicates a capital cost of \$400m to undertake improvements on Cross Road, however RAA expects this to be much higher. A tunnel from Stirling to South Road, below Cross Road, was also considered by KPMG, but cost estimates of \$18b make this project unjustifiable given current demand.

Recommendation 2:

If no alternative access is provided to the North-South corridor, undertake interim improvements to safety and accessibility on Cross Road between the South Eastern Freeway and South Road, that will ensure safe travel for all road users, and sustainable travel for the freight industry. RAA considers this is an interim option only and that an alternative link must be provided to achieve a safe and sustainable connection between these two critical corridors.

Infrastructure review

Mid blocks

Glen Osmond – Crafers

The South Eastern Freeway extends for 7.5km between Glen Osmond and Crafers, terminating at a signalised intersection with Portrush Road, Cross Road and Glen Osmond Road. It's notorious for its long, steep ascent for eastbound traffic and corresponding steep descent for city bound traffic.

Average annual daily traffic volumes exceed 50,000 vehicles, of which 9.5% are commercial vehicles including buses, and rigid and articulated trucks.

The South Eastern Freeway is currently on the Performance-Based Standard (PBS) level 2A network, meaning the largest trucks currently permitted to use the road are 26m b-doubles.

Review of crash data

Casualty crash data for the five years between 2014 and 2018 has been reviewed for this section of the South Eastern Freeway, on both the down-track and up-track. Crashes at the intersection with Portrush Road have been included where a vehicle entering or leaving the freeway was involved.

Over this time period, 11 casualty crashes occurred on the up-track of the freeway, 19 on the down-track, and a further 13 at the intersection with Portrush Road that involved vehicles exiting the freeway (out of a total 21 crashes at this intersection).

Up-track

Of the 11 casualty crashes on the up-track of the South Eastern Freeway, four of these were rear end collisions. Ten of the crashes resulted in a single minor injury, with one resulting in a single serious injury as the result of a collision between two motorcycles.

Table 1: Casualty crash types on the up-track of the South Eastern Freeway

Crash Type	Number of crashes	Number of injuries	Number of fatalities
Rear end	4	4	0
Hit fixed object	3	3	0
Rollover	1	1	0
Head on	1	1	0
Side swipe	1	1	0
Right angle	1	1	0
Total	11	11	0

Table 2: Vehicles involved in casualty crashes on the up-track of the South Eastern Freeway

Vehicles involved	Number of crashes
Multiple cars	5
Single car	2
Single motorcycle	2
Multiple motorcycles	1
Car v cyclist	1

Down-track

Of the 19 casualty crashes on the down-track of the South Eastern Freeway, eight of these were rear end collisions. Side swipe crashes, and vehicles colliding with fixed objects were the next most frequent crash types.

Table 3: Casualty crash types on the down-track of the South Eastern Freeway

Crash Type	Number of crashes	Number of injuries	Number of fatalities
Rear end	8	11	0
Hit fixed object	5	5	0
Side swipe	4	4	0
Rollover	1	1	0
Left road – out of control	1	1	0
Total	19	22	0

Most crashes on the down-track involved multiple cars, with three cyclists also involved in casualty crashes. Two of these involved only the single cyclist, with the third being a side swipe involving a truck. The cyclist crashes all occurred north west of the Old Toll Gate, where cyclists are legally permitted on a short section of the South Eastern Freeway.

Table 4: Vehicles involved in casualty crashes on the down-track of the South Eastern Freeway

Vehicles involved	Number of crashes
Multiple cars	12
Single car	3
Single cyclist	2
Single motorcycle	1
Truck v cyclist	1

Intersection with Portrush Road

Of the 21 casualty crashes occurring at this intersection, 13 involved vehicles leaving the freeway and are the only crashes included in this analysis.

Two highly publicised fatal crashes occurred at the intersection in 2014. The first, in January 2014, involved a semi-trailer rolling over and colliding with a wall while making a left turn onto Cross Road. This occurred because the vehicle's brakes failed while it was descending the freeway, causing it to reach speeds of up to 145km/h and then being unable to stop. The coroner's report³ states that:

“Ultimately, due to constant and excessive use of the primary footbrake, the brakes on both the driving axles of the prime mover and those brakes that were in adequate adjustment on the trailer failed due to the generation of excessive heat within the brake componentry”.

The second crash, in August 2014, involved a rigid sewerage truck colliding with vehicles on Cross Road. Like the January crash, this was due to brake failure in the truck, with the truck's speed reportedly reaching 151km/h. DPTI road crash data reports this crash as a 'rear end' crash.

Rear end crashes are the most common on the South Eastern Freeway approach to the intersection, and this is often due to driver inattention near traffic queued at the intersection.

Table 5: Casualty crash types at the intersection with Portrush Road

Crash Type	Number of crashes	Number of injuries	Number of fatalities
Rear end	7	9	2
Right angle	2	3	0
Side swipe	1	1	0
Rollover	2	1	1
Right turn	1	1	0
Total	13	15	3

It should be noted that 2014 was a poor year for casualty crashes at this intersection, with 6 of these 13 casualty crashes occurring in 2014, with an improving trend in the subsequent four years.

Casualty crashes at the intersection usually involved multiple cars, however there were four involving trucks. As well as the two fatal crashes mentioned above, one crash involved a truck colliding with the rear of a car and another involved a truck rolling over when turning right onto Portrush Road, both resulting in minor injuries.

Table 6: Vehicles involved in casualty crashes at the intersection with Portrush Road.

Vehicles involved	Number of crashes
Multiple cars	8
Single truck	2
Truck v car/s	2
Car v cyclist	1

³ Coroners Court, *Findings of Inquest (2015)*, section 9.1(9), pp76

<http://www.courts.sa.gov.au/CoronersFindings/Lists/Coroners%20Findings/Attachments/605/VENNING%20James%20William.pdf>.

Review of signage and police expiation data

Comprehensive warning signage is provided on the descent of the South Eastern Freeway, as well as regular speed and advisory signs. Between the Crafers and Leawood Gardens speed cameras, there are 10 pairs of variable speed limit signs, with an average spacing of approximately 600m between pairs. Each of these is accompanied by a static sign advising of the 60km/h speed limit applying to all trucks and buses.

Despite this signage, drivers still regularly exceed the posted speed limit on the South Eastern Freeway. The Crafers and Leawood Gardens fixed speed cameras consistently detect among the highest number of speeding vehicles per year of all the fixed camera sites in South Australia. This was shown following a review of publicly available SA Police expiation notice data⁴.

Year	Camera location	Exceed speed limit	Truck/Bus exceed speed limit
2019	Crafers	2,209	733
	Leawood Gardens	6,559	1,106*
2018	Crafers	3,860	1,183
	Leawood Gardens	7,740	127
2017	Crafers	3,457	770
	Leawood Gardens	8,230	127
2016	Crafers	3,138	927
	Leawood Gardens	10,254	181
2015	Crafers	3,741	632
	Leawood Gardens	13,878	149

*The Crafers fixed speed camera was upgraded in 2019 and activated in May. Technology was improved to ensure that all speeding trucks and buses are detected, as the accuracy of the previous camera was insufficient to detect all speeding trucks and buses.

This equates to a daily average of 25 light vehicle detections at Leawood Gardens and nine at Crafers. For trucks and buses, an average of more than two per day was detected at Crafers between 2015 and 2019, with a daily average of 0.4 detected at Leawood Gardens between 2015 and 2018. Due to the upgrade of the Leawood Gardens camera, an average of almost three trucks or buses were detected speeding at this location every day in 2019.

Between 2015 and 2019, speeding fines at these two cameras totalled more than \$30m. Given the revenue generated, this funding should be reinvested back into improving safety on the South Eastern Freeway.

There is a truck parking/brake checking area approximately 450m west of the Heysen Tunnels, but this doesn't have adequate advance warning signs. The only sign advising of its existence is a small sign located at the entry point to this area. Improved signage and access to this parking area may encourage heavy vehicle drivers to stop at this location to take a rest break, and check brakes or load stability before completing the remainder of the descent.

⁴South Australia Police, Expiation Notice System Data, <<https://data.sa.gov.au/data/dataset/expiation-notice-system-data>>.



Only one sign identifies the truck parking/brake checking area west of the Heysen Tunnels

Recommendation 3A

Invest income generated by the Crafers and Leawood Gardens speed cameras directly into improving safety on the South Eastern Freeway.

Recommendation 3B

Upgrade signage as part of an intelligent motorway upgrade between Crafers and Glen Osmond. This includes overhead gantries, with speed limit signs for each lane to better highlight the prevailing speed limit, particularly for vehicles travelling in the centre lane that may be less likely to observe speed limit signs obscured by other vehicles.

Recommendation 3C

Consider further intelligent transport systems, such as devices on the descent that can detect and display a vehicle's speed in real time. This isn't for enforcement purposes, but to direct an appropriate warning message to speeding vehicles, and direct heavy vehicles to use a safety ramp where needed. This could incorporate individual signs on a gantry above each lane, or overhead digital variable message signs located on the roadside, like those at the Crafers interchange and prior to entering the Heysen Tunnels. These signs could also be installed on the numerous bridges over the South Eastern Freeway between Crafers and Glen Osmond.

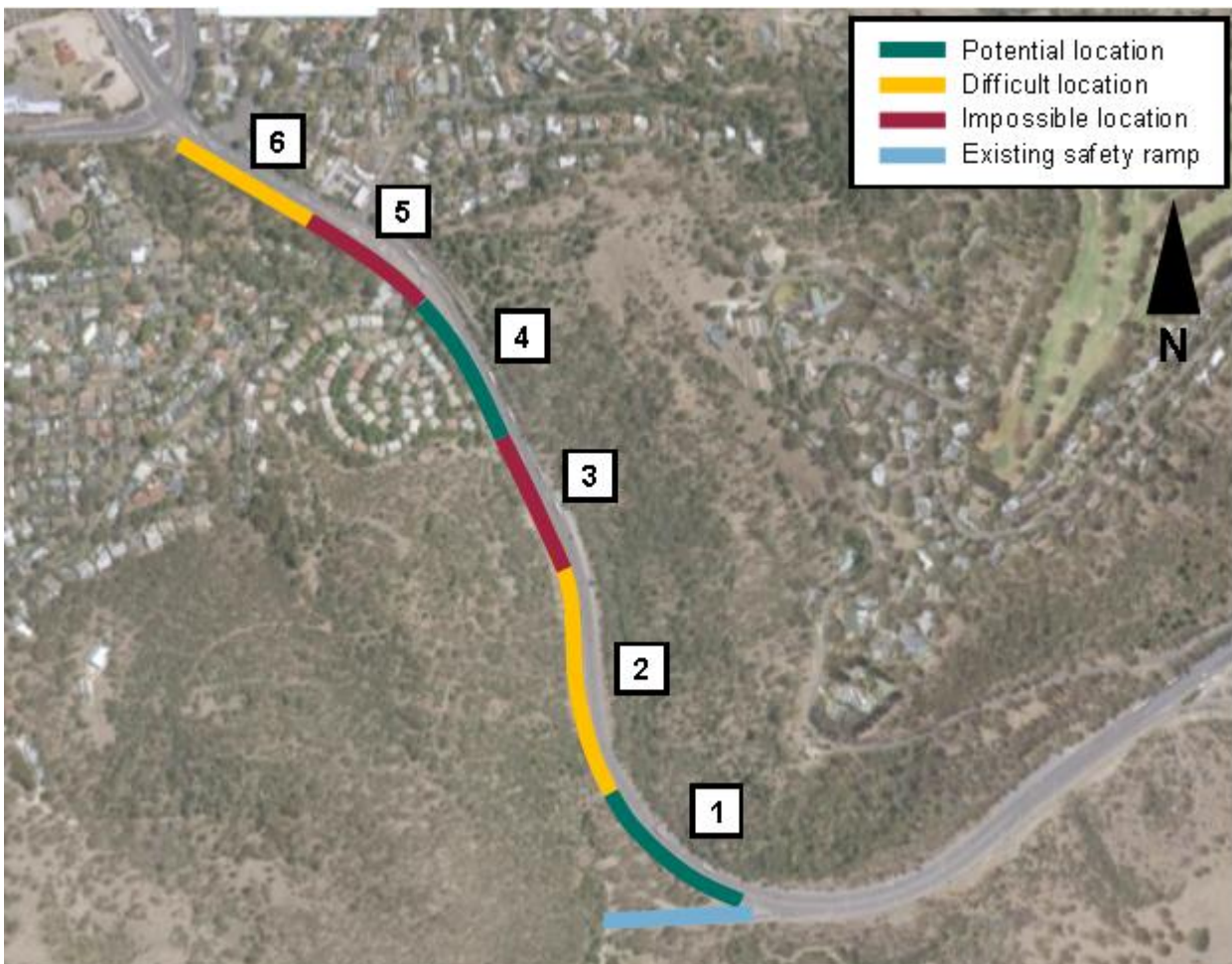
Recommendation 3D

Install additional advance warning signage and a deceleration/entry lane to the truck parking area 450m west of the Heysen Tunnels.

Results of the *Cooperative Intelligent Transport Initiative (CITI)* based in the Illawarra region of New South Wales should be closely monitored, and consideration given to undertaking similar trials on the South Eastern Freeway. In the longer term, an initiative incorporating telematics features from CITI and the *National Heavy Vehicle Charging Pilot* may be a feasible method of alerting drivers to safety issues, while tracking vehicles for the purpose of road user charging.

Third safety ramp

As part of the 2015 SA Coroner's report, it was recommended that further consideration be given to the feasibility and desirability of a third safety ramp. DPTI has deemed it was not possible to proceed with this recommendation. Full and side-entry ramp concepts were explored with cost estimates as high as \$44m for a full ramp near the Portrush Road intersection, and \$7m for a side entry ramp that would result in a loss of the hard shoulder emergency runoff area for light vehicles. Selecting a location to install a third safety ramp is difficult due to the existing geometry of the South Eastern Freeway and the surrounding topography. Six potential locations have been considered by RAA.



Location 1 extends for approximately 250 metres beyond the existing safety ramp and is seen as the most likely location to install a full-length safety ramp. The issues with this location are that it's very close to the existing safety ramp, and a high-speed vehicle may roll over before reaching the ramp. The safety ramp should be constructed tangential to the curve to avoid substantial shifting of the vehicle load when entering the ramp, and to ensure both front wheels enter the gravel pit simultaneously. Environmental constraints may be present in the second half of the safety ramp, which could limit the length available for construction.

Constructing a safety ramp at location 2, while possible, would be extremely expensive due to the earthworks required – there's a cutting about 20m high next to the roadway, as pictured below.



Location of the cutting in relation to the existing safety ramp

Location 3 is considered impossible because it's on the inside of a curve and it's likely that a heavy vehicle would roll over while attempting to enter the ramp.

Location 4 is considered possible for a side-entry safety ramp or dragnet type arrester system. A safety ramp or arrester system in this location may impact access to the Mira Mona residential estate.

Location 5 is considered impossible as it's located on the inside of a curve and it's likely that a heavy vehicle would roll over while attempting to enter the safety ramp.

Location 6 is considered possible, however it's very close to the Portrush Road intersection. The risk of a collision with the rear of the traffic queue under normal traffic conditions is also far higher in this location.

Recommendation 3E:

Install an additional safety ramp below the current lower ramp, that includes a dragnet system to stop runaway vehicles.

Intersection with Portrush Road

During RAA's assessment, the signalised intersection with Portrush Road, Glen Osmond Road and Cross Road was reviewed. A 60-minute survey of heavy vehicles exiting the freeway was undertaken between 10.30am and 11.30am on 25 February 2020. During the survey:

- 65% turned right onto Portrush Road
- 22% continued straight on to Glen Osmond Road
- 13% turned left onto Cross Road.

If an alternative freight corridor is not introduced prior to the completion of the North-South Corridor, RAA expects an increased amount of traffic to turn left onto Cross Road, rather than turning right onto Portrush Road. This will introduce operational challenges along Cross Road, while alleviating issues with freight interactions along Portrush Road. Interactions at the bottom of the freeway will also be improved, with fewer heavy vehicles changing from the far-left lane to the far-right lane to turn right onto Portrush Road.

While crossing the intersection on foot, pedestrian safety issues were revealed at most crossing points. Pedestrian refuges located within the median of Portrush Road, Glen Osmond Road and Cross Road are all very narrow and provide minimal clearance between pedestrians waiting to cross and turning vehicles.



Pedestrians have minimal separation from turning traffic within the various refuges (Portrush Road refuge pictured)

The safety of pedestrians crossing the slip lane between Glen Osmond Road and Portrush Road is also poor, because pedestrians and turning vehicles have restricted sight distance of each other due to sculptures on the verge. Signalling pedestrian movements across this slip lane will reduce the risk of crashes between vehicles and pedestrians.



Approaching traffic is hidden from pedestrians at the crossing point on the Glen Osmond Road to Portrush Road slip lane

There's also a potentially hazardous situation in the slip lane between the South Eastern Freeway and Cross Road. Pedestrians crossing this slip lane are required to activate the signals and are faced with the red 'don't walk' light until traffic is given a red disc. Traffic in the slip lane has a 'left turn give way to pedestrians' sign and no green arrow, so they may stop for pedestrians who are faced with a 'don't walk' light. This creates a risk of rear end collision between vehicles in the slip lane and puts the pedestrian under pressure to cross against the 'don't walk' light. Amber and red arrows are provided in the slip lane for certain intersection phases, including when pedestrians are given a green 'walk' light.

Recommendation 4A:

Widening pedestrian refuges and setting crossings further back from the intersection where possible.

Recommendation 4B:

Stagger the staged pedestrian crossings to increase the spacing between pedestrians waiting in refuges and turning vehicles.

Recommendation 4C:

Fully control the slip lane from the South Eastern Freeway into Cross Road along with a review of other turn movements and signal phasing at the intersection to ensure the capacity of the left turn lane is not exceeded. If no alternative freight route is implemented before the completion of the North-South Corridor, this slip lane will need to be converted to dual lanes and reviewed again.

Recommendation 4D:

Fully control the slip lane from Glen Osmond Road into Portrush Road to improve pedestrian safety.

Road condition

Both carriageways of the South Eastern Freeway between Glen Osmond and Crafers are experiencing various failures in local areas, however the up-track is at a more advanced level of deterioration. Rutting and cracking in the left lane is prominent, however transverse and longitudinal cracking is occurring at various points in the other lanes as well.



Rutting and longitudinal cracking is prominent, particularly in the left lane

On 29 March 2020, it was announced that \$35m was being allocated to rehabilitate and resurface the South Eastern Freeway between the Tollgate and Crafers. RAA welcomes this important project and will monitor progress in the coming months.

Line markings were generally in good condition, with the 'LOW GEAR NEXT X KM' pavement messages recently refreshed. Other line markings were observed to be in satisfactory condition at the time of assessment.






Roadside hazards are mostly protected by w-beam or wire rope barrier systems, with a concrete dividing barrier separating opposing traffic flow. Steep vertical faces are often exposed, particularly on the down-track, however installing effective barrier systems without extensive earthworks would narrow the carriageway to dangerous widths. The current situation has not contributed to the frequency and severity of crashes.

Crafers – Stirling

The 1.3km section of the South Eastern Freeway between Crafers and Stirling is the busiest along the entire corridor. It has AADT (average annual daily traffic) totals of 53,400 vehicles per day, which includes 5200 commercial vehicles. To standardise this traffic volume, heavy vehicles can be converted to 'passenger car equivalents' (PCEs), which approximates the total impact to traffic flow that heavy vehicles have. Using conversion figures provided in the Queensland Department of

Transport and Main Roads' (TMR) *Cost Benefit Analysis Manual*⁵, the current AADT is equivalent to approximately 59,000 passenger vehicles per day and has been growing steadily over time.

Table 7: Vehicle types and traffic volumes between Crafers and Stirling

Vehicle type	AADT
	48,300
 / 	3300
	1050
	750

Between 2014 and 2018, 25 casualty crashes occurred on this short section of freeway, with 80% of these being rear end crashes. This is the most common crash type on congested sections of road. This means this short section of the South Eastern Freeway has the highest crash rate per kilometre of all sections of the freeway.

\$14.2m has been invested on a 50/50 basis by the South Australian and Federal governments to install a three-lane managed motorway between Crafers and Stirling. This project will convert the existing emergency breakdown lane into an additional travel lane, in conjunction with implementing a managed motorway system like other expressways in South Australia. This means the traffic management centre will have the ability to close lanes as required in the event of an incident, whilst using additional road space when conditions are normal. This project is expected to be completed by the end of 2020.



Artist impression of the Stirling to Crafers managed motorway system⁶

⁵ Department of Transport and Main Roads (TMR), 2011, Cost-benefit Analysis Manual, Road projects, section 4.2 2.1 pp4.8.

⁶ Source: DPTI, <https://www.dpti.sa.gov.au/infrastructure/road_projects/managedmotorway>.

RAA welcomes this project, which will improve safety and efficiency along this section of the South Eastern Freeway. This will substantially improve access and egress to the freeway between Stirling and Crafers, and address many of the concerns held at these freeway interchanges for years.

Stirling – Mount Barker

Between 2014 and 2018 there were 63 casualty crashes on the 15.5km section of the South Eastern Freeway between Stirling and Mount Barker.






The 15.5km section between Stirling and Mount Barker has high daily traffic volumes, with daily traffic volumes of 44,300 (Stirling – Bridgewater), 46,600 (Bridgewater – Verdun) and 33,900 (Verdun – Mount Barker). These traffic volumes increased by more than 33% between 2011 and 2019, and if traffic volumes continue to increase at this rate, RAA expects daily traffic volumes between Stirling and Verdun to exceed 50,000 by 2025.

Table 8: Increases in AADT between Stirling and Mount Barker since 2011

Section	AADT 2011	AADT 2015	AADT 2019
Stirling – Bridgewater	33,300	39,500 (+6,200)	44,300 (+4,800)
Bridgewater – Verdun	34,600	40,900 (+6,300)	46,600 (+5,700)
Verdun – Mt Barker	23,900	29,200 (+5,300)	33,900 (+4,700)

Between Bridgewater and Verdun, the current AADT of 46,600 is equivalent to a traffic flow of 52,000 passenger vehicles daily, when converting heavy vehicles into passenger car equivalents (PCEs).

Table 9: Vehicle types and traffic volumes between Bridgewater and Verdun

Vehicle type	AADT
	41,860
 / 	3000
	1000
	740

Current traffic volumes are already at levels that compromise vehicle speeds during peak conditions, with continued growth in traffic volumes expected to further compromise speeds, increase congestion and increase the risk of associated crashes.

Recommendation 5A

Investigate and plan for the construction of a third lane between Stirling and Verdun, so that plans will already be available when this section of the South Eastern Freeway reaches levels of congestion that warrant construction of an extra lane.

Mount Barker - Monteith

The 49km section between Mount Barker and Monteith carries approximately 15,000 vehicles per day between the Mount Barker and Murray Bridge interchanges, and 8000 vehicles per day between the Murray Bridge interchange and the intersection with Old Princes Highway in Monteith.

Between 2014 and 2018, 52 casualty crashes occurred along this section of the South Eastern Freeway, with 18 of these involving vehicles hitting fixed objects and a further 18 involving rear end collisions. Other crash types include four rollovers, and three head-on crashes, of which two were on the Swanport Bridge with fatal outcomes.

Pavement condition is generally satisfactory, considering that 11.6km of resurfacing is currently in progress between Mount Barker and Callington at a cost of \$7.39m. These works are divided into five sections, with four on the eastbound carriageway and one on the westbound carriageway, and address the sections with the most substantial wear at the time of RAA's assessment.

While a five-metre clear zone is generally well-maintained, roadside hazards (mainly trees on the median or verge) are still present along much of this section. Between Mount Barker and Monteith, 10 of the 18 casualty crashes where vehicles collided with fixed objects involved collisions with trees.



Locations of casualty crashes involving a vehicle hitting a tree on the South Eastern Freeway

A combination of w-beam and wire rope safety barriers are used to protect against some hazards, which include steep batter slopes, dense patches of vegetation, and curves, however installation of additional safety barriers will help mitigate one of the key crash types.



Unprotected roadside vegetation poses a crash risk

Recommendation 5B

Install additional safety barriers to protect against roadside hazards between Mount Barker and Monteith.

Interchanges

The following characteristics of each freeway interchange have been reviewed and assessed. *Austrroads Guide to Road Design Part 4C: Interchanges* has been used for classifying and reviewing interchanges.

- Ramp: eastbound (EB, Swanport bound), or westbound (WB, Adelaide bound).
- Average daily traffic volume: DPTI estimates⁷.
- Delineation rating: good/medium/poor rating by RAA survey team during on-site observation.
- Acceleration lane length: estimated total length of the acceleration lane, excluding entry curves but including tapers, measured using GIS software and satellite imagery. A smaller radius entry curve requires a longer acceleration lane due to the lower speeds required to navigate the entry curve. Entry curve radii should be considered where applicable when comparing acceleration lanes.
- Merge distance: estimated total length available for entering traffic to merge into through traffic, measured using GIS software and satellite imagery. This is the measurement of the broken dividing line between the on-ramp and the through lanes, including the length of the taper.
- Sight distance rating: good/medium/poor rating by RAA survey driver during site visit.
- Off-ramp length: estimated length of the off-ramp and deceleration lane including taper and exit curve (if applicable).
- Traffic controls: type of traffic control (if applicable) controlling traffic exiting the freeway.

Mount Osmond

The Mount Osmond interchange is a partial cloverleaf type interchange and provides full access to and from the South Eastern Freeway from Mount Osmond Road. Traffic volumes are quite low, and deceleration and acceleration lanes are largely adequate for their current level of use.

While sight distance entering the South Eastern Freeway from the on-ramps was rated poor to medium, merge distances were deemed enough to allow a driver to determine a safe gap and enter flowing traffic.

Table 10: Mount Osmond interchange measurements and observations.

Ramp	Average daily traffic volume	Delineation rating	On-ramps			Off-ramps	
			Acceleration lane length	Merge distance	Sight distance rating	Length	Traffic controls
EB off	410	Medium				250m	N/A
EB on	120	Medium	330m	240m	Medium		
WB off	130	Good				450m	T (no sign)
WB on	380	Medium	320m	210m	Poor		

RAA recommends that give way signs and line marking are installed at the intersection with the westbound off-ramp and Mount Osmond Road, to create consistency amongst all off-ramp T-interchanges along the South Eastern Freeway.

⁷ Data SA Traffic Volumes, <https://data.sa.gov.au/data/dataset/traffic-volumes>

Recommendation 6A

Install give way signs and line marking at the intersection with the westbound off-ramp and Mount Osmond Road.

Eagle on The Hill

The Eagle on The Hill interchange is a 'T' type interchange that provides eastbound access and westbound egress from Mount Barker Road. The length of ramps, and merging distances are deemed adequate for the low volumes of traffic using these ramps each day. This interchange, in conjunction with the Measdays interchange, provides a bypass of the Heysen Tunnels, and is primarily used for local traffic access to properties in Leawood Gardens

Table 11: Eagle on The Hill interchange measurements and observations.

Ramp	Average daily traffic volume	Delineation rating	On-ramps			Off-ramps	
			Acceleration lane length	Merge distance	Sight distance rating	Length	Traffic controls
EB off	210	Good				500m+	N/A
WB on	180	Poor	320m	210m	Medium		

Measdays

The Measdays interchange is a 'T' type interchange that can be considered the 'other half' of the Eagle on The Hill interchange. The Measdays interchange provides westbound access and eastbound egress from Mount Barker Road to the South Eastern Freeway, while completing a bypass of the Heysen Tunnels in conjunction with the Eagle on The Hill interchange.

Table 12: Measdays interchange measurements and observations.

Ramp	Average daily traffic volume	Delineation rating	On-ramps			Off-ramps	
			Acceleration lane length	Merge distance	Sight distance rating	Length	Traffic controls
EB on	170	Medium	500m+	200m	Good		
WB off	150	Good				500m+	N/A

Crafers

The Crafers interchange is a diamond type interchange with roundabouts at the ramp intersections. Crafers is the third busiest interchange, behind Stirling and Mount Barker, with a combined total of more than 12,000 vehicles using the interchange ramps each day.

Table 13: Crafers interchange measurements and observations.

Ramp	Average daily traffic volume	Delineation rating	On-ramps			Off-ramps	
			Acceleration lane length	Merge distance	Sight distance rating	Length	Traffic controls
EB off	3000	Good				480m	Roundabout
EB on	3400	Medium	250m	80m	Medium		
WB off	3300	Good				500m	Roundabout
WB on	3000	good	550m	240m	Good		

The most significant issue with the Crafers interchange concerns access for eastbound vehicles to the South Eastern Freeway. This on-ramp is relatively short, however it provides sufficient length to accelerate to the 100km/h speed limit. What makes this entry ramp challenging for motorists is the very short distance provided to merge into traffic. While the merging distance is approximately 80m long, due to the taper, vehicles can only travel half this distance before they're encroaching into the trafficable lane, or across the left edge line. *Austrroads Guide to Road Design*⁸ specifies a minimum taper length of 100m when entering a 100km/h zone, and a total acceleration lane length (including taper) to be 380m. This is considered the minimum, and due to high traffic volumes on both the entry ramp and the South Eastern Freeway, should be exceeded.

A review of casualty crash data confirms this issue, with a very high rate of rear end crashes occurring on the eastbound Crafers on-ramp. Between 2014 and 2018, seven rear end crashes resulting in injury occurred on the ramp, with many more rear end crashes occurring that resulted in only property damage.



The length of the eastbound Crafers on-ramp creates difficulties for motorists entering the South Eastern Freeway

⁸ Austrroads, 2017, *Austrroads Guide to Road Design part 4A: Unsignalised and Signalised Intersections*, pp39 – 43.

The westbound Crafers off-ramp occasionally creates difficulties for motorists due to its short entry point, located on the inside of a gradual curve.

These two issues will be resolved upon completion of the \$14.2m managed motorway project which will convert the existing emergency lane into a third travel lane. This will create a continuous lane extending eastbound from the Crafers on-ramp to the Stirling off-ramp, and westbound from the Stirling on-ramp to the Crafers off-ramp.

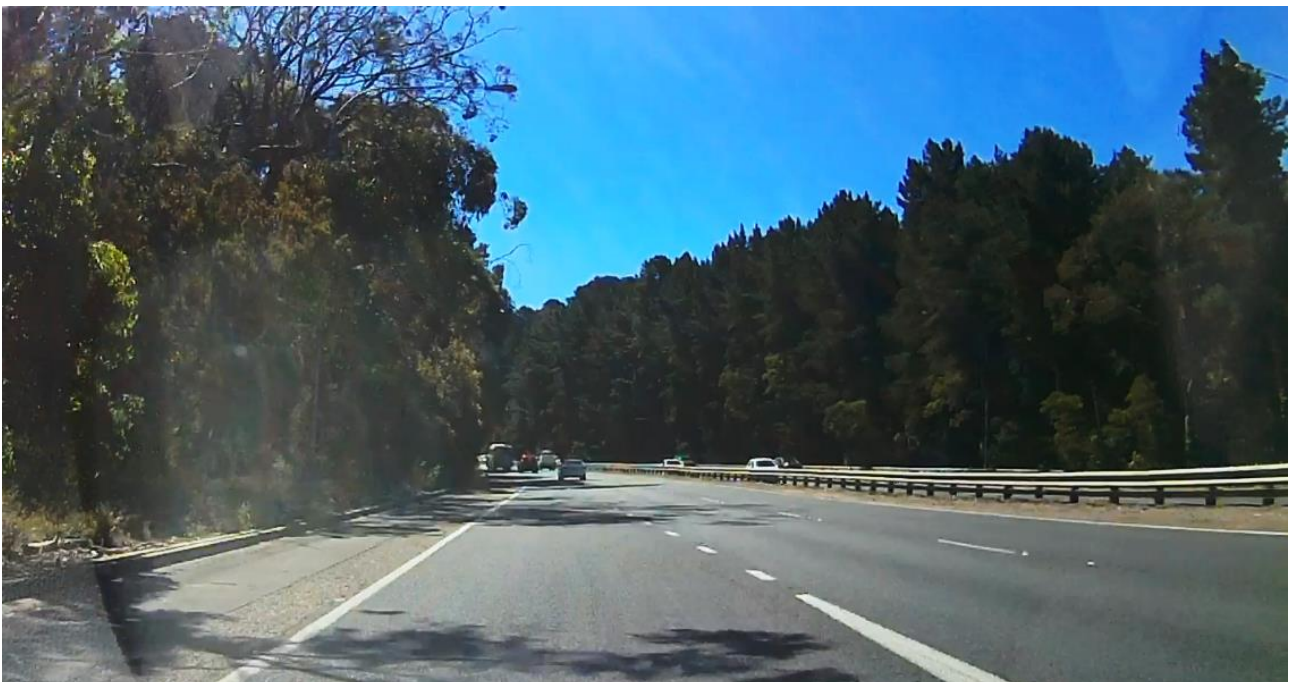
Stirling

The Stirling interchange is a 'trumpet' type interchange, providing full access to and from the South Eastern Freeway, combining elements of cloverleaf and diamond type interchanges. Stirling is the second busiest interchange behind Mount Barker, with a combined total of almost 15,000 vehicles using the interchange ramps each day.

Table 14: Stirling interchange measurements and observations.

Ramp	Average daily traffic volume	Delineation rating	On-ramps			Off-ramps	
			Acceleration lane length	Merge distance	Sight distance rating	Length	Traffic controls
EB off	5700	Medium				760m	Roundabout
EB on	1700	Medium	240m	160m	Poor		
WB off	2000	Good				490m	T (no signs)
WB on	5400	good	380m	80m	Medium		

As with the Crafers interchange, the westbound Stirling on-ramp doesn't provide much length for drivers to identify a safe gap, then merge into flowing traffic. While the total length of the acceleration lane is greater than its Crafers counterpart, the distance for a driver to change lanes is short and should be extended. A review of casualty crash data confirms this issue, with seven rear end crashes resulting in injury occurring on the ramp between 2014 and 2018.



The westbound Stirling on-ramp doesn't allow vehicles enough time to safely enter the South Eastern Freeway

This issue will be resolved upon completion of the \$14.2m managed motorway project, which will convert the existing emergency lane into a third travel lane. This will create a continuous lane extending westbound from the Stirling on-ramp to the Crafers off-ramp.

The eastbound Stirling on-ramp is the least used ramp at the Stirling interchange, however it's another cause for concern due to its short length and poor sight distance when entering the South Eastern Freeway. Sight distance is particularly poor at this on-ramp because it approaches on the inside of a gradual curve. Considering the 60km/h speed limit imposed on the entry curve (which may be higher than the design speed), the minimum acceleration lane length recommended by *Austrroads Guide to Road Design* is 340m. The current acceleration lane falls 100m short of this.

For consistency purposes among all freeway off-ramps, give way signs and line marking should be installed at the intersection of the westbound off-ramp and Mount Barker Road.

Recommendation 6B:

Extend the eastbound Stirling on-ramp by at least 100m to allow safer eastbound access to the South Eastern Freeway from Stirling and address the poor sight distance at this location.

Recommendation 6C:

Install give way signs and line marking at the intersection with the westbound off-ramp and Mound Barker Road in Stirling.

Bridgewater

The Bridgewater interchange is a typical diamond interchange, providing full access to and from the South Eastern Freeway and Carey Gully Road. Traffic exiting the South Eastern Freeway is faced with a give way sign when entering Carey Gully Road. RAA welcomes the 2019 speed limit reduction from 80km/h to 60km/h on this section of Carey Gully Road. This reduces the risk of a high-speed right-angle crash occurring when exiting the South Eastern Freeway onto Carey Gully Road. In 2016, a life was tragically lost at this interchange involving a vehicle turning right onto Carey Gully Road from the eastbound off-ramp.

Table 15: Bridgewater interchange measurements and observations.

Ramp	Average daily traffic volume	Delineation rating	On-ramps			Off-ramps	
			Acceleration lane length	Merge distance	Sight distance rating	Length	Traffic controls
EB off	1700	Good				880m	Give-way sign
EB on	2100	Good	390m	140m	Medium		
WB off	2100	Good				550m	Give-way sign
WB on	1800	Good	400m	90m	Good		

While safety has recently been improved by reducing the speed limit on Carey Gully Road, the road environment still feels like a higher speed road, which can lead to poor compliance with speed limits. While the reduced speed limit is welcomed by RAA, the layout of intersections at this interchange is still undesirable, and further measures can be taken to improve safety by reducing potential crash angles and the number of possible conflict points.

Installation of roundabouts at this interchange would be in line with a safe system approach. This could be done in conjunction with a reduction from four to two travel lanes across the Carey Gully Road bridge, as current traffic volumes across the bridge are estimated at 4800 vehicles per day, which is well within the capacity limits of a two-lane road.



Roundabouts in conjunction with a lane reduction would improve safety at the Bridgewater interchange.

*Austrroads Guide to Road Design*⁹ shows this roundabout configuration to be the most appropriate treatment at a service interchange like Bridgewater.

As a standalone project, a lane reduction across the bridge may still be a viable safety improvement, however RAA would prefer this be undertaken in conjunction with the installation of roundabouts.

Furthermore, the length of the acceleration lane for westbound vehicles to merge onto the South Eastern Freeway is short, and this should be extended to allow safer entry onto the South Eastern Freeway from the Bridgewater interchange.

Recommendation 6D:

Install roundabouts at the Bridgewater interchange in conjunction with a lane reduction on Carey Gully Road, in line with safe system principles. This will improve safety by reducing impact angles and conflict points.

Recommendation 6E:

Extend the westbound on-ramp acceleration lane to allow more time for vehicles to safely enter the South Eastern Freeway when heading towards Adelaide.

⁹ Austrroads, 2017, *Austrroads Guide to Road Design part 4C: Interchanges*.

Verdun

The Verdun interchange is a one-way 'T' type interchange with a roundabout providing limited access to and from the South Eastern Freeway. This interchange provides the primary access point to Hahndorf from the South Eastern Freeway and allows eastbound vehicles to exit and westbound vehicles to enter.

Table 16: Verdun interchange measurements and observations.

Ramp	Average daily traffic volume	Delineation rating	On-ramps			Off-ramps	
			Acceleration lane length	Merge distance	Sight distance rating	Length	Traffic controls
EB off	6100	Good				680m	Roundabout
WB on	6100	Good	400m	80m	Good		

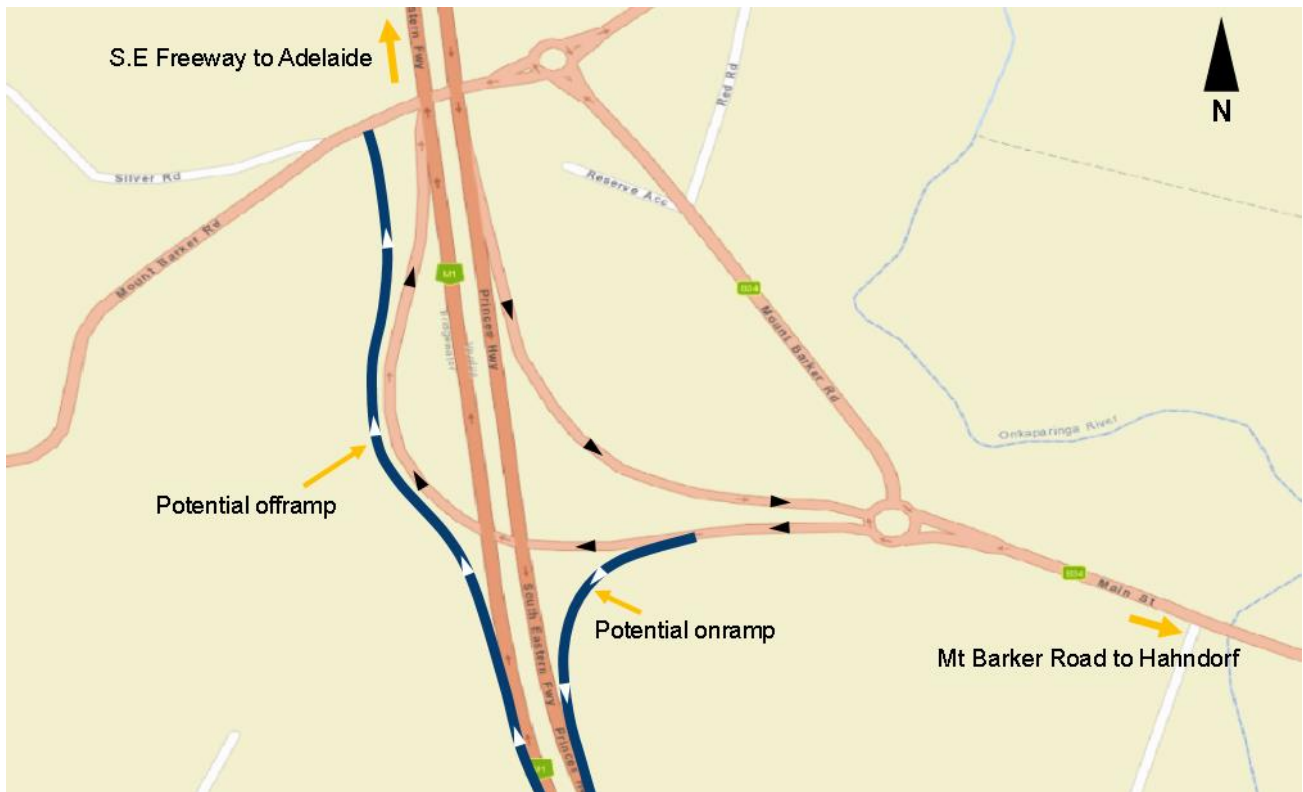
In a recent RAA survey of members residing in the Adelaide Hills Council and Mount Barker District Council, traffic, particularly freight, along Mount Barker Road through Hahndorf was raised as one of the biggest concerns in the region. By providing full access from the Verdun interchange to the South Eastern Freeway, a significant amount of traffic could be shifted away from Mount Barker Road to the South Eastern Freeway, which will substantially improve safety and amenity in Hahndorf.

The *Hahndorf Township Strategic Traffic Planning Study* is currently underway, with \$1m federal funding provided to identify and assess options to address congestion, connectivity, freight efficiency, and safety in and around Hahndorf. This study is set to be completed in mid-2020 and will outline what is needed in the surrounding area. It's expected that an upgrade of the Verdun interchange is being considered in this study, and the feasibility of such an upgrade will be announced when the study is complete.

The House of Representatives Official *Hansard* from Wednesday, 31 July 2019¹⁰ shows that Rebekha Sharkie advised funding of around \$15m would be required to upgrade the Verdun interchange to a two-way freeway interchange. This may be sufficient to deliver a connection between the South Eastern Freeway and Mount Barker Road (Bridgewater), as well as a spur from the existing on-ramp to the eastbound carriageway of the South Eastern Freeway, without constructing any new tunnels or bridges. However, the existing gradients of the surrounding land could make this solution difficult to achieve, however it should still be investigated.

¹⁰ Parliament of Australia, Hansard Display,

https://www.aph.gov.au/Parliamentary_Business/Hansard/Hansard_Display?bid=chamber/hansardr/c53753a5-4ecd-4871-a577-d7549f791ed2/&sid=0256.



Possible alignment of an upgraded Verdun interchange

Additionally, when entering the South Eastern Freeway from Verdun, the merging distance is short, creating difficulties for vehicles merging into traffic at 110km/h. When looking at casualty crashes between 2014 and 2018, four rear end crashes and one side swipe crash occurred as vehicles entered the freeway at the Verdun interchange. Extending the westbound acceleration lane would provide additional time for motorists to judge gaps in traffic and enter the freeway safely.

Recommendation 6F:

Upgrade the Verdun interchange to provide full access to and from the South Eastern Freeway in each direction.

Recommendation 6G

Extend the westbound acceleration lane to allow more time for vehicles to safely enter the South Eastern Freeway when heading towards Adelaide.

Mount Barker

The Mount Barker interchange is a partially signalised diamond interchange providing full access to and from Adelaide Road from the South Eastern Freeway. The Mount Barker interchange is the busiest interchange on the South Eastern Freeway, with a combined total of 22,000 vehicles using the interchange ramps each day. It provides primary access to Mount Barker and Littlehampton, with Nairne traffic more likely to use the recently constructed Bald Hills interchange.

Table 17: Mount Barker interchange measurements and observations.

Ramp	Average daily traffic volume	Delineation rating	On-ramps			Off-ramps	
			Acceleration lane length	Merge distance	Sight distance rating	Length	Traffic controls
EB off	9400	Good				700m	Signalised
EB on	1900	Good	700m	140m	Good		
WB off	1500	Good				640m	Give-way sign
WB on	9200	Good	540m	90m	Good		

The five-year crash history at this interchange is poor, with 11 casualty crashes occurring at the signalised intersection, and eight occurring at the southern unsignalised intersection. Each of these 19 crashes resulted in minor injuries.

Average annual daily traffic volumes across the Adelaide Road bridge exceed 30,000 vehicles, and it's noted that right turns from the right lanes in both directions contribute to delays, frustration, and pose a high safety risk given the volume of traffic. RAA recommends that DPTI explore the feasibility of channelised right turn lanes to access the freeway on-ramps. There may be some difficulty providing space, given the width of the Adelaide Road bridge and its proximity to the two intersections. Due to difficulties, particularly associated with right turns at the southern intersection, RAA also recommends that improvements to this intersection are explored further, with consideration being given to installing a roundabout or signalising the intersection.

During RAA's assessment it was also noted that the merging distance on the westbound on-ramp is very short. As one of the busiest freeway on-ramps, RAA recommends that the westbound acceleration lane is extended to allow more time for vehicles to safely enter the South Eastern Freeway from Mount Barker towards Adelaide.

Recommendation 6H:

Explore the feasibility of installing channelised right turn lanes to access the freeway on-ramps at the Mount Barker interchange.

Recommendation 6I:

Upgrade the southern intersection at the Mount Barker interchange which may include a roundabout or signalisation.

Recommendation 6J:

Extend the westbound acceleration lane to allow more time for vehicles to safely enter the South Eastern Freeway from Mount Barker towards Adelaide.

Bald Hills

The Bald Hills interchange is a combination of a cloverleaf and diamond interchange, providing full access to and from the South Eastern Freeway and Bald Hills Road, with roundabouts at the intersections. The interchange, which was opened to traffic on 15 August 2016 at a cost of \$27m, has provided more convenient access to and from Nairne and surrounding areas, and to the developments in eastern Mount Barker.

Table 18: Bald Hills interchange measurements and observations.

Ramp	Average daily traffic volume	Delineation rating	On-ramps			Off-ramps	
			Acceleration lane length	Merge distance	Sight distance rating	Length	Traffic controls
EB off	2600	Good				650m	Roundabout
EB on	1200	Good	900m	340m	Good		
WB off	1400	Good				580m	Roundabout
WB on	2,900	Good	890m	320m	Good		

This interchange has been constructed to a high geometric standard and provides ample time for vehicles to safely assess traffic and enter the South Eastern Freeway from Bald Hills Road.

Callington

The Callington interchange is a partial cloverleaf type interchange providing full access to and from the South Eastern Freeway and Callington Road. While the length of acceleration lanes is quite short, and merging distance could be improved, traffic volumes are quite low, and the 2014-2018 crash history doesn't indicate any casualty crashes occurring that could be related to these dimensions.

Table 19: Callington interchange measurements and observations.

Ramp	Average daily traffic volume	Delineation rating	On-ramps			Off-ramps	
			Acceleration lane length	Merge distance	Sight distance rating	Length	Traffic controls
EB off	650	Good				620m	Give-way sign
EB on	700	Good	290m	120m	Poor		
WB off	750	Good				750m	Give-way sign
WB on	650	Good	270m	120m	Medium		

Monarto South

The Monarto interchange is a combination of a partial cloverleaf and diamond interchange with a T intersection south of the freeway, and a staggered T intersection north of the freeway. The access ramps to and from Adelaide carry the majority of traffic at this interchange, with a small percentage of traffic using other ramps.

Table 20: Monarto South interchange measurements and observations.

Ramp	Average daily traffic volume	Delineation rating	On-ramps			Off-ramps	
			Acceleration lane length	Merge distance	Sight distance rating	Length	Traffic controls
EB off	800	Good				300m	T (no signs)
EB on	170	Good	230m	170m	Medium		
WB off	180	Good				610m	T (no signs)
WB on	700	Good	280m	50m	Good		

The westbound on-ramp provides a very short merging distance as it joins the South Eastern Freeway, just before travelling under the Ferries McDonald Road Bridge. Sight distance to through traffic when entering the freeway is good from the acceleration lane, which alleviates some of the issues with the short merging distance. Traffic volumes are low and there is no recent casualty crash history indicating major issues with this entry ramp.

RAA recommends that give way signs and line marking is installed on each of the off-ramp approaches to Ferries McDonald Road, to create consistency amongst all off-ramp T-interchanges along the South Eastern Freeway.

Recommendation 6K:

Install give way signs and line marking on each of the off-ramp approaches to Ferries McDonald Road.

Murray Bridge West

The Murray Bridge interchange is a one-way 'T' type interchange, very similar in design to the Verdun interchange. This is the primary interchange linking Murray Bridge and the South Eastern Freeway. Access is provided to and from the freeway from Murray Bridge to Adelaide.

Table 21: Murray Bridge West interchange measurements and observations.

Ramp	Average daily traffic volume	Delineation rating	On-ramps			Off-ramps	
			Acceleration lane length	Merge distance	Sight distance rating	Length	Traffic controls
EB off	3200	Good				500m+	N/A
WB on	3100	Good	570m	150m	Good		

Geometry of the ramps is good, and movements to and from the freeway can be made easily.

There's no need to provide full access at this interchange given the proximity of the Swanport interchange, however this could provide a safer access for heavy vehicles into Murray Bridge, as an alternative to the current Swanport Road and Hindmarsh Road freight routes.

Swanport

The Swanport interchange is a combination of a diamond and cloverleaf interchange, with similarities in design to the new Bald Hills interchange. The Bald Hills interchange is superior in that it provides a larger exit curve radius, safer intersections and longer acceleration lanes.

Table 22: Swanport interchange measurements and observations.

Ramp	Average daily traffic volume	Delineation rating	On-ramps			Off-ramps	
			Acceleration lane length	Merge distance	Sight distance rating	Length	Traffic controls
EB off	700	Good				550m	Give-way sign
EB on	1400	Good	320m	250m	Good		
WB off	1300	Good				700m	Give-way sign
WB on	750	Good	510m	100m	Good		

While the westbound on-ramp provides a less than ideal merging distance, traffic volumes are low, and there's no recent crash history to indicate major issues for drivers accessing the freeway from this on-ramp.

The speed limit along Jervois Road is currently 80km/h where the freeway off-ramps meet. RAA recommends this be reviewed with consideration given to applying a 60km/h speed limit between the Swanport Hotel and Irena Court. This 600m section of road contains five intersections, one commercial property access point, and two residential property access points. This will improve safety for vehicles entering and exiting the South Eastern Freeway, vehicles travelling along Jervois Road, and vehicles accessing properties on this section of Jervois Road

Recommendation 6L:

Review the speed limit on Jervois Road with consideration given to applying a 60km/h speed limit between the Swanport Hotel and Irena Court.

Other discussion

Use of safety ramps

DPTI does not charge a fee for the use of the safety ramps and covers the costs of removing a vehicle from the ramp to a safe place. The safe place would be determined at the time of the incident, depending on the load type. Although there's no charge or fee issued by DPTI, SAPOL may conduct an investigation into the incident. Depending on the evidence, the driver could be expiated for a breach of section 45C of the *Road Traffic Act 1961*, or face a criminal charge of reckless or dangerous driving under section 46(1) of the *Road Traffic Act 1961*, which carries a maximum penalty of two years imprisonment.

Recommendation 7A:

Clearly publicise that no fee is charged for extracting a heavy vehicle from the safety ramps, and that the cost of towing to a safe place is covered by DPTI.

Current rules for trucks and buses

Current speed limit restrictions for all trucks and buses descending the section of the freeway from the Crafers interchange to the bottom of the freeway have been in place since 1 September 2014. All trucks and buses are limited to a maximum speed of 60km/h on the South Eastern Freeway and must use a gear that's low enough to enable a vehicle to safely descend without the use of the primary brake.

In 2019, changes were introduced under section 9C of the *Road Traffic (Road Rules—Ancillary and Miscellaneous Provisions) Regulations 2014*, whereby Australian Road Rule 108(1) doesn't apply to the South Eastern Freeway descent. This is due to it being a prescribed road and is instead covered under section 45C of the *Road Traffic Act 1961*. Under section 45C, a first offence for exceeding the speed limit by 10km or more carries a penalty of \$1036, six demerit points and a \$60 victims of crime levy.

Second, third and subsequent offences also incur six-month, 12-month and three-year licence disqualifications respectively.

Comparatively, a breach of section 108 of the *Australian Road Rules (SA)*, attracts a \$382 fine, three demerit points and a \$60 victims of crime levy.

The body corporate levy for a business that fails to nominate a driver for camera-detected offences is \$5000 and is between \$10,000 and \$20,000 if the body corporate is found guilty in court.

From 1 May 2019 to 6 December 2019, a \$25,000 body corporate levy applied. Six-month licence disqualifications for a first offence also applied to bus and truck drivers breaching speed and low-gear restrictions over this time. A second offence attracted a 12-month licence disqualification, with third and subsequent offences attracting a three-year licence disqualification. From 6 December, the licence disqualification was removed for a first offence.

In addition, all trucks and buses are required to use the left lane for the first 1.3km of the descent, commencing at a point 200m east of the Waverly Ridge Road Bridge in Crafers. This provides a dedicated lane for trucks and buses to reduce speed to 60km/h (or lower), with a lower impact on traffic flow for other vehicles. Beyond this 1.3km section, trucks and buses are permitted to overtake, provided they don't exceed the 60km/h speed limit.

Definition of trucks and buses

For the purpose of the current rules, a truck is defined as a vehicle with a gross vehicle mass (GVM) more than 4.5 tonnes, and a bus is defined as a vehicle that seats more than 12 adults (including the driver).

Concerns have been raised that small buses, such as a Toyota Commuter with a seating capacity of up to 14 adults, are required to stay in the left lane of the South Eastern Freeway and not exceed 60km/h. Being restricted to the left lane means they're driving behind larger vehicles descending at a much slower speed, and they're prohibited from overtaking on the initial section of the descent.

There have been calls from some bus operators for the definition of a truck or bus to be changed to apply to vehicles with a GVM of eight tonnes or more. This would mean that smaller trucks and buses, specifically Toyota Coasters and Commuters, Fuso Rosas and stretch limos would be exempt from the 60km/h speed limit and the need to stay in the left lane.

The proposed categories would be as follows:

- **restricted bus** means a bus with a GVM over eight tonnes
- **restricted truck** means a truck with a GVM over eight tonnes

It's understood this was initially considered but not proceeded with due to concerns that the new category of restricted vehicle could create further confusion for the heavy vehicle industry. This is because existing rules applying to trucks and buses (including those that apply nationally, for example, Australian Road Rule [ARR]108), would continue to apply as per the existing definitions. Also, the existing definition of bus in the ARRs is based on the number of seats and not the GVM of the vehicle.

This means that small vehicles, such as 12-seater buses with a GVM of less than three tonnes, are operating under the same restrictions as a heavy vehicle with a GVM in excess of 60 tonnes.

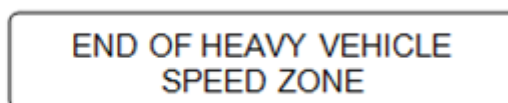
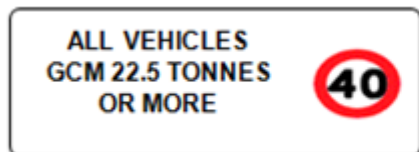
The commercial vehicles on which these small buses are based (Toyota Hi-Ace for example) are not subject to the same restrictions and can descend at a higher speed. Additionally, private vehicles such as 4WDs towing a large trailer can have a gross combination mass (GCM) of six tonnes in some cases, but aren't subject to any vehicle-specific speed or lane restrictions during their descent. By contrast, small trucks and buses are subject to the restriction even when unladen and their actual weight is well below that of a laden 4WD and trailer combination.

It's noted that some jurisdictions, notably Western Australia, have descent restrictions in place based on GCM, namely:

- WA, Greenmount Hill (7% gradient) on Great Eastern Highway, Shire of Mundaring
- WA, Coalfields Highway (7% gradient) in the Shire of Harvey
- WA, Bedfordale Hill (5.11% gradient) on Albany Highway, City of Armadale

Under the *WA Road Traffic Code 2000*, drivers of heavy vehicles with a (GCM) of 22.5 tonnes or more are required to slow down to 40 km/h while travelling within these zones, irrespective of whether their vehicles are laden or not.

Such heavy vehicle speed zones are signed as shown below:



Implementing a GCM-based system for this section of the South Eastern Freeway would still ensure that heavy vehicles descend under control, while allowing lighter vehicles the flexibility to overtake slower moving heavy vehicles, while still complying with the requirements of ARR 108.

Recommendation 7B:

Consider adopting a GCM-based model for the classification of vehicles to which Section 45C of the *Road Traffic Act 1961* applies, for vehicles travelling on the prescribed section of the South Eastern Freeway. This will require consultation with key stakeholders including industry groups and government agencies to determine how this model could operate effectively and to ensure no unintended consequences occur as a result of any changes.

