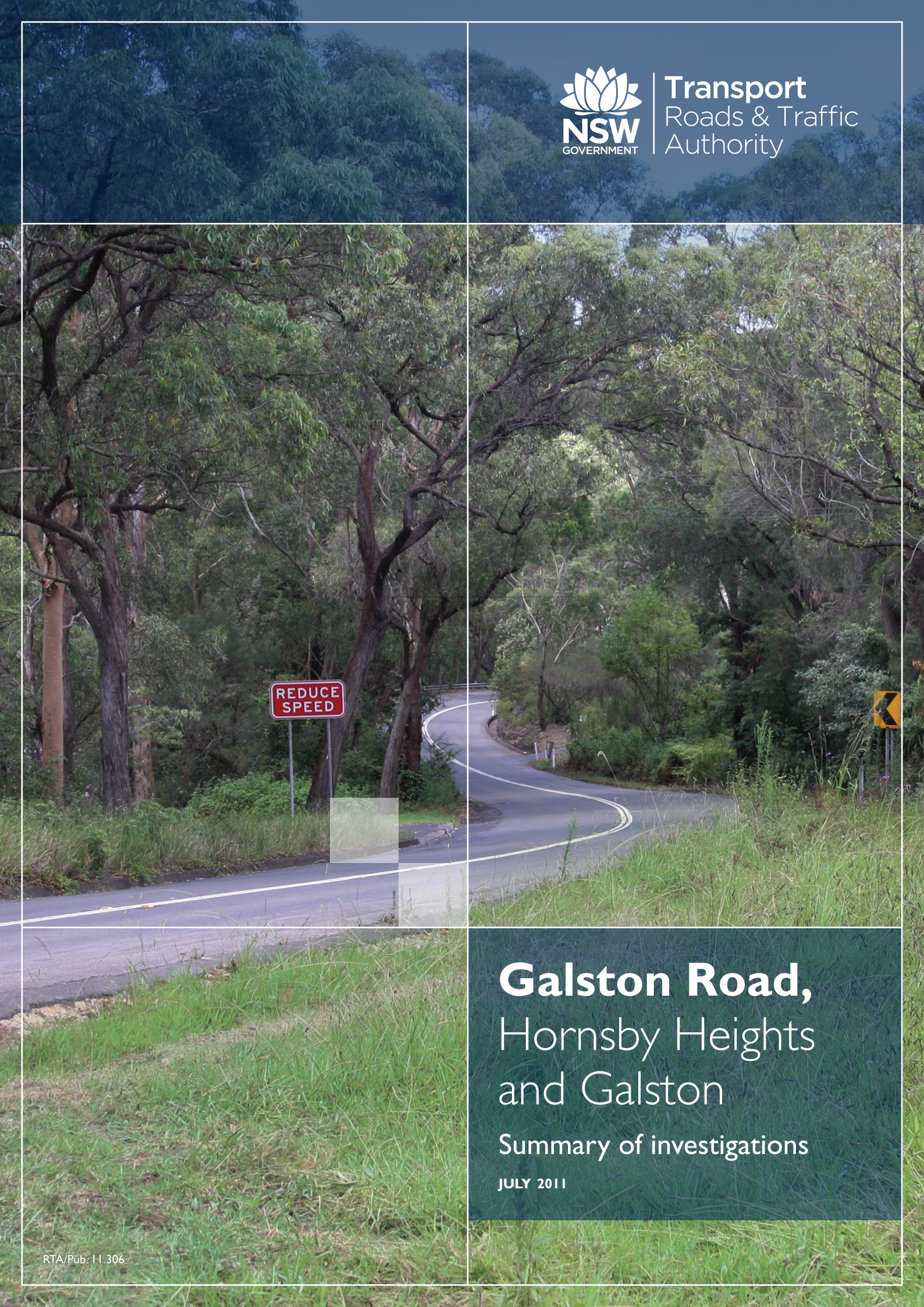


NSW GOVERNMENT
Transport
Roads & Traffic
Authority

Galston Road, Hornsby Heights and Galston

Summary of investigations

JULY 2011

RTA/Pub. 11.306

Contents

1 Background

Galston Road is an important regional link with an Average Annual Daily Traffic (AADT) volume of 5000 vehicles. Galston Road through Galston Gorge is the most direct route between Galston and Hornsby.

There are large warning signs on Galston Road at the approaches to both ends of Galston Gorge warning long vehicles not to proceed through the Gorge. The signs have flashing lights and notify drivers that vehicles longer than 7.5 metres are prohibited through the Gorge. The signs advise of heavy fines should motorists proceed.

The 7.5 metre maximum length restriction was prescribed in the *Motor Traffic Regulations 1935*.

Since that time, manufacturing improvements and modifications to vehicle turning paths have been made. The Roads and Traffic Authority (RTA) is unaware if the vehicle length restriction has ever been reviewed in light of these improvements.

The *Motor Traffic Act* was repealed in 1999 when the *Australian Road Rules* came into effect. There are no specific provisions under the *Road Rules* to enforce a length restriction on Galston Road through Galston Gorge. This restriction is imposed by the 'No Truck' signs installed along the approaches to Galston Gorge.

The Sydney Sector Vehicle Regulation on-road enforcement program includes Galston Gorge. Currently, teams of inspectors patrol the Gorge on average twice a week to ensure heavy vehicles (over 4.5 tonnes) do not disobey the 7.5 metre length restriction signs. If a heavy vehicle driver is detected by RTA inspectors, a fine for 'Disobey No Truck Sign (length) - Galston Gorge' for the amount of $1776 is issued. Similarly, a bus driver detected entering the Gorge is issued with a $143 fine for 'Disobey No Buses sign (length)'.

The RTA does not have the legislative powers to enforce a length limit for light vehicles (under 4.5 tonnes). This power is with the NSW Police.

The RTA is unaware if the length restriction has ever been enforced for light vehicles.

The RTA is also unaware of any incidence of light vehicles/vehicle combinations becoming stuck in the Gorge.

There is a recorded history (on average 3 per year) of trucks and articulated vehicles contravening the 7.5 metre length restriction and becoming stuck in the tight, steep bends of Galston Gorge. When this happens and the roadway becomes blocked, major detours are required and major delays to road users occur.

Already this year there have been two reported incidents of over-length vehicles becoming stuck in the Gorge. On Tuesday 8 February the Gorge was closed for more than four hours after a prime mover with a trailer carrying five horses became trapped. Police were called to manage the traffic which had to be turned around. Further crews removed the horses and then towed out the empty truck. On Friday 25 March, a coach measuring 13.5 metres in length became stuck and required removal.

2 The proposal

In November 2010, based on community concerns about delays to traffic caused by vehicles blocking the road and the time it takes to remove such vehicles, a package of work was announced. The package aimed to **reduce the number of vehicles that become stuck in the tight, steep bends of the Gorge.**

Work is described in Figures 1, 2 and 3 below and involves:

- Installing an over-length vehicle monitoring (transportable infrared truck logger) and corresponding camera system on the eastern end of the gorge to monitor and take images of over-length vehicles.
- Installing an over-length vehicle monitoring system (transportable infrared truck logger) on the western end of the gorge to measure vehicle length and trigger a sign with flashing lights to warn the drivers of specific over-length vehicles to turn around and not proceed to the gorge.
- Upgrading the intersection of Galston and Calderwood roads, Galston by replacing the existing T-intersection with a roundabout.
- Constructing a truck facility on the departure side of the proposed roundabout to prevent the passage of eastbound heavy vehicles greater than 7.5 metres beyond the intersection.

These initiatives were proposed, based on the preliminary information available at the time.

The RTA prepared a review of environmental factors (REF) for the approval of the proposed roundabout and associated truck facility. This review was completed in February 2011 and is available on the RTA website.

A separate review of environmental factors for the transportable infrared truck logger and corresponding camera system was completed in January 2011.

Figure 1: Proposed roundabout and truck barrier

Figure 2: Transportable infrared truck logger (TIRTL)

Figure 3: Camera system

3 Consultation

The RTA consulted with key stakeholders and sought feedback from the community about this proposal.

Based on the issues raised in community discussions the RTA has undertaken traffic studies, surveyed the bends of the Gorge, and undertaken modelling of the truck barrier.

Feedback from the community has been used to inform the landscaping options and access arrangements.

3.1 Western side of the Gorge, Galston

On 3 December 2010 information regarding the proposed roundabout and truck facility was letter-boxed to residents on the western side of the Gorge in the vicinity of the proposal. Contact details for the RTA project manager and a request for residents to call and arrange an on-site meeting to further discuss any issues/ concerns were provided at that time.

On-site meetings were held with residents on 10 December 2010 and 14 January 2011.

3.2 Eastern side of the Gorge, Hornsby Heights

On 3 January 2011 information regarding the proposed installation of a transportable infrared truck logger and corresponding camera system was letter-boxed to residents on the eastern end of the Gorge in the vicinity of the proposal.

On-site meetings to discuss residents' issues and concerns were held on 17 January 2011 and 22 February 2011.

Ongoing dialogue has been maintained with these residents to address concerns as they arise.

The issues raised are described below:

- Visual impact and reduced visual amenity, particularly in the vicinity of the transportable infrared truck logger and camera hardware.
- Reduced/restricted access for:
  - Residents with long vehicles/vehicle combinations living east of the Calderwood Road/Galston Road intersection.
  - Residents with long vehicles/vehicle combinations living east of the over-length camera.
  - Emergency vehicles – potential difficulties gaining safe passage through the proposed 'truck facility.'
  - Delivery trucks, garbage trucks and other over-length vehicles. (Vehicles over 7.5 metres in length which are not travelling through the gorge but need to pass the camera or truck facility).
  - Local business operators with a history of being able to drive their car and trailer (over-length light vehicle combination), through the gorge without incident.
  - Local residents with a history of being able to drive their over-length light vehicle combinations through the gorge without incident.
- Reduced amenity for local residents. Previously uninterrupted bush views have been replaced with views of RTA hardware.

Other feedback provided during on-site discussions includes:

- "Residents are concerned about the number of drivers who speed along Galston Road through Galston Gorge. We're much more concerned about speeding and safety than the number of vehicles that get stuck in the Gorge. Speeding is a big issue."
- "Over-length trucks and articulated vehicles represent a 'blockage' risk through the Gorge. Over-length light vehicle combinations do not."
- "Show me some evidence that a light vehicle has ever been stuck in the Gorge."

- "Installing barriers and other hardware in the road corridor represents a road safety hazard."
- "The RTA should consider investigating turning paths as opposed to overall length if it wants to avoid causing unnecessary inconvenience to local residents, business operators and motorists."
- "The RTA should consider giving an exemption to the drivers of light vehicle combinations. This will avoid hindering commuters unnecessarily. Detouring along Pennant Hills Road adds approximately 50kms to the daily commute."
- "Installing over-length cameras is a revenue raising exercise. Friends and family will be discouraged from visiting us because if they're towing their boat, trailer or caravan, they'll pass the camera and get fined."

To meet the project objectives as well as incorporate community feedback, the RTA has:

- Worked with residents regarding landscaping, drainage and pedestrian access options.
- Worked with residents to ensure access to residential properties on the eastern end of the Gorge is maintained for residents, emergency service and delivery vehicles.
- Agreed to construct measuring bays at both the eastern and western ends of the Gorge to assist drivers to measure the overall length of their vehicle/vehicle combination.
- Investigated a range of design options for the proposed roundabout and truck facility at the western end of the Gorge. These options will assist the RTA to ensure safe access is maintained for all road users. This includes residents, emergency service vehicles, garbage trucks and delivery vehicles. See section 4.3 for more information on these investigations.
- Provided information to the NSW Police Force Local Area Commander regarding resident concerns of 'speeding' along Galston Road for future intelligence and action.
- Reviewed historic traffic count data to determine the types of vehicles travelling through the Gorge. See section 4.1 for more details.
- Investigated data relating to recorded incidences of vehicles blocking the Gorge. See section 4.1.1 for more details.
- Recorded current patterns of vehicle usage. See section 4.1.2 for more details.
- Undertaken 3D modelling of the horizontal and vertical geometry of the bends through the Gorge. See section 4.2 for more details.
- Investigated turning paths and physical dimensions of light and heavy vehicles plus combinations. See section 4.2 for more details.

4 Investigations

To meet the primary objective of this project, **reducing the number of vehicles that become stuck in the tight, steep bends of the Gorge**, and at the same time minimise its impacts on:

- road safety
- visual amenity
- amenity for local residents, business operators and road users
- traffic flow
- access to residential properties for over-length vehicles
- the existing natural and built environment

the RTA has collected additional traffic information and undertaken a range of investigations.

These investigations have assisted the RTA to determine a way forward in terms of:

- The types of vehicles which cannot reasonably negotiate the Gorge – vehicles which represent an unacceptable 'blockage' risk.
- Providing safe yet effective measures to manage the passage of east and westbound over-length heavy vehicles.
- A technical basis for the existence of a length restriction on Galston Road through Galston Gorge.

These additional investigations are detailed below.

4.1 Traffic data

4.1.1 Historical data

Available traffic data between November 2008 and March 2011 indicates that 10 trucks have been stuck in the gorge and have required the assistance of government authorities to be freed. It should be noted that this data does not capture incidents where stuck vehicles have been able to free themselves.

According to the information available, the following types of trucks have been stuck in the Gorge:

- Removalist truck.
- Semi trailer.
- Primer mover with a trailer carrying 5 horses.
- Bus.
- Flatbed truck.

The information available has not produced results regarding light vehicles with trailers but anecdotally, trucks have been responsible for blocking the Gorge.

4.1.2 Recent data

On 26 February 2011, the transportable infrared truck logger installed on the eastern end of the Gorge was switched on for the purpose of data collection.

For the 50 day period between 7 April 2011 and 26 May 2011, the data logger detected a total of 247,222 vehicle movements along Galston Road through Galston Gorge. An average of 4944 vehicles travelled through the Gorge each day. Of this, approximately 4813 were light vehicles/light vehicle combinations (Class 1 & 2) and approximately 131 were heavy vehicles/heavy vehicle combinations (Class 3 to 12).

For this period heavy vehicles represented approximately 2.7% of the total number of vehicles travelling through the Gorge each day.

In this 50 day period, 6569 heavy vehicles passed through the Gorge. Of these, 101 heavy vehicles or 1.5 per cent, were longer than 7.5 metres. In terms of direction of travel, 61 were heading west (toward Galston), and 40 were heading east (towards Hornsby).

In this same period, about 1,319 light vehicle combinations (0.53 per cent of total vehicles), passed through the Gorge. Of these, 67 (or 5.1 per cent), were over 10 metres in length and 20 (or 1.5 per cent), were greater than 11 metres in length.

During this period, there were no recorded blockages in Galston Gorge. Vehicles classified under Class 1 through to Class 10 were recorded travelling through the Gorge.

A summary of vehicle classifications can be found in Appendix A.

4.2 2D and 3D modelling of the bends

The RTA undertook topographical survey of the bends in Galston Gorge. These surveys combined with 3D simulation of the turning paths of model vehicles, enabled the RTA to determine the types of vehicles/vehicle combinations which are able to negotiate the tight, steep bends of the Gorge without incident.

The bends were identified numerically from 1 to 5 with 1 being the western most bend at Galston and 5 being the eastern most bend at Hornsby Heights. See Appendix B for more details.

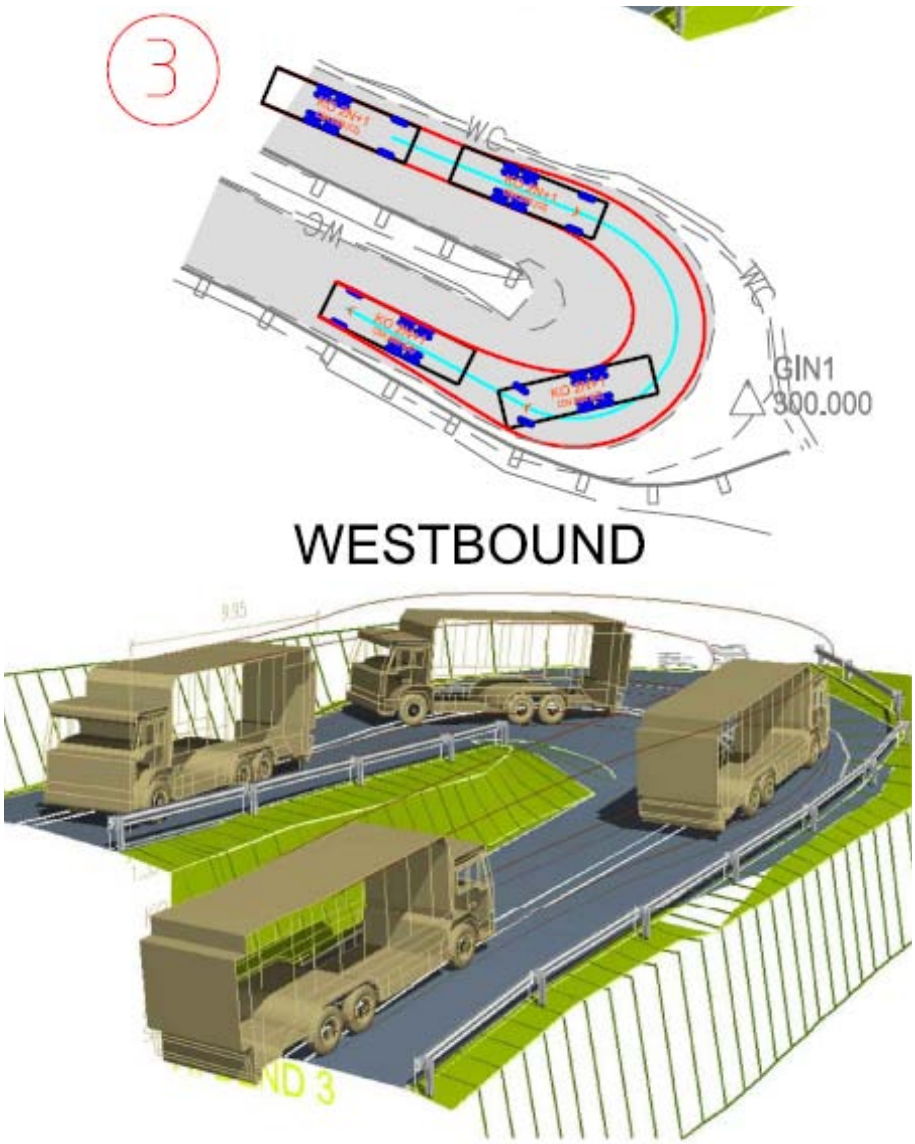
The bends are relatively consistent. They are all characterised by having very small radii curves and steep grades, differing only in terms of available road width and road side features such as rock cuts and guardrails.

The worst/tightest conditions are prevalent at bend number 3. Due to existing grades, issues of traction loss and the need for longer vehicles to cross over onto the wrong side of the road to negotiate the turns, the worst/most difficult direction of travel is eastbound.

A range of model vehicles from a car to a semi trailer where used in the 2 D and 3D bends simulation. Issues of grade and the need to travel on the wrong side of the road were also incorporated.

Most vehicles need to cross the road centre when negotiating the bends of the Gorge – this is unavoidable. The centreline has been removed around each bend.

Where longer vehicles needed to utilise the inside of a curve to negotiate a turn, it was identified that traction could become an issue. Images of the 2D simulation (top) & 3D simulation (bottom) are shown below.

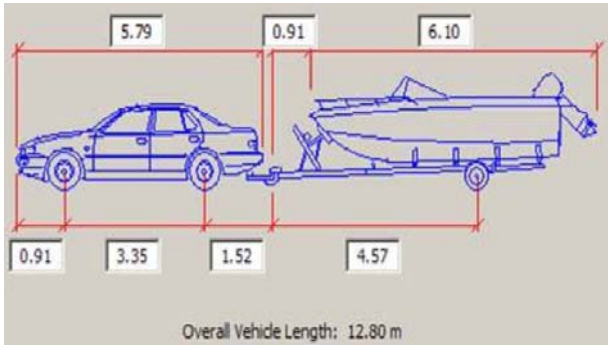


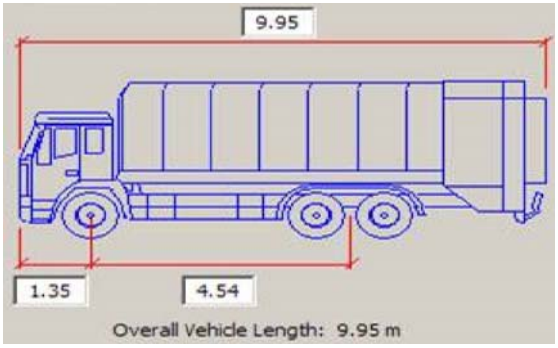
The simulation was run using the following rules:

- Manoeuvre must be completed in one go i.e. no 3 point turns.
- Vehicle must not collide with any road side feature.
- The following constraints were also applied in the simulation:
- Driver picked the correct line of travel the first time.
- Only vehicles available in the database were modelled. (These vehicles represent a realistic sample of the types of vehicles potentially travelling through the Gorge).

4.2.1 Vehicles which passed the simulation

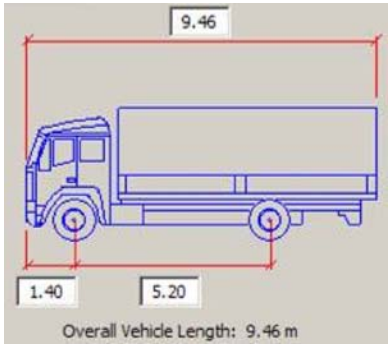
The simulation indicates that the vehicle types below can navigate the bends of the Gorge without incident:

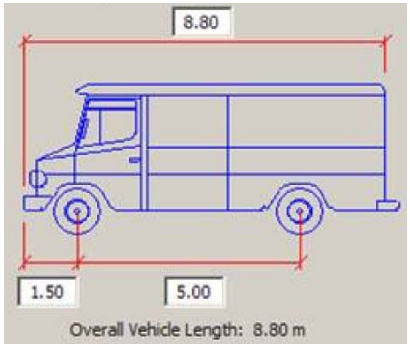




4.2.2 Vehicles which marginally passed the simulation

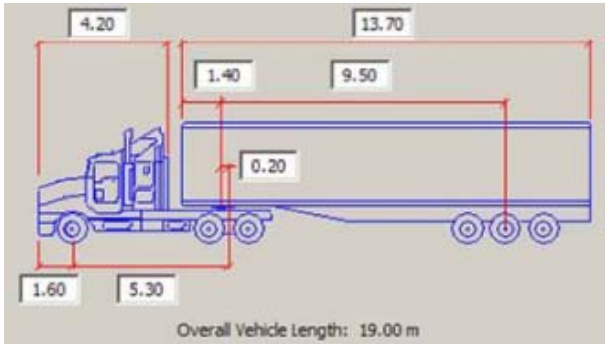
The simulation indicates that the vehicles types below can only just navigate the bends of the Gorge without incident:

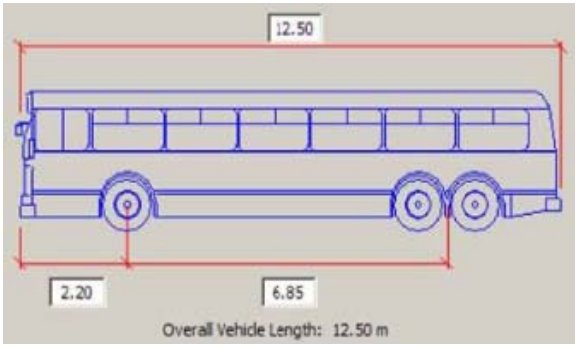


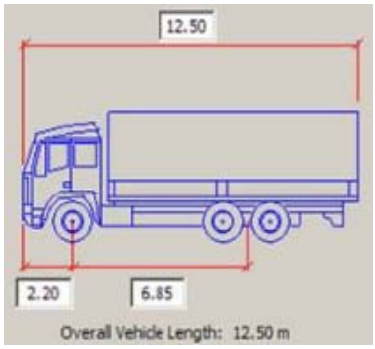


4.2.3 Vehicles which failed the simulation

The simulation indicates that the vehicle types below can not navigate the bends of the Gorge without incident:







4.2.4 Summary of simulation results

Notwithstanding human error, the simulation identified that the most critical influence on a vehicle's ability to negotiate the bends, is the steering lock angle i.e. a vehicle's turning circle. The lower the lock angle the more difficult it is for the vehicle to navigate the bends. The next most critical factor is vehicle length.

As illustrated above, a 9.95 metre long truck with an excellent (high) steering lock angle could pass through the Gorge easier than a slightly shorter truck with a moderate (medium) steering lock angle. The turning paths of the above vehicles are attached in Appendix C.

Based on the topographical survey as well as the 2D and 3D modelling, the RTA has determined that light vehicle combinations up to 11 metres long can traverse the Gorge without incident. This is supported by the data collected by the transportable infrared truck logger that shows a number of vehicles of this combination using Galston Gorge without incident.

Given that the most critical influence on a vehicle's ability to negotiate the bends of the Gorge is the steering lock angle and that this angle varies greatly in heavy vehicles, the RTA has concluded that the 7.5 metre length restriction for heavy vehicles should be maintained.

4.3 Design options for the roundabout and truck facility/barrier

A roundabout and associated truck facility are proposed to deter long vehicles likely to get stuck if they proceed along Galston Road east of the Calderwood Road intersection.

The design of the truck facility departs from the RTA's *Road Design Guidelines 2006*. This is because the truck facility needs to be purpose built to specifically address the issue of over-length vehicles entering the Gorge.

The concept design for the truck facility/barrier incorporates a series of tight curves. This would make the passage of an over-length vehicle very difficult. It would also pose a safety risk to other road users.

The design speed of the truck facility is about 15km/h. Galston Road is currently posted at 60km/h. Motorists failing to slow sufficiently before entering the facility and/or drive to the appropriate road conditions, risk injury or damage.

It should be noted that there are currently no physical barriers installed within the road environment at this location. Introducing a physical barrier would in itself, provide an additional road safety hazard.

To address the road safety concerns associated with the concept design of the roundabout and truck facility, the RTA developed several alternative design options. These were assessed with the intended aim of selecting a design which could meet the objectives of the proposal and at the same time, maintain an acceptable level of safety for motorists. See below for further details of this assessment.

4.3.1 Configuration options for the truck facility/barrier

The options to configure the truck facility are described below.

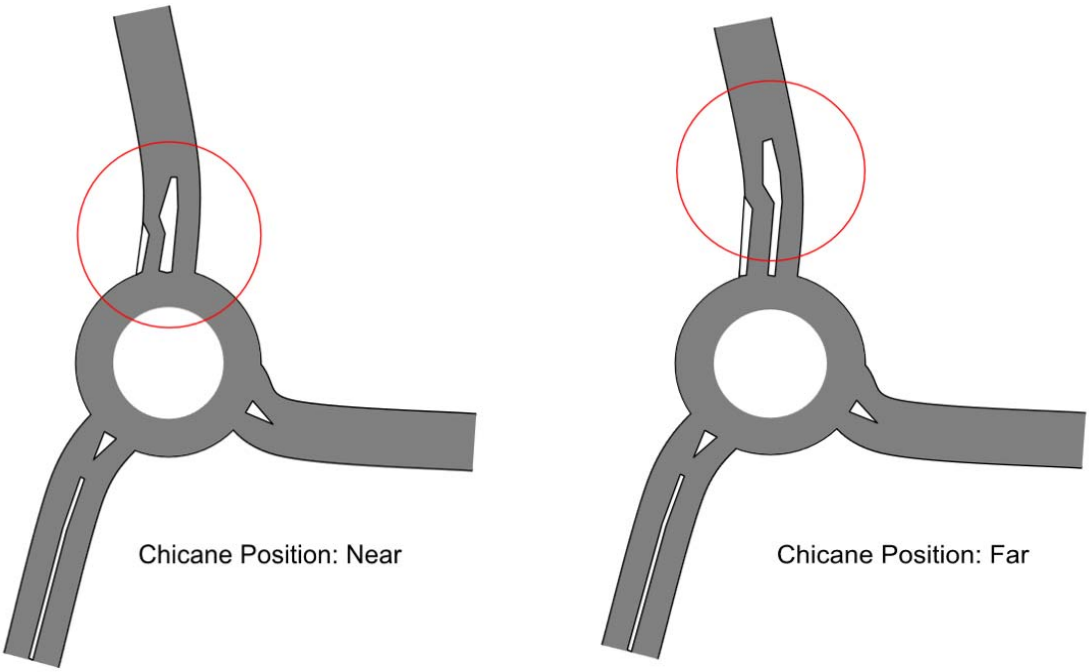
4.3.2 Position of the chicane

The position of the chicane impacts on sight distance.

By positioning the chicane further away from the roundabout, it would be less visible to drivers. This means drivers could potentially change their mind about proceeding through the chicane at a point where it is too late to simply u-turn at the roundabout. This would result in the driver having to reverse out of the chicane and back into the roundabout, impacting on traffic flows and risking the safety of other drivers.

By moving the chicane further way from the roundabout, sight distance for drivers can be improved.

These options are illustrated below:

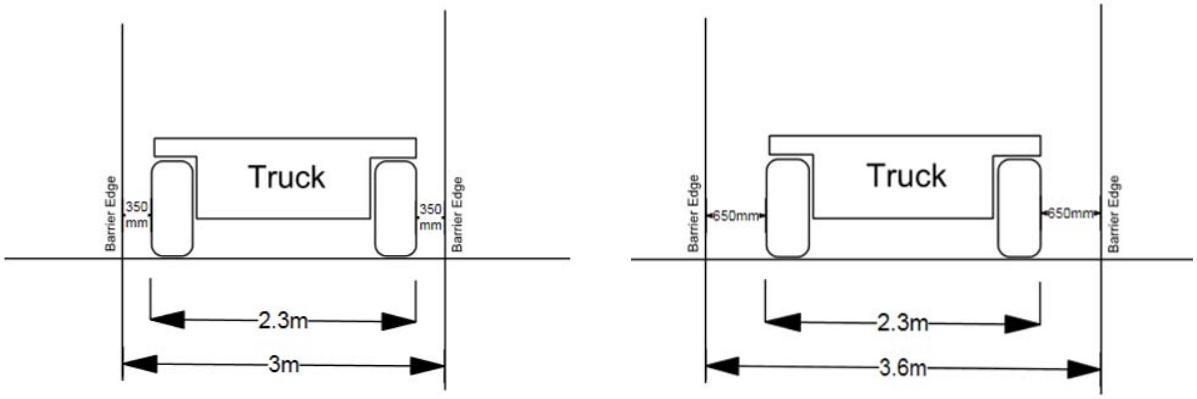


4.3.3 Lane Width

Reducing lane widths has the effect of slowing down traffic.

Due to the tight curves of the chicane, reduced lane widths would have the additional effect of making manoeuvres more difficult. This would mean reduced room for driver error.

These options are illustrated below:



4.3.4 Barrier Type

A key influence on the design of the chicane is the type of barrier selected. The type of barrier selected will also significantly influence the operation of the chicane.

A low barrier would allow vehicles with a high clearance to mount and drive over the chicane.

A standard type F barrier in conjunction with the 10-13% approach grade for westbound traffic would obstruct driver vision for vehicles entering the roundabout and would therefore pose a road safety hazard, reducing road user safety.

It should be noted that installing any physical barrier within the road environment represents a hazard to road users.

4.3.5 Consideration of barrier type

When considering the barrier type, the RTA has investigated various scenarios. Please refer to the images on the next page for information on barrier options.

Scenario 1 – Motorbike/bicycle travelling east from Galston at high speed

If a motorbike/bicycle rider failed to slow sufficiently before entering the chicane and clipped one of the kerb edges, the rider could lose control and either be flung from their bike or end up sliding along the road pavement. The design of the chicane would determine the outcomes for the rider as below:

- **Concrete barrier** – Likelihood of rider impacting the barrier square on is high. Risk of death or severe injury to the rider is also high.
- **Elsholz redirective kerb** - Lower barrier height would result in moderate risk of death or injury due to impact with the kerb. Possibility the rider could be flung into the opposing traffic.
- **Standard kerb** – The risk of death due to impact is low.

Scenario 2 – Car travelling east from Galston at high speed

If the driver of a light vehicle fails to slow sufficiently before entering the chicane they risk clipping one of the kerb edges and losing control. The design of the chicane would determine the outcomes for the driver as below:

- **Concrete barrier** – Likelihood of the car crashing head on into the barrier is high. Risk of the car being a 'write-off' is high. Risk of severe injury to the driver/any passengers is high.
- **Elsholz redirective kerb** – Likelihood of significant damage to the car on impact with the kerb is high. Moderate injuries are likely to be sustained by the driver/any passengers.
- **Standard kerb** – The risk of injury to the driver/any passengers is low. It is likely some damage to the vehicle would be sustained.

Scenario 3 – Car travelling west from Hornsby

- **Concrete barrier** – The risk of side impact crashes with vehicles in the roundabout is high. A concrete barrier would obscure vision into the roundabout for westbound drivers i.e. it would be difficult for westbound drivers to see vehicles which are already in the roundabout.
- **Elsholz redirective kerb** – Due to the low height of Elsholz kerbing, sight distance and therefore side impact crash risk for westbound drivers would not be an issue.
- **Standard kerb** - Due to the low height of barrier kerbing, sight distance and therefore side impact crash risk for westbound drivers would not be an issue.

Scenario 4 – Car with/without a trailer travelling east from Galston

The design of the chicane would determine the outcomes for cars with/without trailers as below:

- **Concrete barrier** – The risk of installing a chicane comprising a solid curved wall is that drivers who are unfamiliar with this design option may hesitate, increasing the risk of rear end crashes and queuing. By obscuring visual cues, the height of the concrete barrier would also make assessment of the correct path of travel difficult to determine. As a result, the risk of drivers scraping their car, trailer or wheels when negotiating the chicane is high.
- **Elsholz redirective kerb** – The height of this barrier would not obscure visual cues. Because of the height of the kerb the potential for drivers to scrape their car, trailer or wheels whilst negotiating the chicane, still exists.
- **Standard kerb** – Standard kerbing is commonly used along roadways. The risk of damage to a car or trailer would be low however some bumping of the wheels could occur.

Scenario 5 – Over-length truck heading east from Galston

- **Concrete barrier** – Installing a solid wall would present a visual deterrent. If a driver chose to proceed and attempt to pass through the concrete barrier, at some point the truck would become wedged. This would cause scraping damage to the truck. The truck would then need to be backed out or if really stuck, winched out of the chicane before normal operation could resume. In the meantime, traffic could bypass the chicane under traffic control.
- **Elsholz redirective kerb** – Has sufficient height to make passage through the chicane very difficult for trucks. Trucks with large wheels and sufficient ground clearance may be able to mount the kerb.
- **Standard kerb** – Trucks could simply mount standard kerbing. Mounting the kerb would however cause bumping of the wheels which would make for an uncomfortable ride.

Concrete barrier

Elsholz redirective barrier

Standard kerb

4.4 Summary of design considerations

As reported in sections 4.1 and 4.2 traffic data and modelling of the bends supports the RTA's conclusions that:

- light vehicle combinations up to but not exceeding 11 metres in length can traverse the Gorge without incident and the 7.5 metre length restriction should be removed for light vehicles
- the 7.5 metre length restriction for heavy vehicles is appropriate and should be maintained.

As per the proposal, the main design objective of the barrier is to restrict the ability of vehicles/vehicle combinations likely to get stuck in the Gorge from proceeding along Galston Road to the Gorge.

In line with the modified business rules for light vehicle combinations, the barrier would therefore need to restrict the passage of heavy vehicles exceeding 7.5 metres in length while allowing for the safe passage of light vehicles up to 11 metres in length.

After investigating the various truck facility design options, road safety constraints and modified business rules for light vehicle combinations, the evidence indicates that in terms of meeting the main design objective, the more effective the barrier is, the greater the implications for road user safety and access.

The RTA therefore considers that the risks associated with constructing an effective truck facility fall outside the limits of acceptable risk to legitimate road users. As a result, the RTA has determined it will construct the proposed roundabout but not the associated truck barrier. To ensure the main design objective is met and to enhance the overall operation of the transportable infrared truck logger and camera system, the RTA will install additional truck loggers and warning signs on both approaches to the Gorge. This will ensure all over-length vehicles proceeding to the Gorge are recorded and monitored every time.

TABLE 1: CHICANE DESIGN OPTIONS

	Considerations	Current thinking
Barrier type		
Concrete Barrier	• high risk, road safety issue, impacts would be severely compounded by grades and speeds • high risk, road safety issue, height of walls would impede sight lines into roundabout from gorge and compounded by speeds • moderate risk, road safety issue, height of walls would impede sight lines from chicane to driveway and vice versa • low visual appeal • restrictive and likely to cause damage to through vehicles	N
Half height concrete barrier	• high risk, road safety issue, impacts would be severely compounded by grades and speeds • moderate risk, road safety issue, truck roll over potential and hopping over • low visual appeal • restrictive and likely to cause damage to through vehicles	N
Elsholz redirective kerb	• low risk, road safety issue, truck roll over potential and hopping over • provides visual cue for restriction due to extended lip of kerb • restrictive and likely to cause damage to through vehicles	N
SM/SA barrier kerb	• lower barrier will restrict but may allow vehicles to pass through • flaps placed on to will provide additional notification of chicane	N
SA/SA barrier kerb	• lower barrier will restrict but may allow vehicles to pass through • provides visual cue of restriction due to extended lip of kerb • flaps placed on to will provide additional notification of chicane	Y
Setback barrier and barrier kerb combination	• in theory to provide restriction to separately address light and heavy vehicles, difficult to design due to variables in vehicles types and abilities	
Width		
3m	• restrictive and does not allow for driver error • narrow lanes will impact traffic capacity by slowing down • not forgiving and more likely to cause damage to vehicle due to smaller clearance	N
3.6m	• typical road standard	Y
Position	•	
Near	• chicane can be easily identified from roundabout • allows drivers to reassess choice of entering chicane	Y
Far	• due to steep grades, location of chicane is not easily visible from roundabout • vehicles reassess choice of entering chicane will have to reverse uphill for a long stretch	N

5 The way forward

The RTA considered:

- The key objective of the project – to reduce the number of vehicles that become stuck in the tight, steep bends of the gorge.
- Community feedback.
- Traffic data.
- 2D and 3D modelling of the hairpin bends of the gorge.
- A variety of design options for the roundabout and truck facility/chicane

As a result, the RTA has modified the project scope and has developed business rules to support the operation of the new over-length vehicle monitoring/measuring system.

- **Light vehicles –** After modelling the bends and investigating traffic data the RTA has determined that light vehicle combinations up to 11 metres can traverse the Gorge without incidence. The RTA has also concluded that there is no evidence to support the need to maintain a 7.5 metre length restriction for light vehicles. The 7.5 metre length restriction for light vehicles is therefore being removed in favour of advisory signage warning the drivers of light vehicle combinations exceeding 11 metres, not to proceed to the Gorge.
- Heavy vehicles – After modelling the bends and investigating traffic data the RTA has concluded that the 7.5 metre length restriction for heavy vehicles is appropriate and should be maintained. The RTA will continue to enforce the current 7.5 metre length restriction for heavy vehicles.

The modified and enhanced package of work for Galston Road through Galston Gorge aims to:

- Reduce the number of vehicles that become stuck in the tight, steep bends of the Gorge.
- Reduce unnecessary inconvenience to local residents, business operators and motorists.
- Enhance road user safety.

Work will comprise:

- A roundabout to replace the existing T-intersection at the intersection of Galston and Calderwood roads, Galston.
- Measuring bays on both sides of the Gorge to assist drivers to measure the overall length of their vehicle/vehicle combination.
- A transportable infrared truck logger and corresponding camera system on the eastern end of the Gorge to monitor and take images of over-length vehicles proceeding to the Gorge.
- A second transportable infrared truck logger on the eastern side of the Gorge to trigger a sign with flashing lights warning the drivers of over-length vehicles to turn around and not proceed to the Gorge.
- A transportable infrared truck logger on the western side of the Gorge, immediately west of the roundabout, to trigger a sign with flashing lights warning the drivers of over-length vehicles to turn around at the roundabout and not proceed to the Gorge.
- A second transportable infrared truck logger on the western side of the Gorge, immediately east of the roundabout to monitor and record the details of over-length vehicles proceeding to the Gorge.
- Modified advanced warning signs and regulatory 'No Tuck' signs on the approaches to the Gorge warning drivers of the:
    - over-length cameras ahead
    - 7.5 metre length restriction for heavy vehicles
    - heavy fines which apply should a heavy vehicle proceed to the Gorge
    - 11 metre advisory length limit for light vehicle combinations
    - opportunities to turn around and not proceed to the Gorge.

It should be noted that the transportable infrared truck loggers are linked i.e. they do not work in isolation but rather track and record the path of all over-length vehicles. This will enable the RTA to monitor on an ongoing basis, vehicle types and usage, and will facilitate future planning.

If an over-length vehicle proceeds to the Gorge, the RTA's Heavy Vehicle Inspectors will receive an SMS, providing them with advanced warning of potential blockages and the opportunity to intercept and infringe offending heavy vehicles.

These modified measures mean that every over-length vehicle will be recorded and monitored and the enforcement process for over-length vehicles will commence.

Refer to Appendix D for a map of the proposed initiatives in the vicinity of Galston Gorge.