

# TCS 062 – 2015

## The Supply of Trailer Mounted Electronic Speed Limit Signs (ESLS)

Revision:	A
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## Foreword

This specification has been developed by VicRoads. It is one of a number of technical specifications, and associated standard drawings, which set out the requirements for roadside ITS devices, traffic signal equipment and other electrical equipment and associated devices and control systems.

This specification is intended for use in all relevant works undertaken by or on behalf of VicRoads.

VicRoads Standard Drawings, Specifications and Guidelines are available for downloading from VicRoads website at the following address under 'Tenders & Suppliers', <http://www.vicroads.vic.gov.au/itsspecs>

**Specification updates.** VicRoads specifications and associated standard drawings are subject to periodic review. To keep the specifications up to date, amendments or new editions are issued as necessary. It is therefore important for users of VicRoads specifications to ensure that they have the latest version and associated amendments.

## APPROVED PRODUCTS

All equipment covered by this specification shall hold current VicRoads 'Type Approval' certification. To obtain VicRoads 'Type Approval' the manufacturer/supplier must submit a written request, together with a sample product, to VicRoads for evaluation. Such requests shall include all relevant documentation demonstrating compliance with this specification. Type Approval issued in accordance with this specification does not constitute automatic approval against future versions of this specification. Where it is considered necessary, VicRoads may withdraw current Type Approval and request that the affected product be re-submitted for evaluation against future versions of this specification.

All equipment covered by this specification shall be manufactured by an approved manufacturer under a VicRoads approved Quality Assurance System and shall be subject to all requirements of audit therein

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## Revision History

Revision	Date	Approved by
A (original)	April 2015	W Harvey

# **PREFACE**

## **A. TELECOMMUNICATIONS EQUIPMENT**

- A.1 All telecommunications equipment shall comply with relevant requirements of the Australian Communications and Media Authority (ACMA). Such equipment shall be labelled with a Regulatory Compliance Mark.

## **B. CHANGES TO THIS SPECIFICATION**

- B.1 The main changes to this specification from the previous version are listed below:

- Modification of headings and reorganisation of sections for greater consistency with Australian Standard;
- Conversion to TCS format.

The following table details previous versions to this specification:

<b>Date</b>	<b>Revision Owner</b>	<b>Purpose of Revision</b>
October 2012	VicRoads M80 Ring Road Upgrade	Incorporate comments from industry
September 2012	VicRoads M80 Ring Road Upgrade	Developed for M80 Ring Road Project

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# SECTION 1 SCOPE AND GENERAL

## 1.1 SCOPE

- 1.1.1 This Specification covers the design and manufacture of Trailer Mounted Electronic Speed Limit Signs (ESLS). These signs are typically used to convey temporary speed limits to motorists on sections of roads during roadwork.
- 1.1.2 This document specifies the requirements for the trailers and any modifications to standard ESLS for use with trailers.

## 1.2 INTELLECTUAL PROPERTY

- 1.2.1 In relation to all intellectual property used in/or to operate the Trailer Mounted ESLS, the contractor grants to VicRoads non exclusive licence to “use and modify that without the licence, could be a breach of the licensors Intellectual Property. Intellectual Property shall include, but not be limited to, the following:
- Software;
  - Source code;
  - Schematic diagrams;
  - Circuit diagrams;
  - Wiring diagrams;
  - Listings of components and sub-components;
  - Any and all operational and maintenance documentation

## 1.3 GENERAL

- 1.3.1 Any reference to “ESLS” within this specification shall be taken to mean “Trailer Mounted Electronic Speed Limit Sign”.
- 1.3.2 ESLS shall be designed to operate and be compatible with the VicRoads ITS Platform as well as requirements outlined in contract specification documentation.
- 1.3.3 ESLS shall comply with the requirements of TCS-037, Electronic Speed Limit Signs except where varied within this specification.
- 1.3.4 The trailers associated with Trailer Mounted ESLS shall comply with the requirements of this specification.

- 1.3.5 The Signs shall be designed to provide (as a minimum) legible speed limits of 40, 50, 60, 80 and 100km/h to drivers during any time of the day or night in accordance with this Specification.

## SECTION 2 RELATED SPECIFICATIONS AND DRAWINGS

- 2.1 The fabrication and supply of all components shall conform to all relevant Australian Standards.
- 2.2 All installation works shall conform to the relevant VicRoads specifications and related specifications and standards as indicated throughout this document.
- 2.3 Where no specific reference is made to an Australian Standard, the materials and processes used shall conform to the relevant Australian Standard or generally accepted practice if no Australian Standard exists.
- 2.4 The following related Australian Standards are referenced:

AS 1742	Manual of Uniform Traffic Control Devices
AS 1743	Road signs - Specifications
AS 1744	Forms of letters and numerals for road signs
AS 5156	Electronic speed limit signs
AS 61000.6.3	Generic standards – Emission standard for residential, commercial and light industrial environments
AS/NZS1170.2	Structural Design Actions, Part 2: Wind Actions
AS60529	Degrees of protection provided by enclosures (IP code)

- 2.5 The following specifications are referenced:

VicRoads Specification TCS037	The Supply of Electronic Speed Limit Signs
VicRoads Specification TCS060	VicRoads extensions to RTA protocol for roadside devices
RTA Specification TSI-SP-003	Communications protocol for roadside devices
Road Rules	Victoria
VicRoads	Traffic Engineering Manual, Volumes 1 and 2
STREAMS	VicRoads ITS Platform

## SECTION 3 TRAILER REQUIREMENTS

### 3.1 GENERAL

- 3.1.1 The trailer provides two functions. It provides the base (foundation) for the actual ESLS to be mounted on and allows portable transportation of the ESLS.
- 3.1.2 The trailer needs to act as a counterweight for the ESLS and associated components such as the solar panels. The trailer must be limited in size to reduce its potential to become a hazard.
- 3.1.3 The trailer shall comply with the applicable Australian Design Rules. The trailer mounted sign unit shall be suitable for registration in accordance with the statutory requirements of the relevant State or Territory.
- 3.1.4 Any levers/or trailer parts when ESLS is deployed should not protrude beyond the limits of the trailer.
- 3.1.5 The trailer shall have affixed the manufacturer's compliance plate as per Victoria road regulations.
- 3.1.6 Prior to use on the Victorian road network, the trailer shall have current registration as per road regulations for trailers used for commercial purposes.
- 3.1.7 The trailer and ESLS sign shall be securely fixed to avoid theft and vandalism.

### 3.2 DIMENSIONS

- 3.2.1 The trailer dimensions have taken into consideration the components required to support an ESLS. The trailer dimensions shall be as indicated in Table 1 below.

<b>Item</b>	<b>Preferred Dimension</b>	<b>Maximum Allowed Dimension</b>	<b>Minimum Allowed Dimension</b>
Width	1.2m	1.5m	-
Length	2.5m	3.0m	-
Height to base of sign when installed	2.4m	-	2.2m
Trailer deck height above ground	-	0.6m	-

**Table 1 – Trailer Dimensions**



### **3.3 WIND LOADING**

- 3.3.1 The facilities provided for supporting and stabilising/anchoring the trailer and sign shall ensure that when installed for normal operation, the sign will maintain its intended orientation and position when subjected the wind loading conditions applicable to the region in which the trailer Mounted ESLS is intended to be used, in accordance with AS 1170.2.
- 3.3.2 The weight of the trailer shall be reviewed in accordance with the relevant safety requirements to minimise roadside hazard for traffic.

### **3.4 SHAPE**

- 3.4.1 The trailer shall have a flat top and a minimum ground clearance equal to the height of the trailer wheel axle.

### **3.5 STORAGE COMPARTMENT**

- 3.5.1 The storage compartment shall incorporate separate battery, hoist control and general storage compartments. In order to provide a high standard for OH&S, the compartments shall not protrude more than 30mm above the deck height.
- 3.5.2 A minimum of one storage compartment for general use with a minimum of 0.1m<sup>3</sup> capacity shall be provided.
- 3.5.3 All storage compartments shall be lockable and comply with applicable occupational health and safety regulations and requirements.
- 3.5.4 The storage compartments shall provide adequate ventilation for the battery and shall have a minimum weather resistance of IP45.

### **3.6 STABILISERS**

- 3.6.1 The trailer shall be suitably designed to ensure stability of the ESLS and associated hardware (i.e. solar panels). The type of stabilisers employed shall:
- Allow for swivel;
  - Be wind-down and stowable when towing;
  - Be located on four corners, have fixed location on all four corners engineered to stabilize trailer and sign with sign fully extended while meeting wind loading;
  - Have a load rating capable of levelling the trailer; and
  - Have locking mechanism or removable handles and secure drive nuts.

### **3.7 TOWING MECHANISIM**

- 3.7.1 The towing mechanism needs to be structurally designed and certified to tow the aggregate trailer mass (ATM) including a standard 50mm ball coupling.
- 3.7.2 The ball coupling shall attach to an 'A-frame' drawbar
- 3.7.3 The trailer shall include mechanical or hydraulic override brakes.
- 3.7.4 The ATM needs to take into account the weight of the trailer and load capacity (i.e. ESLS and the associated hardware).

### **3.8 AXLE, WHEELS AND TYRES**

- 3.8.1 The trailer shall use a single axle, two wheels and light truck tyres.
- 3.8.2 At least one lock nut on each wheel shall be provided for security.
- 3.8.3 The wheels shall be capable of being easily removed when the trailer is 'in situ' and lifted onto the stabilisers to prevent theft while on-site.

### **3.9 TRAILER LIGHTS**

- 3.9.1 The trailer shall be equipped with only LED lighting in accordance with Australian Design Rules and VicRoads requirements.
- 3.9.2 The connecting plug for the trailer lights shall be a standard Utilux type, round, 7pin plug.

### **3.10 FINISH**

- 3.10.1 The trailer shall be of powder coated or baked enamel finished with rust galvanised treatment.
- 3.10.2 Such treatment shall ensure that deterioration due to atmospheric and/or local environmental conditions has no detrimental effect on the structural integrity or visual appearance (including colour fading) of the trailer for a period not less than ten years.
- 3.10.3 The colour of the finish shall be golden yellow, Hex code #FFDF00, Decimal Code R,G,B (255,223,0).

### **3.11 HOIST MECHANISM**

3.11.1 The hoist mechanism shall meet the following requirements:

- Have a maximum height (including solar panels) when retracted of 1.9m above deck height;
- Have a minimum extended height of 3.3m to the top of sign above ground level;
- Raise and lower via hydraulic or mechanical means excluding cable driven mechanism;

### **3.12 ESLS ATTACHMENT TO HOIST**

3.12.1 The ESLS shall be attached to the top of the hoist using vandal resistant bolts or other means to minimise the risk of theft.

3.12.2 The attachment shall allow for the sign to have a maximum horizontal rotation of 100 degrees.

3.12.3 When in the transport position, with the hoist lowered, the sign shall be capable of being rotated so that the sign face is parallel to the trailer length.

## SECTION 4 ELECTRICAL SYSTEM

### 4.1 SOLAR POWER

- 4.1.1 The trailer mounted ESLS shall be designed to operate on solar power.
- 4.1.2 When designing the system, consideration must be given to the power consumption, the hours of operation and the average amount of sunlight available.
- 4.1.3 The solar power system shall have:
- Solar panel size shall not exceed the trailer footprint;
  - Solar panel mounting that is capable of an automated tilt of 45° and rotation of 350 degrees;
  - Solar supply capacity of 24 hours operation per two hours of sunlight and a battery redundancy of 8 days, 50% Depth of Discharge (DoD;)
  - Regulator system for features, communications and monitoring; and
  - System voltage of 12 or 24 volt.

### 4.2 BATTERY

- 4.2.1 The battery shall have the capacity to fully operate the ESLS for a period of 24 hours per day for two days and provide all communications and control functionality continuously for the same two days from a normally operational charged state without receiving any further charge from the solar panel.
- 4.2.2 Suitable sealed gel type battery shall be used for the trailer mounted ESLS.
- 4.2.3 Before the voltage of the power supply battery drops to a level that would prevent the battery from being recharged by the charging system, the signs control system shall log this event.

## **SECTION 5      SIGN REQUIREMENTS**

### **5.1      GENERAL**

- 5.1.1 The ESLS shall meet the requirements of VicRoads Specification TCS 037, The Supply of Electronic Speed Limit Signs.
- 5.1.2 Where requirements of this specification differ from those of TCS 037, this specification shall take precedence.

### **5.2      MECHANICAL REQUIREMENTS**

- 5.2.1 The ESLS shall incorporate any required additional reinforcing and/or bracing to ensure that the sign mechanically and structurally suitable for the intended application.
- 5.2.2 The front viewing window shall be made from anti-glare and U.V. stabilised polycarbonate with a minimum thickness of 4.5mm.

### **5.3      DIMENSIONS**

- 5.3.1 The ESLS display shall be based on a 'C' size speed limit sign as defined in AS 1743.
- 5.3.2 The enclosure of the ESLS should be square in shape and approximately 1050mm x 1050mm.

### **5.4      CONTROL EQUIPMENT**

- 5.4.1 As with other ESLS, the trailer mounted ESLS shall be operated via VicRoads ITS Platform via the 3G network.
- 5.4.2 Appendix A describes the ITS Platform.
- 5.4.3 The control equipment shall be located within the sign housing and the housing should be secure.
- 5.4.4 The control equipment shall be configured locally at the ESLS or remotely (master/slave).

- 5.4.5 When configured as master / slave operation the manual override control (remote) shall only operate from the master sign and operate as a pair.
- 5.4.6 The flashing (frequency 50 to 60 times per minute) of the annulus for a pair of signs shall be synchronised.

## 5.5 WIRELESS MODEM CONNECTION

- 5.5.1 The wireless modem connection shall be accessed by both VicRoads and the maintenance contractor and shall enable simultaneous connection.
- 5.5.2 The wireless modem communication shall be secured and have data encryption.

## 5.6 MANUAL OVERRIDE CONTROL

- 5.6.1 For signs installed in pairs, the override of both signs shall be achieved as per section 5.4.2 using a device approved by VicRoads.
- 5.6.2 This device shall be capable of changing the speed limit display remotely and must not interfere with the operation of any adjacent (not intended) ESLS.

## 5.7 FACILITY SWITCH

- 5.7.1 The sign shall incorporate a manual override switch, located on the outside of the housing, which can be operated via a standard VicRoads facility key.
- 5.7.2 The switch shall include the following positions:
  - For single speed signs the switch positions detailed in Table 2.
  - For dual speed signs the switch positions detailed in Table 3.

Switch Position	Function
Auto	This position shall allow the sign to operate normally
Off	This position shall switch the sign off
On	This position shall switch on the display

**Table 2 - Manual Override Switch Configuration for Single Speed Signs**

Switch Position	Function
Auto	This position shall allow the sign to operate normally
Off	This position shall switch the sign off
Speed 1	This position shall switch on the lowest speed
Speed 2	This position shall switch on the second speed

**Table 2 - Manual Override Switch Configuration for Dual Speed Signs**

## **5.8 OPERATION & MAINTENANCE MANUAL**

5.8.1 Each trailer shall be supplied with an operation and maintenance manual.

5.8.2 The manual shall provide, as a minimum, clear instructions on the following:

- Safe transport of the trailer;
- Onsite installation;
- Suitable location;
- Setting up of the ESLS for operation;
- Programming;
- Starting up;
- Shutting down;
- Charging of the power supply batteries;
- Routine maintenance;
- Troubleshooting; and
- Occupational Health and Safety (OH&S) requirements.

# APPENDIX A

## VICROADS ITS PLATFORM

(Informative)

### A1 GENERAL

- A1.1 VicRoads ITS communications/control platform currently uses the STREAMS system.
- A1.2 STREAMS is owned and maintained by Transmax Pty Ltd, a Queensland based company which is part of Queensland Main Roads.
- A1.3 STREAMS is an integrated control system which is being used by VicRoads to operate it's ITS Freeway Management Devices on Melbourne's freeway network.
- A1.4 All ITS field devices must be compatible with STREAMS.
- A1.5 Some devices operate using VicRoads Extensions to the RTA Protocol (See VicRoads Specification TCS 060).
- A1.6 Typical ITS field devices connected to and operated by STREAMS include:
- Variable Message Signs (VMS)
  - Freeway Data Stations (FDS)
  - Ramp metering/control signs
  - Lane Use Signs (LUS)
- A1.7 The above devices are typically connected to STREAMS via a Field Processor (FP).
- A1.8 Figure A1 is a high level schematic diagram which shows the communications/control system.



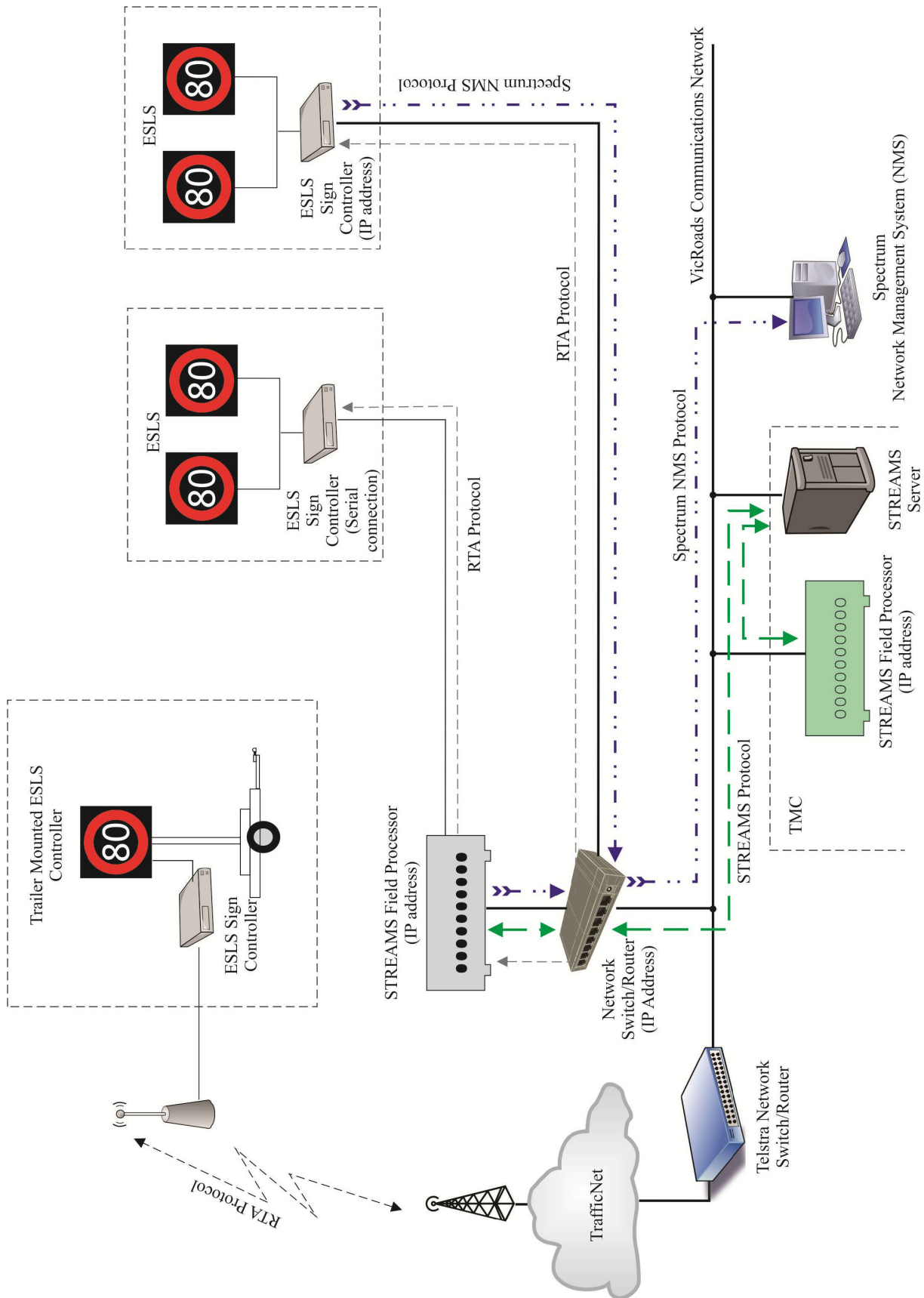


Figure A1 – STREAMS communications/control schematic

## **A2 FIELD PROCESSOR**

- A2.1 The FP is used to interface internet protocol (IP) and serially connected field devices to STREAMS.
- A2.2 Communications between the FP and the ITS Field Device is typically RTA protocol.
- A2.3 The FP is typically installed within an ITS Field Cabinet.
- A2.4 The ITS Field Cabinet is typically located adjacent to the freeway.
- A2.5 In some situations, the FP may be located in VicRoads building at Kew.

## **A3 COMPLIANCE WITH STREAMS**

- A3.1 ESLS must be fully compliant and compatible with STREAMS.
- A3.2 To ensure compliance with STREAMS, the supplier shall obtain a compliance certificate from Transmax for operation on VicRoads ESLS system.
- A3.3 A copy of Transmax certification shall be provided to VicRoads.

## **APPENDIX B**

### **REQUIREMENTS FOR APPROVAL**

(Informative)

#### **B1 GENERAL**

- B1.1 ESLS shall be subject to standard evaluation procedures in accordance with the requirements of TCS 037 – The Supply of Electronic Speed Limit Signs.
- B1.2 The trailer shall be subject to acceptance on a tender by tender basis. That is, the Supplier shall demonstrate to VicRoads satisfaction that the trailer complies with this specification.

# APPENDIX C

## GUIDELINES FOR IMPLEMENTATION

(Informative)

### C1. GENERAL

- C1.1 ESLS shall be installed with due consideration of the requirements set out in AS5156 and the VicRoads specification TCS 037 – The Supply of Electronic Speed Limit Signs. These signs are to be used to display worksite speed limits during traffic management activities and for general safety speed limits during construction.
- C1.2 Consideration shall be given to consistent spacing and placement of signs, to limit vehicle speeds through driver compliance and minimise the need for enforcement. Further consideration shall be given to the placement of signs in relation to other traffic management/construction devices such as gawk screens. It is important to provide clear line of sight to the signs to encourage compliance.
- C1.3 Any existing fixed speed limit signs or ESLS should be decommissioned prior to the use of the trailer mounted ESLS during upgrade works to minimise confusion and ensure that a consistent approach is applied to speed limits.
- C1.4 An ESLS shall be trailer mounted located on one side and where possible both sides of a freeway carriageway, such that it is clearly visible from each lane of the carriageway. The location of the trailer and display shall meet the requirements of the VicRoads traffic management guidelines.