

Lessons learned from one of New Zealand's most challenging civil engineering projects: rebuilding the earthquake damaged pipes, roads, bridges and retaining walls in the city of Christchurch 2011 - 2016.

Best practice for speed management at temporary work sites - Christchurch

Story: Speed Management Best Practice Guideline

Theme: Construction

A best practice traffic management guideline which helps traffic management team members slow motorists through road work sites safely.

This document has been provided as an example of a tool that might be useful for other organisations undertaking complex disaster recovery or infrastructure rebuild programmes.

For more information about this document, visit www.scirtlearninglegacy.org.nz



This work is licensed under a [Creative Commons Attribution 3.0 New Zealand License](https://creativecommons.org/licenses/by/3.0/nz/).

The authors, and Stronger Christchurch Infrastructure Rebuild Team (SCIRT) have taken all reasonable care to ensure the accuracy of the information supplied in this legacy document. However, neither the authors nor SCIRT, warrant that the information contained in this legacy document will be complete or free of errors or inaccuracies. By using this legacy document you accept all liability arising from your use of it. Neither the authors nor SCIRT, will be liable for any loss or damage suffered by any person arising from the use of this legacy document, however caused.

Best practice guide for speed management at temporary work sites - Christchurch

Content:

- Background
- Speed treatment options
- Temporary speed limits (TSLs)
- Appendix A: CITTM speed trials
- Appendix B: Speed treatment examples
- Appendix C: Decision-making matrix worksheet



Background

There is a range of speed treatments that can be used to slow road users to safe speeds at roadwork sites. With the high number of work sites around Christchurch, SCIRT has recently considered these treatments and has identified, in order of preference, speed treatment options for work sites.

Temporary speed limits (TSLs) are commonly used and can be useful tool to slow road user speeds. However, if TSLs are used too frequently, or unnecessarily, the value of TSLs is reduced as road users may become desensitised or ignore TSLs. In many situations, it is better to use other speed treatment options.

The best practice guide outlines the speed treatment options available to STMS when it comes to reducing road users to safe speeds through worksites.

Speed treatment (positive traffic management)

Speed treatments are enhancements to work sites that help to reduce road user's speed. The types of speed treatments are detailed below in order of preference, with an explanation of each treatment option.

This order of preference was informed by recent speed trials by SCIRT as part of the CITTM initiative. More information on the findings from these trials is available in Appendix A (page 8)

Temporary speed limits (TSLs) are commonly used but as there are many worksites in Christchurch, it is important to only use a TSL when it is absolutely necessary.

There are other speed treatment options that should be considered before a TSL is used. A TSL should always be used in conjunction with other speed treatments. Speed treatments are exemplified in Appendix B (page 8).

Speed treatments (in order of preference)

- Side friction
 - Threshold treatments (coned approaches/pinch points)
 - Lane narrowing
 - Reduced cone spacing
- Barriers or barricades
- Anti-gawking screen (or device that blocks visibility longitudinally)
- Additional static signs
- Temporary speed limits (TSLs)
- Speed feedback signs
- Temporary speed humps

It is likely that there will be some sites where it is not appropriate to use certain treatments. The STMS must use their discretion to determine which treatments are suitable for each site.

Most treatments can be implemented without CTOC approval, barriers, speed feedback signs and temporary speed humps require CTOC approval as details/specifications will be required for each site.

Speed treatments explained

Coned approaches (threshold treatments) are additional cones that continue from the closest sign (e.g. TSL signs) to the start of the taper. For a two-lane two-way road this would generally be done on both the edge lines and the centre line (*refer to speed treatment examples drawing 3*).

Pinch points (threshold treatments) are similar to lane narrowing and can be used in areas that do not need or cannot have the full length of road narrowed. An example of where pinch points could be used is at a long site with gaps between narrow areas or on detours where motorist behaviour is a concern (*refers to speed treatment examples drawing 2*).

Lane narrowing is reducing lanes down from the normal width¹. Most motorists are reluctant to drive too close to cone or other pieces of equipment, so they slow down to ensure they do not collide with the cones (*refer to speed treatment examples drawing 1*).

Reduced cone spacing is used to make drivers feel that they are driving faster through the site as they are passing cones faster than they are used to (*refer to speed treatment examples drawing 4*).

Barriers are used as a way to enhance side friction. The most effective way to use barriers to slow motorists is by narrowing the lanes against the barriers.

Anti-gawking screen is a meshed material that is generally placed on 6ft fences within a TTMP site. This reduced visibility and slows motorists as they drive through the site.

Additional static signs are usually custom-made signs specific for the site. These are usually used to advise motorist of why the work site is in place if it is not immediately clear, e.g. 'workers under bridge'

Speed feedback signs have radar inside them that can tell how fast a car is travelling. When used as part of the TTM operation, these signs can display vehicle speeds up to the highest value of the TSL. The VMS boards can be programmed to flash 'SLOW DOWN' to any vehicles going above the TSL while vehicles obeying the TSL will get a message saying 'THANK YOU' (*refer to speed treatment examples drawing 5*).

Temporary speed humps are used in the same way as a permanent speed hump. This speed treatment required prior approval by CTOC before use and should only be considered after all other variable options have been trailed (*refer to speed treatment examples drawing 6*).

¹ this might only be useful during attended hours as cones might be knocked over

Temporary speed limits – not always the right option

Temporary speed limits (TSLs) can be a STMSs first port of call for reducing traffic speeds at a work site. However, if used too frequently or unnecessarily, road users become desensitised to TSLs and may ignore or simply not see TSLs at worksite.

The advantages of TSLs are that they slow road users to a safe speed through a site and can be enforced by police when set up correctly².

The risks of TSLs are that, if the site is incorrectly set up or if the road user cannot see the need for a TSL, road users are less likely to comply with the TSL, and other TSLs in and around Christchurch.

On 50kph permanent speed limit roads, if road users can safely traverse the site at 35kph or more with only minor alterations to the normal driving behaviour, then 30kph TSLs should NOT be used. This will normally require the following conditions to be met:

- Deficiencies are no more than minor
- Visibility is available (greater than Warning Distance B (50m minimum for L1 and 75, for L2 roads))
- Road users are able to see hazards or understand them through TTM devices/signs or approaches to the site, so they naturally slow down to a suitable speed
- The type of work presents a low accident risk to workers and road users

If conditions at the site require traffic speed of 35kph or less for safety reasons, then a posted TSL of 30kph or less should be used. This may be necessary where:

- Major deficiencies exist, such as tight geometrics, narrow lanes or rough/unsealed surfaced
- Visibility is restricted below Warning Distance B (50m minimum for L1 and 75, for L2 roads)
- Hazards are not clearly visible to road users when they are approaching at the permanent speed limit
- The type of work had a high accident risk for workers or road users, for example, repeated work on foot close to a live lane.

New Sign References

RS1 is used for speed signs between 20kph and 90kph

RS2 is used for 100kph

TG1 is used for the 'temporary' supplementary under an RS1

² Police are not able to enforce TSLs that are not set up to the approved TMP and will also have difficulty justifying enforcement of a TSL when it is obviously not appropriate for the conditions. Accurate documentation is required

CoPTTM Guidelines

CoPTTM v4 Section C4.4 covers general requirements for TSLs. The list below is a reduced selection of common requirements; refer to CoPTTM for more information.

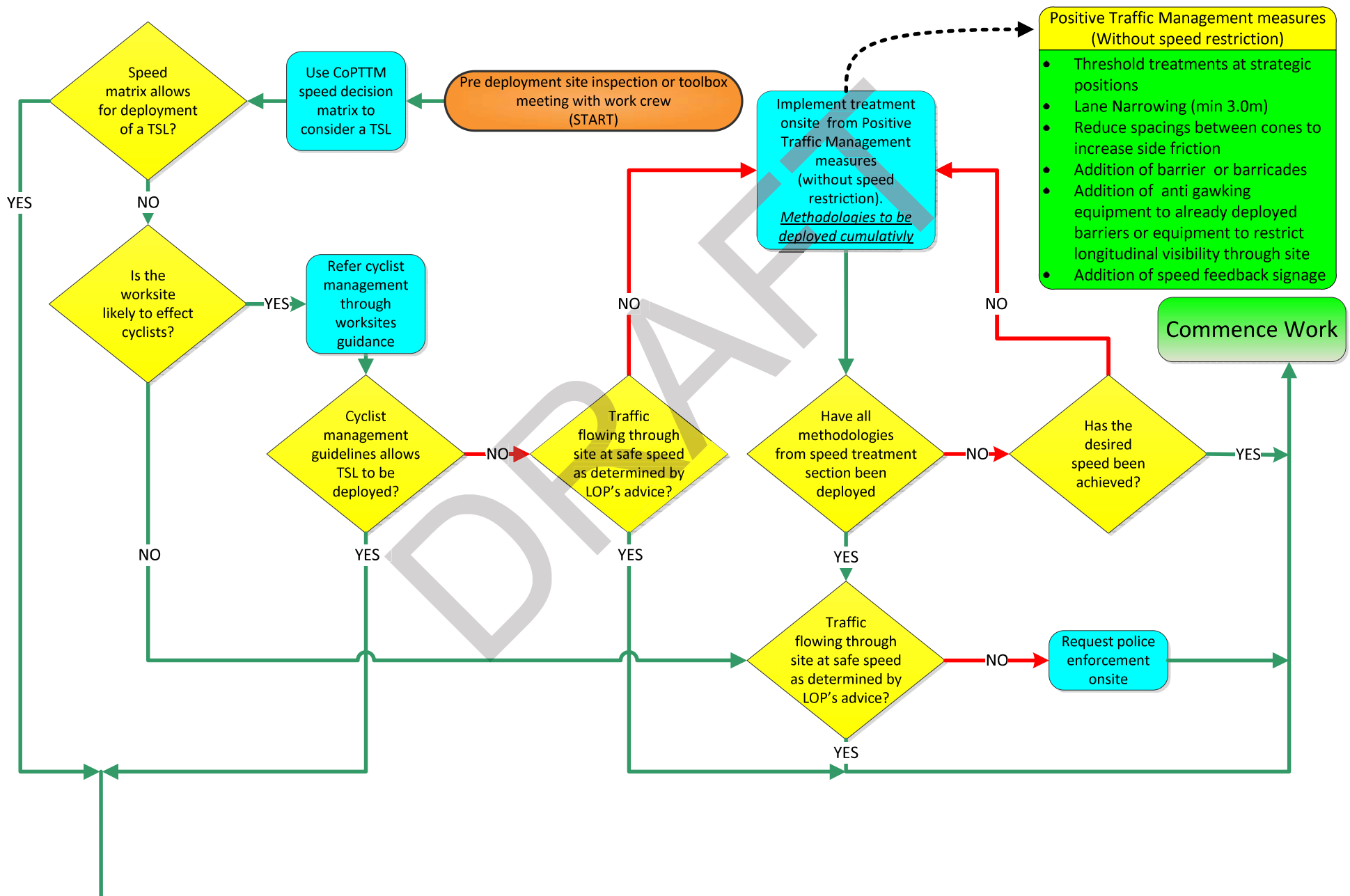
- TSL signs are to be gated unless the road is under 500vpd and the plan is approved with single side TSLs
- Repeaters to be used at intervals no greater than 400m
 - gated on multilane roads
 - left-hand side on two-way two-lane roads
- Existing speed signs within a site need to be covered³ (as per CoPTTM)
- Recording TSL details, include⁴:
 - TSL installed (e.g. 30kph TSL)
 - Date/Time of installation
 - Placement location e.g. house location
 - Length of TSL (m)
 - Date and time removed
- TSL cannot reduce PSL by less than 20kph or lower than 20kph
- **TSL MUST BE REMOVED WHEN NOT REQUIRED**

³ All other signs that contradict the sites will also need to be covered or removed. If the signs are part of another worksite you must speak with the other sites STMS before making changes that could affect the other site.

⁴ Accuracy of these details needs to be within 20m. All TSL records must be kept for at least 12 months, or longer if the worksite is under investigation.

Christchurch TSLs Flow Chart

For Urban Christchurch Roads 60-50kph



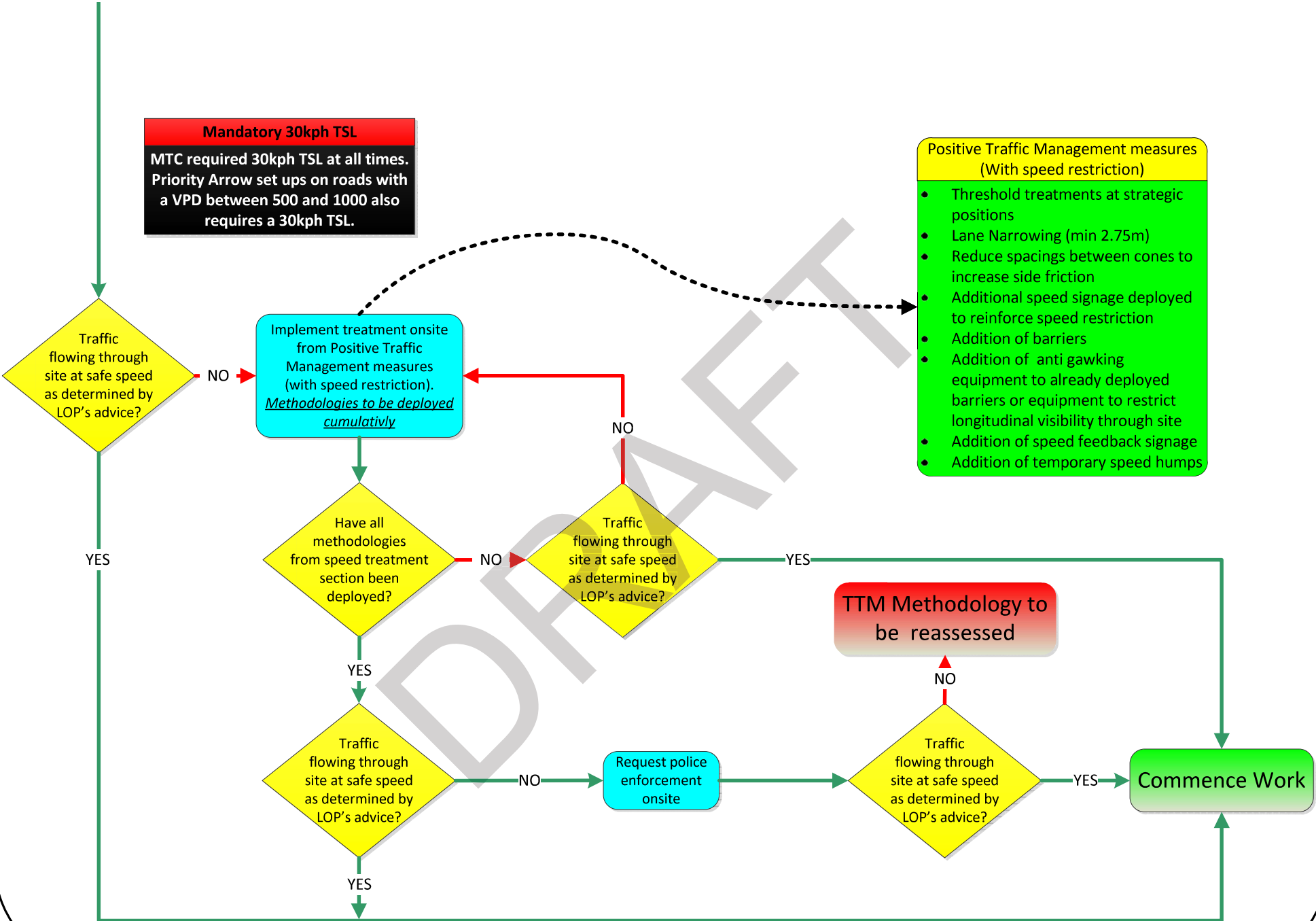
Mandatory 30kph TSL
MTC required 30kph TSL at all times.
Priority Arrow set ups on roads with
a VPD between 500 and 1000 also
requires a 30kph TSL.

**Positive Traffic Management measures
(With speed restriction)**

- Threshold treatments at strategic positions
- Lane Narrowing (min 2.75m)
- Reduce spacings between cones to increase side friction
- Additional speed signage deployed to reinforce speed restriction
- Addition of barriers
- Addition of anti gawking equipment to already deployed barriers or equipment to restrict longitudinal visibility through site
- Addition of speed feedback signage
- Addition of temporary speed humps

Implement treatment onsite
from Positive Traffic
Management measures
(with speed restriction).
*Methodologies to be deployed
cumulatively*

**TTM Methodology to
be reassessed**



Appendix A: CITTM Speed Trials

As part of the CITTM initiatives SCIRT did various speed trials to identify ways of slowing speeding motorists through work sites.

Speed Trials Undertaken

- Side Friction - 3 variations
- Speed Humps - 2 variations
- VMS Messages - 2 variations
- Removal of TSLs - 2 variations

Speed treatments trials undertaken by SCIRT provided the following results:

Side Friction:

Side friction was found to be useful on site to reduce speeds. As explained in the speed treatment section, there are several varieties of side friction. Each site should have some type of side friction that can be used.

Speed Humps:

Speed humps were found to be the most effective treatment used onsite.

VMS Message (Speed Feedback Signs):

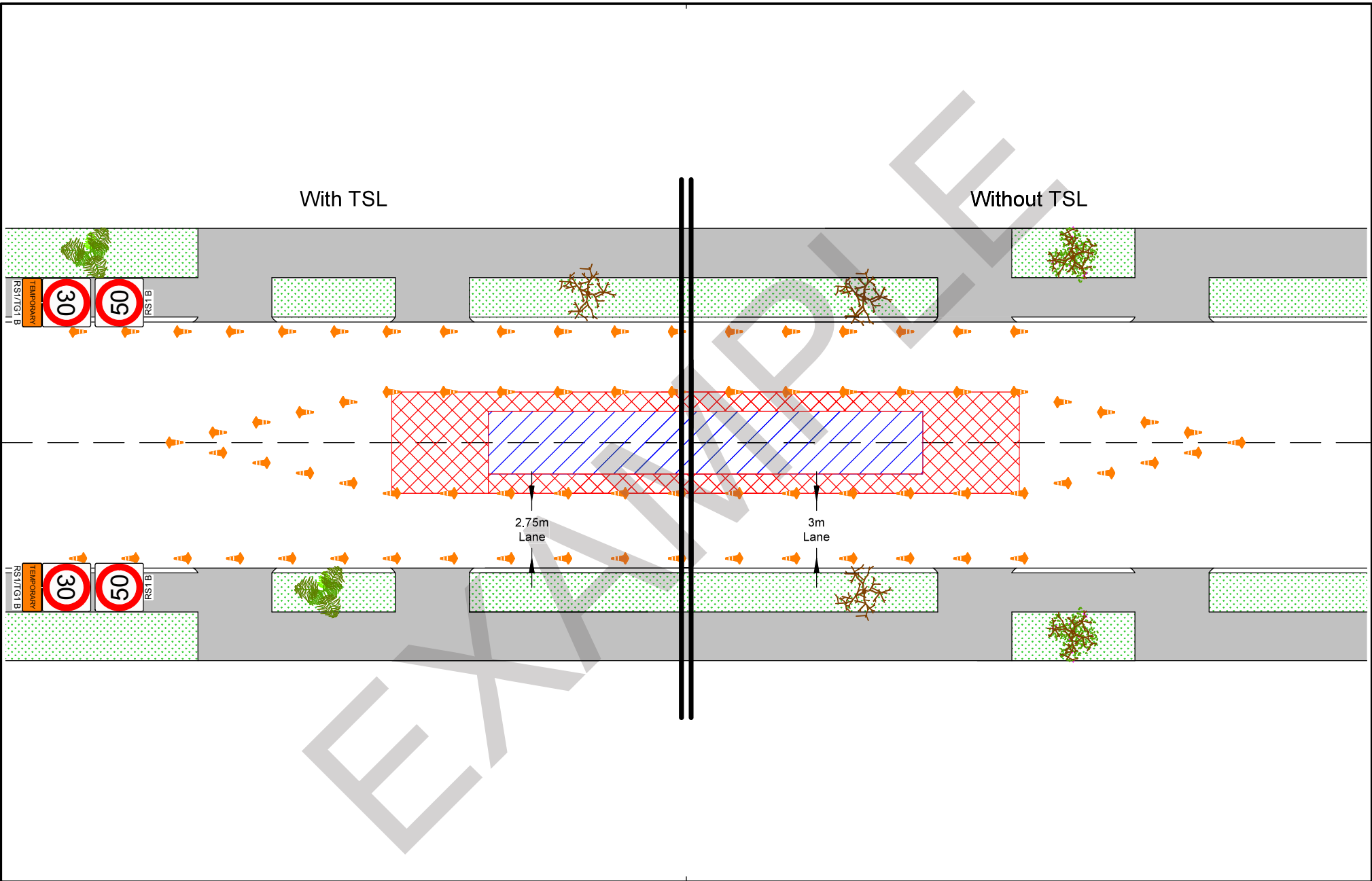
VMS messages were found to be slightly more effective than well maintained side friction. VMS boards are usually used for high profile sites, over use can reduce the effect of VMS boards overall.


Removal of TSL:

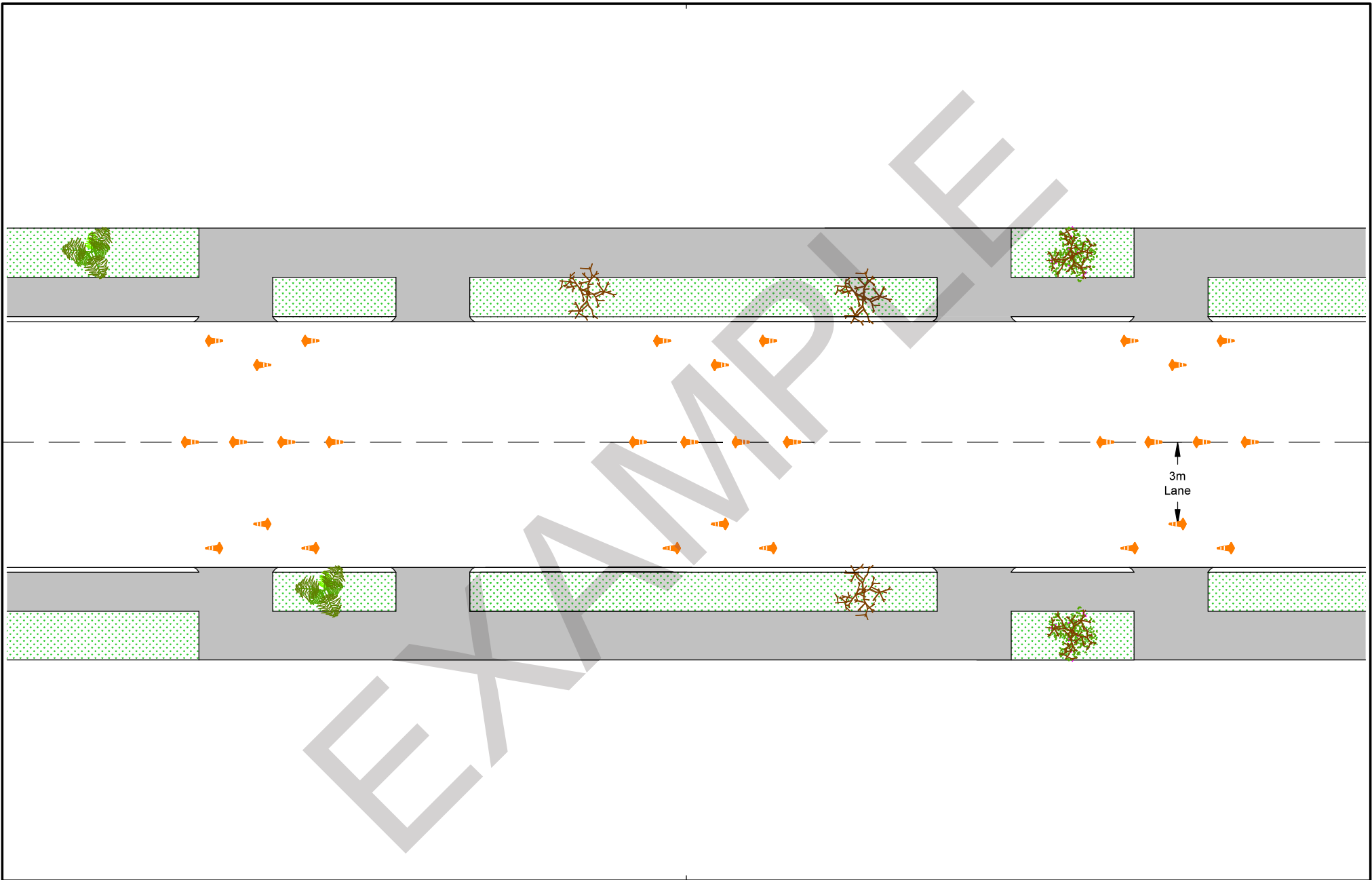
Removing the TSL is not a speed treatment but it was trailed to record its impact on road users. This trial was done on two separate sites and data showed that motorists either did not change their speed or went slightly slower.


Appendix B: Speed Treatment Set Up Examples

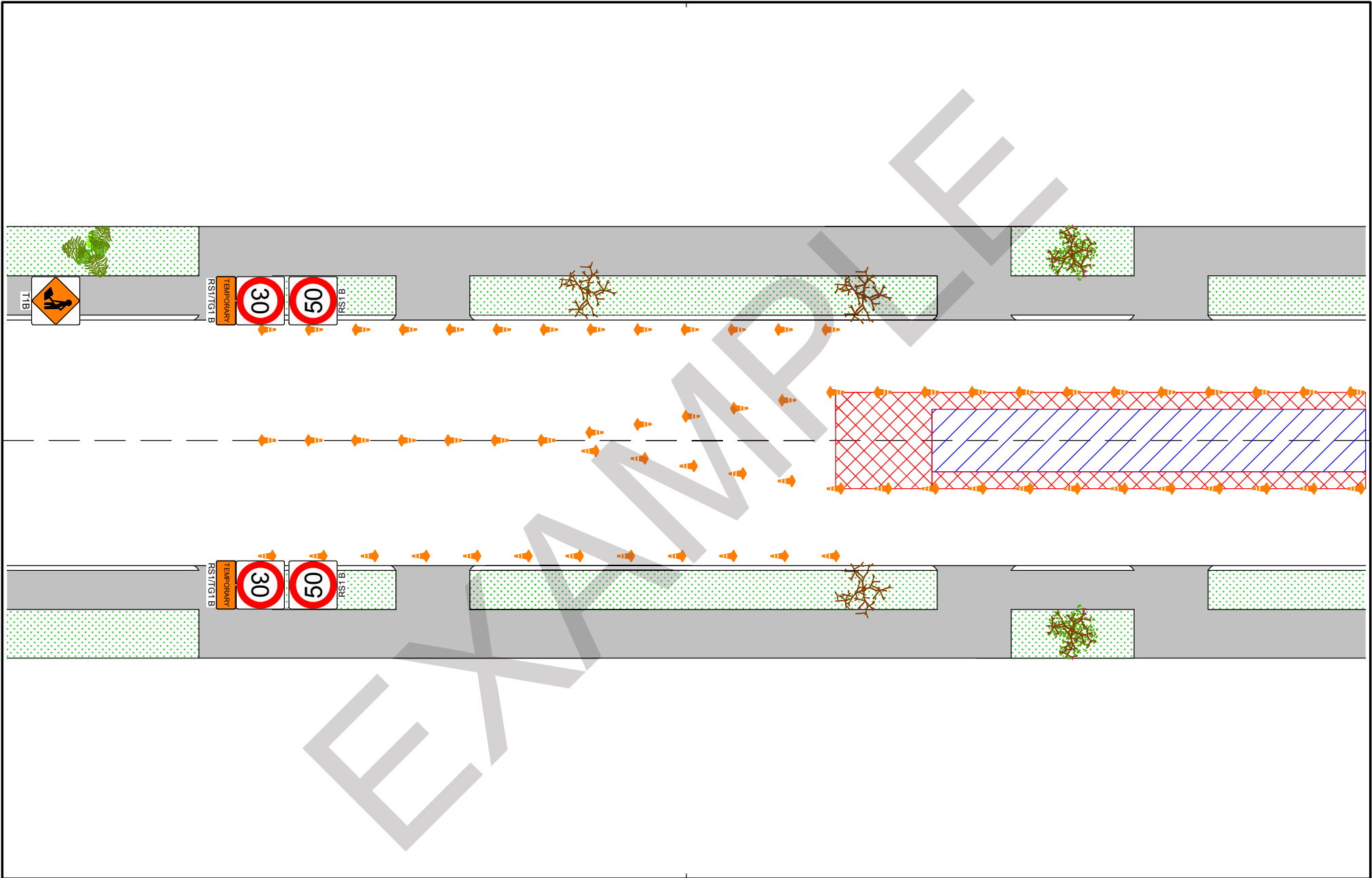
- 1 Side Friction – Lane Narrowing
- 2 Side Friction – Pinch Points
- 3 Side Friction – Coned Approach
- 4 Side Friction – Reduced Cone Spacing
- 5 VMS Boards (Speed Feedback Signs)
- 6 Temporary Speed Hump




Reference No: 01	Level:	Operation: Static		Drawing:	Project: Side Friction - Lane Narrowing	
	Designed & Drawn: Luke Murphy L2-3 STMS NP - ID:59739			Version: 1 Date: February 2014	Drawing Title: TSL Best Practice	
				This drawing is not to any defined scale.		

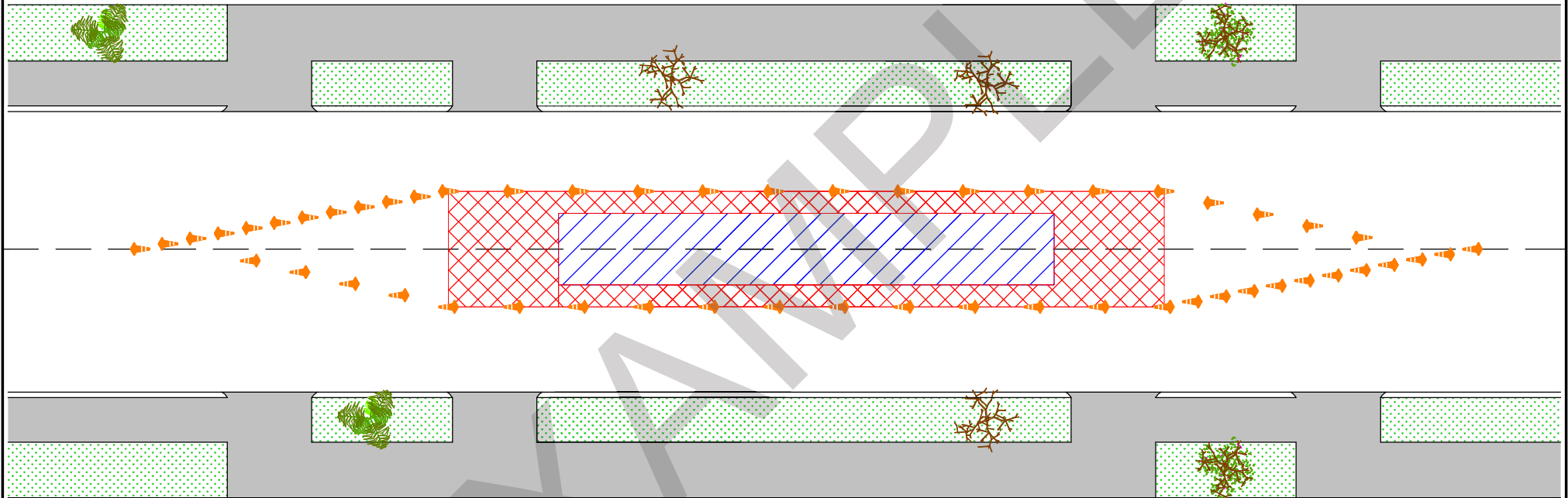
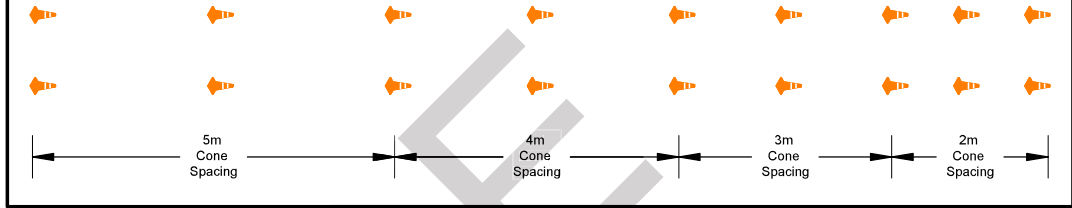


Reference No: 02	Level:	Operation: Static		Drawing:		Project: Threshold Treatment - Pinch Points
	Designed & Drawn: Luke Murphy L2-3 STMS NP - ID:59739			Version: 1	Date: February 2014	Drawing Title: TSL Best Practice
This drawing is not to any defined scale.						



Reference No: 03	Level:	Operation: Static		Drawing:	Project: Threshold Treatment - Coned Approach
	Designed & Drawn: Luke Murphy L2-3 STMS NP - ID:59739			Version: 1 Date: February 2014	Drawing Title: TSL Best Practice
				This drawing is not to any defined scale.	

Reduced Spacing For Conned Approaches



Reference No: 04	Level:	Operation: Static		Drawing:	Project: Side Friction - Reduced Cone Spacing
	Designed & Drawn: Luke Murphy L2-3 STMS NP - ID:59739			Version: 1 Date: February 2014	Drawing Title: TSL Best Practice
This drawing is not to any defined scale.					

**YOUR SPEED
XX KPH**

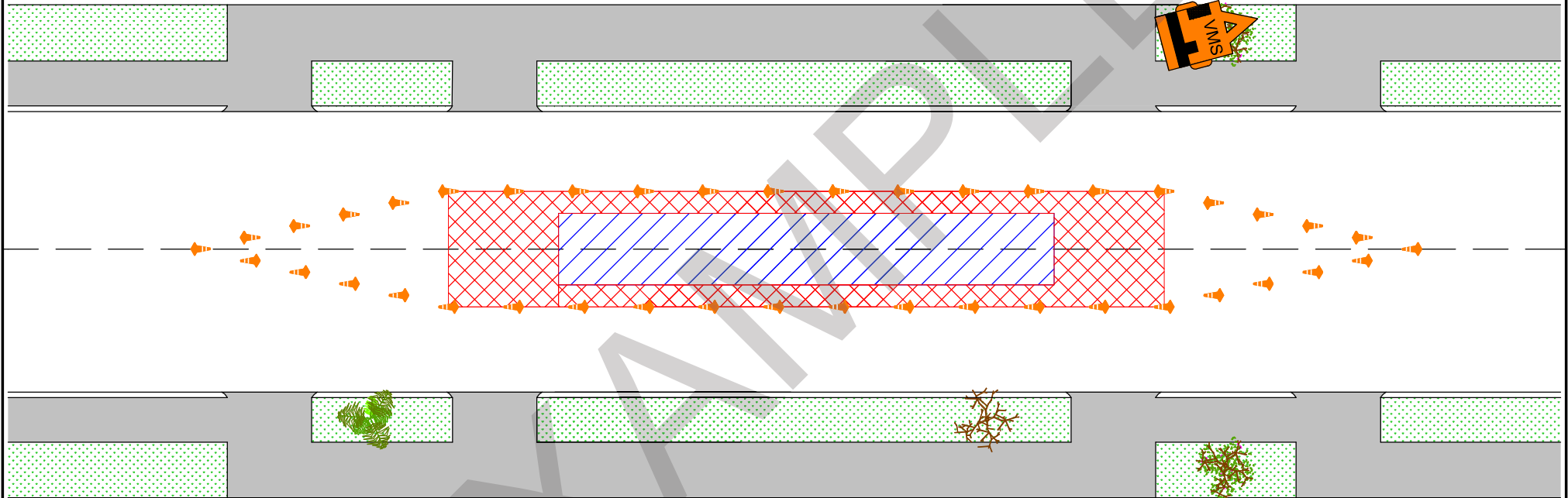
Going Over
Desired Speed →

**SLOW
DOWN**

Going Under
Desired Speed →


**THANK
YOU**

It is suggested to limit the speed that is shown to be only 5kph above desired speed.

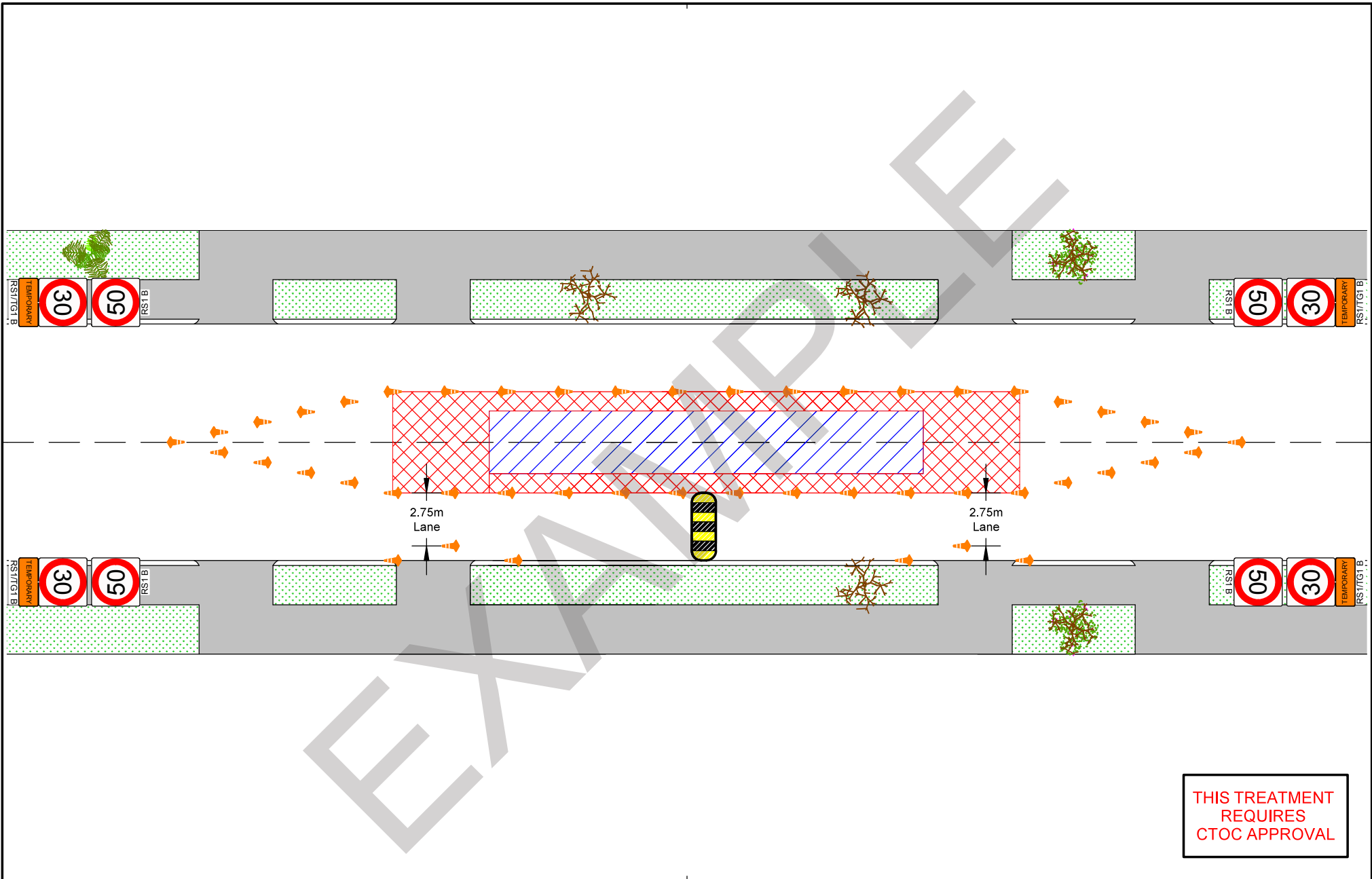


When placing a Speed Feedback Sign onsite you need to take into account where the radar picks up vehicles. Usually you would place the radar well inside the site. Placing the sign at the start of the site will usually pick up vehicles outside of the area where they need to slow down and this can reduce the positive effect it can have onsite.

**THIS TREATMENT
REQUIRES
CTOC APPROVAL**



















Reference No: 05	Level:	Operation: Static		Drawing:	Project: VMS Message
	Designed & Drawn: Luke Murphy L2-3 STMS NP - ID:59739	Version: 1		Date: February 2014	Drawing Title: TSL Best Practice

This drawing is not to any defined scale.



Reference No: 06	Level:	Operation: Static		Drawing:		Project: Temporary Speed Hump
	Designed & Drawn: Luke Murphy L2-3 STMS NP - ID:59739			Version: 1	Date: February 2014	Drawing Title: TSL Best Practice
This drawing is not to any defined scale.						

E2 Appendix B: Temporary speed limit (TSL) decision matrix worksheet

TEMPORARY SPEED LIMIT (TSL) DECISION MATRIX WORKSHEET		INSTRUCTIONS Select the appropriate road condition description for each of the four factors, and in the right hand circle list the chosen TSL for that road condition. Transfer lowest TSL to the bottom circle. If the LOWEST TSL is at least 20km/h below the Permanent Speed Limit that TSL should be applied.				Appendix B Possible Temporary Speed Limit
	EXCELLENT	AVERAGE	BELOW AVERAGE	POOR		
	 	 	 	  		
1. Minimum Lane Width	3.5m	3.25m	3.00m	2.75m		
2. Pavement / Surface Condition	The shoulder and lane is clear of loose or greasy material and the traveled way is smooth	The road is close to normal condition except for a few minor defects (eg small pot holes or a few pieces of loose aggregate) 70km/h where new seal has been swept but not marked	Defects and / or loose material on the lane (eg unattended reseals) 50km/h for protection of a new seal	There are major defects and / or significant loose material on the lane (eg recently milled surface, large stones, steel plates)		
3. Visibility and Alignment	There is greater than 140m visibility to the first cone in taper, and the worksite has not imposed a change in alignment	There is less than 140m visibility to the first cone in taper, or vehicles are deflected by 20 degrees or less from the original direction of travel 	There is less than 60m visibility to the first cone in taper, or vehicles are deflected by 20 - 45 degrees from the original direction of travel 	There is less than 30m visibility to the first cone in taper, or vehicles are deflected by more than 45 degrees from the original direction of travel 		
4. Site Clutter	Low site clutter, clear vehicle lanes, cycle lanes and footpaths	Some site clutter either plant or materials, vehicle lanes, cycle lanes and footpaths are lightly trafficked	Considerable site clutter requires additional management to guide vehicles though the site. Some queues of road users	Has numerous driver distractions including construction traffic. Cycle lanes or footpaths are closed. 30km/h for portable traffic signals, MTC operations or where traffic has to traverse the actual active working space (either in a delineated single lane or where traffic is not separated from the working space)		
					Is the LOWEST TSL at least 20km/h below the Permanent Speed Limit?	
					<input type="checkbox"/> Yes → Use this Temporary Speed Limit <input type="checkbox"/> No → No Temporary Speed Limit Required	

Appendix C: Decision-making matrix worksheet.