SCIRT
Rebuilding Infrastructure

CTOC

Best practice for speed management at roadwork sites

Contents

Background

Temporary Traffic Management (TTM) at roadwork sites has typically included Temporary Speed Limits (TSLs) as a 'standard' part of the configuration. They have often been deployed without or with minimal levels of positive traffic management (refer COPTTM[1] C10). This approach can be effective for isolated worksites where road users can tolerate a temporary reduction in speed.

However, with the high number of worksites in Christchurch, this approach is not working.

Road users have become desensitised to TSL signage, and are unwilling to accept 'unnecessary' travel time delays. As a result, they routinely ignore TSL signage where there is no obvious reason to reduce speed.

Police enforce speed limits, however, they will only enforce TSLs when there a clear need to slow down. More effective guidance around positive traffic management options to manage speed through roadwork sites was required.

Speed treatment trials were undertaken by Stronger Christchurch Infrastructure Rebuild Team (SCIRT) in 2013 as part of the Christchurch Improvements for Temporary Traffic Management (CITTM) initiative to test a number of ideas. Feedback from the trials was discussed with Christchurch Transport Operations Centre (CTOC) and a list of treatment options in preferential order was determined.

Purpose

The objective of this guide is to assist Traffic Management Plan (TMP) designers and onsite Site Traffic Management Supervisors (STMSs) to create 'self-explaining' worksites through good application of positive traffic management.

By layering the various treatment options, a worksite should be able to display sufficient justification for road users to appreciate the need to reduce speed. The result should be vehicles travelling through the TTM configuration at a safe operating speed for both themselves and for construction crews working at the site.

To be effective, this requires the smart choice of TTM devices and layout with adjustments/additions to be made onsite to fine-tune the configuration as necessary.

While TSL signage is included as one of the treatment options available, it is near the end of the list, and the desire is that many TTM operations will not require TSL deployments to achieve safe vehicle operating speeds.

[1] Code of practice for temporary traffic management (COPTTM): Part 8 of the Traffic Control Devices Manual, http://www.nzta.govt.nz/resources/code-temp-traffic-management/copttm.html

In the current Christchurch environment, it is important to only use TSLs when absolutely necessary. The reason for the need to reduce speed must be obvious to all users, including police officers who may be required to enforce the speed reduction.

This guide is intended to be a best practice document that becomes the ‘new normal’ approach for speed management at roadwork sites.

Speed treatment options (positive traffic management)

Positive traffic management is a measure that safely reduces traffic speed to the desired operating speed. It does so by exerting a natural and acceptable restriction on traffic that reinforces the need to slow down from the perspective of the driver.

Speed treatment options are listed below in order of preference. These are primarily passive treatments to supplement the standard TTM configuration. There is no change to the mandatory requirement to install TSLs for manual traffic control, and for priority flow operations.

The recommended approach is to 'layer' the options until a safe operating speed is achieved, ie before the latter options are selected, some or all of the preceding options should be applied to the site. STMS judgement must be used to select options that best fit the needs of each site. Where low speeds are essential for the health and safety of workcrews and road users then most, if not all, of the treatments should be considered.

If TSL signage is deemed necessary, this must always be used in conjunction with other speed treatments. Refer to Appendix B for example drawings of each treatment.

Speed treatments (in order of preference):

1. Side friction
    a) Coned approaches
    b) Pinch points
    c) Lane narrowing
    d) Reduced cone spacing
2. Closure edge hardening (barriers or barricades)
3. Closure transparency reduction (anti-gawking screen)
4. Additional messaging signs (static or mVMS)
5. Temporary speed limit*
6. Speed feedback sign
7. Speed humps*
8. Police enforcement**

An additional implicit speed treatment is that of utilising desirable distances for sign spacing and taper lengths rather than minimums wherever practicable. COPTTM[2] Layout Distance Tables note that 'the longer distances must be used wherever

[2] http://www.nzta.govt.nz/resources/code-temp-traffic-management/copttm.html

possible'. In the constrained urban environment this option may not always be viable, but should be considered nonetheless for all sites requiring speed management.

The desired vehicle operating speed should be initially identified by the TMP designer and appropriate speed treatments built into TMPs. Refer to the Speed Management Flowchart in Appendix A for guidance.

If operating speeds at the site are higher than expected post-deployment, then the designer and STMS should consider additional treatments.

* Specific CTOC acceptance is required for use of options 5 (TSL) and 7 (Speed humps). The others can be utilised as needed without special approval provided that:

- sign spacing is not affected or is adjusted to accommodate the additional devices.
- the TTM methodology, traffic impact and worksite operation is not fundamentally changed from that approved in the TMP.

** Police enforcement should only be requested after most/all of the preceding options have been implemented onsite but are proving to be insufficient AND the safety of the public or construction workers is clearly being threatened by continuing high traffic speeds.

Speed treatments explained

1a. **Coned approaches** are additional cones deployed prior to the start of the closure area. For a two-lane two-way road, deployments would generally be made on both the edgeline and centreline of the approach. Refer to Example Drawing 1a.

1b. **Pinch points** are localised sections of lane narrowing. They can be useful on the approach to the closure area to slow approaching traffic, and also at selected locations through the worksite to maintain an acceptable operating speed. This is a useful method of achieving side-friction in areas where it is impractical to narrow the full length of road, eg along detour routes. Refer to Example Drawing 1b.

1c. **Lane narrowing** is reducing lane width below normal width. Most motorists are reluctant to drive too close to TTM equipment, and so reduce speed to reduce the risk of collision. Minimum COPTTM or LOP lane widths must be maintained. Narrowed lanes require a good standard of site maintenance. Factors to consider that could give rise to problems include:

- large vehicle movements through the worksite
- unattended hours
- the safety of workers undertaking maintenance.

For long-term worksites at risk of the issues above, once a suitable configuration is set out onsite it may be useful to deploy semi-permanent TTM devices (eg stick-down posts) to reduce maintenance demand. Refer to Example Drawing 1c.

1d. **Reduced cone spacing** is deploying greater numbers of cones within a certain length of road, by reducing the spacing between them. This increases the physical presence alongside the live lane, and may make drivers feel that they are driving faster than normal by passing TTM devices at a higher than normal rate. Caution should be applied not to overuse cones to increase side-friction. It may be better to select Option 2 below instead. Refer to Example Drawing 1d.

2. **Closure edge hardening** is strengthening longitudinal side-friction through the worksite by employing barriers or barricades. These devices have an increased physical presence and are perceived to be more of a hazard to road users than cones, and are therefore more effective at reducing operating speeds. This option is particularly effective when combined with lane narrowing. Delineation needs must be considered, particularly on the approach to the closure. Refer to Example Drawing 2.

3. **Closure transparency reduction** is blocking road user sightlines (visibility) through the closure area. This reduces the width of the road user's 'cone of vision' and increases the perception of side-friction. Since the only part of the carriageway that road users can clearly see is the live lane, this also has the side-benefit of reducing distraction risk from the working space.

   'Anti-gawking screen' is a term commonly applied to a meshed material that is often attached to 6ft fences, although any device that reduces visibility through the closure area is effective. Note that screening/blocking can be effective to both longitudinal and/or lateral sightlines. The best results are achieved when both types are fully blocked. Refer to Example Drawing 3.

4. **Additional messaging signs** are additional signage that advise of a reason for reducing speed to support the various speed treatments employed through the worksite. They could be used to provide justification for reducing speed when the reason is not immediately clear, eg "WORKERS UNDER BRIDGE", and where strengthened safety warning is necessary. The messages can be displayed on either static (custom) signage designed for the site, or on Variable Message Signs (VMS) incorporated into the TTM layout. If a mobile VMS is used for this purpose, refer to the relevant LOP chapter.

   The additional messaging sign should be deployed prior to the critical hazard area within the working space, or prior to the entire closure area, so that it encourages reduction in vehicle speeds prior to encountering the hazard area. Refer to Example Drawing 4.

5. **Temporary speed limit (TSL)** is deployment of a legally enforceable temporary speed limit as authorised by the RCA (CTOC). A TSL must only be chosen when it meets the warrant of CTOC LOPs or COPTTM's TSL decision-matrix worksheet. Proposed use of TSLs must be accepted by CTOC.

6. **Speed feedback signs** react to an approaching vehicle's speed by displaying either nothing, the speed of the vehicle up to the site's posted or temporary speed limit, or a "SLOW DOWN" message, as appropriate. If a mobile VMS is used for this purpose, refer to the relevant LOP chapter. The speed feedback sign should be located near the start of the closure area so that it encourages reduction in vehicle speeds prior to encountering the critical hazard area of the working space. Refer to Example Drawing 6.

7. **Speed humps** are vertical deflection devices that require slow speeds for travel that is non-damaging, safe and comfortable. Potential problems include noise pollution, ground vibration, vehicle damage, slower response time for emergency vehicles, traffic diversion, driver distraction, vehicle occupant discomfort, and potential spinal injury. For these reasons this is an

option of last resort and must be specifically accepted by CTOC. A posted speed limit (PSL) or TSL of 30 kph or less must always be deployed when speed humps are used. Refer to Example Drawing 7.

8. **Police enforcement** is a valid speed treatment but should only be considered as an option of last resort. While Police are supportive of enforcing TSL deployments, they will only do so when there is an obvious need to slow down, and this enforcement is subject to their resource availability. Therefore, enforcement should only be requested after most or all of the above options have been implemented onsite but are proving to be insufficient AND the safety of the public or construction workers is clearly being threatened by continuing high traffic speeds.

CTOC LOP direction for determining when TSL may be warranted

On 50kph posted speed limit (PSL) roads, if the site can be safely traversed at 35kph or more with only minor alteration to 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.
- good visibility is available (greater than Warning Distance B (50m minimum for Level 1, and 75m minimum for Level 2 roads)).
- road users are able to see hazards or understand them through TTM devices/signage on approach to the site, so that they naturally slow down to a suitable speed.
- the type of work presents low-severity accident risk to workers and road users.

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

- major deficiencies exist (tight geometrics, narrow lanes, rough / unsealed surface etc).
- visibility is restricted below Warning Distance B (50m minimum for Level 1, and 75m minimum for Level 2 roads).
- road users cannot clearly see hazards or understand them when approaching at the PSL.
- the type of work presents high-severity accident risk to workers and road users, for example repeated work on foot close to a live traffic lane.

CTOC LOP_v2_FINAL_20130828

COPTTM direction for determining when TSL may be warranted

Refer COPTTM Section C4 and E2 Appendix B (TSL decision matrix worksheet).

Speed Management Flowchart

For Urban Christchurch roads 50-60kph

Mandatory 30kph TSL

30kph TSL is mandatory for:

- **Manual traffic control (MTC)**
- **Priority flow operation on roads with a AADT 500 to 1000 AADT.**

START

Is Speed Management required?

YES

Is 30kph TSL mandatory?

NO

What is the desired Operating Speed through Site for acceptable level of safety of work crews and road users?

YES

NO

Target Operating Speed

41 – 50 kph

31 – 40 kph

21 – 30 kph

TREATMENT OPTIONS

1. Side Friction
   a. Coned Approaches
   b. Pinch points
   c. Lane Narrowing
   d. Reduced Cone Spacings

Is operating speed of traffic providing acceptable level of safety?

YES

NO

(1 above plus:)
2. Closure Edge Hardening
3. Closure Transparency Reduction
4. Additional Message Signs

Is operating speed of traffic providing acceptable level of safety?

YES

NO

(1-4 above plus:)
5. Temporary Speed Limit
6. Speed Feedback Signs
7. Speed Humps

Is operating speed of traffic providing acceptable level of safety?

YES

NO

8. Request police enforcement

Is operating speed of traffic providing acceptable level of safety?

YES

NO

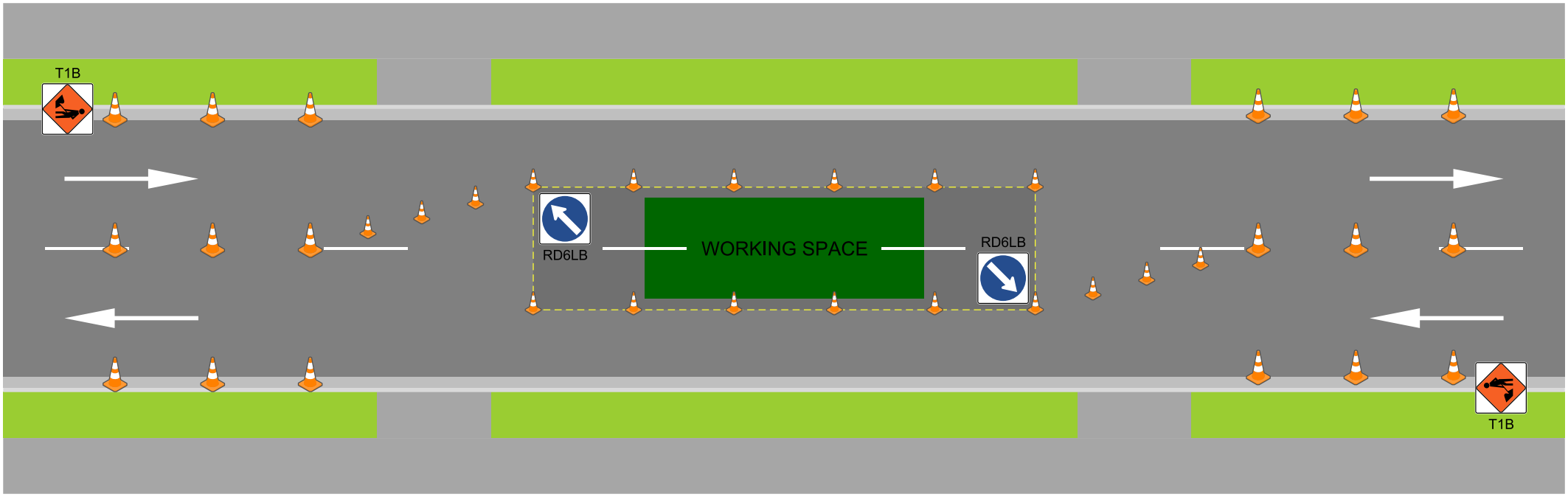
Reconsider TTM Methodology

Standard advance warning signage and direction and protection equipment deployed

Commence Work

Continuous assessment of traffic speed and worksite level of safety as work progresses

11 March 2014 V2.0



WORKING SPACE

SAFETY ZONE

STANDARD CoPTTM

SPEED TREATMENT

Christchurch City Council

1a - Side Friction - Coned Approach

Speed Management Best Practice

Original Plan Size: A4

ISSUE. 1 JUNE 2014

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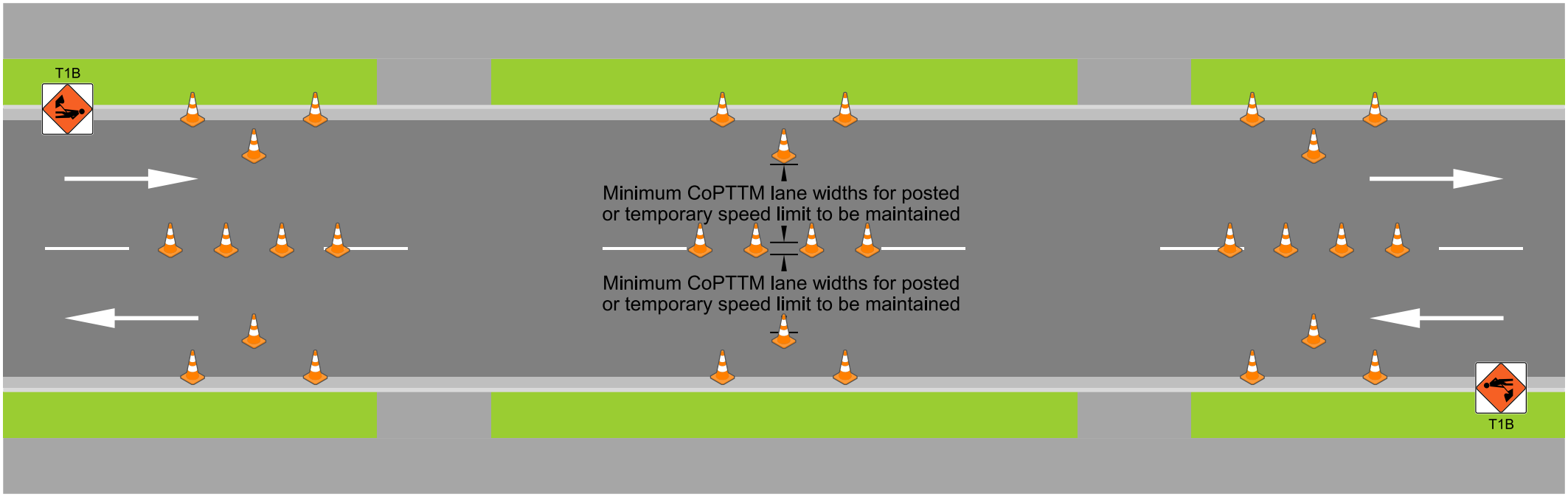

WORKING SPACE

SAFETY ZONE

SPEED TREATMENT

Christchurch City Council

1b - Side Friction - Pinch Points

Speed Management Best Practice

Original Plan Size: A4

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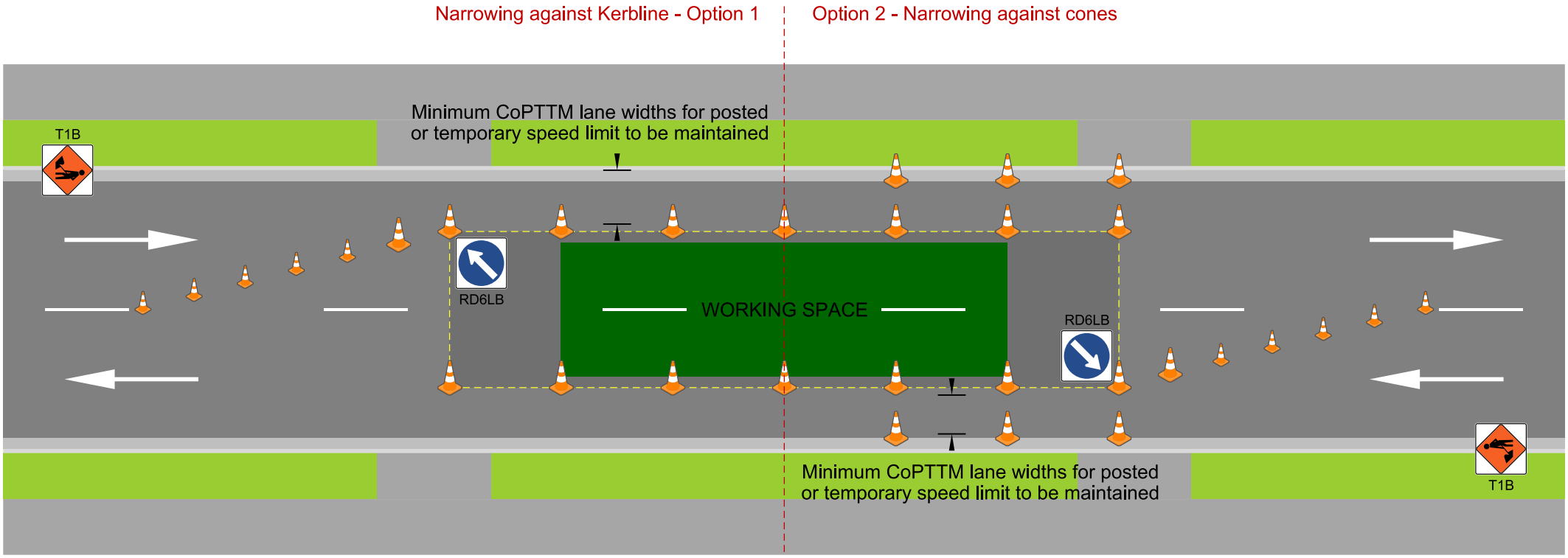

WORKING SPACE

SAFETY ZONE

STANDARD CoPTTM

SPEED TREATMENT

Christchurch City Council

1c - Side Friction - Lane Narrowing

Speed Management Best Practice

Original Plan Size: A4

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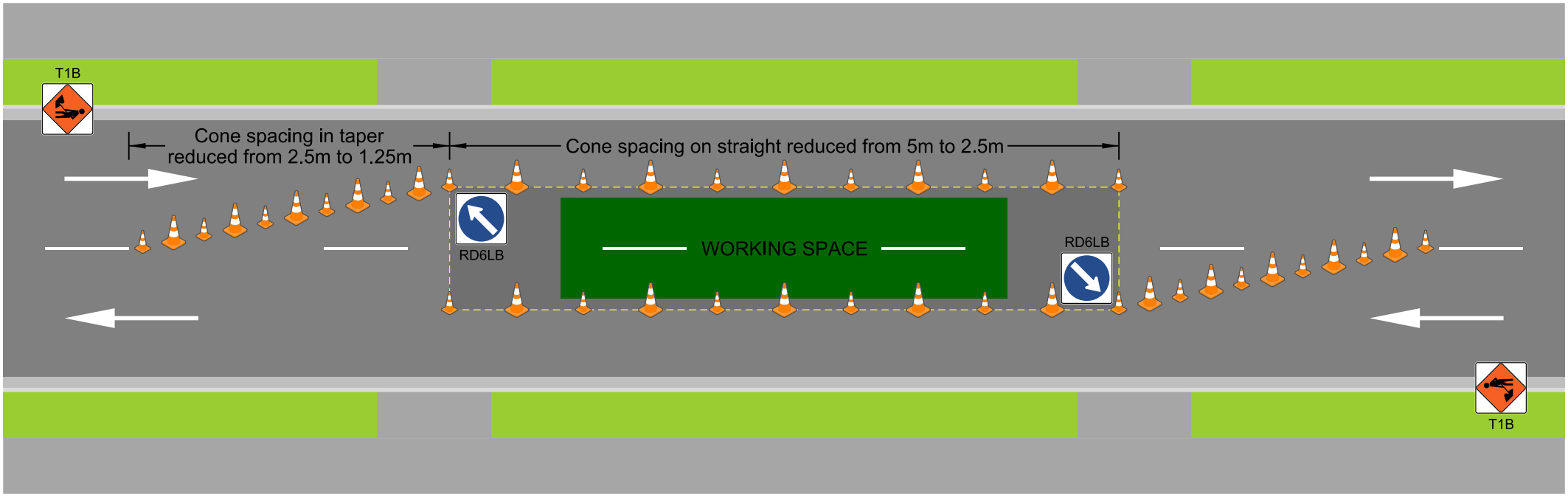

Note: In this example the standard CoPTTM spacing have been halved. However any reduction in spacing will achieve some benefit.
The STMS should select a spacing they think is appropriate for the site (e.g. "1.5m in tapers and 3m on straights") and modify this onsite if necessary.

WORKING SPACE

SAFETY ZONE

STANDARD CoPTTM

SPEED TREATMENT

Christchurch City Council

1d - Side Friction - Reduced Cone Spacing

Speed Management Best Practice

Original Plan Size: A4

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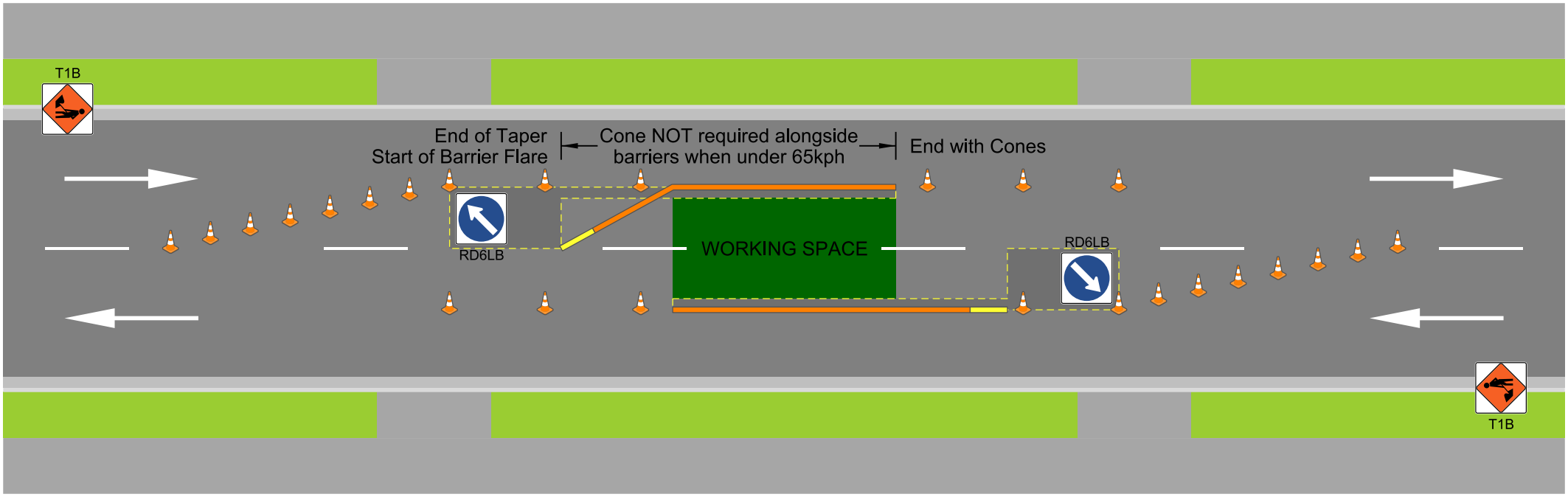

Note: For clarity this example drawing has not included any of the 1a - 1d speed treatments. These should be included in actual TMPs.

WORKING SPACE

SAFETY ZONE

BARRIER (for Edge Hardening purpose, Not worksite protection)

BARRIER END TREATMENT

Christchurch City Council

2 - Closure Edge Hardening

Speed Management Best Practice

Original Plan Size: A4

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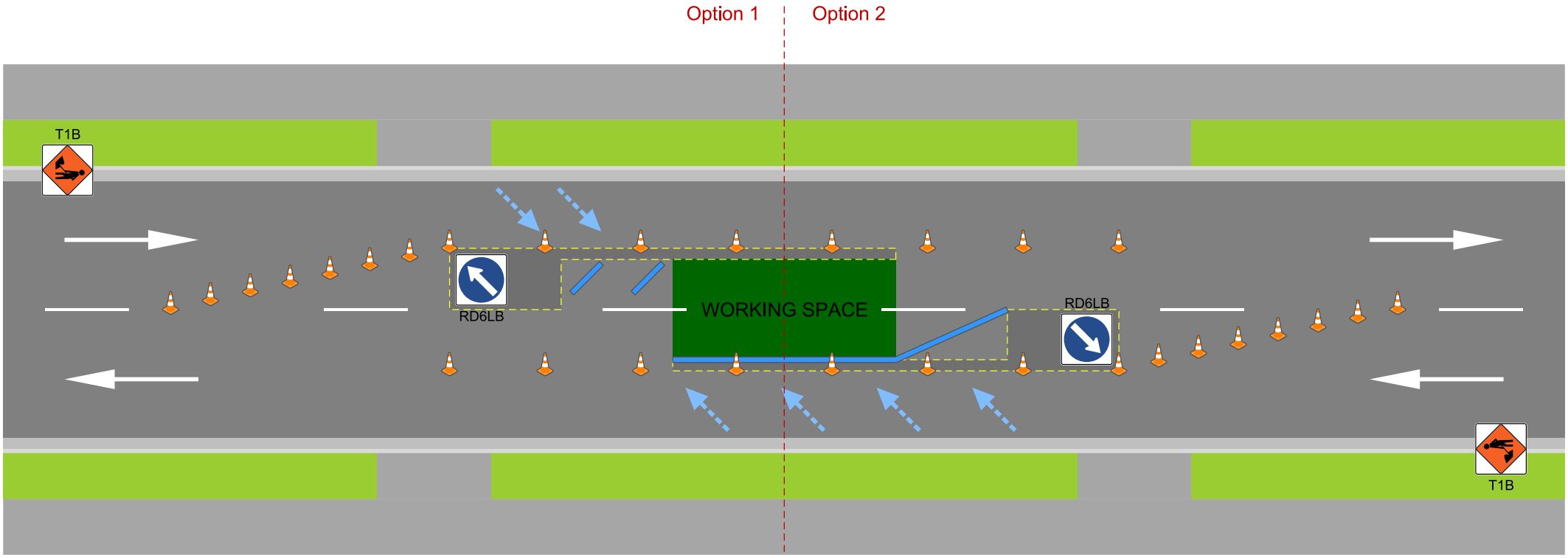

Note: For clarity this example drawing has not included any of the 1 - 2 speed treatments. These should be included in actual TMPs.

WORKING SPACE

SAFETY ZONE

TRANSPARENCY BLOCKING DEVICE

ROAD USER SIGHTLINE

Christchurch City Council

3 - Closure Transparency Reduction

Speed Management Best Practice

Original Plan Size: A4

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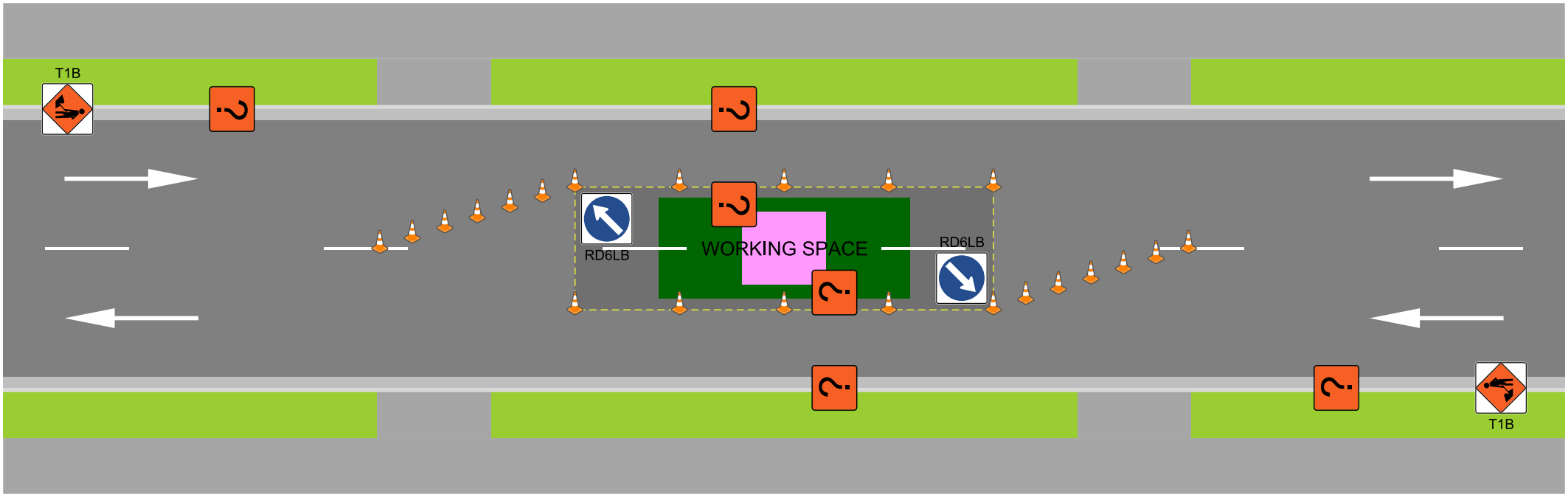

Note: For clarity this example drawing has not included any of the 1 - 3 speed treatments. These should be included in actual TMPs.
Additional messaging signs deployed prior to critical hazard area or closure area. Gating static signs will increase effectiveness.

WORKING SPACE

SAFETY ZONE

CRITICAL HAZARD AREA

? ADDITIONAL MESSAGING SIGNS

Christchurch City Council

4 - Additional Messaging Signs

Speed Management Best Practice

Original Plan Size: A4

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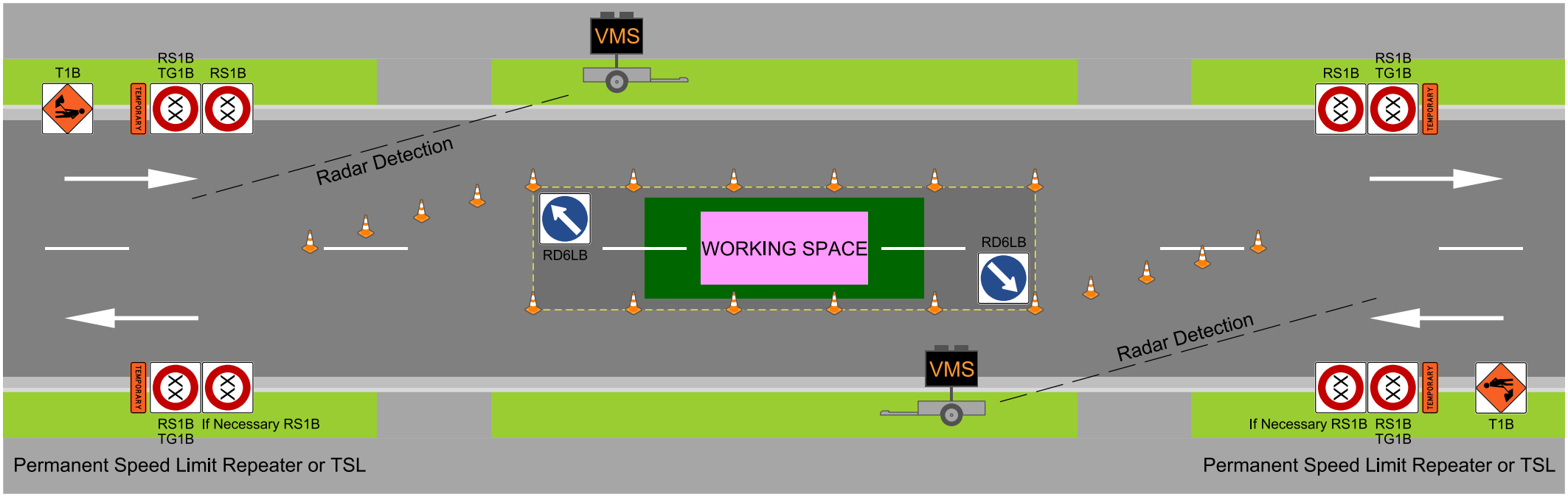

Note: For clarity this example drawing has not included any of the 1 - 5 speed treatments. These should be included in actual TMPs.
Speed feedback sign deployed prior to critical hazard area. Radar must only detect vehicles within the PSL or TSL length.
If mVMS used for this purpose, refer to CTOC LOPs for acceptable message.

WORKING SPACE

SAFETY ZONE

CRITICAL HAZARD AREA

Christchurch City Council

6 - Speed Feedback Signs

Speed Management Best Practice

Original Plan Size: A4

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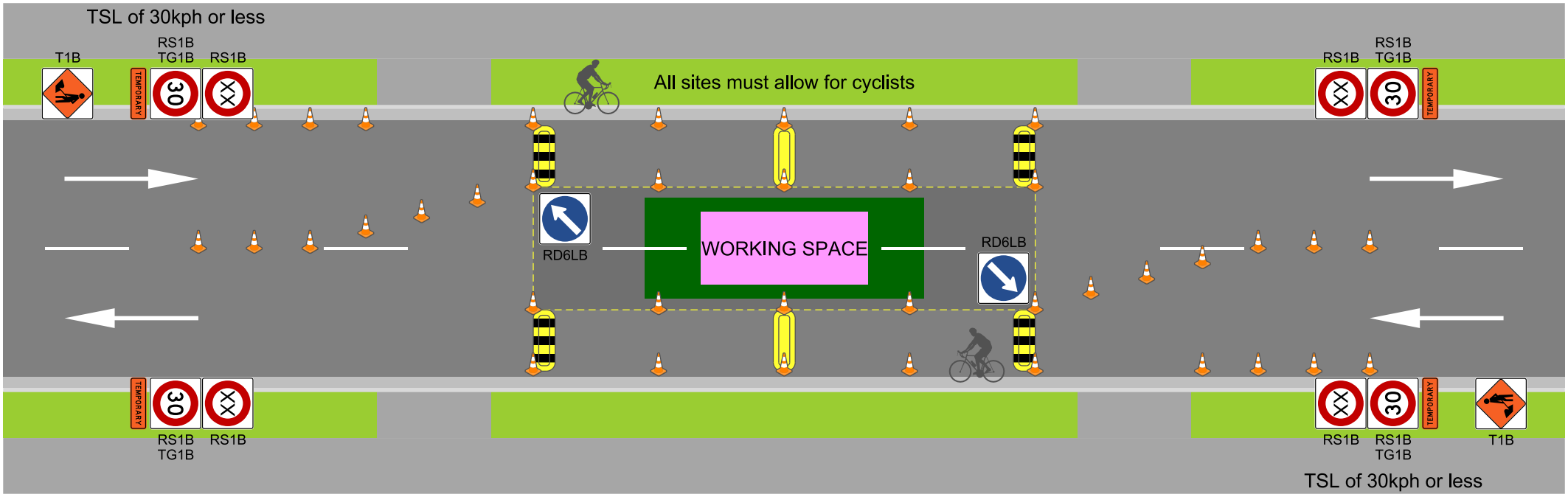

Note: For clarity this example drawing has not included the mandatory speed limit of 30kph or less.
The other speed treatments 1 - 4 and 6 should also be considered for actual TMPs.
Speed humps deployed at start and end of worksite to manage speed past hazard area. Intermediate speed humps may be needed for long sites.

WORKING SPACE

SAFETY ZONE

CRITICAL HAZARD AREA

SPEED HUMP

INTERMEDIATE SPEED HUMP

Christchurch City Council

7 - Speed Humps

Speed Management Best Practice

Original Plan Size: A4

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