SCIRT Rebuilding Infrastructure

LEARNING LEGACY

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.

New (SCIRT) Pro Forma – Supplementary Document

Story: Pro Forma Traffic Management Plan

Theme: Construction

Additional information to supplement all SCIRT traffic management plans.

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

Programme funded by
Christchurch City Council
New Zealand Government

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Christchurch City Council
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city care
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Fulton Hogan
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Fletcher

SCIRT Supplementary TMP Document

This document provides supplementary information for all SCIRT TMPs*. This document must be treated as part of the TMP and be onsite/presentable at all times.

Content:

- Supplementary Document Intentions and Use
- Potholes, Loose Chip and Line Marking Requirements
- SCIRT PPE Requirements
- Contingency Plans
- Contact Details
- STMS Onsite Communication Flow Chart
- Speed Management Flow Chart
- Cyclist Flow Chart
- CTOC LOPs
- CoPTTM Standard Spacing's

* This included the SCIRT service agreement, road space bookings as well as all site specific TMPs.

STMS Name:	Date Issued:

Supplementary Document Intention and Use

This supplementary document was created to collate a large amount of generic information and procedures to assist the STMS/TC with their work and to supplement site specific information contained in TMPs. As this document supplements the SCIRT TMP proforma it must be treated as part of the TMP and be onsite and presentable at all times.

This is not a controlled document and is the responsibility of each delivery team to ensure that their staff and subcontracted have this information onsite. if information within this document becomes outdated it will be at the discretion of SCIRT IST as to when an update is required, until that time this document will still be seen as revenant and required onsite.

Potholes, Loose Chip and Line Marking Requirements

When an STMS/TC does a site check it is expected that they will record any potholes, locations with excessive loose chip or missing line marking and provide these details to the project engineer/project manager to resolve.

Timeframes:

Potholes	All potholes on SCIRT sites and detour route must be repaired within 24hrs of them being identified. *NOR41a and CCC Road Asset Maintenance document July 2011*
Loose Chip	All surplus chip in stockpiles on the road reserve shall be removed immediately following the completion of each day's work, unless otherwise approved. All areas with essential road markings shall be swept sufficiently to allow reinstatement of markings within 24hrs. *CSS Part 6 14.6*
	The Carriageway shall be swept within 72hrs of the completion of chipsealing. *CSS Part 4 19.1*
Line Marking	Intersection 'Stop' and 'Give Way' marking, and fire hydrants shall be remarked within 24hrs of final surfacing. All other road markings shall be remarked within 24hr of carriageway sweeping where the final surface is chipseal or 48hrs of final surfacing otherwise. *CSS Part 6 25.4*

SCIRT Personal Protective Equipment (PPE) Requirements

The below PPE is required on all SCIRT site by all onsite. STMS must check these requirements are met before inducting people onto site.

Safety Boots

Hard Hat

– Must have SCIRT induction Sticker visible.

High-viz Vest

– As per the NZTA Standard.

Long sleeve shirt and long pants, or overalls

Gloves

– You must carry gloves and wear them for all physical activities where it is appropriate for the task.

Safety Glasses

Note: STMS who are working in close proximity to noisy machinery / equipment are encouraged to use some form of ear protection.

Contingency Plans

<table>
<tr>
<td rowspan="4">Generic contingencies for:
• Major incidents
• Incidents
• Pre planed detours.
Remove any options which do not apply to your job</td>
<td>Major Incident
A major incident is described as:
• Fatality or serious injury - real or potential.
• Significant property damage, or
• Emergency services (police, fire, etc) require access or control of the site.</td>
<td>Actions
The STMS must immediately conduct the following:
• Stop all activity and traffic movement.
• Secure the site to prevent (further) injury or damage.
• Contact the appropriate emergency authorities.
• Render first aid if competent and able to do so
• Notify the RCA representative and / or the engineer.
• Under the guidance of the officer in charge of the site, reduce effects of TTM on the road or remove the activity if safe to do so.
• Re-establish TTM and traffic movements when advised by emergency authorities that it is safe to do so.</td>
</tr>
<tr>
<td>Incident
An incident is described as:
• Excessive delays - real or potential.
• Minor or non-inquiry accident that has the potential to affect traffic flow.
• Structural failure of the road.</td>
<td>Actions
The STMS must immediately conduct the following:
• Stop all activity and traffic movement if required.
• Secure the site to prevent the prospect of injury or further damage.
• Notify the RCA representative and / or the engineer.
• STMS to implement a plan to safely remove TTM and to establish normal traffic flow if safe to do so.
• Re-establish TTM and traffic movements when it is safe to do so and when traffic volumes have reduced.</td>
</tr>
<tr>
<td>Detour
If because of the on-site activity it will not be possible to remove or reduce the effects of TTM once it is established a detour route must be designed. This is likely for:
• Excessive delays when using an alternating flow design for TTM.
• Redirecting one direction of flow and / or
• Total road closure and redirection of traffic until such time that traffic volumes reduce and tailbacks have been cleared.
The risks in the type of work being undertaken, the risks inherent in the detour, the probable duration of closure and availability and suitability of detour routes need to be considered.
The detour and route must be designed including:
• Pre-approval form the RCA's whose roads will be used or affected by the detour route
• Ensure that TTM equipment for the detour - signs etc. are on site and pre-installed.</td>
<td>Actions
When it is necessary to implement the pre-planned detour the STMS must immediately undertake the following:
• Notify the RCA and / or the engineer when the detour is to be established.
• Drive through the detour in both directions to check that it is stable and safe.
• Remove the detour as soon as it practicable and safe to do so and the traffic volumes have reduced and tailbacks have cleared.
• Notify the RCA and / or the engineer when the detour has been disestablished and normal traffic flows have resumed.</td>
</tr>
<tr>
<td colspan="2">Note also the requirements for no interference at an accident scene:
In the event of an accident involving serious harm the STMS must ensure that nothing, including TTM equipment, is removed or disturbed and any wreckage article or thing must not be disturbed or interfered with, except to:
• Save a life of, prevent harm to or relieve the suffering of any person, or
• To maintain the access of the general public to an essential service or utility, or
• To prevent serious damage to or serious loss of property.</td>
</tr>
<tr>
<td>Other contingencies to be identified by the applicant
(i.e. steel plates to quickly cover excavations)</td>
<td colspan="2">• If there are any excessive traffic delays (5 minutes), the site will be reassessed by the nominated STMS. Operations to be postponed cancelled or modified until traffic is at an acceptable level.
• If emergency services need access through the site, the site will be immediately opened if possible.
• In the event of a crash or accident at the site, traffic will be stopped and diverted if required. The local RCA controller and approving engineer will be notified immediately, i.e.
• If adverse weather conditions exist that make the work site dangerous, the STMS will postpone, cancel or modify operations until the hazard is eliminated or minimised to a safe level.</td>
</tr>
</table>

Contact Details

	Job Title	Name	Phone #	E-mail
CTOC	CTOC Team Leader – TTM			
	CTOC Duty Phone (6am to 6pm)			
	Traffic Management Coordinator			
	Traffic Management Coordinator			
	Traffic Management Coordinator			
	Traffic Management Coordinator			
	Ecan Duty Manager			
		Bus Exchange		
SCIRT	Transport Planning Manager			
	Traffic Manager / SCIRT AE			
	Traffic Manager / SCIRT AE			
SCIRT Delivery Teams – Forman to be contacted before Managers, Supervisors or Coordinators				
City Care	City Care STMS Foreman			
	City Care TM Coordinator			
	City Care Afterhours (6pm to 6am)			
Fletcher	Fletcher STMS Foreman			
	Fletcher Traffic Manager			
	Fletcher Afterhours (24hrs)			
Fulton Hogan	Fulton Hogan STMS Foreman			
	Fulton Hogan Department Manager			
	Fulton Hogan Afterhours (24hrs)			
Downer	Downer STMS Foreman			
	Downer TM Coordinator			
	Downer Afterhours (24hrs)			
McConnell Dowell	McConnell Dowell STMS Foreman			
	McConnell Dowell TM Coordinator			
	McConnell Dowell Afterhours (24hrs)			

STMS Onsite Communication

July 2015 Version 2

START

STMS given TMP to deploy onsite.

Site check done by STMS before site deployment

Is the site within the advance warning zone of another site?

Yes

Find other sites STMS and discuss:

- Type of work
- Type of TTM
- Duration
- Following/Preceding Stages
- Who is doing work

No

Does a conflict exist?

Yes

Are you able to resolve onsite with the STMS?*

No

Escalate to STMS Foreman/Lead STMS and TMP planners

Can Foremen/Lead STMS & TMP planners resolve issues?* *Must liaise with Site Engineer/PM to change/adapt work method*

No

Is the conflict between two SCIRT worksites

No

Escalate to Approving Engineer and CTOC TMC

Yes

Escalate to Approving Engineer

Coordination discussion

No

Yes

STMSs to document agreed integration of worksites on both TMPs and document which STMS is responsible for which area. STMS to notify TMP planners of changes

Yes

Proceed and document details on TMP

Proceed with work

*Impact must be less than covered in approved TMP

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

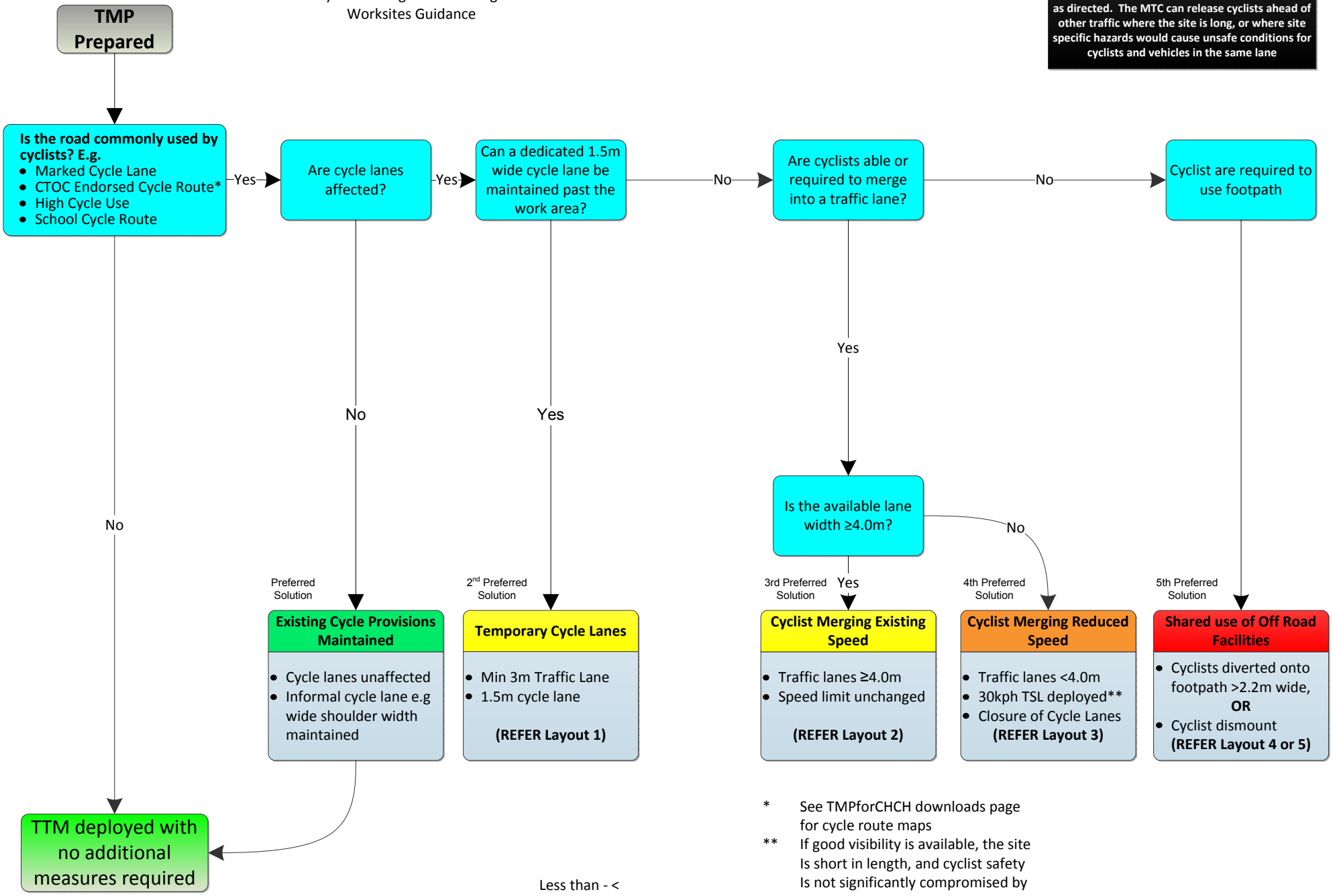
11 March 2014 V2.0

Cyclists Flow Chart

Cyclist Management Through Worksites Guidance

MANUAL TRAFFIC CONTROL

The use of MTC requires that all cyclists are to stop as directed. The MTC can release cyclists ahead of other traffic where the site is long, or where site specific hazards would cause unsafe conditions for cyclists and vehicles in the same lane



* See TMPforCHCH downloads page for cycle route maps

** If good visibility is available, the site Is short in length, and cyclist safety Is not significantly compromised by site conditions. TSL is optional

Less than - <
Greater than - >

May 2014 V1.0

TTM Local Operating Procedures (LOP)_v4

This document outlines the Christchurch Traffic Operations Centre (CTOC)'s view on Temporary Traffic Management (TTM) applications within the area administered by CTOC (Christchurch City and Banks Peninsula). The NZTA Code of Practice for Temporary Traffic Management (COPTTM) is the primary reference standard, and this LOP document explains variations to COPTTM that are acceptable in our area. Roads are classified as Level LV, 1 or 2. Relevant sections of COPTTM 4th Edition and other documents are referenced.

The LOPs are intended to be applied to all roads in the CTOC area to become the 'new normal' approach. Justification will be required if TTM Providers wish to apply the traditional COPTTM approach.

The LOPs aim to clarify RCA expectations and outline differences to traditional COPTTM practice. Details not mentioned, are expected to follow standard COPTTM practice. Please aggregate LOPs together into each TMP to achieve maximum benefit and consistency throughout our area.

Where differences to CCC's Construction Standards Specification (CSS) exist, this document takes precedence.

Note that TTM activities on roads outside of the area administered by CTOC must meet normal COPTTM or RCA requirements. CTOC boundaries can be found at:

http://www.ccc.govt.nz/thecouncil/policiesreportsstrategies/policies/groups/streetsroads/speedlimits/speedlimitregister/index.aspx

LOP CHAPTERS

1. Submitting Traffic Management Plans

All TMPs must be submitted through the www.tmpforchch.co.nz website.

2. Real Time Operations (RTO) Contact Ref E1.8.3

All work within 50m of a signalised intersection must be notified to CTOC's RTO team. This includes sign deployments, and detouring significant volumes of traffic through signalised intersections. RTO contact details are: **03 941 8620** (6am – 6pm and for Emergencies) or signals@tfc.govt.nz

When major modifications to signal operations are likely to be required, Contractors must contact RTO during the planning phase to discuss requirements. This must occur a minimum of **two weeks prior** to scheduled Start Date on site to enable pre-planning and signal controller personality changes.

Notifications confirming scheduled deployment:

- **24 to 48 hours before work commences** on site (email preferred). RTO will automatically have received a copy of the TMP from TMPforChch when it was accepted – please refer to the TMP number. If specific intersection details and impacts are not already covered in the TMP, then a detailed plan or drawing must be provided to help explain these.
- **At the time of TTM deployment** (phone call preferred). For night deployments, provide confirmation of scheduled deployment during the preceding business hours.
- **Before any significant changes** are made to established TTM.
- **24 to 48 hours before disestablishment** from site (phone call preferred).

These notifications enable implementation of pre-planned signal changes.

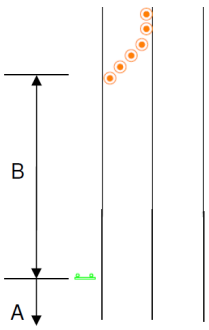
CITTM 1.1

3. T1 ROAD WORKS Signs Ref C3.2.3, B1.4.1, C3.2.1

T1 ROADWORKS signs should be omitted in low risk situations where they do not add value. Four scenarios have been identified to facilitate risk assessment:

	Scenario Description	Requirement
1	Posted Speed Limit higher than 50kph	T1 signs must be deployed as per standard practice
2	'Isolated' worksites[1]	T1 signs must be deployed as per standard practice
3	Christchurch CBD area within the four avenues	T1 signs must be omitted*
4	Other	T1 signs should be omitted* wherever risk is low. TMP Designer / STMS to judge road environment risk, with verification (if needed) from AE / TMC. Refer below for guidance

* Provided that the minimum sign requirement below is met:



SCIRT NOTE: LOP chapter 3 does not apply to SCIRT work unless it is within the CBD perimeter or specifically stated on a site specific TMP

At least one stand-mounted sign of size appropriate to the level of the road must be deployed a Warning Distance B prior to each closure. This is to ensure minimum sign visibility on the approach to the site.

Under Scenario 4, T1 signs should be omitted wherever risk is low. Low risk sites will generally have:

- Good visibility. ie Minimum Warning Distance B and Sign Visibility Distance A available.
- Sign Spacing maintained.
- Be located near other roadworks. ie in an area where roadworks are commonly encountered.

- Acceptable vehicle operating speeds for the road environment (85%ile speeds are approximately 50kph or less). This could be a result of: permanent road features, the TTM configuration providing effective speed management, temporary hazards being clearly recognisable or understandable through TTM devices / signage, surface condition regulating speeds etc.

Under this scenario TMP Designers / STMSs are empowered to judge when T1 signs are warranted due to the presence of significant risk factors, and deploy when needed. Examples could include hidden traffic queues, and reduced visibility at night.

[T] Definition: Significantly separated from other TTM sites. Eg 'worksites out of sight of each other', or 'greater than 300m between worksites'. Use your judgement – does the site feel isolated from others, or is it located in an area where worksites are commonly encountered?

Note regarding COPTTM definitions: If T1 signs were to be the only Advance Warning sign normally deployed in the Advance Warning zone for the site, then application of the above would result in omission of the 'Advance Warning zone' as defined by COPTTM. In this situation, the first signs and devices encountered would be part of the 'Direction and Protection' zone as defined by COPTTM. Given the risk assessment approach and minimum Warning Distance requirements above, this is considered to be acceptable.

The 'Advance Warning' zone definition in COPTTM is not considered to need amendment to reflect the omission of T1 signs on applicable sites.

CITTM 1.1

4. Omission of TG2 WORKS END signs — Ref C3.2.2 (diagram), C3.2.5

TG2 WORKS END signs must be omitted on all worksites. This includes the TG2, TG31 THANK YOU combination.

The 'End of Works' zone is redefined as: *"The last sign or TTM device used".* Where a Temporary Speed Limit (TSL) has been deployed, the 'End of Works' zone will usually be defined by the Permanent Speed Limit reinstatement signs. Where a TSL has not been deployed, it will usually be defined by the last TTM device (eg cone) used in the Direction and Protection zone around the closure, or the first sign for the opposing approach.

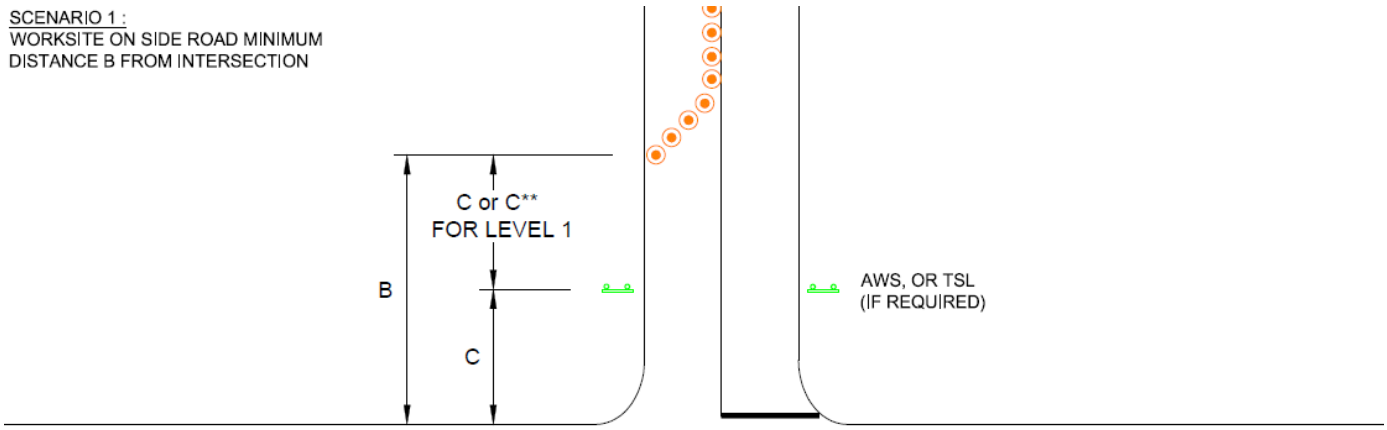
CITTM 1.2

5. Side Road Signage — Ref Section F Layout Diagrams, C3.2.2 (diagram), C3.2.3

In Scenarios 1, 3 & 4 below, T1 ROAD WORKS signs should be omitted from the main road. In Scenario 2 they may be omitted in certain situations.

Scenario 1: Closure on Side Road a Minimum Distance of B from Intersection — Ref F2:19

- T1 ROAD WORKS signs to be omitted from the main road.
- For Level 1 roads, refer to Diagram F2:19 for C** Table. A minimum Warning Distance B of 50m must be provided wherever possible, and especially if cornering speeds are above 30kph.
- For Level 2 roads, use C as per Level 2 Layout Distances Table.
- At least one stand-mounted sign of size appropriate to the level of the road must be provided prior to the closure. For example, this could be a suitable Advance Warning Sign (AWS) or TSL signs (if TSL required).

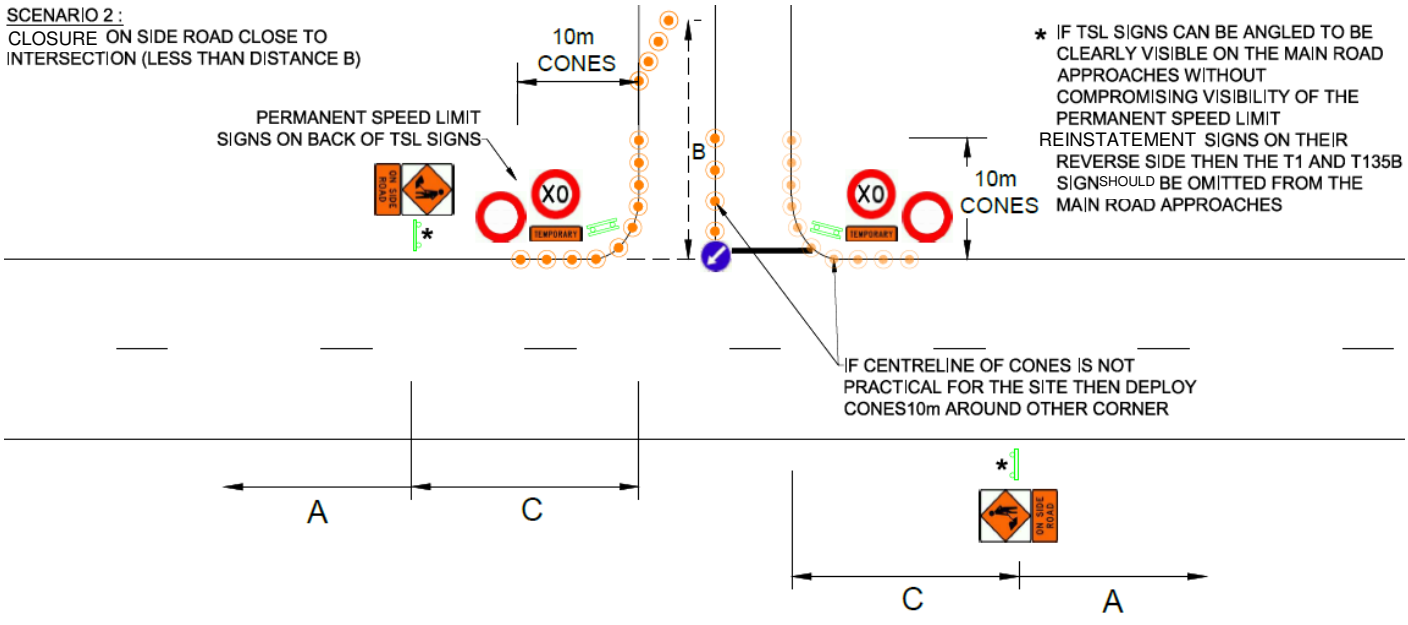


Scenario 2: Closure on Side Road close to Intersection (less than Distance B) ***Ref F2:20***

(i) When most vehicles (85%ile) travel around the corner at speeds less than 30kph, and
(ii) Sign Visibility Distance A is available to the sideroad intersection, and
(iii) When there is low risk of queuing on the sideroad, then the following layout may be used instead of diagram F2:20:

- T1 ROAD WORKS and T135B ON SIDE ROAD signs deployed on main road approaches (if necessary)*
- Gated TSL signs deployed at the sideroad intersection, with the Permanent Speed Limit reinstatement signs on their reverse side.
- Cones deployed for 10m lengths along the main road LHS shoulder, and down the sideroad shoulder and centreline (or RHS shoulder) to provide side-friction / threshold treatment for turning vehicles.
- A cone-mounted RD6L KEEP LEFT arrow deployed on the first cone on the sideroad centreline.

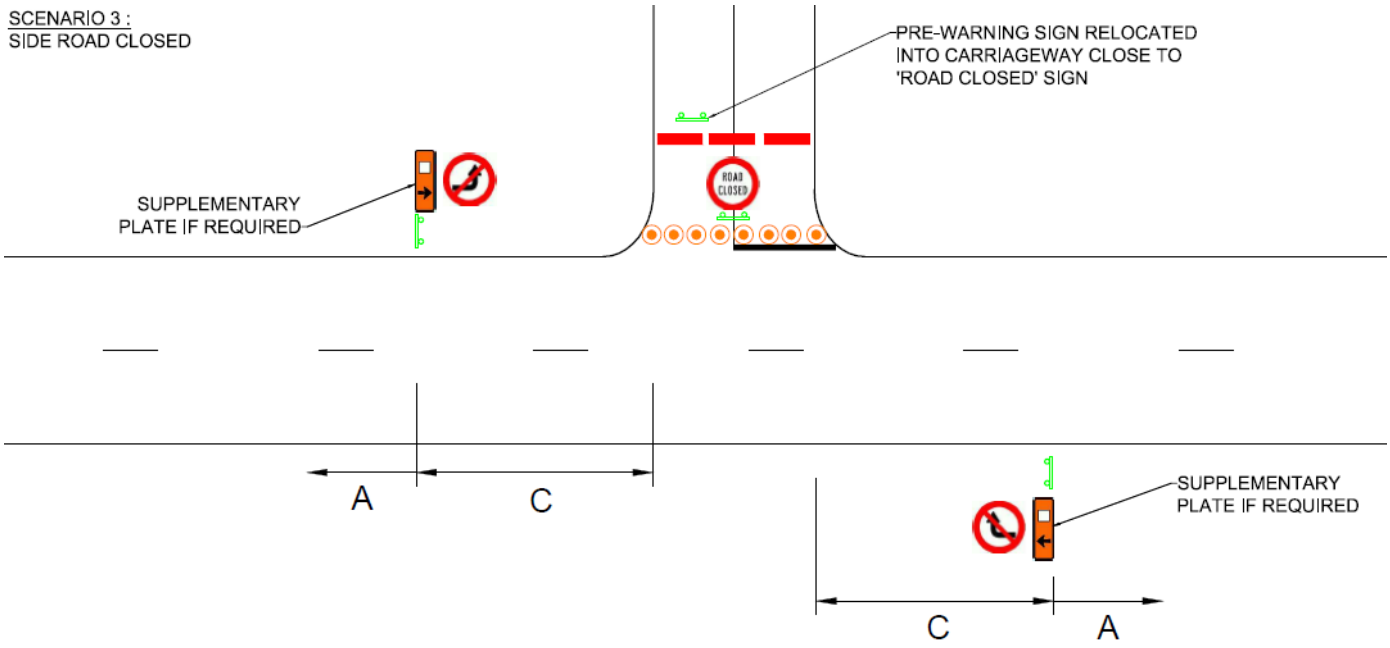
* T1 and T135B signs should be omitted from the main road approaches if TSL signs can be angled to be clearly visible on the main road approaches, without compromising visibility of the Permanent Speed Limit reinstatement signs on their reverse side. Refer to LOP chapter 3 for further guidance on T1 omission.



Where significant hazards exist on the sideroad close to the main road intersection, then STMSs must enhance or extend signage on the main road approaches to provide sufficient warning. This may require deploying the normal F2:20 layout.

Scenario 3: Side Road Closed Ref F2:25

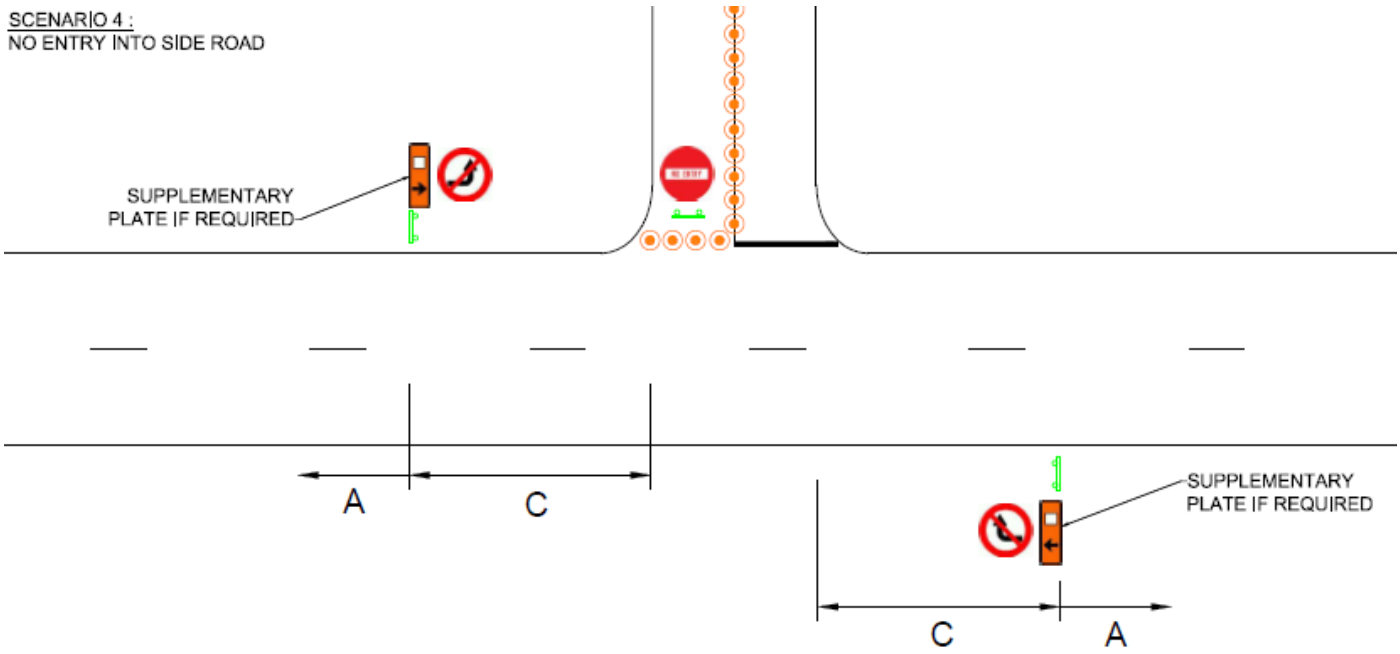
- T1 ROAD WORKS signs should be omitted from the main road.
- TD1 Variant SIDE ROAD CLOSED AHEAD signs should be omitted from the main road.
- TD3A DETOUR AHEAD FOLLOW □ signs should be omitted from the main road.
- RD1R/L NO RIGHT/LEFT TURN, with supplementary TDA6 FOLLOW ↑ (if appropriate) must be installed.
- RD3 ROAD CLOSED at intersection must be installed.



In speed environments greater than 65kph, or where major risks exist (eg tight geometrics, restricted visibility, narrow road carriageway etc), then STMSs must enhance or extend warning signage on the main road approaches to provide sufficient warning. This may require deploying the normal F2:25 layout.

Scenario 4: Side Road is Exit Only (Entry closed)

- T1 ROAD WORKS signs should be omitted from the main road.
- TD1 Variant SIDE ROAD CLOSED AHEAD signs must be omitted from the main road.
- TD3A DETOUR AHEAD FOLLOW □ signs should be omitted from the main road.
- RD1R/L NO RIGHT/LEFT TURN, with supplementary TDA6 FOLLOW ↑ (if appropriate) must be installed.
- RD2 NO ENTRY at intersection must be installed.



In speed environments greater than 65kph, or where major risks exist (eg tight geometrics, restricted visibility, narrow road carriageway, rough / unsealed surface etc), then STMSs must enhance or extend warning signage on the main road approaches to provide sufficient warning. This may require deploying the normal F2:25 layout.

CITTM 2 **6. Speed Management** **Ref 'Best Practice for Speed Management at Roadwork Sites'**

If Speed Management is required to create safe vehicle operating speeds through a site, then the 'Best Practice for Speed Management at Roadwork Sites' guideline must be followed. CTOC acceptance must be specifically obtained for any use of Temporary Speed Limits and Speed Humps.

CITTM 2 **7. Temporary Speed Limits** **Ref C4, 'Best Practice for Speed Management at Roadwork Sites', E2 App B**

Temporary Speed Limits (TSLs) must be appropriate to provide an acceptable level of safety at the site, but to not unduly delay traffic. They must not be used in every situation, but only where TSLs can be justified as part of an overall Speed Management treatment for a site.

Refer to the 'Best Practice for Speed Management at Roadwork Sites' document for techniques, guidance and direction for applying appropriate TSL use. Refer also to the TSL decision matrix in COPTTM E2 Appendix B for further guidance.

Note: Clause 5.2(2)(b) of the Land Transport Rule: Setting of Speed Limits 2003 requires TSLs to be "at least 20kph less than the Permanent Speed Limit" (PSL) in roadwork situations. This prevents use of 40kph TSLs on 50kph PSL roads.

CITTM 1.3 **8. Signage Gating** **Ref C3.3.1, Land Transport Rule 2003_Setting-Speed-Limits-2003**

Signage gating is not required on two-lane two-way, and any other 'single approach lane per direction' roads, except for the initial set of speed limit signs that must still be gated.

Gating is required as per normal:
1. On multi-lane carraigeways, where the left hand side sign may become obscured by traffic in Lane 1.
2. Where other site specific factors (eg sight-distance limitations, need for good speed management etc) necessitate additional signs.

9. Cone Mounted KEEP LEFT / RIGHT signs — Ref B1.4.2

To assist guiding traffic around the closure, 400mm diameter RD6L/R KEEP LEFT/RIGHT (single) arrows are permitted to be mounted onto cones in low risk situations.

Cone-mounted RD6L/R signs are **not** intended for use at the start and end of lane closure tapers and chicanes. These (high risk) situations must be signed as per normal COPTTM practice.

10. Traffic Delays — Ref A5.6.1, A7.4.1, C16, Guideline for TTM Efficiency, SWIF Flowchart

Traffic impact must be considered during development of each TMP, and a suitable balance of safety, construction efficiency and network impact be proposed by the TTM methodology. The TMP Designer must identify if traffic volumes are likely to exceed the available capacity at the site, and along detour routes.

COPTTM C16 and the CTOC 'Guideline for TTM Efficiency' document, provide tools for TMP Designers to use. More detailed Network Modeling and impact assessment / coordination may be necessary to provide assurance of the expected capacity.

TMPs must summarise the assessment undertaken, identify when network efficiency impact is likely to occur, and outline mitigation measures to minimize impact.

11. Mitigation Measures when Network Impact Unavoidable — Ref Mitigation Measures Flowchart

When Network Impacts are unavoidable, mitigation measures must be considered, planned and delivered alongside the TMP. Specific details of Communication and Notification Strategies do not need to be included in the TMP, however the TMP must at least outline the measures being planned.

12. Barrier Systems — Ref B12 &C18, SHGDM Section 7.3

Where barrier systems are proposed as a safety device for closure protection, the following elements must be clearly explained in the TMP:

- Test Level in terms of NCHRP 350 or AASHTO MASH. The proposed product must be included in NZTA's authorised product list.
- Layout details:
  - Upstream End Treatment
  - Flare sections
  - Protection Zone (Length of Need)
  - Downstream End Treatment (if required)
  - Offset to live lanes
  - Delineation*
  - Transition details (if required)
  - Deflection Distance

  A close-up scale drawing and cross-sections are recommended to fully explain the proposed barrier system configuration.
- How key elements will be installed so that performance will replicate crash-tested performance**. Any differences to the crash-tested configuration may result in the system performing poorly and being non-compliant with NZTA M23: 2009. Components must be installed in accordance with manufacturer instructions wherever practicable.
- Maintenance standards proposed for the barrier system. Note that water-filled systems may require higher levels of monitoring and maintenance than other types.

* The minimum Delineation for barriers used to channel traffic at speeds less than 65kph is reflective markers (chevrons) at 10m spacing. Additional delineation is necessary for any worksites with a speed limit higher than 65kph, or where significant risks exist.

** Where the crash-tested configuration (especially deflection distances) cannot be provided, the TMP must explain why the configuration is proposed, the expected performance, and any mitigation measures to be adopted to manage risks.

13. Peak Traffic Hours

(General) "Peak Hours" are defined as:

07:00 – 09:00 Monday to Friday
16:00 – 18:00 Monday to Thursday
15:30 – 18:00 Friday
Any weekday prior to a public holiday assumes Friday timing.

On Strategic Routes, the AM and PM Peak Hours above may require adjusting to reduce risk of severe network congestion. The TMP Designer should present an initial opinion on this as part of their Traffic Impact Analysis, with review and confirmation of acceptable timings from AEs and TMCs.

14. Work during Peak Hours

Ref A3 & C16

Road Level	TTM Operations	Construction Work within established TTM worksite
2	Not permitted	Permitted, provided that capacity is not reduced below what is accepted in the TMP. Disruptive vehicle maneuvering for site accessing, and operations that significantly distract passing traffic are not permitted.
1	Permitted*	Permitted*
LV	Permitted*	Permitted*

* Provided that traffic delays do not exceed 5 minutes, or as accepted in the TMP.

15. Site Accessing

Ref C15 & A3

Site accessing methodologies must be planned for each TMP. Specific access points must be detailed into TMPs wherever possible, to confirm that both the work and the necessary site accessing methodologies are viable without compromising sign spacing, safety zones, traffic flow, safe road operating conditions etc.

Where site accessing cannot be accomplished in the normal direction of traffic (eg reversing into site, using oncoming lanes), then a safe methodology must be designed, explained clearly in the submitted TMP, and resources allowed for site operations.

16. Mobile Variable Message Signs (mVMS)

Ref B10, NZTA ITS-06-04 (VMS Specification), NZTA VMS Policy, NZTA VMS Procedures, NZTA ITS-06-04 Notes, CTOC SWIF flowchart

The following information is intended to cover the operational application of mVMS trailers used to warn / advise of TTM activities. AWVMS are not covered by this policy. Equipment capabilities and standard requirements must meet NZTA specifications unless noted otherwise.

Appropriate Usage

Due to the risk of diminished impact caused by overuse of mVMSs, these devices must be reserved for **operationally critical purposes only.** These are defined as: **"Significant TTM operations where road user behaviour modification or awareness is essential".**

'Significant' means either delays greater than 5 minutes on Strategic Routes, or where severe localised impacts have a high probability of occurring and high consequence for network, safety or site operations.

The focus of messages must generally be on Journey Management only (not other purposes), and for VMSs to remain credible, messages must provide timely, reliable, accurate and relevant information for that journey. Messages must be blanked or signs removed completely from site when messaging is no longer necessary.

For the above reasons, mVMSs should generally **not** be used to warn of Nightworks, for localised minor impacts eg carpark access changes, or as a 'Contingency' for missing static signage, because the impact from these activities is usually small and mVMS usage would be excessive. The initial lead-in to a long-duration impact (greater than 1 week), may justify prewarning and mVMS usage during the initial 'acute' impact phase, however once this has passed, other channels for ongoing messaging are likely to be more appropriate eg static signs or Traveller Information releases.

Refer to the CTOC *'Significant Works Identification Flowchart'* for further guidance on when mVMS use is appropriate.

Before displaying any message on a mVMS, the wording of the message, the dates/times it will be operational and blanked, and deployment location(s), must be documented in a TMP and accepted following normal TMP authorisation process. Where more than one Message Phase is required, the operational details of each phase must be clearly documented.

mVMS Strategy Design

Site Specific consideration and design is required for all situations. Designers should keep the following questions in mind throughout the process:

(i) *What is the key message that needs to be conveyed for this phase of the TTM operation, to mitigate or warn of the effects created?*
(ii) *How do I make this message effective for the majority of approaching road users?*

Solving the second question usually answers: *'How many signs will I need, and where do they need to be located?'*

Site Specific Design

The objective of the following sections is to assist in identifying what message is required for each phase of the TTM operation, and how to make the message effective.

Message Construction

Units of Information can be identified by the following questions:

QUESTION	ELEMENT	UNIT OF INFORMATION	CONDENSING
What happened / Is going to happen?	**(Problem)**	ROAD CLOSED	Usually included
Where?	(Location)	OPAWA ROAD	When needed
What is the Effect?	(Effect)	ROUTE CLOSED	Optional
Who is Affected?	(Audience)	ALL TRAFFIC	When needed
What Action is Advised?	**(Action)**	FOLLOW DETOUR	Usually included

The message must be condensed down to the most important elements only, ideally using four units of information or less, and eight words or less, by eliminating non-critical information and information the traveller will reasonably infer. Core elements that are usually needed are the Problem and Action descriptors.

The above example would be condensed down to:

Frame 1	*Frame 2*
OPAWA ROAD CLOSED	**FOLLOW DETOUR**

"Chunking" Units of Information

Each unit of information should be kept on the same line or frame display. Where portions of different units have to be displayed together, it is acceptable to place a hyphen between units.

Days of the Week / Calendar Dates

Days of the week should be used in preference to calendar dates when the impact is less than 7 days away eg:

Frame 1	*Frame 2*
ROAD CLOSED WED – FRI	

For an impact greater than 7 days away a combination of days of the week and calendar dates should be used eg:

Frame 1	*Frame 2*
ROAD CLOSED	**WED 6 NOV - DEC**

Message Viability Check

Each trial message must be tested for viability against the capabilities of the mVMS equipment allocated for the site. To ensure message viability on *any* mVMS equipment, it is good practice to design messages assuming maximum 9 character width and 3 line depth being available per frame. This is the approach taken in the examples above and below. More complicated messages could be designed, and number of frames potentially reduced, if the equipment is capable of displaying additional characters per line, or numbers of lines, and that particular equipment can be guaranteed to be allocated to the site.

Message Phases

For planned TTM operations where mVMS use is justified, there are usually two phases required:

1. Prewarning Phase: this occurs for (usually) 1 week prior to the full TMP deployment, to warn regular commuters of the upcoming impact. This encourages them to plan ahead and adjust behaviour (eg travel patterns) to accommodate the change. It also minimizes complaints by setting expectations ahead of time. mVMS must be located close to the point of impact (the future worksite) during this phase.

2. During Deployment Phase: this occurs for (usually) 1 week after the date of full TMP deployment. The Prewarning mVMS must be relocated upstream of the worksite to a location that is effective to achieve the purpose of phase 2. eg this could be to provide either advance warning of the worksite to support the static signage, or to provide remote messaging to encourage rerouting onto alternative roads. Additional mVMSs may be needed to supplement the first mVMS and cover other key approach roads. After 1 week, if continued messaging is needed, the mVMSs should be replaced with static signage displaying appropriate messages.

Example of Prewarning Phase message:

Frame 1	*Frame 2*
MONTREAL ONE LANE FROM TUES	**CONSIDER ALTERNATE ROUTE**

Example of During Deployment Phase message:

Frame 1	*Frame 2*
MONTREAL ONE LANE	**EXPECT DELAYS**

The dates for each phase to be active must be clearly detailed in the TMP, and coordinated around the date for full TMP deployment. To maintain credibility of all parties and support Traveler Information and other Mitigation Strategies, this means that full TMP deployment dates must be certain at least 1 week prior, and changes to the full deployment date must be minimized.

Examples of During Deployment Phase Messages, including possible LED colour choice (black = standard yellow LED colour):

Frame 1	*Frame 2*
MAJOR ROADWORKS DURHAM ST	**EXPECT DELAYS APR - JUN**
MAJOR ROADWORKS AHEAD	**TAKE EXTRA CARE**
SALISBURY ST CLOSED	**USE ALTERNATE ROUTE**
E-BND TRAFFIC	**FOLLOW DETOUR**
TRAFFIC CONTROL CHANGE	**STOP AHEAD**
ALL TRUCKS	**USE LEFT LANE**
PILOT CAR AHEAD	**PREPARE TO STOP**

Message Format

- Three lines of 300-350mm character height. (200mm character height may be considered in low speed environments, or where local requirements dictate).
- Ability to display a minimum of 9 characters per line.
- Upper case (capitals) to be used for all characters, except the abbreviation for kilometres (km).
- Spacing, Font and Visual Performance to be as per NZTA ITS-06-04 Specification.
- Text to be centre justified.
- If Pictograms are proposed instead of standardized text, CTOC will consider these applications on a case-by-case basis.

LED Colour

The current NZTA national position is that only yellow LEDs are permitted. Research is underway to assess the human factor impacts and any additional value from other colours / combinations of colour.

The CTOC position is that for most warning or advisory messages, the standard yellow LED colour is appropriate and this is therefore the default expectation for most mVMS deployments.

However in the interim period prior to an updated NZTA position being released, CTOC is willing to consider trialling colours other than yellow under the following conditions:

- A single colour must be used per Unit of Information.
- The colour(s) used in the message must be suitable and effective for the site (eg blue and green can be difficult to read in some situations).
- The colour must logically match the Unit of Information (eg green could be used for a 'permissive' message, while red could be used for a 'restrictive' message).
- The brightness and legibility of each colour in a mixed-colour message must be equal.
- The message must be understandable (self-explaining) on its own, and not rely on the colour to be understood. This enables colour-blind road users to still comprehend it.

Some examples of possible colour choice are provided above.

Frames and Timing

- Single, two and (only where absolutely necessary) three-frame message displays are permitted.
- The minimum number of frames must be used to clearly convey the message.
- Single frame messages must be displayed continuously. Two frame messages must use 2 second timing per frame. Three frame messages must use 1.6 second timing per frame.
- Scrolling messages across/down, and flashing messages, are not permitted.

Location

Location(s) must be chosen to best fit the road environment and be effective in achieving the purpose of the message. The key objectives are to select location(s) on the network that will be: (i) effective in conveying the message to the main approaches flowing towards the worksite, and (ii) enable the desired road user reaction to occur (eg rerouting).

The following factors must be considered:

- Left Hand Side Preferred - Should be positioned to the left of the approaching road user.
- Minimise Hazard to Traffic - Must be positioned or protected to minimise the risk of any vehicle strikes eg ideally located outside of clear zones, as far as practicable from edge of live lanes (while still remaining visible), behind TTM device protection, behind barrier protection, removed when not required etc.
- Clear Sight Distance - in speed environments of 60kph or less, the desirable minimum CSD is 100m. A minimum CSD of 75m must be available. In higher speed environments, normal CSD requirements apply (usually 3 x Speed Limit). Management of parking areas may be required to guarantee CSD.
- Road Geometry - avoid locating immediately before a sharp bend, blind crest, or intersection, where the sign may distract attention at a critical moment.
- Glare - avoid positioning directly in front of a rising or setting sun, beneath bright lighting sources, and where sun reflection on the board may reduce legibility.

- Distance from Key Intersection – where a mVMS is intended to advise of a travel route diversion, the sign must be located sufficiently in advance of the intersection to allow users to react in time, including changing lanes if necessary.
- Presence of Other Signage and Traffic Control Devices – a mVMS must not compete with other signage, or interfere with traffic control devices both proceeding and beyond the site. Minimum spacings must therefore be achieved to these features.
- Impact on Cyclists and Pedestrians – placement must not impede cycle lanes or footpaths.
- Number of mVMSs – A sufficient number of mVMSs must be allocated to display the message to the main approach flow(s) towards the worksite.

Since two Message Phases will be required for most TTM operations, two mVMS Strategy Plans will usually be required within TMPs to explain the proposed messages and mVMS locations for each phase.

17. mVMS Used for Speed Management

Ref 'Best Practice for Speed Management at Roadwork sites'

mVMS could be used to improve Speed Management through worksites or to treat severe issues at TTM worksites. In accordance with the principle of reserving mVMSs for operationally critical purposes, these options must only be considered for worksites on strategic routes, and/or where severe localised risks / issues are occurring:

1. Additional Messaging: mVMS used to advise of a reason for reducing speed, to support the various speed treatments employed through the TTM site.

2. Speed Feedback: mVMS used to display either nothing, the approaching vehicle's speed up to the posted or temporary speed limit, or a "**SLOW DOWN**" message as appropriate.

Where a mVMS is used for speed feedback, the display controller must incorporate an adjustable lower threshold which, when it is not exceeded, results in the sign remaining blanked. This threshold will typically be set 20kph below the posted or temporary speed limit.

When the nominated lower threshold is exceeded, the words "**YOUR SPEED**" must be displayed with the approaching vehicle's speed displayed as a figure in kph.

When the nominated upper threshold (usually the posted or temporary speed limit) is exceeded, the message "**SLOW DOWN**" must be displayed.

18. Fixed VMS for TTM messages

CTOC controls a number of fixed VMSs in strategic locations on the network (currently SH1 Main North Rd, SH1 Main South Rd & SH74 Tunnel Rd). Where practicable, messages could be displayed on these VMSs to support roadworks in close proximity to the signs. Please contact CTOC to discuss possibilities if TMPs are located near to these locations. A reduced number of characters / lines may be available compared to mVMS equipment.

19. Cyclist Impacts

A5.7.1, C3.3, C13, 'Best Practice for Cyclists' Guide

Where marked cycle lanes, CTOC endorsed cycle routes, or any road with high cyclist demand (eg near schools, universities, suburban shopping centres, key activity areas etc) are affected by TTM operations, the 'Best Practice for Cyclists' Guide must be followed. The principles must be considered during both the TMP Design phase and also (continuously) during onsite operations.

C2.5 Combined level LV and level 1 worksite layout distances

Permanent speed limit or RCA-designated operating speed (km/h)		≤50	60	70	80	90	100
Traffic signs							
A	Sign visibility distance (m)	50	60	70	80	90	100
B	Warning distance (m)	50 or 30*	80	105	120	135	150
C	Sign spacing (m)	25 or 15*	40	50	60	70	75
Safety zones							
D	Longitudinal (m)+	10 or 5*	15	30	45	55	60
E	Lateral (m)+	1	1	1	1	1	1
Tapers							
G	Taper length (m)#	30	50	70	80	90	100
G	**LV roads** taper length (m)#	25	30	35	40	45	50
K	Distance between tapers (m)	40	50	70	80	90	100
Delineation devices							
Cone spacing in taper (m)		2.5	2.5	5	5	5	5
Cone spacing: Working space (m)##		5	5	10	10	10	10

* Larger minimum distances apply on all state highways and also on all multi-lane roads. The smaller minimum distances may be applied on other roads to accommodate road environment constraints.

+ On LV roads the longitudinal and lateral safety zones may be reduced, or eliminated, in order to retain a single lane width. Positive traffic management and an appropriate TSL must be used.

\# On non-state highways with speeds 50km/h or less, a **10m taper** (with cones at 1m centres) may be used when there are road environment constraints (eg intersections and commercial accesses).

On all roads where shoulder width is less than 2.5m and the activity does not affect the live lane, a **10m shoulder taper** is permitted (with at least 5 cones at no greater than 2.5m centres).

A **taper of 30m** (with cones at 2.5m centres) **must** be used where manual traffic control (stop/go), portable traffic signals or priority give way are employed.

LV roads: double the cone spacing alongside working space (eg 5 = 10, 10 = 20).

Lane widths									
Speed (km/h)		30	40	50	60	70	80	90	100
F	Lane width (m)	2.75	2.75	3.0	3.0	3.25	3.25	3.5	3.5

Except for delineation device spacings, which are maximum values, the distances specified in the above tables are minimum values.

LV/low risk roads

Working on roads designated as LV/low-risk roads (less than 250vpd - less than 20 vehicles per hour), with clear sight distance to the operation and an operating speed of less than 65km/h:

- use an appropriate advance warning sign (static installation) and amber flashing beacon(s) on working vehicle when on the shoulder
- consider stop/go or give way control of traffic when activity encroaches onto lane.

If the above requirements cannot be achieved, the operation must be modified to comply with the requirements of a higher risk rating.

These CoPTTM Spacings will be used on all SCIRT sites unless otherwise specified on the TMP

C2.6 Level 2 worksite layout distances

Permanent/TSL (km/h)		≤50	60	70	80	90/100
Traffic signs						
A	Sign visibility distance (m)	60/50+	70/60+	80	100	120
B	Warning distance (m)	100/75+	120/90+	140	160	200
C	Sign spacing (m)	50/35+	60/45+	70	80	100
Safety zones						
D	Longitudinal (m)*	15	20	30	45	60
E	Lateral (m)					
	1. Behind cones	1	1	1	1	1
	2. Behind concrete barrier	0.5	0.5	0.5	0.5	0.5
	3. Behind other barriers	As recommended by manufacturers				
Tapers						
H	Initial taper length per lane (m)**	90/50+	100/60+	120	150	180
I	Subsequent taper length per lane (m)	50	60	70	80	100
K	Minimum distance between tapers (m)	50	60	70	80	100
Delineation device						
Spacing (centres)	All tapers (m)	2.5	2.5	2.5	2.5	2.5
	Cones parallel to the lane (eg between tapers and alongside the working space) (m)	5	5	10	10	10
	At merge and diverge points for ramps and slip lanes, intersecting road entry and exit points, and worksite access points	2.5m for 10m either side of a change in alignment		2.5m for 20m either side of a change in alignment		

* A longitudinal safety zone is not required when a barrier completely protects the approach end of the worksite.

** Taper length is based on a single lane shift of 3.5m.

\+ The longer distance is the desirable distance, the shorter distance is the minimum distance required. The longer distances must be used wherever possible. The shorter distances may only be used where there are road environment constraints.

Lane widths									
Speed (km/h)		30	40	50	60	70	80	90	100
F	Lane width (m)	2.75	2.75	3.0	3.0	3.25	3.25	3.5	3.5

Except for delineation device spacings, which are maximum values, the distances specified in the above tables are minimum values.

Approach sign distances and spacings, the initial taper(s) and any longitudinal safety zone associated with that taper must be based on the permanent speed limit. The layout distances of the remainder of the worksite, including any subsequent tapers, may based on the TSL, provided the TSL is applied prior to the first taper.

These CoPTTM Spacings will be used on all SCIRT sites unless otherwise specified on the TMP