

NATIONAL OPERATING PROCEDURES

FOR WAKA KOTAHI NZ TRANSPORT AGENCY

VARIABLE MESSAGE SIGNS

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0.4	Final Draft for Approval	24 Dec	Sue Jones

Purpose

The purpose of this document is to provide guidance on the procedures for the operation of variable message signs (VMS). It should be read in conjunction with the National Operating Policy for Waka Kotahi NZ Transport Agency Variable Message Signs. Waka Kotahi has deployed VMS on the state highway network and local roads where there is a responsibility to provide traveller information.

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More information

Waka Kotahi NZ Transport Agency
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If you have further queries, call our contact centre on 0800 699 000 or write to us:

Waka Kotahi NZ Transport Agency
Private Bag 6995
Wellington 6141

This document is available on Waka Kotahi NZ Transport Agency's website at www.nzta.govt.nz

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1. Introduction

1.1. Background

Variable Message Signs (VMS) are now established as a strategically important, highly visible part of New Zealand's state highway network. Management of the network relies on a diverse array of processes and resources of which VMS are a crucial part.

Waka Kotahi recognises that international best practice must be applied when managing, operating and displaying messages, and that a high level of national consistency when presenting information to travellers, are essential to maintaining credibility. While regional differences dictate there will be some variations, Waka Kotahi's national philosophy on VMS messaging, is described in two documents which cover policy and procedures. In addition, lower-level site specific information is placed in a series of separate Standard Operating Procedures

1.2. Scope

This is a national document spanning every Waka Kotahi region. It covers the operation and control of messages on all Waka Kotahi motorway, urban & rural VMS. The document's coverage also extends to Mobile VMS.

This document **does not** cover CMS, LCS, LSU, EJT and other non-VMS electronic signage.

1.3. Relationship between Policy, Procedure & Schedules

Waka Kotahi has established three levels of documentation relating to the operation of VMS. These comprise of:

1. National Operating Policy.

This national document outlines the overall operating policy relating to the control of messages on Waka Kotahi's and Contractors VMS. It covers motorway urban & rural locations, and Mobile VMS.

2. National Operating Procedure.

This national document outlines the operating procedures governing Waka Kotahi's VMS. It contains a menu of standard messages and outlines the best practice processes used to compose VMS messages. The National Operating Procedure sits below and is consistent with, the National Operating Policy.

3. SOP's

These documents declare who, why and when a task must be performed. They tell staff where responsibilities lie to provide consistency and clarity around our procedures no matter the different staff that come in and out of the TOC's.

SOP's also show external parties our compliance with regulation and how tasks are completed.

1.4. Credibility

VMS must provide timely, reliable, accurate and relevant information. Credibility is extremely important. Regardless of how well a message is worded, travellers will distrust the system if they perceive the information to be inaccurate. Therefore, all messages displayed shall be: -

- Accurate – using verified information
- Current – only up-to-date information is displayed
- Relevant – within the area of influence of the VMS
- Significant – only important traffic information is displayed
- Coordinated – appropriate messages at every VMS relevant to incident
- Well worded – easily read and understood

1.5. Definitions and Acronyms

Term/Acronym	Definition
ATMS	Advanced Traffic Management System
ATOC	Auckland Transport Operations Centre
AVID	Automatic Video Incident Detection
BCP	Business Continuity Plan
CIMS	Coordinated Incident Management System
CMS	Changeable Message Sign
DYNAC	Traffic Management System
EJT	Estimated Journey Times
EPIC	Event Project Information Coordination
MVMS	Mobile Variable Message Signs
PLO	Police Liaison Officer
SOP	Standard Operating Procedure
TOP	Transport Operating Procedures
VMSS	Variable Mandatory Speed Sign
WTOC	Wellington Transport Operations Centre
NTCIP	National Transportation Communications for ITS Protocol.
VMS	Variable Message Sign.

2. VMS Operation Centres

2.1. Current Operation Centres

While the locations and numbers of centres may change over time, VMS operation centres are currently located at:

Auckland TOC at a purpose-built facility within Smales Farm, controls all Motorway VMS within Auckland and the upper North Island VMS.

Wellington TOC at Helston Road, Johnsonville (top of Ngauranga Gorge), controls all Motorway VMS within Wellington, the lower North Island, and the South Island VMS.

2.2. Back Up Operation Centres

Should an operation centre be unable to function, the other operation centres is expected to carry out the essential functions including posting and blanking of messages. To that end both the Auckland TOC and Wellington TOC shall at all times maintain the capability to run VMS in all parts of the country, albeit on reduced service levels if necessary.

The Auckland TOC and Wellington TOC shall hold relevant electronic and hard copy files of the Standard Operating Procedures for the rest of the country.

This information must be updated at least 6 monthly by each of the operation centres during March and October and forwarded to the Auckland and Wellington centres by the last day of these months.

2.3. Additional Back Up Control Capability

Should the back-up operation centre fail in a disrupt scenario, Business Continuity Plan protocols will be followed.

3. Delegated Authority

3.1. Levels of Authority within the DYNAC Traffic Management System.

3.1.1. Read Only

Waka Kotahi read only users have the permission to:

- View current and scheduled network states
- View and export system logs and reports
- Receive alarms and system-initiated communications

They have the rights to execute actions at the lowest priority within the system

3.1.2. Operator

Waka Kotahi Operator users have the permissions to carry out actions that a Read Only user can as well as the following:

- Monitor and implement state change with all devices and integrated systems

They have the rights to execute actions at the highest priority within the system

3.1.3. Supervisor (Senior Operator)

Waka Kotahi Supervisor users have the permissions to carry out actions that an Operator and Read Only user can as well as the following:

- View system privileges for all users and devices
- Add / modify network management configuration (build and approve traffic management plans)
- Enable / disable active communications and toggle operating modes of an individual or group of devices / integrated systems

They have the rights to execute actions at the highest priority with the system.

Some users within this group are provided rights to edit / modify system details of specific device groups / domains (i.e., Maintenance Contractors).

3.1.4. Administrators

Waka Kotahi Administrator users have the permissions to carry out actions of a Supervisor, Operator and Read Only user can as well as the following:

- Add, configure and delete devices as registered objects
- Configure integration points and system details
- View / modify system privileges for all users, devices, and active sessions
- Run diagnostics on devices
- Configure / modify system monitoring and alarm settings

The have the rights to execute actions at the highest priority within the system.

4. Processes When Publishing Messages

4.1. Approved Standard Messages

Please refer to the Approved Standard Messages Register for all messages that are pre-approved to be used. The register also holds all messages that are not approved and therefore should not be used.

4.2. Approval Processes for New Messages

Please refer to the Message Approvals Standard Operating Procedures for the message approval processes for the various message types.

5. Mobile VMS

Mobile VMS are frequently deployed to provide travellers localised information. Every reasonable effort shall be made to ensure that messages posted on the mobile VMS are compatible with information provided elsewhere on the network, in particular when deployed in the proximity of other mobile or fixed VMS or LCS.

The wording on Mobile VMS should be consistent with the “Principles of Message Structure” (Appendix 1) and the Approved Standard Messages Register.

Messages on Mobile VMS should be defined as part of the Traffic Management Plan.

5.1. In the Auckland Urban Motorway TOC Controlled Zones

Mobile VMS within the Auckland Urban Motorway controlled zones shall be only set or changed by ATOC staff. This is to ensure compatible management of all traffic control devices on the motorways particularly where there may be mobile and fixed signs in close proximity.

5.2. In the Remainder of the Country

Mobile VMS signs outside the Auckland TOC zone shall also be managed to ensure compatibility with fixed VMS. Before setting a message on a mobile VMS, the wording of the message, and the dates/times it will be posted and blanked is to be discussed and agreed as part of any TMP.

6. Preconditioning Messages


Preconditioning messages advise travellers of road changes that are in the future.

The length of the preconditioning is determined by the frequency and detour availability and is normally only used when the road user impact is moderate to severe.

If preconditioning is used greater than a week out dates should be used. If preconditioning within the current week, then days of the week should be used.



A black rectangular sign with yellow text. The text is arranged in three lines: "SADDLE ROAD", "CLOSING", and "27 MARCH".



A black rectangular sign with yellow text. The text is arranged in three lines: "SADDLE ROAD", "CLOSING", and "WEDNESDAY".

Appendices

Appendix 1 – Principles of Message Structure

1.1 Units of Information

Messages are constructed from **units of information**.

A **unit of information** is an item of data that a motorist may require to make a decision. This is illustrated by the questions and answers in the following table.

Question	Example Answer	Units of Information
What Happened? (Problem)	SNOW	1 unit
Where? (Location)	SH1 DESERT ROAD	1 unit
Effect?	ROAD CLOSED	1 unit
Who is Affected? (Audience)	NO TRUCKS	1 unit
What Action is Advised?	USE ALTERNATIVE ROUTE	1 unit

The answers to the questions make up the **Base Message**. However, it is impractical and undesirable to present travellers with a message containing all of the units of information above. As the amount of information increases, travellers find it increasingly difficult to read and comprehend the message, and of course the message must fit on the VMS display.

Each message should be condensed down to four units of information or less, and eight words or less, by eliminating information the traveller will reasonably infer.

Many effective messages consist of just two or three units of information.

1.2 Identifying the Base Message and Condensing

The message design process begins with writing down all units of information in the **Base Message** which is then condensed down to the most important elements.

Base Message Elements

Element Descriptor	Purpose	Comment
Problem	Conveys the type of incident.	Usually included. (Sometimes replaced by the Effect descriptor. e.g. ROAD CLOSED)
Location	Conveys location of the problem	Should always be included. E.g. INCIDENT AHEAD or SH2 PETONE
Effect	Conveys the consequences of the incident	Desirable. E.g. EXPECT DELAYS (Sometimes replaces the Problem descriptor).
Audience	Identifies the group of drivers for whom the message is intended (e.g. truck drivers, or drivers bound for a given destination).	Desirable where the message does not apply to all travellers. E.g. NO TRUCKS.
Action	Conveys the course of action to be taken by drivers	Usually included. (Unless the Action is rendered superfluous by the Problem descriptor or the Effect descriptor)

The operator should consider if they have enough of the information above to reliably inform drivers. If not, more information should be gathered before a message is implemented.

1.3 Problem/Incident Descriptor

Examples of descriptors for problems or incidents include:

- CRASH**
- INCIDENT**
- ROADWORKS**
- SNOW**
- ICE**
- ROCKFALL**
- FLOODING**
- REDUCED VISIBILITY**
- STRONG WINDS**

While this list is not exhaustive, limiting the number of variations on these descriptors will enhance national message consistency.

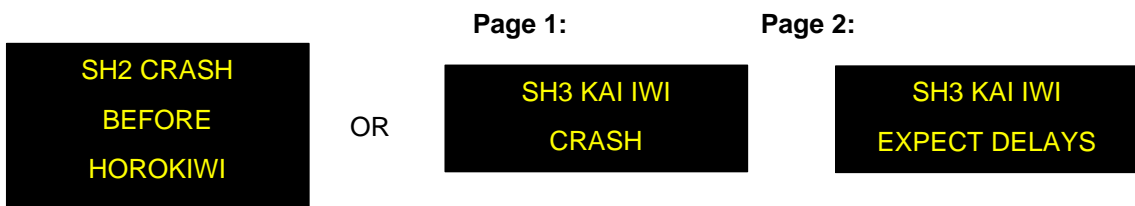
Having many variations for similar descriptors should be avoided. For example, CRASH is preferred to TRUCK OVERTURNED.

1.4 Location Descriptor

1.4.1 Referencing Locations

Locations must be written on a VMS in a way that can be understood by all road users. A Location Descriptor should never reference local terminology or something that cannot be found on maps.

Crash Example:



See approved message list dealing with use of “accident” “crash” and “incident”.

Use of Terms “Before”, “At”, “From”, “After”, “On”

As in the message above, consideration can be given to using the terms:

BEFORE [road name, place name]
AT [road name, place name]
FROM [road name, place name]
AFTER [road name, place name]
ON [road name]

To provide information about the locality and whether the motorist can reach towns or locations located before the incident.

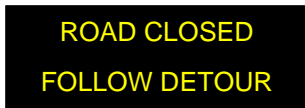
Road Closure Example:

Two Line VMS:

Page 1:



Page 2:



Four Line VMS:



Without some form of *action descriptor*, travellers do not know whether they should wait for the road to be re-opened, or to use a detour.

1.4.2 VMS on Same / Different Road as Incident

Refer to the Waka Kotahi VMS Operating Policy on the need to include the SH number.

1.5 Effect Descriptor

Delays Example

Travellers' interpretations of what a delay may mean in terms of time vary widely, depending on location and time of day and length of the delay. Both **LONG DELAYS** and **EXPECT DELAYS** can be used but dependent on the situation and effect on customers journeys compared to normal traffic conditions.

LONG DELAYS

EXPECT DELAYS

1.6 Attention Descriptor

The *Attention Descriptor* is only used when the *Action* applies to a specific group of travellers.

TRUCKS USE SH4

Travellers expect that when they see an *Attention* message on the VMS, they will also see an *Action* message. An *Attention Descriptor* must always be accompanied by an *Action Descriptor*.

1.7 Action Descriptor

The *Action* element tells travellers what to do, and a message should normally contain an *Action Descriptor*. However, provided the appropriate action is clearly implied by other elements in the message, an *Action Descriptor* may be superfluous.

**REDUCED
VISIBILITY**

In this example, adding an Action Descriptor is generally considered superfluous. Action is implicit in the Problem statement.

Non-Specific and Specific Diversion Route Examples

Where traffic is diverted to a non-specified alternative route the possible *Action Descriptors* include:

USE ALTERNATIVE ROUTE (Usually too long to fit on a VMS)

USE ALT ROUTE

Where traffic is diverted to a specified alternative route the possible *Action Descriptors* include:

USE SH[XX]

FOLLOW DETOUR

NO DETOUR

Appendix 2 – Principles of Message Design

2.1 General Considerations

Standard Regional VMS are capable of displaying 16 characters per line. The space between words is the equivalent of one character.

Motorway VMS are capable of 18 characters per line. The space between characters is the equivalent of two characters.

As described in Section 5, messages are constructed from **units of information** selected from the **Base Message**. As a general rule the problem should appear first and then the action required, but this is message dependent. It is important that the first unit of information should give the driver a good reason for continuing to read.

Each message be condensed down to four units of information or less, and eight words or less by eliminating information the traveller will reasonably infer.

If more than four units of information or more than eight words need to be displayed as part of an approved sequence of message(s); the message is to be fed back through the Waka Kotahi stakeholder group to consider if alternate wording can be recommended.

All characters will use upper case (capitals), except the abbreviation for kilometres (km) which shall be presented in lower case.

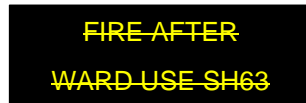
2.2 Maximum Numbers of Units of Information

Two messages can be displayed simultaneously, but as a rule no more than **4 units of information** should be presented in high-speed environments.

In low traffic volume or low speed environments (50kph or less) a maximum of **5 units of information** may be accepted.

2.3 “Chunking” Units of Information

Keeping a *Unit of Information* on one line is referred to as “chunking”. The aim is to keep the whole unit of information on the same line to avoid confusing travellers and increasing reading time.



FIRE AFTER
WARD USE SH63

Lines not meaningful

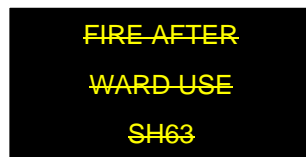


SH1 AFTER WARD
ROAD CLOSED

Lines meaningful

Where portions of different units have to be displayed on the same line, it is acceptable to place a hyphen between the preceding portion and an action unit. This is not desirable, and units of information should be shortened instead.

Taking the above example:



FIRE AFTER
WARD USE
SH63

Lines not meaningful



SH1 VIVIAN
STREET – CRASH
EXPECT DELAYS

Acceptable

2.4 Splitting Messages

After selecting the necessary elements of the Base VMS Message, reducing the number of units of information, deleting dead or superfluous words, and using abbreviations, the message may still be too long to fit into one display frame.

Two rules apply when messages must be displayed in more than one frame.

2.4.1 No More Than Two Alternating Frames

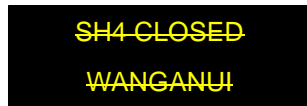
Messages are normally displayed as a single “frame,” however a maximum of two frames may be used to display messages providing the requirements outlined in this manual are met. Human factors research has shown that travellers have difficulty reading messages displayed on more than two frames.

When messages are presented in two alternating frames, each frame is automatically displayed for 3 seconds.

Scrolling messages across/down the display, or flashing messages, is not permitted.

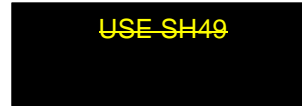
2.4.2 Each Frame Must Be Understood By Itself

Each frame must be understood by itself. Either frame may be read first by the passing traveller, and some people may only see one frame.



SH4 CLOSED
WANGANUI

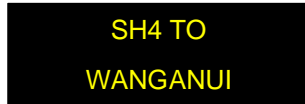
Frame 1



USE SH49

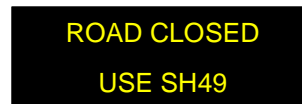
Frame 2

This example is not acceptable, as each frame is not understood by itself.



SH4 TO
WANGANUI

Frame 1



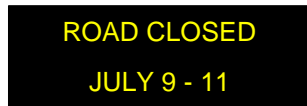
ROAD CLOSED
USE SH49

Frame 2

This example is acceptable, as each frame is understood by itself, and they are understood regardless of the order in which they are read by a passing traveller.

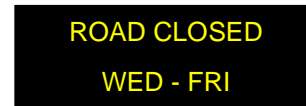
2.5 Calendar Dates / Days of the Week

Human factors tests show travellers comprehension is significantly greater when a message displays days of the week as compared to displaying calendar dates, however, calendar dates are acceptable when preconditioning for a major event requires it.



ROAD CLOSED
JULY 9 - 11

Acceptable



ROAD CLOSED
WED - FRI

Acceptable

NOTE: When days of the week are displayed, the message must be displayed *no more than 6 days in advance*.

The meaning of a hyphen (-) as used in the message above is understood by most travellers and its use in the above context is acceptable.

2.6 Avoid Forms of Advertising

For special events, use generic wording that avoids providing a form of indirect advertising.



SPEIGHTS COAST
TO COAST RACE

Not acceptable



PUBLIC EVENT

Acceptable

SH6 GREYMOOUTH
PUBLIC EVENT

Acceptable

WATCH FOR
CYCLISTS

Acceptable

2.7 Message Priority

The following general principles shall apply:

- Where separate messages for different sections of road are displayed simultaneously, the message for the closer section is placed at the top, and the further away section is placed underneath.
- Where there are too many messages, the greatest consequence for travellers is the highest priority. The assessment should include the degree to which travellers may not expect to encounter the situation, and the potential consequences of any hazard. If the hazards are roughly equal the nearest one(s) are the highest priority.

2.8 Driving Time Considerations

Some VMS, especially those in remote locations, may be several hours driving time from an incident. Where driving time from the VMS exceeds the expected time to re-open the road, no message should be displayed. Where possible, VMS that are far away from an event should be terminated before the road is reopened to stop road users unnecessarily using an alternative route.

2.9 Advising Message Updates

Where it is appropriate to display a message advising that an update can be expected at a certain time, the message will give a time and be presented in the format: "Update [XX:XX]AM or PM".

2.10 On Re-Opening a Road

When a **ROAD CLOSED** message is displayed, traffic may stop and wait at the VMS. On re-opening the road, instead of just blanking the sign, which is a passive form of information, an active message should be displayed. The following "ROAD NOW OPEN" message should be displayed for 15 minutes, or the time that it takes to drive from a preceding VMS displaying road closed, whichever is longer, and then the sign blanked:

ROAD OPEN

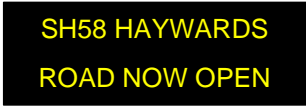
ROAD NOW OPEN

*Conveys a recent
change*

Where it is necessary to identify a specific State Highway the following message should be used.



ROAD OPEN



SH58 HAYWARDS
ROAD NOW OPEN

Insert the SH number and the location

2.11 Blanking the Display

VMS shall remain blank unless an adverse road condition, preconditioning for a major event, an approved safety message or a sign test message is required (except for briefly displaying a re-opening message when a closed road is re-opened).