

vic roads

ABN 61 760 960 480
Traffic & Road Use Management
2nd Floor 60 Denmark Street
Kew Victoria 3101

Tel: (03) 9854 2767
Fax: (03) 9854 2918
www.vicroads.vic.gov.au

Mr Ian Dundas
Committee Secretary
Standing Committee on Transport and Regional Services
Parliament House
CANBERRA ACT 2600

Dear Mr Dundas

**INQUIRY: VARIABLE SPEED LIMITS –
A CASE STUDY OF INTELLIGENT TRANSPORT SYSTEMS**

I refer to your letter dated 2 August 2002 to Mr Brent Stafford of ITS – Australia concerning the House of Representatives Standing Committee on Transport and Regional Services inquiry into the potential to apply variable speed limits on the F3 Freeway and the Hume Highway between Sydney and Canberra.

VicRoads has a significant background in the development, installation and monitoring of Intelligent Transport Systems in Victoria. We have installed a variety of systems, particularly on our freeway and highway networks, some of which are listed below:

- Drive Time (Real Time Traffic Information signs)
- Variable Message signs
- Incident Detection Systems
- Ramp Metering
- Freeway Condition Signs
- Ramp Control Signs
- Ice Detection Systems
- Closed Circuit Television Cameras
- Roadside Speed Check Systems.

VicRoads is also currently installing a dynamic variable speed limit system on the Western Ring Road in Melbourne. The variable speed limit system will predict traffic congestion using traffic information being collected from the road and determine the most appropriate safe driving speed to optimise traffic flow. Variable speed limits will be conveyed to motorists by a series of some eighty (80) roadside electronic LED variable speed limit signs.

VicRoads believes that variable speed limits have the potential to provide significant benefits in terms of efficient traffic flow and road safety improvements including:

- Reduced rates and severity of accidents and incidents
- Improvements in traffic flow and travel times
- Reduced congestion and traffic queues
- Reduced motorist stress levels
- Improved safety for emergency services personnel during incidents.



The project is scheduled for completion within the next 2-3 weeks.

In addition, a number of Intelligent Transport Systems as listed above are being installed as part of the Geelong Road Project, due to be completed by end 2002.

As the Federal Government contributes funding to both the Geelong Road Project and the Western Ring Road, it may be appropriate for the Committee to consider in detail the ITS work that is being undertaken on these roads.

VicRoads would welcome a visit by members of the Committee to Melbourne to view both projects and to discuss how VicRoads' experience may assist with the inquiry.

A VicRoads submission for the hearing is attached. VicRoads would also be willing to be represented if necessary. If you need any further information, please do not hesitate to contact me (Tel: 9854 2600).

Yours sincerely



**TED VINCENT
GENERAL MANAGER
TRAFFIC AND ROAD USE MANAGEMENT**

5/8/02

PARLIAMENTARY INQUIRY
VARIABLE SPEED LIMITS
A CASE STUDY OF INTELLIGENT
TRANSPORT SYSTEMS

Mr Ted Vincent
General Manager
Traffic and Road Use Management Department
VicRoads

Level 2, 60 Denmark Street
KEW VIC 3101

Tel: 03 9854 2600
Fax: 03 9854 2918

e-mail: ted.vincent@roads.vic.gov.au

**INQUIRY
VARIABLE SPEED LIMITS
A CASE STUDY OF INTELLIGENT TRANSPORT SYSTEMS**

ABSTRACT

In response to a call for submission to the Inquiry – Variable Speed Limits – A case study of Intelligent Transport Systems, VicRoads wishes to pass on its experiences in the development of the Variable Speed Limit System on the Western Ring Road in Melbourne.

The primary aim of the variable speed limit system is to improve road safety and traffic flow on the Western Ring Road.

The Western Ring Road is a major urban freeway in the western part of Melbourne which carries approximately 100,000 vehicles per day and large proportions of heavy vehicle traffic. The road consists of a divided carriageway and is 26 km in length. The speed limit on the road is 100kmh.

High traffic volumes on the Western Ring Road at certain times of day can cause breakdowns in flow, which results in traffic congestion and accidents.

The variable speed limit system will predict traffic congestion using traffic information being collected from the road and determine the most appropriate safe driving speed to optimise traffic flow.

Variable speed limits will be conveyed to motorists by a series of roadside electronic variable speed limit signs. Changes to the variable speed limit signs will occur automatically based on traffic conditions but will also be capable of being manually operated from VicRoads Traffic Control Centre during times of emergency.

All changes to the speed limits on Western Ring Road shall be logged and transmitted to the VicRoads Traffic Control Centre in real time as well as to a fixed digital speed camera system which will also operate on the road.

This submission provides an overview of the operation of the Variable Speed Limit System and examines:

- Aims of the system
- The proposed system operation
- The key components of the system
- The status of the system's implementation.

Dynamic, real time variable freeway speed limits have the potential to provide significant benefits in terms of efficient traffic flow and road safety improvements.

The variable speed limit system is scheduled for implementation in September 2002.

**INQUIRY
VARIABLE SPEED LIMITS
A CASE STUDY OF INTELLIGENT TRANSPORT SYSTEMS**

INTRODUCTION

In response to a call for submission to the Inquiry – Variable Speed Limits – A case study of Intelligent Transport Systems, VicRoads is submitting this report about the development of its Variable Speed Limit System on the Western Ring Road in Melbourne.

The system which is nearing completion is scheduled to be commissioned in September 2002.

The aim of the variable speed limit system is to improve road safety and traffic flow on the Western Ring Road by selecting and indicating roadside speed limits which are consistent with the prevailing traffic conditions.

The variable speed limit system will be linked to a system of fixed digital speed cameras.

This submission describes the concept and status of the project.

BACKGROUND

The Western Ring Road is a major urban freeway in the western part of Melbourne, which carries approximately 100,000 vehicles per day. The proportion of heavy vehicle traffic is approximately 15%. The freeway is approximately 26 kilometres in length and the speed limit is 100kph.

High traffic volumes on the Western Ring Road at certain times of day can cause breakdowns in flow, which results in traffic congestion and accidents.

The variable speed limit system will predict traffic congestion using traffic information being collected from the road and determine the most appropriate safe driving speed to optimise traffic flow. The speed limit displayed will be consistent with the prevailing traffic conditions.

These speed limits will be conveyed to motorists by a series of roadside electronic variable speed limit signs that will be installed as part of this project.

Changes to the variable speed limit signs will occur automatically but will also be capable of being manually operated from VicRoads Traffic Control Centre.

Essentially, the project involves:

- The collection and interpretation of existing traffic data being collected by VicRoads;
- The development of a system to calculate the optimum safe driving speed on the Western Ring Road at any given level of traffic;
- The installation of electronic variable speed limit signs on the Western Ring Road to indicate the regulatory speed limit;
- The establishment of remote monitoring and override facilities for use from the VicRoads Traffic Control Centre;
- Delivery of real time operational status of the system to the VicRoads Traffic Control Centre; and
- The provision of a link between the variable speed limit system and the fixed digital speed camera system (FDSC), to be completed at about the same time as the completion of this project.

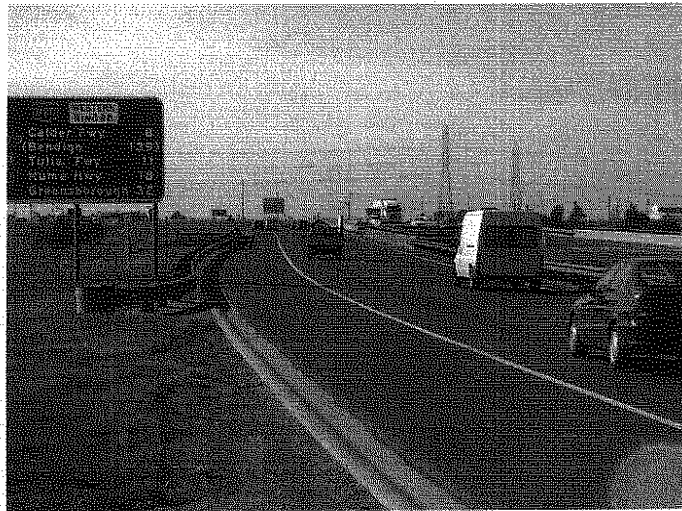


Figure 1 – Western Ring Road

VARIABLE SPEED LIMIT SYSTEM CONCEPT

The variable speed limit system on the Western Ring Road is a real time, dynamic system. The system will determine the most appropriate safe driving speed to optimise traffic flow based on the real time traffic information being collected from the Western Ring Road by existing systems.

As traffic conditions on the Western Ring Road change, the system will progressively adjust the speed limit to suit the prevailing conditions. The system will incorporate a method for 'smoothing' the displays on the signs to ensure that the displayed speeds do not fluctuate unduly with slight changes in traffic conditions.

In situations where a low speed limit is being set, the system will set buffer zones on the approach to that speed limit, rather than dropping suddenly from a high speed limit to a low speed limit. The step down will not be greater than 20kph from one pair of signs to the next.

The system will also be capable of implementing different speed zones for each carriageway as well as different speed zones in different sections of the freeway. Where these sections are close to each other, the system will take this into account when setting speed limits.

As indicated above, changes to the variable speed limit signs will be initiated by the system automatically. The system will also provide for pre-programmed time of day operation and will also be capable of being manually operated. This includes the ability to switch the system off.

Changes made by the Traffic Control Centre will incorporate a 'speed limit response plan' so that a specific request to change the speed limit at a specific location will result in the necessary changes to the buffer zone speed signs on the approach and departure to the location where the initial speed limit change request was made.

On failure of the data collection system, the variable speed limit system shall return to the default speed limit (100kph). The system will also be capable of coping with low level system failures (ie lane loop failures or site data collection station failures).

All parameters, limits and settings used by the variable speed limit algorithm will be capable of being easily adjusted by VicRoads if required. It is likely that adjustments to the system will be required over time.

The system will record and log all changes to the speed zone including:

- Time and date of speed zone change (automatically incorporating day light savings);
- Speed displayed before and after the change;
- The specific signs which have been changed;
- Manual or automatic change; and
- Failure of the signs.

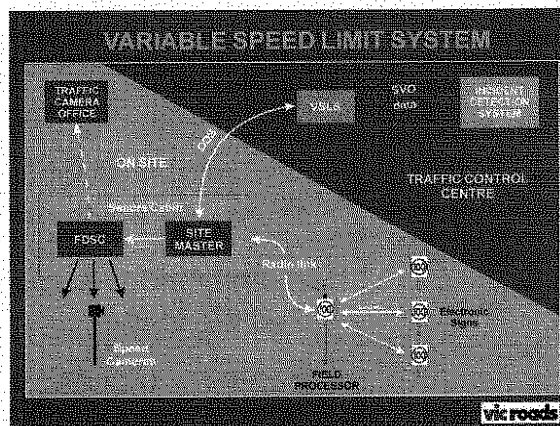


Figure 2 – Variable speed limit system concept

DATA COLLECTION

Data for the operation of the Variable Speed Limit System will be obtained from on site processors known as incident detection stations. These stations are located at known intervals along the freeway, approximately 500 metres apart. Using inductive loops embedded in the road surface and connected to each incident detection station, the average vehicle speed, volume of traffic and occupancy of the loops is measured and transmitted to VicRoads central processor every 20 seconds. This effectively provides a real time 'snapshot' of freeway conditions at each incident detection station (Ref 1).

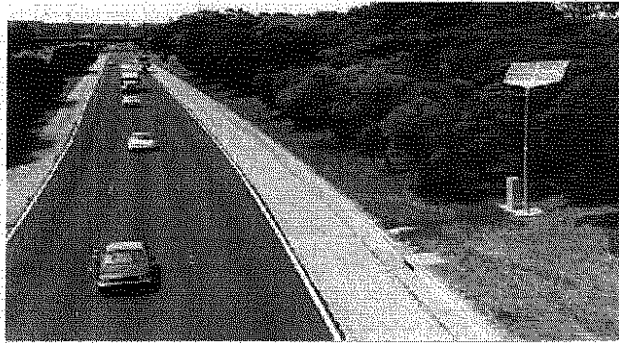


Figure 3 – Incident detection station for data collection

The data processing system for the variable speed limit system is located 'off site' at the VicRoads Traffic Control Centre. However, an interface from the system to the associated fixed digital speed camera system will be provided at a secure facility on site.

ELECTRONIC VARIABLE SPEED LIMIT SIGNS

Strategically placed LED variable speed limit signs will convey the speed limit to motorists. A total of 74 signs will be installed on the freeway and its entry points.

Each sign location will consist of a pair of signs installed on each side of the carriageway so that a pair of signs is visible to approaching motorists at each sign location.

The system has been designed so that displays on sign pairs will never be in conflict with each other. Each pair of signs is linked via a hard wire to ensure consistency of display including brightness.

The signs will be capable of displaying speed limits – 100 through to 50 kmh in 10 km steps. The signs will operate continuously.

At times of a failure in communications, the sign or signs will return to the default speed limit (100 kph). The signs will also allow for on-site manual intervention for switching the signs off if required.

The system will incorporate monitoring of each individual sign. The system will include remote diagnostics from the Traffic Control Centre to ascertain system status including:

- Speeds being displayed;
- Display failures (including any partial failure of the display);
- Power failures;
- Communications failures between the various system elements.

SIGN LAYOUTS

The signs will consist of white numerals on a black background with a red annulus.

Part of the red annulus of the signs will flash on and off at times when the speed zone changes from its normal operating mode. This is to alert drivers to the changed speed limit.

For the freeway carriageway signs, Type C (900 x 1200mm) signs will be used. For entry ramp signs, Type B (600 x 800mm) signs will be used.

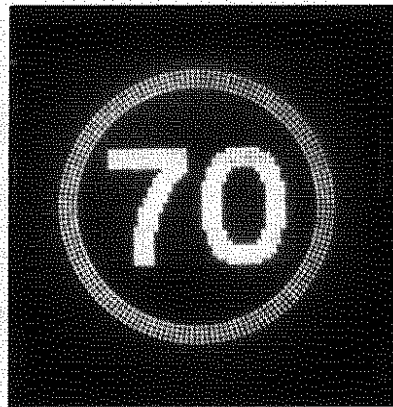


Figure 4 - An LED variable speed limit sign.

STATIC SIGNING

Advance static information signs will be provided at the start of the variable speed limit zone. The signs display "VARIABLE SPEED LIMITS AHEAD"

COMMUNICATION SYSTEM

The communication system operates via a combination of:

- High level telephone line;
- Radio; and
- Hard wire links.

Communication to the radio base station from the central computer is by a high level telephone link. From the base station, radio communications will be established with a number of field processors each incorporating a data radio modem.

From the field processors, which will be generally located within variable speed limit signs, hard wire links will be established to nearby groups of signs. This includes signs pairs on each side of the carriageway which will always be linked via a hard wire.

The proposed system of communications has been chosen for its reliability, flexibility and simplicity.

FIXED DIGITAL SPEED CAMERAS

In conjunction with the variable speed limit system, a series of fixed digital speed cameras (FDSC) is being installed on the Western Ring Road. There will be cameras at eight separate locations along the 26 km length of freeway (Figure 4).

This project will incorporate provision for a link between the variable speed limit system and the fixed digital speed camera system. The link will enable communication between the two systems to ensure appropriate operation of the FDSC under various different speed limits. There will be a pre-determined delay between the operation of the FDSC and any change to the speed limit.

The link with the FDSC will be made at a secure on site location.

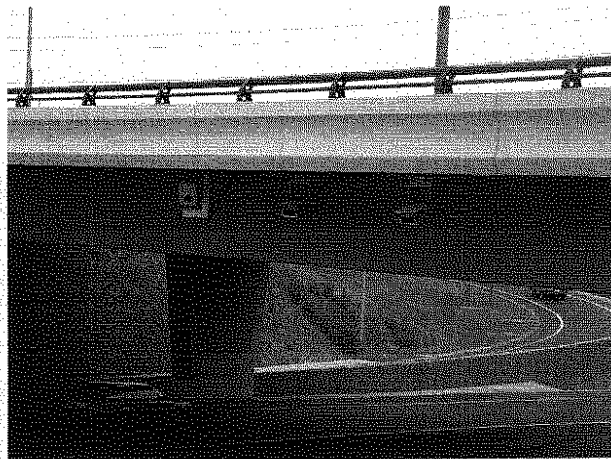


Figure 5 - Fixed digital speed camera installation

GRAPHICAL USER INTERFACE

The variable speed limit system software will incorporate a graphical user interface (GUI) designed to run on existing VicRoads Traffic Control Centre computers. The system will allow for a minimum of eight users.



Figure 6 – VicRoads Traffic Control Centre

The purpose of the GUI software is to manage, monitor and control the Variable Speed Limit system as required.

The Variable Speed Limit system software will be designed so that it will be capable of expansion for future operations on other freeways.

TIMETABLE FOR INSTALLTION

Works on the project are nearing completion and the system is due to be commissioned in September 2002.

SUMMARY

The Variable Speed Limit system on the Western Ring Road complements VicRoads' other activities in Intelligent Transport Systems and builds on the successful incident detection system which VicRoads operates on most of its urban freeway network.

Dynamic, real time variable freeway speed limits have the potential to provide significant benefits in terms of efficient traffic flow and road safety improvements.

Through the use of variable speed limit systems, it is expected that:

- The level of accidents and incidents will be reduced;
- There will be improvements in traffic flow and travel times;
- Congestion and queues will be lessened;
- Motorist stress levels will be reduced; and
- Safety for emergency services personnel will be improved during incidents.

REFERENCES

- (1) DR DARRYN PATERSON AND DR GEOFF ROSE (Institute Of Transport Studies – Monash University), STEVE BEAN (VicRoads) (1999) - Improving Dynamic Travel Time Estimates For Melbourne's Drive Time System.
- (2) STEVE BEAN (VicRoads) (2002) – A Dynamic Variable Freeway Speed Limit System.

-End-