Crash Reduction in Wet Weather on M1 with Intelligent Transport Systems

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Abstract

In 2006 the speed limit on the northbound carriageway on the M1 (between the Hawkesbury River and Mount White) was increased to 100km/h for dry conditions and designed to drop to 90km/h in wet weather using Intelligent Transport Systems (ITS). This study analyses variation in crashes before and after the implementation of the system for both northbound B and southbound carriageways. The crash data includes fatal crashes, injury crashes and non-injury crashes for both dry and wet conditions. The analysis portrays what worked and what didn't work with the implementation of an ITS based variable speed system in a motorway environment.

Background

Over the past twenty years, a high number of crashes on the M1 between the Hawkesbury River and Mount White resulted in the reduction of the speed limit for the area. However, in 2006, following public demand for higher speed the Roads and Maritime Services implemented a variable speed limit scheme that increased the speed for the northbound carriageway to 100km/h for dry weather condition only and lowered it to 90km/h during wet weather.

Method

In order to assess the effect of the variable speed limit scheme, Roads and Maritime compared crash data for dry and wet conditions for the seven years before and after the scheme was introduced. Roads and Maritime also assessed vehicle volumes as part of this study. The data revealed that there were no changes in road conditions such as road surface improvements, signs, delineation, speed limits or road widening post installation of the system that could affect the results (Ozroads, 2014). Changes in vehicle technologies over the period were not considered.

Intelligent Transport System

The ITS system utilizes Variable Speed Limit Signs (VSLS) to vary legal speed in wet weather on the northbound carriageway and includes a speed camera for enforcement. The VSLS are switched to a lower speed when wet weather is encountered by the wetness sensors. See Figure 1 for location of ITS on the M1.

Figure 1.ITS Location

Findings and Results

Of the three main crash categories assessed, there was a marked improvement of overall crash numbers on the northbound carriageway after the introduction of the ITS system in 2006, however the increase of injury crashes indicated an opportunity for further improvement. After comparing the northbound versus southbound data, Roads and Maritime identified higher crash levels on the northbound as a result of the steep and curvaceous road, and increased northbound traffic volumes (on average five per cent). The scheme implemented a higher speed of 100km/h for northbound in dry condition rather than a lower speed limit e.g. of 80km/h in wet conditions. In accordance with Nilsson's Power Model, higher speeds attract higher crashes (Nilsson, 2004). The increased number of crashes at higher speeds results in more injuries.

What's more, because the speed camera is located at the top of the hill, there is a natural tendency for motorists to increase speed after passing the speed camera. The steep slope at the end of the variable speed limit allows motorists to increase their speed to 110km/h on this slope with sharp turns and in presence of heavy vehicles.

The southbound speed limit remains at 90km/h for all weather conditions. While the speed camera is on the northbound it is detected on the southbound due to proximity. Also, the southbound has more regular police patrols that have become more intense over the years. The results are summarized in Table 1.

Table 1. Summary of Crashes 1999 to 2013

Direction of Travel	Injury		Non-Injury		Fatal	
	Dry	WET	Dry	Wet	Dry	Wet
Summary 1999 to 2006						
Northbound	19	33	59	93	2	1
Southbound	15	34	28	68	0	1
Total	101		248		4	
Summary 2007 to 2013						
Northbound	29	37	28	61	0	0
Southbound	14	21	24	45	0	2
Total	101		158		2	

Conclusion

A variable speed limit on the M1 using ITS reduces the overall number of crashes on the northbound even while the speed is increased from 90km/h to 100km/h during dry conditions.

References

Nilsson, Gorran (2004). *Traffic Safety dimensions and the Power Model.* Unpublished Traffic Engineering, Lund Institute of Technology, Lund.

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