



**SCOTTISH EXECUTIVE**

FABER MAUNSELL

## SCOTTISH JOURNEY TIME SYSTEMS TRIAL

### EXECUTIVE SUMMARY



## Executive Summary

In 2001/2002, a STREETWISE study into the benefits of two distinct journey time systems was undertaken on the Scottish Trans-European Road Network (TERN). These two journey time systems were as follows:

- (1) A Mobile Journey Time System (MJTS) that utilizes Automatic Number Plate Recognition (ANPR) technology; and
- (2) A Local Journey Time System (LJTS) that utilizes existing loop based Monitoring Sites to develop journey times from spot speeds.

The benefits of using these two systems were addressed as part of the domain of the STREETWISE project, of which the Scottish Executive is a representative partner. This Euro Regional project aims to deliver seamless, reliable, accessible and competitive travel information services that meet consistent quality and common standard to road users on the TERN in the United Kingdom and Ireland. The Scottish Executive commissioned FaberMaunsell to carry out the trial and evaluation of a MJTS and a LJTS for the benefit of travellers on the TERN. This investigation falls under domain 1, "Road Monitoring Infrastructure", of the STREETWISE project.

### MOBILE JOURNEY TIME SYSTEM

The MJTS is a form of targeted monitoring that is being trialed to improve monitoring at Scotland's major road works sites. Currently, a traffic liaison officer provides updated information concerning delay to traffic at road works sites to the National Network Control Centre (NNCC). However, due to various competing activities on road works sites, this task tends to be given a lower priority, which can result in delays in passing the information on to the NNCC.

The MJTS uses a trailer mounted ANPR camera at road works sites to provide the NNCC with more accurate delay information relating to road works sites. Initially, the system was trialed on the M8 at a major road works site between Edinburgh and Glasgow. Sites on the A720 were later included as part of a broader study into the potential methods of developing a congestion monitoring index for Scotland. The recognition rate of the ANPR was validated against inductive loops located adjacent to the MJTS cameras. The "hit rate" of the ANPR was found to be consistently over 60%, with accuracies reaching close to 100% at some locations.

Whilst raw results from the system show its ability to measure journey times, obtaining meaningful results from this data required further analysis. A significant number of outliers were found from the central cluster of "typical" journey times at the trial location; thus, an averaging function was required to produce more representative journey times.

A rolling average of the raw results output by the system was initially investigated. This average was skewed by the outlying data and as a result, a rolling median was adopted. The rolling median was found to provide a very close reflection of the "typical" or "real" journey time.

Once the estimated journey time is established, this information can be passed on to the NNCC. Depending on the location of the system and traffic conditions on the surrounding network, operators at the NNCC may then choose to:

- (1) Set a local mobile VMS to inform drivers of the change in Journey Time or Delay through the site; or

- (2) Provide a more strategic response to the information, utilizing other VMS at strategic network positions, and consider wider dissemination of the information.

During this study, two technical considerations in the deployment of the system were noted:

- (1) The offset of the trailer from the target vehicle should be minimised wherever safely possible; and
- (2) Direct sunlight can potentially diminish the “hit rate” of the system. Camera placement should be carefully considered to minimise this effect.

A number of practical issues were highlighted from the trial. The cost of traffic management was found to have a large impact on the overall cost of system deployment. To help reduce these costs, the time spent on site in setting up the system was minimised wherever possible.

The system is currently deployed on the M8, between Glasgow and Edinburgh, where its performance will continue to be monitored, before possible role out across the network. Overall, ANPR technology was found to be suitable for deployment as part of the MJTS. The technology was found to produce reliable results, which provided valuable prompt feedback about traffic conditions at road works sites.

#### **LOCAL JOURNEY TIME SYSTEM**

The second system to be trialed by the Scottish Executive is the Local Journey Time System (LJTS). The LJTS develops journey time by averaging spot speeds provided by inductive loops, which are currently utilized by NADICS for incident detection. Hybrid signs, comprised of rotating prism units, will be used to display different destinations, while LED units will be used to display journey time in the nearest minutes to selected destinations. Six popular destinations were chosen in central and western Glasgow to be represented on these signs.

The algorithm used to produce the journey times was developed from a pre-existing algorithm already in place at the NNCC. The existing algorithm needed to be modified for it to be practically deployed. Previously, the system algorithm only produced results if all Monitoring Sites along the route were able to provide consistent information to NADICS. The system was modified to “bridge” up to two faulty monitoring sites, and allowed an estimate of journey time to be produced.

The new algorithm was validated against floating vehicles in a survey carried out over a peak/inter-peak period. The floating vehicle survey was carried out following a statistically robust methodology. This methodology was shown to produce a good representation of the actual journey time for the survey section. Despite the variation of journey time during peak/inter-peak period, congestion during peak period was accounted for the large variation between the floating vehicle and the LJTS output. If the validation were conducted during off-peak period, there would be less variation between these two data sets. In general, the LJTS was shown to produce a very close correlation to the floating vehicle results, with a 95% probability that the two sets of results are the same. Therefore, the LJTS was found to be representative of the actual journey time experienced by the majority of drivers along the route surveyed.

It is envisaged that further validation of the LJTS will be conducted during peak and off-peak period. This system will be continually monitored over the next twelve months, including the undertaking of market research surveys to determine user acceptance as part of this process.