

M50 Demand Management

Executive Summary

April 2014



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Background

The M50 is the most heavily trafficked road in the country with in excess of 130,000 vehicles per day using several sections. The road was originally envisaged as a bypass route for strategic traffic around Dublin, however following the economic growth that took place during its construction, the M50 is now located within the suburbs of Dublin and provides a range of functions over and above that expected of a strategic corridor. A proposal to widen the carriageway and upgrade the junctions over most of the M50 received permission to proceed by An Bord Pleanála in 2005.

The traffic analysis undertaken for the upgrade scheme suggested that increasing demand would result in traffic flows that would significantly exceed the capacity of the upgraded M50 within its design life. As such it was recognised that future demand would need to be managed if the benefits of the upgrade were to be fully realised.

In acknowledging this, one of the conditions of the planning permission was to include the development of a scheme of demand management measures; with the condition stating the following:

***Condition 7:** A scheme of specific demand management measures for the M50 motorway corridor shall be published by the relevant road authorities not later than three years after the M50 Motorway Upgrade Scheme has been completed.*

In order to discharge this planning requirement the NRA convened a Steering Group (comprising the NRA, Dublin City Council, Dún Laoghaire Rathdown, Fingal and South Dublin County Councils) with a view to undertaking a study to identify a scheme of indicative Demand Management Measures for the M50. This report provides a summary of the work undertaken and describes the indicative scheme of measures identified.

However it must be stressed that no decision to implement these measures has been taken; such a decision is a matter for Government. The implementation of any scheme at a future date will be dependent on Government policy and decision, as well as being subject to the relevant statutory processes and legislation.

Traffic and Congestion on the M50

Traffic flows on the M50 have continued to grow since moving to free-flow tolling in August 2008 and the completion of the upgrade in stages between 2008 and 2010 with increases of up to 25% experienced on some sections of the M50 since 2010. As a result congestion has started to occur on sections of the M50. (This increase has occurred against a background of decreasing traffic elsewhere, with a 5% reduction in traffic on other National Primary Roads over the same period.)

Research has been carried out which shows that congestion will start to occur once hourly traffic

flow in an individual motorway lane exceeds a certain level. This level of traffic flow is termed the safe operational capacity of an individual lane. Traffic data shows that in January 2010 all lanes in all sections of the M50 (northbound and southbound) were operating within this safe operating capacity even during peak periods. However, by November 2011 some 12% of the sections of the M50 were experiencing traffic flows in the busiest lane at peak times that exceeded this level.

The congestion has started to occur within the last two years reflects this and has in turn resulted in more frequent incidents and collisions. In the absence of the introduction of demand management it is forecast that by 2023 some 50% of sections of the M50 will experience traffic flows in the busiest lanes that exceed the safe operating capacity, primarily during peak times, but also at other times of the day.

In summary, the assessment of existing conditions has found that a number of key sections of the M50 are already beginning to experience some form of congestion and that by 2023, much of the M50 will be operating in excess of its safe operating capacity, with congestion commonplace.

As a result demand management measures are required to:

- Address the strong levels of growth in transport demand, predominantly through managing growth in the level of discretionary traffic, such that the strategic function of the M50 can be protected;
- Manage and mitigate the safety and reliability impacts that result from congested conditions, and which also threaten the strategic function of the M50; and
- Ensure flows in excess of the safe operating capacity are not sustained on a section for any period.

In essence, these three requirements relate to the need to influence demand that may be attracted to the M50, and subsequently manage the traffic that nevertheless has chosen to use the M50. This suggests two very different forms of management, one based on giving a price signal to users which influences the generation of demand and the other based on controlling traffic flow which materialises, a distinction that has been recognised throughout the study.

Extensive work was undertaken as part of this study in investigating, developing and testing various measures aimed at managing demand on the M50 in a way that will protect its capacity over its design life. The impacts and benefits that would arise from these measures have also been identified as part of this study.

Indicative Scheme of Demand Management Measures

The study has culminated in the identification of an indicative package of demand management measures of five different types;

- Fiscal Measures
- Intelligent Transport Systems/Traffic Control
- Information
- Smarter Travel
- Network Control

Fiscal Measures: Variable Distance-based Tolling by Vehicle Type on the M50

The study has concluded that the current single point tolling system, under which only 39% of M50 users are subjected to a toll, should be replaced with a variable distance-based system. This would result in between 80% and 100% of users being subjected to a toll depending on the type of system implemented. Toll amounts would vary for different vehicle types, as is the case with the current single eFlow toll, and would vary for different times of the day to reflect the varying level of demand throughout the day.

A pure distance-based closed system, which captures 100% of users via toll points at all entry and exit points, would align best with the objective of demand management. However, with current technology the collection costs for a closed system would be higher compared to a multi point system, which could lead to tolls having to be higher to cover the cost. Therefore an indicative scheme which provides for an open system with five toll points (including the existing eFlow toll location where the toll rate would be reduced) has been put forward at this time, see Figure 1 on page iv).

The indicative scheme includes variable toll rates for different periods of the day, as shown in the Table 1 below.

Table 1 - Indicative Range of Variable Toll Rates at Individual Toll Points

Toll Type	Peak Periods (07:00-09:30 & 16:00-18:30)		Inter-peak Periods (06:00-07:00-, 09:30-16:00 & 18:30-19:30)		Off-peak Period (19:30-06:00)	
	Car	HGV >10t	Car	HGV >10t	Car	HGV >10t
Registered	€1.20-1.40	€3.60-3.90	€0.90-1.10	€2.90-3.20	€0.40-0.60	€1.00-1.20
Unregistered	€2.20-2.40	€4.60-4.90	€1.90-2.10	€3.90-4.20	€1.40-1.60	€2.00-2.20

NB: Toll rates ranges are shown at 2013 levels. At time of implementation appropriate indexation will be applied to these rates.

Under such a system a registered car user travelling the full length of the M50 would pay a total of €6.00 to €7.00 at peak times, €4.50 to €5.50 in the inter-peak period and €2.00 to €3.00 at off-peak times, compared to a single toll of €2.10 to €2.60 at present (€2.60 for video registered car users).

The study has confirmed that an indicative scheme of variable multipoint tolling, as an expansion of the M50 eFlow system using free-flow technology, is viable and will lead to an increase in the toll capture rate of M50 users which will provide better equality for all users. Such a scheme will ensure that the demand management measures are effective in protecting the full length of the M50.

Intelligent Transport Systems/Traffic Control: Variable Speed Limits

The study has examined the practicality and effectiveness of Variable Speed Limits (VSL) along the M50. The feasibility studies have identified that the section of the M50 between Junction 3 (M1) and Junction 14 (Sandyford) is most suited to the implementation of VSL, with the potential to extend it to the full length of the M50 in the future as demand on other sections increases. This would be expected to have a notable impact on journey time reliability and safety as the M50 experiences periods of near-congestion.

Intelligent Transport Systems/Traffic Control: Incident Detection

The study has included the provision of Incident Detection as a key strategy for managing demand along the M50. An appropriate incident management desk will be provided within the existing Traffic Control Centre, and lines of communication will be established between the incident room, key media outlets and the emergency services.

Information: Internet

The provision of Variable Speed Limits, Incident Detection, and tolling schemes will require a large amount of roadside detection and monitoring equipment, the data from which will be collated and monitored through the Traffic Control Centre. This information will be provided to road users via the internet, either through posting on web pages, social media or news feeds. During times of congestion, this information can be used to actively encourage potential road users to make alternative travel arrangements, and in this context will be an effective demand management tool.

Information: Roadside Information

Similarly this information will be provided to road users via Variable Message Signs, which are currently provided throughout the Dublin Area, with approximately 35 signs provided along the M50. This will provide information that is fully up to date to road users during their journey.

Smarter Travel: Area-Based Travel Planning

The study investigated the potential for Area-Based Travel Planning in order to manage demand on the M50 and concluded that, whilst travel planning can have a significant local impact in terms of reduced traffic demand, the impact on the M50 corridor itself would be limited (1-2% demand reduction). A number of locations have been proposed:

- Sandyford/Stillorgan;
- Park West;
- City West; and
- Cherrywood;

The implementation of Area Based Travel Planning can effectively be delivered by the Local Authorities as part of their integrated land-use and transportation planning.

Network Control: National Control Centre

The Intelligent Transport Systems measures set out earlier are all based on the provision of a Traffic Control Centre to monitor road conditions, respond to incidents and provide relevant information to road users. The existing Control Centre located at the Dublin Port Tunnel toll plaza is insufficient in its current layout to meet the requirements of an increased level of management, and an expansion of that facility is currently being examined. It is envisaged that a single control centre would manage all the operational functions of the national roads network.

The indicative package of demand management measures is shown in Figure 1 below.

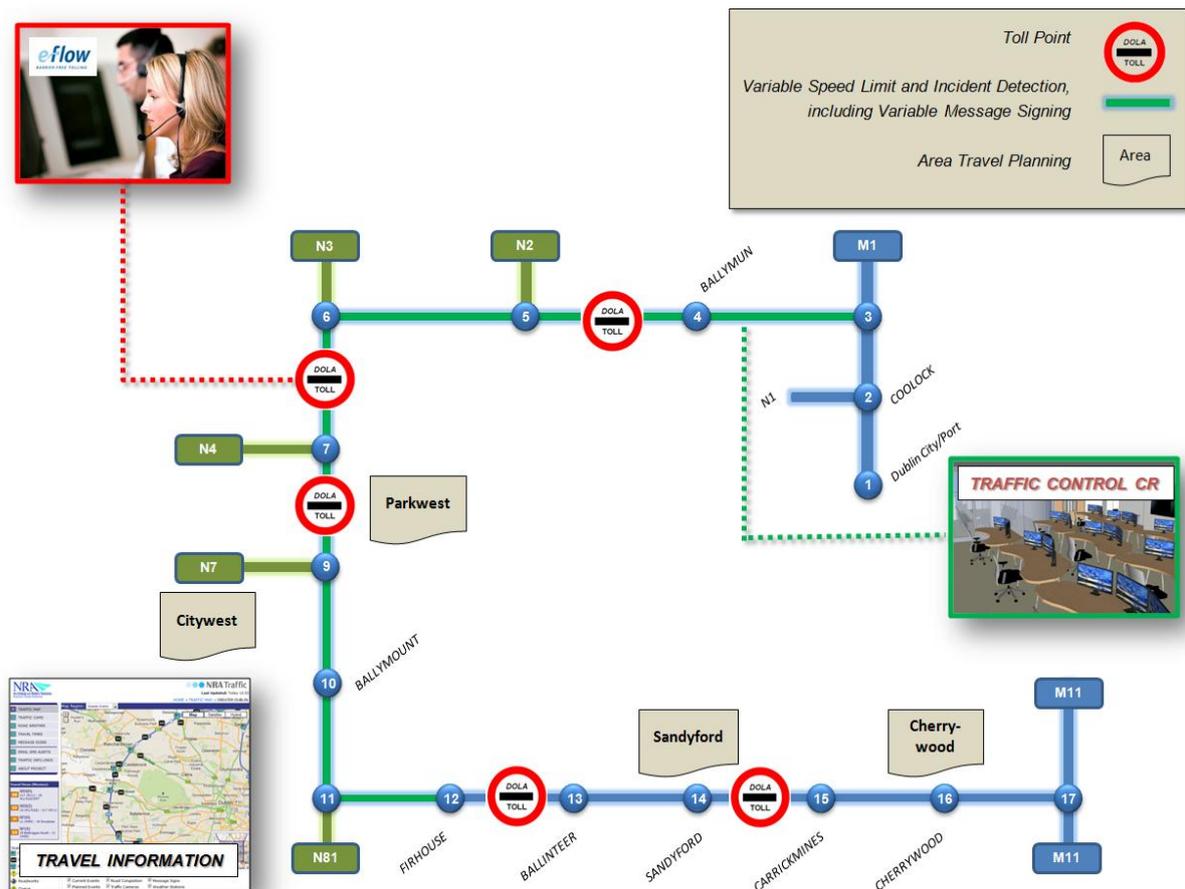


Figure 1 - Indicative Package of M50 Demand Management Measures

Benefits of the Indicative Scheme of Demand Management Measures

Fiscal: Variable Distance-based Tolling by Vehicle Type

The introduction of variable distance-based tolls will deliver considerable benefits to traffic on the M50 as a result of three key changes in traffic behaviour.

- **Reassignment**, where M50 users change their routing to avoid tolls. For such users, the perceived additional travel cost associated with using longer routes is less than the cost of the toll;
- **Mode switching**, where M50 users change to an alternative mode of travel mode due to the increased cost associated with travelling by private car. Such changes include switching to bus or rail for longer trips, or to walking or cycling for shorter trips;
- **Demand changes**, which describe decisions to travel to alternative (lower travel cost) destinations, to link trips together in order to reduce overall travel costs, or decisions not to make a trip at all.

As a result of these changes in travel behaviour the transport model developed for the study forecast a reduction in traffic flows along the M50 of the order of 20%. Approximately half of this reduction is as a result of mode switching and demand changes, with the other half arising from reassignment / re-routing onto the non-motorway road network.

The traffic modelling also shows that the increase in traffic on other roads as a result of

reassignment of traffic from the M50 is relatively diluted and could be managed through supporting measures such as traffic management measures, online improvements and junction improvements.

With this level of reduction in demand by 2023 only 20% of the sections of the M50 will experience traffic flows in the busiest lanes that exceed the safe operating capacity during peak times, whereas 50% of the sections will experience congestion without the measures. This will lead to traffic flows and conditions similar to conditions experienced in 2011, with a significant reduction in the number of incidents, better journey times, as well as an increase in the reliability of journey times compared to the do-nothing scenario.

To address the remaining sections on which flows still exceed the safe operating capacity, control measures, in particular Variable Speed Limits, will assist in managing the traffic by reducing the likelihood of incidents occurring and improving the level of service provided by the M50. The inclusion of control measures in the Demand Management Strategy reduces the reliance on fiscal measures and avoids the need for higher toll rates on these sections to manage demand. In addition, the business benefits to commercial traffic would be significant, with a reduction in journey time variability and greater ability for just-in-time haulage, in addition to reductions in journey times during peak periods.

In summary the assessment demonstrates that the impact of the M50 variable distance-based toll scheme will be positive in terms of reducing demand, congestion and incidents, and thus improving reliability and safety, on the M50. The consequential increases in traffic on other roads will require the consideration of some targeted traffic management measures in the final scheme to mitigate these impacts. Such measures would seek to reduce toll avoidance through sensitive areas, or improve safety and/or capacity on those roads which receive additional traffic.

Intelligent Transport Systems/Traffic Control: Incident Detection

The detection and management of incidents will reduce the safety risks associated with knock-on incidents following a collision, and provide ample warning to other road users of potential disruption so that they can take this into account when planning journeys. This will lead to improvements in journey time reliability. The introduction of Variable Speed Limits has been shown to reduce total annual incidents and the benefits derived from this reduction accrue from monetary saving associated with reducing the number of fatal or serious injuries, as well as time savings experienced by other road users who would otherwise be delayed by incidents, whether these are collisions or mechanical breakdowns.

Information: Internet Travel Information and Roadside Information (Variable Message Signs)

The existing Variable Message Signs on the M50 would be used as part of the measures and would be complimented by broader web-based information tools. The concept is that users will be able to develop a knowledge of historic and current network conditions either:

- Pre-trip, through the use of the travel information website;
- Pre-trip through the dissemination of travel bulletins using SMS or Twitter alerts; or
- In-trip, using the Variable Message Signs.

Variable Message signs are a safe means of providing in-trip information to road users, who will

have restrictions on their access to web-based information whilst driving. It is noted that this infrastructure is already in place throughout much of the M50 and the main approach roads. The result of the measures proposed here will be that road users will have full information on the condition of the M50, and can plan their trip accordingly.

Smarter Travel: Area Based Travel Planning

Analysis of similar schemes elsewhere highlight that significant impacts are observed particularly in the increase of car sharing against single occupant car trips, and in journey time reductions. The key qualitative successes of similar schemes have included;

- Launching car sharing websites and incentivising these using travel vouchers and financial rewards;
- Increased cycling and public transport use promoted via travel plan bulletins, posters, websites and other local media outlets;
- Designation of car-sharing bays at workplaces;
- The setting up of new travel related forums for businesses and interested parties at locations around the country to discuss and tackle common travel issues using a co-ordinated approach with shared risks and benefits; and
- Improved bus services at many sites brought about by direct contact with public transport operators and improved communication between parties.

Network Control: Traffic Control Centre

The Intelligent Transport Systems measures set out earlier are all based on the provision of an expanded traffic control centre facility that would manage all the operational functions of the national roads network. The incident management and response function of the Traffic Control Centre will deal with live incidents on the M50.

Key Stakeholders

During the study the Steering Group discussed the study with the Department of Transport, Tourism and Sport (DTTAS), the National Transport Authority (NTA) and the Strategic Policy Committee (SPC) of the four Local Authorities. The purpose of the discussions was as follows:

- To provide information on the work being undertaken and the measures that were emerging from the studies;
- To ensure that the work was fully compatible with other policies and plans being developed at government level; and
- To identify the legal and institutional framework that would be necessary to implement the measures included in the emerging proposals.

Specifically presentations of the emerging package of measures, followed by questions and answer sessions, were made to the SPC's on the following dates:

- 11th June 2013, Dún Laoghaire Rathdown County Council;
- 12th June 2013, Dublin City Council;
- 1st July 2013, Fingal County Council; and
- 5th September 2013, South Dublin County Council

In general, with the exception of some specific local issues, there was a lot of commonality in the questions asked and the views expressed by the SPC members. The key issues raised / comments made were:

- A degree of acceptance that the problem would occur in the future, but not that it was occurring yet;
- Strong opposition to the proposed fiscal measures (tolling), with little or no support for increased tolls along the M50, particularly in view of the current economic climate;
- Objection to the imposition of fixed toll rate throughout the day;
- It was felt that the proposed tolling was being taken as a way of generating revenue rather than managing demand;
- Concern about the impact of traffic diverting onto the local road network;
- Some acceptance that it would be fairer for more users to be tolled, although the current eFlow toll was still viewed as a toll for using the bridge across the Liffey rather than a toll for using the M50;
- Recognition that a lot of valuable work had been undertaken in the study;
- Almost unanimous support for all the non-fiscal measures.

Discussions with DTTAS suggested that some modifications to the existing traffic signage regulations would be necessary for the implementation of the Variable Speed Limits, although this could be incorporated into an ongoing exercise to review the existing regulations.

Of particular note was that the SPC consultations raised the potential for a distributed pricing scheme with tolls varying across the day based on the traffic demand. The study team took time to consider the feedback from the various consultations and as a consequence reviewed the fiscal proposals. As a result a significant change was made to the proposed measures, with variable tolls for different times of the day being introduced to reflect the varying level of demand.

Implementation

The timescale for the implementation of the scheme of indicative measures, subject to various governmental approval and statutory procedures, is outlined below.

Table 2 - Planning and Implementation Period from Decision to Proceed with any of the Measures

Measure	Year 1	Year 2	Year 3	Year 4	Year 5
Variable Speed Limits	Planning	Implementation			
Incident Management System			Implementation		
Distance Based Tolling	Planning	Implementation			
Smarter Travel Planning	Planning		Implementation		

It is estimated that a period of 12-15 months would be sufficient to progress the necessary preliminary works and statutory procedures outlined above. Following this, and given the limited infrastructure requirement, the construction and testing stage is expected to take a further 12-15 months.

If at a future date a decision is taken to implement a distance-based toll scheme, a further more detailed study would be needed to determine whether to implement an open multi-point tolling system similar to this indicative scheme or to adopt a closed tolling system which would charge

for distance of the M50 used based on entry and exit points.

Any future toll scheme would draw on the information prepared as part of this study, and would require a period of approximately three years for consultation (including an approval process from the necessary bodies, namely, the Minister for Transport, Tourism and Sport, the NTA and the European Commission) and implementation. The scheme would be also subject to the statutory process set out in the Roads Act which requires approval by the NRA Board. The scheme would also consider the mitigation of impacts that would be necessary on local roads that might result from the tolling proposals.

Conclusions

This study has been undertaken by the Steering Group to comply with the conditions imposed by An Bord Pleanála as set out below.

Condition 7: *A scheme of specific demand management measures for the M50 motorway corridor shall be published by the relevant road authorities not later than three years after the M50 Motorway Upgrade Scheme has been completed.*

Reason: *To protect the traffic capacity provided by the M50 Motorway Upgrade Scheme over its design life.*

In response the Steering Group investigated a wide range of possible alternatives and developed an indicative scheme of specific demand management measures for the M50, covering the M50 between Junction 3 (M1) and Junction 17 (M11). The various elements of the indicative scheme are set out in Table 3 below;

Table 3 - Summary of Elements of Indicative Scheme of Demand Management Measures

Category	Measures Taken Forward
Fiscal Measures	Distance-Based Tolling Variable tolling Tolling by Vehicle Type
Intelligent Transport Systems/Traffic Control	Variable Speed Limits Incident Detection
Information	Internet Roadside Information
Smarter Travel	Area-Based Travel Planning
Control	National Traffic Control Centre

The assessment of the fiscal measures has been based on an indicative five toll point open system, which provides a coverage rate of greater than 80% of trips. This has been derived to demonstrate the benefits and impacts of such a solution as a proxy for a pure distance based closed charging system, which would capture 100% of users via toll points at all entry and exit points.

With current technology the collection costs associated with a closed system would be higher compared to a five point system, which could lead to tolls having to be higher to cover the cost. Therefore, the five toll point open system has been put forward at this time.

However, it is worth noting that the cost of closed system tolling is anticipated to reduce as technology develops and improves in the future and as large-volume transaction systems become more cost-effective. As such any future development of a variable distance-based toll system on the M50 should consider the option of implementing a closed system or of providing a higher number of toll points in an open system. Ultimately any multi-point tolling scheme will have the potential to evolve to a closed system which would be able to better protect the traffic capacity of the M50 in the longer term.

The study showed clearly that fiscal measures had by far the most significant impact on managing future demand on the M50. In this regard it is important to note that in the absence of the introduction of the fiscal measures identified (i.e. variable distance-based tolling) it is unlikely to be possible to protect the traffic capacity provided by the M50 Motorway Upgrade Scheme over its design life.

This study demonstrates the feasibility of the indicative demand management measures which can provide a basis for the development of a detailed scheme for implementation.