

## Executive summary

This document reports on a project undertaken for the Department for Transport (Traffic Management Division) in March 2011 entitled *Investigation of Options for Traffic Management Techniques for Cyclists at Signalled Junctions in the Urban Environment*. It describes the outcome of a desktop study that investigates the techniques that are in common usage both in the UK and overseas for cyclist provision at traffic signals.

The objectives of this study were to:

- 1) Identify the issues relating to movement of cyclists at the approaches to and through signalled junctions, with particular attention to cyclist, junction capacity and impact on safety of all road users, including pedestrians and cyclists;
- 2) Develop proposals in light of any issues identified and recommend solutions to identified problems.

The project involved a detailed literature review of more than 60 publications written in the English language, sourced from both the UK and overseas. These documents were made up of policy guidance, technical papers, local authority guidelines and journal articles.

The literature review was supported by a consultation process with industry specialists and cycling groups. This was undertaken using TRL's existing contacts within the industry as well as identifying key figures from the literature review. To gain specific experience and feedback from a wider audience online forums and professional networking websites were used as a mean of making contact.

Following the literature review and consultation process a list of 48 different techniques were identified that could assist cyclists when negotiating traffic signal controlled intersections. These techniques ranged from relatively small design amendments that could be employed during the design stage or retrofitted, to more involved strategic plans that need to be incorporated in the design stage or would require a junction redesign.

An assessment scoring methodology was used to critically assess each of the 48 techniques against a range of criteria. This assessment investigated the advantages and disadvantages of each technique from a number of different viewpoints, for example cyclists, pedestrians and all motorised vehicle users. In addition to this the practical challenges raised by implementing these techniques were also rated. These included policy and legislation changes needed, cost of the technique, and highway disruption during implementation etc. The scoring system used was based on a Red Amber Green rating system using a range of five different scores (-2 through to +2).

Recommendations were made based on this assessment; this highlighted those techniques which struck a balance between offering increased benefits for cyclists whilst keeping the negative impacts experienced by other road users to a minimum, and keeping value for money in mind. The recommendations picked up on further development of existing practises, as well as the implementation of more innovative solutions. It was found during the assessment stage of the

project that there were no techniques that were without compromise, therefore one of the key recommendations relates to ensuring that the selection of any individual technique is carried out taking full account of the individual circumstances of the location concerned. Factors would include the level of cycle use (both current and potential) and an understanding of the characteristics of the users; traffic flows and speeds, and vehicle types; the extent and nature of existing cycling infrastructure that feeds the junction, e.g. whether on carriageway or fully off-road. Clearly the costs of many type of infrastructure will be greater if implemented onto existing road infrastructure than if included into new schemes from the start. The implications of loss of capacity for other vehicles will be less significant at locations where cycling has a large modal share (or the potential to become so); similarly measures that lead to reduce traffic speeds will be considered differently on roads whose primary purpose is the movement of traffic than on roads where it is desirable to reduce traffic speeds to improve road safety and for other community benefits.

The techniques highlighted in the recommendations as showing greatest promise for development and implementation on the UK road network are shown in the table below. This table summarises the scores for each of the six key themes investigated, these scores themselves aggregated from 48 individual criteria.

	Technique	Total Cyclist Score	Total Pedestrian Score	Total Other Road User Score	Total Cost Implication Score	Total Regulation and Legislation Score	Total Other Score	Aggregate Total
1	Intergreens designed for cyclist speed	10	0	-3	12	4	14	37
2	Intergreens extended using detection	11	0	-3	7	2	12	29
3	Separate cycle phases with cyclist signal aspects	15	-2	-6	-4	1	2	6
8	Pre signal for cyclists for early start (cycle aspect only)	11	-1	-5	-1	-6	7	5
9	Pre signal for cyclist for early start (separate red amber green signal head)	12	-1	-3	-1	-6	6	7
10	Advanced cycle stop lines	16	1	-2	11	8	13	47
11	Staggered advanced cycle stop lines	5	1	2	11	-4	13	28
12	Cycle by-pass lane for left turning cyclists (signal controlled)	18	-6	3	-7	3	5	16
14	Cycle by- pass lane for straight ahead movement cyclists at T-junction (onto footway)	13	-5	3	-3	-1	6	13
15	Cycle by- pass lane for straight ahead movement cyclists at T-junction (within carriageway)	22	-9	6	-6	-1	3	15
18	Coloured cycle lanes through intersections (one)	14	1	4	11	1	10	41
21	Coordination of signals for cyclists progression "green wave"	16	0	-2	3	0	5	22
26	Road markings to highlight loop detectors	9	0	0	12	-8	9	22
30	Dwell on green for bikes (reverse priority) (cycle track or cycle phases only)	18	7	-3	11	-3	9	39
43	Priority for cyclists during inclement weather	14	-1	-2	-6	2	3	10
44	Straightening staggered Toucans, and make a single phase	16	8	-3	6	0	13	40
45	Pre- timed maximum timer on Toucans	13	3	-4	12	0	10	34
47	Two green periods per cycle for cyclists (to be used with separate cycle phases)	10	-1	-4	9	-1	10	23
48	Conversion to continental style roundabout (vehicle flows under 10 - 15,000)	10	-4	3	-8	0	0	1

Each of these techniques is at a different stage of development, with some being widely used whereas others have only been implemented in a limited number of locations.

In conclusion, the techniques listed above have been shown to perform the best when considering a wide range of criteria. However, it is recommended that these techniques are taken forward for consideration for further trials. In some instances the effects of these techniques could be simulated to keep cost and disruption to a minimum; however it should be noted that the impacts on other road users will differ on a site by site basis.