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WHEN IS A CYCLE GATE NOT A CYCLE GATE?

An alternative interpretation of guidance

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INTRODUCTION

Preliminary design was required for a high street improvement scheme on Houghton Street, Southport in Merseyside (See Figure 1 below). The scheme was to extend from Houghton Street's junction with London Street, to the south-west, and its junction with the B5245 and B5280, to the north-east.

As well as signal-controlled junctions at each end of the scheme, it was proposed that the junctions with Hill Street/Mornington Rd and the Union Street/Church Street were to also be signal controlled.

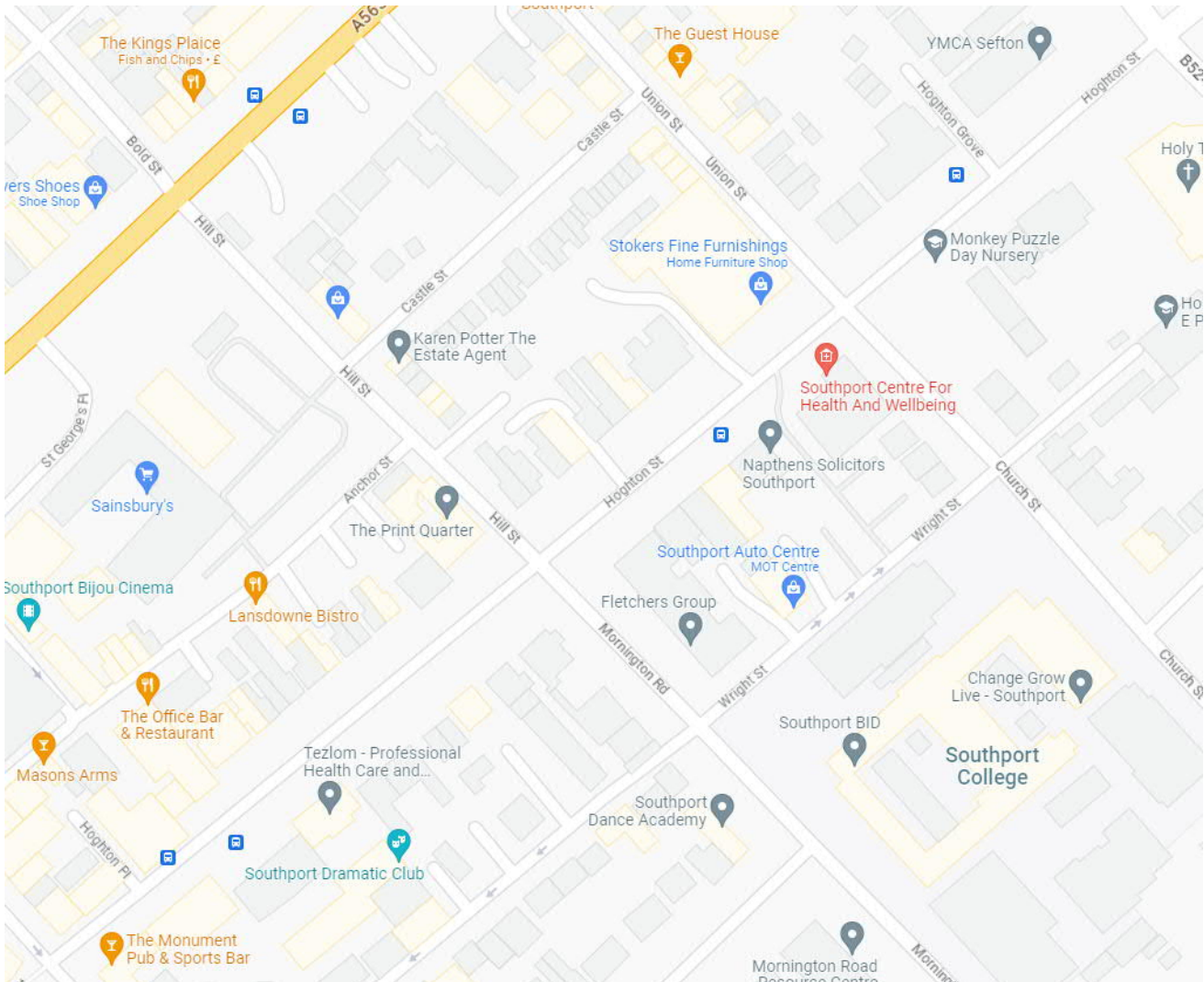


Figure 1 Google mapping of scheme extents

Some of the Houghton Street approaches to junctions have overall highway widths of only 15m.

As well as delivering a sense of place, the scheme is to formalise the provision of segregated cycle facilities in both directions along the corridor replacing that which was introduced as a temporary measure in 2020 as a response to the COVID-19 pandemic and, as of 2023, remains in place.

Two options were developed:

1. Provide a two-way cycle way to one side of the main carriageway.
2. Provide a single lane cycleway on either side of the carriageway matching the direction of the adjacent traffic lane.

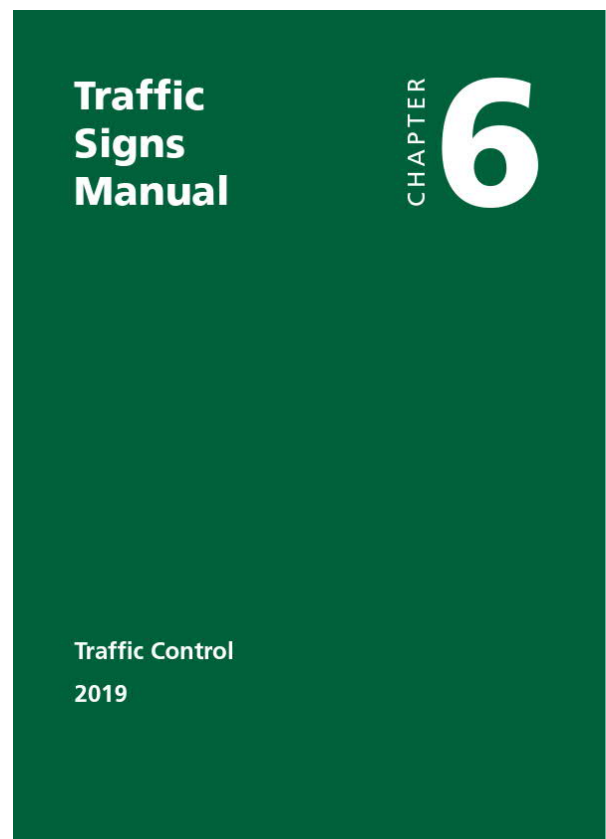
This paper documents how an alternative approach to those given in guidance was developed for the control of cycle lane approaches to the signal-controlled junctions in option 2.

GUIDANCE

The proposed site is in England and along a low-speed highway, so the following regulations and guidance applied:

- Traffic Signs Regulations and General Directions (TSRGD) 2016 (as amended 2017).
- Traffic Signs Manual (TSM) Chapter 6 Traffic Control.
- LTN 1/20 Cycle Infrastructure Design.

The remainder of this paper will focus on the guidance contained in LTN 1/20. However, much of the relevant part of this guidance is duplicated in TSM Chapter 6 so the findings will be largely applicable in parts of the UK where LTN 1/20 does not apply such as Scotland.



EXISTING OPTIONS

Chapter 10 of LTN 1/20 provides a list of cycle facility types. It places these in an order of preference based on the level of protection they provide to cyclists.

10.6.5 Types of cycle facilities at traffic signals, generally in descending order of protection for cyclists, include:

- › Cycle bypasses;
- › Separate cycle phases;
- › Cycle and pedestrian-only stage;
- › Hold the left;
- › Two stage right turns;
- › Cycle gate;
- › Early release; and
- › Advanced stop lines.

Advanced Stop Lines and Early Release

The easiest to implement and deliver for the scheme out of these would be an Advanced Stop Line.

The existing, post-Covid temporary arrangement, already provides some ASLs so that cyclists may position themselves ahead of motorised traffic held by a red signal. Cyclists wishing to perform a right turn could position themselves within the ASLs more easily by being able to leave the cycle lane on approach to the ASL by passing through the light-segregation. By fully segregating the cycle lane it would become more difficult for cyclists to position themselves within the ASL for a right turn movement.

TSRGD 2016 allows ASLs to vary in length between 4m and 7.5m. Extending the length to 7.5m would allow cyclists wishing to turn right to position themselves more easily for this movement.

To complement the ASL, early-release signals could be used. This enables cyclists to establish themselves within the junction ahead of the release of general traffic, in order to reduce the risk of potential conflicts between cyclists and turning traffic.

This arrangement, an indicative layout of which is shown below, requires little, if any, additional highway width but does require some additional highway length.

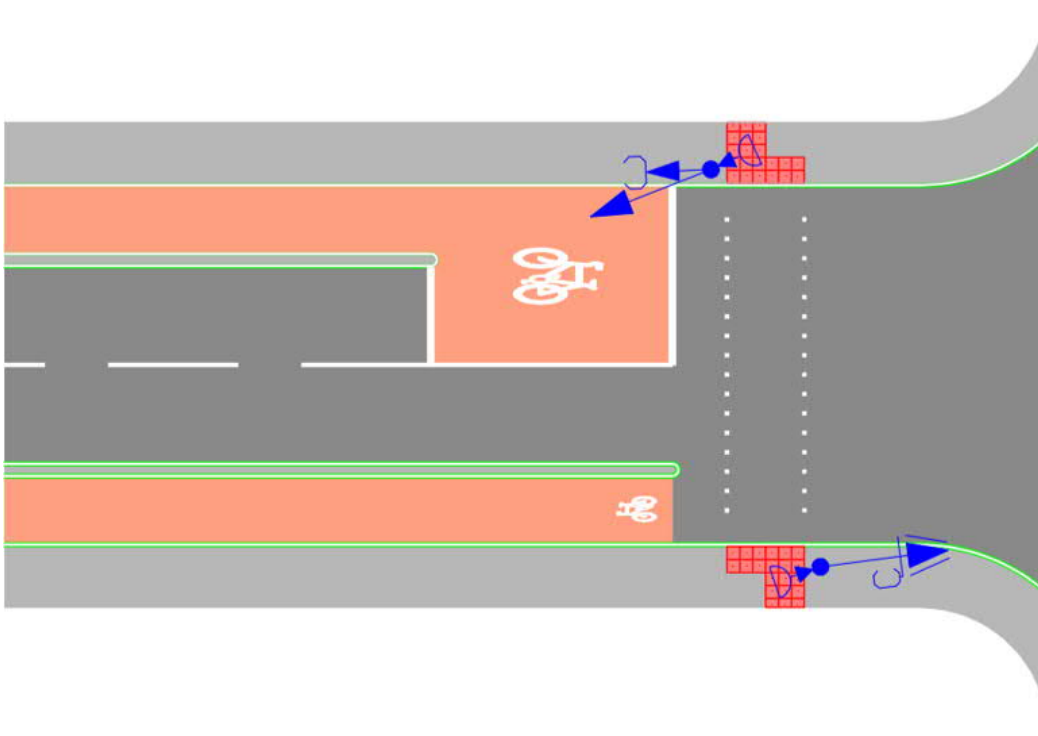


Figure 2 - Max length Advance Cycle Stop Line with Early Release Cycle Signals

Although Advanced Cycle Stop Lines and Early release signals would provide facilities for cyclists, they would only be of benefit to cyclists who arrive while the junction approach is at red. For cyclists arriving during a green signal, they will be in conflict with motorised traffic. E.g., A car turning left as a cyclist continues along Hoghton Street.

Clause 10.6.44 of LTN 1/20 states that ASLs should “only be considered to meet the full accessibility needs of most people on a junction approach” where “the approach is on green for no more than 30% of the cycle time”. At the Hill Street/Mornington Rd and Union Street/Church Street junctions particularly, some of the cycle route approaches are likely to exceed this level.

Traditional Cycle Gate

To control the conflict when cyclists arrive on a green signal LTN 1/20 details a cycle gate option. As the kerbed strip between cycle lane and traffic lane fully segregates cyclists from motorised traffic in physical space, traffic signals can fully segregate cyclists from motorised traffic in time.

A cycle gate provides a reservoir area with separately controlled entry points for cyclists and motor traffic. Cyclists and motor vehicles are held in the reservoir at a second set of signals, at different stages in the signal cycle.

While a cycle gate can provide equally efficient use of cycle time as an advance cycle lane with early release, unlike an advanced stop line, the controlled access to the reservoir means that cyclists do not have to travel through the junction at the same time as motor vehicles. It also eliminates the conflict that can occur when cyclists reach an ASL just as the signals change to green.

However, as can be seen in the layout below (Figure 3), a cycle gate layout requires significantly more highway width, length, and much more signal equipment. LTN 1/20 specifies a minimum offset between cycle stop lines of 7 metres and a minimum offset between road stop lines of 18m. The kerbed strip between cycle way and road needs to be widened to accommodate a traffic signal pole and lantern and a central reserve needs to be added, again for the placement of traffic signals but potentially also of sufficient width to provide an adequately sized refuge if a pedestrian crossing over the junction arm is present. All this increases financial and carbon costs for construction and maintenance of the scheme as well as the amount of highway space required which could be costly or impossible to obtain.

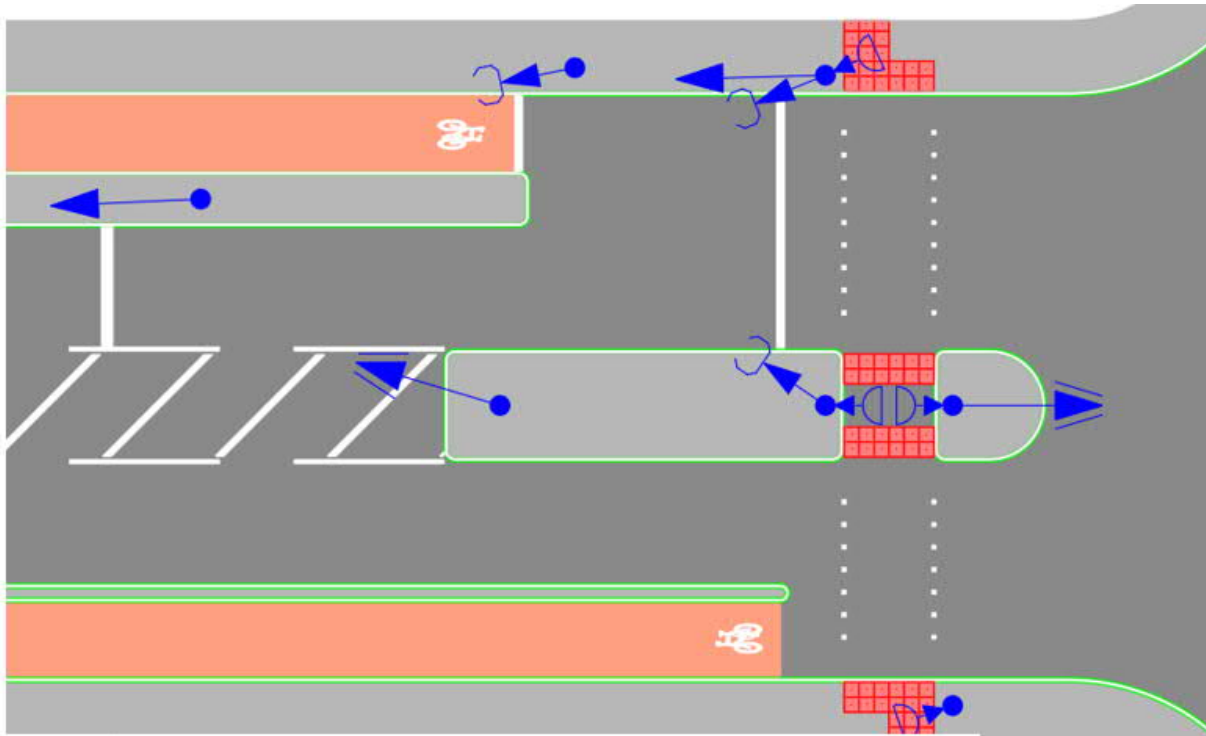


Figure 10.34: Cycle gate signal sequence

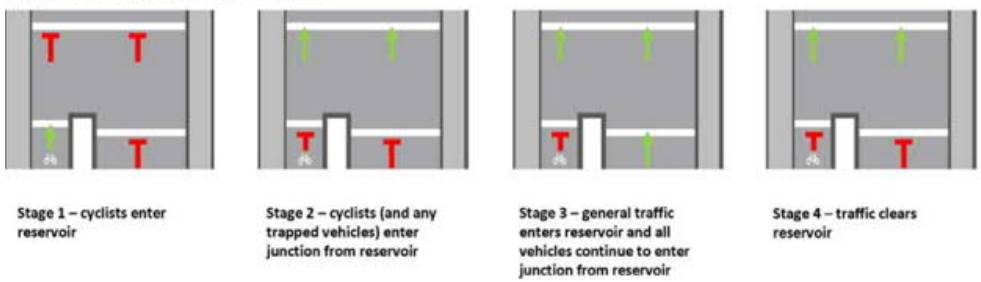


Figure 3 - Traditional Cycle Gate

Separate Cycle Phase

An alternative way to separate cyclists and motorised traffic in time is to treat the cycle lane and road as completely separate and independent junction approaches as shown below in Figure 4.

While this achieves safe operation, it has two key draw backs:

- Firstly, the segregating strip between the cycle lane and road will need to be significantly wider to accommodate a traffic signal pole and lanterns.
- Secondly, this arrangement will have a less efficient use of cycle time as the cycle lane signals could have a longer minimum green time and that an additional intergreen period following the appearance of the cycle lane's signal will be required.

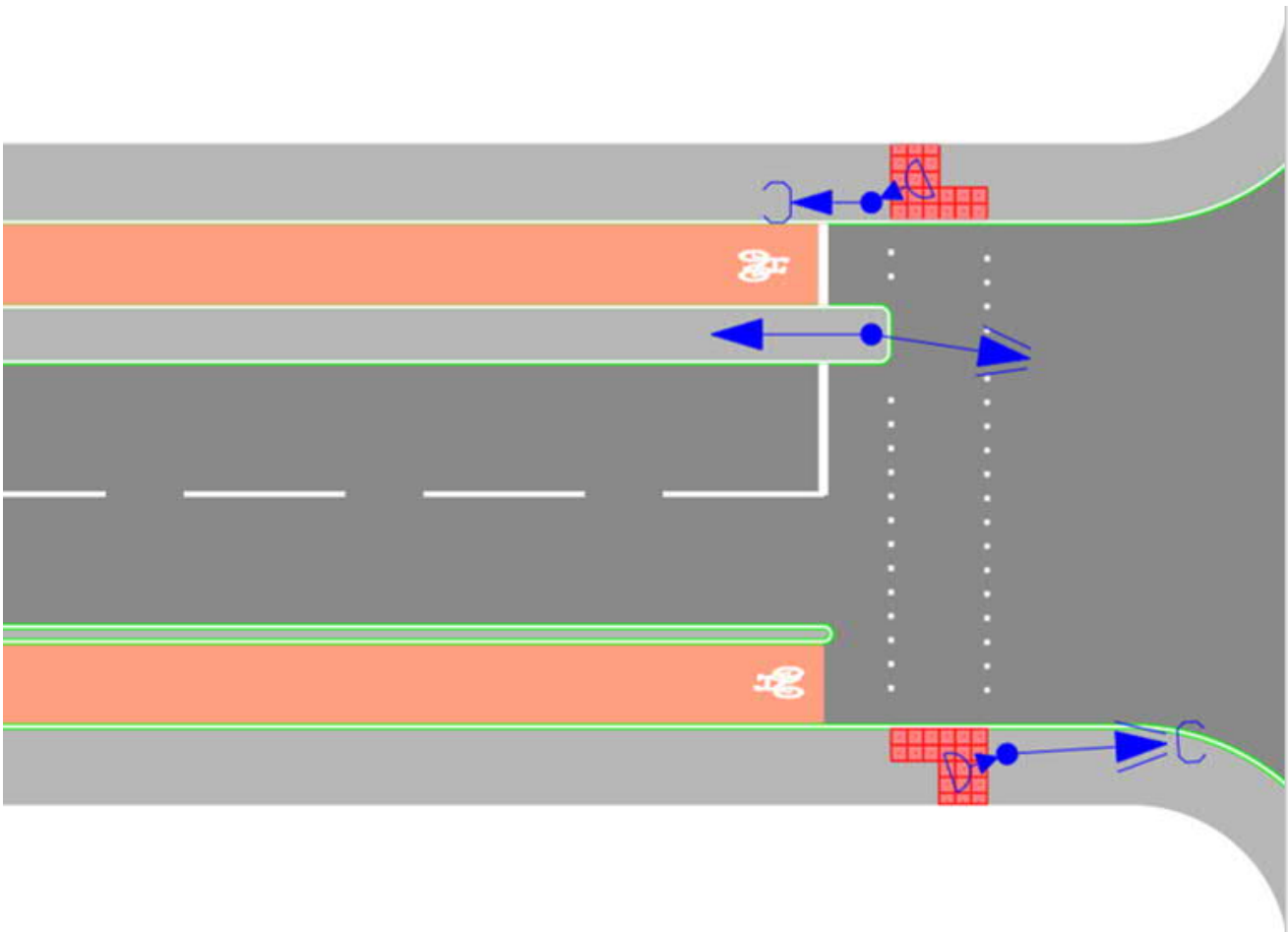


Figure 4 - Separately signalled cycle phase

ALTERNATIVE

With the site conditions being unsuitable for the use of an Advance Stop Line and insufficient highway width available to accommodate the needs of a cycle gate or separately signalled approach phases an alternative solution was required.

To this end, the advance stop line with early release option was revisited. The key difference between this and a cycle gate is that when motorised traffic is receiving a green signal, cycle traffic is held at a red signal.

It was therefore considered whether the combination of advanced stop lines and early release signals could be further combined with an upstream separate cycle phase. The layout shown below in figure 5 was created.

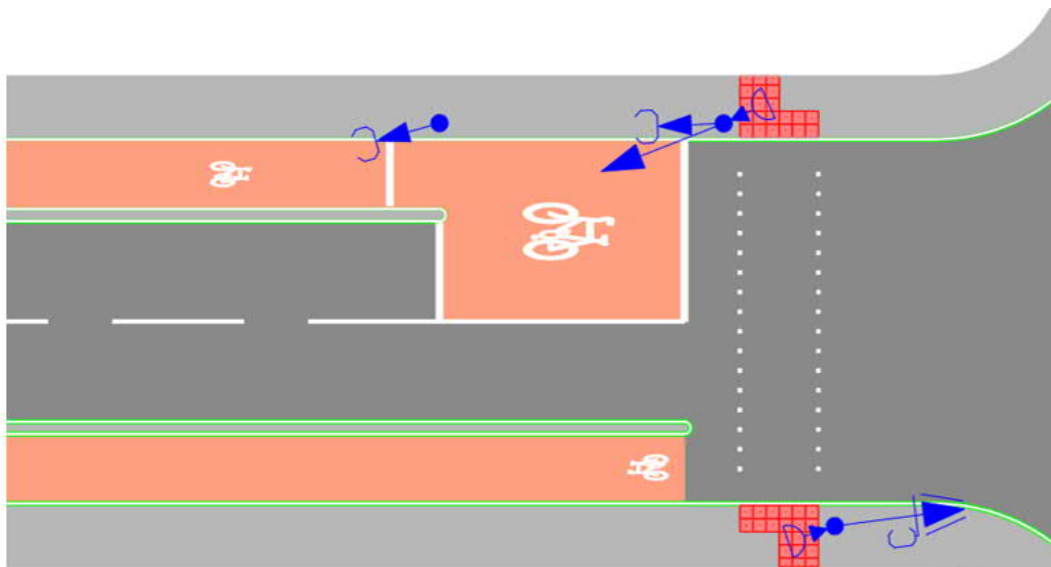


Figure 10.34: Cycle gate signal sequence

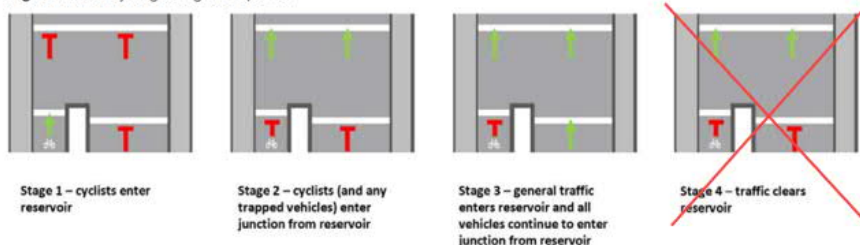


Figure 5 - Alternative Cycle Gate

This option is proposed to operate by effectively achieving the same stage sequence as a traditional cycle gate except for stage 4 being unneeded due the reduced distance between stop lines for motorised traffic. The distance between cycle stop lines could be increased if needed to demonstrate to cyclists that this is a separate signal to the junction.

In stage 1 only the separate cycle signal phase would be at green allowing cycles to access the ASL. Other traffic this arm would be held at the start of the ASL area. This arm would remain in this state while the rest of the junction is serviced.

In stage 2, cycles would be released from the ASL by the low-level cycle signals allowing their early release while other traffic is still held at the start of the ASL by a red signal. The separate cycle phase would also turn to red for this stage to prepare for the release of motorised traffic.

In stage 3, a green signal would release motorised traffic into the junction through the, now clear, ASL. At the end of this stage both the green signal to motorised traffic and the early release signal would turn to red simultaneously prior to the separate cycle phase turning green in stage 1 to refill the ASL with cyclists.

COMPARISON

When the options are compared in the terms discussed above there are few downsides to this alternative arrangement (See Table 1 below).

Table 1 - Option Comparison	Advance Cycle Stop Line	ACSL with Early Release	Traditional Cycle Gate	Separate Signals	Alternative Cycle Gate
Minimum highway width (m)	15	15	19	16	15
Carriageway length (m)	7 - 10.5	7 - 10.5	21	3	8.5 to 13
Separates cycles and cars in time	x	?	✓	✓	✓
Efficient use of time	✓	✓	✓	x	✓
Main Stage / Long green time / High flows	x	x	✓	✓	✓
Street Clutter	✓	✓	x	✓	✓

Although there may be concerns regarding compliance of cyclists with a red signal at the separate cycle phase and with drivers not encroaching in the ASL area, these are also issues present in traditional cycle gates and/or ASLs. It is not expected that this issue would be worsened in this layout.

While this option was developed due to a particular set of circumstances, there appears to be no reason why this arrangement could not be an alternative intervention, alongside the others listed in LTN 1/20, for a wider range of traffic signal approaches with cycle lanes.

ACTIVE TRAVEL ENGLAND

Before proposing the alternative cycle gate arrangement for the Houghton Street project, the Project Manager naturally wanted some assurance that it would be accepted as a suitable measure when assessed against the advice of Active Travel England (ATE), such as in the Cycling Level of Service Tool or the Junction Assessment Tool detailed in LTN 1/20.

To obtain such assurances, WSP contacted Brian Deegan for his review. Brian Deegan is the Director of Inspections at Active Travel England.

Brian is one of the UK's leading experts in active travel design and helped write the 'Cycling Level of Service' and 'Healthy Street Check for Designers', as well as co-authoring 'London Cycling Design Standards' and the 'EU Cycling Strategy'.

He is currently heading a team of inspectors ensuring design quality on several billion pounds of government investment in active travel infrastructure.

Brian was supportive in principle of the design stating he had "drawn it up myself before". Other comments he provided to be considered if the layout were to progress to detailed design were:

- Consider providing gaps in the segregation on the approach so that cyclists who want to bypass the 'gate' can take it upon themselves to skip it in a legal way.
- Consider a half-width or three-quarter width ASL as studies have shown that compliance levels, in terms of cars not encroaching, are actually higher with those compared to full-width ASLs.
- As with early release signals, a key element will be the timings with particular care given to ensure cyclists are given adequate time to clear the junction before other traffic is released.

Overall, he said that ATE would be happy to support a trial and would, potentially, even fund some monitoring for it.

CONCLUSIONS

The alternative cycle gate layout is an intervention that could provide a good level of service to cyclists at signal-controlled junctions.

It should be considered as another option within the list of interventions given in LTN 1/20 either as an alternative to a cycle gate or separate cycle signals or an improvement over advance stop lines with or without early release signals.

NEXT

For the Houghton Street scheme, the alternative cycle gate arrangement was the main intervention used on junction approaches across the corridor. The landscape drawing for this concept is shown below in figure 6.

Plan View: Houghton Street - One Way Cycleway



Figure 6 - Houghton Street - One Way Cycleway

Although the Client chose to progress with the two-way cycle track option, even that option includes the alternative cycle gate on both B5245 approaches to the junction at the north-east end of the scheme as shown in figure 7 below.



Figure 7 - Houghton Street - Two-way Cycleway (North-east terminus)

The project is yet to proceed to detailed design.

The alternative cycle gate arrangement will continue to be considered for use on future schemes where it can contribute to the best possible design layout.