A.11 Cycle Lanes

Key Principle

The decision to provide cycle lanes should be reached by reference to the *hierarchy of provision* (Local Transport Note 2/08 Table 1.2) and such tools as the CROW derived 'speed/flow' diagram (see below); they should not be seen as a universal solution. Where provided, they should be a minimum of 1.5m wide, continuous, made conspicuous across side roads at junctions and not abandon cyclists where roads become narrow, for example at right turning lanes. When cycle lanes are being introduced, the cost of remedial measures to the carriageway surface should be included within the scheme budget.

Design Guidance

Background

Cycle Infrastructure Design

7.1.1 Cycle lanes can benefit cyclists, but poorly designed lanes can make conditions worse for them. There is no legal obligation for cyclists to use cycle lanes (or any other type of cycle infrastructure provision).

7.4.3 Drivers do not always realise that cyclists need to move away from the kerb to avoid surface hazards and may expect cyclists to stay in lane regardless of its width. A narrow cycle lane may therefore give motorists (misplaced) confidence to provide less clearance while overtaking than they would in the absence of a cycle lane. At localised carriageway width restrictions, designers can continue a full-width advisory cycle lane alongside a substandard all-purpose lane, or the cycle lane can simply be discontinued. A narrow cycle lane should not be used here.

Whilst cycle lanes can create benefits for cyclists, they should not be considered to be the default solution for on-road facilities, especially when this results in them being too narrow, badly sited or not continuous.

Manual for Streets:

6.4.1 Cyclists should generally be accommodated on the carriageway. In areas with low traffic volumes and speeds, there should not be any need for dedicated cycle lanes on the street.

Recent research[1] confirms the view put forward in a TRL report[2] that motorists do not always moderate their behaviour when cyclists are provided space within a cycle lane. The research concludes "*The analysis shows that significantly wider distances are adopted by motorists in the condition without a 1.45 cycle lane with posted speed limits of 40 mph and 50 mph with a 9.5m wide carriageway. These findings were not replicated for a similar width road with a posted speed limit of 30 mph and a 1.3m wide cycle lane.*"

[1] Parkin J., Meyers C. *The effect of cycle lanes on the proximity between motor traffic and cycle Traffic* 2009
[2] *Drivers' perceptions of Cyclists* TRL report TRL549

It is worth noting that although the results were not statistically significant in the case of the 30mph limit, in all cases motorists passed closer to cyclists when there was a cycle lane than when there was not. This suggests that where cycle lanes are introduced they should be as wide as possible and that sub-standard width cycle lanes compound the problem

The actions of motorists overtaking cyclists have also been the subject of a study[3] which found:

"When overtaking the test bicycle, drivers passed closer when the experimenter:

- *Rode towards the centre of the lane rather than the edge*
- *Wore a helmet*
- *Appeared female rather than male*

The helmet effect is likely (to be) the result of drivers judging cyclists' skills from their appearance and adjusting their overtaking accordingly.
Drivers of buses and heavy goods vehicles got significantly closer than other vehicles."

The benefits of cycle lanes have been tabulated below. The table also comments on the factors which limit the effectiveness of the benefits and suggests measures which could be adopted to help overcome these limitations.

Benefits	**Limitations**	**Potential mitigation**
Create a comfort zone, especially for less experienced cyclists nervous about mixing with motor traffic	Motorists often see cycle lanes as adequate provision for cyclists and make no further allowance for their movements. They sometimes pass cyclists using cycle lanes too closely or too quickly, because they do not appreciate that cyclists sometimes need to deviate from the lane.	Make cycle lanes 2.0m wide whenever practicable (1.5m minimum). Mandatory lanes are preferred but advisory ones will be necessary where motor vehicles have to encroach on them. Cyclists can use the additional lane width to increase the distance between them and passing motor vehicles. Where traffic speeds cannot be reduced to 40 mph or below, and space permits, consider off-carriageway provision.

[3] Walker I. *Drivers overtaking cyclists: Objective data on the effects of riding poison, helmet use, vehicle type and apparent gender* 2006

Benefits	Limitations	Potential mitigation
	Cycle lanes may be blocked by parked cars outside peak periods	Parking should be prohibited or, if space permits, the cycle lane could be taken outside parked vehicles using a 1m wide buffer zone (0.5m minimum) between the parking spaces and the cycle lane. (TSRGD limits maximum width of buffer zone to 1m). Where parking problems cannot be resolved cycle lanes are probably not appropriate.
	Cycle lanes can accumulate debris due to reduced wind-sweeping effect from passing motor vehicles. This creates potential for punctures and accidents. The swept path of long vehicles may encroach upon a cycle lane at corners	Introduce regular sweeping regime or consider introducing wide nearside lanes in place of cycle lanes if space permits This should not take this for granted but be should taken into account as part of any proposal to introduce cycle lanes
Assist cyclists or give them an advantage over motorists in difficult or congested situations.	Cycle lanes that cease at difficult junctions or other hazards are of little or no value.	Ensure continuity of cycle lanes, including across side road mouths and at right turning lanes and refuges. Introduce ASLs at signalized junctions.
Provide the opportunity to bypass features intended to slow or exclude other traffic.	Cycle by-passes require additional land-take so not always possible to provide. If present, can accumulate debris.	Consider mandatory cycle lanes through pinch points. Use 1.5m wide bypasses if space permits. Use speed cushions instead of full-width road humps.
Guide cyclists through complex junctions.	Cycle lanes cannot be provided for every possible manoeuvre a cyclist might want to carry out at a given location. For example, if a large number of cyclists need to turn	For problem junctions, introduce signalized control with ASLs. Position ASL feeder lane to serve cyclists carrying out the most hazardous manoeuvre. (TSRGD only permits one feeder

Benefits	Limitations	Potential mitigation
	right at a signalled junction with an ASL, a nearside feeder lane would introduce them to the reservoir on the wrong side of the carriageway with the potential for conflict with motor vehicles.	lane at an ASL - authorisation required for additional feeder lanes). On the approach to roundabouts it is preferable to stop cycle lanes short to avoid directing cyclists to take an outside path around it (annular cycle lanes are not normally recommended– see A13 Roundabouts).
Can sometimes control the speed of other traffic by reducing road space available to them.	In tight situations, motor vehicles may simply encroach upon the lane. May reduce traffic speeds at the expense of cyclist comfort.	Investigate measures to reduce speeds and volumes which do not rely on the presence of cycle lanes. In general, the deliberate use of cyclists to control traffic speed should be avoided. However, in certain circumstances, cycle lanes can be used to influence driver behaviour. For example, where traffic conditions permit, it may be beneficial to provide wide, advisory cycle lanes on both sides of the road and remove the central white line. This creates a single, centrally positioned all-purpose traffic lane where oncoming motorists briefly encroach into one or other of the advisory cycle lanes to pass each other.

Benefits	Limitations	Potential mitigation
Alert motorists as to the likely presence of cyclists.	While cycle lanes may help to make motorists aware of the likely presence of cyclists, they do not make them aware of the consideration they should show when overtaking them or carrying out other manoeuvres in their vicinity. Motorists may not always expect to see cyclists, even when cycle lanes are present.	Consider measures such as elephants feet markings (WBM 294 – requires DfT authorization) through signalised junctions or separate cycle-only phases to improve cyclist safety.
	In areas where cycle flows are very light motorists are less likely to respect the need to keep out of the lane and will, for example, pull across it to cut corners, park or turn or treat it as an extension of give way markings,	Use mandatory cycle lanes in preference to advisory ones. Ensure that where advisory cycle lanes cross side road junctions, they are coloured and positioned to deter encroachment by emerging vehicles.

It is also worth noting that whilst a cycle lane gives cyclists some separation from motor traffic, under the National Cycle Training Standards, cyclists are trained to ride in the safest position on the carriageway which is usually at least 1.0m from the kerb edge. This is so that they can avoid gulley grates and debris and to ensure that they are within the sightlines of drivers waiting at side roads (see Bikeability training course

Narrow cycle lanes potentially reduce the level of separation between vehicles and cyclists by encouraging cyclists to stay closer to the kerb, and if a lane is too narrow to comfortably ride within it, the object of providing it in the first place is lost.

Types of cycle lane

Cycle lanes can be either mandatory or advisory. Mandatory cycle lanes, like bus lanes, may be restricted to operation at certain times or they can operate at all times. Mandatory and advisory lanes are mostly with-flow, but both can be used in contraflow to motor traffic if desired (see A06 Contraflow).

Mandatory cycle lanes

Mandatory cycle lanes benefit cyclists because other traffic is excluded from them by traffic regulation orders (TROs). Operation of the lanes may be enhanced through additional measures that control parking and loading.

TROs require statutory consultation and confirmation of the order may be delayed if objections arise. If this occurs, the orders and lanes can be introduced on an experimental basis to establish whether the difficulties anticipated by objectors

are justified or not. The orders may then be confirmed or withdrawn after the true pattern of use has been established. (The use of advisory cycle lanes to circumvent these difficulties is not recommended, as they should also be the subject of wide consultation and, in any case, are likely to require traffic regulation orders to restrict car parking.)

Cycle lanes should continue across the mouths of side roads. In these and other circumstances where other traffic needs to cross them, mandatory lanes should be replaced by sections of advisory lane.

Advisory cycle lanes

Where a mandatory lane is unsuitable, an advisory lane can be used.

Advisory lanes are not recommended if they are likely to be regularly blocked by parked vehicles. In these circumstances, consideration should be given to alternative arrangements such as wide nearside lanes with no cycle lanes marked within them.

An advisory lane passing the mouth of a side road is useful in alerting motorists to the likely presence of cyclists but they are sometimes blocked by emerging vehicles about to join the main road. The problems this creates for cyclists can be reduced by using a coloured surface in the lane to emphasise its existence, and by making it wide enough to accommodate cyclists forced to weave around vehicles partially blocking it.

Coloured cycle lane crossing side road junction and set out from give way line to discourage encroachment

Picture: Steve Essex, ERCDT

An alternative method of maintaining continuity of provision for cyclists passing the mouths of side roads is to drop the lane markings and simply rely on coloured surfacing, cycle symbols and direction arrows. This will help alert motorists to the likely presence of cyclists without defining an area in which they may be inclined to wait. Note that coloured surfacing has no legal meaning under TSRGD. It becomes largely ineffective at night.

Advisory cycle lanes are useful in situations where occasional encroachment into the lane by motor vehicles is unavoidable. A typical example would be where an advanced stop line (ASL) is installed at a signalled junction and carriageway width is limited (see A09 Advanced Stop Lines).

Cycle lanes may also encroached upon by long vehicles at corners or tight bends. This could lead to cyclists being forced off of the carriageway or, worse still crushed against barriers by overtaking vehicles. This potential hazard should be taken into account within any proposal to introduce cycle lanes by widening the carriageway or reducing the number of traffic lanes to take account of this. Where this is not possible suitable warning signs should be used to alert both cyclists and drivers to this possibility.

Contra-flow cycle lanes

Contra-flow cycle lanes (see A06 Contraflow) are particularly beneficial for cyclists. They help ensure that areas where the movement of motor traffic is restricted remain permeable to cyclists.

If a proposed traffic management scheme includes the imposition of one-way working for motor vehicles, the default position should be that cyclists will not be subject to the same restriction. Contra-flow cycle lanes should only be dismissed if there are over-riding safety reasons for doing so. Highway authorities should also consider introducing a programme of restoring two-way cycle flow in all existing one-way streets and gyratory systems.

Two-way cycle lanes

Two-way cycle lanes can overcome problems that are difficult to resolve in other ways. For example, if two cycle routes join a major road in close proximity and on the same side, a two-way cycle lane can be used to link the routes without requiring cyclists to cross the road. Another example of their use would be where contra-flow and with-flow cycling movements within a busy gyratory system are combined.

These lanes need to be carefully designed to ensure they operate safely. They have more potential for conflict than any other type of cycle lane and should only be introduced after all alternative solutions have been thoroughly explored and rejected.

Two-way cycle lanes require traffic regulation orders to exclude motor vehicles. As they are situated within the road, they also need to be physically segregated from the rest of the traffic. If such a scheme is implemented, it should be introduced initially on a trial basis using an experimental traffic regulation order. There should be a commitment to revise or abandon the scheme if it proves necessary.

The following outlines some of the difficulties associated with two-way cycle lanes;-

- They can create confusing conditions for drivers, especially as cyclists may also be present in the general traffic lanes. If traffic flow on the main road is two-way, it will be impossible to avoid the situation where a cyclist come towards a motorist on the motorists' left side (unless the cycle lane is located centrally which is very unlikely). Confusion here can increase significantly at night when motorists might have white lights coming towards them on both sides.

- There may be a need for cycle gaps at intervals in the segregating feature so that cyclists can pass between the two-way cycle lane and

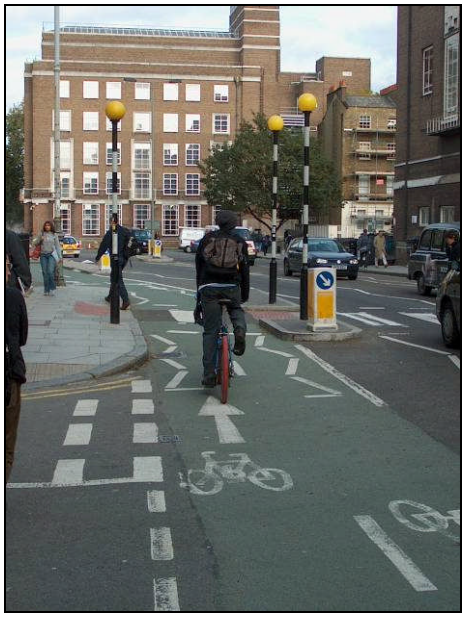
the main carriageway. This requires careful attention to detail if cyclists are to do so safely and conveniently.

- Side road junctions can be particularly difficult to get right. Ideally, they should be closed except for cycle access. Where this is not possible measures will need to be implemented to make it clear to motorists entering or leaving the side road that cyclists may have priority and may come from an unexpected direction, close to the give-way line. Some traffic calming might also be necessary.

- The design of the side road junctions should make it clear to motorists that they are not to enter the cycle lanes when turning onto the carriageway and to prevent misuse of the lanes for loading and parking: the use of bollards for this purpose requires careful detailing if they are not to become hazards for cyclists;

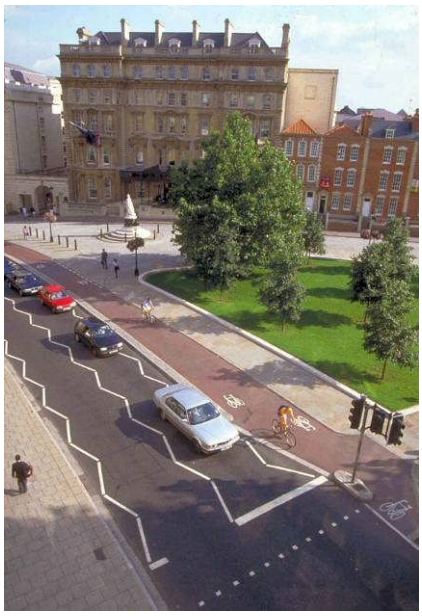
- The routes pedestrians are to take to cross the lane should be clear and where possible they should be given priority. As with drivers waiting to pull out across the cycle lane, pedestrians may not realise they should look both ways before crossing it.

- The physical segregation of the lane can effectively sterilise one side of the road in terms of general vehicular activity such as parking or loading.



Two-way cycle lane, Camden

Picture: © Alex Sully



Two-way cycle lane, Bristol

Picture: Sustrans

Width of Cycle Lanes

Wherever possible cycle lanes should be 2m wide. This is particularly important where parents are accompanying children and for cyclists overtaking other cyclists. In addition, unlike most vehicles in urban areas, cyclists travel at different speeds and will regularly need to pull out to overtake slower cyclists.

Cycle lanes can only provide comfort and reassurance for cyclists if motorists do not pass them too closely. There is evidence to suggest that cycle lanes can actually encourage motorists to pass cyclists more closely than if there were no cycle lanes.

Where cycle flows are heavy (over 150 cyclists in the peak hour) and frequent overtaking occurs, cycle lane width should be increased to 2.5m. Where space is restricted, with-flow cycle lanes can be a minimum of 1.5 m wide. This creates the minimum width to allow vehicles in 30mph zones to overtake cyclist riding single file (without the need for the vehicle to cross the central lane markings) so as not to cause discomfort to cyclists. This will also permit cyclists to avoid debris and surface irregularities such as potholes and sunken gullies at the carriageway edge.

Contra-flow cycle lanes should ideally be at least 2.0m wide although where width is restricted this may be reduced to a minimum of 1.5 (see A06 Contraflow). Cycle lanes between all-purpose vehicle lanes should be 2.5m with an absolute minimum of 2m. Cycle tracks accommodating 2-way cycling should be 2.5m wide.

Widths below these recommended widths will need to be carefully assessed for safety. Danish research (not available in English but referred to and referenced in Dutch guidance *Design manual for bicycle traffic* CROW 2007) has shown that narrow cycle lanes (below 1.2m) are three times more dangerous than wider cycle lanes (expressed in the number of accidents per bicycle kilometre cycled). In general, lanes below 1.5m are rarely justified as this induces cyclists to ride towards the edge of the carriageway where surface conditions are often at their worst. However, ASL feeder lanes below this width may be appropriate over short distances (see A09 Advanced Stop Lines).

1.5m wide cycle lane provided and vehicle lane narrowed to 2.2 m in congested location: Oxford.

Picture: Patrick Lingwood, ERCDT

It is important that poor surface conditions such as sunken gullies or potholes are not allowed to reduce the effective width of any cycle lane. The maintenance regime should be rigorous enough to ensure that such defects are promptly rectified (see C06 Maintenance).

Cycle lanes and controlled crossings

Within the zig-zag zone of a controlled crossing, no other road markings are allowed. Cycle lane markings on the approach to such a crossing must therefore terminate before the zig-zags start and can be resumed directly after they finish. Some authorities choose to maintain a cycle lane of sorts through this zone by aligning a line of zig-zags with the cycle lane line, but this option should be used with consideration for its contribution to 'street clutter' and is not authorised by the DfT. An example of this is shown in the picture below.

A visual "cycle lane" can be continued by stopping the lane marking at the zig-zags but taking the coloured surface of the cycle lane right up to the crossing point. However the colour should not continue through the crossing point itself. Colour can be used in this way because it has no legal meaning under the regulations.

The cycle logo to Diag 1057 should not overlap the lane markings or other markings such as double yellow lines. Where this does occur it may be an indication that the lane is too narrow.

Cycle lane at a Zebra crossing, Ipswich. Note that the cycle logo overlaps the double yellow lines – see text

Picture Rob Marshall ERCDT

Cycle lanes alongside parked cars

Cycle lanes can be marked on the offside of a line of parking bays. There should be a buffer zone between the bays and the cycle lane of no more than 1m (1m is the recommended width, 0.5m minimum). The angle of the cycle lane with the kerb on the approach to, and departure from the parking bays should be 1 in 10.

An open car door can extend over 1m into the carriageway

Picture: Patrick Lingwood, ERCDT

Cycle lane with hatched margin next to car parking.
Note: The TRO giving effect to the mandatory cycle lane must be written in a manner that permits motorists to cross the lane to access the parking

Picture: Rob Marshall, ERCDT

Coloured surfacing

Coloured surfacing in cycle lanes is effective in highlighting the space intended mainly for cyclists. In some cases, the full length of a cycle lane is coloured. However, coloured surfacing is relatively expensive and adds to the maintenance liability of cycle lanes. In addition, over-use of colour may diminish its impact where it is more necessary, i.e. where there is a high level of interaction between cyclists and motorists.

The use of coloured surfacing should be considered for use in the following locations;-

- Lead-in lanes and ASL reservoirs (strongly recommended)
- Priority cycle crossings at side roads (strongly recommended)
- Central and right-turn cycle lanes
- Contra-flow cycle lanes
- Lanes beside parking bays
- Cycle lanes alongside narrow vehicle lanes (i.e. under 2.5m wide) or where the road centre line markings have been removed
- At junctions particularly where there are exempted cycle movements

- Through zig-zag markings at zebra and pelican crossings and at bus stop markings (surfacing only)
- 2-way cycle lanes (strongly recommended)
- Other locations where cyclists may be put at greater risk, e.g. short cycle lanes through pinch points.

End of cycle lane markings

The end of a cycle lane may be indicated by an 'END' carriageway marking (Diagram 1058) placed immediately beyond a cycle symbol (Diagram 1057). However, the use of these markings is not mandatory and in most cases, they are unnecessary. Alternatively, the use of a bicycle symbol (Diagram 1057) and an 'ahead' arrow (Diagram 1059) can indicate to all road users that the route continues even though the lane has ended.

In most cases the cycle lane markings should simply stop. This is particularly true for short breaks in the lane such as where it encounters the zig-zag markings of a zebra crossing (where the zig-zags end, the lane restarts without the need for an introductory broken line taper).

Wide nearside lanes

An effective alternative way of providing for cyclists without using cycle lanes is to simply increase the width of the all-purpose lane, (i.e. the nearside lane if there is more than one lane in each direction). There is no consensus on whether wide nearside lanes (WNL) are better overall than cycle lanes, but they do have certain advantages.

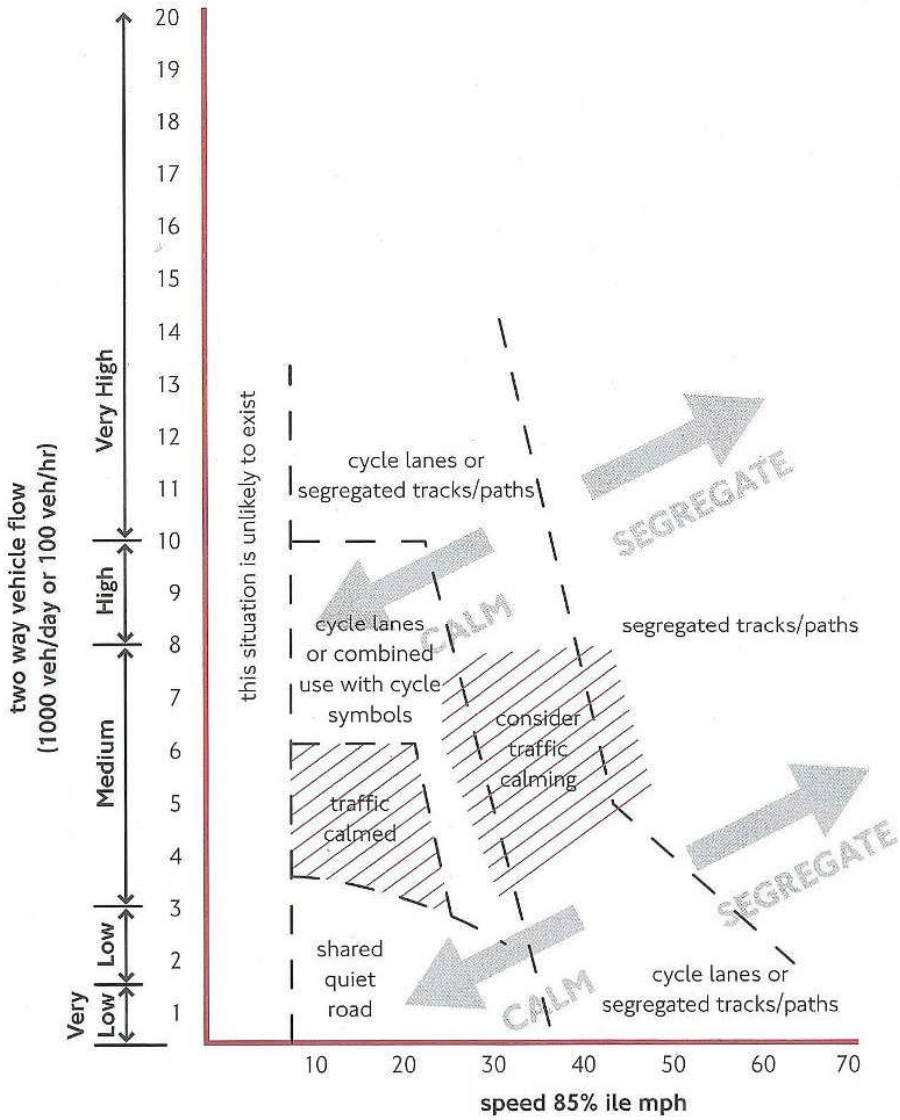
WNLs give cyclists more freedom of movement when deciding where they want to position themselves in the carriageway. They allow cyclists to weave around surface defects without having a cycle lane to try to stay inside. Motorists may find it easier to accept cyclists moving away from the nearside when there is no cycle lane present. However, this flexibility may be more of an asset to experienced cyclists - those with less experience might feel more comfortable in a cycle lane.

WNLs may encourage motorists to pass cyclists with greater clearance because they cannot use a cycle lane marking as a reference point to judge the passing distance. The nearside part of the carriageway of a wide nearside lane will also benefit from the sweeping effect of vehicles as they will travel closer to the kerb (at times when there is no cyclist present) compared to carriageways with cycle lane markings.

A wide nearside lane is one of the main examples of invisible infrastructure (see A01 Invisible Infrastructure). They can be much cheaper to install and are less visually intrusive than cycle lanes. However, they may encourage drivers to drive faster because of the width available.

Speed/Flow Diagram

The diagram and notes below (source: *London Cycling Design Standards*, TfL 2005) are derived from the original Dutch guidance set out in the CROW cycle design manual 'Sign up for the bike'. Whilst it provides an apparently straightforward way of determining what features should be considered, it should be used with care and final decisions made by reference to the *hierarchy of provision* (Local Transport Note 2/08 Table 1.2) and the width of the available carriageway. Where the speed and volume of motor traffic can be reduced as a first step, this has the potential to change the solution suggested by the diagram and hence any conclusion reached about the most suitable measures (if any) to adopt.



Notes:

1. Each route will need to be judged in the light of its specific situation
2. Cycle lanes or tracks will not normally be required in traffic calmed areas
3. Congested traffic conditions may benefit from cycle lanes or tracks
4. Designs should tend to either calm traffic or segregate cyclists

References

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Cycling England Gallery pictorial examples

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