Birmingham Cycling Design Guidance

Consultation Draft

July 2014

BIRMINGHAM CYCLE REVOLUTION

Birmingham City Council

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Executive Summary

1. Birmingham recognised a need to produce local guidance on cycling infrastructure as part of the recommendations of the 'Changing Gear' scrutiny report in 2012.

2. A significant programme of cycle infrastructure investment has begun following a successful bid for Cycle Ambition Grant funding from central government. This follows an earlier successful application to the Local Sustainable Transport Fund. These two funds, together with Local Transport Plan expenditure, are adding significantly to the extent and quality of cycle infrastructure in the city.

3. The Birmingham Cycle Revolution strategy has a long term aim to achieve a 5% mode share for cycling by 2023 and a 10% mode share by 2033. This document offers technical advice on infrastructure design to support that aim. It is not a policy document however, and all local decisions about changes to infrastructure will be subject to the usual technical analysis and public consultation that applies to any highway works.

4. Current UK guidance on cycling is dated and is scattered throughout various Local Transport Notes and volumes of the Traffic Signs Manual, making it difficult to use.

5. Rapid growth in cycling in London and the core cities is starting to expose the inadequacy of some existing infrastructure to cater for mass cycling and to safely accommodate a wide range of abilities including children and elderly people. These groups need to be able to use the infrastructure if cycling is to achieve a significant mode share.

6. This guidance sets out good practice in designing for cycling in different circumstances. It starts by considering what are the ideal conditions for cycling but also investigates options for what can be achieved within constraints of existing highway boundaries and traffic conditions.

7. The first part of the document covers design principles and practice. The appendices include technical layout drawings of typical features that can be used as a basis for customised site specific designs.

8. Knowledge about providing cycle facilities is constantly evolving. This document will be produced in web-based pdf format to enable regular updating.

9. We gratefully acknowledge the cooperation of other Cycle Ambition grant recipient cities, Transport for London and the Welsh Government for sharing information, in particular Transport for Greater Manchester for preparing the original materials for the technical drawings appendix.

1 Introduction

Acknowledgements

This guidance has been written with the collaboration of the design teams from Bristol, Leeds, Manchester, Newcastle and Norwich as well as representatives from Transport for London who are working together to help to introduce new infrastructure for their Cycle Ambition programmes. This guidance also draws upon issues discussed in production of guidance to support the Active Travel Bill Wales, which reflects current thinking on the implications of the Equality Act on street design. In particular we would like to thank Transport for Greater Manchester for the use of original technical drawings upon which the Appendix drawings are based.

Birmingham's Cycle Revolution

In 2013, Birmingham was awarded government funding to help transform cycling in the city to become a mainstream mode of transport. The aim is for cycling to make up 5% of all journeys by 2023 and 10% by 2033.

The ambition is to work towards a long term goal of creating a safe and convenient cycling environment where anybody, *of any age and ability*, can realistically choose cycling as a mode of transport.

This guidance is to assist in the design of that network, in response to recommendations of the 'Changing Gear' scrutiny committee report published in April 2013.

Aims

The aims of the guidance are to:

- Ensure consistent and high quality provision with a more standardised approach that reflects the function and importance of the cycle route within a local network (regardless of whether the space for cyclists is provided via an off-highway route, off-carriageway track, cycle lane or shared road/space). For example, the Rea Valley Route is a *strategic cycle route* but consists largely of off-road tracks and lightly trafficked minor roads that are not strategically important to other modes.
- Set out underlying principles for consideration of speed limits, traffic volume, requirements for kerbside activity (bus stops, loading, parking), and available widths that will give cyclists sufficient safety and priority to encourage this mode in a variety of situations within highways.
- Assist with understanding the specific requirements of cyclists (alongside those of other road users) when making decisions about highway space.
- Set out clearly in one place how cycle infrastructure can be laid out showing relevant signs and markings.

Difference between Guidance and Policy

This is not a policy document. The recommendations are based on proven ideas from the UK and abroad about what creates good conditions for more and safer cycling. Good provision for cycling and walking is an essential component of any city-wide sustainable transport system. It reduces the necessity for short car journeys and supports use of public transport by providing for multi-modal trips, helping to remove car traffic from bus routes.

The design and extent of space for cycling within highways and other public areas must also be compliant with UK legislation (including the requirements of the Equality Act) and will always depend on the usual channels of local consultation and political approval following consideration of the needs of all road users.

Who is the Guidance for?

This guidance is aimed at development and highway planners, urban designers, traffic engineers and contractors working within the city. It is intended to offer greater consistency in the approach to providing for cycling in all infrastructure schemes.

Cycling is an important mode of transport in its own right, and in combination with public transport or car for ‘bike and ride’ trips that cover longer distances. Transport is not the only reason for cycling, infrastructure is also used to promote public health and local leisure/tourism. The city is committed to creating and maintaining attractive public realm and open spaces in which pedestrians and cyclists play a major part.

Where does it apply?

The guidance applies to all transport infrastructure within the city, including all highways and other ways used by cyclists. Work has been undertaken to identify a ‘strategic cycle route network’ for the city (see below), however changes to *any* highway in the city should include consideration of the safety and convenience of cyclists.

A cycle route network generally comprises of three elements:

- **Strategic** – Radial routes serving the city centre and other major local centres. Major connections between strategic radial routes.
- **Local** – All other local access routes serving residential, commercial, education, leisure and employment areas.
- **Green Routes** - These are routes that primarily offer an attractive (and often traffic free) cycling environment.

Facilities for secure cycle parking and interchange with other modes are required across the entire network.

Cycle infrastructure is not just within road corridors. It may be provided in public open space and parks, canal towpaths, railway stations and private developments. Guidance should benefit all organisations providing cycle facilities within the city including developers.

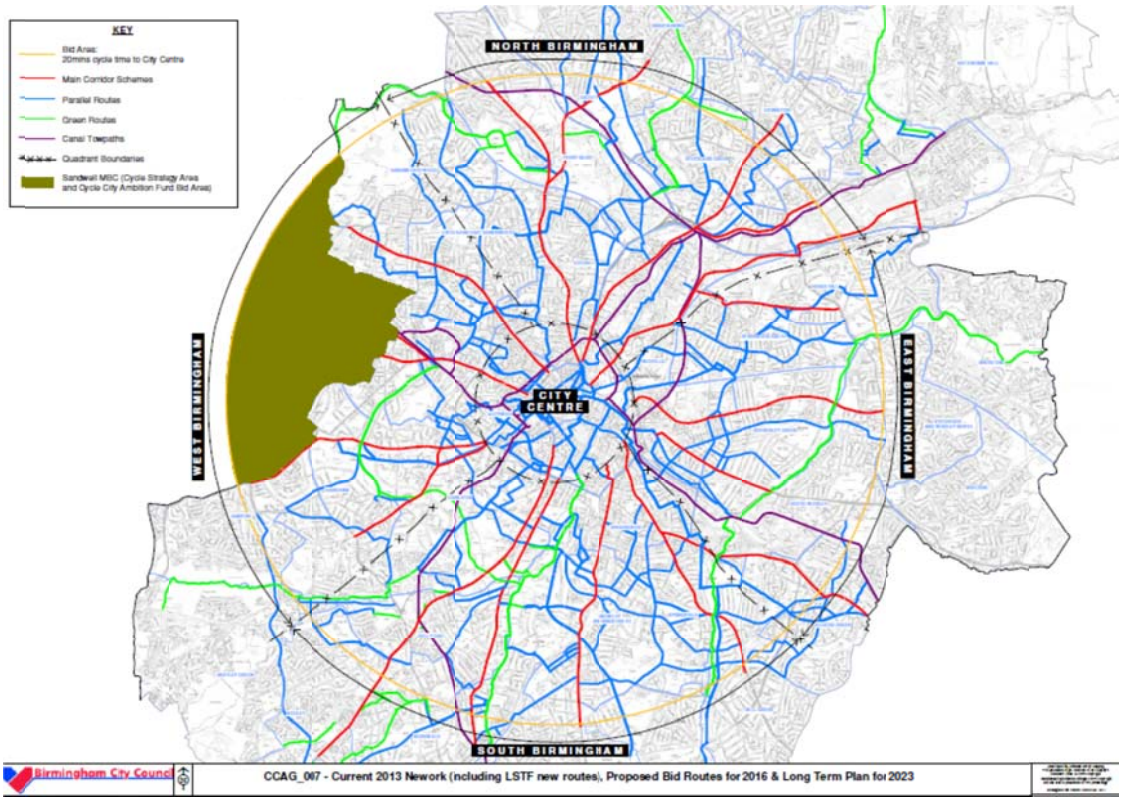


Figure 1: Birmingham's Proposed Strategic Cycle Route Network - 2023

Figure 1 shows Birmingham's developing cycle route network, which includes routes along Main Roads (red), Parallel Roads (blue), Canal Towpaths (purple) and Green Routes (green). The intention is to develop strategic radial routes leading to the city centre and linking district centres. Local connecting links between the radial routes will be provided as part of each route and should also be created as part of the transport provision for new developments.

The map illustrates roads and paths considered to have good potential for cycling although the final alignments and the form of provision will be subject to public consultation.

How this guidance works

The 'Design Principles' chapter gives a brief description of the elements that make up a cycle route network, and sets out some universal principles that apply to all types of route regardless of traffic conditions or the intended users.

The infrastructure chapters describe the main elements of cycle routes, looking at the types of links and junctions in terms of:

- What is the ideal form for cycle provision within the design?
- What common hazards should be considered and address?
- What typical design constraints (available dimensions, topography, drainage requirements and other street activities) need to be considered and how can they be managed?

The signing chapter looks at:

- Regulatory and advisory signs and markings that apply to cycle infrastructure
- Cycle direction signs on the highway

Typical layouts and construction details are in Appendix A.

2 Design Principles

The Functional Network

Cycle journeys commonly follow transport corridors that are also used by buses, cars and pedestrians. The primary function of these routes may differ for different user groups, for example a main road, a district centre high street, a residential street, a parkland path or canal towpath may all form components of a strategic cycle route, but each serves a different function for other users.

It is important to plan and design routes in terms of their function within the cycle route network, as well as responding to the differing requirements of other users. In general, the strategic cycle route network benefits from a greater degree of separation from other modes in order to offer the highest level of service to cyclists.

The Importance of Context

Roads and streets are generally dominated by the requirements of motor traffic, which demands a certain amount of space in which to operate safely, for parking, and to minimise delays. These aspects are generally associated with a 'movement' function.

Pedestrians and cyclists also have requirements for safe movement, places to sit and parking for bicycles. The needs of non-motorised users are predominantly about the 'place' function of roads and streets, although on busier roads and junctions cyclists also need to be able to travel at speed and in safety in a similar manner to motor traffic.

If the basic requirements for non-motorised traffic are not met, the transport system as a whole suffers. Footways that are narrow and congested, cluttered with signs and other street furniture, streets that are too busy and dangerous for residents to enjoy spending time in will all generate more motor traffic simply because travelling on foot or bicycle is unpleasant or hazardous.

If we neglect the 'place' function of residential streets and local centres, strategic transport corridors become congested with car traffic doing very local short trips. The most successful places offer safe access from the surrounding area and space for people to spend time outside in comfort and safety doing a variety of activities, therefore spending more time and money locally.

The context is very important when selecting the type of cycle infrastructure. The appropriate infrastructure will depend on the wider context of a particular location to reflect the dominant function of the street as a whole. For example Victoria Square lies at the very heart of the city centre where lots of cycle and pedestrian routes cross, but its primary function is as a 'place':

- City centre shopping streets where the primary users are pedestrians. Other vehicles, including cycles, should operate as close to walking pace as possible and be prepared to give way when they enter vehicle restricted areas. Being able to use the whole width between buildings can help reduce potential for conflict. Traffic within the area bounded by the Queensway is primarily entering for access to parking and deliveries so there is no requirement for speeds above 20mph, reducing the need to provide physically separated infrastructure for different modes.

- Local centres that sit on main roads such as Kings Heath, Handsworth or Acocks Green need a good balance between 'place' and 'movement' functions. The optimum design treatment may be to reduce traffic speeds to enable cycling on the carriageway and to provide opportunities for pedestrians and cyclists to cross main roads safely to reach local attractors. Wider footways offer better opportunities for people to spend time, on public benches or street cafes, and this activity helps to modify user behaviour, reinforcing lower speeds. This may require moving parking to side streets or formalising it into bays. Restricting turning, parking and loading activities can help to improve local safety by reducing the number of conflicting vehicle movements, making it easier for drivers, cyclists and pedestrians to take in the range of activities.
- The multiple requirements of bus stops, loading bays, parking bays, crossings and frequent side roads that are typical in local centres do not offer good conditions in which to provide continuous fully segregated cycle tracks, but cyclists may need specific assistance at places within the street such as early start signals or a bus stop bypass.
- In residential areas, the principle of 'filtered permeability' can be used to offer short cuts and through routes for cyclists on tracks that are unavailable to motor traffic, although the streets themselves should also have low speed limits to protect residents, especially children.
- In industrial areas there is a high percentage of HGV traffic and the geometry (wide roads and sweeping corners) required to accommodate this enables higher speeds by other vehicles. The combination of high speeds and HGV traffic suggests greater segregation is required for cyclists even though the flows of traffic may be low. This situation also occurs in some local centres that are close to industrial areas or motorway junctions.
- Off-road and leisure routes typically use surfaces that cyclists share with pedestrians, with the expectation that most cyclists will modify their behaviour when pedestrians are present.
- Off road tracks within the highway are required where there are high speeds or flows of motor traffic and should generally be fully separate from pedestrians unless pedestrian use is very low. On busy corridors with few frontages and infrequent side roads, motor traffic speeds will naturally be faster and cyclists and pedestrians will require greater separation from motor traffic. On roads such as Nechells Parkway with few frontages, the number of cyclists is always likely to exceed the occasional pedestrian traffic and there is no need for separation of pedestrians and cyclists on the track itself.

The overall width available, the intensity of use and the relative speeds of the different types of user are critical factors where cyclists share a surface with other modes.

The aim should be to reduce the speed differential as far as possible, and to eliminate or control conflicting movements at busy junctions and crossings.

If this cannot be achieved, there is an increased necessity to provide fully separate facilities for each mode.

	MORE SEPARATION →		MORE INTEGRATION
ON-CARRIAGEWAY			
OFF-CARRIAGEWAY / ON-HIGHWAY			
OFF-HIGHWAY			

Different options for cycle route provision (Transport for London)

The Importance of Adaptability

Facilities that are adequate for a small number of cyclists may need to be adapted as demand increases. There is an ambition for more 'Dutch style' facilities, but successful operation of this type of infrastructure relies to some extent on public acceptance of priority for cyclists at side roads and compliance with car parking regulations. This may be problematic in parts of the city where there is high demand for road space, habitual parking on footways and other vacant spaces regardless of posted restrictions, and where pedestrians and motorists significantly outnumber cyclists.

As the number of cyclists increases, there is greater justification for providing more road space and giving additional time at traffic signals and crossings. Experience in cities such as London, Berlin and New York suggests that the rate of increase quickly gathers pace as cyclists start to form a significant part of the traffic. Birmingham is currently somewhat behind these cities, but the growth in cycling over the last five years suggests significant latent demand.

The **Strategic Network** is for moving people through the area efficiently, serving the main transport nodes around the city and nearby regional destinations. It comprises of main road routes and parallel routes that form other corridors near to main roads. Strategic radial routes will typically converge on the city centre but may be up to 1km apart at the edge of the city, so some connecting routes are required to ensure efficient movement. Multiple centres of activity such as local district centres, suburban business, industrial and retail parks need to be connected into this strategic network. The strategic network is important because it enables more people to travel to key destinations, boosting the economic vitality of the city. The strategic network should also provide opportunities to combine cycling with other modes of transport for longer trips.

The **Local Network** is a finer mesh of routes, typically 250m to 400m apart, offering coherent ways to navigate to local destinations using quieter roads and off road links, with safe ways to cross the busiest roads. These routes serve local schools, shops, housing estates, suburban stations and other destinations. The emphasis on these routes is to address issues that compromise safety or make cycling unattractive, such as busy road crossings or extensive diversions due to one way systems or physical barriers such as canal, rail and river crossings. The local network is important because it helps to address traffic growth and road safety across residential areas by providing an alternative to numerous short local car journeys that have a big impact on minor neighbourhood roads.

The **Green Route Network** is made up of off road trails and quiet roads that provide an attractive environment for cycling. While such trails may be used for all types of trips to key destinations, the design objective may also be entirely to stimulate new trips by providing a largely traffic-free route in attractive surroundings. For many users, the act of cycling will be the sole function of the route. The leisure network is important as a venue for low-cost exercise, local tourism and healthy living. The 'Changing Gear' report particularly emphasises the potential of the extensive canal towpaths and green spaces in Birmingham as a leisure and tourism asset.

Interchanges. The bicycle is not suitable for every journey, but it can easily be combined with car, bus, rail and tram providing there are suitable facilities for 'park and ride', including options for cycle hire. This gives people much greater flexibility in using the whole transport network, leading to overall efficiencies.

In practice these functional distinctions are not so clear cut, but offer a conceptual framework that can be used to think about which of the core principles of design are most important on a given route.

Five Core Principles

The five widely accepted core principles for all cycle routes taken from the original Dutc guidance are:

- **Safety**. Routes should be safe to use and should feel safe for all users. 'Feeling safe' is sometimes referred to as subjective safety, and includes feelings of vulnerability to crime as well as fear of traffic danger (regardless of whether there is an actual record of crime or injury accidents). Cycling is generally a safe activity and there are few accident clusters within the city, however fear of traffic danger is the major deterrent to more people cycling[1]. Routes along busy and/or high speed roads should therefore offer separation from motor traffic where possible. Routes away from roads, in open spaces and in subways should have good visibility and lighting. The fear of crime affecting personal security is the major deterrent to walking, less so for cycling[1] compared to traffic danger. Subways that are now generally regarded as poor provision for pedestrians (due to fear of crime) may therefore still be valued by cyclists if they are well designed and offer a traffic free non-stop route through a complex junction.

- **Directness**. Routes should connect origin and destination using the least distance and least delay as possible, by minimising the requirement to stop at junctions and crossings. The alignment should generally cover the minimum distance between two points, however it is sometimes advantageous to avoid steep gradients or major junctions by using an alternative route that is slightly longer but more convenient and easy to use. For example, crossing the ring road is a barrier to cycling in Birmingham due to the large and complex junctions, but cyclists and pedestrians may have options to cross on link sections away from high capacity multi-lane roundabouts.

- **Coherence**. A network may comprise of many different elements but there should always be continuous provision, with no 'gaps' at difficult locations. This is one of the most important issues to address, because routes that are discontinued due to a major barrier such as a main road crossing or width constraint are of limited value. Clear signing is particularly important where cycle routes use minor roads and tracks that are not signed for other traffic. Coherence involves the whole journey, including easy access to secure cycle parking at home and at the destination. Highway improvement works are often focussed on a particular location, but there should be an underlying plan for phased implementation to build up a coherent route over time.

- **Attractiveness**. Infrastructure should be attractive to the intended users, for example wide enough to cycle side by side, with no sharp corners or restricted sightlines and easy to follow. Routes should generally aim to cater for a wide range of cycling abilities, safe enough for slower cyclists but still convenient for experienced and faster cyclists.

- **Comfort.** Routes should be physically comfortable, with a good quality surface. Riding in traffic can be stressful, especially if the intended manoeuvre is unclear, has many obstacles or is poorly signed. Designs should therefore be mentally comfortable with clarity at junctions, protection from opposing traffic

[1] Understanding Walking and Cycling, Pooley et al, Lancaster University, 2011

movements, separation from pedestrians and be clear of street furniture. Routes designed for leisure cycling should be able to accommodate cycling two abreast, while on-carriageway commuter facilities should ideally provide sufficient width for a cyclist to overtake another cyclist without having to move into an adjacent motor traffic lane.

The experience in London, New York and Copenhagen, all of which have seen a rapid increase in cycling, suggest that a sixth criteria of '**Adaptability**' should be added to enable cycle provision to be revised on a regular basis to cater for increased demand and the changing function of roads and streets over time. In each city, facilities that were adequate for a small amount of cycling have become overwhelmed as numbers increased, and roads that were once dominated by moving car traffic have become more important as 'places'. This type of evolution is necessary, for example dismantling the Queensway inner ring road at the Bullring would have been unthinkable in the 1980s but became inevitable for the expansion of the city centre when the road and its traffic became a barrier to growth rather than an asset.

Width of a cyclist

A moving cyclist travelling in a straight line has an effective width (sometimes referred to as the dynamic envelope) of 1.0m, which is the shoulder width of the cyclist plus a small (0.2m) allowance for deviations from a straight path in order to maintain balance (See Figure 2). At very low speeds of under 5mph on uphill gradients and near junctions, the 'wobble' required to maintain balance is exaggerated (up to 0.8m) and additional width is recommended. Where there are metal drain gulleys at the edge of the carriageway, cyclists need sufficient space to avoid them.

Child trailers, tricycles, three wheeled recumbent cycles and hand-cycles for people with disabilities generally have an axle width of around 0.9m. The additional width and length of non-standard cycles should be considered to ensure infrastructure is accessible to a wide range of users.

Allowing for the wobble-factor and a 0.5m separation between cyclists, Figure 2 illustrates a 2.5m dynamic envelope for two side-by-side cyclists.

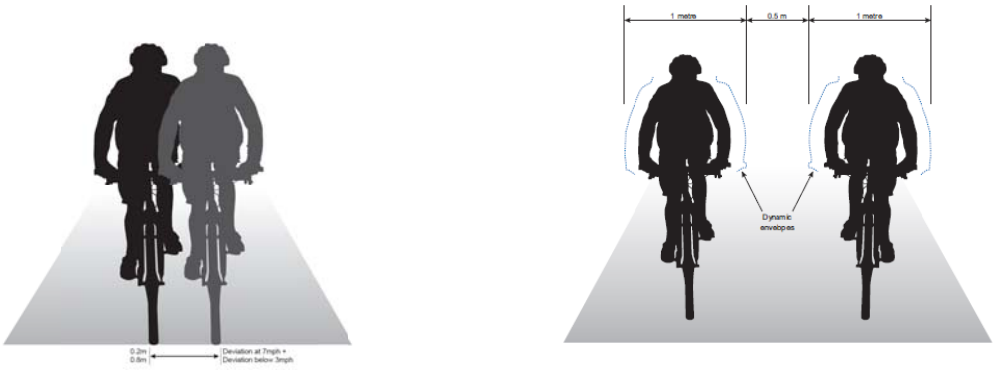


Figure 2: Dynamic envelope of cyclists[2].

[2] Local Transport Note 2-08, Cycle Infrastructure Design

Distance to fixed objects

Where a cycle track or lane is bounded by a solid vertical feature such as a wall, fence or hedge, cyclists will require 1.0m clearance (from their centre line (tyre)) to avoid hitting it. This clearance is reduced to about 0.25m for a smaller upstand such as a low kerb (Table 1).

As with motor vehicles, cyclists require some additional width at bends and corners to enable them to lean into a corner and to maintain momentum. Superelevation is not required on corners but adverse camber should be avoided.

Minimum design distances to fixed objects	
Distance from wheel (centre of cyclist)	Object
0.25m	Kerb <50mm
0.50m	Kerb >50mm
0.75m	Street furniture: sign pole, lamp column etc
1.0m	Wall, railing, bridge parapet, parked vehicle

Table 1: Separation from fixed objects.

Distance to other traffic

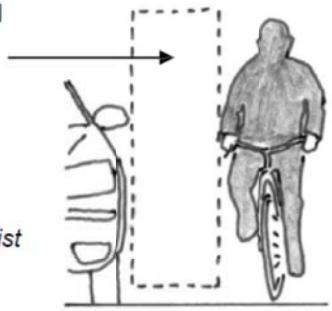
TRL research has shown that, under test conditions, nearly half the cyclists studied felt unsafe when cars travelling at 20mph passed them with a clearance of 0.95m. However, Dutch research has established that motorists driving at this speed are willing to overtake cyclists leaving a clearance of only 0.85m. This distance increases to 1.05m when passing at 30mph. Suggested minimum separation from overtaking traffic[3] is shown below in Figure 3.

Figure 3: Separation from passing vehicles

Minimum clearance (not regarded by all cyclists as safe – see text) between cyclist and overtaking traffic:

0.85m ≤ 20mph
1.05m = 30mph

Note: these measurements are taken between the motor vehicle and the cyclist not the dynamic envelope



Design minimum safe passing distance (measured from *outside* of cyclist's dynamic envelope)	
20mph	1.0m
30mph	1.5m

[3] Cycling England Design Portfolio

These distances are widely adopted throughout Europe, for example it is written into French law that drivers overtaking cyclists should give clearances of at least 1.0m and 1.5m at 30kmh (19mph) and 50kmh (31mph) respectively.

General Traffic Lane Widths

A common issue when retrofitting cycle facilities in the UK is that a localised narrowing such as a pedestrian refuge, and also general lane widths typically between 3.2m and 3.9m are wide enough for a motorist to overtake a cyclist without crossing the centre line, but without the 1.0m to 1.5m clearance that makes it feel safe and comfortable. This lane width is also hazardous when HGV traffic attempts to overtake without crossing the centre line. TRL studies have shown that drivers generally use the centre line as their primary reference point for adopting road position.

For this reason, cycling within a shared carriageway (i.e. no cycle lanes) should generally be accommodated by either 3.0m lanes (or less) that require drivers to consciously overtake by moving into an opposing lane or centre hatching, or lanes of 4.0m width (or more) so that drivers can overtake within the lane and leave adequate clearance. These widths also enable cyclists to safely adopt the 'primary' and 'secondary' riding positions that are taught in Bikeability training (Figure 4).

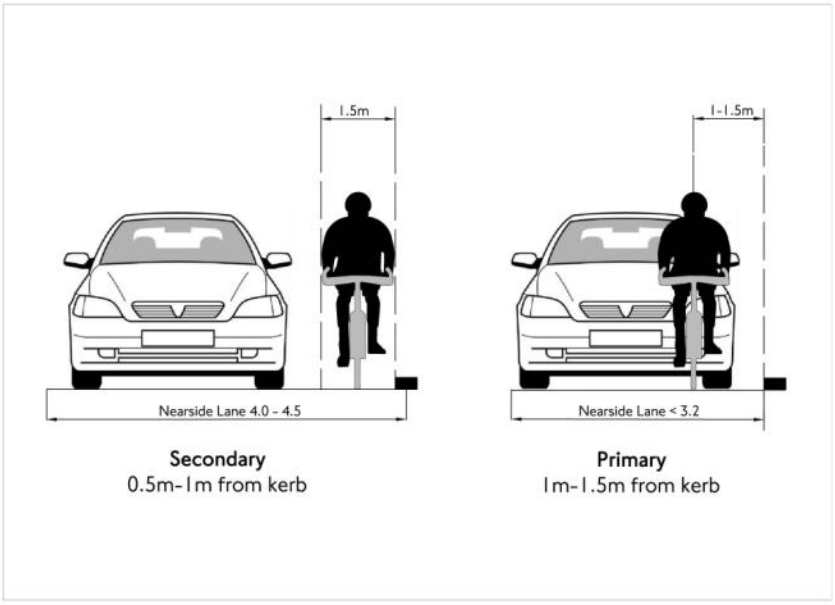


Figure 4: Primary and Secondary positions

In predominantly residential areas that also carry significant volumes of traffic at peak times it may be helpful to include 'throttle' features that prohibit access to wider vehicles and provide a 'gateway' to remind drivers that they are entering an area where lower speeds and more pedestrian and cycle activity are expected.

Figure 5 provides an indication of what overall carriageway widths can accommodate and Figure 6 illustrates the size of vehicles that individual traffic lane widths can accommodate. Widths pertaining to trunk roads are given in TD27, although it should be noted that TD50 permits lane widths as narrow as 2.25m in certain circumstances on the approaches to traffic signal stop lines. Further guidance on traffic lane widths is given in Manual for Streets 2.

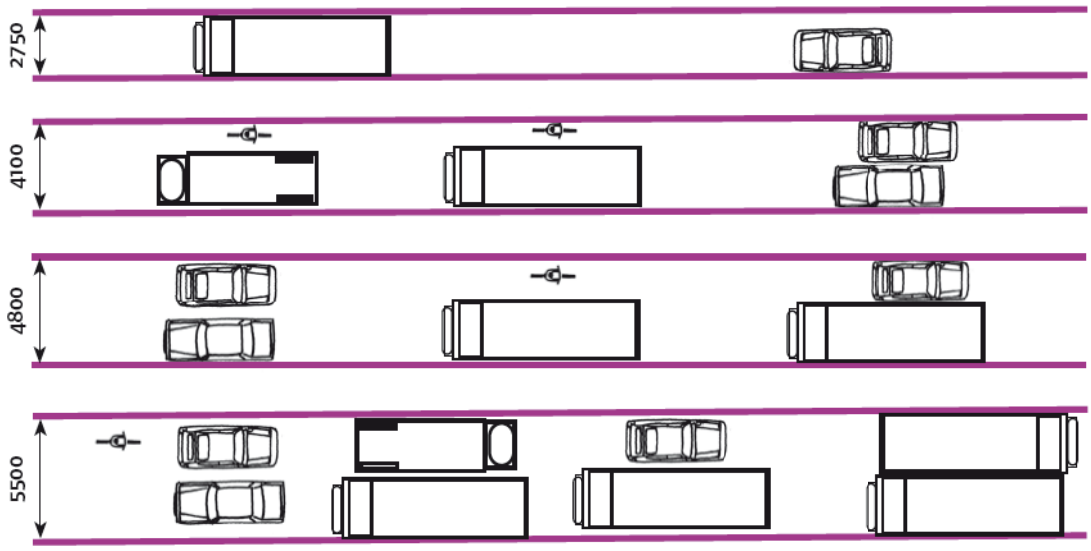


Figure 5 - Illustration of what various carriageway widths can accommodate[4]

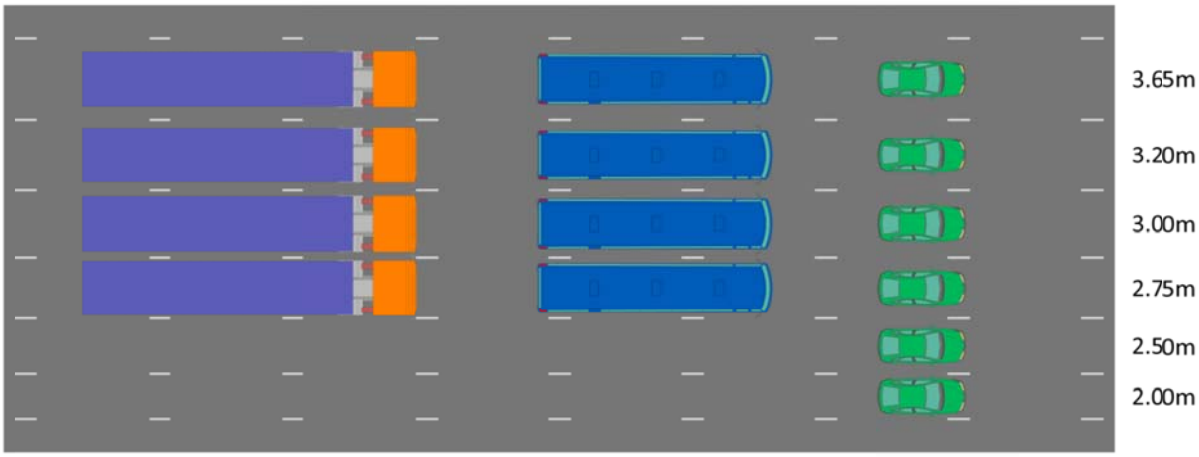


Figure 6 - Vehicles and Lane Widths[5]

Whilst traffic lane widths of 3.65m (metrication of 12 feet) have often been provided as standard in the United Kingdom, lane widths of 3.0 metres have been used in many parts of the country on urban roads for some time, and can successfully accommodate most typical vehicles (including HGVs) at speeds up to 40mph.[6]

Where flows of large vehicles are low, and speeds are modest (less than 35mph), lane widths as narrow as 2.75m can accommodate car traffic comfortably. Larger vehicles can pass one another at this width at lower speed with care, although some drivers may choose to encroach slightly outside of lanes to pass (i.e. into an advisory cycle lane).

Where general lane widths exceed these values, designers should take the opportunity to reallocate space to walking and/or cycling. Where lane widths are in the critical range of

[4] Manual for Streets

[5] Cardiff Cycle Design Guide

[6] Transport and the Urban Environment, IHT, 1997

3.2m to 3.9m, conditions will be unsuitable for cycling on the carriageway unless traffic speeds and volumes are sufficiently low for drivers to cross into the opposing lane to pass a cyclist comfortably.

New developments should either provide sufficient carriageway width for safe on-carriageway cycling within lanes, or off-carriageway cycle tracks (with appropriate provision for crossing the carriageway where necessary and without frequent delays).

Physical width restrictions (in association with a TRO restriction) can be used to exclude larger vehicles from using residential areas with narrow roads as through routes. Access for emergency vehicles (such as the gate in this photograph) must be retained.

Road closures (which may be for traffic/speed management or crime prevention, or to prevent traffic from using residential service roads) often make roads more attractive to cyclists due to the consequent reduction in traffic. Cycle 'gaps' at road closures offer 'filtered permeability' for cyclists where motorised through traffic is being restricted and should be incorporated into the design of all closures unless there is a safety issue.

Width requirements of infrastructure types

The following section explores the width of different infrastructure, taking into account the conditions that are typical in Birmingham.

Table 2 provides a summary of the widths required by the elements that typically make up a cycle route. Because of the need for greater separation as traffic speeds and volumes increase, the table includes options for higher speed roads, and also for roads with high frequency of buses or HGV traffic. The widths for off-carriageway surfaces refer to usable width bearing in mind additional clearance required for vertical features such as walls and traffic sign poles. The widths for on carriageway refer to distances to middle of the white lines.

Table 2: Widths of Infrastructure

Design feature	Desired width	Minimum acceptable width*	Notes
Cycle Tracks and Footways			
Green Route or canal towpath (two-way shared with pedestrians)	2.5m unsegregated 3.0m segregated	2.0m	Width of 2.5m used in some public open space to help reduce cycle speeds and visual impact. Canal towpaths around Birmingham are typically constrained by adjacent structures so ideal width seldom possible.
Footway (pedestrian only space or pedestrian side of segregated facility)	>2.0	1.8m	Footways in busy areas require additional width where possible to offer a good level of service.
Unsegregated footway/cycle track (2-way) within highway with full kerb height to carriageway	3.0m	2.0m	2.0m only acceptable in lightly used areas with little pedestrian activity or at a pinch point. Buffer zone of 0.5m required adjacent to car parking.
Cycle only track (or cycle side of segregated facility)	2.0m	1.5m	It is important that there is sufficient width to overtake/ride two abreast especially where it is impossible to leave the facility due to level difference or kerbed barrier.
Hybrid (terraced) 1 way track adjacent to carriageway and footway	2.5m	1.5m	It is important that there is sufficient width to overtake/ride two abreast especially where it is impossible to leave the facility due to level difference or kerbed barrier.

Design feature	Desired width	Minimum acceptable width*	Notes
Cycle Lanes			
Advisory cycle lane with flow	1.8m	1.25m	1.3m lane can typically be used on one side of a standard 7.3m carriageway where speed limit is 30 mph. 1.5m lane usually adequate within 30mph roads. 1.25 acceptable for nearside advisory lead in lane to advanced stop line if available width is restricted.
Mandatory cycle lane with flow	2.0m	1.25m	2.0m lane allows sufficient space for overtaking or riding two abreast within the lane on roads with higher traffic speeds/flows.
Contraflow cycle lanes (advisory or mandatory)	2.5m	1.5m*	*flows <1500 vehicles per day, average speed <25mph
Protected mandatory cycle lane (Light segregation)	2.3m	1.8m	Includes 0.3m to accommodate separation feature.
All Purpose Traffic Lanes			
Traffic lane (cars only, speed limit 20/30mph)	3.0m	2.75m	2.5m only at offside queuing lanes where there is an adjacent flared lane
Traffic lane (bus route or >8% HGVs, or speed limit 40mph)	3.25m	3.0m	3.65m width on routes not used by cyclists such as flyovers and underpasses.
2-way traffic lane (no centre line) between advisory cycle lanes	5.5m	4.0m	Only where 12 hour flow <4000 vehicles and/or peak hour <500 vehicles with minimal HGV/Bus traffic.

Design feature	Desired width	Minimum acceptable width*	Notes
Other Features			
Bus Lane shared with cyclists	4.5m	3.0m	
Buffer Zones and Verges (kerb segregation feature, hatched area where cycle facility adjacent to parking bays, verge between cycle track and carriageway with 40mph+ speed limit)	>0.5m	0.5m	Increased separation required where traffic speeds and volumes are greatest.
Central reserve at uncontrolled crossing	>2.5m	2.0m	Typical bicycle length is 1.8m
Car parking bay	2.0m	2.0m	
Disabled parking bay	2.7m	2.0m	
Loading bay	2.7m	2.7m	Minimal width must be achieved for bay to be enforceable.
Street furniture (sign poles, lamp columns etc) distance from kerb	Locate off the cycle track or footway	0.5m	Street furniture should not be placed within cycle tracks and footways if possible.

**The minimum widths should not be used on steep gradients where slow moving uphill cyclists require additional width for balance and control and fast moving downhill cyclists require additional clearance from objects and other users.*

Improving conditions on existing highways

The design sections of this document set out some of the ideal solutions for new build schemes and for redesigning whole streets.

Site-specific and budget constraints generally make it difficult to achieve the ideal cycling facility on existing roads. The designer may need to look at identifying parallel routes on quieter roads, opportunities to exclude HGV traffic or to reduce the volume of traffic. Such interventions could include (but are not limited to):

- Reduce vehicle capacity by removing vehicular lanes in order to increase available highway width for cyclists.
- Limit use by large vehicles in order to achieve narrow lane running for general traffic
- Inset, remove or relocate parking and loading bays
- Inset bus stops
- Make links one-way (but retain 2 way cycling)
- Alter or narrow footway configurations as appropriate
- Introduce shuttle working
- Reduce vehicle speed limits or install traffic calming such that links require less segregated cycling infrastructure
- Reduce vehicle volumes through point closures and 'filtered permeability' such that links require reduced specific cycling infrastructure
- Mixed provision along a given link such that it transitions between different cycle link types as appropriate.

Table 3 below sets out the options for allocating carriageway space over the range of highway widths and conditions typically encountered within Birmingham.

Table 3: Cycle Facilities within Carriageways (see also Appendix A for larger version)

		Below 5.5m	5.5-6.0m	6.0-6.5m	6.5-7.0m	7.0-7.5m	7.5-8.0m	8.0-8.5m	8.5-9.0m	9.0-9.5m	9.5-10.0m	10.0-10.5m	10.5-11.0m	11.0-11.5m	11.5-12.0m	12.0m and above
GENERAL (INC LOCAL CENTRES)	BUSY	Unlikely scenario	Centre marking only		Centre marking only, consider narrow hatching at widths approaching 7.0m	Centre hatching and 3.0m lanes	Centre hatching and 3.0m lanes OR 2.0m ghost island and 2.75m lanes if heavy right turns	2.0-2.5m ghost island and 3.0-3.25m lanes		2.5m ghost island and 3.25m lanes	Consider other options to avoid overly-wide traffic lanes - eg parking lay-bys, cycle lanes, central medians, wider footways					
	QUIET	Omit centre marking	Centre marking only	Centre marking only, consider narrow hatching at widths approaching 6.5m	Centre hatching and 2.75m lanes	Centre hatching and 2.75m or 3.0m lanes	Centre hatching and 3.0m lanes OR 2.0m ghost island and 2.75m lanes	2.0-2.5m ghost island and 3.0-3.25m lanes		Consider other options to avoid overly-wide traffic lanes - eg parking lay-bys, cycle lanes, central medians, wider footways						
CYCLE LANES	BUSY	No cycle lanes	No cycle lanes	No cycle lanes	Consider centre hatching options to create 'virtual' cycle lanes	Consider centre hatching options to create 'virtual' cycle lanes, possible narrow cycle lead-in to ASL in one direction only	Consider centre hatching options to create 'virtual' cycle lanes, or 1.5m cycle lane in one direction	Consider centre hatching options to create 'virtual' cycle lanes, or 1.8m cycle lane in one direction	1.3m advisory lanes in both directions or wider lane in one direction only	1.5m cycle lane and 3.0m traffic lane both ways	1.8m cycle lane and 3.0m traffic lane both ways	1.8m cycle lane and 3.25m traffic lane both ways	1.8m cycle lane and 3.0m traffic lane both ways with centre hatching	1.8m cycle lane and 3.0m traffic lane both ways with centre hatching, or narrower lanes with 2.0m ghost island	1.8-2.0m cycle lane and 3.0-3.25m traffic lane both ways, with 2.0-2.5m ghost island	
	QUIET	No cycle lanes	No cycle lanes	Consider centre hatching options to create 'virtual' cycle lanes	Consider centre hatching options to create 'virtual' cycle lanes, possible narrow cycle lead-in to ASL in one direction only	Consider centre hatching options to create 'virtual' cycle lanes, or 1.5m cycle lane in one direction	Consider centre hatching options to create 'virtual' cycle lanes, or 1.8m cycle lane in one direction	1.3m advisory lanes in both directions or wider lane in one direction only	1.5m cycle lane and 2.75m traffic lane both ways	1.8m cycle lane and 2.75m traffic lane both ways	1.8m cycle lane and 3.0m traffic lane both ways	1.8m cycle lane and 2.75m traffic lane both ways with centre hatching	1.8m cycle lane and 2.75-3.0m traffic lane both ways with centre hatching, or narrower lanes with 2.0m ghost island	1.8-2.0m cycle lane and 2.75-3.0m traffic lane both ways with 2.0-2.5m ghost island	
BUS LANES	BUSY	No bus lanes	No bus lanes	No bus lanes	No bus lanes	No bus lanes	No bus lanes	No bus lanes	No bus lanes	3.0m bus lane if cyclists in opposite direction can be accommodated off-c/way**	3.0m bus lane, ideally cyclists in opposite direction should be accommodated off-c/way**	3.0m bus lane, cyclists in opposite direction accommodated off-c/way OR with wide lane containing cycle symbols**	3.0m bus lane with 1.5m cycle lane in opposite direction**	3.25m bus lane with 1.5-1.8m cycle lane in opposite direction**	3.5m bus lane, 3.0-3.25m traffic lanes, 1.8m cycle lane**	Wide bus lane in one direction OR 3.0m bus lane in one direction with centre hatching OR 3.0m bus lanes both ways**
	QUIET	Bus lanes unlikely to be justified on quieter roads														
										** Note - Traffic lane adjacent to a bus lane can be reduced to 2.75m if there is not a significant proportion of HGVs.						
DUAL C/WAY	BUSY (above 1200-1400veh/hr)	Unlikely scenario	Unlikely scenario	Two lanes with centre line marking only	Wide inside lane with cycle symbols along channel	Wide inside lane with cycle symbols along channel, consider narrow cycle lanes esp at lead-in to ASLs	1.5m cycle lane with two 3.0m traffic lanes	1.5-1.8m cycle lane with two 3.0-3.25m traffic lanes, consider buffer or light segregation	1.8-2.0m cycle lane with two 3.0-3.25m traffic lanes, with buffer or light segregation	Consider other options to avoid overly-wide traffic lanes - eg parking lay-bys, bus lanes, or wider footways / central reserves						
	BUSY (below 1200-1400veh/hr)	Unlikely scenario	Unlikely scenario	Convert inside lane to bus lane (3.25m preferred if off-peak parking), with one 3.0-3.25m traffic lane	Convert inside lane to bus lane 3.25-3.5m, with one 3.0-3.25m traffic lane	Convert inside lane to bus lane up to 4.5m wide with traffic lane up to 3.5m wide, consider advisory cycle lane within bus lane		Convert inside lane to bus lane 3.0-3.5m, with 3.0-3.25m traffic lane and separate cycle track on inside, consider buffer or light segregation		Bus lane 3.0-3.5m, with two 3.0-3.25m lanes, OR 3.5m bus lane and one traffic lane and separate cycle track on inside with buffer or light segregation		Unlikely scenario	Unlikely scenario	Unlikely scenario	Unlikely scenario	Unlikely scenario
	QUIET	Unlikely scenario	Convert inside lane to cycle lane with buffer OR 2.0m parking bay with wide single lane inc cycle symbols		Convert inside lane to 2.0m parking bay and 1.5-1.8m cycle lane, with one 3.0m traffic lane	Convert inside lane to 2.0m parking bay and 1.5-1.8m cycle lane with buffer or light segregation, and one 3.0m traffic lane	Unlikely scenario	Unlikely scenario	Unlikely scenario	Unlikely scenario	Unlikely scenario	Unlikely scenario	Unlikely scenario	Unlikely scenario	Unlikely scenario	Unlikely scenario

Notes:

'Busy' refers to A Roads, or to B (and occasionally Unclassified) Roads with significant number of buses or HGVs.

'Quiet' refers to most Unclassified Roads, or to 'B' Roads with few buses or HGVs.

If parking is retained then deduct 2.0m from overall c/way width (or 4.0m for parking both sides), plus width of buffer zone 0.5-1.0m if desired.

Information shown is for guidance only and designers should still consider local conditions and carry out stakeholder and public consultations on any proposals.

Any lane widths less than those shown in the table would require agreement with the Traffic Manager.

Facility selection in relation to traffic speeds and volumes

A choice of design options is available on any particular connection notwithstanding physical constraints, budget and operational requirements of the wider network. The designer may choose to integrate cyclists with motor traffic on the carriageway, or look to separate them from other users by providing cycle tracks within the highway or by creating a completely separate route away from the highway.

Table 4: Flow / Speed Table:

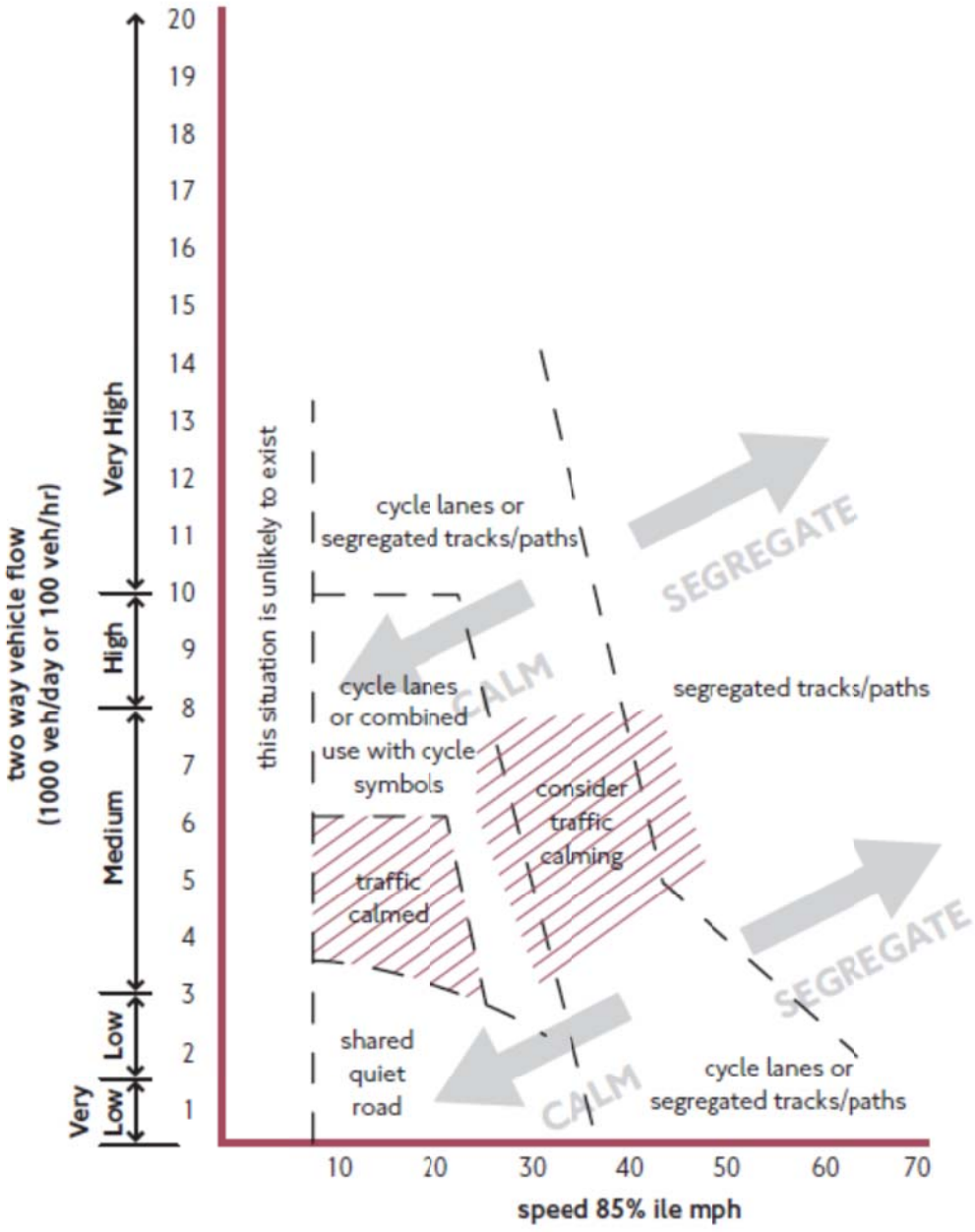
Flow	**85th percentile speed**			
	<20 mph **Very Low**	**20 to 30 mph** **Low**	**30 to 40 mph** **Medium**	**>40 mph** **High**
Very Low **Less than 1,500 vpd,** **or 150 vph**	Quiet Street	Quiet Street	Cycle lanes	Cycle lanes or tracks
Low **1,500-3,000 vpd,** **or 150-300 vph**	Quiet Street	Quiet Street or Shared Use	Cycle tracks or lanes	Cycle lane or tracks
Medium **3,000-8,000 vpd,** **or 300-800 vph**	Cycle tracks or lanes	Cycle tracks or lanes	Cycle tracks or lanes	Cycle tracks
High **8,000-10,000 vpd,** **or 800-1,000 vph**	Cycle tracks or lanes	Cycle tracks or lanes	Cycle tracks or lanes	Cycle tracks
Very High **Greater than** **10,000 vpd**	Cycle tracks or lanes	Cycle tracks or lanes	Cycle tracks or lanes	Cycle tracks

Source: Adapted from London Cycle Design Standards (TfL, 2005)

Notes:

1. *vpd = number of motor vehicles in a 24 hour weekday.*
2. *vph = typical number of motor vehicles in a typical morning peak hour.*
3. *Where traffic speed/flow is low, the designer should aim to avoid the use of signs or markings specifically for cyclists.*
4. *Cycle lanes used in the higher speed/flow situations should provide good separation between cyclists and motorists. Wide cycle lanes or hatching can help here.*
5. *In congested areas, cycle lanes can be useful even when traffic speed is low.*

In general, where there is a high volume of traffic or fast moving traffic, it is advantageous to separate cyclists from motor traffic or undertake traffic management measures to reduce the volume and speed of traffic (see Figure 5).



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

Figure 5: Facility Selection (London Cycling Design Standards 2005)

Facility selection in relation to location

There are places on relatively high flow roads within city and district centres that also have a lot of pedestrian activity e.g. Broad St, Harborne and Kings Heath high streets. The aim in these areas is to reduce traffic speeds as far as possible to enhance safety for pedestrians and cyclists. These areas usually include frequent crossings, side roads, on-street loading,

busy bus stops, and in some cases kerbside car parking, all of which can make it difficult to provide any form of continuous cycle track or lane that gives any advantage to cyclists. They are sometimes called 'mixed priority' roads and streets.

Separate cycle facilities do not always work particularly well in such locations. Cycle lanes and tracks may be interrupted by bus stops, loading bays and parking. If kerbed facilities are installed to deter unlawful parking on a cycle track, this may act as a barrier or trip hazard for pedestrians.

An alternative way to better accommodate pedestrians and cyclists in district centres is through a combination of 'de-cluttering' to remove obstacles such as signs and other street furniture from footways, removing on street parking to widen the footway or formalising on-street parking into bays, reducing the carriageway width to single lane for through traffic and reducing speeds to 20mph. Local Transport Note 3-08, Mixed Priority: Practitioners Guide gives further advice on designs.

A 'shared space' approach using traffic calming measures and urban design helps to change the appearance and user behaviour, as in this example from Poynton, Cheshire where there are over 27,000 vehicles per day including 6% HGVs. The ultra-low-speed environment has helped to smooth the flow of traffic through the town so that the overall vehicle journey times have not increased. Because of the low speeds, motorists are more willing to stop to permit pedestrian crossing movements, even away from designated crossing points.

Poynton: Removal of street clutter, use of textured central margin and side bars to visually narrow carriageway while still providing adequate width for HGVs. Cyclists use the all-purpose carriageway but can enter the footway at-grade to stop at shops etc.

Birmingham City Council has identified the potential for extensive 20mph speed limits (see Figure 6), that would enable safer on-road cycling on residential roads and district shopping areas within the city. This is an important element of the cycling strategy because the way in which people use the streets changes significantly when traffic speeds are reduced. For cycling, 20mph roads may offer greater opportunities for quiet routes, exemptions from turning bans and unsegregated contraflow cycling, reducing the requirement for segregated cycling infrastructure.

The Chamberlain Clock at the centre of the Jewellery Quarter is dominated by motor traffic in contrast to Seven Dials in London where traffic management and lower speed limits have helped to increase the number of pedestrians and cyclists and returned it to being a local focal point.

In common with the core retail area in the city centre and local district centres, residential streets are also places where fully segregated facilities are of limited benefit. In new developments, there is some advantage in having separate cycle facilities that connect up culs de sac, making walking and cycling more attractive through the principle of 'filtered permeability'. This may also be desirable in older streets where through-traffic is a problem, by closing off an existing road but retaining a 'gap' for cyclists. Making areas less conveniently accessible to car traffic is an important part of encouraging more journeys on foot and by bicycle because this helps to ensure that there is a time advantage for cycling, as well as improving the safety and ambience of streets.

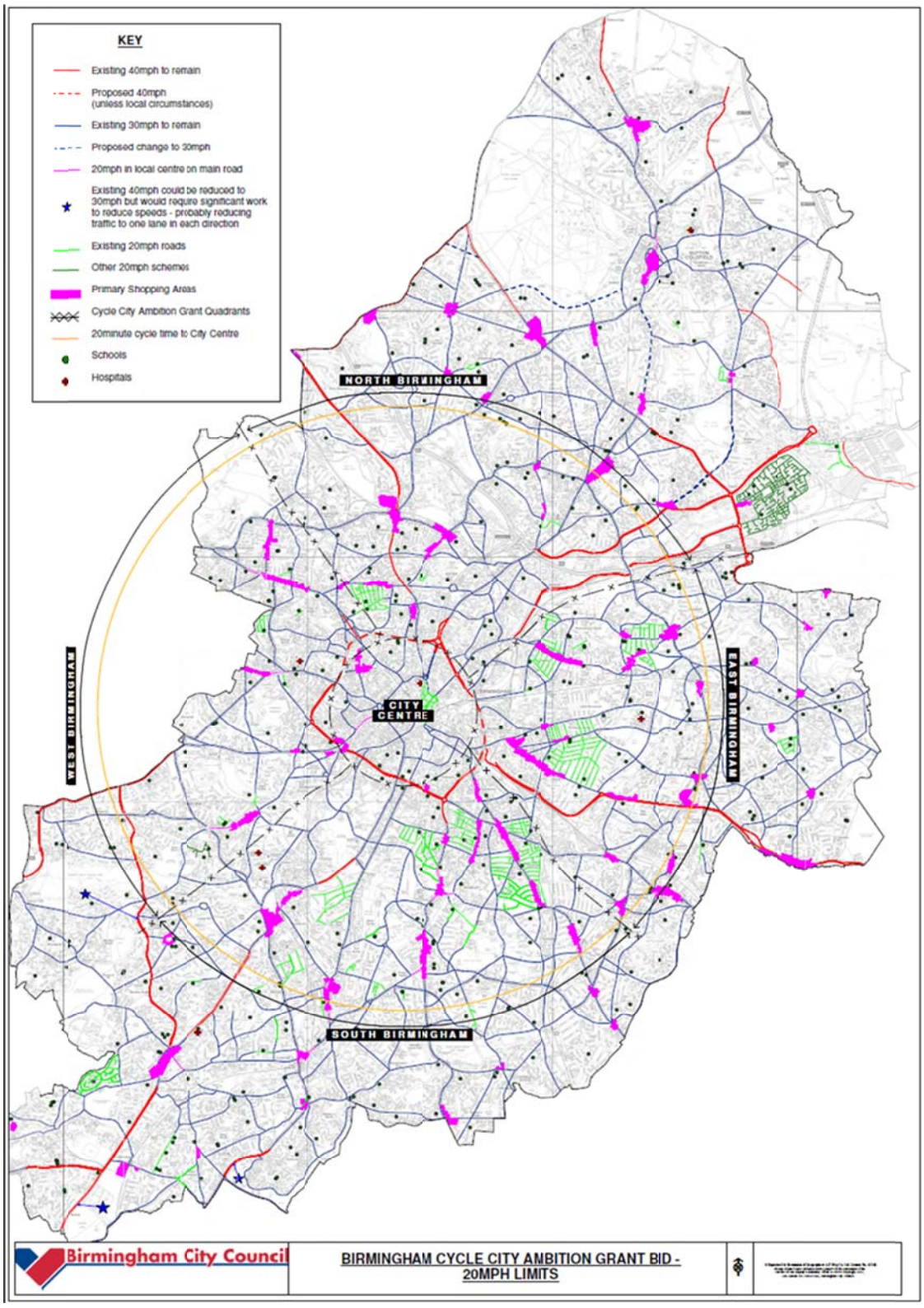


Figure 6: Proposed 20mph areas

The initial approach should always be to look at what measures can be introduced to address traffic speeds and flows on roads where this as part of the overall traffic management strategy for the city or locality, and then at what is the appropriate infrastructure for cycling. Failure to address strategic traffic management issues can result in expensive over-engineered cycle infrastructure that is unused because it is impossible to develop continuous safe facilities within existing traffic conditions.

Where the number of cyclists using a street exceeds the number of vehicles (e.g. Cheddar Rd on the Rea Valley route), it may be possible to introduce a 'cycle street' (similar in concept to a Home Zone), where the design of the street implies priority to pedestrians and cyclists.

Textured paving, narrow carriageway, greenery and limited forward visibility used to create low speed areas with priority for non-motorised users while retaining capacity of on-street residential parking. (DfT)

At the other extreme, roads and streets with few 'active frontages' (i.e. blank building walls or wide verges) tend to have higher speeds (regardless of the speed limit), relatively low pedestrian flows and few side roads and crossings. These areas are typically local distributor roads, parts of the ring road or sections of arterial roads running between local centres where 'movement' is the primary function. It is along these roads that segregation in the form of wide cycle lanes or cycle tracks is the most desirable form of provision for cyclists, including adequate separation at the busiest and most complex junctions.

3 Green Routes and Canal Towpaths

Description

Birmingham has a number of paths that are available for cycling that do not lie within highways. This includes routes through public open space, links and alleyways running between buildings (which may or may not be designated highway land), canal towpaths (usually owned and managed by the Canal and River Trust), and Green Routes and other paths and tracks within land owned and managed by the Council. Cyclists are also entitled to use bridleways and restricted byways that form a part of the public rights of way network, and may have permissive access to privately owned land such as educational campuses. There are various legal mechanisms that relate to access for pedal cycles including the Highways Act, Cycle Tracks Act and local Byelaws, and designers should always check on the local circumstances to determine the correct procedures.

Design Objectives

- Create a 2.0m wide space for cyclists to travel in one direction (2.5m for unsegregated two-way use shared with pedestrians). *These are the minimal requirements and should be increased to allow for overtaking on heavily used routes and for cycling two abreast on leisure routes*.
- Minimise stopping and starting (at crossings and junctions with carriageways) to smooth the flow of cyclists along the route.
- Provide sufficient width to overtake other cyclists and pedestrians without slowing down or leaving the surfaced facility.
- Provide centre line markings to divide opposing flows on heavily used routes.
- Provide separate space for cyclists and pedestrians where their movements are likely to conflict, or a shared surface width of at least 3.0m to enable users to pass at a safe and comfortable distance. There is a high speed differential between pedestrians and cyclists who may be going up to 7x faster. Where forward visibility is restricted (and at other places where there is a desire to moderate the speed of cyclists), a width of 2.5m is acceptable on the understanding that this will be less comfortable and convenient for all users at the busiest times.
- Provide adequate maintenance to periodically clear routes of fallen leaves and overhanging branches where they are bordered by trees and shrubs.
- Provide lighting for routes intended for year round commuter use (or provide a signed lit alternative route). Solar stud lighting is acceptable where street lighting is undesirable for environmental reasons.
- Minimum kerb radius of 6.0m at corners.
- Crossfall of up to 3% to facilitate drainage.
- Gradients of 5% preferred for ramps connecting to subways, canals etc (see also DfT ‘Inclusive Mobility’ guidance on this issue).
- For leisure routes, create a ‘memorable’ experience using sculpture, providing benches at viewpoints, and providing information about the locality (history, nature, nearby attractions).

Re-graded ramped access to Birmingham Canal Old Line towpath, sealed aggregate surface (but requires widening and removal of overhanging branches to bring up to cycle route standard)

Eroded gravel path on slope in Selly Oak Park. Sealed surface is more expensive but may have reduced overall costs when maintenance is considered

Design Principles

- **Convenient.** Direct, step and barrier free connections to the highway network.
- **Useable in all seasons**. Always use a sealed surface in urban areas to facilitate all-weather cycling and minimise maintenance costs. Provide lighting (or a lit alternative route) at commuting times.
- **Safe from crime.** Avoid (where possible) lengthy stretches that are not overlooked by adjacent properties or have no access points to help minimise personal security concerns. Keep a clear margin alongside the path free of vegetation to improve visibility and ensure that full surface width is available for users. Provide adequate lighting.

Riding surface

Highways standard machine laid tarmac offers the most durable and comfortable surface. A resin bonded aggregate finish may be preferred to give the appearance of a gravel path on canal towpaths and open spaces. Some 'luminous' products are now available that may be helpful in areas where street lighting is unacceptable due to environmental concerns.

Unsealed gravel surfacing is not recommended on steeper gradients as it is easily washed away and the resulting gulleys can be hazardous. Unsealed surfacing is also not suitable for regular commuting because it makes clothes and bicycles dirty, adding to the difficulty of cycling.

Lighting

Highways standard lighting can be used where this is desirable, particularly where there is a known risk of crime. However this is expensive to install and operate, and may be intrusive in residential areas. Solar LED studs have been used along sections of the Rea Valley Route to help mark out the edge of the path in dark conditions. These generally work well but can fail due to water ingress. The operating costs and maintenance liability should always be considered.

Managing Conflicts

Access Barriers. Access barriers are sometimes installed to prevent motorcycles getting onto cycle and pedestrian routes. These barriers often also exclude other users (hand-cycles, tandems, tricycles, child trailers, some wheelchairs and mobility scooters) and cause delays and inconvenience on popular routes. They should therefore be introduced only when there is a persistent problem of illegal access that cannot be resolved by enforcement.

Speed Humps. It can be helpful to add humps at junctions between shared routes and footpaths to remind users to slow down.

Speed hump at junction of footpath and shared path in a park.

Access barriers are not compatible with high volumes of cycle use and exclude people with child seats, trailers and mobility scooters.

There are many areas such as parks and Green Routes where unsegregated shared-use is the 'best' design solution that can be achieved, but where high levels of pedestrian activity are anticipated. Additional signs such as the one above can help to remind cyclists to ride with due consideration for others, particularly where pedestrian-only paths cross a shared path.

Common hazards

The main hazards for cyclists along link sections of a route are:

- Surface defects due to inadequate maintenance or poor quality construction such as potholes, loose slabs, poor drainage, fallen leaves.
- Insufficient space to overtake slower cyclists / pedestrians on shared paths.
- Meeting opposing cyclists/pedestrians at blind corners and other areas with poor forward visibility.

- Street furniture or vegetation within a track causing a width restriction and hazard in dark conditions.
- Crime and fear of crime due to restricted access points, poor visibility and lack of lighting.

Wheeling Ramps

Wheeling ramps may be required alongside steps where cycle access is being improved at an *existing* footbridge or stepped access to a route where space is restricted, they should not usually form part of the design of *new* infrastructure other than at building entrances such as basement cycle parks or at a new access point to an existing feature such as a towpath or Green Route. The ramp can be provided as a metal channel bolted to the step or by infilling the side of the steps to create a smooth ramp. The channel should normally be placed on the right hand side of the steps for 'upwards' movement (which enables the cycle to be carried on the right side of the body with the chain well away from clothing).

Simple concrete wheeling ramp to cycle parking at building entrance

Access from canal towpath at Cambridge St

Typical 'bolt on' metal channel on railway footbridge

Legal aspects of creating cycle routes away from roads

Urban footpath: An existing footpath may be suitable for shared use by cyclists and pedestrians as part of development of the cycle route network. This is typically

maintainable highway not adjacent to carriageway and not on the definitive map, with or without cycle prohibition order. There may be a need to allow cyclists and pedestrians to use part or the entire width.

Procedure - Cycle Tracks Act 1984 (CTA) to convert all [or part] to shared use

The Cycle Tracks Act 1984 states that a highway authority may designate "any footpath for which they are highway authority", or part of it, as a cycle track. There is no qualification of the footpath i.e. no mention of it being a 'definitive' footpath (appearing on the definitive footpath map) or an 'urban' footpath (surfaced highway as found in urban areas and created after the drawing up of the definitive map).This is interpreted as meaning that any footpath which forms part of the highway, whether or not surfaced or maintained by the highway authority, is a 'footpath' for the purposes of the CTA and should be converted by its application.

Separate planning consent is not needed since CTA 3(10) states that the local authority has the power to carry out any physical works necessary and that any change of use that would have constituted development within the meaning of the Town and Country planning Act 1971 is deemed to be granted under Part III of that Act.

However, if the footpath is not converted but the existing surface is widened such that the cycle track is created alongside and segregated from the existing footpath then the use of the CTA does not apply:

Note: It is generally considered that in these circumstances segregation by some form of physical delineation is appropriate. This is because cyclists have no 'right' to cycle on the remaining section of footway and without definition of 'their' path (by a white line etc.) are likely to do so. This also casts doubt on the value of retaining a narrow strip (often too narrow to walk upon) of the definitive footpath, when converting under the CTA, if the resulting user paths cannot be defined because of the chosen surface materials (e.g. crushed stone). This practice is sometime used to overcome objections that the creation of the cycle track will result in the removal of the footpath from the 'definitive map'.

The Town and Country Planning Act 1990 (TCP) s.55 (b) and the Town and Country Planning Act (General Permitted Development Order) 1995 (GPDO) (Part 13 A) give(s) a local highway authority the ability to maintain and improve a 'road' maintainable at public expense without the need to seek planning approval. The GPDO enables such an authority to 'improve' a highway by doing works immediately adjacent to the existing highway without the need to apply for planning approval. These abilities are interpreted as meaning that no statutory procedures have to be completed to create a cycle track alongside a surfaced urban footpath – see cover photograph for an example. It is, however, good practice to consult with existing users, local residents and adjoining landowners and give prior notification of carrying out the works to create the cycle track.

Any byelaw or order prohibiting cycling must be removed prior to (or in parallel with other procedures) the conversion of a footpath to a cycle track. Whilst, strictly speaking, this may not be necessary if a cycle track is to be created alongside the footpath, the presence of any form of prohibition, supported by signs to give it effect, can appear illogical and lead to confusion over user rights.

Naturally, it is also necessary for the highway authority to acquire the land either by purchasing it (compulsorily if required) or achieving a dedication to the highway from the owner. However, since the wording of any dedication is usually along the lines of (the

landowner) 'hereby freely dedicates the land shown coloured pink on the attached plan to the highway maintainable at public expense' it is not necessary to state the purpose for which the land is to be subsequently used i.e. as carriageway, footway or cycle track etc as this is determined by the authority. This is analogous to the highway authority purchasing land/taking a dedication to widen an existing carriageway and create a footway alongside it. Whilst the plans used for the transaction/dedication agreement could well be extracts from the scheme plans, it does not require further action to formally 'create the footway/additional carriageway in order to give the police the power to enforce offences under the Road Traffic Regulation Acts.

Similarly, agreements under Highways Act 1980 s38 between developers and highway authorities generally have similar wordings that confirm that the developers are owners of the land identified on the drawings and through the agreement are dedicating the land, shown on the drawings, to the highway maintainable at public expense. Such plans invariably indicate the nature of the works to be undertaken and, therefore, the future use of the land e.g. bridge, carriageway etc but again, there is no requirement to dedicate as one form of use and then for the authority to go through other procedures to establish the status of each element of the additions to the highway network.

Definitive Footpath: This is a footpath that is included on the definitive map of public rights of way. There may be a requirement to widen it and/or convert it for shared use by cyclists and pedestrians.

Procedure - Cycle Tracks Act 1984 (to convert all or part of footpath to shared use).

The procedure is the same as for other urban footpaths. If the land is not owned by the highway authority it must ensure that the landowner has consented in writing [CTA s3] and any land lying outside the width of the existing footpath which needs to be acquired for the purposes of constructing the cycle track has been dedicated to/purchased by the highway authority to enable widening to take place.

Where it is proposed that the line of a public footpath is to be diverted to achieve a more appropriate alignment so that it may then be converted to a cycle track leaving no isolated pedestrian rights of way, the diversion of the footpath should be confirmed before the order is made under the CTA.

A landowner may give permission for cyclists to use land occupied by a definitive footpath to avoid the use of the Cycle Tracks Act or because it wishes to retain control of the land. However, it is understood that the DfT takes the view that if the landowner is also the highway authority it should abide by the spirit of the Act and make an order. If the authority does not wish the land to become highway, for example where it runs through a public park or the long term use of the land is undecided, then it is advised to publish details of its proposals and consult with all stakeholders as though it were making an order.

Public footpath which terminates at the rear of a footway and conversion of the footway crossing (to enable cyclists to reach the carriageway)

Procedure - Cycle Tracks Act and Highways Act. The conversion of the public footpath should be dealt with in the same way as any other i.e. the CTA. The footway should be converted by using the powers available under the Highways Act 1980. This Act does not say in s65 that such a cycle track must be of a minimum length or travel in any direction relative to the carriageway. This may be interpreted as permitting the conversion of the short length of footway necessary to achieve a crossing.

Example of off-road cycle track along line of a footpath that crosses the footway of the road.

A 'footway' not part of the public highway

Procedure – varies. A 'footway' outside the highway boundary has by definition no highway status and cannot, therefore, be treated as a footway as defined by the Highways Act 1980. This situation could arise where the footway (and accompanying carriageway) was originally created by a housing authority but not subsequently adopted as public highway. Similarly, it might occur in the case of a development that allows public access but the means of access are not adopted as highway e.g. on a major business or retail park.

The conversion of such a feature can, therefore, only be dealt with as a permissive route or the authority will have to find a way for it to be adopted as highway by some means, with the owner's co-operation, and then converted.

This is a complex issue and should be dealt with locally on a case by case basis.

Footbridges and Underpasses

Procedure - Cycle Tracks Act 1984 or Highways Act 1980

The procedures employed will be based upon the circumstances under which these features were created. Where these are not clear, local judgement will be required as to whether the footbridge or subway acts as a footpath or a footway.

Path (Bridleway) Creation

Procedure - Highways Act 1980 s26

Section 30(1) of the Countryside Act 1968 gives the public the right to ride a bicycle on any bridleway, but in exercising that right, cyclists must give way to pedestrians and persons on horseback. The act places no obligation on the highway authority to 'improve' the surface to better accommodate cycle use. The Highways Act provides powers to create bridleways by means of a 'public path creation order'

Widening the highway adjacent to a bridleway to create a surfaced cycle track

Procedure – TCPA and GPDO. This is similar to widening a footpath as described above except that the highway to be widened is a bridleway and not a footpath.

Conversion of a footpath alongside a watercourse/river/canal

Procedure – varies. Cycle tracks created alongside a watercourse by the conversion of a public footpath will inevitably require engineering works, if only in the form of signs. In addition to the use of the Cycle Tracks Act or planning approval (if access is based on permissive rights) it may be necessary to obtain consent under the Water Resources Act 1991 – contact the Environment Agency for more information. In some regions and in most circumstances the agreement of the Internal Drainage Board will be required where any work impacts upon its operations.

In the case of footpaths alongside canals, it appears that the Canal and River Trust's powers to introduce a byelaw prohibiting cycling take precedence over any highway rights. It is, therefore, recommended that contact be made with the local office to discuss the best means of achieving cycle access.

Cycling is permitted on most towpaths within the city council area unless there are physical constraints that prevent safe cycling.

Prevention of use of cycle tracks by motor vehicles

(Cycle tracks created through use of Town & Country Planning Act)

Procedure – none necessary. The Cycle Tracks Act s2(1) used to make this an offence but this was superseded by s21 of the Road Traffic Act 1988. This offence does not take account of how the cycle track was created. Creation by the use of Town and Country Planning legislation is not relevant to this issue any more than if the same legislation had been used to create a carriageway which forms part of the highway. To give an example, once a bypass has been created through the use of a planning application and all of the other statutory procedures, there is no need for further orders to ensure that, for example, the police can enforce the national speed limit or other similar offences.

In other words, so long as the correct creation procedures have been properly followed and the necessary signs have been erected to denote that the highway at that point is a cycle track then no further orders are necessary for the police to enforce the requirements of the Road Traffic Act.

4 Cycle Tracks within Highways

Design Objectives

- Create a 2.0m wide space for cyclists to travel in one direction at up to 25mph.
- Provide adequate width for cyclists to overtake other cyclists without leaving the facility.
- The cycle track should generally be one-way adjacent to the flow of traffic on each side of the road.
- Two-way cycle tracks on one side of the road should generally be restricted to places where there are few side roads and there is a good set-back to enable priority at side road crossings, and where there is not much requirement to cross the road (i.e. infrequent side roads and attractors on opposite side). They are also valuable where they form logical links between other facilities such as a section leading to a toucan crossing, or where a cycle track crosses a road as a staggered junction arrangement.
- Minimise stopping and starting (at side roads, crossings and transitions to and from carriageways) to smooth the flow of cyclists along the route.
- Provide separate space for cyclists and pedestrians where their movements are likely to conflict.
- Shared footways alongside the carriageway are not generally acceptable over long distances unless there are very few pedestrians.
- Separate cyclists from pedestrians due to high speed differential.
- Manage conflicting movements around parking, loading and bus stop areas to minimise stopping.

Design Principles

- Greater separation (increased spatial separation and/or separation by level difference) of cyclists from other modes is required with greater speed and volume of motor traffic, and on gradients where cycle speeds can be unusually fast or slow.
- Cycle tracks can be provided alongside any road where there is space and where they would offer a safe and convenient facility for cyclists.
- Cycle tracks usually require changes to junction geometry at side road crossings to help to slow down the turning movements of vehicles, or to provide the necessary set-back to enable the cycle track to have priority.
- There is no statistical evidence that cycle tracks alongside a carriageway are ‘safer’ than on carriageway cycling (because tracks alone do not eliminate conflicts at junctions where most collisions occur) but they contribute to ‘perceived’ safety by offering physical separation from motor traffic, and therefore help to encourage more people to cycle. Some Nordic design manuals recommend returning cyclists to the carriageway about 20m before side road junctions so that they can integrate back into the traffic flow, while the Dutch advocate segregation, but with clearly marked priority of either the cycle track or carriageway at every location.

Speed/flow criteria for provision of cycle tracks

LTN 2/08 suggests cycle tracks or shared-use should definitely be considered where traffic flows exceed 10,000vpd and traffic speeds are above 30mph, and should be the first choice on roads in excess of 40mph and with more than 3,000-8,000vpd or 300-800vph.

This does not of course mean that they cannot be provided alongside less busy roads. There is an increasing public expectation that segregated facilities are required to encourage more cycling, particularly among children and the elderly. It is important that cycle tracks are suitable for existing experienced riders and the least competent and slow cyclists, and that requires adequate widths, surfacing of similar standard to the carriageway, and priority at side road crossings where this can be done safely.

Common hazards

The main hazards for cyclists along link sections of a route are:

- Side road crossing collisions. A cycle track does not eliminate the common hazard of being struck by a left-turning vehicle unless the cyclist or the turning vehicle is forced to yield priority.
- Side road congestion. Even where the cycle track has priority, it may be blocked by cars waiting to exit a side road, which may lead to cyclists making risky manoeuvres of swerving into the main carriageway or crossing between slowly moving vehicles.
- Surface defects due to inadequate maintenance or poor quality construction such as potholes, loose slabs, poor drainage, fallen leaves.
- Insufficient space to overtake slower cyclists / pedestrians.
- Street furniture or trees causing a width restriction.
- Vehicle crossovers (often with poor visibility) where residential property is immediately alongside a transport corridor.
- Conflicts with pedestrians or with motor traffic when passing occupied bus stops and loading bays.
- Unlawful stopping/parking of motor vehicles within cycle tracks.

Design

In general cycle tracks within the highway should be distinct and separate from pedestrians so that each mode has its own defined space because cyclists will typically be travelling up to seven times faster than pedestrians within a relatively confined strip along the edges of the road.

Cycle track separation from other modes–

- a level difference between cycle track and pedestrian and motor vehicle space is preferred. However a large kerb upstand can be hazardous, especially where width is restricted. A diagonal chamfered (K9) kerb can help cyclists to move between adjacent carriageway and footway space if necessary, reducing the chances of conflict and falling off due to catching a wheel or pedal on a right angled kerb. Depending on the circumstances, space for the cycle track may be taken from a lightly used footway, a verge, or from the carriageway. Where the kerb is being moved, there will often be a requirement to modify the drainage arrangements. Other factors that may add significantly to construction costs are services or tree roots close to the surface and these need to be

identified at an early stage in preliminary design. In some circumstances it may be possible to build up the level of an adjacent footway as a more cost effective alternative to excavation in order to create a level difference.

Brighton's Old Shoreham Road with-flow hybrid (half-height) cycle track (Alex Sully). Manchester's Oxford Road (right) has a higher demand for parking and an adjacent bus lane, therefore more signing and lining is required.

- A cycle track at the same level as the carriageway can be separated by a continuous kerb. The separation usually needs to be 0.5m wide to accommodate bollards at the start and end points, and to offer adequate separation of a 'buffer zone' where there are parked cars to the offside, but can be narrower by simply laying two adjacent kerbs on link sections (e.g. Hill St contraflow). This arrangement may require additional drainage or new connections to existing services. Kerb-face gulleys can be used to avoid metal gulleys within the limited space of the cycle track. Using chamfered kerbs can help to avoid cycle crashes due to wheels or pedals catching the kerb edge and also reduce the chance of injury in the event of a fall onto a kerb. This arrangement does cause additional trip hazards for pedestrians and formal crossing points are required for blind and wheelchair users.

Kerb separated cycle track width should be 2.0m to allow for sweeping and overtaking, chamfered kerbs would be more forgiving than right angled kerbs.

- Segregation from a pedestrian path using a raised white line (Diag 1041.1) or painted line (Diag 1041) where a cycle track runs alongside a footway. This is the least desirable but may be acceptable over short

distances or in low use areas. It is unlikely to be observed by users which can lead to conflict between pedestrians and cyclists in busier areas. Where the overall available width is less than 3.0m, it is usually better not to separate pedestrians and cycle parts of the path.

Use of Diag 1041.1 raised white line to separate space within a footway level cycle facility

- Segregation within shared footways and pedestrianized areas of highways using 'urban design' features to indicate preferred routes (different surfacing materials, small changes in levels, placement of benches, planters and other street furniture). These techniques are useful in core areas and heritage areas to help minimise street clutter and signs.

Different colour and texture separates pedestrian and cycle sides of footway helping to minimise signing and lining.

Street furniture (sign poles, lamp columns, letter boxes, telephone boxes, planters) must not be placed within the cycle track, and must be moved if an existing area is being converted into a cycle track.

Where a cycle lane or track passes a bus stop, a bypass may help to improve cyclists safety by removing the requirement to move into the traffic lane to the offside of the bus. This will be less satisfactory at busy bus stops due to more risk of pedestrian conflict. Two potential arrangements are illustrated here with shelters in different places. A flat topped speed hump is used where the pedestrians cross the track and in both cases cyclists are expected to give way to pedestrians. In the example on the right, the cycle lane continues on a straight line within the highway and the bypass is only used when a bus is present.

Car parking can be used as a 'buffer' between the cycle facility and the live traffic as in the examples above. Ideally 0.5m gap should be left to protect cyclists from car doors. This arrangement is useful for contraflow facilities where cyclists are facing the drivers and so are at less risk from car doors.

Cycle Tracks at Side Road Junctions

The aim should be to develop a design that gives priority to the cycle traffic along the main road, as would be the case for on-carriageway cycling. This can be achieved by:

- Returning cyclists to the carriageway in advance of the junction;
- Cycle track crosses the junction at carriageway level;
- Cycle track crosses on a flat top hump at junction mouth (or set back from junction mouth)

- Cycle track and footway continue across junction and carriageway crosses them on a vehicle crossover (similar to residential drive arrangement).

It is important that the design and placement of Give Way lines and signs makes the priorities clear to all users.

Cyclists return to carriageway ahead of left turn to a cycle lane offside of the turning lane. Only works for with-flow cycle facilities. (Phil Jones Associates)

Cycle track crosses side road at carriageway level (Alex Sully). The cyclist here has the same status as if cycling along the carriageway (only works for one-way with-flow cycle tracks)

Cycle track crosses on a raised hump set back (at least 5.0m) from junction mouth (Phil Jones Associates). Cycle track uses 'give way' on raised flat top hump. Works for one-way or two-way cycling (can legally be done in UK using Give-Way markings, buff tactile paving and shared ped/cycle crossing area).

Side road is interrupted by a continuous cycle track and footway, vehicles using the side road are forced to give-way (similar to a residential driveway cross-over). Works for one-way or two-way cycling. May need yellow lining (or Diag 1026.1 marking for minor culs de sac) to prevent parking over junction mouth.(Phil Jones Associates)

There are some specific issues associated with designing cycle track crossings at side roads:

- Cyclists at risk from vehicles turning left into the side road;
- Cyclists at risk from vehicles turning right into side road (particularly at two way cycle tracks and/or where cyclists are in contraflow with general traffic and also where vehicles are turning through 'gaps' in queuing traffic and their view of the cycle track is therefore obscured);
- Vehicles queuing within the line of the cycle track while waiting to leave a side road.

There is no universally correct solution to these issues as the preferred design will depend on the speed and volume of traffic, frequency of turning movements, visibility splays and the intensity of cycle and pedestrian use. Some examples of different layouts that help to give cyclists priority are shown above and in the design appendix.

On busier roads, with higher speed limits, or with high proportion of HGV traffic the cyclist would normally be required to Give-Way and wait for a safe gap in the traffic flow.

Legal aspects of cycle tracks within the highway (adjacent to footways and carriageways)

Converting an existing footway (adjacent to carriageway & within maintainable highway) to permit cycling

Procedure - Highways Act 1980

To convert all or part of a footway to cycle track, all or the appropriate part of the footway must be removed under section 66(4) of the Highways Act 1980, and a cycle track 'constructed' under section 65(1) of the act. No physical construction is necessary but there needs to be clear evidence that the local highway authority has exercised these powers. This can be provided by a resolution of the appropriate committee.

Clearly there will be some 'works' if only the erection of signs to denote the change of use. It is good practice to consult with existing users and give prior notification of carrying out the necessary works. The designers should also consider any implications relating to the Equality Act for users to ensure that access for all is still possible.

Widening the footway to create a Cycle Track

Procedure – General Permitted Development Order and Highways Act. The highway authority has powers under the GPDO to widen the existing highway to create or widen a footway without the need to seek planning consent. It also has powers under the Highways Act 1980 62 (4) to "alter or remove any works executed by them …"

The cycle track can then be created under the powers described above if all or part of the resulting footway requires conversion. Alternatively, it may be created just as a cycle track, if that is the sole purpose of the widening (Highways Act 1980 65[1] – a highway authority may create a cycle track "in or by the side of a highway")

Greenfield site, compulsory purchase

Sometimes there is no suitable public space within the highway boundary but the adjacent land may be vacant (i.e. not existing highway land). There is a need to acquire land from landowner [by Compulsory Purchase Order] to enable use by pedestrians and cyclists

Procedure - Town and Country planning Act 1990 to create the cycle track as 3 above and Highways Act 1980.

General powers to acquire land are provided by the Highways Act 1980 s239. Where local authorities find it necessary to resolve to exercise compulsory purchase powers they can do so either to improve the highway or to promote countryside access. The former is more commonly known about and better understood but the latter does provide opportunities to create facilities that have a low utility component. For more information consult appropriate staff or see The Compulsory Purchase Manual DTLR 2001.

Greenfield site, dedication of land to the highway for the creation of a cycle track

Procedure – Highways Act 1980 and Town and Country Planning Act 1990: Sections 37 and 38 of the Highways Act provide a means for land to be dedicated as public highway. Since the Act does not refer to the nature of the use, simply referring to dedicating a "way as a highway" this may be interpreted as meaning that land may be dedicated to serve any function acceptable to the highway authority e.g. footway, cycle track, carriageway etc. This is analogous to agreements between developers under s38 where the status of the highway so dedicated is confirmed by the plans accompanying the agreement and the works subsequently carried out.

It is worth noting that dedication to the highway is often confirmed by the signing of the s38 agreement not the physical completion of the carriageway, footway, cycle track etc. This enables the highway authority to exercise its various powers to do works within the highway to complete any outstanding construction works in the event of the failure of the developer to complete their obligations under the agreement. This also indicates that the dedication to the highway is not dependant on works being carried out by the landowner prior to that dedication.

Where the cycle track is to be created by the highway authority, consent under the Town and Country Planning Act 1990 will be required for the change of use and engineering works to create the cycle track.

5 Cycle Lanes

Design Objectives

- Create a 2.0m wide space for cyclists to travel in one direction at up to 25mph.
- Provide sufficient width in a cycle lane to overtake other cyclists without leaving the cycle lane.
- Reduce the speed /flow / mix of motor traffic to a level where cyclists feel safe using the carriageway by introducing speed limits and weight/height/width restrictions to exclude larger vehicles.
- Minimise stopping and starting to smooth the flow of cyclists along the route.
- Enable two-way cycling on most streets by providing for contraflow on one-way traffic systems.
- Eliminate unlawful footway cycling by making the carriageway the most attractive and convenient place to cycle.
- Create attractive high quality public realm areas/streets where all modes can share a common surface at low speeds.

Design Principles

Greater separation of cyclists from other modes is required with greater speed and volume of motor traffic, and on gradients where cycle speeds can be unusually fast or slow.

Speed/flow criteria for provision of cycle lanes

Cycle lanes offer a sense of route continuity and can be used on all roads with speed limits up to 40mph and flows up to 10,000 vpd. They help to define space for cyclists within roads. They do not however offer any sort of protection from passing vehicles and are generally preferred on roads with average speeds of 30mph or less, and without significant HGV traffic. Where space is restricted and there are fewer than 5,000 vpd, advisory cycle lanes may be provided by removing the centre lane to give a single two-way carriageway. This does not work on higher flow roads because opposing vehicles have to move into the cycle lanes to pass.

Common hazards

The main hazards for cyclists along link sections of a route are:

- Overtaking vehicles passing too close.
- Being struck from behind due to poor visibility or driver inattention (this is the only common collision on links, but usually results in serious injuries or death). This type of collision often happens on rural and unlit roads.
- Conflicts with motor traffic when passing occupied bus stops and loading bays.
- Insufficient space to overtake other cyclists within a cycle lane
- Unlawful stopping/parking of motor vehicles within cycle lanes.

Protected Cycle Lane

Protected Cycle Lanes (Light Segregation) use a separating feature to help provide an augmentation to the painted white line, while still enabling cyclists to leave the lane and enter the carriageway if necessary. This type of facility appeals to experienced cyclists used to riding on road and not losing priority at side roads, while still offering less confident cyclists some separation from other traffic. The presence of the protective features also has the effect of 'tightening up' side road entrances to help reduce turning speeds, reducing the likelihood of a cyclist being cut-up by a left turning vehicle.

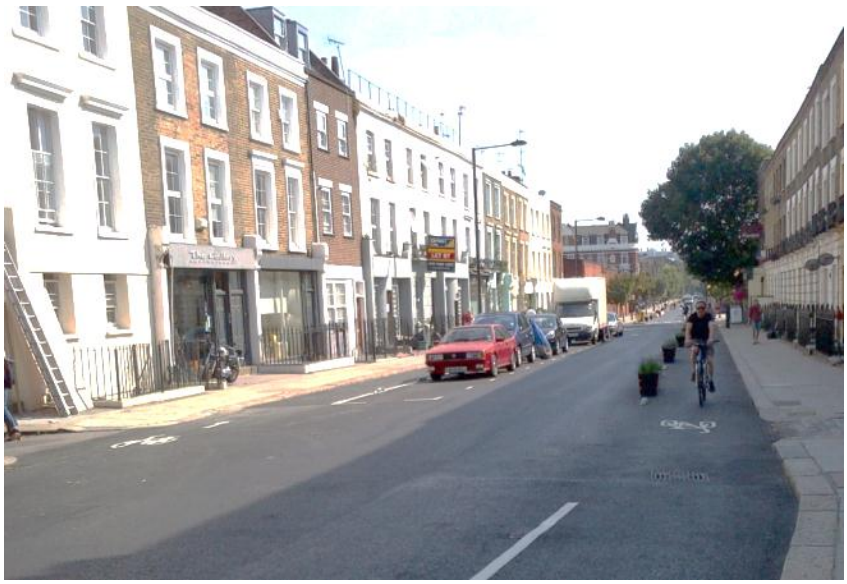
The protection may range from lightweight bollards to pre-formed concrete kerbs laid at intervals and including 'armadillos' (pre-formed rounded plastic dividers) and reflective 'wands' (thin plasic bollards). Because they are permeable, there is usually no need to alter drainage unless the footway kerb is being moved. Parking bays may be provided alongside the protected lane to create an additional buffer to the live traffic lane.

Protected lanes can offer a way to try out using road space to create a cycle facility. In New York city, planters, traffic cones and temporary bollards were used to trial the impact of cycle lanes prior to installation of more permanent facilities bounded by kerbs.

The separation features should be discontinued at side road junctions where the cycle route will need to cross as an advisory lane. On busier roads a protective island and bollard may be required at the start of the protected lane to ensure that approaching drivers see the separation features in good time.

The separation features have no legal status so should be used in conjunction with continuous mandatory cycle lane markings (Diag 1041) and generally require about 0.3m width. Protected cycle lanes should ideally be 2.0m wide to allow for overtaking within the facility.

On busier roads a protective island and bollard may be required at the start of the protected lane to ensure that approaching drivers see the separation features in good time. Even on quieter roads the start points will usually require a vertical feature such as a bollard, and therefore an additional width (0.5m buffer) to accommodate. The spacing of the 'wands' and 'armadillos' is typically at about 2.5m centres (there are no regulations relating to the use of these features,).



Protected cycle lanes, Royal College Street, Camden

TRL test site for separation using Zicla Zebra, Wand bollards, and kerb separation for a cycle track.

Lane protected by bollards at factory entrance, Nottingham

Mandatory Cycle Lane

Mandatory Cycle Lanes are bounded by a solid white line which has the effect of excluding other types of vehicles from entering them. Mandatory cycle lanes should ideally be 2.0m wide to allow for overtaking within the facility.

Legal Issues: The lane must (until the 2016 revision of TSRGD) be backed up by a Traffic Regulation Order, which will prohibit vehicles from entering, proceeding or waiting in the cycle lane. Exemptions are provided for various purposes, including access to premises and loading.

Where a mandatory cycle lane is used, there is no legal requirement for double yellow lines as the cycle lane has the effect of prohibiting vehicular access to the kerbside, although the double yellow lines may be used to ensure compliance because they are widely understood and therefore more easily enforced.

Mandatory cycle lane

Advisory Cycle Lane

Advisory Cycle Lanes can be entered by other vehicles and always need additional markings to indicate any loading and parking restrictions. Cycle lanes should be 2.0m wide where traffic speeds and volumes are high, although a width of 1.5m is sufficient within most 30mph areas. Where carriageway width is restricted a 1.25m advisory lane on 'uphill' sections and on the approach to an advance stop line may be preferable to no lane at all. Removing surface gulleys and replacing them with kerb face gulleys can help to create a smoother area at the edge of carriageway when space is restricted.

Advisory or mandatory lanes can be provided in contraflow to the general traffic lane (see Chapter 7).

Cycle lanes may be installed to the nearside of parked vehicles, thereby using the vehicles as a protective barrier between cyclists and the lane of moving traffic (a buffer strip at least 0.5m wide to protect cyclists from car doors may be required if there is frequent parking activity).

On a 7.3m dual carriageway it may be possible to reallocate the lane markings to provide a 1.3m cycle lane and two 3.0m traffic lanes in each direction. This solution is appropriate within 30mph speed limits but a wider cycle lane or segregated track is required where actual speeds are nearer to 40mph or above.

Cycle lanes (or carriageway edge markings where the width is inadequate for lanes) may be used on low-flow suburban roads (<4000 vehicles per day) to change the 'feel' of the road to help reduce speeds. The residential parking on the left has been inset into bays in the footway to give a clear straight line to the cycle lane.

Coloured surfacing should generally be restricted to areas of potential conflict such as side road junctions and contraflow lanes or where lane markings are not permitted such as at zig-zag and bus stop markings.

Where a cycle track merges into an on-carriageway cycle lane the merge should be smooth and protected, not entering the carriageway from the side.

Cycle track joining carriageway at a protected merge, joining a mandatory cycle lane after the crossing, Northfield.

Cycle Lanes at Side Road Junctions

Cycle lanes should generally be continued (as advisory lanes) at side roads. Coloured surfacing can be used to highlight that this is a potentially hazardous location. It is important that the cycle lane is of adequate width on the approach to the junction. A narrow cycle lane may result in cyclists being more exposed to conflict with left turning vehicles.

This narrow cycle lane with drainage gulley is uncomfortable and hazardous, placing cyclists too close to the kerb and potentially misleading drivers who will be turning left into the side road.

Where a 1.25 or 1.5m cycle lane is installed on the approach to a junction, it may be feasible to widen the lane to 2.0m at the junction mouth, to emphasise to drivers that cyclists on their nearside may be going ahead, and to encourage cyclists going ahead to move out from the most vulnerable position by the nearside kerb. This would reflect the instructions about road position that are given in Bikeability training.

Additional Diag 1057 cycle symbol markings may be installed across the junction mouth to further highlight the cycle lane.

Edge Markings, Hard Strips and Central Hatching

There are many roads where it is not possible to provide a cycle lane of adequate width, and where the lane widths (usually between 3.2 to 3.9m) may create hazards for cyclists due to close overtaking. The width of these roads often varies along a given length. It may be possible in such cases to use either central hatching or edge of carriageway markings to create a more consistent carriageway width and to effectively create a 'buffer' zone which motorists can use to overtake (central hatching) or that cyclists can move into in the event of feeling threatened by an overtaking vehicle (edge of carriageway). These have the effect of creating virtual cycle lanes and the visual narrowing of the carriageway can help in reducing vehicle speeds.

6 Shared Roads and Shared Space

Cycling within all purpose lanes

Many roads in Birmingham are based on Mediaeval or Victorian street profiles that originated when the majority travelled on foot. They were not designed to accommodate motorised traffic and space for parked cars. Improved conditions for cyclists and pedestrians cannot usually be achieved without returning some of the space that has been given to motor traffic, and the initial design consideration should be:

- Can traffic be removed or reduced (through removal of on street parking, road closures to prohibit through-traffic, or one-way working) to release some space for a cycle lane or track, or to make the amount of traffic more acceptable for cyclists and pedestrians?
- Can the speed limit and actual speeds be reduced to 20mph or below to enable pedestrians and cyclists to mix more safely with traffic?

Speed/flow criteria for shared all purpose lanes

Cyclists can mix safely with traffic at speed limits of 20mph and 30mph but whether or not this 'feels' safe will depend on the actual speed of traffic, the amount of traffic, the proximity of overtaking vehicles (particularly buses and HGVs), and the frequency and busy-ness of side roads and on street parking. Measures such as the removal of centre lines on narrower roads can help to encourage drivers to give more clearance when overtaking cyclists, while junction treatments and bay parking can help to address other potential conflict points.

Most minor roads with less than 3000 vpd do not require cycle lanes as an aid to safety and separation from traffic. However cycle lanes or logos can still be helpful in 'wayfinding' part of a marked route or to help visually narrow the carriageway to encourage lower speeds. Roads with more traffic than 3000 vpd should ideally have some form of separate provision for cycling, but it is not always possible to reallocate the necessary space. Measures to manage the volume and speed of traffic as described above should be considered.

Service Roads and Cycle Streets

Cycle streets are increasingly common on the continent and are similar in concept to home zones. They are generally low-flow access streets for motor vehicles where signs indicate that pedestrians and cyclists have priority over motor traffic. Cycle traffic flows should generally exceed the motor traffic flows to ensure that the concept works successfully enough that cyclists 'feel' safe. Dutch guidance suggests a minimum flow of 2000 cyclists per day is required. Textured surfacing and central raised central margins are often used to emphasise that such streets are low speed environments where motor vehicles should not attempt to overtake cyclists.

There are few streets in Birmingham where cyclists will outnumber cars, but there may be opportunities to develop routes within service roads as in the photograph below.

Cycle Street – Cars are Guests sign (Phil Jones Associates)

A cycle lane has been marked on the quiet side of this service road, while the cycle logo provides continuity on the side used for residential parking

A Dutch cycle street and a typical low-speed residential street in Birmingham

Cycling with Street Running Tram Lines

Future extensions of the Midland Metro will re-introduce tram lines into the streets of Birmingham. Work is already underway to construct the extension from Snow Hill to New Street station, and a further extension will run along Broad St.

There are already some well-established street running systems in other UK towns and cities including Manchester, Sheffield, Nottingham, Blackpool and Croydon. A section of Midland Metro in Wolverhampton is on street.

Incidents involving pedestrians and cyclists being struck by a tram happen but are very rare. The main hazard is slips, trips and falls associated with crossing the line. Cyclists are at risk in two ways:

- Bicycle wheels may drop into the groove of the rail and cause a fall (the wheel rarely gets fully 'stuck' but the groove causes the rider to lose their balance);
- Tyres slip on the metal surface of the rail, especially in wet conditions.

For cyclists the key design requirements are:

- Crossings should be at right angles to the line (or as close as possible). This includes arrangements for turning in and out of any side streets along the line.
- Streets where cyclists share the same direction of travel as the trams should offer sufficient width between the track and the nearside kerb for cyclists to avoid ever having to cross the track when going straight ahead.

Where these conditions cannot be met, cycling should be prohibited and an alternative route should be indicated. The standard blue 'Tram Only' signs can be used to mark the streets where other vehicles (including cycles) are prohibited. A supplementary plate describing the alternative route may be required e.g. '*Cycle access to station follow signs via New Street*'.

If there are very long sections of road where it is reasonable to assume that a tram would overtake a cyclist during normal operations there must be sufficient width for a tram to pass with clearance of at least 1.5m between the cyclist and the swept path of the vehicle.

The following non-standard signs were granted Special Authorisation by DfT for use in Nottingham. DfT also sugest use of the general 'Hazard' (exclamation mark) sign with the Tram tracks plate where other vehicles besides cycles use the carriageway.

 Tram tracks	 To avoid tram tracks

7 Contraflow Cycling

Introduction

Provision for contraflow cycling can be achieved using cycle tracks, mandatory or advisory lanes or with no markings whatsoever on low speed-low flow roads. Where a lane or track is proposed a 2.0m minimum width is recommended in order to provide the necessary separation from opposing traffic, although on low-flow, low speed streets no contraflow lanes are required.

Speed/flow criteria for contraflow facilities

Contraflow facilities with advisory cycle lanes or no cycle lane whatsoever should generally be restricted to roads with actual speeds of below 30mph and flows of less than 2000 vehicles per day. Such facilities are compatible with low speed roads with a posted speed limit of 20mph and where actual speeds will not be significantly higher than this.

Simple contraflow on minor street

It is no longer necessary (since 2012) to seek special authorisation from the DfT for the associated signs and markings. Sign (Diag 940.2) for unmarked contraflow or advisory contraflow lanes is now prescribed, and it is permissible to use an 'Except Cycles' plate beneath a 'No Entry' sign to indicate a contraflow facility (See Signs chapter).

This contraflow cycle lane on Hurst St offers a good width and prominent markings including a buffer zone between oncoming traffic and the lane.

Entrance to contraflow lane at Corporation St is protected by a splitter island

On busier roads a mandatory contraflow lane or cycle track of 2.0m width is recommended. Where there is a high demand for parking (or likelihood of unlawful loading and parking), the kerb separation will reduce the likelihood of the facility being blocked.

Protected exit from advisory contraflow lane, Ladywood

8 Junctions

Introduction

Junctions are the most difficult and important places to create good infrastructure for cycling. They are the most hazardous locations where cyclists are potentially in conflict with motor vehicles, and they are also a source of delay and inconvenience. It is important to consider both of these issues when trying to make junctions work better for cyclists.

Around 68% of reported injury accidents to cyclists occur at or near road junctions, with a further 6% at private drives and entrances. The 3 most common accident types at junctions are (in order):

- Cyclist going straight ahead struck by left turning vehicle at side road.
- Cyclist going ahead struck by vehicle exiting a side road.
- Cyclist going ahead struck by vehicle turning right into a side road.

Design Objectives

At junctions the key objectives for cycling are:

- Minimise stopping and starting on key radial routes to smooth the flow of cyclists along the route.
- Remove or reduce conflict by separating cyclists from opposing vehicle movements using dedicated space within the highway and/or dedicated time at signals (including sufficient intergreen time to clear large junctions or junctions on steep gradients before the opposing flow is released).
- Provide clear and unambiguous information about priority to all users to avoid errors.
- On roads where there is a high proportion of HGVs, separate cyclists from vehicles with restricted visibility
- Separate cyclists from vehicles at large high capacity junctions due to high speed differential.
- Minimise disruption to pedestrians.

Design Principles

- Greater separation is required with greater speed and volume of motor traffic and on gradients where cycle speeds can be unusually fast or slow.
- Greater separation is required where there is a high proportion of HGV traffic.
- Greater separation is required where there is a high proportion of child/elderly cyclists and pedestrians.
- Greater separation is required at complex junctions with more than 4 arms and at locations designed to speed the flow of motorised traffic such as large unsignalised roundabouts.
- Junctions with acute angles such as slip roads or where the flare of the junction mouth enables vehicles to turn in and out quickly are most hazardous for cyclists. An approach angle perpendicular to the main junction with ‘square’ kerblines offers better visibility splays and potentially lower speeds.

Types of Facility at Junctions

The optimum facility will depend on site specific factors. The options available include:

- Grade separated cycle subways and bridges at major road junctions
- Roundabout with separate cycle track and signalled crossings such as toucans or cycle-only crossings
- Dutch style roundabout with separate cycle tracks and cycle/pedestrian crossing priority on each arm
- Two-stage right turn at a signalised junction
- Advanced stop lines
- Early start signals
- Loop detectors / push button to trigger a separate cycle track phase at signalled junctions
- Priority crossings at side roads

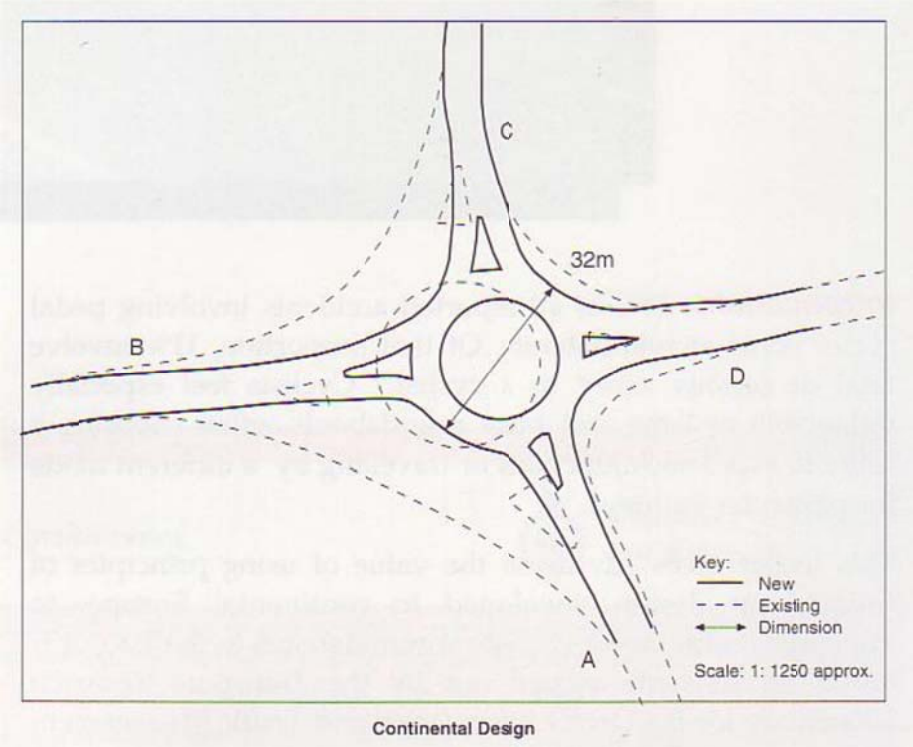
Roundabouts

Large multi-lane and multi-arm roundabouts are particularly hazardous locations for cyclists although they often have comparatively good safety records for motorised traffic. Cyclists are at risk on the approach (usually shunt/merge type collisions from other traffic entering and not looking at cyclists on their nearside), on the circulating carriageway (from traffic entering and leaving across the path of the cyclist) and when leaving (usually from traffic continuing around the roundabout in the outer lane).

Signalisation of large roundabouts is helpful to faster and more confident cyclists, and advanced stop lines at the traffic signals can help. However, roundabouts are designed to maximise the traffic flow and the wide carriageway and high speed differential makes them a hostile environment for slower cyclists. The preferred arrangements at large roundabouts (more than 3 arms and/or over 10,000 vpd) are therefore:

- Alternative routes that avoid the junction altogether (providing these are not lengthy diversions from any nearby destinations);
- Grade separation using subways or bridges (in new build situations the aim should be to keep pedestrians and cyclists at ground level and raise or lower the carriageway);
- Cycle tracks with signalled at-grade crossings of each arm;
- Signalised roundabout with advanced stop lines.

Smaller roundabouts on single lane, single carriageway roads can more easily be modified to make them more cycle friendly. Roundabouts with ‘tight’ geometry, using relatively large centre islands, single lane circulatory carriageway, single entry and exit lanes with minimal flare and maximum deflection are safer for cyclists. Textured over-run material can be used to accommodate any additional space required by HGVs. The diagram below is taken from Traffic Advisory Leaflet 9/97 which covers ‘continental design geometry’. The dashed line shows an existing UK roundabout while the solid line shows the typical continental design which has a better safety record for cyclists.



Extract fom TAL 9/97 showing comparative UK and continental geometry

The Transport Research Laboratory is currently trialling a number of configurations of a 'Dutch style' roundabout that combines the 'continental' geometry shown above, with the addition of priority cycle track and pedestrian crossings on each arm. This work will help to determine how to mark out the crossings in such a way that priority is clear to all users.

Dutch style roundabout trial at Transport Research Laboratory

Grade Separation

Grade separation can be the preferred option at busy, complex and high speed junctions where it is difficult to provide at grade facilities that are both safe *and convenient* to use. The cumulative delay at signalised at-grade crossings of multi-arm junctions can be unacceptably long for convenient cycling. Cyclists and pedestrians sometimes object to subways and bridges because of personal security or because they take them on a long diversion away from the shortest route. Problems with subways and bridges can sometimes be designed out, and this may be preferable to replacement with an at-grade crossing, particularly for cyclists for whom stopping and starting requires additional effort.

Where a subway or bridge is near to a junction but not actually on it, the cycle route should lead to the crossing point via the shortest route, often from some way in advance of the junction, so that the grade separated feature forms a 'natural' part of the route rather than a last minute diversion away from a straight desire line along a main road.

This subway at Bristol St on the left offers relatively good visibility and enables cyclists to avoid a large, busy junction on the ring road. By contrast the Salford Circus subways beneath Spaghetti Junction have a poor crime record and are remote and threatening.

Subways should ideally offer a straight approach, gentle gradients of 5% and good visibility through to the other side. Dutch guidance suggests that if a steeper ramp gradient is required, the bottom section of the ramp is steepest (where the cyclist still has momentum) and then gets shallower towards the top.

Queensway and the ring road have a number of large grade-separated junctions, so subways are likely to remain an ingredient of provision for cyclists in Birmingham for at least the next decade. With improved links to the adjacent roads, the subways in many cases would offer the safest and most convenient routes through a major junction. Further enhancements such as lighting, CCTV and widening may be needed to improve personal security.

New roads with grade separation can be constructed similar to the designs in Stevenage and the Netherlands, where the carriageway is raised up by a few metres so that there isn't such a large height difference for pedestrians and cyclists and the approaches are therefore shorter and can more easily be in line with the tunnel section for better visibility.

Signal Controlled Junctions

Advanced Stop Lines. Advanced stop lines enable cyclists to wait and move off ahead of queuing traffic when the lights change. Where there are high levels of cycling they can be helpful to the overall departure flow at the lights by enabling cyclists to move off quickly to reduce delay to other traffic. The reservoir area also enables cyclists waiting to turn right to take up an appropriate position towards the centre of the road. A TRL study concluded that the depth of the ASL reservoir is only the equivalent to a single pcu and therefore ASLs have little impact on capacity unless a queuing lane is removed, and may actually improve capacity in some cases because the lead in lanes and ASL box have a similar effect (on actual vehicle turning paths) to increasing the radius of the junction. Some adjustment to inter-green time may be required, and the traffic light sensor loops may need to be relocated. Where coloured surfacing is proposed it may make economic sense to plane off the surface, relocate the loops and install the advanced stop line using coloured asphalt for a longer life.

Table 7: Recommended lane widths at advanced stop lines

Carriageway (m)	Cycle Lane (m)	Lane 1 (m)	Lane 2 (m)	Opposing Lane (m)
7.3	1.3	2.75	--	3.25
7.5	1.5	2.75	--	3.25
8.0	1.5	2.75		3.75
8.5	1.5	3.0		4.0
9.0	1.5	3.0		4.5 (3.0 + 1.5)
10.0 (1 lane)	1.5	3.5		5.0 (3.5 + 1.5)
10.0 (2 lane)	1.25	2.75	2.75	3.25
10.5	1.5	2.75	2.75	3.5
11.0	1.5	2.75	2.75	4.0
11.5	1.5	2.75	2.75	4.5 (3.0 + 1.5)
12.0	1.5	3.0	3.0	4.5 (3.0 + 1.5)
15.0	1.5	3.0	3.0	3.0 + 3.0 +1.5

Notes: All treatments on a site by site basis. Lanes of less than 3.0m unsuitable for regular HGV traffic and ASL lead in lanes should be advisory. Lanes below 3.0m (2.75m if few buses or HGVs) require agreement with the Traffic Manager

While some authorities choose to have a policy of fitting ASLs at every signalised junction, it is not always the optimum arrangement. Traffic Advisory Leaflets 8/93 and 5/96 note that right turning cyclists find it difficult to use nearside approach lanes where traffic flows per lane exceed 200-300 vehicles per hour, and that the reservoir is of limited value when the proportion of red time at signals is small.

There are some concerns around safety, as nearside feeder lanes and the area at the rear of the reservoir are in the blind spot for HGV drivers. The fitment of convex mirrors (known as Trixi Mirrors after a cyclist who was fatally injured at a junction) onto the traffic signal pole was approved by DfT for all local authorities in October 2011.

Advance stop line with Trixi mirror fitted to signal head

The standard depth of the reservoir (i.e. distance between the cycle stop line and other vehicle stop line) is 5.0m. Trials are currently taking place of 7.5m and 10.0m reservoirs to assist cyclists with a greater head start at busier junctions, and to provide additional separation from HGVs, buses and vans where the volume of cycle traffic is likely to lead to cyclists queuing in the nearside lane blindspot. The Department for Transport will currently authorise 7.5m ASLs on request (February, 2014).

Half width ASLs may be suitable on narrower roads where the path of larger vehicles turning into a junction occasionally crosses the centre line. Their use currently requires special authorisation.

Nearside feeder lanes intended for cyclists going straight ahead should never be placed alongside a left-turn traffic lane. If a central feeder lane is installed to the offside of a left-turning lane, it should generally be 2.0m wide to give adequate separation from the traffic. It is permissible to install ASLs with no lead-in lane where this is considered the best option. Occasionally an offside feeder lane may be required (usually where cyclists can turn right but other vehicles must go ahead only). The offside feeder lane requires special authorisation.

Separate phase. Cyclists may need to make movements that are not available to other traffic. The arrangement of stop lines is similar to a conventional junction, with a green cycle aspect on the signals. 'Elephants footprint' markings can be used to indicate the route through the junction if necessary. The 'elephants footprint' markings are not included in TSRGD and therefore require special authorisation.

This separate signal phase enables cyclists on Hill St to cross over to a contraflow track in Hurst Street on the opposite side of Smallbrook Queensway.

Where cyclists have a separate route marked through a signalled junction, elephants footprint markings will be authorised by DfT. (DfT)

Early start for cyclists. It is possible to include a separate signal head at traffic lights to release cyclists typically 2 to 5 seconds ahead of other traffic (using a green 'cycle' signal in a similar arrangement to a 'filter' light). This enables cyclists to clear the junction prior to turning traffic, reducing the likelihood of a conflict, and helps prevent vehicles being delayed by cyclists when the lights change. At present a full size signal aspect mounted at the same height as other traffic lights must be used as only the full size lights have legal approval for use. There are many existing examples of such lights including sites in Bradford, Cambridge, London and York. Trials are underway (2014) for separate low-level signals for cyclists with the intention that the equipment will get type approval and may therefore be approved by DfT for use in England (with special authorisation) from 2016 onwards.

Example of low level signal aspect on trial at Transport Research Laboratory

Two-stage Right Turns

At large signalised cross-roads and T junctions (such as where Edgbaston Road crosses Priory Road and Bristol Road), it can be difficult to provide adequate inter-green time for right-turning cyclists. Cyclists also find it hazardous to safely move into a central position on the multi-lane approaches. One idea adopted in Denmark and Ireland is to offer a two-stage right turn to enable cyclists to remain on the nearside and make the turn in two stages. *The arrangement shown in the photograph of an Irish cross roads is currently illegal within England but may become possible with special authorisation in future following trials. An experimental scheme is currently being trialled in Southampton.* It is legally possible to replicate this sort of arrangement at T junctions however by using cycle tracks and signs /signals shown within TSRGD.

Two-stage right turn with right turn pocket, Ireland (Phil Jones Associates)

9 Crossings

Toucan Crossings

Toucan crossings are the standard UK treatment for cycle tracks crossing roads. They are always shared with pedestrians on the crossing itself, although the approaches may be segregated. Some authorities continue segregation of the crossing area by using coloured surfacing.

Wide toucan crossing with shared use approaches on A38 Bristol Road at Selly Oak

It is feasible to design a 'parallel' signalled crossing similar to a Pegasus (equestrian) crossing arrangement where a cycle track is off to one side of the pedestrian crossing area. These crossings generally require additional poles and signal heads.

Separate parallel crossing arrangement, Bristol

A simple 'jug handle' approach can be used to take cyclists from the carriageway into the waiting area of a toucan crossing.

Zebra Crossings

Cyclists are currently required to dismount when using a zebra crossing. Some authorities have installed cycle tracks that lead up to a zebra crossing and added 'Cyclists Dismount' signs adjacent to the crossing. This is not good practice, and cyclists are unlikely to dismount in practice.

The DfT is currently revising the regulations (2014) with the intention that some equivalent form of crossing (sometimes called Tiger crossings) will be available to cyclists in 2016. The layout is likely to be similar to the example below.

This example shows (currently illegal arrangement) a parallel cycle track and zebra crossing on a wide flat top speed hump. (Cycling England)

Priority Crossings

A mid-block priority crossing for cyclists can be located on a raised road hump with give-way markings. These should only ever be installed where the speed limit is 30mph or below and average speeds are at or near the speed limit.

Cycle track mid-block priority crossing of carriageway, Thetford (Rob Marshall)

On quieter routes such as this one in Bournville, provision of dropped kerbs may be adequate, while on busier routes additional half-size give way markings and buff tactile paving can be used to indicate a mid-block crossing point.

On wider roads, a central reservation should be provided at unsegregated crossings. The reservation should be at least 2.0m wide to prevent wheels overhanging into the carriageway.

10 Cycle Parking

Standards

Secure cycle parking is required in homes, workplaces, schools, and other public and commercial buildings. Setting local planning standards that specify the amount and preferred style of parking for different classes of new developments can help to ensure the quality of provision. The standards for Birmingham are in Table 8.

Identifying Demand

As cycling increases, the demand for public cycle parking also increases. Improvements to cycle routes may help to stimulate new cycle journeys, leading to cycles being parked in areas where there was previously no demand. The cycle route design process should therefore identify attractions along the route (local shops, schools, workplaces, suburban stations) that would benefit from an increase in security or capacity of cycle parking.

Existing cycle parking areas should be monitored on a regular basis so that capacity can be increased in response to demand. Bicycles that are abandoned in public cycle parking stands can be removed periodically. There is a statutory period during which a notice is fixed to the bicycle to give the owner chance to retrieve it prior to removal.

Design

The preferred and simplest form of cycle parking is a Sheffield stand. Recent trials by Transport for London suggest that a 'M' shaped design offers increased security by making more points available to lock both the frame and wheels, and more options for securing smaller wheeled bicycles.

On street cycle parking is primarily for short-stay visits where convenience is the primary consideration. It is therefore better to have several parking areas scattered throughout a locality close to shops, offices and public buildings rather than one large central base.

Covered and off-street parking is better for longer stay. In Birmingham, the car parks at Brindley Place and the Mailbox offer relatively secure public off-street parking that is monitored by CCTV.

Cycle parking stands should be at least 0.6m from adjacent walls and kerbs to allow for the overhang of the wheels, and require at least 1.0m clear space in front to allow for bikes to be wheeled into the stand. Sheffield type stands should be at least 0.8m apart to allow adequate space for both sides of the stand to be occupied. Double decker stands require a ceiling height of 2.7m and 1.5m clear space in front of the stands for loading. Stands may be placed in echelon style at 45 degrees to the kerb which may be helpful when locating them in former car parking bays or between build outs so that cyclists do not have to stop and dismount within the main carriageway.

Cycle stands at Birmingham University

City centre stands on built-out footway at Temple Row.

Retrofit parking hoop at Paradise Circus. This design can be fitted to existing guardrail, sign poles and other street furniture to offer more secure locking points.

Cycle parking integrated into design of a Dutch railway station.

Legal Issues for cycle parking within the highway

Part IV of the Road Traffic Regulation Act 1984 allows for the provision of offstreet parking places for vehicles and authorises the use of any part of a road as a parking place. These powers are extended by Section 63 of the Act to allow provision "in roads and elsewhere of stands and racks for bicycles". A single order under this act can be used to cover cycle parking within the highway in the whole of an administrative area. However, all the individual sites must be set out in the mandatory accompanying Schedule.

In pedestrianised streets, section 115B of the Highways Act 1980 (inserted in Schedule 5 of the 1982 Act), provides for a local authority to place objects or structures on a highway for the purposes of providing a service for the benefit of the public or a section of the public. Where pedestrianised highways have been introduced under section 249 of the Town & Country Planning Act 1990, this also gives local authorities the powers to place objects or structures on the highway.

If waiting and loading restrictions are in force, bicycles (like other vehicles) may not be legally parked on the carriageway or the footway. Where such restrictions are in force,

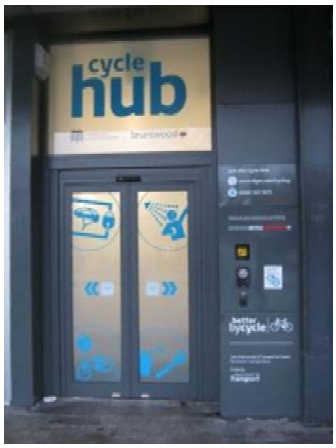
cycle parking can be permitted through an exemption within the existing waiting and loading orders, or by additional orders designating part of the road for cycle parking only.

Cycle Hubs

Cycle Hubs offer secure cycle parking that is usually staffed or accessed via a smartcard membership scheme. They are a relatively new concept in the UK and take-up of their services to date has been slow.

The hub may also offer other facilities such as a repair workshop, cycle hire, café and information centre. Some hubs offer showers and changing facilities, and one chain of hubs is also linked to gym membership.

Staffed hubs are suitable for city centre locations where there is likely to be good demand for repair and maintenance services that will supplement the cycle parking business. The success of Ealing Broadway's facility in west London suggests that there will be growing demand for unstaffed suburban hubs at district centres, park and ride sites and railway stations so long as they are secure locations.



Cycle hub accessed by membership smartcard in Manchester city centre. Double decker secure indoor parking at Sheffield station.

Unstaffed cycle hub at Selly Oak station has lighting, CCTV and smartcard secure entry.

Table 8: Cycle Parking Standards

Use	Minimum Standard
Flats and apartments	One space per bedroom
Hotels and guesthouses – Use class C1	Consideration of spaces for staff. Provision determined by expected number of staff. Secure space for left luggage to be of adequate dimensions to accommodate two bicycles.
Purpose built student accommodation.	1 space per 2 bedrooms.
Restaurants and cafes – Use Class A3	1 space per 18 covers
Public houses, wine bars and private clubs – Use Class A3.	1 space per 100m^2 drinking area.
Convenience retail – Use Class A1.	1 space per 125m^2 for developments <1000m^2 1 space per 400m^2 for developments >1000m^2
Comparison retail – Use Class A1.	1 space per 300m^2 for developments <1000m^2 1 space per 400m^2 for developments >1000m^2
Financial and professional services.	1 space per 125m^2 for developments <1000m^2 1 space per 400m^2 for developments >1000m^2
Offices and flexible business use.	1 space per 250m^2 for developments <1000m^2 1 space per 400m^2 for developments >1000m^2
General industry and warehousing.	1 space per 500m^2 (this only applied to <1000m before)
Higher and further education and schools.	1 space per 10 staff or students
Cinemas, theatres and conference facilities.	1 space per 50 seats
Sheltered residential accommodation.	1 space per 10 units
Doctors, dentists and health centres.	1 space per consulting room or 1 space per 10 staff whichever is higher
Hospitals	1 space per 10 staff

11 Signs

Introduction

This Chapter provides summary information on mandatory and informatory signing of cycle facilities and of relevant surface markings. Signing should always be kept to the minimum to reduce street clutter and maintenance costs.

Mandatory & Informatory Signing

The respective diagram numbers refer to those specified in the Traffic Signs Regulations and General Directions (TSRGD), 2002. A new edition of TSRGD will be published in 2015. Careful positioning of signs associated with cycle facilities is required in order to comply with siting requirements, to maximise visibility and to minimise street clutter. Size and illumination requirements for Diags 955, 956 and 957 were relaxed in 2013 to reduce street clutter.

Diag. No (TSRGD)	Description	Details
 955	Route for cycles only	Cycle tracks that are segregated from both motorised traffic and pedestrians
 956	Shared pedestrian/cycle route	Unsegregated shared cycle/footways
 957	Shared pedestrian/cycle route	Segregated shared cycle/footways
 958.1	Start of with-flow cycle lane	Mandatory cycle lane only
 959.1	With-flow cycle lane	For use with mandatory cycle lane only. Diagram 967 may be used for an advisory lane,.

Diag. No (TSRGD)	Description	Details
 960.1	Contra-flow cycle lane	On one-way street with mandatory contra-flow cycle lane.
 960.2	Contra-flow cycling (advisory lane or no lane)	On one-way street where contra-flow cycling is permitted. It is now permitted to use the No Entry Sign Diagram 610 and "Except Cycles' plate Diag 954.4 at the start of an unmarked contraflow.
 961	Time qualifying plate	Beneath Diagrams 958.1 and 959.1 as appropriate.
 962.1	Cycle lane at junction or crossing	Warns road users of potential conflict with cycle route. Generally unnecessary except for situations where contra-flow cycling is permitted.
 962.2	Contra-flow bus and cycle lane at junction	Warns road users of potential conflict with cycle route.
 963.1	Pedestrian sign for cycle route crossing	Warns pedestrians of potential conflict with cycle route. Generally unnecessary except for situations where contra-flow cycling is permitted.
 967	Route recommended for cyclists on main carriageway	Advisory cycle route or lane. Can be used in conjunction with Diag 1057 and no lane markings

From January 2012 it is permissible to use the Except Cycles plate in conjunction with No Entry, No Right/Left Turn, No Through Road, and signs to indicate mandatory turns for vehicles.

A map type explanatory sign can be used where the cycle route leaves the carriageway on a different alignment to that of on-carriageway traffic. The sign below is a variant loosely based on Diag 2601.2 that required special authorisation.

Diag. No (TSRGD)	Description	Details
1001.2	Advanced Stopline for Cyclists (ASL)	Box may be 5.0m or 7.5m long.
1003	Give Way line	When used across cycle route, 300mm (half size) long marking to be used
1004	Advisory Cycle Lane bounding line; or Centre line on 2-way cycle track	4.0m line, 2.0m gap, 150mm wide
1009	Taper at start of cycle lane; or Back of cycle lane across side road	600mm long marking to be used
1014	Swerve arrow where vehicular traffic is deflected by cycle facilities	Use variant appropriate to traffic speed
1023	Give Way triangle	Use 1.875m (half size) variant on cycle track
1040.2	Safety buffer hatching	Used to define safety buffers, minimum width 500mm if bounded on one side only (e.g. adjacent to kerb)

Diag. No (TSRGD)	Description	Details
1041.1	Safety buffer hatching	Used to define safety buffers, minimum width 500mm adjacent to parking or loading bays.
1048.1/1048.4	Cycle/Bus Lane	Use in contra-flow or shared cycle/bus areas only
1049	Boundary between mandatory cycle lane and traffic lane	150mm continuous white line
1049.1	Boundary between pedestrian and cycle sections of a shared segregated cycle/footway or path.	150mm continuous white line, trapezoidal in cross section, 12mm to 20mm in height
1057	Cycle symbol	1.215m variant used within defined cycle facilities and shared streets; or 1.78m variant used at Advanced Stop Lines (forms an integral part of the ASL marking)
1059	Direction arrow	Use 2.0m variant in vicinity of junctions, 1.0m elsewhere

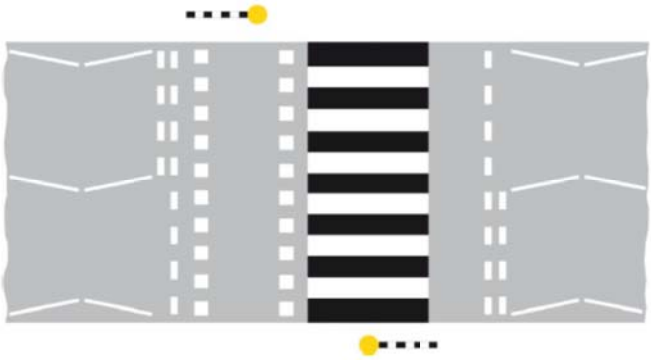
Forthcoming changes and new signs

Some signs are likely to be permitted in the next few years such as the 'shared space' sign that appears in 'Signing the Way'.

Possible new sign for shared space streets

From 2016 it is likely that cyclists will be permitted to use a parallel crossing adjacent to a zebra crossing. The maximum permitted distance from the give way line to the zebra crossing marking is 3.0m. If new zebra crossings are installed with this maximum distance to the give way line, that should provide adequate space for them to be converted to parallel crossings once they are legalised. The layout for the future crossing is indicated below

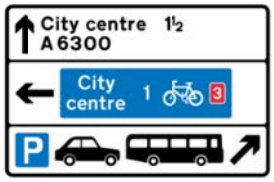
although it is likely that the final version will use just the single give way line marking (as used currently at zebra crossings).



Direction Signs

The following signs are the most commonly used for highway cycle routes. Signs should always be used sparingly to minimise maintenance costs and street clutter. Designers may explore whether signs can be placed on existing street furniture to reduce the need for additional poles. Where cycling is on carriageway the signs may be incorporated (as shown in Diags 2105.1 and 2106.1 below) into general traffic signs and do not necessarily need to be separate, thereby reducing street clutter.

Diag. No (TSRGD)	Description	Details
 2602.1	Direction of cycle route at junction. Distance or journey times may be placed on sign.	
 2602.1	Permitted variant. Route branded sign with times instead of distance.	Permitted on all cycle route only signs from January 2012
 2601.1	Direction of cycle route/s ahead. Times may be shown on signs instead of distance.	Permitted on all cycle route only signs from January 2012
 2601.1	Sign to indivate direction of route ahead. Destinations omitted.	
 2606	Direction to railway station	

Diag. No (TSRGD)	Description	Details
 2105.1	Junction of cycle route off non-primary road	
 2106.1	Junction of cycle route off non-primary road	
 2603	Direction to cycle parking	
 2604	Direction and distance to cycle parking	

Principal Destinations

The list of key destinations for the pedestrian and cycle signage in the city is included in Table 9 below. More local destinations can be signed from within 400m. Direction signing along a route, particularly off-road routes, should include directions to local centres and other attractors such as retail and business parks typically within 400m – 500m of the route.

Named Cycle Routes

The following cycle routes already have some 'branding' on mapping.

- Harborne Walkway
- Merrits Brook Green Route
- Rea Valley Route
- Bournbrook Route
- Valley Parkway
- Moseley University Route
- Cole Valley Route
- Stratford Road Parallel Route

- Ward End Route
- River Tame Way
- North Birmingham Route

- National Cycle Network Route 5
  Regional Cycle Routes 533, 534,535

Table 9: Main Destinations for Cycle Route Signs

Acocks Green	Buckland End	Kingshurst	Shard End
Bearwood	California	Kingstanding	Shenley Fields
Birmingham (from Sutton Coldfield)	Castle Bromwich	Ladywood	Shirley
Bournville	Castle Vale	Lapal	Short Heath
City Centre	Colehall	Lifford	Showell Green
Digbeth	Chad Valley	Little Aston	Small Heath
Erdington	Chester Road	Little Bromwich	Smith's Wood
Harborne	Churchfield	Lodge Hill	Soho
Jewellery Quarter	Cofton Common	Longbridge	Solihull Lodge
King's Heath	Cotteridge	Lozells	South Yardley
King's Norton	Deritend	Lyndon Green	Sparkhill
Moseley	Doe Bank	Maney	Springfield
Northfield	Driffold	Mayer's Green	Stechford
Selly Oak	Edgbaston	Mere Green	Stirchley
Smethwick	Falcon Lodge	Minworth	Streetly
Sutton Coldfield	Five Ways	Moor Green	Sutton Park
Winson Green	Fordbridge	Nechells	Ten Acres
Wylde Green	Four Oaks Park	New Oscott	Thimble End
All Saints	Frankley	New Town Row	Tower Hill
Alum Rock	Frankley Green	Newtown	Tudor Hill
Aston	Greet	Old Oscott	Tyseley
Balsall Heath	Hall Green	Perry	Vauxhall
Banners Gate	Hamstead	Perry Barr	Wake Green
Bartley Green	Handsworth	Perry Beeches	Walker’s Heath
Beech Lanes	Handsworth Wood	Perry Common	Walmley
Billesley	Hardwick	Pheasey	Walmley Ash
Birchfield	Harts Green	Queslett	Ward End
Boldmere	Hawkesley	Quinton	Warstock
Bordesley	Hay Mills	Reddicap Heath	Washwood Heath
Bordesley Green	High Heath	Ridgacre	Weoley Castle
Bournbrook	Highgate	Roughley	Whitehouse Common
Brandwood End	Highter’s Heath	Rubery	Witton
Bromford	Hill Hook	Saltley	Woodgate
Brown's Green	Hockley	Sandwell	Yardley
	Hodgehill	Selly Park	Yardley Wood

Hospitals, university sites and other important local destinations may be added to signs.

12 Construction and Maintenance

This chapter[7] deals with the construction, maintenance and management of a pedestrian or cycle facility.

Introduction

Close attention to construction and maintenance standards will ensure that routes used by pedestrians and cyclists are comfortable for all users, including those with mobility, sensory or cognitive impairments, as well as being legal, aesthetically acceptable, easy to maintain and durable.

It is important to consider the full life costs and benefits of a scheme. Certain options may require increased capital expenditure at the outset but may result in lower maintenance and management costs. It is only by considering planning, design and street management as a whole that user needs can best be met. Construction costs for a sealed surface path usually outweigh those of an unsealed path, but this is often false economy once maintenance requirements are included.

On-carriageway cycle routes

The typical choice for the carriageway is an asphalt surface. Asphalt used for roads and paths contain bitumens and aggregates which give a durable, joint-free surface that is relatively straightforward to construct and maintain. Different products are available, each with their own properties. The main variables are the aggregate size, aggregate content, binder content and binder grade, which have an effect on stiffness, resistance to cracking and other physical properties of the asphalt. The smoothness of the riding surface tends to be dictated by the texture depth of the asphalt – the higher the texture depth, the rougher the surface and vice-versa.

Asphalt surface treatments for carriageways generally come in one of two forms:

- HRA, hot-rolled asphalt, with or without precoated chippings, was the UK surface material of choice before the 2000s. Its use has been in decline especially in urban areas due to the positive textured nature of this material, which means it generates more noise than some other treatments. For HRA with pre-coated chippings, hard-stone (often granite) chippings are rolled into the asphalt surface course while it is still hot. They add texture to the surface and therefore increase its skid-resistance properties. The chippings are pre-coated with a binder, which can contain coloured pigment if necessary. They must be hard-wearing but with a high polished stone value (PSV), so that they are durable and do not polish over time. A typical choice for carriageway surfaces would be HRA 35/14 but other carriageway and footway grades exist.
- TSCS, a thin surface coarse system, is often applied to carriageway rather than footway surfaces. It typically uses a 10mm or 14mm aggregate. The advantage of using TSCS is that these materials come in a variety of texture depths and also colours. The use of clear bitumens and coloured aggregates allows these materials to be used as decorative asphalts. Use of such decorative asphalts is not recommended in areas of load unless assurances are sought from material suppliers.

[7] Chapter based on draft Wales Active Travel guidance

Note that proprietary types of TSCS have replaced generic SMA (stone mastic asphalt).

The use of all these materials is described in the European Standard Specification EN13108 and thicknesses should be specified using the British Standard BS594987: 2010, Asphalts for roads and other paved areas – specification for transport, laying compaction and type testing protocols, in conjunction with the local highway authority's design and construction standards. Full guidance on using the British Standards is provided in PD 6691 Guidance on the use of BS EN 13108 Bituminous Mixtures - material specifications (BSI, 2010).

All routes for cyclists should be machine-laid rather than hand-laid, which is less regular. A smooth surface texture significantly reduces the effort needed to cycle, adding to comfort.

Thin Surface Coarse System **Hot Rolled Asphalt**

Modifications to the surface may be required to incorporate cycle lanes, advanced stop lines, or traffic speed control measures (traffic calming). Dimensional tolerances should follow normal highway standards, and when a new on-road cycle route is installed a check should be carried out to confirm that this is the case.

Where kerb re-alignment is needed any new carriageway construction should be to normal highway standards unless there is kerb segregation of the cycle lane, when a lighter construction should be used, although surface quality should still be to highway standards. In the case of carriageway widening this can entail the relaying and/or protection of utilities plant (electricity, gas, water, foul and surface water drainage, telephone, cable TV etc.)

Coloured surfacing

In most situations black bituminous surfacing in conjunction with cycle logos and appropriate lane markings is satisfactory and colour should be used sparingly. Extensive use of coloured surfacing is not recommended for maintenance reasons, and poorly maintained coloured surfacing can pose an additional hazard for cyclists.

Footway construction

Footway construction should be of sufficient depth to withstand the loads likely to be imposed on it.

Consideration should be given to the likelihood of accidental or intentional overrun of a footway by heavy vehicles and the thickness increased accordingly. The construction at vehicle crossovers may need to be thicker than the adjacent lengths of footway depending on the nature of the crossover. Cracking or rutting of surfaces due to overloading can be unsightly, create trip hazards and/or drainage problems. The construction specification for footways, footpaths and cycle tracks is contained in HD39, Tables 3.1 to 3.4.

Footpath construction

Where a footpath is constructed away from the highway consideration should be given at the design stage to the practicalities of constructing the path and in particular access arrangements for construction vehicles. Access points to some paths can be several hundred metres away and may require material to be moved by dumper truck. This might be satisfactory for moving sub base materials, but keeping tarmac hot enough to lay properly may be a concern. Additional access points may need to be constructed, and the path may need to be able to carry plant associated with the works.

Where a footpath also serve as access routes for maintenance vehicles e.g. adjacent to waterways, the surfacing and construction of the path needs to reflect this.

It may also be appropriate to thicken sub base layers, or use geotextile materials if necessary where ground conditions are poor. Where paths use land that is contaminated avoid excavating in these circumstances and lift path levels if areas are unavoidable.

Cycle Track Construction

One of the reasons why some cyclists use the main carriageway in preference to a cycle track alongside the road is that the riding quality of the main road carriageway is better. The riding quality of the cycle track should be at least as good as that of the adjacent road and should be machine laid.

Among the most important considerations in choosing an appropriate surface material are cost (and variation by colour), durability and skid resistance. Polished stone value (PSV) gives a measure of skid resistance. A PSV of 55 is normally acceptable for road skid resistance. Table 10 below shows a comparison of different surface materials and treatments according to these criteria.

Only materials costs are included here. Laying costs can vary considerably depending on the area (m2) and the required traffic management arrangements – difficult and restricted access, in particular, are likely to increase costs. The cost per square metre will also be higher for smaller areas. In each case, more accurate figures should be obtained from suppliers.

Table 10: Surface treatments for cycle routes and indicative costs

Surface Material[1]	Life (years)	Skid resistance (PSV)	Indicative cost per square metre (£)		
			Normal	Red	Blue/Green
6mm asphalt concrete	20	60+	8	12	25
Coloured TSCS, 30-50mm thick	20	55+	-	25+	25+
Block paving	20	55	20-30	20-30	-
Brick paving	20	-	-	20-40	-
Concrete paving flags	10	-	20-30	-	-
Tactile paving	10	-	30-40	-	-
York stone flags	20	-	160	-	-

Surface Material[1]	Life (years)	Skid resistance (PSV)	Indicative cost per square metre (£)		
			Normal	Red	Blue/Green
Granite paving flags	20	-	100	-	-
Thermoplastic High-Friction Surfacing	4-6	70+	13	16	16
Resin High-Friction Surfacing	8-10	70+	15	18	18
Cycle Track Veneer (thermoplastic slurry)	5	55+	8	8	8
Cycle Lane Veneer (polymer binder)	10	55+	10	12	12
Slurry Seal (poor colour and life)	5	55			
Surface Dressing – Granite Stone (bituminous binder)	20	60+			
Surface Dressing – Granite Stone (clear binder colour enhance)	20	60+			
Surface Dressing – Pea Shingle Stone	20	50			

The preferred surfacing is machine laid bituminous material, although bound or unbound aggregate, concrete or stone flags or paving blocks are sometimes used. Unbound aggregate surfaces are generally unsuitable in an urban / urban fringe environment as they cause excessive dust in dry weather and can be susceptible to ponding and become muddy in wet weather, leading to rapid deterioration. This also makes them unsuitable for regular commuting cyclists due to repeated dirt and damage to clothing and machinery.

Generally paving blocks and concrete or stone flags will provide a more aesthetically attractive finish and are more suited to high quality public realm areas, but are less comfortable to cycle on and more expensive to maintain.

There may be local sensitivities around surfacing of paths with black bituminous material in areas of high heritage value or green spaces and these should be considered and addressed as part of the consultation; however in reality there is often little argument once a path is finished and open. If necessary, paths can be surface dressed with appropriate materials.

Tactile paving

Tactile paving is provided on walking routes to assist visually impaired people in moving around an area and on segregated shared-use routes to enable them to navigate safely, preventing them from walking into the cycle track inadvertently. Types of tactile paving used and their typical uses are listed below in Table 11. The most common form of tactile paving provided in association with walking routes is blister type tactile paving at road crossings.

Table 11: Common Tactile Paving Types for Pedestrian and Cycle Areas

Type of tactile paving	Typical usage	Typical example
Blister (red coloured)	Signalised pedestrian crossing facilities, including zebra and toucan crossings	
Blister (buff coloured)	Uncontrolled pedestrian crossing facilities	
Corduroy	Where a footway joins a shared use path, top and bottom of steps or other hazard	
Ladder/tramline	Start, end and repeater indication of segregated footway/cycleway (ladder on footway side and tramline on cycleway side)	

Guidance on the provision of tactile paving is set out in the Department of Transport publication 'Guidance on the Use of Tactile Paving' and 'Inclusive Mobility' on the use of tactile paving surfaces' and reference should be made to that document when specifying tactile paving.

Current national guidance covers simple layouts but does not give detail for the wide variety of layouts that are encountered in reality. For non-standard layouts engineers need to apply

the principles contained in the guidance and consult with local groups representing the visually impaired during the design process.

Kerbs, edgings and verges

Footways may require some form of edge restraint in order to maintain their structural integrity. Where a footway is not adjacent to a wall or building this can be provided by an edging strip. Edgings are generally formed from precast concrete units. Any edge treatment will increase the overall cost - pre-cast concrete kerbing roughly doubles the cost of a path.

Where a footway is provided adjacent to a road the footway will normally be delineated from the adjacent carriageway with a kerb. This offers a degree of protection to pedestrians and can assist blind or partially-sighted pedestrians identify the edge of the footway.

In low vehicle speed environments where a 'shared space' is being created it may be appropriate to omit the kerb. In these cases the impact of not providing a kerb on blind or partially-sighted users should be considered with appropriate use of tactile paving, or a low kerb upstand be retained.

Kerb heights should be as set out in Table 11 below.

Table 12: Kerb Heights

Location	Upstand	Typical example
General	75mm to 125mm Half battered profile adjacent to footway Splayed (45°) where no adjacent footway and on high speed roads	
Pedestrian or cyclist crossing	Flush with tactile paving Any upstand makes it more difficult for wheelchair users	

Vehicle crossover	25mm To maintain continuity of edge of carriageway drainage and provide a continuation of the line for blind or partially-sighted pedestrians.	

Away from the carriageway edgings are generally formed from precast concrete units but in rural or more lightly used situations timber edges can be used. However, in many locations away from the highway an alternative to kerb edgings is to construct the sub-base and binder course 300mm wider than the path, providing a 150mm shoulder on either side to support the path.

Where a footway or cycle track is provided adjacent to a higher speed, or more heavily trafficked road the footway should be separated from the adjacent carriageway by a verge, typically at least 1m in width, in order to provide a margin between the active travel path and vehicular traffic. In most cases this margin is likely to be grassed.

A verge of between 0.5m and 1m should be maintained each side of an off carriageway route, as mown edges prevent the vegetation encroaching onto the useable width of the path. The remainder of the verge may be left and can be of value to wildlife.

Drainage

Standing water and poorly-designed surface water run-off can cause problems for pedestrians and cyclists users and seriously damage pavement construction. Keeping water off and moving it away from a carriageway or path will increase the longevity of the pavement structure and increase its use. Any drainage system needs to be efficient and reliable and may need to extend beyond the immediate edges of a new path to be effective.

Where water comes from and how it is disposed of needs proper consideration. It is important to include proper drainage within a design. Poor drainage can give an impression of a forgotten route and lead to a host of other problems.

On carriageway drainage

When cyclists are on carriageways, attention will need to be paid to gully location and levels, which are critical for cyclists as well as ensuring good route drainage. This is particularly important where full or light segregation for cycling has been introduced, since cyclists will find it difficult to avoid gullies. Acceptable gully characteristics are as follows:

- In any location where there is a possibility that cycle wheels will cross gullies, the grate slots should be at right angles to the direction of travel. Alternatively, non-slot ‘pedestrian style’ gratings should be provided.
- no gaps between the frame and cover wider than 15 mm
- recessed gully frames raised to be flush (tolerance +/- 5mm) with the surface
- suitable for their location to take public highway loadings

- open in a manner suitable to be cleansed by a normal gulley cleansing or jetting machine under the relevant highway authority contract

Dished and other gratings unsuitable for cycling across should be replaced. Side-entry gullies or perforated kerb type gullies (e.g. Beany Blocks) may be suitable in some circumstances, particularly where there is restricted width and where cyclists will be close to the kerb.

Fully segregated cycle tracks and hybrid lanes will need additional gullies as well as appropriate falls to facilitate run-off. A minimum grating size of 300 x 300mm is recommended, as the smaller size gully gratings that are sometimes used in off-carriageway situations tend to get blocked.

A gully should be provided in the carriageway at the upper side of any pedestrian / cycle crossing in order to prevent surface water running across the point at which people step into the carriageway

Off-Carriageway Routes

Where new routes are being provided, or widened into soft verges consideration should be given to the effects of any increase in the volume of surface water run-off contributing to the existing drainage system. Once taken off the path surface it is essential that water is returned back into the system at a suitable location. This requires careful thought and understanding. Simply diverting over land run off, or removal of flood water into the nearest ditch or culvert may create problems further downstream.

To prevent ponding of surface water, or the formation of ice, a crossfall or camber should be provided on the carriageway or path surface within the limits stated in Table 10.5 below. Excessive crossfall is uncomfortable to walk on and can cause difficulties for wheelchairs, pushchairs and cyclists.

Table 12: Crossfalls

	Crossfall (%)
Minimum	1.5
Preferred	2 – 3.3
Maximum (at crossings)	7

The direction of the crossfall should be set so that surface water does not run-off onto adjacent property where there is no highway drainage along the boundary. Typically footways will fall towards the adjacent carriageway. On cycle tracks the crossfall should generally fall towards the inside of a bend.

Where it is not possible to provide a continuous crossfall across a path, either due to the relative levels between the kerb and the back of the path or the width of the path, it will be necessary to provide drainage channels within the path. Table 13 sets out four options.

Table 13: Drainage Channels on Paths

Measure	**Advantages**	**Disadvantages**	**Typical example**

Dished channel blocks	Easy to maintain	Trip hazard Requires gullies Can result in ponding water Not suitable on cycle routes	
Flat channel blocks	No trip hazard Easy to maintain	Less capacity Requires gullies Can result in ponding water	
Linear channel with gratings	Can avoid having to create a low spot in a surface	Prone to blocking and silting up Gratings can work loose and cause trip hazards	
Linear slot drain	Visually un-intrusive Can have high capacity (in pipe below ground)	Prone to blocking and silting up Have to be jetted or rodded to be cleaned	

If gullies or gratings are used as part of a path drainage system a heel proof grating should be specified.

Access Controls

Access Controls are sometimes placed on off-carriageway routes to prevent access being gained by unauthorised vehicles, particularly motorcycles.

It is recommended that designers should start with a presumption against the use of any form of access control, as these cause difficulties to many legitimate users and are often ineffective in addressing the issues they are intended to address. In particular, restrictive access controls:

- are inconvenient, can be unsightly and can actively discriminate against some user groups who have legitimate rights to use a path.
- extend the journey time for cyclists and so reduce the utility of a cycle route
- add another level of cost, and maintenance concern, to a path.
- are frequently ineffective because fencing along a traffic free corridor is missing, broken or subsequently vandalised so that the access control can be bypassed.

There is also a tendency to install access barriers to stop, or slow, cyclists at the end of a path for safety reasons – whether actual, or perceived. This is often inappropriate, and designers fail to consider other solutions, such as clear signing and (if necessary) other means of slowing cyclists such as changing path geometry.

A single bollard, and clear sight lines will be effective in many locations. Double rows of bollards, with a spacing of between 1.20 – 1.50m can reduce cycle speeds and prevent motor cycle / car access, whilst retaining better permeability for users than chicane barriers.

Access Control using bollards, Weymouth

Sustrans' document "A guide to controlling access on paths" provides detailed information on assessing whether an access control is needed, and if so the most appropriate design solutions. It covers:

- Legal issues, including the Equalities Act
- Whether an access control is required
- Alternative measures to control access
- Risk assessment
- Deciding on type of access control required
- Design parameters
- Layout and design solutions

Fencing and Hedgerows

Fencing may be required along off-highway paths for the safety of users, the security of neighbours and livestock control. Where needed fencing should remain visually unobtrusive.

The installation of fencing has an impact upon all route users, but greater impact upon cyclists as a fence immediately adjacent to the path edge reduces the effective path width by 500mm.

Fencelines set 1.0m away from a path edge will generate a better visual aspect, and where required on both sides of a path reduce the "tunnel effect". Verges will allow space for drainage, and if necessary ducting for lighting.

Security fencing can be harsh and oppressive, creating environments that are visually off putting to pedestrians and cyclists alike.

Under most circumstances 1.5m high fencing is, or should be, adequate in all but exceptional circumstances. To a pedestrian they still provide views over, and the visual and aesthetic impact upon a traffic free route is considerably less.

Hedgerows form part of the immediate environment for many paths away from or alongside the road. Developing routes that include at least one hedgerow as a boundary feature can re-invigorate them as dead wood, brambles and unwanted species are removed and new growth encouraged. Thorny species such as Hawthorn or Dog Rose should be avoided where necessary, but if used will require planting further back from the path edge to prevent hedge clippings causing punctures.

Lighting

If walking and cycling are to play an important role as an alternative to the car for short journeys they must be promoted as around-the-clock means of transport, rather than just a daylight activity. Many walk and cycle journeys will be made after dark, especially during the winter months, and routes should normally be lit to provide an adequate level of safety, both real and perceived. The benefits of lighting a walking or cycling route include enabling users to:

- Orientate themselves and navigate the route ahead
- Identify other users ahead
- Detect potential hazards
- Discourage crime and increase a sense of personal security

It is important that the provision of lighting is considered at an early stage in the design process, so that the issues can be properly considered and the needs of users taken fully into account in the choice of equipment and the design of the scheme.

Routes along urban and many rural highways will be lit by the existing highway lighting but specific lighting will be needed for off-highway routes. However, in lighting such routes consideration also needs to be given to wider factors, including:

- Limiting levels of light pollution
- Level of ambient brightness in the surrounding area
- The visual impact of the lighting equipment
- Intrusion on nearby properties
- The needs of visually impaired users for uniform illumination at surface level
- Vandalism issues

- Proximity of electricity supply
- Energy usage and cost
- Costs of installation, operation and maintenance

Further information is available in Sustrans Technical Information Note 12 Lighting of Cycle Paths, 2012.

Maintenance and Management - Introduction

Maintenance of the path or carriageway surface is of great importance to pedestrians and cyclists, including proper reinstatement following works by statutory undertakers. For routes away from the highway it is essential to establish responsibility for maintenance of the path, and put into place a regular regime for visits and minor works.

A route that is kept in good condition will be more useful, attractive and popular than one allowed to deteriorate. Maintenance needs to be well planned as, having invested time and money by building the route, it is important that it remains attractive to users.

Programmed maintenance of the wider highway network can offer opportunities to enhance the network of walking/cycling routes if properly planned – see Chapter 9.

Walking and riding quality should be maintained, particularly keeping routes clean and ice free in autumn and winter.

Designing with maintenance in mind

Maintenance should be considered as part of the route development process long before construction starts. A thoughtful design will mean less maintenance in the future. For example an off-highway path surfaced with bituminous material will have a long life needing little maintenance.

The future maintenance burden, both financial and operational, on local highway authorities for any new cycling and walking infrastructure should be a major consideration for designers and it is recommended that both a Value Engineering and Future Maintenance Audit are carried out on all proposed designs before implementation.

It is particularly important to think about maintenance at the start of the design process if the project has capital funding available but maintenance will have to come from existing budgets. Sometimes money can be put aside from the capital source into a separate fund for future maintenance. Irrespective of what the ultimate arrangement will be, it is essential that the design team has agreed the future maintenance arrangements early in the scheme's development.

Maintenance Responsibilities

As noted in Chapter 2, most active travel routes will almost certainly be highways under the definition of the Act (a highway being a route that the public has the right to pass and re-pass), but this does not mean that the highway authority is responsible for their maintenance. Where the route is on the road it will usually be the responsibility of the highways department but some routes may well be the responsibility of another part(s) of the council – for example the education department if the route is through school playing fields.

Every department with future responsibility for the maintenance of the route needs to accept those responsibilities at the outset of the project and allow for them in future budgeting.

Many local parks and former railway greenways have local volunteer groups supplementing the staff carrying out the bigger maintenance tasks. They provide a hugely valuable role, ensuring the local community is involved in its local path and promoting its use, while carrying out smaller maintenance tasks.

General Maintenance Tasks

Each Local Highway Authority will have its own defect intervention criteria as part of the 'well maintained highways' process and established safety inspection regimes based on the hierarchical status and functionality of each asset.

The following list, though not exhaustive, gives some indication on the type of defects that affect walking and cycling network safety and serviceability.

Carriageway, Footway and Cycleway surface defects.

- Broken/uneven riding or walking surface with defects meeting or exceeding applied intervention criteria.
- Worn riding or walking surface with suspect skid resistance - where appropriate, testing of the surface should be carried out to ensure adequate skid resistance for traffic expected to use it
- Defective kerbs, edging and channels

On the parts of the cycle network that run within the carriageway any maintenance inspection regime of road surfaces should ensure that the area of the road which cyclists will most probably use (up to 2m from the kerb) receives a closer examination, with hazards in those locations receiving priority attention.

Drainage and utility covers maintenance

- Missing or damaged inspection or drainage covers and frames
- Surface water flooding or severe standing water
- Blocked surface water gullies and drainage systems

Ironworks, such as drainage gullies and utility covers, are particularly hazardous for cyclists, being both slippery in wet conditions, and often associated with potholes which form around their edges. Where cycle routes are located on roads shared with traffic, such surface defects can lead to greater conflict, with people on bikes often having to make often risky manoeuvres..

Guardrail, fencing and restraint systems

Missing or damaged posts, rails or barrier likely to cause a potential danger or render system ineffective

Signage, Road Studs and Markings

- Missing, damaged or illegible sign faces.
- Damaged post or fixings
- Insufficient headroom from underside of sign
- Insufficient offset from trafficked areas

- Post/ sign obstruction to passage or visibility
- Loose sign brackets resulting in turned sign face
- Missing or damaged road studs
- Missing , faded, worn or incomplete markings

Streetlighting, Traffic Systems, pedestrian and cycle crossings

- Daytime lamp burn
- Lamp out
- Damage, corrosion to columns or posts
- Damaged/turned heads or lanterns
- Missing/loose access doors to columns or cabinet
- Missing / damaged tactile paving at crossing
- Missing / damaged tactile rotating cone on crossing

Verge, Trees and Hedges

- Obstructed visibility or physical obstruction to free passage by vegetation, particularly at junctions and crossing points; cuttings to be kept clear of path surface.
- Root heave to surrounding walking or cycling surface
- Obvious damage, disease or poor condition of any tree within falling distance of the route
- Need for periodic cutting back of adjacent grass verges or banks to maintain full width of asset

Cleanliness and Weed Growth

- Unacceptable levels of leaf litter likely to cause drainage or safety issues for users
- Unacceptable levels of litter, detritus or dog fouling
- Sign face cleansing
- Unacceptable levels of weed growth
- Presence of Noxious weed growth
- Programmed cleansing of litter/dog fouling bins

A poorly cleansed surface, apart from discouraging users, can present real dangers to the user. Bypasses and gaps for cyclists do not benefit from the movement of motor traffic to push debris out of the way, so these need to be of sufficient width for street sweepers and regularly swept if they are to be usable.

Broken glass is one of the more obvious dangers to both cyclists and walkers. However, excessive leaf litter or detritus build up can cause potential slip hazards and impact on the efficiency of surface water drainage infrastructure.

Often more of an issue on off road infrastructure, failure to control weed growth can have a detrimental effect of the safety and serviceability of an asset as well as its attractiveness to users.

If litter bins are provided within the design, there must be a commitment to their regular cleansing. However, the maintenance of litter bins is a considerable burden on Local Highway Authorities, especially on rural routes.

Maintaining Routes Through Roadworks

Roadworks should provide suitable provision for pedestrians, particularly disabled people and cyclists – and without cyclists needing to dismount. Equipment located on the footway must be fenced off and the accessibility of the route maintained for all types of user, with signed diversion routes where necessary.

TROs may be used to place temporary traffic restrictions on roads during construction in order to enable the works to proceed safely, such as making a route one way.

Temporary contraflow cycle lane during roadworks, London

DfT Safety at Street Works and Road Works states that:

> *"If your work is going to obstruct a footway or part of a footway, you must provide a safe route for pedestrians that should include access to adjacent buildings, properties and public areas where necessary. This route must consider the needs of those with small children, pushchairs and those with reduced mobility, including visually impaired people and people using wheelchairs or mobility scooters. You should always try to enable pedestrians to remain safely on the footway if at all possible." (p28 DfT, 2013)*

Chapter 8 of the Traffic Signs Manual states that:

> *"O3.14.6 Where there is cycle provision, such as cycle lanes or tracks, efforts should be made to keep these open or to provide an acceptable alternative during the road works. They should not be blocked by signs, debris, plant etc."*

Road works and any unavoidable consequential route changes must be clearly signed and promoted. Where route changes are planned the Local Authority must raise awareness in the local community and at key facilities or destinations served by the route. This must include using local radio, talking newspapers, and informing disability groups.

Bridges and other structures

Bridges usually have a separate inspection and management system from the rest of the highway and traffic free networks. Bridge owners such as local councils and Network Rail have sophisticated bridge management systems. These tend to focus on the structural condition of the bridge and can pay less attention to the environment of the bridge. Thus

graffiti can remain indefinitely unless reported to the council, making the whole environment feel uncared for and potentially threatening for walkers and cyclists. Underpasses provided for pedestrians and cyclists to avoid busy roads are particularly vulnerable to this type of abuse making their use at best an off-putting and sometimes frightening experience.

Smaller bridges in parks and similar traffic-free environments sometimes have wooden decks. Unless these are treated with a good antiskid surfacing material at the time of construction they can become very slippery when wet. Once again, by considering the maintenance problems at the design stage, potential problems can be avoided before they become significant.

It is important to keep trees and bushes cut back close to bridges to allow inspectors a clear view of the structure and to avoid damage to by those trees and bushes which can cause masonry to crack and painted surfaces to corrode.

Winter Maintenance

Local Highway Authorities in Wales are under a duty to ensure, so far as reasonably practicable, that safe passage along a highway is not endangered by snow or ice.

Whilst this is not an absolute duty due to the qualification of 'reasonable practicality', the Active Travel Act raises the priority of walking and cycling routes and this should be reflected in local authorities' winter maintenance programmes.

It is not reasonable, due to the scale and cost to expect Local Highway Authorities to apply this service to all of the highway network or ensure that treated sections of the network remain ice or snow free. However, well used walking and cycling routes should merit a high priority.

It is therefore recommended that the authority:

- Undertakes risk assessments of which parts of the cycling and walking network should be identified for treatment in Winter Service Plans
- Engage cycling and walking stakeholders and users in the development of policies, winter service and operational Plans
- Advise and inform walking and cycling network users and stakeholders on the extent of the service and safe use during these periods

Highway Enforcement and Custodianship

Although not strictly a maintenance function, Local Highway Authorities also have a duty to assert and protect the rights of the public to the use and enjoyment of any highway, including active travel routes.

The following list, though not exhaustive, shows typical enforcement or controlling actions that may need to be taken to meet the needs of users and ensure compliance with statutory duties in relation to walking and cycling. All the following have potential to cause unnecessary obstruction or potentially unsafe conditions for both cyclists and walkers, and should be addressed by the local authority or police, as appropriate.

- Placing of builders skips within the highway
- Placing of building materials within the highway
- Scaffolding within the highway
- A boards placed within the highway

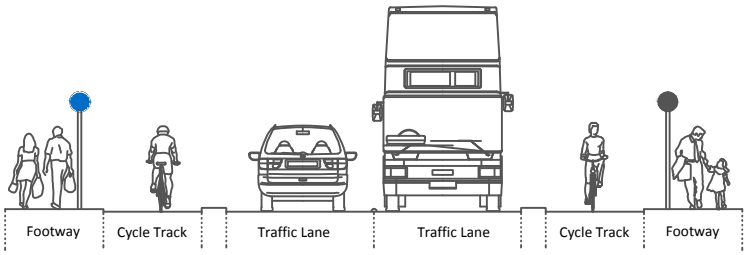
- Displaying of goods for sale within the highway
- Parking on the footway and across dropped kerbs
- Parking of trailers or caravans so as to cause obstruction
- Illegal signage within the highway
- Cutting back of privately owned vegetation encroaching on the highway
- Mud etc deposited on the highway
- Control of statutory undertakers and maintenance works

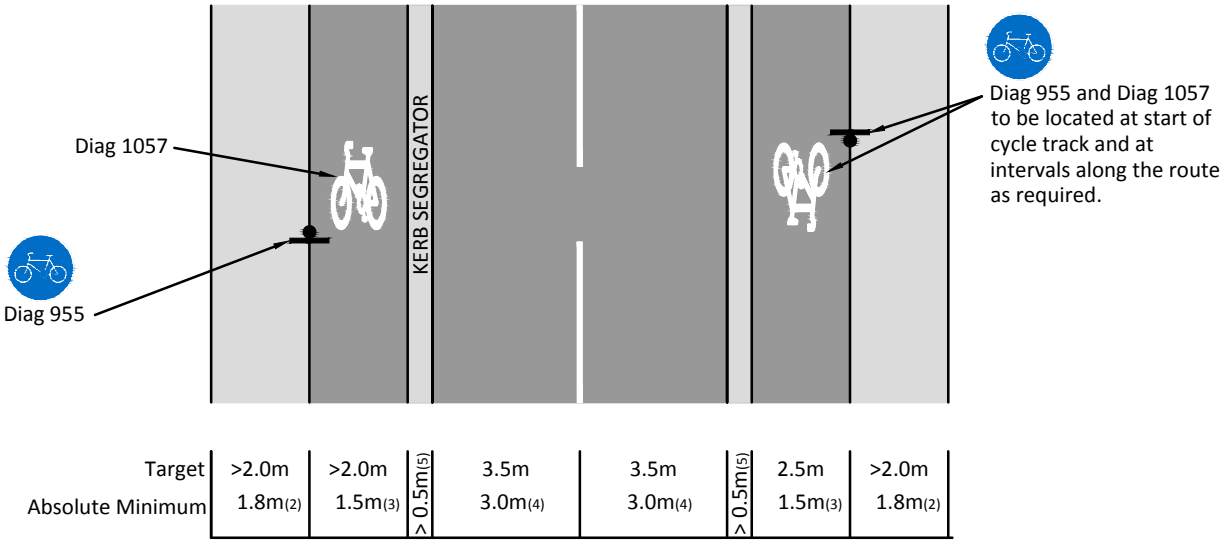
APPENDIX A – LAYOUT DRAWINGS

BIRMINGHAM CYCLE REVOLUTION

Title:

ONE-WAY CYCLE TRACKS





Target	>2.0m	>2.0m	0.5m(5)	3.5m	3.5m	0.5m(5)	2.5m	>2.0m
Absolute Minimum	1.8m(2)	1.5m(3)		3.0m(4)	3.0m(4)		1.5m(3)	1.8m(2)

(1) Effective width subject to pedestrian flow.
(2) Localised narrowing of footway due to street furniture permitted.
(3) Absolute minimum cycle track width only permitted for low cycle demand (<100/day) over distances < 100m, not on gradients > 7%.
(4) Absolute minimum traffic lane 3.25 bus or HGV route. 3.0m within 30mph
(5) Desirable and absolute minimum to be 0.5m.

Advantages:

- High profile facility exclusively for cycles
- Provides positive physical segregation from motorised traffic and pedestrians

Disadvantages:

- Has to revert to cycle lanes through junctions
- Sometimes complex solutions for bus stops and adjacent on-street parking or loading areas
- Requires wide highway
- High construction costs due to drainage issues

Key Criteria:

- Physical segregation between cyclists and both motorised vehicles and pedestrians.
- 24-hour operation
- No loading and no parking
- Street furniture including lighting columns and signs and supporting structures to be located outside of cycle track
- Consistent quality is essential, no changes in track widths, no “gaps”
- No coloured surfacing
- Smooth, flat, well-drained and well-maintained surface
- Not suitable where frequent side roads / driveway accesses intersect cycle track
- Gullies preferably located in kerb (or a continuous drainage system) and not in cycle track. Additional gullies may be needed to provide adequate carriageway drainage.

Typical Costs:

Work Zone Length	1000m
Lower Cost Estimate	£420,000
Upper Cost Estimate	£1,300,000

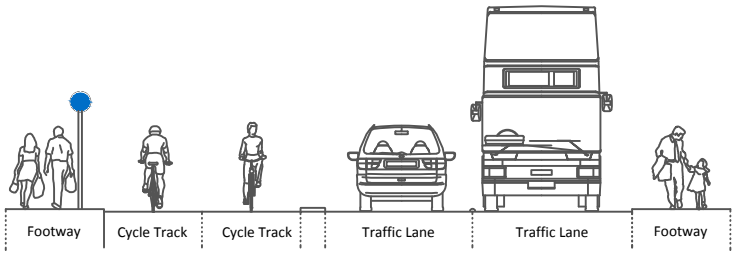
- Cost estimates are indicative only and can vary significantly depending upon local site conditions.
- Lower cost value based on minimal engineering interventions
- Upper cost value based on maximum engineering interventions
- Cost estimate assume cycle facility provisions on both sides of the carriageway.

Drawing No:	L-CT-GE-01	Rev:
Lead Section:	LINKS	

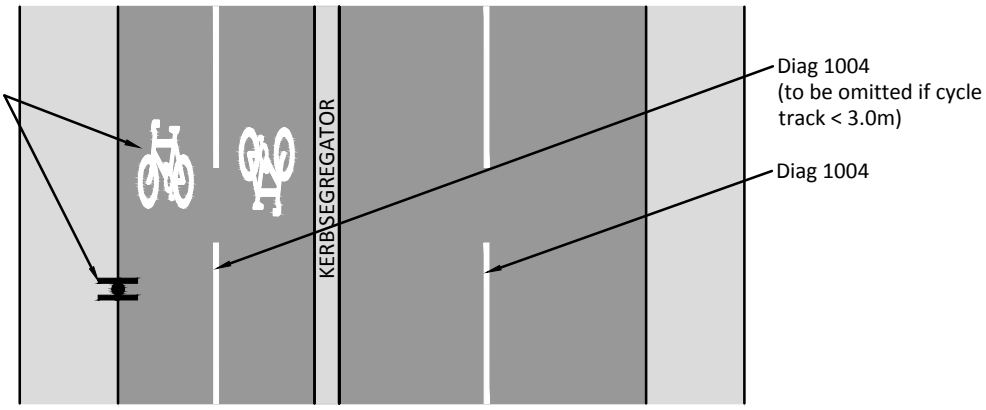
BIRMINGHAM CYCLE REVOLUTION

Title:

TWO-WAY CYCLE TRACK



Diag 955 mounted back to back and Diag 1057 to be located at start of cycle track and at intervals along the route as required .
Mount on other street furniture (E.g lighting column) where possible to reduce clutter.



Target	>2.0m	4.0m	> 0.5m(5)	3.5m	3.5m	>2.0m
Absolute Minimum	1.8m(2)	2.5m(3)		3.0m(4)	3.0m(4)	1.8m(2)

(1) Effective width subject to pedestrian flow.
(2) Localised narrowing of footway due to street furniture permitted.
(3) Absolute minimum cycle track width for low cycle demand (<100/day) , only permitted over distances < 100m, not on gradients > 7%.
(4) Absolute minimum traffic lane 3.25 if bus route, HGV levels > 8% or speed limit > 30mph. 3.0m in 30mph areas.
(5) Desirable and absolute minimum to be 0.5m.

Advantages:

- High profile facility exclusively for cycles
- Provides positive physical segregation from motorised traffic and pedestrians

Disadvantages:

- Has to revert to cycle lanes through junctions
- Sometimes complex solutions for bus stops and adjacent on-street parking or loading areas
- Requires wide highway
- High construction costs due to drainage issues

Key Criteria:

- Physical segregation between cyclists and both motorised vehicles and pedestrians.
- 24-hour operation
- No loading and no parking
- Street furniture including lighting columns and signs and supporting structures to be located outside of cycle track
- Consistent quality is essential, no changes in track widths, no “gaps”
- No coloured surfacing
- Smooth, flat, well-drained and well-maintained surface
- Not suitable where frequent side roads / driveway accesses intersect cycle track
- Gullies preferably located in kerb (or a continuous drainage system) and not in cycle track. Additional gullies may be needed to provide adequate carriageway drainage.

Typical Costs:

Work Zone Length	1000m
Lower Cost Estimate	£300,000
Upper Cost Estimate	£1,200,000

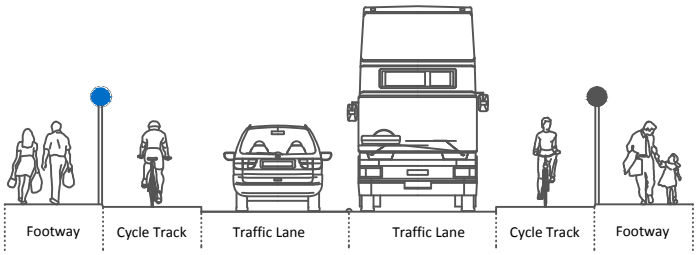
- Cost estimates are indicative only and can vary significantly depending upon local site conditions.
- Lower cost value based on minimal engineering interventions
- Upper cost value based on maximum engineering interventions
- Cost estimate assume cycle facility provisions on both sides of the carriageway.

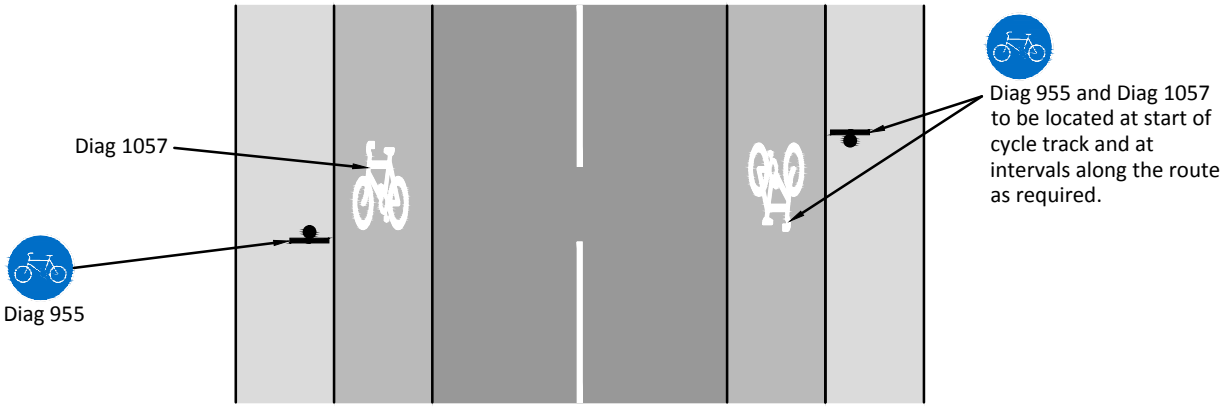
Drawing No:	L-CT-GE-02	Rev:
Lead Section:	LINKS	

BIRMINGHAM CYCLE REVOLUTION

Title:

HALF HEIGHT CYCLE TRACKS





Target	>2.0m	2.5m	3.5m	3.5m	2.5m	>2.0m
Absolute Minimum	1.8m(2)	1.5m(3)	3.0m(4)	3.0m(4)	1.5m(3)	1.8m(2)

(1) Effective width subject to pedestrian flow.
(2) Localised narrowing of footway due to street furniture permitted.
(3) Absolute minimum cycle track width only permitted for low cycle demand (<100/day) over distances < 100m, not on gradients > 7%.
(4) Absolute minimum traffic lane 3.25m if bus route, HGV levels > 8% or speed limit > 30. 3.0m where no buses and few HGVs.

Advantages:

- High profile facility exclusively for cycles
- Provides positive physical segregation from motorised traffic and pedestrians

Disadvantages:

- Has to revert to cycle lanes through junctions
- Sometimes complex solutions for bus stops and adjacent on-street parking or loading areas
- Requires wide highway
- High construction costs
- No buffer zone between traffic and cycles

Key Criteria:

- Physical segregation (level difference) between cyclists and both motorised vehicles and pedestrians.
- 24-hour operation
- No loading and no parking
- Street furniture including lighting columns and signs and supporting structures to be located outside of cycle track
- Consistent quality is essential, no changes in track widths, no “gaps”
- No coloured surfacing
- Smooth, flat, well-drained and well-maintained surface
- Less appropriate where frequent side roads / driveway accesses intersect cycle track

Typical Costs:

Work Zone Length	1000m
Lower Cost Estimate	£500,000
Upper Cost Estimate	£1,900,000

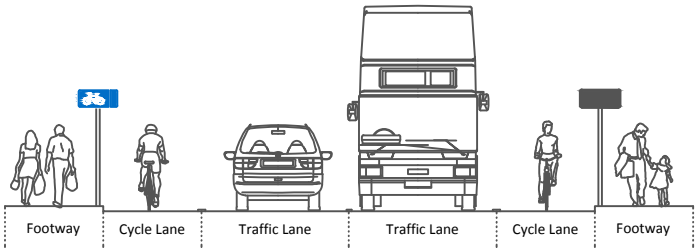
- Cost estimates are indicative only and can vary significantly depending upon local site conditions.
- Lower cost value based on minimal engineering interventions
- Upper cost value based on maximum engineering interventions
- Cost estimate assume cycle facility provisions on both sides of the carriageway.

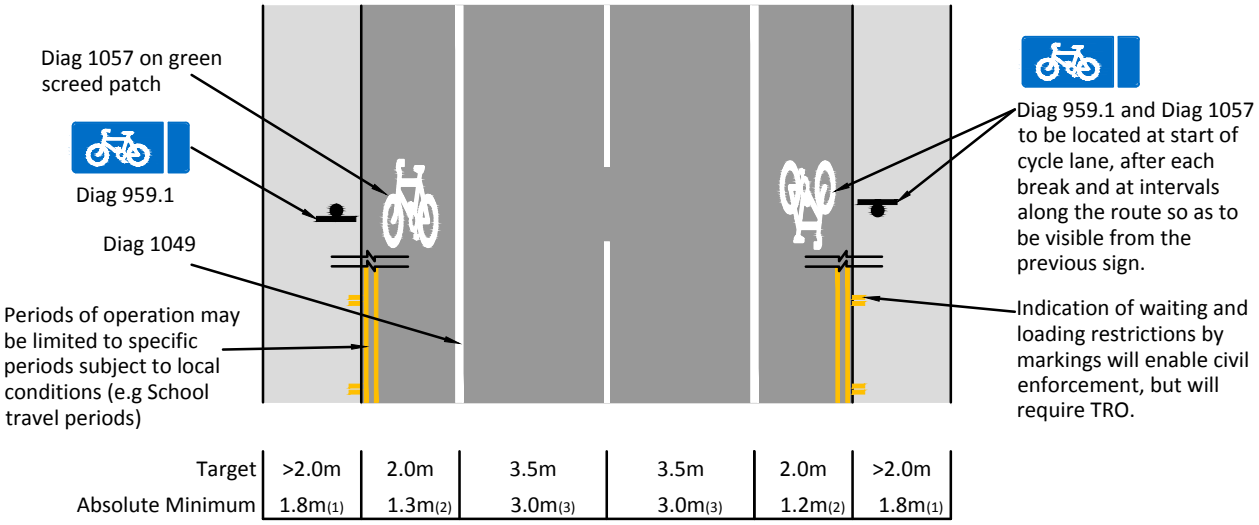
Drawing No:	L-CT-HT-01	Rev:
Lead Section:	LINKS	

BIRMINGHAM CYCLE REVOLUTION

Title:

MANDATORY CYCLE LANE





Target	>2.0m	2.0m	3.5m	3.5m	2.0m	>2.0m
Absolute Minimum	1.8m(1)	1.3m(2)	3.0m(3)	3.0m(3)	1.2m(2)	1.8m(1)

(1) Localised narrowing of footway due to street furniture permitted - need to reflect pedestrian flows.
(2) Absolute minimum cycle lane width only permitted for low cycle demand (<100/day) over distances < 100m, not on gradients > 7%.
(3) Absolute minimum traffic lane 3.25m if bus route, HGV levels > 8% or speed limit > 30mph. 3.0 where there are no buses and few HGVs

Advantages:

- Exclusive use by cyclists during specified hours of operation
- Delineated by a solid line, less likely to be crossed by drivers than an advisory lane
- Drivers commit an offence if they enter the lane

Disadvantages:

- Requires a TRO which can be a lengthy process and subject to objections
- Has to revert to advisory where vehicles can legitimately cross (e.g. junctions, adjacent to parking or loading bays, where traffic lanes are narrow)
- High level of statutory signing requirements

Key Criteria:

- Consistent quality is essential, no changes in lane widths, no “gaps”.
- Sufficient road width must be available to cater for other road users outside the cycle lane.
- Parking and loading not permitted in cycle lane and must be provided elsewhere if required. Mandatory cycle lane has to change to advisory cycle lane through junctions, at bus stops, and at parking and loading areas.
- Smooth, flat, well-drained and well-maintained surface.
- Gullies preferably located in kerb (or a continuous drainage system) and not in cycle lane.
- 24-hour operation.

Typical Costs:

Work Zone Length	1000m
Lower Cost Estimate	£70,000
Upper Cost Estimate	£265,000

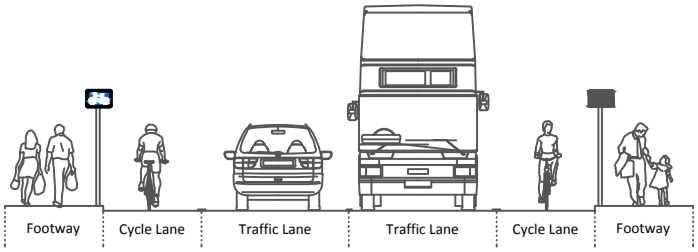
- Cost estimates are indicative only and can vary significantly depending upon local site conditions.
- Lower cost value based on minimal engineering interventions
- Upper cost value based on maximum engineering interventions
- Cost estimate assume cycle facility provisions on both sides of the carriageway.

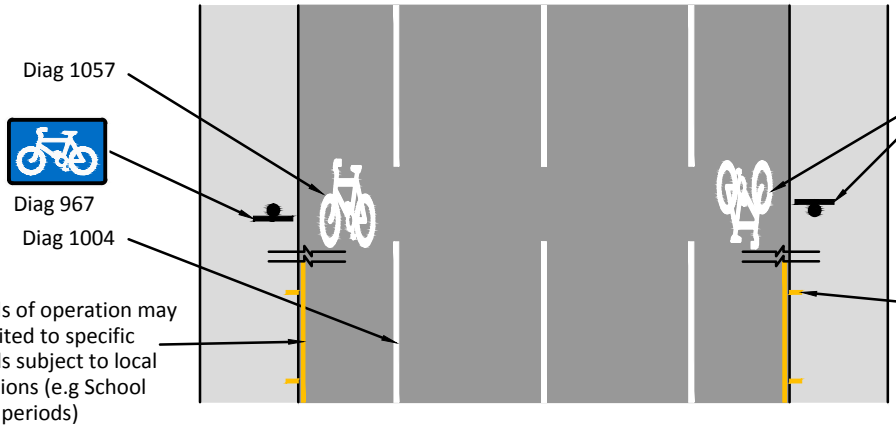
Drawing No:	L-CL-GE-01	Rev:
Lead Section:	LINKS	

BIRMINGHAM CYCLE REVOLUTION

Title:

ADVISORY CYCLE LANE





Target	>2.0m	2.0m	3.5m	3.5m	2.0m	>2.0m
Absolute Minimum	1.8m(1)	1.2m(2)	3.0m(3)	3.0m(3)	1.2m(2)	1.8m(1)

(1) Localised narrowing of footway due to street furniture permitted - need to reflect pedestrian flows.
(2) Absolute minimum cycle lane width only permitted for low cycle demand (<100/day) over distances < 100m, not on gradients > 7%.
(3) Absolute minimum traffic lane 3.25m if bus route, HGV levels > 8% or speed limit > 30mph. 3.0m where there are no buses and few HGVs

Advantages:

- No TRO required for cycle lane
- Quick to introduce
- Low level of signing
- Solution for use alongside adjacent parking and loading bays, bus stops and across junctions, or on sections of road with narrow traffic lanes

Disadvantages:

- Indicative only - no statutory backing
- Largely ignored by other road users
- TRO may be required to keep lane clear of parked and loading vehicles at specific times

Key Criteria:

- Consistent quality is essential, no changes in lane widths, no “gaps”.
- Sufficient road width must be available to cater for other road users outside the cycle lane.
- Advisory cycle lanes should be used where there are demands for waiting or loading that cannot be mitigated by design. A Traffic Regulation Order will be required to impose waiting and loading restrictions appropriate to the level of prohibition required.
- Smooth, flat, well-drained and well-maintained surface.
- Gullies preferably located in kerb (or a continuous drainage system) and not in cycle lane.

Typical Costs:

Work Zone Length	1000m
Lower Cost Estimate	£70,000
Upper Cost Estimate	£265,000

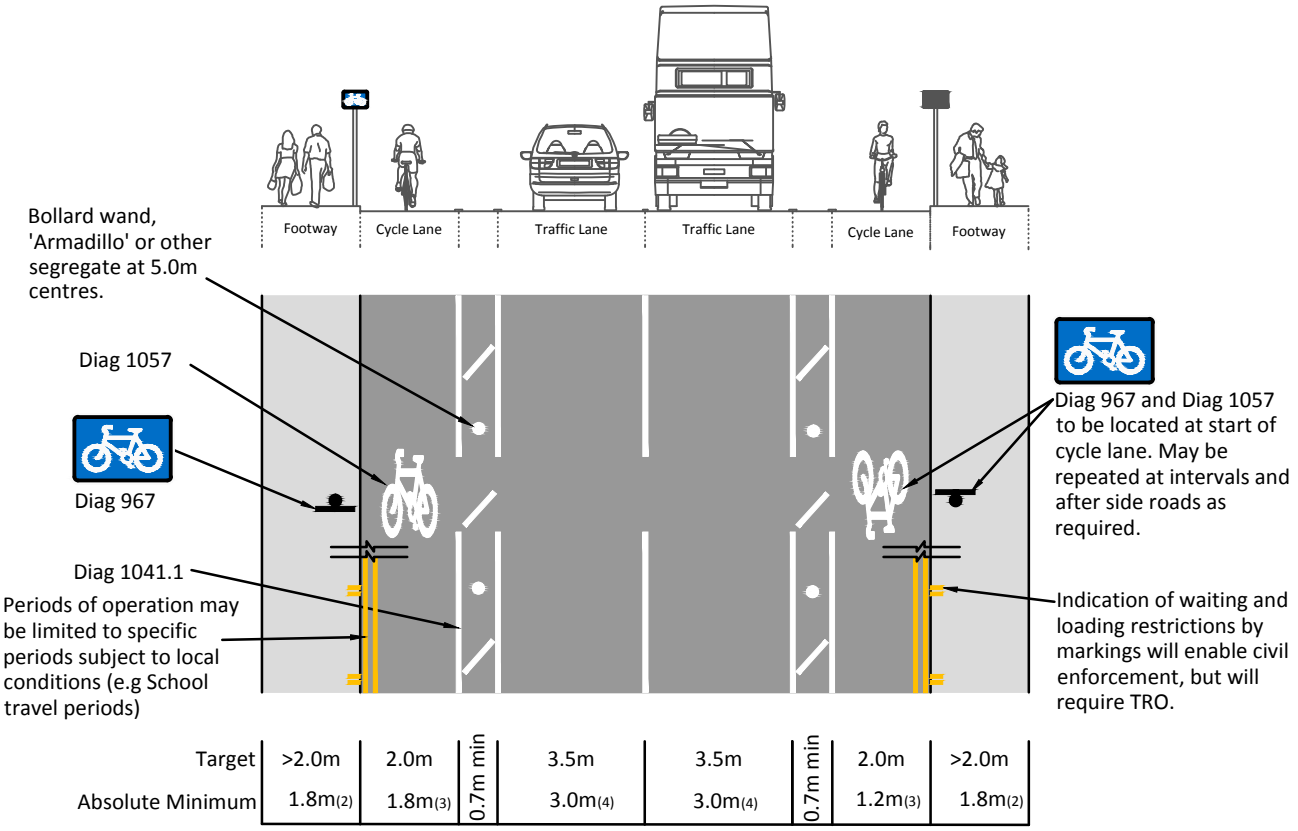
- Cost estimates are indicative only and can vary significantly depending upon local site conditions.
- Lower cost value based on minimal engineering interventions
- Upper cost value based on maximum engineering interventions
- Cost estimate assume cycle facility provisions on both sides of the carriageway.

Drawing No:	L-CL-GE-02	Rev:
Lead Section:	LINKS	

BIRMINGHAM CYCLE REVOLUTION

Title:

PROTECTED CYCLE LANE



Target	>2.0m	2.0m	0.7m min	3.5m	3.5m	0.7m min	2.0m	>2.0m
Absolute Minimum	1.8m(2)	1.8m(3)		3.0m(4)	3.0m(4)		1.2m(3)	1.8m(2)

(1) Effective width subject to pedestrian flow.
(2) Localised narrowing of footway due to street furniture permitted.
(3) Absolute minimum cycle track width only permitted for low cycle demand (<100/day) over distances < 100m, not on gradients > 7%.
(4) Absolute minimum traffic lane 3.25 if bus route, HGV levels > 8% or speed limit > 30mph. 3.0m there are no busses and limited HGV traffic

Advantages:

- No TRO required
- Quick to introduce
- Low level of signing
- Solution for use alongside adjacent parking and loading bays, bus stops and across junctions, or on sections of road with narrow traffic lanes

Disadvantages:

- Requires wide kerb to kerb width.
- May require a TRO to keep lane clear of parked and loading vehicles at specific times

Key Criteria:

- Consistent quality is essential, no changes in lane widths, no “gaps”.
- Sufficient road width must be available to cater for other road users outside the cycle lane.
- Parking and loading not permitted in cycle lane and must be provided elsewhere if required. Mandatory cycle lane may change to advisory cycle lane through junctions, at bus stops, and at parking and loading areas.
- Gullies preferably located in kerb (or a continuous drainage system) and not in cycle lane.
- Maybe Advisory (as shown) or mandatory by use of continuous bounding line on cycle lane side of Diag 1041.1 marking.

Typical Costs:

Work Zone Length	1000m
Lower Cost Estimate	£160,000
Upper Cost Estimate	£1,000,000

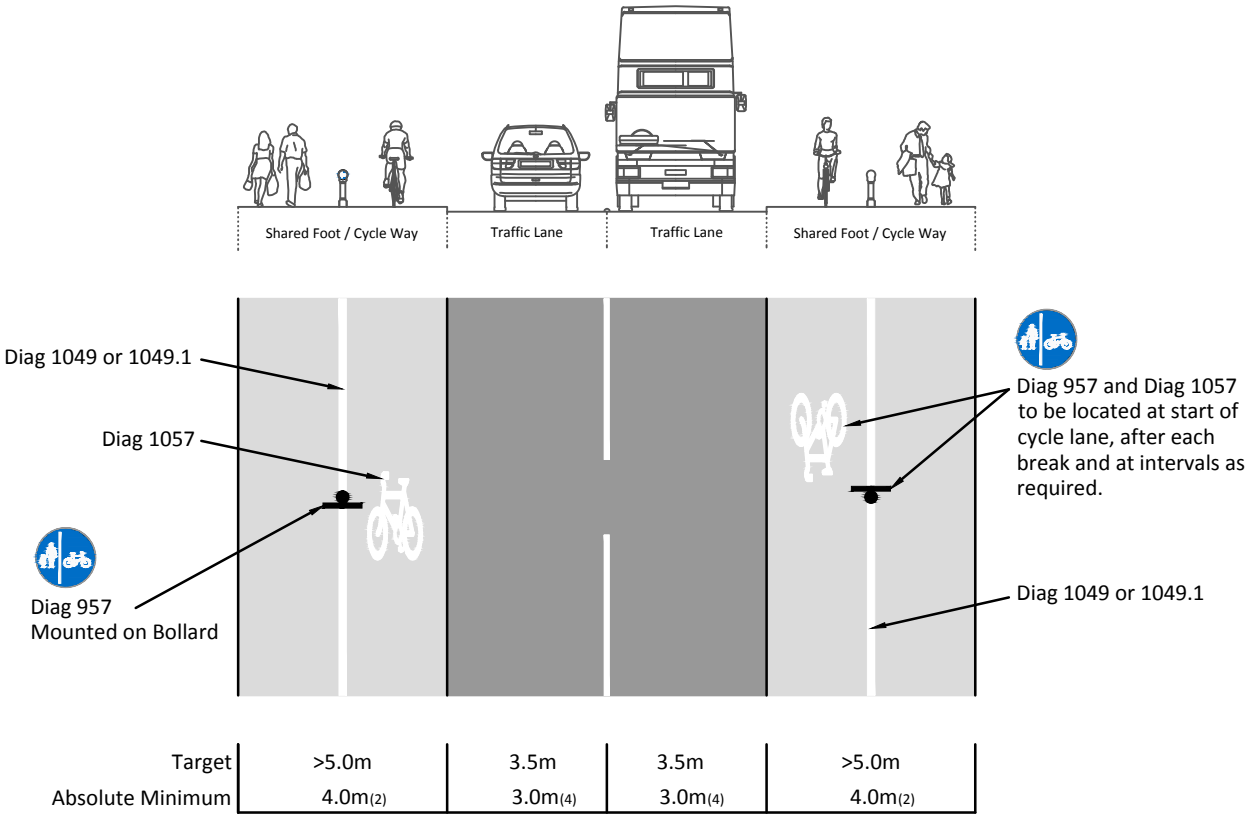
- Cost estimates are indicative only and can vary significantly depending upon local site conditions.
- Lower cost value based on minimal engineering interventions
- Upper cost value based on maximum engineering interventions
- Cost estimate assume cycle facility provisions on both sides of the carriageway.

Drawing No:	L-CL-GE-03	Rev:
Lead Section:	LINKS	

BIRMINGHAM CYCLE REVOLUTION

Title:

ADJACENT FOOTWAY + CYCLE TRACK



Target	>5.0m	3.5m	3.5m	>5.0m
Absolute Minimum	4.0m(2)	3.0m(4)	3.0m(4)	4.0m(2)

(1) Effective width.
(2) Localised narrowing of footway due to street furniture permitted.
(3) Absolute minimum cycle/ped width only permitted for low cycle demand (<100/day) over distances < 100m, not on gradients > 7%.
(4) Absolute minimum traffic lane 3.25m if bus route, HGV levels > 8% or speed limit > 30mph

Advantages:

- High profile facility exclusively for cycles
- Provides positive physical segregation from motorised traffic and pedestrians

Disadvantages:

- Segregation may not be observed, leading to conflict.
- Sometimes complex solutions for bus stops and adjacent on-street parking or loading areas.
- Requires wide highway.
- High construction costs.
- Side road crossing can be a problem.
- Likely to be used as two-way by cyclists.

Key Criteria:

- Physical segregation between cyclists and both motorised vehicles and pedestrians.
- 24-hour operation
- Street furniture including lighting columns and signs and supporting structures to be located outside of cycle track
- Consistent quality is essential, no changes in track widths, no “gaps”
- No coloured surfacing
- Smooth, flat, well-drained and well-maintained surface
- Not suitable where frequent side roads / driveway accesses intersect cycle track

Typical Costs:

Work Zone Length	1000m
Lower Cost Estimate	£190,000
Upper Cost Estimate	£1,200,000

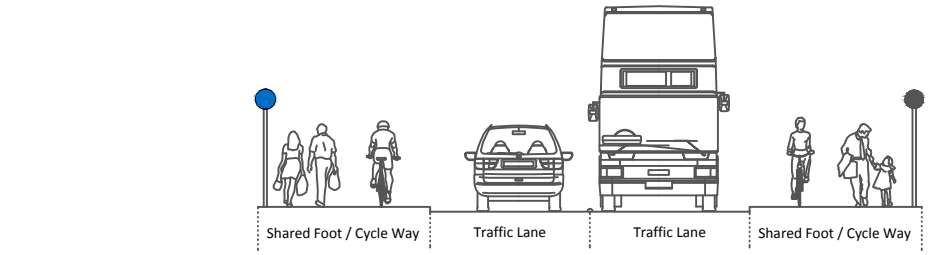
- Cost estimates are indicative only and can vary significantly depending upon local site conditions.
- Lower cost value based on minimal engineering interventions
- Upper cost value based on maximum engineering interventions
- Cost estimate assume cycle facility provisions on both sides of the carriageway.

Drawing No:	L-SF-GE-01	Rev:
Lead Section:	LINKS	

BIRMINGHAM CYCLE REVOLUTION

Title:

SHARED FOOTWAY / CYCLEWAY - UNSEGREGATED



Diag 956

Diag 956 to be located at start of cycle lane, after each break and at intervals along the route so as to be visible from the previous sign.

Target	>3.0m	3.5m	3.5m	>3.0m
Absolute Minimum	2.5m(2)(3)	3.0m(4)	3.0m(4)	2.5m(2)(3)

(1) Effective width.
(2) Localised narrowing of footway due to street furniture permitted.
(3) Absolute minimum cycle/ped width only permitted where few pedestrians use footway (<100/day) over distances < 100m, not on gradients > 7%.
(4) See Table 7, Chapter 2 for minimum general traffic lane widths.

Advantages:

- Provides some protection on link sections

Disadvantages:

- Ped/Cycle conflict
- Sometimes complex solutions for bus stops and adjacent on-street parking or loading areas
- Requires wide highway
- High construction costs
- Problematic at side roads
- Usually used as 2-way by cyclists

Key Criteria:

- Physical segregation between cyclists and both motorised vehicles and pedestrians.
- 24-hour operation
- Street furniture including lighting columns and signs and supporting structures to be located outside of cycle track
- Consistent quality is essential, no changes in track widths, no “gaps”
- No coloured surfacing
- Smooth, flat, well-drained and well-maintained surface
- Not suitable where frequent side roads / driveway accesses intersect cycle track

Typical Costs:

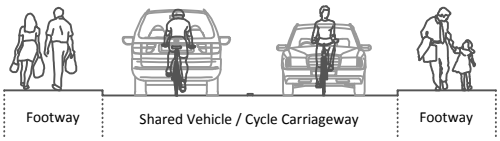
Work Zone Length	1000m
Lower Cost Estimate	£105,000
Upper Cost Estimate	£690,000

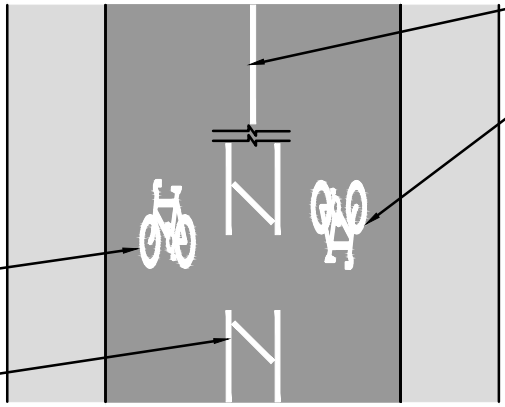
- Cost estimates are indicative only and can vary significantly depending upon local site conditions.
- Lower cost value based on minimal engineering interventions
- Upper cost value based on maximum engineering interventions
- Cost estimate assume cycle facility provisions on both sides of the carriageway.

Drawing No:	L-SF-GE-02	Rev:
Lead Section:	LINKS	

Title:

QUIET STREET





For carriageway widths <5.5m, carriageway centre marking to be omitted.

Diag 1057
To be located at the start, after each junction and at intervals not greater than 160m.

Diag 1057

For carriageway widths >7.0m, Localised carriageway narrowing to be provided. May be done with edge of carriageway marking also.

Target	>2.0m	7.0m max available carriageway	>2.0m
Desirable Minimum	2.0m(1)		2.0m(1)
Absolute Minimum	1.8m(2)		1.8m(2)

(1) Effective width subject to pedestrian flow.
(2) Localised narrowing of footway due to street furniture permitted.
(3) Upright signs Diag 967 may be used if considered necessary.

Advantages:

- Solution for narrow streets where there is insufficient width for formal cycle priority
- Provides continuity of designated cycle routes in such situations

Disadvantages:

- Depends on cyclists establishing their position in the lane

Key Criteria:

- Appropriate for roads with carriageway width <7.0m, and subject to 20mph speed limit
- No segregation between cyclists and motorised vehicles - cyclists encouraged to occupy full lane, and traffic follows
- On carriageways less than 5.5m in width, centre line omitted
- Suitable for roads subject to low traffic volumes and little or no through traffic
- Careful detailing required when traffic calming present.
- 20mph speed limit or quiet 30mph road typically < 3000 VPD

Typical Costs:

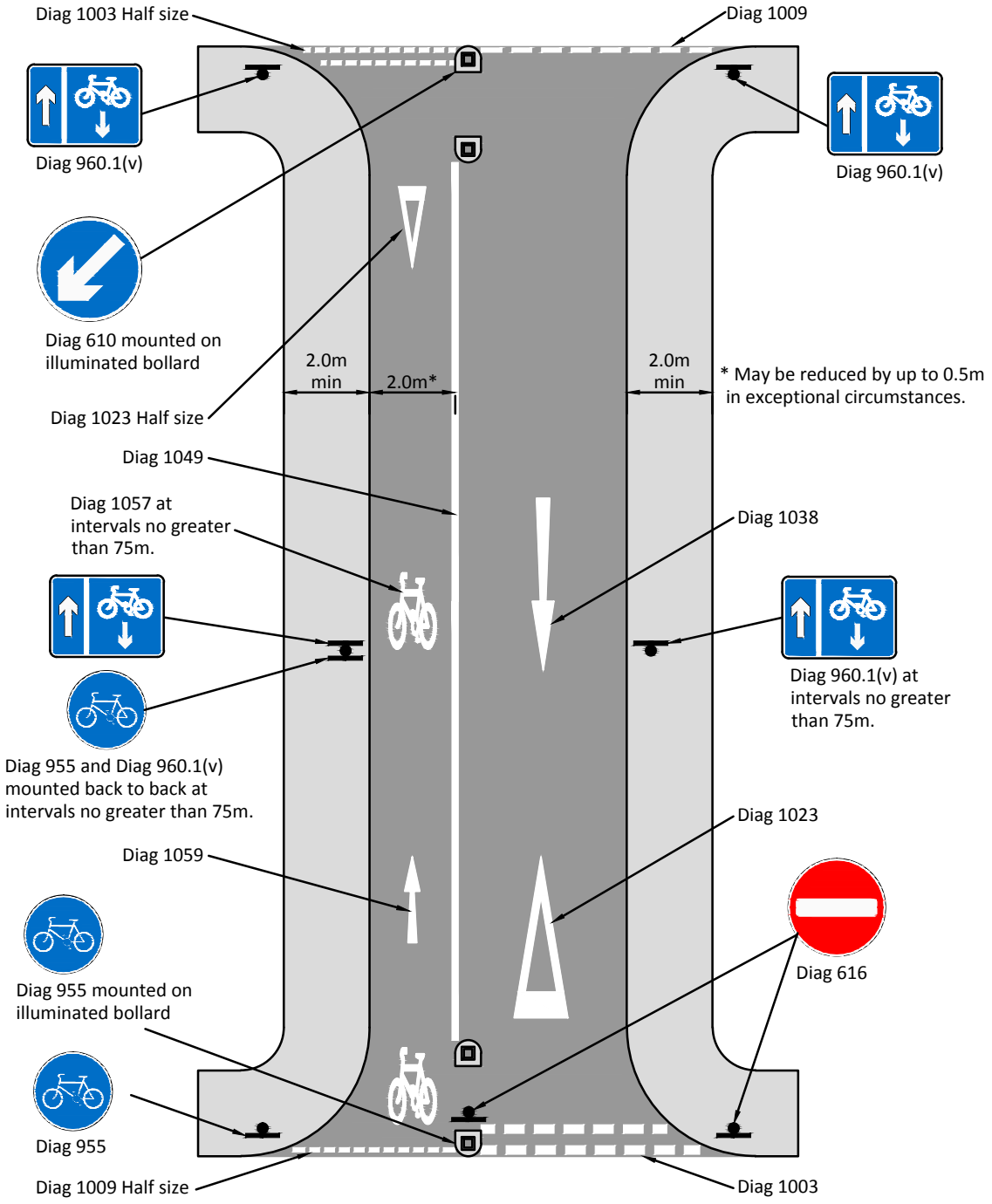
Work Zone Length	1000m
Lower Cost Estimate	£100,000
Upper Cost Estimate	£680,000

- Cost estimates are indicative only and can vary significantly depending upon local site conditions.
- Lower cost value based on minimal engineering interventions
- Upper cost value based on maximum engineering interventions
- Cost estimate assume cycle facility provisions on both sides of the carriageway.

Drawing No:	L-QS-GE-01	Rev:
Lead Section:	LINKS	

Title:

MANDATORY CONTRAFLOW CYCLE LANE



Key Criteria:

- Use on one-way streets
- May also incorporate with-flow cycle lane on opposite side.
- Can provide improved accessibility and continuity for cycle routes in one-way networks.

Typical Costs:

Work Zone Length	1000m
Lower Cost Estimate	£80,000
Upper Cost Estimate	£100,000

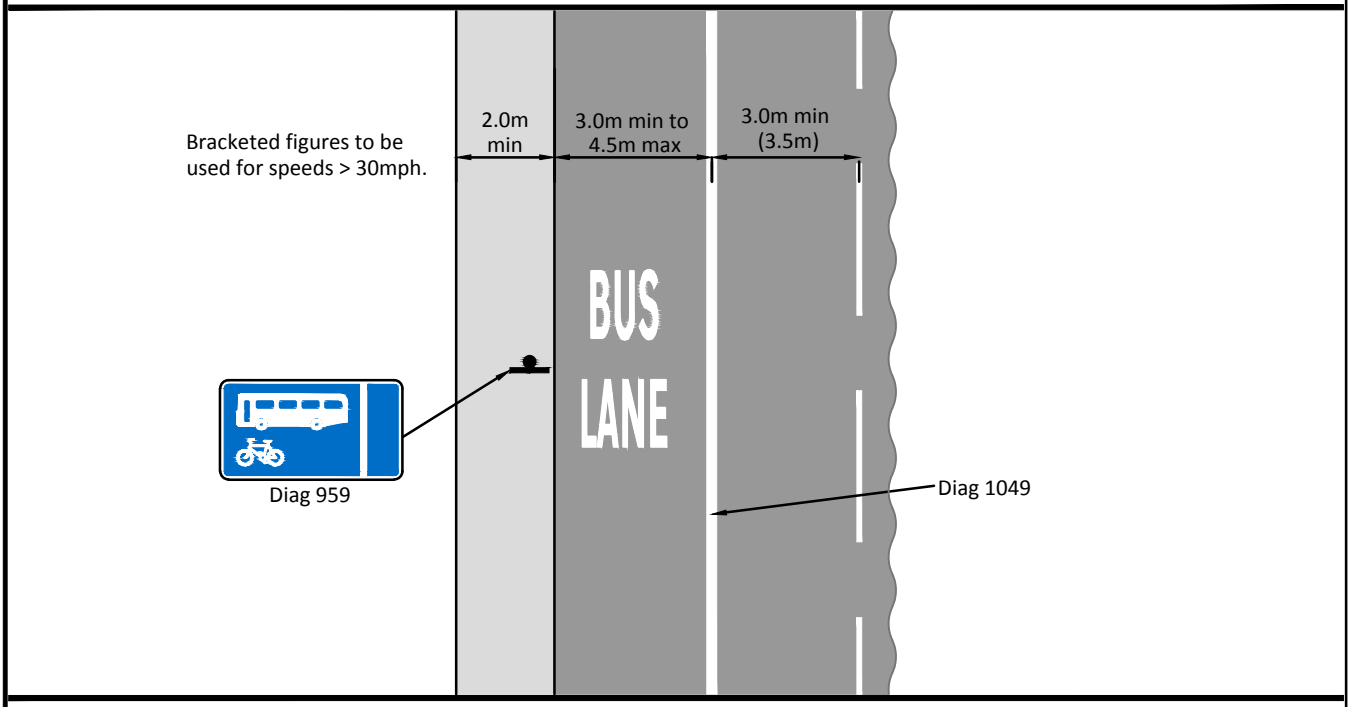
- Cost estimates are indicative only and can vary significantly depending upon local site conditions.

Drawing No:	L-CL-CF-01	Rev:
Lead Section:	LINKS	

BIRMINGHAM CYCLE REVOLUTION

Title:

BUS LANES



Key Criteria:

- At locations where a 4.5m Bus and Cycle Lane can be provided, a 1.5m advisory cycle lane should be marked adjacent to the kerb. This provides confidence for the cyclists using the lane, and a guide to bus drivers that sufficient clearance is available to overtake within the confines of the Bus Lane.
- At bus stops, the advisory cycle lane marking should be terminated at the bus cage, and re-started beyond. There will be sufficient width between the outer longitudinal edge of the bus cage marking and the outer bounding line of the Bus Lane to provide a passing lane for cyclists when the bus cage is occupied.
- If available road width constrains Bus Lane width, then the maximum width of the Bus Lane is 3.2m. This prevents users from misjudging clearances when overtaking. Cycles are still allowed to use the Bus Lane
- At bus stops, the advisory cycle lane marking should be terminated at the bus cage, and re-started beyond. As the gap between bus cage and bounding line is likely to be narrow (about 0.5m), consideration should be given to local widening of the Bus Lane through the bus stop to provide a 1.5m passing lane for cyclists.

Typical Costs:

Work Zone Length	1000m
Lower Cost Estimate	£200,000 / (£130,000)
Upper Cost Estimate	£1,200,000 / (£780,000)

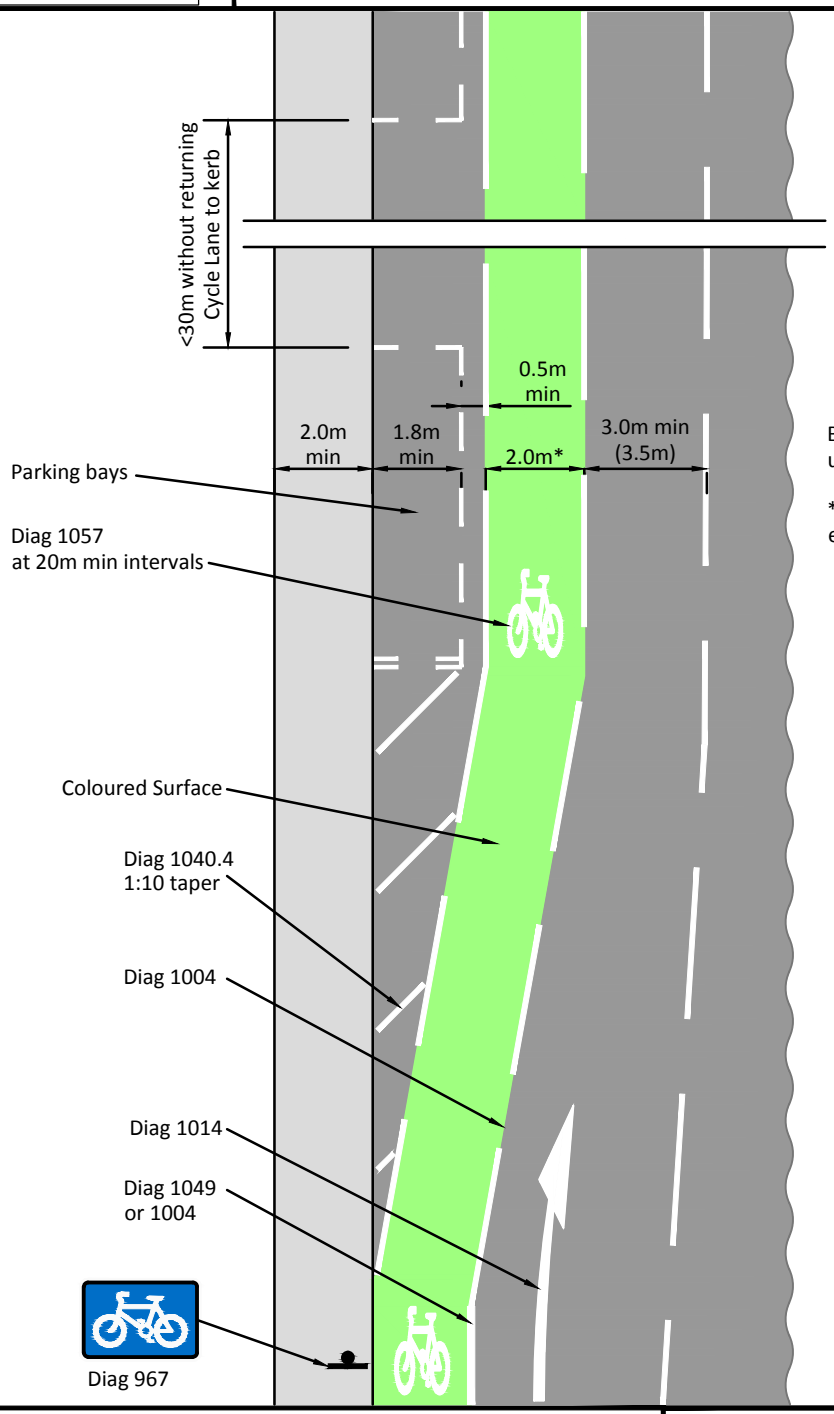
- Cost estimates are indicative only and can vary significantly depending upon local site conditions.
- Bracketed figure are Bus Lane Only.
- Lower cost value based on minimal engineering interventions
- Upper cost value based on maximum engineering interventions
- Cost estimate assume cycle facility provisions on one side of the carriageway.

Drawing No:	L-CL-BL-01	Rev:
Lead Section:	LINKS	

BIRMINGHAM CYCLE REVOLUTION

Title:

CYCLE LANE AT PARKING BAYS



Bracketed figures to be used for speeds > 30mph.

*May be reduced by up to 0.5m in exceptional circumstances

Key Criteria:

- Suitable where there is high kerbside activity
- Loading bays to be 2.0m minimum width

Typical Costs:

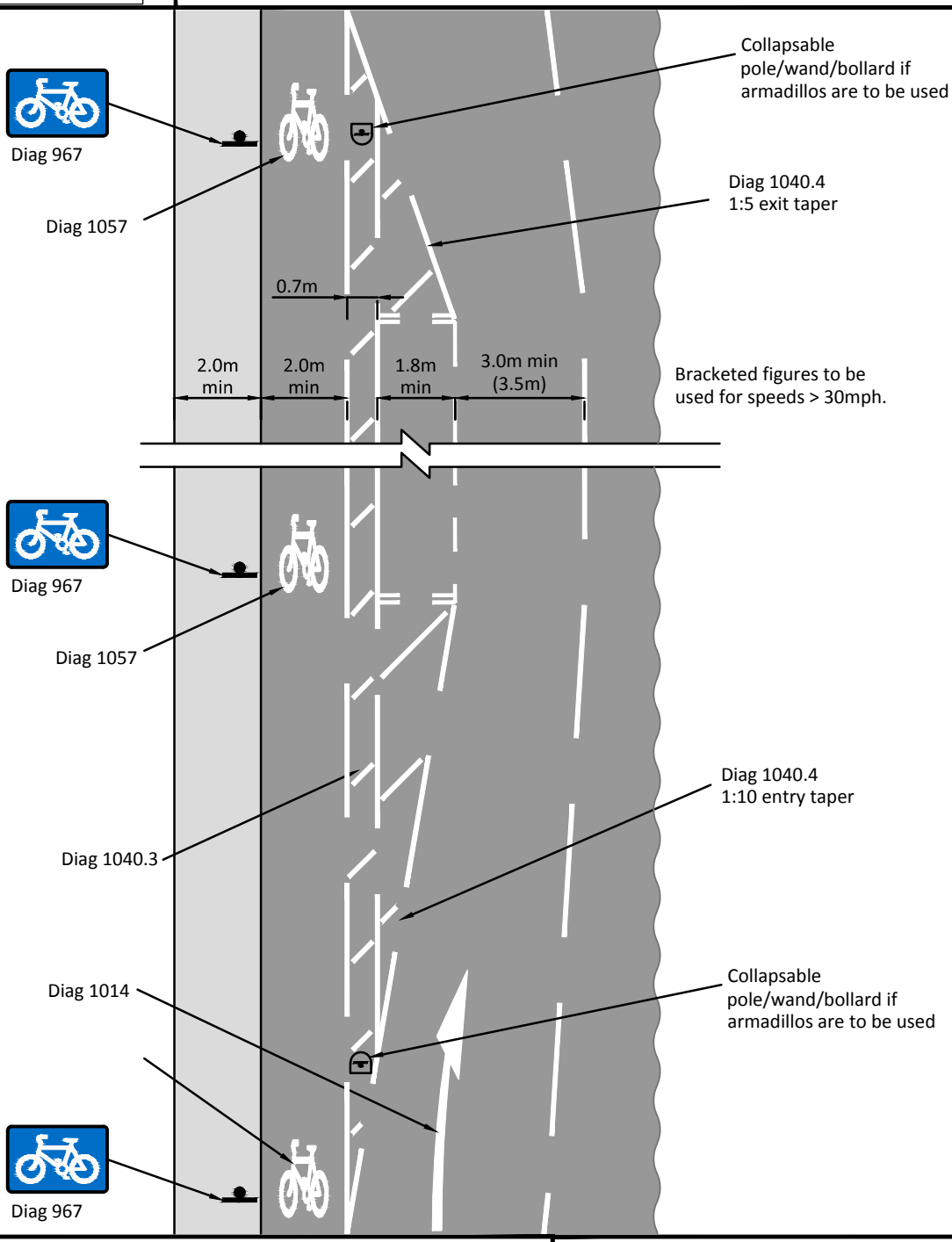
Work Zone Length	75m
Lower Cost Estimate	£15,000
Upper Cost Estimate	£80,000

- Cost estimates are indicative only and can vary significantly depending upon local site conditions.
- Lower cost value based on minimal engineering interventions
- Upper cost value based on maximum engineering interventions
- Cost estimate assume cycle facility provisions on one side of the carriageway.

Drawing No:	L-CL-PK-01	Rev:
Lead Section:	LINKS	

Title:

CYCLE LANE AT PARKING BAYS



Key Criteria:

- Permeable barriers (e.g. 'armadillos' may be installed within the Diag 1004 hatched areas at 5.0m centres subject to DfT approval
- Suitable where there is low kerbside activity.

Typical Costs:

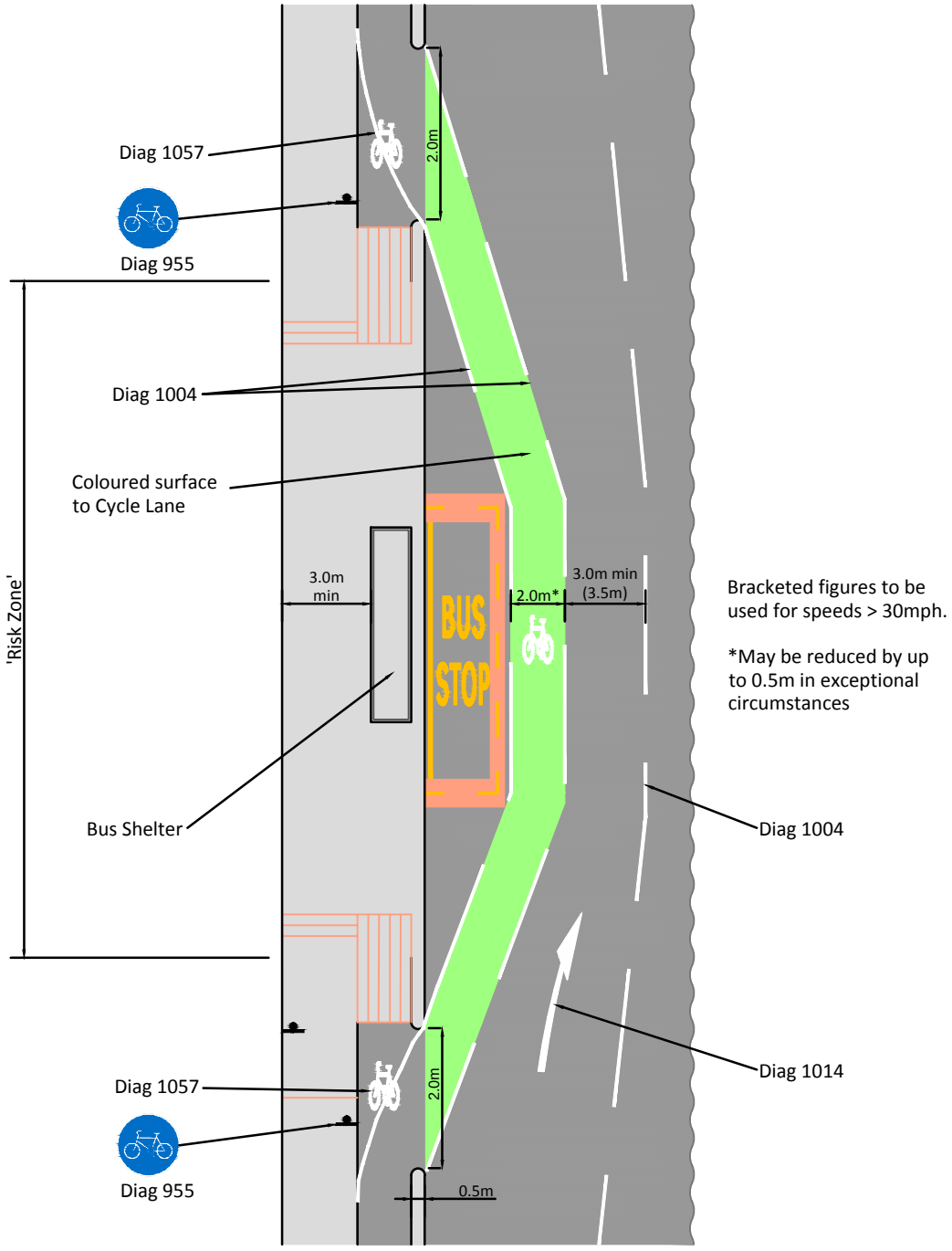
Work Zone Length	75m
Lower Cost Estimate	£15,000
Upper Cost Estimate	£105,000

- Cost estimates are indicative only and can vary significantly depending upon local site conditions.
- Lower cost value based on minimal engineering interventions
- Upper cost value based on maximum engineering interventions
- Cost estimate assume cycle facility provisions on one side of the carriageway.

Drawing No:	L-CL-PK-02	Rev:
Lead Section:	LINKS	

Title:

ONE-WAY CYCLE TRACK AT A BUS STOP WHERE FOOTWAY BUSY



Key Criteria:

- Shared footway/cycleway behind bus shelter may be segregated or unsegregated according to levels of pedestrian and cycle use
- On-carriageway cycle lane may simply terminate at the bus cage and re-start beyond if the bus stop has a low frequency of occupancy (less than 30 buses per hour)
- Careful management of pedestrians / cycle conflict required within the 'Risk Zone'.

Typical Costs:

Work Zone Length	75m
Lower Cost Estimate	£40,000
Upper Cost Estimate	£155,000

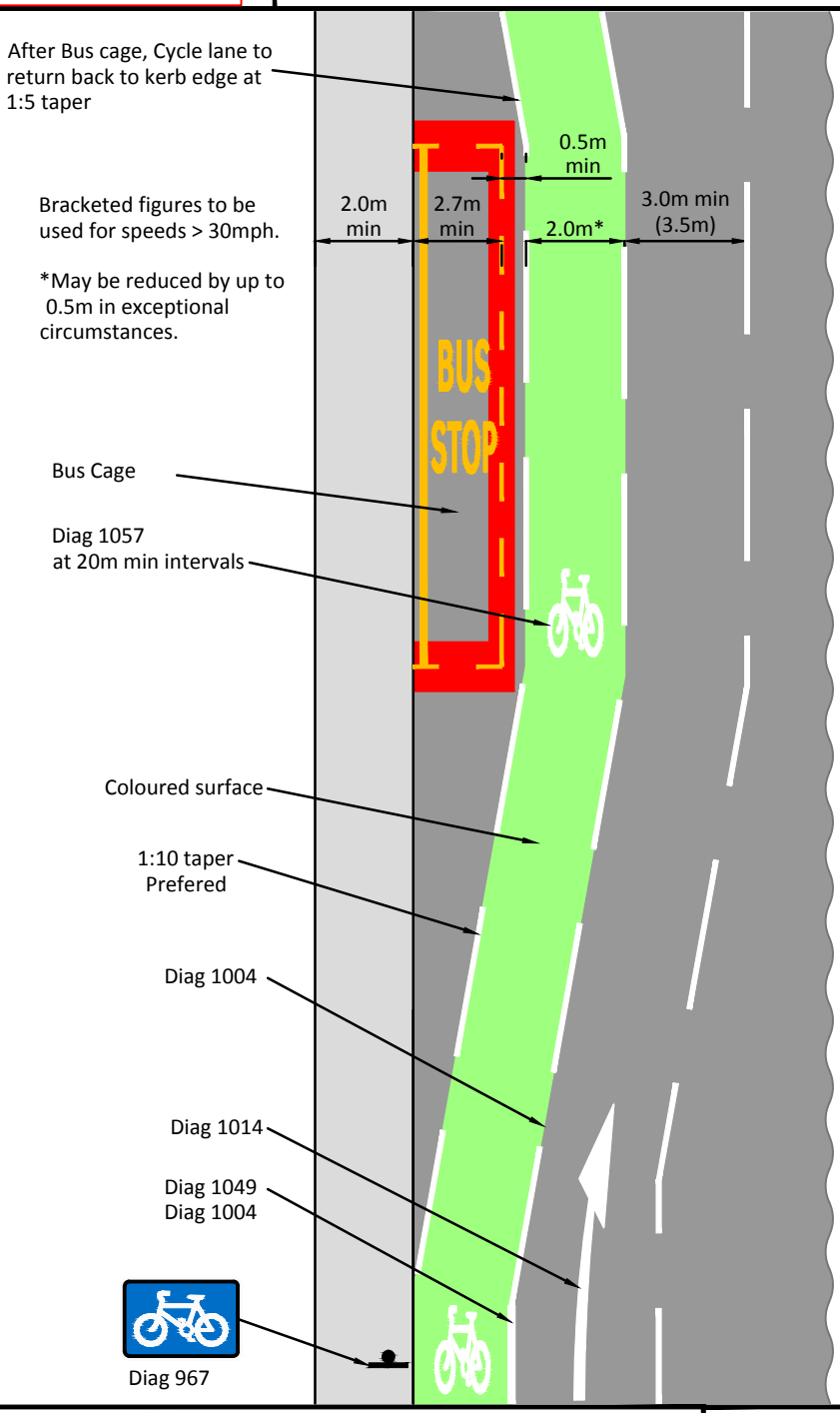
- Cost estimates are indicative only and can vary significantly depending upon local site conditions.
- Lower cost value based on minimal engineering interventions
- Upper cost value based on maximum engineering interventions
- Cost estimate assume cycle facility provisions on one side of the carriageway.

Drawing No:	L-CT-BS-01	Rev:
Lead Section:	LINKS	

BIRMINGHAM CYCLE REVOLUTION

Title:

CYCLE LANE AT BUS STOP



Key Criteria:

- Use where bus stop has high frequency of occupancy (30 buses per hour or more, or occupied for 30 mins per hour or more)

Typical Costs:

Work Zone Length	75m
Lower Cost Estimate	£20,000
Upper Cost Estimate	£120,000

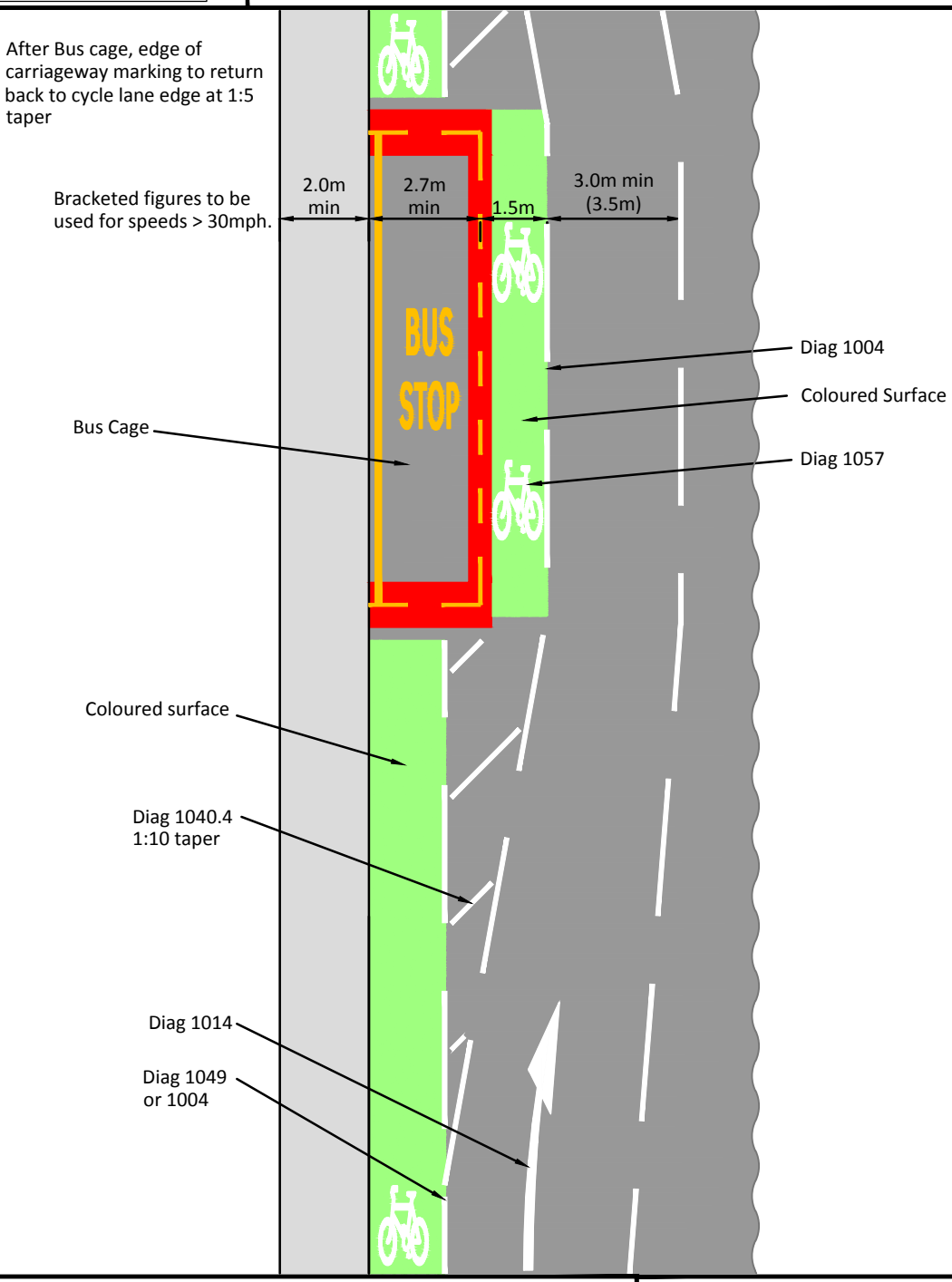
- Cost estimates are indicative only and can vary significantly depending upon local site conditions.
- Lower cost value based on minimal engineering interventions
- Upper cost value based on maximum engineering interventions
- Cost estimate assume cycle facility provisions on one side of the carriageway.

Drawing No:	L-CL-BS-01	Rev:
Lead Section:	LINKS	

BIRMINGHAM CYCLE REVOLUTION

Title:

CYCLE LANE AT BUS STOP



Key Criteria:

- Use where bus stop had low frequency of occupancy (less than 30 buses per hour, or occupied for less than 30 minutes per hour)

Typical Costs:

Work Zone Length	75m
Lower Cost Estimate	£20,000
Upper Cost Estimate	£100,000

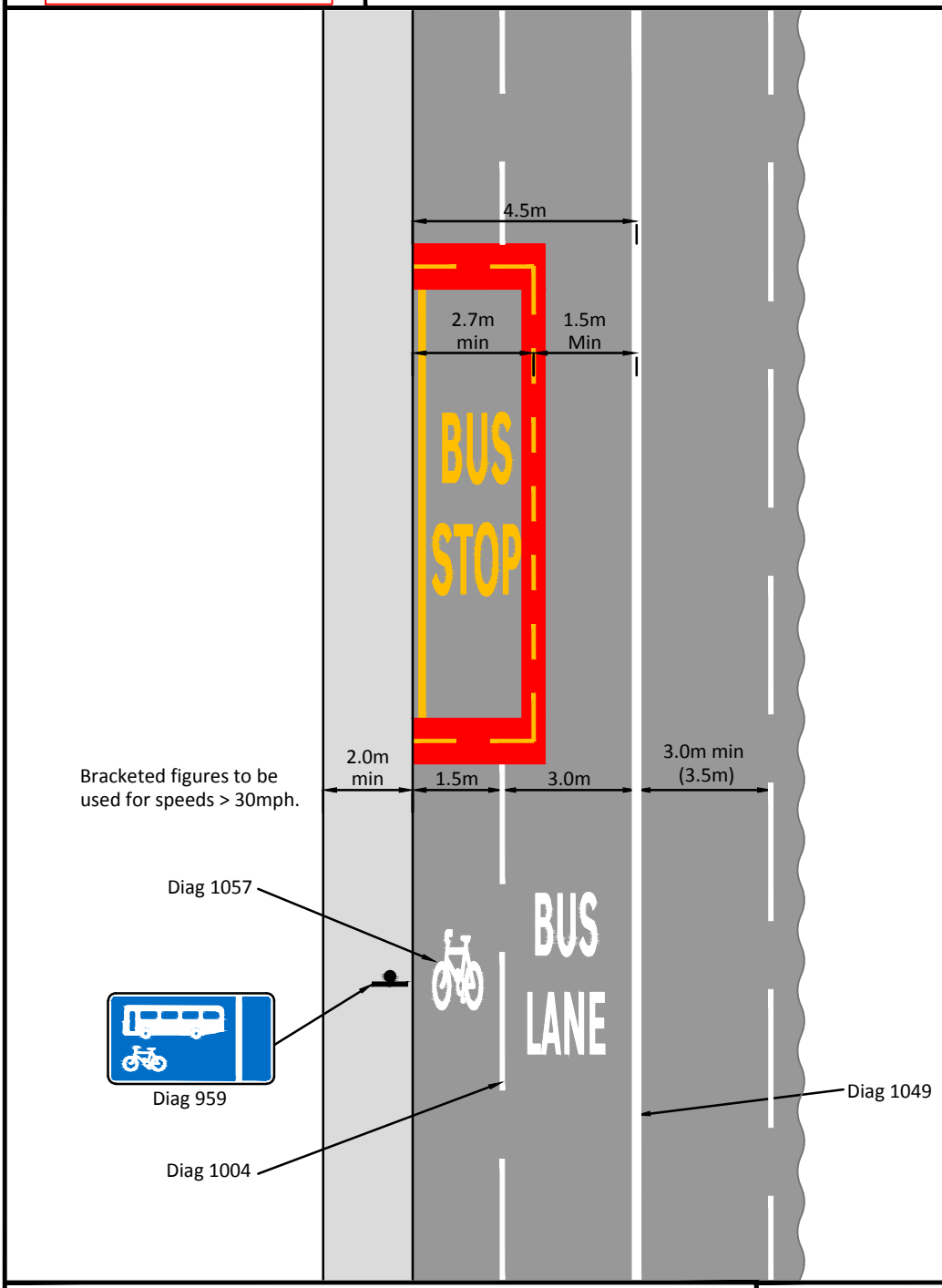
- Cost estimates are indicative only and can vary significantly depending upon local site conditions.
- Lower cost value based on minimal engineering interventions
- Upper cost value based on maximum engineering interventions
- Cost estimate assume cycle facility provisions on one side of the carriageway.

Drawing No:	L-CL-BS-02	Rev:
Lead Section:	LINKS	

BIRMINGHAM CYCLE REVOLUTION

Title:

CYCLE LANE AT BUS STOP WITHIN BUS LANE



Key Criteria:

- For use on Bus Lanes of 4.5m width.
- See L-CL-BL-01.

Typical Costs:

Work Zone Length	75m
Lower Cost Estimate	£15,000
Upper Cost Estimate	£75,000

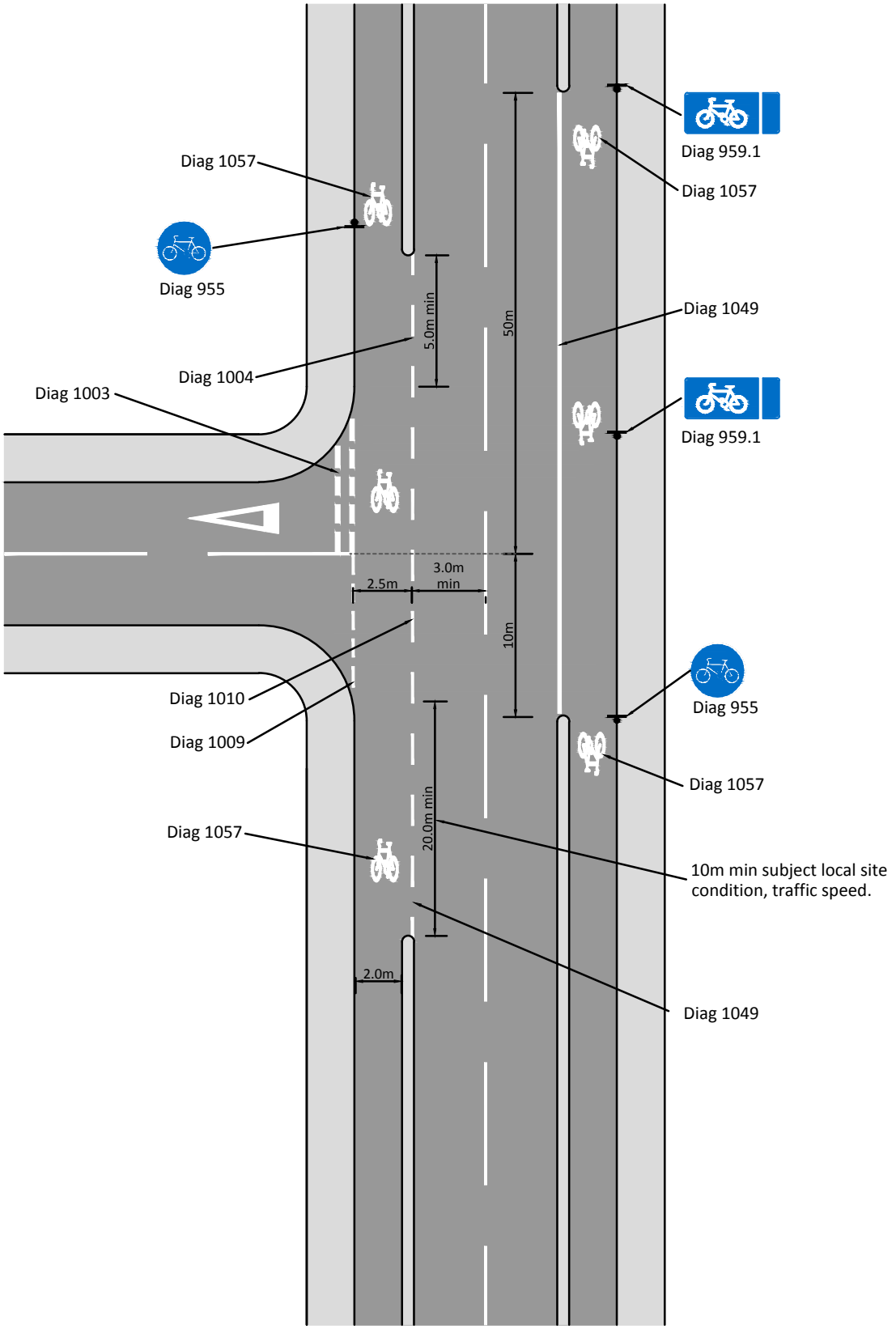
- Cost estimates are indicative only and can vary significantly depending upon local site conditions.
- Lower cost value based on minimal engineering interventions
- Upper cost value based on maximum engineering interventions
- Cost estimate assume cycle facility provisions on one side of the carriageway.

Drawing No:	L-CL-BS-03	Rev:
Lead Section:	LINKS	

BIRMINGHAM CYCLE REVOLUTION

Title:

ONE-WAY CYCLE TRACKS AT SIDE ROAD



Typical Costs:

Work Zone Length	50m
Lower Cost Estimate	£20,000
Upper Cost Estimate	£80,000

- Cost estimates are indicative only and can vary significantly depending upon local site conditions.
- Lower cost value based on minimal engineering interventions
- Upper cost value based on maximum engineering interventions
- Cost estimate assume cycle facility provisions on both sides of the carriageway.

Notes:

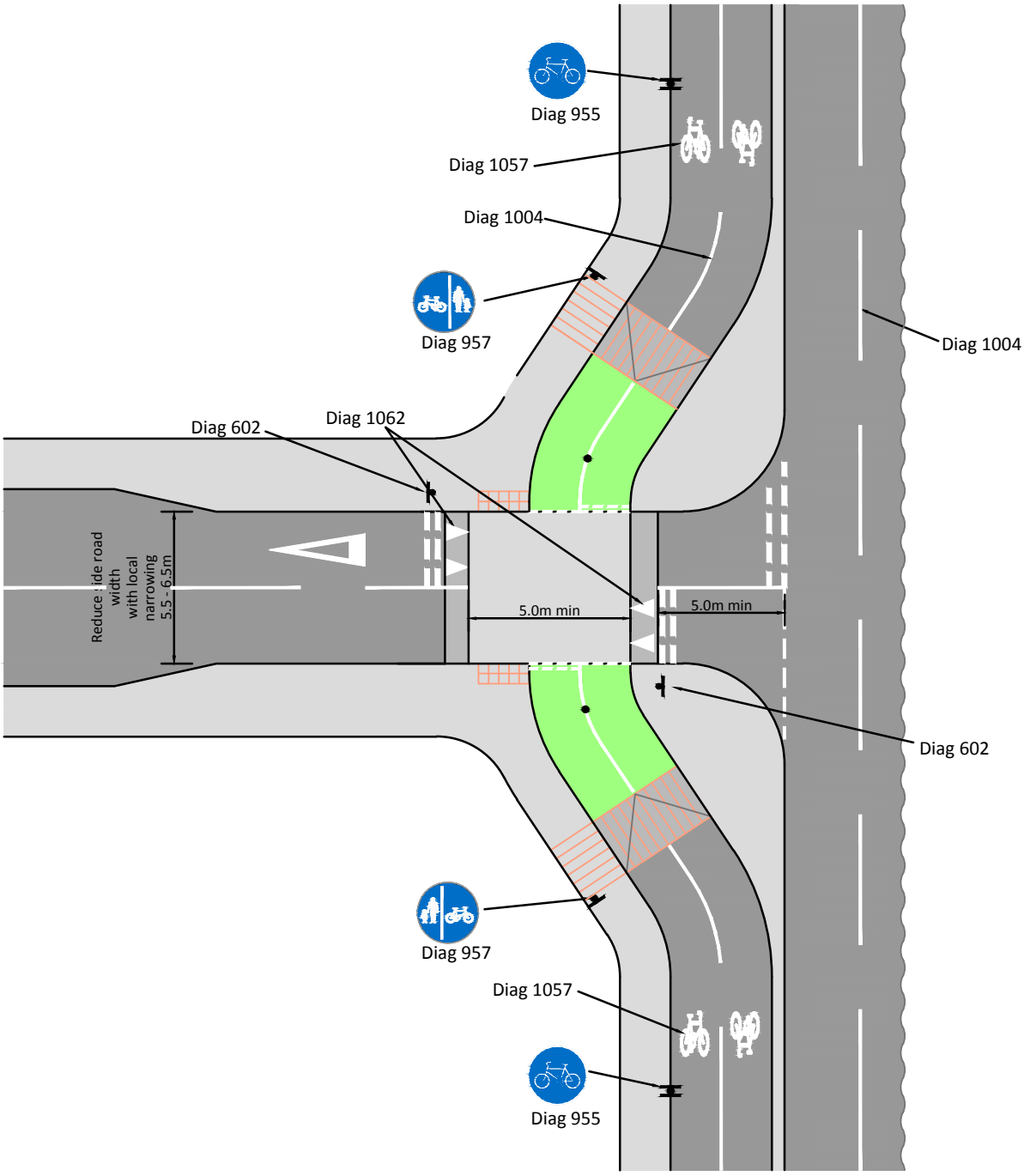
- Cycle Track details shown on L-CT-GE-01.

Drawing No:	J-CT-GE-01	Rev:
Lead Section:	JUNCTIONS	

BIRMINGHAM CYCLE REVOLUTION

Title:

TWO-WAY CYCLE TRACK AT SIDE ROAD - RAISED JUNCTION WITH 5.0m SETBACK



Typical Costs:

Work Zone Length	50m
Lower Cost Estimate	£30,000
Upper Cost Estimate	£80,000

- Cost estimates are indicative only and can vary significantly depending upon local site conditions.
- Lower cost value based on minimal engineering interventions
- Upper cost value based on maximum engineering interventions
- Cost estimate assume cycle facility provisions on one side of the carriageway.

Notes:

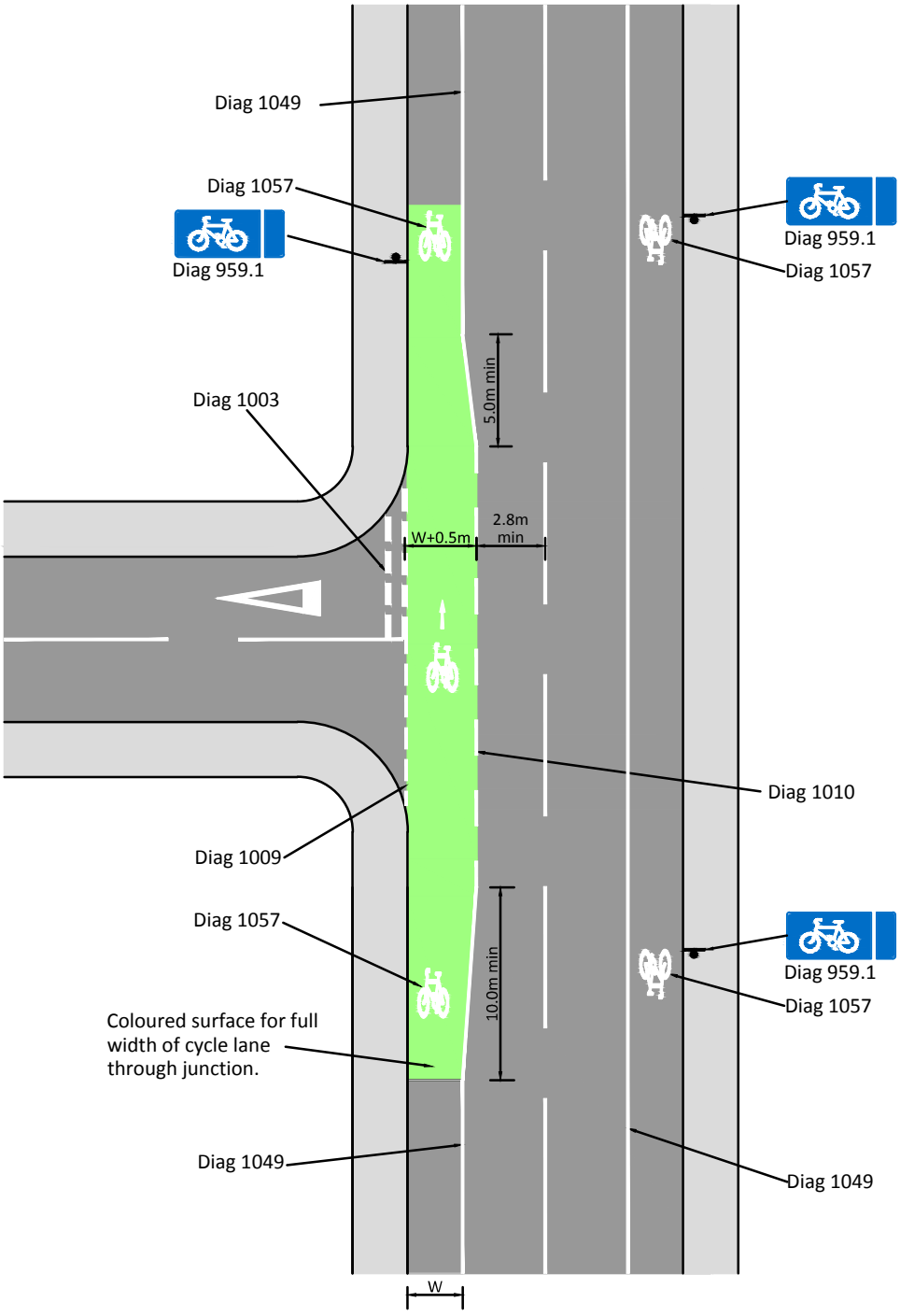
- Cycle Track details shown on L-CT-GE-02.
- To be used when there is a higher vehicular demand on the side road. (<50 Veh / Hr)

Drawing No:	J-CT-GE-05	Rev:
Lead Section:	JUNCTIONS	

BIRMINGHAM CYCLE REVOLUTION

Title:

MANDATORY CYCLE LANE AT SIDE ROAD



Typical Costs:

Work Zone Length	50m
Lower Cost Estimate	£10,000
Upper Cost Estimate	£50,000

- Cost estimates are indicative only and can vary significantly depending upon local site conditions.
- Lower cost value based on minimal engineering interventions
- Upper cost value based on maximum engineering interventions
- Cost estimate assume cycle facility provisions on both sides of the carriageway.

Notes:

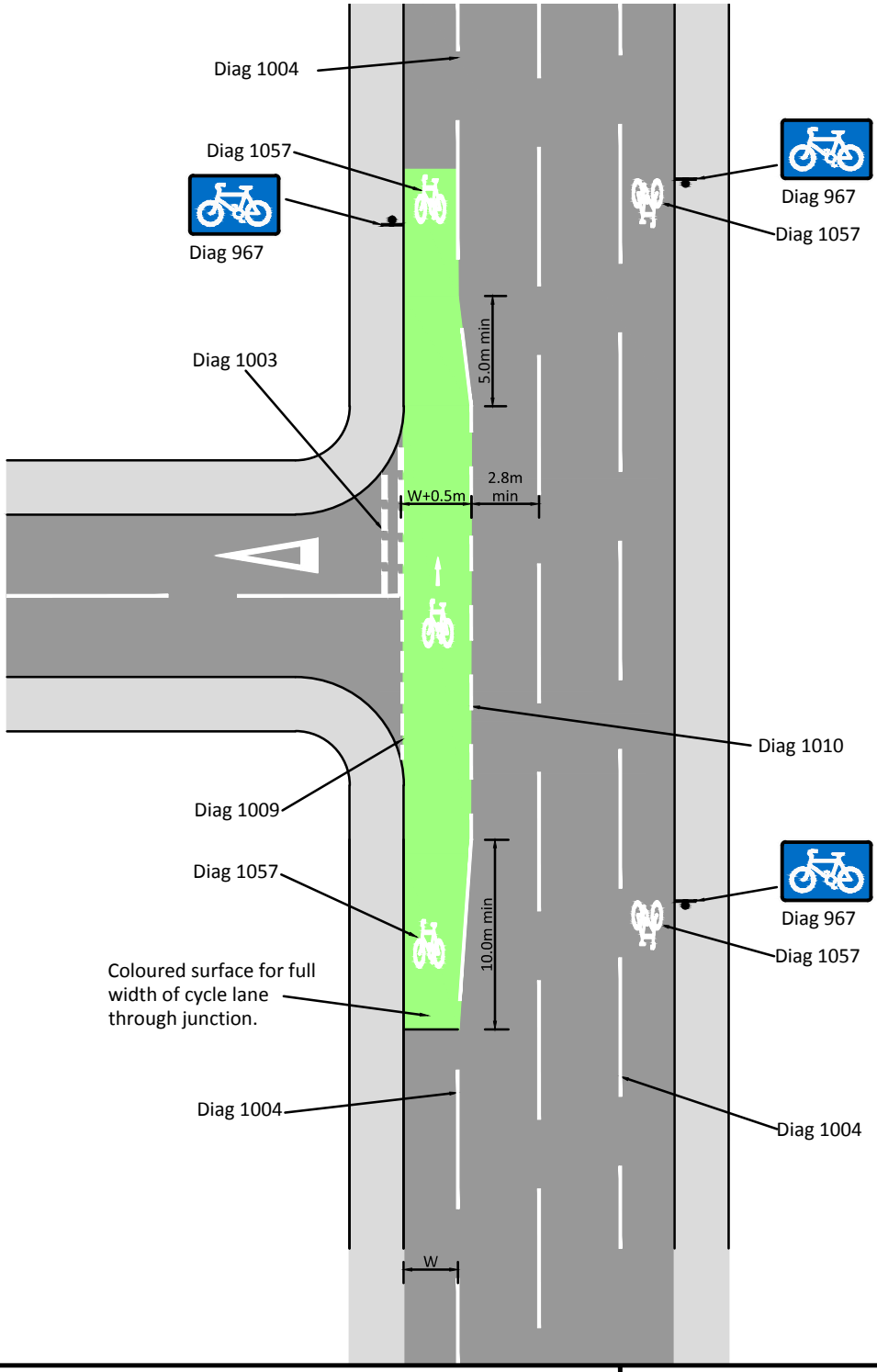
Cycle Lane details shown on L-CL-GE-02

Drawing No:	J-CL-GE-01	Rev:
Lead Section:	JUNCTIONS	

BIRMINGHAM CYCLE REVOLUTION

Title:

ADVISORY CYCLE LANE AT SIDE ROAD



Typical Costs:

Work Zone Length	50m
Lower Cost Estimate	£10,000
Upper Cost Estimate	£50,000

- Cost estimates are indicative only and can vary significantly depending upon local site conditions.
- Lower cost value based on minimal engineering interventions
- Upper cost value based on maximum engineering interventions
- Cost estimate assume cycle facility provisions on both sides of the carriageway.

Notes:

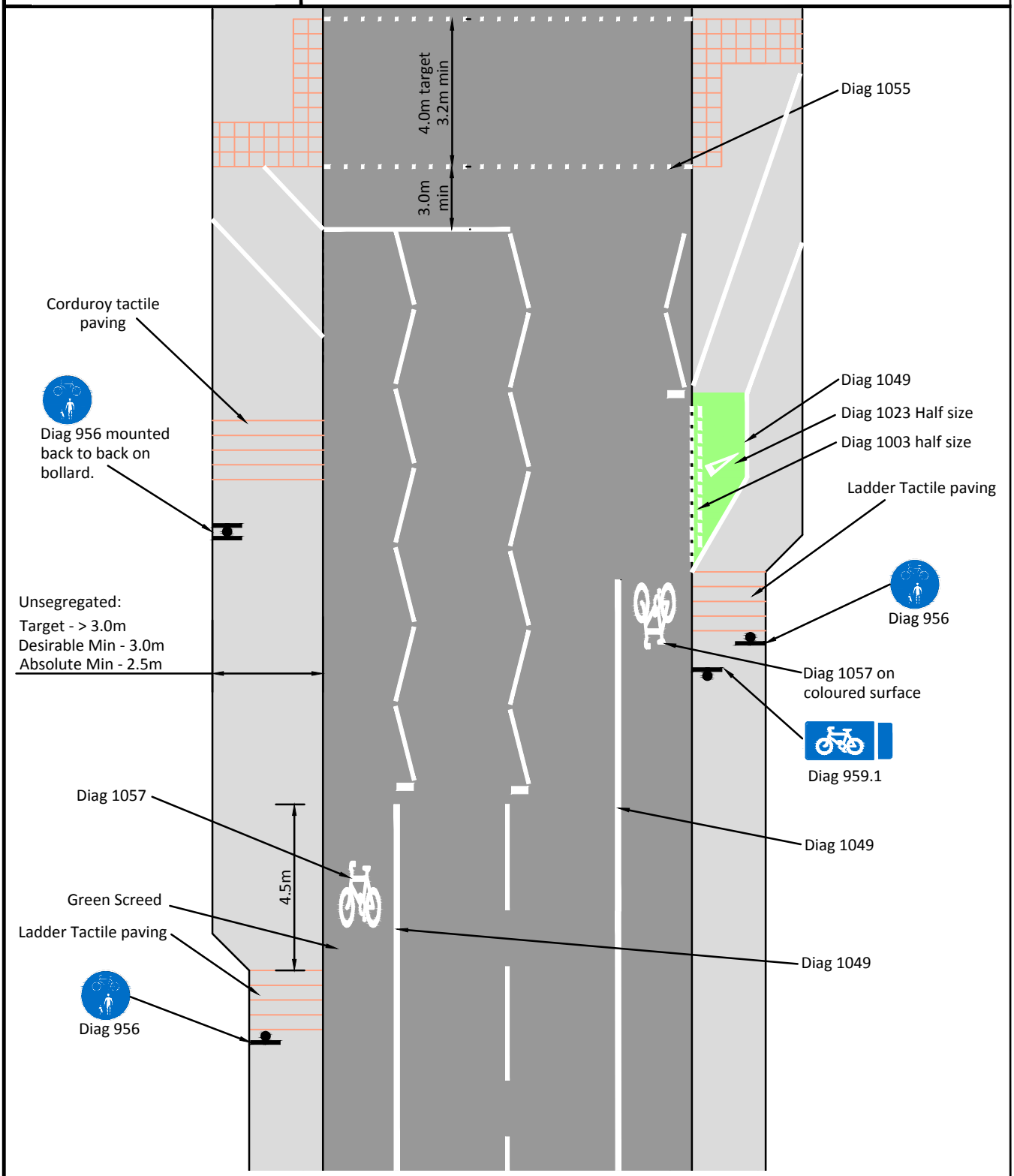
Cycle Lane details shown on L-CL-GE-03

Drawing No:	J-CL-GE-02	Rev:
Lead Section:	JUNCTIONS	

BIRMINGHAM CYCLE REVOLUTION

Title:

ONE-WAY MANDATORY CYCLE LANE AT TOUCAN CROSSING



Typical Costs:

Work Zone Length	50m
Lower Cost Estimate	£60,000 / (£30,000)
Upper Cost Estimate	£120,000 / (£85,000)

- Cost estimates are indicative only and can vary significantly depending upon local site conditions. (Bracketed figures not including crossing facility)
- Lower cost value based on minimal engineering interventions
- Upper cost value based on maximum engineering interventions
- Cost estimate assume cycle facility provisions on both sides of the carriageway.

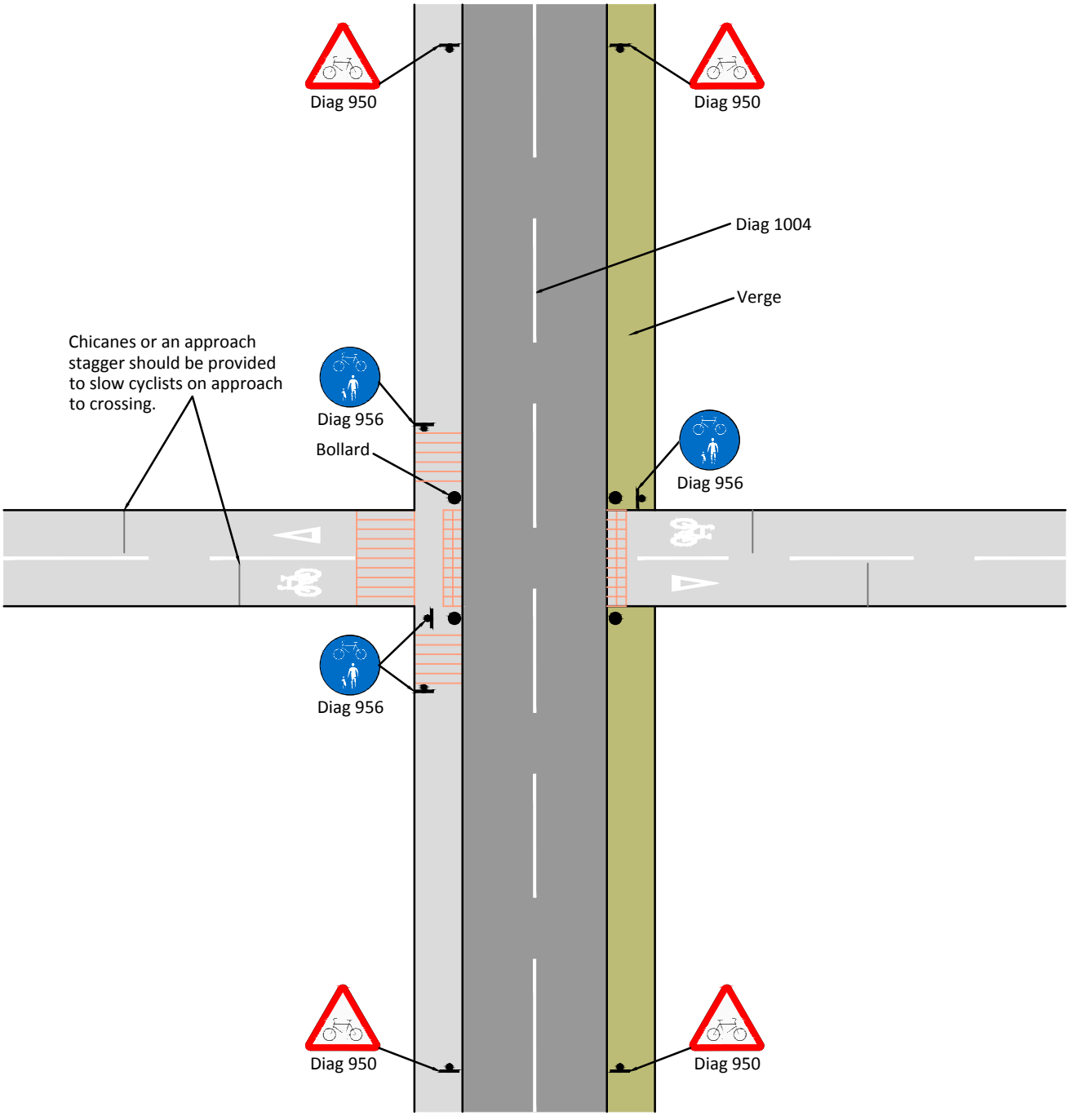
Notes:

- Applies to mandatory and advisory cycle lanes
- Cycle Lane details shown on L-CL-GE-02 (mandatory) and L-CL-GE-03 (advisory)

Drawing No:	C-CL-GE-01	Rev:
Lead Section:	CROSSINGS	

Title:

CYCLE CROSSING PRIORITY TO CARRIAGEWAY



Typical Costs:

Work Zone Length	100m
Lower Cost Estimate	£6,000
Upper Cost Estimate	£8,000

- Cost estimates are indicative only and can vary significantly depending upon local site conditions.
- Cost estimate assume cycle facility provisions on both sides of the carriageway.
- Cost estimate excludes the construction of cycle track facilities.

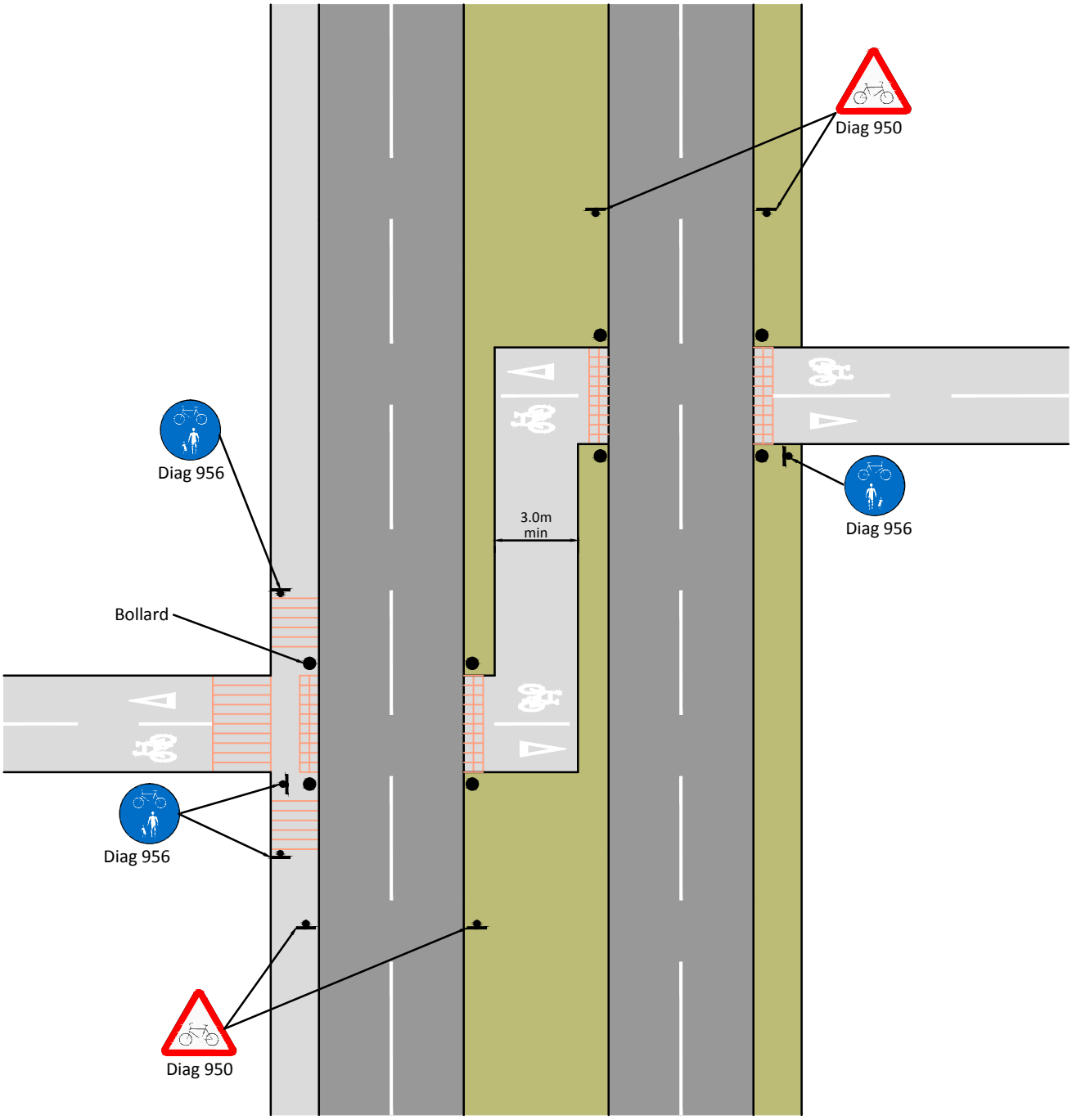
Notes:

- Layout indicates options for urban areas (with footways) and rural areas (with verges).

Drawing No:	C-CP-GE-01	Rev:
Lead Section:	CROSSINGS	

Title:

CYCLE CROSSING AT UNSIGNALISED DUAL CARRIAGEWAY



Typical Costs:

Work Zone Length	100m
Lower Cost Estimate	£6,000
Upper Cost Estimate	£8,000

- Cost estimates are indicative only and can vary significantly depending upon local site conditions.
- Cost estimate assume cycle facility provisions on both sides of the carriageway.
- Cost estimate excludes the construction of cycle track facilities.

Notes:

- Layout indicates options for urban areas (with footways) and rural areas (with verges).

Drawing No:	C-CP-GE-02	Rev:
Lead Section:	CROSSINGS	