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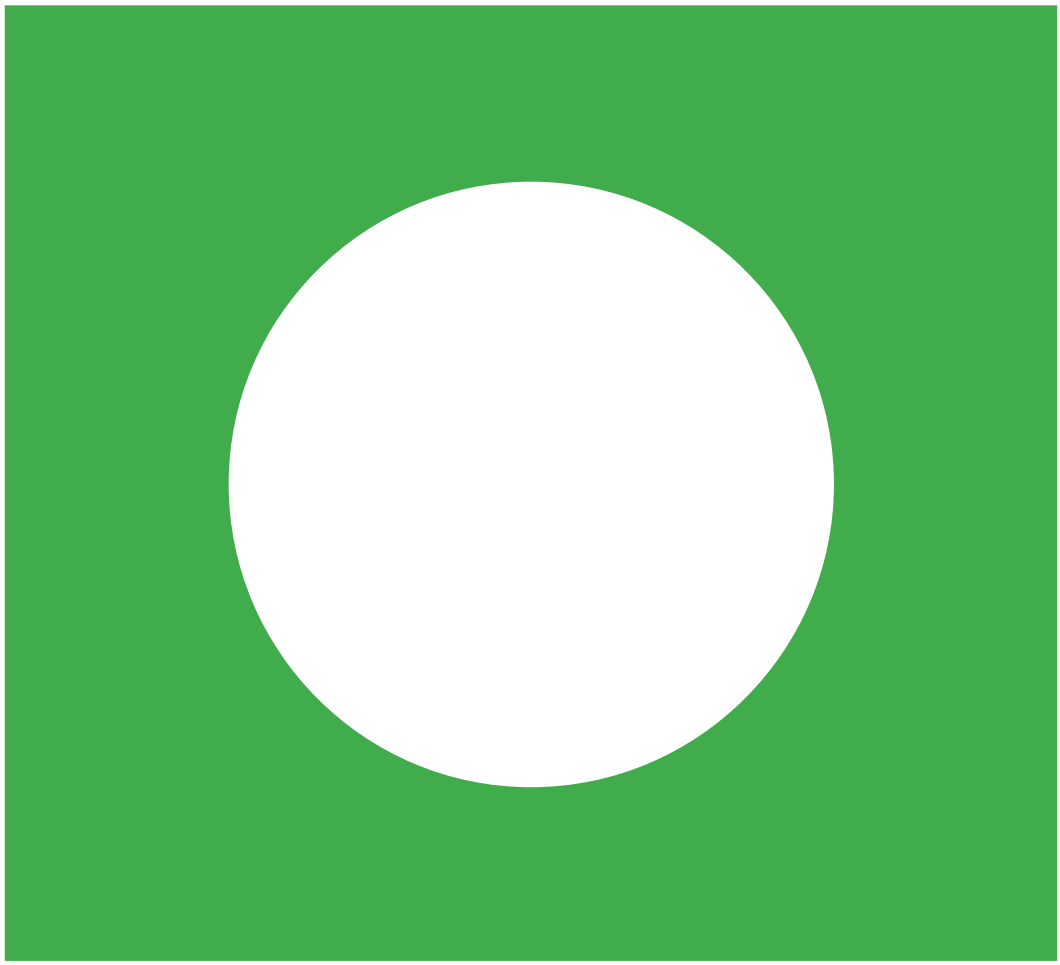

Bus Back Better Support Programme

Support Package 5
Bus infrastructure guidance and road space design

April 2023

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Transport for the South East, Transport East and England's Economic Heartland

Bus Back Better Support Programme

Support Package 5
Bus infrastructure guidance and road space design

April 2023

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Abbreviations

Term	Definition
BBA	Better Bus Area
BBB	Bus Back Better – National bus strategy for England
BCR	Benefit Cost Ratio
BSIP	Bus Service Improvement Plan
BSOG	Bus Service Operator Grant
CIHT	Chartered Institution of Highways and Transportation
CIL	Community Infrastructure Levy
DfT	Department for Transport
EEH	England's Economic Heartland
EP	Enhanced Partnerships
EV	Electric vehicles
IDP	Infrastructure Delivery Plan
KPI	Key Performance Indicators
LA	Local Authorities
LGA	Local Government Association
LTA	Local Transport Authority
PSED	Public Sector Equality Duty
PTEG	Passenger Transport Executive Group
RTSC	Railway and Transport Strategy Centre
SAF	Simplified Appraisal Framework
STB	Sub-National Transport Bodies
TAG	Transport Analysis Guidance
TE	Transport East
TfSE	Transport for the South East
TMA	Traffic Management Act
TRO	Traffic Regulation Order
VfM	Value for Money

1 Introduction

This technical note is one of a series produced as part of the joint project commissioned by three Sub-National Transport Bodies (STBs), England's Economic Heartland (EEH), Transport East (TE) and Transport for the South East (TfSE), to help support Local Transport Authorities deliver the government's National Bus Strategy for England ('Bus Back Better'). To deliver this strategy, the government has invited Local Transport Authorities (LTAs) and bus operators to formally collaborate and work with stakeholders and bus users to identify, and then implement, initiatives that will improve bus services and attract new users. It is envisaged that these improvements will be delivered through Bus Service Improvement Plans (BSIPs), Enhanced Partnership (EP) schemes, and franchising.

1.1 Background

The Department for Transport (DfT) has identified some additional funding to support its key priorities. There are four areas where STBs could undertake further work:

- **Decarbonisation:** Helping the DfT and Local Authorities (LAs) to implement the commitments made in the Transport Decarbonisation Plan.
- **Buses:** Helping LTAs to deliver on the commitments in Bus Back Better and develop an effective intra-regional bus network.
- **Electric Vehicle (EV) Infrastructure Strategy:** Assisting LTAs in the rollout of EV infrastructure, potentially through regional strategies.
- **Local Authority Capability:** Playing a role in building capability within resource- constrained LAs, to help them in the planning and delivery of local transport.

Three STBs, EEH, TE and TfSE, have joined forces to deliver a package of work to assist LTAs within the three regions with the delivery of their BSIPs and implementation of their EPs. The LTAs are:

- **England's Economic Heartland:** Bedford, Buckinghamshire, Cambridgeshire, Central *Bedfordshire**, *Hertfordshire**, *Luton**, Milton Keynes, North Northamptonshire, *Oxfordshire**, Peterborough, Swindon, West Northamptonshire.
- **Transport East:** *Norfolk**, Suffolk, Essex, Southend-on-Sea, Thurrock.
- **Transport for the South East:** Bracknell Forest, *Brighton & Hove**, *East Sussex**, Hampshire, Isle of Wight, *Kent**, Medway, *Portsmouth**, *Reading**, Slough, Southampton, Surrey, Windsor & Maidenhead, Wokingham, *West Berkshire**, *West Sussex**.

(indicates an LTA that has received BSIP funding)*

The project supports all the LTAs whether they have received DfT funding for their BSIPs or not.

The project is split into two stages. The initial stage of the project – **triage and prioritisation** – ran from August to December 2022. It took stock of LTAs' current progress in delivering the BSIPs and scoped the work programme for future delivery activities. Online workshops were held in September 2022 and provided a forum for LTAs and bus operators to discuss their aspirations and explore themes, priorities, challenges, and potential solutions. The project is ensuring that opportunities for technical pieces of work that would benefit multiple authorities are identified and progressed.

The second stage of the project – **implementation** – involves the delivery of support packages for the following topics that were identified during Stage 1:

- Support Package 1: Fares and Ticketing
- Support Package 2: Data Analysis, Monitoring and Evaluation
- Support Package 3: Low Cost and Quick Win Solutions
- Support Package 4: Building a Strong Case
- Support Package 5: Infrastructure and Road Space
- Support Package 6: Demand Responsive Transport
- Support Package 7: Rural Hubs and Integration
- Support Package 8: Funding Mechanisms
- Support Package 9: Collaborative Working
- Support Package 10: Marketing
- Support Package 11: Alternative Fuels and Low Emission Vehicles

Support will be delivered using a mix of channels, including webinars, toolkits and guidance, case studies and one to one support. It will also include establishing bus forums in each of the three STB areas to promote efficiency, avoid duplication of effort, share knowledge and best practice, and identify where joint working would be productive. The technical work will be undertaken to collate evidence and research. The emphasis will be on a regional approach so that common themes can be identified but localised assistance will be available to improve capacity in LTAs and provide specialist inputs regarding local issues.

1.1.1 Intended outputs and outcomes

Project Outputs: Improved delivery of BSIPs and EPs, and support to LTAs who have not received government funding in the current round. This will include:

- Enhanced evidence base through research papers on prioritised knowledge gaps.
- Knowledge sharing within and between STBs and their constituent members and between the public and private sectors.
- Better resourced LTAs through prioritised third-party support, provided in targeted areas.

Project Outcomes: These outputs will seek results in outcomes aligned to the National Bus Strategy including:

- Increased patronage.
- Enhanced accessibility and social inclusion.
- Reduced carbon emissions and improved public health.
- More commercially sustainable bus networks.

TfSE is managing the project on behalf of the three STBs. A consultant consortium of Mott MacDonald and Arup is delivering the project. A Steering Group has been established, comprising the DfT, the three STBs, representatives from some of the LTAs, and Mott MacDonald and Arup.

1.2 Overview

This technical note forms part of **Support Package 5: Bus infrastructure guidance and roadspace design**. The National Bus Strategy requires that each BSIP focuses on improving bus patronage through delivering faster and more reliable services. This Support Package focuses on driving increases in bus patronage by giving LTA officers an opportunity to explore design solutions for situations where bus priority infrastructure is desired or considered appropriate but there are environmental or engineering constraints that make typical design approaches unsuitable.

Early engagement with LTAs indicated that bus infrastructure guidance and road-space design is an area where very high levels of support are requested. This included frequent requests for targeted knowledge sharing, and data and research, and for this information to be shared via webinars and technical advice notes.

This note is set out as follows:

- **Section 2** provides an overview of the key policy and regulation issues that are relevant to bus infrastructure and outlines some high-level challenges when implementing changes.
- **Section 3 to 6** explores the different types of bus priority measure, with case studies and supporting evidence.
- **Section 7** explores the wider issues to consider when implementing bus priority schemes beyond the primary infrastructure.
- **Section 8** provides key advice to LTAs and operators.
- **Section 9** summarises the engagement to date and responds to specific questions raised.

2 Overview of bus infrastructure

Bus priority and infrastructure measures refer to interventions that aim to improve bus journey times and connectivity for bus passengers and help provide a more reliable service. Bus priority measures include bus-only roads, bus lanes, and bus advance areas, as well as traffic management tools such as vehicle detection at traffic signals, speed limits, and congestion charging zones.

Buses play a vital role in people's daily travel across the UK. It is one of the most popular public transport modes with 4.5 billion passenger journeys in Great Britain in 2019 - equal to 57% of all public transport journeys in that year (Department for Transport, 2020). These essential bus infrastructure tools ensure that capacity on the road network is being used effectively to help manage all these passenger journeys, and support wider bus operational matters such as cashless ticketing, enforcement, ongoing maintenance and monitoring regimes.

Bus priority measures can generate many operational, environmental, and financial benefits for people and governments - they enable the movement of more people on a given road area, providing a boost to local economies, through a good return on government investment. A report from the Department for Transport (DfT, 2016), quotes a return on investment for the Local Majors Fund, Local Sustainable Transport Fund, and "Better Bus Areas"- Fund, of £4.20 for every £1 invested, while in a 2014 report (Greener Journeys, 2014) auditors KPMG estimated that bus priority schemes can typically generate £3.32 of benefits for every £1 invested by the Government and in some cases £7 benefit for every £1 invested.

2.1 Policy and regulation

2.1.1 National Bus Strategy

The National Bus Strategy, which was published in March 2021, sets out the government's ambitions for new bus infrastructure and roadspace reallocation. Key extracts on the Governments advice and expectations are below, representing a significant departure from the adopted approach to roads over recent decades, one which LTAs must adopt.

- '*the key intervention will be significantly more ambitious bus priority schemes, making services faster, more reliable, more attractive to passengers and cheaper to run*' (page 13);
- *'Buses must have greater priority on urban roads. LTAs will be given new powers to enforce traffic regulations. They will be expected to promote bus reliability, and to implement ambitious bus priority schemes, to receive funding.*' (page 30);
- '*We expect Bus Service Improvement Plans to … Identify where bus priority measures are needed*' (page 41);
- *'… we expect all LTAs … commit to significant improvements in traffic management, including bus priority measures …*' (page 45);
- Section headed '*There must be significant increases in bus priority*' (page 46) which refers to priority at traffic signal junctions and bus gates; and
- LTAs are expected to *'deliver noticeable improvements for passengers, particularly around bus priority measures…*' (page 80).

2.1.2 Local Transport Note 1/97

LTN 1/97 ("Keeping Buses Moving") provides advice and guidance to LTAs who wish to implement measures to assist buses. The guidance builds upon the experience gained since the release of LTN 1/91. It includes advice on innovative techniques (at the time of publish) such as bus advance areas, bus priority in SCOOT and other signal control systems, camera enforcement of bus lanes, and the importance of decriminalised parking control in assisting the movement of buses. It also updates previous advice, especially in relation to signing and road markings, road humps and traffic calming, and the responsibilities of Passenger Transport Executives (PTE) and/or Combined Authorities. However, bus priority interventions and technology have changed dramatically since it was published. Government priorities and legislation have also undergone fundamental re-thinking and changing how road space is both planned, designed, and managed.

Updating the LTN 1/97 is a policy commitment in the government's National Bus Strategy, Bus Back Better. At the time of this technical note (April 2023) LTN 1/97 was being updated.

2.2 Key challenges

Many challenges can materialise when it comes to implementing bus infrastructure. The key challenges are summarised below, with more detail provided throughout this technical note. The following are some the key challenges when implementing bus infrastructure and road space re-allocation schemes:

- Differing stakeholders perceptions and needs.
- Cross-border difficulties with a potential lack of continuity.
- Integration with other modes such as walking and cycling.
- Space requirements.
- Political support.
- Cost.

Buses are constrained by other road users, traffic has increased post-pandemic and as services get slower, they become more expensive to run and less attractive to passengers.

Bus priority schemes can make services faster, more reliable, more attractive to passengers and cheaper to run – shifting priority towards bus users, pedestrians, and cyclists.

This note will help in addressing these challenges and should be read alongside technical material produced as part of the wider BBB programme of works such as Support Package 2 Data Analysis, monitoring and evaluation, Support Package 4 Presenting a strong case, and Support Package 8 Funding Mechanisms.

3 Physical priority

Physical priority measures refer to alterations to the way road space is managed, with a particular focus on the interaction of buses and general traffic to reduce congestion.

Physical priority measures have the advantage as an approach of requiring lower costs than fuller corridor approaches (discussed in Section 4) and, as the level of the intervention is smaller, the requirements for consultation can be lower.

However, physical priority is dependent on interactions between different parts of the road network and as such still depend on the wider road network, unlike full corridor approaches. For example, to increase reliability and reduce the impact on congestion, buses being able to bypass traffic is advantageous. For some physical priority measures full segregation is not provided, therefore a bus will still be affected by general traffic conditions on the road.

3.1 Bus only streets

Also known as ‘busways’ these can be effective for creating car-free ‘cells’ in city centres. Many also allow taxis and operate as a street which restricts certain modes of travel to enable priority to be given to buses on their journey. They can be effective by:

- increasing bus service reliability.
- improving bus passenger journey times.
- encouraging the use of public transport.
- providing a safer lane for cyclists.
- providing priority for emergency vehicles.

Bus only streets are usually defined by road markings and signs that show which vehicles are permitted use. The Wapping bus gateway implemented in November 2019 for example was reported to have reduced ‘rat-running’ traffic by a third by the following August[1].

[1] Wapping bus gateway reduces rush-hour traffic

Case study: Vicar Lane, Leeds

Several bus flow improvements have been implemented on Vicar Lane in Leeds. This is a key corridor that connects the bus station at Leed's Corn Exchange to many neighbourhoods to the north of the City centre. This road was changed into a two-way route, which removed a key bottleneck (on The Headrow) and created a better bus stop environments. The northbound lane is open to buses and taxis only during the peak periods and the southbound lane are open to buses and taxis only during the daytime south of Harrison Street[2]. This will make it possible to close the lower section of New Briggate to traffic and provide an opportunity further enhance the experience for pedestrians.

Before

After

3.2 Bus gates

Short sections of bus only streets are referred to as bus gates. These are stretches of road that have restricted access and are normally only used by public transport and other authorised vehicles, such as emergency service vehicles.

Bus gates can reduce congestion, prioritise smoother and more efficient travel for public transport, improve journey reliability times from buses stop to stop, increase pedestrian safety, and reduce noise and air pollution in the area[3]. However, violation rates can be high, so suitable enforcement measures should be in place to deter general traffic. West Sussex County Council (Highways, Transport and Planning) has recently produced a useful guide[4] which includes details of signing, approach, and camera type positioning for enforcement.

[2] Traffic changes in Vicar Lane, Leeds

[3] Changes to Bristol Bridge, Baldwin Street and Union Street

[4] Bus gate enforcement developer's pack

Case study: Baldwin Street, Bristol

A range of highway modifications and improvements were implemented to enable improve public transport and active travel flows along Bristol Bridge (which connects Bristol City Centre to Bristol's largest rail station, Bristol Temple Meads) and surrounding roads. These changes were part of the Bristol Transport Strategy to meet air quality and 2030 climate goals. Specifically, the measures included:

- Banning general traffic on streets around Baldwin Street in Bristol.
- Installing a bus gate, with buses given priority.
- Reducing traffic in the city centre and improving bus journey time.

Before

After

3.3 Junction bypass / modifications

Junctions can be modified to allow buses priority over other road traffic. This can be achieved by bypassing a junction or modifying it to enable buses to complete moves banned to general traffic (such as turning right). This approach means that buses have priority over general traffic and can shorten bus journey times as they do not need to adhere to general traffic routing[5].

3.4 Bus advance area / advance stop lines

Bus advance areas provide buses with increased priority while still retaining full highway capacity by stopping non-priority traffic at a secondary stop line level to the end of the bus lane. This technique allows buses to make full use of the green phase of the main signal. They provide buses with an advantage over general traffic and improved bus journey times. However, trials have shown that these measures work better on roads with minimal obstacles i.e. side roads, bus stops etc. as obstacles can cause a delay to the movement of the buses and therefore usability of the green time.

Many bus lanes stop short of a junction to enable left turning movements – essentially, this is priority for car users and creates delays for bus movements. Overcoming this can be achieved by re-casting junctions, where space allows, to incorporate advanced stop lines for buses. These enable buses to proceed on an additional signal phase to get ahead of other traffic; this can be triggered by detection loops on the approach so that the phase is included only when needed in the signal cycle. However, additional road width (a minimum of 1.5m) is required to separate the bus lane from the general traffic lane(s) and install separate signal poles. Pedestrian crossing arrangements should also be clear to avoid confusion.

[5] The identification and management of bus priority schemes

Such measures can be undermined by poor detection of approaching buses and inappropriate signal cycles that result in buses avoiding them. Where installed properly, considerable time savings can be achieved by buses, particularly if there is a long length of bus lane on the approach. Creating adequate space may require some imaginative design and possibly realignment of kerb lines. This should not be to the detriment of other road users, particularly pedestrians, but can make better use of the space available at junctions. Some locations have vast areas of circulatory space which can be intimidating for people wanting to cross and is wasted by vehicle movements. Where this occurs, stop lines can be brought further forward to allow bus priority, providing that adequate turning space is retained.

It should be noted that a proliferation of 'safety' fencing is not only unsightly but can creats hazards by reducing the visibility of small children and, potentially, squashing people between buses and railings. Intuitive walking routes help to alleviate difficulties and potential conflicts.

3.5 Summary

Physical priority is characterised by alterations to how road space is managed with the aim of giving priority to bus, though not necessarily providing full segregation. A advantage of this approach is that the cost and consultation requirements are significantly less than that of a corridor approach and yet there are still improvements made to journey times and bus reliability. One of the disadvantages to this approach is that the measures enable parts of priority on a route. If there is severe congestion on the full route of a journey, a bus will still be significantly impacted by this, negating some of the benefits of the priority.

3.6 Considerations for implementation

When considering different types of interventions, it is important to recognise that the applicability of the different types of options will depend on the local context and wider network:

- It is likely that a solution for residential streets differs from solutions for, say, orbital highways so it is important to consider solutions in context, as part of a wider package of measures.
- Ideally, LTAs should aim to deliver simple designs, but sophisticated enough to have a meaningful impact on the local context.
- Local knowledge is key – it is important to consider the history of a road space, is there a reason for why it is set up how it is? Should it therefore be kept this way or is this approach now no longer appropriate?
- It is important to focus on where the impact of the priority on improvements to journey times can be clearly demonstrated as this will help to make the case to those constituent members who may be more hesitant to engage in priority measures.
- It is important to consider the integration between buses and active travel and rather than seeing them as competing modes view how they can be integrated more easily together.
- There can be challenges within the last mile of getting to key destinations especially with retrofitting systems as many competing modes will need to cover the road on the approach to these destinations. To manage this challenge one approach is to work with stakeholders to identify who the key users are and to involve operators in these conversations. It would be helpful to have a mechanism to deal with competing priorities. At times, this may require prioritising certain views over others.
- It is important to consider the strategic fit: consultation may be more successful if consideration is given to how the bus priority measures impact the identified key users. This will enable a unique solution for each bus corridor.
- When designing bus priority, it is critical to think about how a user would access the services. If the service is relatively inaccessible, then there is unlikely to be a strong business case and sufficient return on investment for implementing bus priority schemes.

4 Segregated Bus Corridor approach

Unlike physical priority, a corridor approach segregates buses from general traffic to avoid wider congestion. They are highly effective for speed and reliability, and more self-enforcing than physical measures though can be difficult to integrate into existing junctions and require space for implementation. There can also be safety implications with existing traffic and active travel users, with crossing points a key consideration.

The full corridor approach can be an effective way to tackle congestion and result in faster and more reliable journey times, which helps improve the attractiveness of bus as a travel mode. However, building an effective corridor system has high associated costs which tend to scale up with the complexity and scale of intervention. The most expensive option is a fully segregated busway, which requires significant capital infrastructure investment but has the benefit of aiding enforcement. However, bus lanes painted onto existing roads also have a cost to them with enforcement also required.

4.1 Bus lanes

In this measure priority access to one lane of a road is restricted to general traffic: full (24 hours/day) or part time (e.g., peak hours only).

Bus lanes restrict the use of a section of carriageway to buses and other non-private car modes, usually taxis and bicycles (see potential issues in Section 7). They are identified by a thick white line and associated traffic signs. If supported by Traffic Regulation Orders (TROs), bus lanes can effectively prohibit movement in the lane by the prohibited modes. TROs associated with bus lanes can still enable entry for kerbside activity i.e., parking/loading, access to private driveways. Thus, kerbside controls will also be required.

Bus lanes can be divided into two categories in terms of the operation time: static bus lanes and dynamic bus lanes. Static bus lanes operate 24/7, while dynamic bus lanes operate in peak hours only.

4.2 Contra-flow bus lanes

Contra-flow bus lanes are where buses flow either entirely in the opposite direction of the traffic, or travel two-way, whilst general traffic is one-way.

Few of these have been implemented in the UK, and those mostly in London (e.g.: Piccadilly). [6] They have the disadvantage of causing vulnerable road users to have to be alert to traffic from two directions in what is ostensibly a one-way street. The first contraflow bus lane in the UK was introduced in King's Road, Reading, as a temporary measure when the road was made one-way in 1968. The initial reason was to save the expense of rerouting the trolleybus, which was due to be scrapped later that year. However, it proved so successful that it was made permanent.

Reversible bus lanes for peak hour traffic are usually designed to run down the centre of a road. This is of little practical use in most UK or European cities, as stops are too frequent to merit pulling across a lane of traffic each time. Those that exist are usually for specialist situations such as sports stadia or event venues, such as in Gävle, Sweden[7].

[6] The Leigh to Ellenbrook Guided Busway

[7] Intelligent reversible bus lane in Gävle

The advantages of contra-flow bus lanes are:

- Travel time reductions as they allow buses to diversions.
- Reduce passenger waiting times at bus stops.
- Require a relatively low level of enforcement and reduction in lane use by unauthorised vehicles or illegal parking.

4.3 Busways

Busways are a form of segregated bus corridor, usually purpose built. They may be guided (e.g., Leeds and Edinburgh's planned "City of Edinburgh Rapid Transit") or non–guided (e.g., the long–established Runcorn busway). These are bus-only roads in concrete channels. Extra wheels on the bus guide it along the channel, which therefore doesn't need to be as wide as a conventional bus lane. The buses drive normally when they have left the guided busway[8]. Examples include:

- Ipswich – a 200m long section of guideway connecting two housing areas.
- Leeds – sections of guideway exist on the A61 and A64 within the city.
- Cambridge to St Ives – a long section of guided busway extending about 16 miles on a former railway alignment.
- Cambridge to Addenbrookes – a second route running south from the city Centre.
- Luton to Dunstable busway – runs along a former railway alignment between the two towns.
- Southeast Hampshire Bus Rapid Transit – also runs along a former railway between Farnham and Gosport.

The extra road infrastructure can provide reassurance to bus users and potential users of the permanence of bus infrastructure and services, for example for those moving to the area with a view to regular use of the bus services[9].

[8] Network Management Notes: Bus Priority

[9] Crawley FastWay

Case study: the Leigh to Ellenbrook guided busway

The Leigh to Ellenbrook guided busway is a 7.5km guided busway integrated with park and ride sites and a walking / cycling path. It was funded via the Greater Manchester Transport fund (£68m) with a detailed business case appraisal and monitoring case developed.

As built, the scheme includes an off-road busway, park and ride sites at three locations for 450 cars, enhanced passenger waiting facilities, highway priority measures, extensive. pedestrian and cycling improvements along the corridor and frequent premium bus services (Vantage).

At appraisal stage, the scheme had a Benefit to Cost Ratio (BCR) of 2.1:1, which increased to 2.8 if wider economic benefits were included. In the first six months of operation, more than 900,000 passenger journeys were made. In its first full year of operation the guided busway carried more than 2.1 million passengers.

- The scheme was the subject of a Public Inquiry, which concluded that the busway option provided the best Cost Benefit Ratio of all the options considered.
- Reasons for higher appraisal ratings included more adequate patronage forecasting and increased benefits from high quality and a high frequency and flexible bus service when compared to rail for instance.
- In 2009 the scheme was prioritised for inclusion within the Greater Manchester Transport Fund (GMTF) and was successful in securing the required funding to deliver the scheme.
- The key drivers for inclusion within the GMTF were the transport need and projected economic growth.

Case study: Crawley Fastway

The Crawley Fastway involved a series of bus priority measures linking Horley, Gatwick Airport and Crawley. The scheme involved the re-design of heavily trafficked roundabouts and signal-controlled junctions to provide bus lanes and priority infrastructure for the Fastway services. Parts of the route were also segregated with kerb guidance.

The service on the route was planned to operate at 10-minute intervals at peak periods and every 20 minutes off-peak, giving 5 minute and 10 minute intervals respectively on the common sections of the route. It was delivered in three phases with the first services originally intended to be operationally in 2002.

The economic evaluation of the scheme has displayed an economic return on investment of £4.67 for every £1 spent – it was funded by a combination of public and private sources (£38m).

The scheme has succeeded in attracting increasing passengers, exceeding targets (160% patronage growth) has reduced journey times with passenger satisfaction over 90%. There is also evidence to suggest that the scheme has resulted in a decline in road traffic.

4.4 Summary

A corridor approach is characterised by segregating buses from general traffic to avoid congestion. Key factors for bus corridors are:

- They are very effective for improving bus reliability and reducing journey times.
- A disadvantage is requiring significant sums of capital infrastructure investment to enable implementation and a comprehensive enforcement regime.
- This priority type demonstrates that there can be wide reaching economic benefits for corridor approaches. Important to put real focus into how BCR is calculated and to promote the wide economic benefits of a scheme.

4.5 Considerations

The key issues to consider when implementing bus corrridor schemes are as follows:

- Consider whether it is just buses or whether other modes will benefit from a corridor approach. These approaches require considerable political support, so it is important to demonstrate the wider benefits of a scheme (see Support Package 4 Building a strong case).
- Make sure that pedestrians and cyclists, are planned for and consider whether vehicles such as taxis should be permitted. The design of the corridor approach will differ dramatically depending on vehicle access, so it is important to consider this early on and especially note the political ramifications of the different options.
- Consider whether certain options will make it more feasible to implement a corridor – this approach is often very reliant on political will as well as often needing to be facilitated through significant sums of government backed funding.

5 Virtual priority

Virtual priority uses technological solutions to regulate highway space and provide priority to buses over general traffic. No new physical infrastructure is usually required for these interventions.

Virtual priority measures are reliant on compliance to work effectively. Ensuring compliance in this situation can become more challenging, as it is not always possible to build physical barriers to prevent noncompliance with the measures.[10] For this reason, it is often necessary to introduce traffic cameras to enforce these types of measures. They can, however, be relatively low cost compared to solutions that involve extensive infrastructure that alter the road material itself. Furthermore, as the measures are virtual, and less disruptive to the existing environment, they can be more politically acceptable and trials can be conducted, with the measures monitored to demonstrate effectiveness.

5.1 Priority movement repetition

Unlike standard traffic signal staging, priority repetition means that in more complex sequencing, i.e. when there are a large number of stages, the ‘bus’ green stage occurs twice.

This approach can improve frequency and increase the allocation of green time for bus movements, aiding bus journey speed and reliability and doing so in a more dynamic manner. However, there is a potential for a reduced proportion of green time allocated to other stages and there can be increased inefficiencies i.e. through inter-greens during the cycle.

5.2 Green priority weighting

This solution increases the allocation of green time at traffic signals for bus movements i.e. providing green time over and above the ‘optimum’ phase length relative to the level of service for the entire junction.

This can lead to an increased overall level of service for buses as they will encounter a green light more often. Although it can lead to a loss of stage time for other arms of the network where congestion can result.

Case study: Liverpool ITS

In Liverpool, *Intelligent Transport Systems* (ITS) have been incorporated into the city’s traffic signal system. The ITS system was financed through the City Region’s Local Growth Fund.

ITS alters signal timings to prioritise buses which are running late, using real time information data to track the buses.

[10] Traffic light technology improving journeys for Liverpool City Region bus users.

5.3 Bus signal timings

In this solution adjacent traffic signals are linked along a bus route by timing the green stage to coincide with bus arrivals according to a determined average speed.

This approach can lead to reduced delays through an increased likelihood of encountering green traffic signals at linked junctions[11]. However, this approach is less effective if stops are located between sets of signals (although the sequencing may incorporate an assumed delay to account for the stop). The sequencing can also affect adjacent junctions depending on demand for other movements.

In implementing bus priority at signalised junctions, it is important to bear in mind that omitting stages (i.e., changing the sequence of the traffic lights) may confuse pedestrians who are familiar with the site and compromise their safety. At very busy junctions, the measures can also delay other buses on the network.

Case study: Coventry, West Midlands

Bus Selective Vehicle Detection (SVD) was provided at 10 traffic signal junctions on suspended bus lanes in Coventry. This:

- Enabled vehicles to interact with traffic signals via transponders.
- Ensured that priority was given to buses.
- Before and After vehicle data collection was used to measure the effectiveness.
- This data used comparisons of each month journey data compared to the same month the year before with 2017 being the year representing after.
- This research found no determinantal impact on journey times for all vehicle traffic and that bus journey reliability improved.
- This is a relatively cost-effective method of delivering these benefits. With limited set-up costs and a large ability to make use of existing infrastructure.

[11] Greener Transport Journeys: SVD West Midlands/Coventry

5.4 Signal priority

In traffic signal priority schemes the signal staging adjusts its timings when the system detects an approaching bus, such as part of the Crawley Fastway scheme. This is usually achieved by special loops or an on-board transponder that triggers an earlier and/or extended green stage. This approach helps reduce delays and improve journey times.

However, the system must compensate for earlier/longer stages that prioritises bus movements over other movements. Otherwise, there is a risk that bus prioritisation will increase congestion on other arms at the junction. This could be problematic on busier bus routes where stage compensation can be difficult to provide and there can be a cumulative effect on other arms through prioritisation to bus movements.

5.5 Actuated priority phase

Actuated priority phasing is an approach that enables buses to trigger traffic signal staging when they approach traffic signals, either via an embedded loop in the tarmac or transponder. This links with adjacent traffic signals to create a wave of green signals that favour buses travelling at an assumed average speed. A global positioning system linked to an on-bus computer identifies the bus's location, direction, and speed of travel at any time, and can be linked to the SCOOT (Split Cycle Offset Optimisation Technique) traffic signal controller and used to advance or delay signal settings.

Depending on the separation between signalised junctions, signal controllers may be able to trigger a green stage once an upstream point clear of the stop is passed. This can help boost the speed and service reliability benefits achieved by avoiding delays at junctions.

An example of this approach includes a scheme jointly delivered by Nottingham City Council and Nottinghamshire County Council[12], which enables bus operators to issue real-time requests to signal controllers to change or extend green signals at junctions. This system is not impacted by weather, does not need a line of sight between the vehicle and controller, and it can determine when to switch back to 'normal' operations. However, it necessitates proprietary installations on all buses, and at junctions. Following this, the council installed a central traffic signal bus priority system using combined funds from the Transforming Cities Funding and funding from Derby and Nottingham City Council. The advantage of this type of system is that proprietary infrastructure is not required. It also enables the storage of process data for analysis and optimisation. As of August 2020, this system has been rolled out to cover 237 junctions.

5.6 Summary

Virtual priority is characterised by using technological solutions to regulate highway space to give buses priority over other traffic. A key advantage of this approach is the relative ease at which to set up these mechanisms. Furthermore, they are often more politically acceptable than physical measures and can be used effectively for trial periods. On the other hand, their impact is often relatively limited and may not be sufficient for countering the impact of congestion. Furthermore, they are most effective in urban areas so may be limited in terms of their ability to make a difference in suburban or rural areas.

This type of priority has been shown to work well in places like the West Midlands, which has used this approach to improve reliability in a relatively low-cost manner with a limited wider impact on other modes. Additional benefits can be achieved through linking up with systems which use Real Time Information data to focus on late running buses, providing targeted priority.

[12] Transforming Cities Fund - Nottingham & Derby Providing Centralised Traffic Signal Bus Priority Via East Midlands

5.7 Considerations

The key issues to consider when implementing virtual priority schemes are as follows:

- Virtual priority measures can be effective in reducing journey times in congested urban areas, but this is not necessarily the case in other less urban areas.
- Public messaging about the benefits of virtual priority measures should emphasise their effectiveness on the whole passenger journey. While some journeys may start in rural areas, they may end in more congested urban areas where these measures have greatest impact.
- It is important to understand the limits of the capabilities of virtual priority systems and their impact on non-bus highway users. Ideally, these considerations should be captured in the business cases that underpin investment decisions in virtual priority measures.

6 Traffic management

Traffic management provides a broader approach to bus priority by managing the movement of traffic to facilitate bus priority on the road network. Although not all these measures are directly focused on buses, they can have a net positive impact through the way they are targeted.

Measures can discourage car use in busy areas by restricting traffic through initiatives such as low emission zones or by providing an alternative through park and ride schemes. Ultimately, the measures seek to reduce general traffic in an area meaning the bus has less traffic to compete with, thus making journeys more reliable.

6.1 Park and ride

Park and ride is a form of integrated transport that allows car drivers to park their vehicle in a car park, usually on the edges of a city centre or at a node on a public transport link, before travelling to their destination via public transport. It works by reducing traffic congestion in the city centre, while still providing access for those whose end-to-end journey is not connected by park and ride hubs. The 'park' aspect of park and ride can take up significant space on valuable land that could be used for other land uses such as housing or employment, and so park and ride sites can can be expensive to develop, especially if a multi-storey car park is needed[13]. Park and ride sites are also sometimes criticised for not fully addressing the issue of people driving, and in some cases can generate additional car trips that might otherwise have been undertaken by public transport.

Case study: Park and Ride, Norwich

A Park and Ride system in Norwich has been implemented, with sites being added over time rather than all at once.

To incentivise family travel, fares are expressed as per car rather than per passenger. Buses depart up to every 10 minutes.

Since the development of these sites traffic in the central area of Norwich has reduced.

6.2 Dynamic scheduling

Dynamic bus scheduling uses real-time information to improve the performance of the bus network. It monitors and evaluates performance such as passenger demand, bus frequency, or congestion in real time and can dispatch buses dynamically to cater for the demand being experienced. By design the static operating schedule and status of a bus is adjusted based on the real-time data being received. If implemented correctly, dynamic buses can solve traffic congestion and reduce passenger waiting time, with minimal surplus on the network i.e., less buses would run with increased passengers in quieter periods rather than more empty buses.

The scheduling system fundamentally relies on the hardware being available to capture the data and provide it to the system in real time. Extensive digital updates along whole bus routes would be required if these do not exist and an operations centre with staff trained to handle the software would need to be established.

[13] Norwich Park and Ride Case Study: Research by Transport Scotland

6.3 Low emission zones and congestion charging

Low emissions zones are schemes that cover specific areas and are designed to tackle air pollution. They restrict certain vehicle types from entering a specified zone and typically charge a vehicle if it enters the zone and does not reach the minimum standard for emissions specified. The aim to limit the amount of traffic in an area, usually a city, but also has a wider benefit of reducing air pollution as in theory only 'cleaner' vehicles will enter due to the cost incurred for vehicles not meeting the standards. [14]Low emissions bus zones are also designed to tackle air quality by concentrating cleaner buses on the most polluting routes. Congestion charging zones work in a similar way to low emission zones, but target traffic volume rather than the types of vehicles entering the zone. Some places, such as London, have introduced both low emission and congestion charging zones. In some cases, the revenues raised from these types of interventions have been directed invested into improving bus services.

Case study: A total systems approach, Oxford

Linked to the Local Transport Plan in Oxford a 15-minute city approach has been developed that combines workplace levies, traffic filters and zero-emission zones to control traffic. Private vehicles can still operate but measures such as traffic filters limit where they can go and at what time. This enables priority to be given to bus and active travel modes to make they more reliable, faster and more attractive.

Early engagement with key stakeholders was vital in implementing the scheme, as well as aligning with local policy which improves confidence that the schemes is part of a wider strategic initiative.

[14] Oxford Traffic Filters

6.4 Summary

While buses are not the primary target for all traffic management interventions, they still benefit from overall improvements in the efficiency of the road network and reductions in traffic, leading to more reliable and punctual bus journeys. Key factors for traffic management are:

- One of the key advantages of traffic management measures is that, due to their relatively easy setup, they can be used effectively for trial periods. They can also naturally form part of the wider transport strategy of an area – influencing significant parts of a bus journey.
- One of the key disadvantages of these measures are that many have become source of controversy for example, LTNs, so there can be political challenges implementing them.
- Case studies show the benefits of developing a package of measures e.g., low emission zones, traffic filters etc. rather than just one or the other. Due to the current controversies associated with these measures it is critical to engage in a robust stakeholder engagement process for which there can be confidence. It can be helpful to conduct monitoring and evaluation as quickly as possible to be able to demonstrate any benefits of the programme and for this monitoring to include the wider impact of the measures to ensure that all concerns with the approach are being considered as not being ignored.

6.5 Considerations

The key issues to consider when implementing traffic management schemes are as follows:

- When designing these solutions, consideration should be given to whether the solutions are legible for the end user. Are the various restrictions and regulations enacted by certain solutions obvious to all who are travelling in the local area?
- It is important to consider how different solutions can be integrated together to understand the direct and indirect benefits that certain solutions can result in.
- Measures should be part of an overall transport strategy to achieve local transport objectives.

7 Wider issues to consider

When implementing bus priority measures, several wider issues should be considered to ensure that there is a holistic improvement being made to the transport network. Bus priority measures should not be considered in isolation and should provide improvements for all transport users including pedestrians, cyclists and other road users, in line with a modal hierarchy that reflects sustainable transport goals. This will ensure that the network works together to improve modal shift to more sustainable travel and achieve carbon targets.

The wider issues discussed In this section are:

1. **Accessible infrastructure:** Proposed bus infrastructure designs must be accessible to all types of users, inclusive of all gender, age, and ability.
2. **Integration with active travel:** Bus infrastructure and road design schemes must be designed to be integrated with walking and cycling. This includes designing infrastructure that prevents clashes between bus users and cyclists and pedestrians.
3. **Scheme delivery:** Considerations on appraisals and funding is crucial in delivering schemes successfully.
4. **Monitoring and evaluation:** Schemes require monitoring and evaluation plans to identify and enable relevant data collection and assess scheme effectiveness against its objectives.
5. **Marketing with stakeholder communication:** Effective communication strategies must be in place to convince the public and those in power of the importance and benefits of bus infrastructure and road design schemes.
6. **Enforcement:** Provision of infrastructure needs to accompany robust enforcement for maximal effectiveness. Ideally, measures should be easy to understand for car drivers and should be reasonably self-enforcing.

Each ‘wider issue’ is considered in turn, with case studies and supporting evidence advising on how best to integrate these issues with the priority measures outlined in the preceding chapters.

7.1 Accessible Infrastructure

There are legal obligations for transport organisations to consider people with all levels of need when designing infrastructure. The Equality Act 2010[15] outlines the public sector equality duty (PSED), where public authorities must eliminate discrimination, harassment, victimisation and any other conduct that is prohibited, advance equality of opportunity between persons, and foster good relations between persons. It also specifies that all buildings or services must be accessible to people with mobility issues.

These include, but are not limited to: those with different mobility needs such as wheelchair users; the elderly; those with injuries; those with strollers, prams, or small children; and those with hearing or vision disability. Bus services and its infrastructure must therefore be designed to be accessible to these people with different mobility needs. This will encourage usage and maximise the benefits that can be achieved with higher levels of public transport use – shifting people from private cars.

[15] Equality Act 2010

Accessibility consideration for bus stop design

- Security (including lighting)
- Bus Stop post and flag
- Surface markings for buses
- Bus passenger shelter and seating
- Information (timetables and maps)
- Drainage
- Pedestrian footway
- Adequacy of waiting area
- Space for bus to straighten
- Approach and exit paths for buses
- Connectivity with footway
- Convenience for passengers
- Utilities access
- Height and type of kerb

In light of raising awareness within DfT on its PSED, DfT (2018) published **The Inclusive Transport Strategy**[16], where it outlines the Government's plans to make the transport system more inclusive, and to make travel easier for disabled people. While the focus of this document is on the inclusion of disabled people, many of the improvements will also benefit travellers with different mobility needs. Section 4.7 to Section 4.16 highlights the responsibilities of bus operators and LTAs in ensuring provision of inclusive services.

Below is an example of the responsibilities of LTAs regarding bus infrastructure:

> *Local Transport Authorities (LTAs) are generally responsible for roadside infrastructure supporting bus services, including bus stations and stops, and passengers should contact the relevant authority if facilities are insufficiently accessible to meet their needs. In undertaking their activities LTAs and other public bodies are subject to the Equality Act 2010 Public Sector Equality Duty (PSED) and the duty to make reasonable adjustments. (Section 4.12)*

More recently the DfT is updating the **Local Transport Note 1/97 – Keeping Buses Moving**[17], which was last updated in 2001, to reflect changes in policies.

A Transport for London (2017) document, titled **Accessible Bus Stop Design Guidance**[18]**,** and its predecessor documents, detail key requirements necessary to provide accessible bus stops. Although applicable to London, it is useful as a wider reference for all LTAs as an exemplar document. This document has been developed in the context of the Equality Act 2010, the previous Mayor's Transport Strategy and Accessibility Implementation Plan. It also incorporates design guidance on interaction of bus stops with other street facilities such as cycling. Accessibility must not only be considered during the initial design of infrastructure but also during operation and maintenance. One example given is maintaining kerb height during resurfacing of roads adjacent to bus stops.

Currently, many bus stops have yet to be designed to enable step-free boarding and alighting. For step-free boarding, raised kerbing is necessary to match the bus platform. This needs to be located where the bus door will be, not on the approach – unless a straight and impeded approach for the bus is achieved, then the front of the bus will skirt over the kerb to align with the high kerbing as effectively as possible. If this cannot be achieved, then there will be a gap between kerb and bus. If raised kerbing is installed in advance of a stop, then both it and the front nearside corner of the bus are likely to be damaged. This problem is exacerbated where two door buses are in use.

Additionally, routes to bus stops need to be suitable for all users, including those using wheelchairs. This may require liaising with relevant highway authorities to reduce street furniture

[16] The Inclusive Transport Strategy: Achieving Equal Access for Disabled People

[17] Local Transport Note 1/97

[18] Accessible Bus Stop Design Guidance

clutter around bus stops and provision of adequate lighting for both personal security and navigation at night.

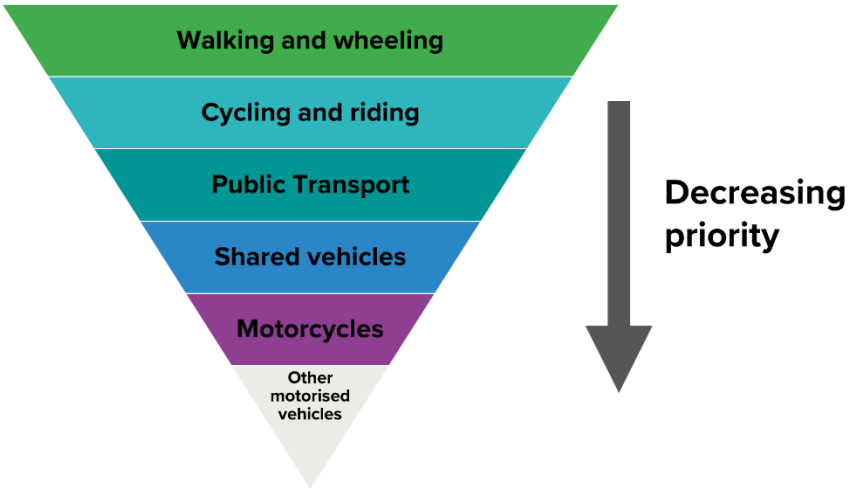
Another accessibility issue is for the blind and partially sighted. Audio information is not currently provided at bus stops. Previous trials run by TfL, which provided audio information at bus stops to help blind and partially sighted people find their way around the network independently, were unsuccessful due to objections from local residents about noise. This should be a key consideration for any future trails that LTAs may wish to undertake around this issue.

7.2 Integration with active travel

On city streets, buses and cyclists often have the potential for conflict, and whilst occupying opposite ends of the size and weight spectrum, they often operate in the same side of the street and at roughly the same speeds over significant stretches of road.

Acknowledging this, several design manuals for streets and local transport plans have started to explicitly state a hierarchy of road users in policy development and scheme design. An example of this can be found in Oxfordshire. Policy 1 of the **Local Transport and Connectivity Plan**[19] states that they will develop, assess, and prioritise transport schemes, development proposals and policies according to the transport user hierarchy shown in Figure 7.1.

Figure 7.1: Oxfordshire transport user hierarchy



The implementation of a modal hierarchy like this will help reduce the private car's dominance and develop a more balanced transport system. If there are delays caused by bus prioritisation measures to car users, then this policy would support this impact as it advocates that promoting bus use is more important than maintaining car journey times. Similarly, however, any bus improvement measures must not negatively impact pedestrians and cyclists.

Health concerns and the implementation of temporary cycle lanes during the Covid-19 pandemic has put the active travel agenda in the forefront of many transport planning strategies. Consequently, planning for buses must also consider how the bus system will integrate with, support, and encourage active travel.

Several guidance documents have been developed to address, at some level, the integration of these different modes. Section 6.6 of Local Transport Note (LTN) 1/20 – Cycle Infrastructure Design[20], for example, provides guidance for the design and implementation of cycle

[19] Local Transport and Connectivity Plan 2022-2050

[20] Local Transport Note (LTN) 1/20 – Cycle Infrastructure Design

infrastructure in relation to buses. This includes details on how cycle lanes should be designed at bus lanes, bus gates and bus-only roads, bus stops, bus stop bypasses and bus stop boarders.

To reduce potential clashes between these three sustainable travel modes (walking, cycling and public transport), it is recommended that LTAs take an integrated approach in delivering transport improvements. Examples of this can range from the delivery of whole transport network improvements like that being done through the Bee Network in Manchester to the delivery of public realm improvements together with bus infrastructure improvements.

Case study: the Cambridgeshire guided busway

The Cambridgeshire Guided Busway (also known as the Cambridge-Huntingdon Rapid Transit Scheme) connects Cambridge, Huntingdon and St Ives and, at 25km, is the longest track of its kind in the world. The busway was opened in August 2011 as part of the Cambridge Gateway Project, designed to improve bus, cycle and pedestrian access into Cambridge railway station by offering a viable alternative to the congested A14 road. As such, the busway was delivered alongside walking and cycling paths.

Throughout the route, each mode has its own dedicated road space, designed from the outset to reduce potential clashes. Reflective road studs were incorporated on the road to provide a consistent level of light, giving cyclists and pedestrians a sense of security and safety along the track. This clear delineation of the cycle path edges protects cyclists and other users from straying into the busway.

Another approach to consider is implementing traffic limitation techniques. CIHT suggests that these techniques will tend to boost public transport use and active travel and reduce the amount of road space required for private cars[21]. Section 6 of this technical note covers options of these techniques in more detail, as they are considered a part of wider traffic management.

Analysis of collision locations shows that most collisions that occur between buses and other road users occur on the bus lane side of the road, and particularly at junctions. Special consideration therefore needs to be given to the design of junctions, as these tend to be where most collisions occur. For example, the wide radii needed to accommodate long buses may create unfriendly crossing points for pedestrians, as well as encouraging driver behaviour that can be less safe for people cycling.

On roads with less space, bus lanes may sometimes double as cycle lanes, as cycles are permitted to use them in the UK. This can be a problematic approach where bus speeds would otherwise exceed typical cycle speeds, as buses will get held up behind cycles. Regular bus movements and cyclists are a poor mix and should be segregated wherever possible. Combining large but regularly stopping buses with cyclists who want to maintain a steady speed (typically lower than the bus) creates friction. In addition, these lanes are also popular with none but the more confident and faster(?) riders.

Where more space is available, more dedicated bus-cycling-walking infrastructure can be designed. An example of dedicated infrastructure is the Cycle Optimised Protected Signals (CYCLOPS) junction, the bus- and cycle-friendly junction layout that has been pioneered in Manchester. This design has been proven successful as an alternative to a conventional roundabout. Cycle lanes pass round outside pedestrian crossings, and both are separated by stage from buses and other motor vehicles.

Another dedicated infrastructure example is floating bus stops, where cycle paths pass ‘behind’ the stop and the waiting passengers. These avoid the problem of cycles having to pass

[21] Buses in Urban Developments

stationary buses at stops or worse, undertaking the buses while passengers are trying to board. However, there are still concerns with this type of infrastructure as there might still be conflicts between cyclists and bus users.

It is acknowledged that there is more guidance needed on how to design integrated infrastructure for the different modes on the road, especially in conflicting areas. This has been identified as one of the issues that may be covered in the developing LTN1/97 but has yet to be confirmed. Currently, LTAs need to make a judgement call in deciding which mode to prioritise, depending on local context, overall network performance and local aspirations.

Case study: Oxford Road, Manchester

Cycling lanes have been installed along Oxford Road, Greater Manchester's busiest bus corridor, where 26 cycle bypass lanes at bus stops were delivered. DfT reported a BCR of 7.15 due to a 38% increase in cyclist volumes along this corridor.

The following lists several design considerations for walking and cycling:

- Adequate space for walking should be retained or created. This includes bus stop installations that narrow the footway. Buildouts at crossings can be helpful by reducing the width of the road. Buildouts at bus stops ('boarders') can also overcome the problems of inappropriate parking. All bus users will be walking to and from the bus stop so clear routes and well-designed streets support bus use.
- Footways should have more generous dimensions on streets with buses or other heavy traffic to help mitigate the impact of noise and fumes but also to reduce intimidation when large or fast-moving vehicles pass close to pedestrians.
- Dedicated space for cycling should continue past bus stops but here and in other places, it is essential that the needs of pedestrians are taken into account, particularly disabled people.
- A Road Safety Audit needs to be undertaken which must take into account the interactions between buses and cyclists; between bus passengers accessing the bus stop and cyclists; and pedestrians using the adjacent footpath and other cyclists within the vicinity.

7.3 Scheme Delivery

The appraisal process and identifying funding are two key stages in ensuring successful delivery of infrastructure and road space design schemes.

7.3.1 Appraisal

Appraisal is the process of assessing the costs, benefits, and risks of alternative options to realise certain set objectives. It helps LTAs and other decision makers understand the potential effects, trade-offs, and impact of options by providing an objective evidence base for decision-making. Several guidance documents are available to help conduct appraisals of potential infrastructure and road space design schemes.

Table 7.1 below gives a summary of the different guidance documents available.

Table 7.1: List of guidance document for appraisal process

Guidance Document	Details
The Green Book HM Treasury	Detailed guidance on how to appraise policies, programmes and projects. It provides approved thinking models and methods to support the provision of advice to clarify the social – or public – welfare costs, benefits, and trade-offs of alternative implementation options for the delivery of policy objectives. The guidance applies to all proposals that concern public spending, taxation, changes to regulations, and changes to the use of existing public assets and resources. However, many bus infrastructure and road space design schemes, especially that on the local level, would deem this process laid out by the guidance as too resource intensive. Although, the guidance suggests that the resources and effort employed should be applied in proportion to the costs, benefits and risks involved.
Transport Appraisal Guidance (TAG) DfT	While the Green Book provides guidance generally on all types of public spending, TAG focuses on transport projects. Key principles in the Green Book were highlighted and applied in the transport appraisal context. TAG must be used for schemes that require Government approval. For projects or studies that do not require Government approval, TAG should serve as a best practice guide. However, there has been some calls for reform by practitioners on some of the methods outlined by the guidance. Transport Planning Society (TPS) has highlighted[22] that the current system of appraisal does not reflect the current realities and priorities, notably decarbonising transport, support for disadvantaged people and communities and the promotion of active travel. The government has been made aware of this issue[23] and reforms could potentially take place.
Simplified Appraisal Framework (SAF) for Small Scale Public Transport Schemes PTEG (now Urban Transport Group)	Passenger Transport Executive Group (PTEG) undertook a study to investigate the evidence for the value for money (VfM) of small public transport schemes. A SAF was developed as part of the study, building on existing best practices, to provide a tool for assessing the VfM of small public transport schemes. The project assessed several different types of schemes and identified three main types of impacts: user benefits, mobility benefits and efficiency benefits. It also highlighted several benefits that are not easy to express in monetary terms, such as better lighting or improved public realm. The case study on Derby Road Bus Corridor demonstrates the input that was used in SAF for the project.

Case study: Derby Road Bus Corridor

Nottingham City Council, along with local bus operators, implemented a series of measures along Quality Bus Partnership Corridors in the city. Measures include 24h bus lanes, onboard CCTV and low floor buses. The scheme has led to substantial improvements in bus punctuality and an improved perception of bus services. The estimated BCR of this scheme is >7.

The appraisal input for the SAF were:

- Journey Time Savings
- Journey Time Reliability
- Improved Facilities (at the station)
- Improved Facilities (on the bus)
- Non-user Benefits
- Patronage
- Revenue Generated
- Scheme Cost

[22] State of the Nations: Transport Planning for a Sustainable Future

[23] Commons Library Research Briefing: Transport Appraisal and Evaluation

7.3.2 Funding

Most infrastructure and road design schemes are funded by a combination of public and private funding. Public funding includes grants from DfT such as Bus Service Improvement Plan (BSIP), Bus Service Operator Grants (BSOG), Better Bus Areas (BBA) and Levelling Up Funds, and local authority budgets. Private funding includes funding from bus operators and local developments, which can be secured via Section 106 and Section 278 agreements, or Community Infrastructure Levies (CIL).

Additional funding can also be sourced from enforcement. Bus lane enforcement may raise money through fines. However, measures such as cameras, data collection and the issue and collection of penalties all have their extra costs. These may be borne (and the fines used) by the LTA.

The CIHT recommends using Infrastructure Development Plans (IDP) to help secure funding[24]. An IDP provides a key opportunity for local authorities to identify their infrastructure requirements to deliver the policies and proposals set out in their local plan, whether publicly or privately funded. It should be produced as part of the local plan and subject to consultation and the Examination in Public process. It identifies all the known infrastructure requirements including social, physical and green infrastructure for the duration of the plan. The IDP sets out what is needed, where it is needed and when.

The IDP also helps the authority to prioritise and determine bids for section 106 monies and CIL income. To enable bus services and any transport infrastructure to receive section 106 and CIL funding, it is essential that detailed network plans for these services be included in the infrastructure delivery plan.

Further information on funding streams for bus initiatives and schemes can be found in Support Package 8 Funding Mechanisms.

7.4 Monitoring and Evaluation

Monitoring and evaluation are distinct activities. Monitoring is defined as the collection of data to check progress against planned targets and benefits. Evaluation is defined as the assessment of the scheme effectiveness and efficiency after implementation (this includes measuring the causal effect of the scheme on planned outcomes and impacts and assessing whether the anticipated benefits and value for money have been realised). Both monitoring and evaluation require a proportionate approach depending on the size and nature of the project.

Table 7.2 lists several guidance documents that are available to help perform monitoring and evaluation.

While the appraisal process is important, post-implementation evaluations can be more important in the long run for influencing policy decisions[25]. More resources should be dedicated to monitoring and evaluation as they can produce hard evidence on outcomes and impacts, which can be fed back into the scheme appraisal, as well as capturing lessons learnt to improve the design of future projects and demonstrating the performance of the intervention to the general public. However, in developing monitoring and evaluation approaches practitioners must recognise the necessary trade-off between the resources applied and the likely level of robustness achieved. In particular, if an assessment is based on monitoring key outcomes, the limitations of using such data to address wider more complex questions, such as the causes of observed change, should be recognised.

[24] Buses in Urban Developments

[25] An economic evaluation of local bus infrastructure schemes

Table 7.2: List of guidance documents on monitoring and evaluation

Guidance Document	Details
DfT evaluation strategy and programme 2022[26] DfT, 2022	The DfT strategy was initially published in 2013 and since then has been updated several times. Monitoring and evaluation activities are referred to as 'evaluation' in this document. This current version serves to refresh the evaluation strategy, in compliance with the requirement of the Evaluation Task Force (ETF), provides a comprehensive update on progress current evaluation projects, and provides information about the findings of past evaluation projects and links to published reports. Th30ocumentnt highlights the challenges related to evaluation, lists out criteria for prioritisation, and sets out guiding principles of the evaluation strategy. The National Bus Strategy is included in the list of current programmes highlighted by DfT.
Monitoring and Evaluation Framework for Local Authority Major Schemes[27] DfT, 2012	This framework is designed to meet the responsibilities for evaluation of Local Authority Major Schemes. The process was designed to be as consistent and proportionate as possible. This evaluation system aims to be complementary with the devolution of decision making, developing a consistent evidence base to enable a clear demonstration that intended outcomes and impacts have been delivered effectively and scheme objectives have been achieved. This will provide valuable evidence to support future funding streams. The framework also sets out Departmen''s expectations for the monitoring and evaluation of Schemes and engagement with DfT and monitoring requirements.
The Green Book[28] **& The Magenta Book**[29] HM Treasury, 2022/2011	The Green Book is a guidance issued by HM Treasury on how to appraise policies, programmes and projects. It also provides guidance on the design and use of monitoring and evaluation before, during and after implementation. Chapter 8, specifically, sets out the approach to monitoring and evaluation including different types of evaluation and uses before, during and after implementation. The Magenta Book is complementary to the Green Book, as it is HM Treasury guidance on what to consider when designing an evaluation.
Monitoring and Evaluation Guidance[30] Local Sustainable Transport Fund (LSTF), 2012	This document has been developed to provide accessible best practice guidance on practical techniques and methodologies, which can be used to deliver robust and cost-effective monitoring and evaluation of LSTF schemes. This information could also be used more broadly as a framework for assessing the impact of other local transport schemes. The guidance sets out principles and building blocks of monitoring and evaluation programmes. It also highlights the methods of defining and measuring economic, carbon and secondary impacts of projects.

In summary, monitoring and evaluation of investment outcomes and impacts should be incorporated into delivery programmes of bus infrastructure and road design schemes. This will help provide evidence of the efficiency and effectiveness of the programme and support future funding opportunities.

Further detail on methods of collecting data for monitoring and evaluation can be found in Support Package 2 Data Analysis, monitoring and evaluation.

[26] DfT evaluation strategy and programme 2022

[27] Monitoring and Evaluation Framework for Local Authority Major Schemes

[28] The Green Book

[29] The Magenta Book

[30] Monitoring and Evaluation Guidance

Case study: Mansfield Interchange

A fully enclosed bus station building with connecting footway to the railway station. Key features include a pedestrian bridge linking bus and rail, and improved walk routes to the town centre. Monitoring and evaluation was undertaken against a set of Key Performance Indicators and Targets. Ex post business case analysis show that BCR of scheme is likely to be in the range of 4.3–- 6.5.

Key Performance Indicators, Targets and Data for Mansfield Interchange are shown below.

KPI	Target	Actual data
Patronage growth	5% growth in first year	7% growth in the first year.
Customer satisfaction	Customer satisfaction rating over 90%	Satisfaction has increased significantly since 2005. However, only five categories have scored 90% or above, while the rest of the categories have slightly lower satisfaction scores (70-88%).
New bus and rail users	None	Data indicates potential reverse of rail station usage decline.
Bus to rail interchange passengers	2% increase in bus to rail interchange	Significant increase in rating of the walk route to the train – No data confirming increase in interchange passengers.
Bus accidents	Reduce bus accidents to 25% of 2005 levels	Reduction in accidents to 29% of 2005 levels in 2014. However, this cannot be robustly attributed to the new interchange.
Journey time	No specific target	Improvement in reliability (5% increase in buses that were on time).

7.5 Communication Strategies

7.5.1 Stakeholder Engagement

Stakeholder engagement is an important part of implementing bus infrastructure and road design schemes. As there is no formal process that exists for planning and implementing bus infrastructure and road design schemes, this step often varies as it depends on each LTAs' internal processes and approach. To ensure effective stakeholder engagement, it is advised that LTAs develop a stakeholder engagement plan. Figure 7.2 below sets out the process of developing a stakeholder engagement plan.

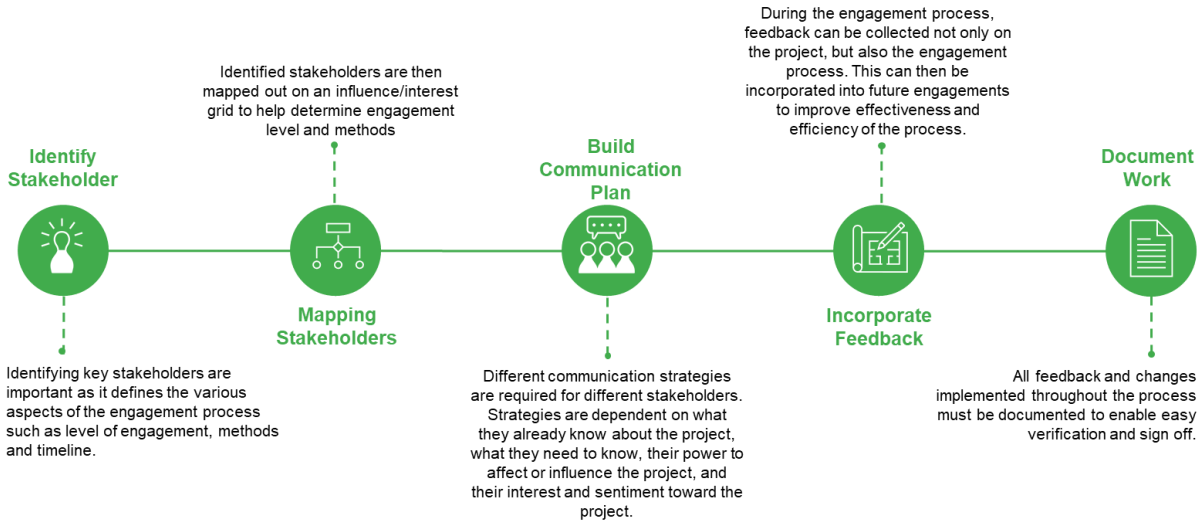


Figure 7.2: Stakeholder engagement plan development process

Stakeholders come from a variety of sectors, and it is important to identify these different stakeholders as it helps formulate effective strategies for communication in securing support. The Local Government Association (LGA) recently conducted a study on stakeholder engagement. Their study concluded that LTAs must learn how best to sell the benefits from a local stakeholder perspective. To do this, LTAs must understand stakeholders fully so that it can lead to successful engagement. Framing the benefits associated to the project in terms of the local audience will enable LTAs to better counter opposition and approach stakeholder engagement from a stronger stance, effectively winning hearts and minds. LTAs must also share information on the benefits and bring stakeholders along during the engagement process, especially those with the greatest ability to promote and defend the benefits on behalf of a project[31].

List of typical stakeholders

- Traffic commissioners
- Traffic authorities
- Local Authorities
- Passenger Transport Executives
- Passenger user and advocacy groups
- Police
- Bus operators
- Bus users
- Schools
- Disability advocacy groups
- General public / local residents
- Active Travel England (ATE)
- Other Active Travel advocacy groups (e.g., Sustrans, Living Streets)
- Local businesses
- Other road users

The Confederation of Passenger Transport (CPT) has designed a toolkit[32] to help address common concerns raised by various stakeholder during the engagement process. The document agrees that while there is a lot of evidence to demonstrate the value of buses and

[31] Reflections from an Upper Tier Authority - How do we frame the benefits of road space reallocation in both rural and urban areas?

[32] Delivering Better Bus Services: A Toolkit for Engaging with Local Communities

bus priority measures, it is essential to consider how the arguments are articulated to ensure that they are strong enough to influence attitudes and behaviour. It was found that the most persuasive arguments in favour of bus prioritisation are:

- They have environmental benefits.
- They make towns and city centres more pleasant through reducing traffic.
- They make travel accessible, helping to boost life opportunities.

The toolkit also highlighted the biggest concerns of those opposed to bus priority measures and are therefore the areas in which more counter-messaging is required. It also highlights that two different types of messaging are needed to encourage effectiveness of delivery:

- Word of mouth – people want to hear from others who travel by bus frequently, for a better understanding of the experience.
- Evidence – using data to illustrate the impact of bus priority measures.

In the past consultations have generally involved a press release followed by static and pop-up display points at which people fill in questionnaires or comment sheets. Online consultations, which have been used more extensively since COVID-19, have the potential to reach more people, but for maximum visibility need to be accompanied by alerts such as press coverage, posters and displays, and letters to relevant groups. Additionally, online consultation platforms can be accompanied with interactive features that would help stakeholders better understand the impact of these schemes on them.

Table 7.3 highlights several communication methods that have been proven successful in garnering public support on bus priority projects.

Table 7.3: Successful communication methods[33]

Method	Details
Interagency co-operation	Close collaboration between bus operators and road authorities, as well as with communication agencies help the development and implementation of effective communication strategies.
Public outreach	It is crucial to make sure everyone feels that their voice is being heard and that, if need be, minor parts of project design may be compromised to get to implementation, all the while holding firm on the most crucial elements.
Public representative support	In some cases, public representative support can be more important than general ‘public’ support at planning stage.
Popular vote	In some cases, voter supported measures can help expand funding sources and assist the implementation of bus priority schemes.

Further detail on engaging with stakeholders and developing support for bus priority initiatives can be found in Support Package 4 Presenting a strong case.

[33] The identification and management of bus priority schemes

7.6 Enforcement

To maximise effectiveness, bus infrastructure and road design schemes need to be accompanied with enforcement. Ideally, measures should be easy to understand for car drivers and should be reasonably self-enforcing. To do this, enforcement needs to be part of the design of the infrastructure.

Traffic handling powers have been increasingly delegated to LTAs. On 31 May 2022, the Traffic Management Act (TMA, 2004) amendments came into force, allowing LTAs to apply for an order to enable moving traffic enforcement. As a result of the amendments, LTAs can now align laws concerning parking offence enforcement and moving traffic offence enforcement (including unauthorised use of bus lanes) and collect money from any fines paid. In short, this will enable LTAs to co-ordinate the introduction of any new traffic management measures needed for bus priority with their other enforcement, such as parking.

The DfT published statutory guidance on the TMA amendment in October 2022[34]. This guidance sets out the policy framework for bus lane and moving traffic enforcement, including how to approach, carry out and review enforcement. It applies to all local authorities in England outside London enforcing bus lane and moving traffic contraventions under the TMA. The guidance sets out the issues that LTAs need to consider before applying for bus lane and moving traffic enforcement powers, how to set charges, and highlights the importance of ensuring motorists are properly informed of the new arrangements for enforcing contraventions of moving traffic restrictions, which have previously only been enforced by the police.

In February 2022, West Sussex County Council launched guidance[35] for developers who plan to use bus gates in their developments. The guidance covers various aspects of enforcement, including types of cameras and signages to use and how to position them, as well as Traffic Regulation Orders (TRO) that must be applied and Road Safety Audits (RSA) that must be undertaken.

To implement an effective enforcement regime, rules and signage must be unambiguous. A decision must be made to determine the types of vehicles that can or cannot use bus lanes. The definition of ‘bus’ needs to be clear – local service buses, longer distance bus/coach services, home to school contracted services, specific services or similar. On top of clarity, consistency is also key – rules should be consistent across an area. Bus lanes often allow use by cycles and taxis but exclude motorcycles and private hire vehicles; other situations may allow motorcycles or even delivery vehicles and similar. Other variations apply e.g., in Oxford, a specified length of bus lane can be used by car-borne park and ride users also.

Days and hours of bus lane operation need to be consistent across an area and be clearly signed. Ideally, they should be operational for 24 hours every day, the simplest designation especially where there are strong bus flows during evenings, weekends, and night buses.

Any priority measure is useless if it not enforced. Occurrences such as vehicles blocking bus stops or using bus lanes on the approach to junctions are obstructive and undermine the credibility of the scheme. Camera enforcement is particularly effective but requires reliable equipment and back-office support.

Self-enforcing measures can also be effective. Self-enforcing measures are types of measures that are developed to increase the road user’s compliance with the bus priority regulations and

[34] Traffic Management Act 2004: statutory guidance for local authorities outside London on civil enforcement of bus lane and moving traffic contravention

[35] Bus gate enforcement developer’s pack

reduces the enforcement resources in transport enforcement authorities by using the infrastructure instead. As per CIHT advice[36], a number of these approaches can be used:

- **Colour differentiation of road surface**: red or green surfacing to reduce unintentional encroachment by other vehicles and encourages enforcement authorities to pay special regard to keeping the bus lane clear. In Blackpool, the term “red carpet” is used, and of giving buses “red carpet treatment”.
- **Textural differentiatio**n: rough surfacing material, such as cobble stones, outside the bus’s “trackway”, to discourage violation. The design for the proposed Leigh Guided Busway in Greater Manchester includes “deterrent paving” along the centre line of each bus way, to prevent violation by other (narrower) vehicles (Greater Manchester PTE Quality Bus Routes consultation brochure, 1999).
- **Partial segregatio**n: longitudinal ridge, which can be crossed, but not unintentionally. Used in mainland Europe, e.g., Brussels and Paris. Being considered for use in Britain, subject to safeguards for two–wheeled vehicles.
- **Full segregatio**n: bus lane separated by kerbs from remainder of carriageway: commonly used with contra–flow lanes. Lack of space (carriageway width) and the need for part time access to the lane may preclude widespread use.
- **Traffic island**s: islands make separation of the bus lane from the rest of the carriageway more obvious and may mean that a conscious driving decision is needed to enter the priority lane.
- **Sump buste**r: A sump buster is a low riding structure designed to prevent general traffic past – allowing only access by buses and other larger vehicles such as fire engines and ambulances. They are an effective enforcement technique and ensure that general traffic does not enter a particular section of road system. However, due to their nature they can be vandalised and also lead to injuries for cyclists who fail to notice them – therefore are potentially less safe than other enforcement measures.

Examples of self-enforcing measures

Partial segregation of bus lanes in Paris


Sump buster in Bracknell, Berkshire

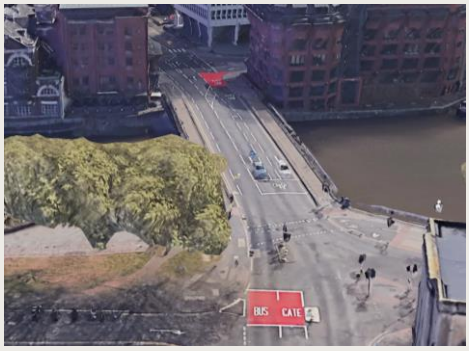
[36] Network Management Notes – Bus Priority

Case study: Bristol Bridge

Bristol City Council implemented several bus gates in the city centre. Each bus gate is signed as required by Traffic Signs Regulations and General Directions 2016 (TSRGD 2016).

However, in 2021, fines for driving through the new bus gate were quashed due to inadequate warning signs. Following the adjudication by a fines tribunal, Bristol City Council has painted more warnings in the road and created lanes to warn drivers they are not allowed to go through.

Bus Gate, with traffic signs



Bus Gate, with painted road surface

8 Key advice

Implementing bus infrastructure and road space reallocation schemes can be challenging for most LTAs. This document has summarised the different types of approaches that LTAs can consider as well as several important considerations that LTAs must take into account when deciding, planning and designing for these schemes. This section summarises the overall key advice for those planning and delivering bus priority measures.

8.1 Quality bus corridors

A quality bus corridor should bring together the infrastructure measures outlined in the previous chapters and create a single or networked route to increase ridership and make journey times more reliable. Good examples include:

- **Crawley Fastway guided busway**[37] is a series of bus priority measures including junction redesign and guided busways along two core routes linking Horley, Gatwick Airport and Crawley. With a 10-minute interval at peak times, it has exceeded its target number of passengers and returned over £6 of economic value per £1 invested.
- **Leigh to Ellenbrook Guided Busway**[38] includes an off-road busway, highway priority measures, and park and ride sites at three locations. It also has new passenger waiting facilities, extensive pedestrian and cycling improvements along the corridor, and frequent premium bus services.
- **Southeast Hampshire Bus Rapid Transit**[39] is an entire network designed as a viable alternative to the private car. It has reduced local car traffic and returned an estimated £8 for each £1 invested. One of its routes is a former disused railway line.

Merging a physical priority and corridor approach can be done using high occupancy vehicle (HOV) lanes where private vehicles with a minimum number of passengers can also use the segregated lane. This approach can raise enforcement issues, as HOVs are hard to distinguish and cannot be tagged for automated monitoring, and so enforcement is labour intensive. However, there are successful examples for such schemes in England and many other locations around the world.

8.2 Bus priority measures may not always be appropriate

Bus services may not be delayed on some sections of route hence maintaining traffic flows can be of most benefit to buses. There has been a tendency to introduce bus lanes where delays are not experienced and avoid the difficult sections of route where they would be most beneficial. In some cases, unnecessary bus lanes have been removed which has not helped the cause of promoting bus use and has negligible impacts on bus movements or other traffic.

8.3 Identifying where delays occur and their causes

Delays to buses are invariably due to other vehicles, moving or stationary, and the causes of these delays need to be understood if bus priority measures are to be introduced effectively.

[37] Crawley Fastway guided busway
[38] Leigh to Ellenbrook Guided Busway
[39] Southeast Hampshire BRT

Causes of delays include specific junctions where traffic signals manage queues but regular delays are typical at urban roundabouts where buses are unable to disrupt vehicles flows and priority junctions where a bus pulling into or across a traffic stream is difficult.

Other delays may be caused by inappropriate on-street parking, loading/servicing premises, road works and similar such as pedestrian crossings and multiple side roads and accesses. In some instances where buses are delayed, there is a knock-on effect for following services. Even relatively small obstacles such as a car or van occupying a bus stop can create delays to buses.

Measures to counteract these sorts of delays include effective enforcement by parking controls (usually dedicated parking officers) and moving vehicle penalties for mis-using bus priority measures and obstructing bus stops. Moving vehicle enforcement may be by the police or the LTA where powers exist.

Extensive lengths of priority can provide significant benefits in predictable and faster bus journeys. Sporadic lengths of bus lane are of limited value in comparison, tend to cause confusion and may be eroded over time. A ‘whole route’ approach is ideal but not always achievable.

8.3.1 Number of buses per hour

In general, the threshold for which there is likely to be a case for introducing extensive bus priority measures is at a flow of at least 20 buses per hour per direction. This applies in London and other major urban areas but elsewhere, the density of services is likely to be less. This should not be a deterrent to implementing measures and a threshold might be ten buses per hour. Ideally, car users should be able to see buses passing them during their journey.

8.3.2 Displacement of other traffic

Sometimes, bus priority measures will displace other traffic. Care should be taken not to disadvantage other bus services on nearby routes or relocating queues elsewhere. However, if there are no detrimental effects on other traffic, bus priority should be as comprehensive as possible. Effective implementation has the added benefit that bus use has a conspicuous advantage over car use.

8.4 Impacts of new bus lanes

8.4.1 Authorised vehicles

Multi-occupancy lanes have been introduced in South Gloucestershire on the approach to Bristol and in Leeds. These were designed to accommodate any vehicle conveying more than one person. However, the Leeds scheme has now reverted to a conventional bus lane.

8.4.2 Traffic Regulation Orders (TROs)

TROs are required for bus priority measures, although not necessarily for other measures such as yellow box junctions or for bus stop clearway orders. However, a TRO is required for every bus lane or bus gate. Introducing or revoking TROs is a lengthy process which requires advertising the scheme and then addressing any objections from local stakeholders. Often, a length of street can have one or more TROs, the reasons for which may need to be considered cumulatively. Should objections be received and cannot be resolved, then a public inquiry can be instigated, which can be time-consuming and costly.

The use of Temporary TROs is often seen as a means of circumnavigating the full process and can be applied where there is not time to invoke the full process e.g. emergency measures, or where the implementation programme is condensed. Temporary TROs are also a useful means

of trialling new road space reallocation schemes such as bus lanes or cycleways without requiring significant up-front costs or managing community opposition.

For BSIP schemes, Temporary TROs will almost certainly be required due to the constraints of funding availability. The success or failure of temporary TROs will be instructive in whether or not to proceed with permanent TROs for major bus priority schemes that have been identified in BSIPs.

8.4.3 On-street parking removal

The removal of on-street loading, waiting, and parking spaces are usually the most contentious issue related to bus priority. Local stakeholders often claim that their businesses will suffer without passing trade, although in reality it is often the business owner or building manager that wants parking rather than their customers. As with cycle lanes, successful bus priority schemes bring more business compared to kerbside parking.

This debate is at the crux of the kerbside debate about who or what should have greater claim to the use of the street. Some premises have no option other than servicing and loading from the street, but others have rear access of some sort. Managing these competing requirements is often as simple as introducing time-based restrictions for different vehicle times, such as part-time bus lanes and time-restricted loading zones.

However, the common presumption that businesses have a right to the kerb outside their premises is to be challenged. The DfT is clear in its position that bus services should be given more prominence over other activities such as private vehicle parking or servicing vehicles. The benefits of better bus services outweigh those of a minority of car users or localised resident and business interests which can be managed through other traffic engineering interventions.

Road space reallocation and managing stakeholder expectations to such schemes is covered in more detail in Support Package 4 Building a strong case.

8.4.4 Design considerations

Some bus priority measures are poorly designed or compromised to the extent that they achieve little. Common problems include bus lanes that are too narrow for buses to pass other vehicles in the adjacent lane or require buses to strike every drain cover which get progressively more sunken and uncomfortable. Other faults include curved sections of bus lane not allowing sufficient width for buses to fit so that they encroach into the adjacent lane.

8.5 Bus journey times

8.5.1 Number of bus stops

Many routes have evolved over a long period with bus stops being added over time. While this conveniences passengers in terms of the walking distance to local bus stops, it contributes to lengthening bus journey times. In combination with extensive bus priority measures, reducing the number of bus stops will help create faster bus journeys.

There is no hard and fast rule about bus stop spacings and their precise location depends on several factors such as the road layout and junction spacings, maintaining good access to bus stops for those with mobility impairments, availability of space to pair bus stops for each direction of traffic, space on the footway for the bus shelter and to allow pedestrians to comfortably pass, proximity to pedestrian crossings, and the arrangement of key origin and destination points along a route. Ticket information, supplemented by observation if necessary and bus driver knowledge, can identify who and how intensively stops are used with a view to rationalise the number of stops along a route.

It is acknowledged that there may be circumstances in which removing a particular stop will be detrimental to some users such as disabled people so discussing proposals with users is advised. In an trial in the West Midlands, some stops were removed but others retained following engagement with users.

Depending on the circumstances for each stop, removing it removes the deceleration, dwell time and acceleration needed by the bus. In some situations, the bus may take some time to pull out into the traffic due to heavy flows and poor behaviour by other drivers. Hence removing stops can have a positive impact on bus journey times.

8.5.2 Improved bus journey times

Comparing timetabled bus journeys with the equivalent car journey can be revealing. Many routes are slow with multiple stops and other factors to accommodate making the journey an unattractive option compared with car use. This is a major determinant of how people travel, and the total door-to-door time and walking distance involved with driving is often not fully considered. This includes time taken to find a parking space and then walk from the parking space to the destination. The location of a bus stop or bus station may be favourable and in some cases in the same place with a car park above a bus station. However, many car owners manage to park close by or next to where they live with the result that car use becomes the default means of travel.

There is also considerable value in seeing a bus pass a line of traffic which is achieved by bus priority measures. In places where a bus stop is well located in relation to destinations such as close to a hospital or shopping centre entrance or a short distance from workplaces, then the advantage of bus becomes apparent. Instead of having to navigate across a car park to get to a destination, bus users should be given priority access.

A series of improvements that provide better punctuality and shorter journey times may create resource savings for operators. This depends on the Peak Vehicle Requirement (PVR) which is a function of journey time, layover and frequency. If the number of vehicles can be reduced, then there is a significant cost saving or alternatively, it may be possible to intensify the timetable with a higher frequency service that could attract new users.

9 Question & answer

The table below summarises responses to key questions from LTAs throughout the engagement phases of this Support Package. The responses are not intended to be universally applicable to all contexts. In several cases, the responses are presented as a generalised narrative to widen their relevance to LTAs and operators. A number of factors – including (but not limited to) the market and operator environment, the strategic aims of each LTA, funding availability, and local context – will all have a bearing on how individual LTAs and operators could respond to the specific challenges and queries laid out below.

The questions have been grouped by engagement phase as follows. It is noted that questions and answers raised and responded to live in the webinar can be found in the accompanying recording:

- Pre-webinar engagement (online questionnaire)
- Post-webinar engagement (email communication)

All questions have been anonymised.

Table 9.1: Pre-webinar engagement: question and answer

Question	Answer
How to approach bus priority with elected members so not seen as 'anti-car'	There are a number of techniques that can be used when approaching members: • Give and take approach – remove some space but add some better arranged spaces with kerb build-outs and public realm, crossing etc. to make self-enforcing (avoid all day parking). • Key is early engagement. • Marketing campaigns. • Image and perception. Support Package 4 covers this topic in more detail
Traffic calming chicanes on commercial bus routes - operators really don't like them; they say they penalise buses more than cars and can lead to tyre damage when kerbs are clipped. Our engineers say some form of traffic calming is required, but we have struggled to find anything that both parties can agree to.	There is no one solution to this problem – managing conflicts between different stakeholders can be difficult. To address this, engagement with operators is key to further understand their issues and discuss solutions. For this particular example soft infrastructure measures could be the optimal solution. Removing the chicanes and implementing a 20mph speed limit for traffic management. This could be enforced with cameras and would manage speeds without impacting on the bus infrastructure.
In a space constrained area floating bus stops have been provided, where there is not adequate space a ""hybrid"" arrangement has been designed in which passengers load and	To address this solution, it is important to think about: • Adequate waiting area space. • Improved signage. • Visibility and line of site for the cyclists to the crossing / bus stop and vice versa.

unload from the bus on the floating island but then cross a cycle lane (raised, coloured and with zebra marking) to travel onwards on the footway / wait at the bus stop. Are any further improvements that can be made to this arrangement?	• Stopping speed distances (LTN 1/20). • Does the stop cater for those with mobility impairments, the elderly and others? • Traffic calming measures to slow cyclist down i.e. a winding approach, planters etc. Ultimately the solution decided upon should take into account the space available and how best to optimise safety for bus users.

Table 9.2: Post-webinar engagement: question and answer

Question	Answer
Evidence of supporting bus gates and benefits to the economy, particularly local high streets and district centres. Local business is the area are concerned about the loss of through traffic and perceived implications on their businesses.	See information provided in Chapter 3 above. Bus gates are designed to prevent cars, not people, from accessing congested areas. If bus schemes are implemented correctly footfall outside of a business should be consistent, and if people are using sustainable measures (public transport, walking and cycling) they will have more flexibility to visit local businesses as, particularly is the case for bus users and pedestrians, they will not need to park – having a much more flexible approach to travel and movement through an area.