Lancaster City Council

Lancaster South Growth Area

Sustainable Travel Strategy

July 2023

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Version 2-1

July 2023

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Project Information Sheet

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Glossary of Terms

AAP	Area Action Plan
BGV	Bailrigg Garden Village
BLG	Broad Location for Growth
CO2e	Carbon dioxide equivalent (for greenhouse gas emissions)
CIL	Community Infrastructure Levy
DPD	Development Plan Document
EV	Electric vehicle
HIF	Housing Infrastructure Fund
LCC	Lancaster County Council
LCiC	Lancaster City Council
LCWIP	Local Cycling and Walking Implementation Plan
LTN	Low Traffic Neighbourhood
MSM	Mode Shift Model
PRoW	Public Right(s) of Way
RAG	Red / amber / green (rating)
SPD	Supplementary Planning Document
STS	Sustainable Travel Strategy
TCPA	Town and County Planning Association

1. Introduction

1.1 Integrated Transport Planning has been commissioned by Lancaster City Council (LCiC) to prepare a Sustainable Travel Strategy (STS) to inform an Area Action Plan (AAP) being delivered for a new garden village to the south of Lancaster, known as Bailrigg Garden Village (BGV).

1.2 Policy SG1 of LCiC's Local Plan (Climate Emergency Review) describes BGV as:

> *"a major mixed-use development which focuses on the delivery of at least 3,500 new houses, a number of opportunities for employment and economic opportunities including the delivery of Lancaster University Health Innovation Campus and wider University related expansion."*

1.3 More widely, and after the current Local Plan period, BGV could expand to a wider Broad Location for Growth (BLG) comprising around 5,000 homes and additional supporting facilities, subject to the future needs and demands for development which would be assessed through future Local Plans.

1.4 The BLG, including BGV, is allocated as a strategic site in LCiC's Local Plan (2020) and will accommodate a significant proportion of the district's housing need. The preference for strategic growth sites as opposed to more minor, piecemeal development is influenced by the National Planning Policy Framework and the Town and County Planning Association's (TCPA) Garden City Principles, which recognise the potential that comes with growth at scale.

1.5 The purpose of this STS is to inform the AAP, but also to reflect the changing context of transport planning in Lancaster and nationally. LCiC has declared a climate emergency, has ambitious carbon targets, and is suffering from congestion. Planning growth with sustainable mobility outcomes in mind will help to tackle these issues and create communities which are less reliant on the private car, as well as reducing car reliance within neighbouring areas.

1.6 This STS has been prepared working closely with LCiC and through engagement with Lancashire County Council (LCC), in their capacity as the local highway authority, local Parish Councils, and other relevant stakeholders and parties.

1.7 Notwithstanding the sustainable mobility aspirations for the BLG, there will also be a need for vehicle access and targeted highway capacity upgrades. The South Lancaster Growth Catalyst, led by LCC and supported by LCiC and other partners, were successful in a bid for the Housing Infrastructure Fund (HIF) to deliver a new spine road through BGV, reconfigure Junction 33 (J33) of the M6, and provide a new link road between J33 and BGV and other sustainable transport measures. Whilst new road infrastructure will

enable access to BGV, these are costly pieces of infrastructure, and the full bid value was not awarded by Government. In addition, since the initial inception and drafting of this STS, LCC has made the decision to suspend delivery of the M6 link road and BGV spine road scheme due to rising construction costs and uncertainty. Therefore, funding to deliver highway and other sustainable transport focussed infrastructure associated with growth will need to be carefully considered in this STS, in the context of the AAP and more widely by both authorities.

1.8 If the AAP is progressed despite the uncertainty around the spine road delivery, LCiC will seek to commission a Highways Assessment which will relate closely to this STS but will focus on ensuring that the vehicle impacts of BGV are not unacceptable. The study will follow on from the STS and hence the findings of this strategy in terms of the infrastructure and interventions necessary to achieve modal shift, and the resultant trip rates and mode shares, should be fed into the Highways Assessment.

1.9 This STS adopts a 'vision-led' approach to planning growth (described further in Chapter 2), sometimes referred to as 'decide and provide' or 'vision and validate'. This means that it assumes an alternative, sustainable future can be achieved, and works back from there to understand what is needed to achieve it. It is based on the understanding that conventional development in the UK has perpetuated car dependency and resulted in poor outcomes for too long, and an alternative approach is now needed to respond to the climate emergency and housing crisis.

1.10 The remainder of this STS is structured as follows:

Chapter 2 describes the vision-led approach to planning growth which has been adopted in this STS

Chapter 3 summarises a comprehensive evidence base review of regional and local policies and studies

Chapter 4 distils the evidence base into a single transport and movement vision and a clear set of objectives, along with a user hierarchy to be adopted in the STS

Chapter 5 reviews at a high level the existing conditions in and around the BLG

Chapter 6 summarises a review of sustainable places and best practice, and sets out the findings as a long list of potential interventions relevant to the BLG

Chapter 7 organises the long list into three spatial packages of interventions, representing potential for low, medium and high levels of mode shift

Chapter 8 presents the results of a mode shift and carbon modelling exercise for the three scenarios

Chapter 9 summarises the above into an overall strategy and next steps

2. The vision-led approach

Vision-led vs. predict and provide

> *"Planning for people will result in places for people; planning for cars will result in places dominated by cars"*[1]

2.1 The vision-led approach adopted for the STS focuses on establishing a clear sense of what outcomes new development is seeking to achieve, and then identifies the design framework required to achieve them. The desired outcomes could include more active lifestyles, better access to employment opportunities, more attractive places to live and improved public health - all of which can be intrinsically linked to travel mode share. The approach in this STS seeks to first establish a mode share vision for everyday trips, and then test different possible sustainable transport interventions to measure their prospective contribution towards achieving it.

2.2 The approach moves away from the more conventional 'predict and provide' model that has historically dominated growth planning. Predict and provide relies on empirical data and highways-based modelling approaches, and tends to hypothesise a 'worst case' in terms of mode share, which in turn predicts high vehicle demand and unacceptable highway impacts. Highway-focussed mitigation strategies are consequently proposed, usually aimed at unlocking additional highway capacity, and ultimately facilitating greater numbers of car trips.

2.3 The predict and provide approach is not solely based around highway trips, and equally a vision-led approach will still need to consider journeys by motorised vehicles. As such there remains a need in future for related studies to test the future mode share vision and identify the residual impacts on transport infrastructure, including the highway network. Judicious and creative use of transport models is therefore critical, and incredibly useful, in providing a rounded assessment, as part of a wider range of tools and methodologies.

2.4 The overall approaches are visualised in Figure 2-1 below and Figure 2-2 overleaf.

[1] Better planning, better transport, better places (CIHT, 2019). Available at: https://www.ciht.org.uk/knowledge-resource-centre/resources/better-planning-better-transport-better-places/

Figure 2-1: Vision-led approach

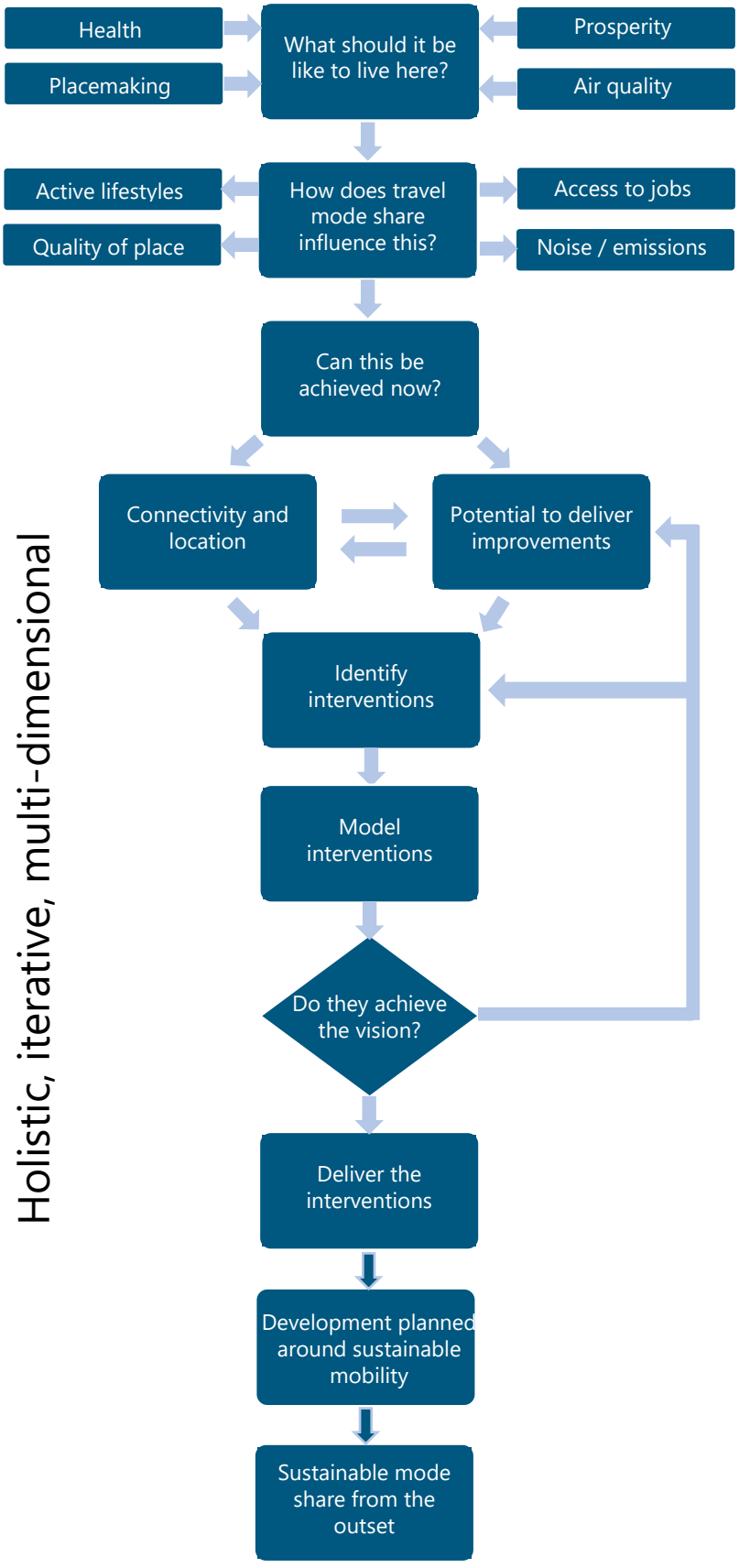
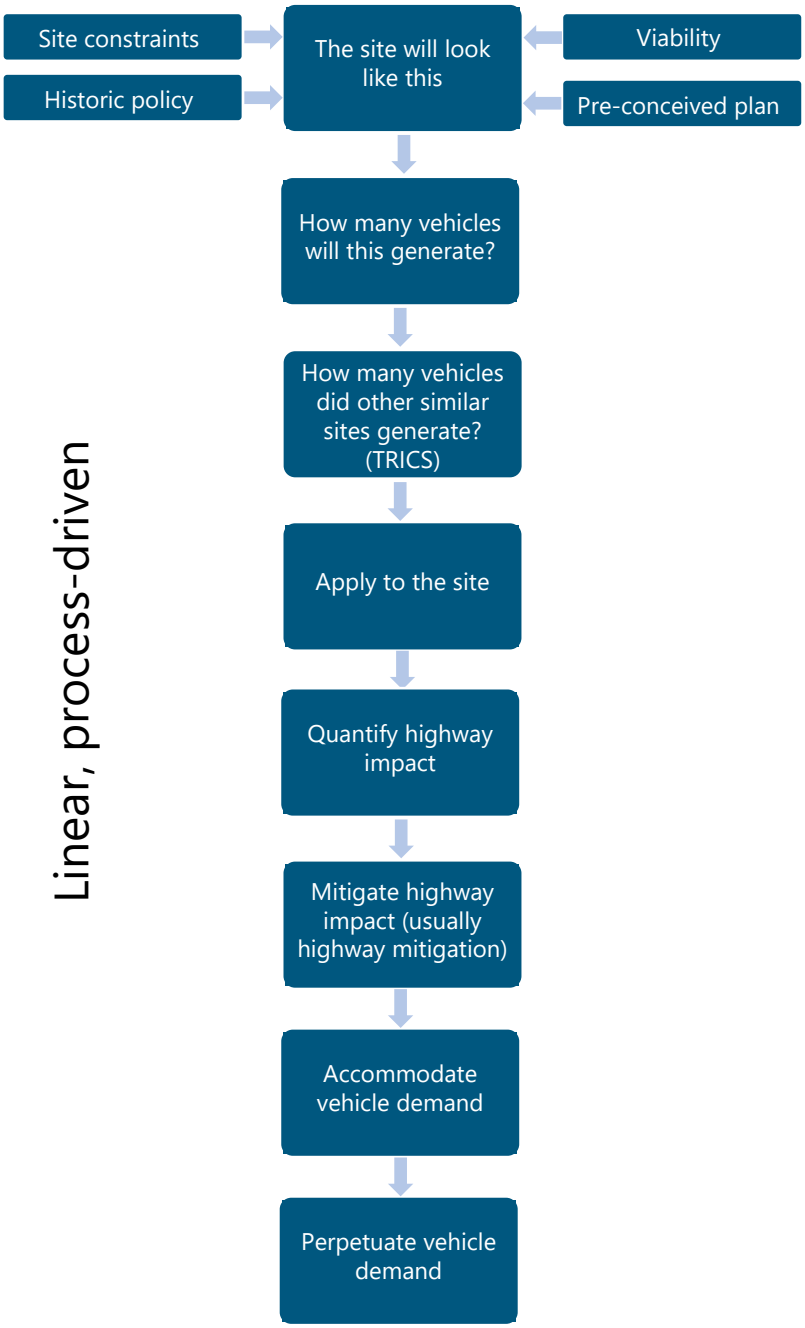


Figure 2-2: Predict and provide approach



Why apply it in Lancaster South BLG?

2.5 Various studies have found too much housing across the UK - including that already delivered in emerging Garden Communities - is sub-optimal, both in design and construction, lacking basic day-to-day facilities on-site or usable walking, wheeling, cycling or public transport infrastructure. The result is that much of what is being built is destined to become car-dominated, adding to carbon emissions and air pollution, whilst contributing towards a future of poor health of the residents that live there through inactivity[2][3][4].

2.6 The reviews of the existing evidence base and conditions in Lancaster presented in Chapters 3 and 5 highlight that Lancaster presents a great deal of opportunity to embed sustainable travel habits, benefitting from high levels of internal commuting, cycling trips, and low car ownership. That said it is not immune to many of the challenges outlined above in terms of recent growth, and these are compounded by its proximity to the M6, topography, historic building and street patterns, and rural hinterland with fewer opportunities for sustainable trip-making.

2.7 Growth-led capacity investment can provide a catalyst in Lancaster South not only for 'good growth' with high levels of sustainable mode share, but also for mode shift across existing communities to the south of the city, and the wider sub-region. Furthermore, LCiC has declared a Climate Emergency, setting a target to be net zero by 2030. This means that strategic growth such as the BLG will need to be planned with the highest levels of sustainability in mind in respect of funding and delivering tangible and genuinely 'better than car' options for walking, wheeling, cycling and using public transport for the significant volumes of short everyday trips people make.

[2] UCL (2020), A Housing Design Audit for England
[3] Transport for New Homes (2018), Transport for New Homes
[4] Transport for New Homes (2020), Garden Villages and Garden Towns: Visions and Reality

3. Evidence Base

3.1 To understand the existing policy and baseline position, a review of the evidence base relating to transport and movement in Lancaster and the BLG has been undertaken. This will provide the contextual backdrop against which to establish common themes and progress a vision relating to sustainable travel for the area.

3.2 Policies and studies prepared by LCiC, LCC and their partners and consultants have been reviewed and the salient findings are summarised in the following pages. This chapter summarises key documents and themes; other studies which have been reviewed but which are not discussed in detail include:

- Draft Lancaster Local Cycling and Walking Implementation Plan (LCWIP) proposals and engagement feedback
- LCiC's Provision of Electric Vehicle Charging Infrastructure Supplementary Planning Document (SPD)
- LCC's 'Actively Moving Forward' ten-year strategy for cycling and walking
- LCC's Housing Infrastructure Fund bid
- Early information and plans relating to the upcoming planning application for the M6 J33 reconfiguration and M6 to Heysham spine road
- LCC and Blackburn with Darwen Borough Council Bus Service Improvement Plan and Enhanced Partnership Plan

3.3 The proceeding pages summarise key policies and studies undertaken by LCiC, followed by those undertaken by LCC. These include documents with spatial coverage across the district or county, as well as some specific to Lancaster, Lancaster South and BGV.

Lancaster District Climate Emergency Local Plan Review

Overview:

Part One of the adopted Lancaster District Local Plan (2011-2031) sets out the Strategic Policies and Land Allocations in a Development Plan Document (DPD). In light of LCiC's declaration of a Climate Emergency, it was reviewed in June 2022. Part Two of the Local Plan sets out the specific development management policies to guide planning decisions, such as policies relating to parking provision and Travel Plans. The Local Plan is supported by the Infrastructure Delivery Plan (Climate Change Review).

Vision:

A prosperous and growing historic city with a thriving knowledge economy, driven by successful Universities that attract the most capable students to a welcoming environment featuring good retailing, leisure and cultural offer and an historic environment that is managed with a rigour appropriate to its regional significance.

Policy SG1 - Lancaster South BLG (abridged and emboldened):

Securing high-quality urban design which promotes **sustainable, attractive places to live**, defining a sense of place and creates a sense of community for its new residents.

Seeking a modal shift in local transport movements between South Lancaster, the Garden Village, Lancaster University Campus and Lancaster City Centre and beyond into the employment areas of Morecambe and Heysham, through delivery of a Better Buses Scheme and Cycling and Walking Superhighway network.

Ensuring that the necessary **infrastructure to achieve sustainable growth is delivered in the right place, at the right time**, to address strategic constraints to the delivery of future development in the South Lancaster area.

The creation of sufficient areas of high-quality open spaces to provide a distinct sense of place and **deliver a network of green corridors and walking and cycling routes** across the South Lancaster area to the benefit of the local environment and residents.

The creation of healthy and cohesive communities through the delivery of high-quality development and the **correct levels of services, open space and infrastructure** which is provided in safe and accessible locations.

Taking proper account of the need to **design new development to minimise its contribution to, and the impacts of, climate change** and to ensure that new development is resilient and adaptable to the effects of Climate Change.

To ensure **innovative urban design both in terms of the layout and density of new development** and the specific design of new buildings. This should include the application of appropriate new technologies for buildings and transport where possible.

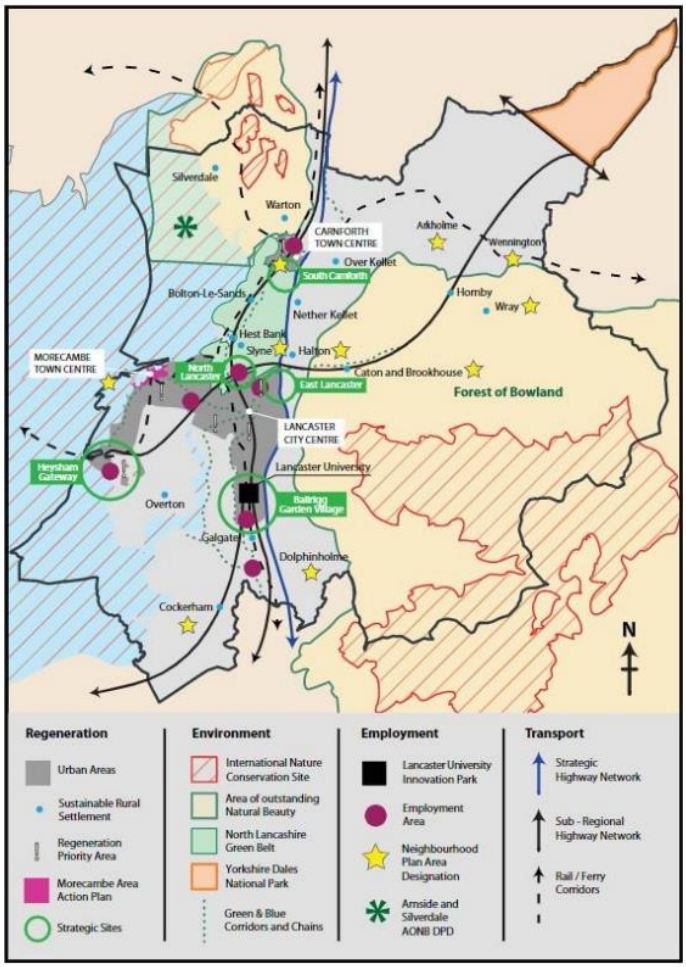
Addressing longstanding constraints and capacity issues in the strategic and local road network through improvements to traffic management and physical interventions to increase network capacity and advantage sustainable travel. This will involve the re-configuration of Junction 33 of the M6 to afford direct motorway access into the South Lancaster area and remove traffic from Galgate which is currently designated as an Air Quality Management Area.

Policy SG2 - Lancaster University Health Innovation Campus:

Proposals should seek to address…the **creation of an attractive entrance point into the Innovation Campus** from the A6 with appropriate landscaping to the site's frontage with the A6.

The incorporation of cycling and pedestrian access with positive linkages to the existing network, including improvements to cycling and walking links from this site into Bailrigg Garden Village, Lancaster University Campus and Lancaster City Centre and proposals should seek to connect with the Cycling and Walking Superhighway proposed in this area. Proposals for cycling and walking should include the retention of Bailrigg Lane as a pedestrian and cycle route.

Proposals should include a detailed Travel Plan, in accordance with Policy DM63 to ensure **opportunities to reduce transport movements by private vehicles are minimised** and the opportunities to access the site via the Better Buses Scheme and Cycling and Walking Superhighway are maximised.



Policy SG3 - Infrastructure Delivery for Growth in South Lancaster:

The forthcoming [AAP] DPD will seek to address…delivery of access into the Strategic Highways Network via a **reconfiguration of Junction 33 of the M6** to the satisfaction of the strategic and local highways authority. In order to achieve this the Council has identified an area of search for the newly configured Junction 33 via Policy T1.2.

Improvements to the local road network as appropriate to address recognised capacity issues and issues of highway safety

Improvements to the public transport network, specifically the creation of a Better Buses Scheme linking South Lancaster to Lancaster City Centre, Morecambe and the Employment areas on the Heysham peninsula to provide genuinely realistic alternatives to private vehicle use

Improved cycling and walking linkages from South Lancaster to the north, towards Lancaster City Centre and the south, towards Galgate. This will be through the creation of a Cycling and Walking Superhighway which will provide a safe and attractive route for pedestrians and cyclists. [Improvements] will also be sought for **improvements to walking and cycling links along the Lancaster Canal**.

Relevance to this STS:

The DPD sets the scene for Lancaster and the BLG, as well as identifying the need for the AAP - providing further detail on application of the key policy principles, setting out a spatial framework for masterplanning and facilitating co-ordination and phasing. In the interim, development within the BLG will be permitted provided that there would be no prejudice to delivery of BGV, it complies with the key principles, and, crucially, that it fully considers opportunities for sustainable transport and does not result in a severe residual impact.

Draft Lancaster Sustainable Travel SPD

Overview:

The Lancaster Local Plan Sustainable Travel Supplementary Planning Document closed its pre-Regulation 18 public consultation in August 2022, with comments now being considered. The SPD supports the ongoing Climate Emergency Review of the Local Plan and emphasises the need for development to respond to climate change, prioritise sustainable modes of travel through good design, and support development of the wider active travel network.

Priority areas for change:

Prioritising active and sustainable travel, through: putting active and sustainable modes at the top of the hierarchy; designing development layouts and low traffic neighbourhoods to put these modes first; discouraging vehicle use through traffic calming; and reducing the prominence of car parking.

Providing well designed cycle infrastructure, based on the principles of Local Transport Note 1/20.

Ensuring highly accessible development, such that people have good access to a range of services within walking distance and bus stops are within 400 metres of every home.

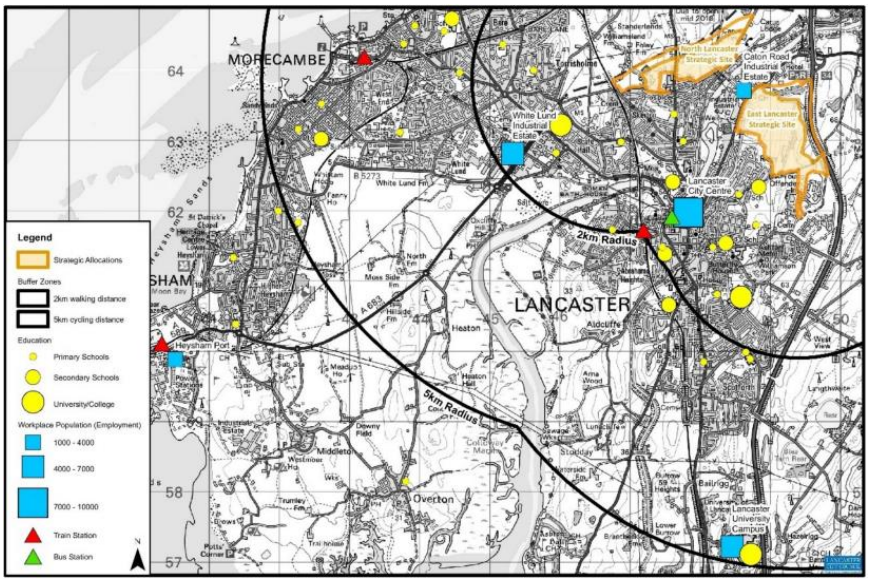
Inclusive design, ensuring that transport networks are barrier free, legible and equitably accessible for all groups and ages.

High quality public transport which is frequent and links to the Lancaster city centre and other key destinations, such as the district's main urban centres and employment areas. Public transport is expected to be within a reasonable safe walking distance to all parts of new development.

Parking for sustainable travel including secure cycle parking which accommodates a range of cycles (e.g. cargo bikes), mobility hubs, mobility scooter parking, space for car clubs and Electric Vehicle (EV) parking.

Travel networks designed to work with green and blue infrastructure to ensure that biodiversity enhancements are achieved.

The SPD sets out frameworks for site-specific active travel networks within Lancaster's proposed strategic development sites, though notes that the active travel network for the Lancaster South growth area will instead be defined in the AAP. The principles for defining active travel networks in development sites should take into account site access points, trip attractors and desire lines.



Relevance to this STS:

The SPD highlights the critical elements needed to deliver development with good sustainable mobility outcomes, which should form the foundations of the STS for Lancaster South.

Travel, Transport and Securing Modal Shift Topic Paper

Overview:

In advance of preparation of the AAP, LCiC are consulting on Topic Papers covering a range of topics relating to the BLG. The Travel, Transport and Securing Modal Shift Topic Paper is based around the principles of Policy SG1 of the Local Plan. To address these, the Transport Topic Paper initially considers the baseline conditions in the BLG, and then sets out considerations and aspirations for improvement, before discussing next steps.

Vision (abridged):

Development in South Lancaster will create a **sustainable place for people to live and work**, it will seek to support innovation through the use of new technologies, providing an attractive location to both live and work and support the delivery of low-carbon living through design, construction and energy generation…

The necessary and appropriate **infrastructure will be delivered in the right place and at the right time** to facilitate new homes and businesses, this includes the creation of new schools, community facilities and healthcare necessary to create an inclusive and cohesive community.

The Council will seek to **promote modal shift**, where possible encouraging local journeys to be made by more sustainable forms of travel, such as cycling, walking or public transport rather than simply by private car. Supporting such a shift will involve the creation of new cycling and walking networks within South Lancaster and also through improving connectivity to other areas of Lancaster and surrounding areas.

Key principles:

Promote public transport from the outset of development through network improvements, with high quality bus services to the city centre and Lancaster Station. Bus gate on the spine road through Bailrigg Garden Village to make the bus quicker than the car.

Self-contained settlement so walking to essential services is the preferred option with walking infrastructure prioritised within the BLG to ensure walkable neighbourhoods. Surrounding network to be upgraded with direct links to the Lune Estuary footpath and improved walking to the city centre, Lancaster University, Galgate, Canal and Burrow Beck.

High-quality cycle infrastructure in the BLG, supported by upgrades in the existing network which provide segregated links to the city centre.

Re-investigate car parking standards to look to pragmatically reduce opportunities for parking whilst providing sustainable transport measures. Recognise that vehicles will continue to play an important role for particular trips and groups of people.

Investigate opportunities for more ambitious levels of modal shift through infrastructure and place-making, whilst also being aware of viability issues and the role that private vehicles will inevitably continue to play.

Relevance to this STS:

The Topic Paper provides a site-specific assessment of opportunities and constraints and sets out a series of approaches to walking, cycling, public transport and vehicles. These will be carried through, and where possible, enhanced in this STS.

Bailrigg Garden Village Masterplan

Overview:

LCiC commissioned JTP to prepare a Spatial Masterplan Framework Document for BGV, setting out the steps needed to take forward Policy SG1 and prepare the AAP. It relates to BGV but considers the broader area of growth and connections to the surrounding areas. Whilst not a fixed masterplan, it indicates potential areas of development and densities.

Key principles:

Clustered and compact developed areas will be surrounded by a productive and resilient green landscape, comprising pastureland, woodland, orchards and allotments, alongside a network of local waterways, including the valuable amenity of Lancaster Canal.

People will be able to connect readily with the city, countryside and surrounding settlements, including Galgate and Lancaster University, via a series of accessible cycle and walking routes. Low carbon public transport options will be made available for longer journeys and travel by private vehicles will be minimised.

The living and working environment will be planned and designed with the **highest standards of placemaking**. All buildings will be designed to use energy and resources as efficiently as possible, in line with Lancaster City Council's commitment to becoming **net zero by 2030**.

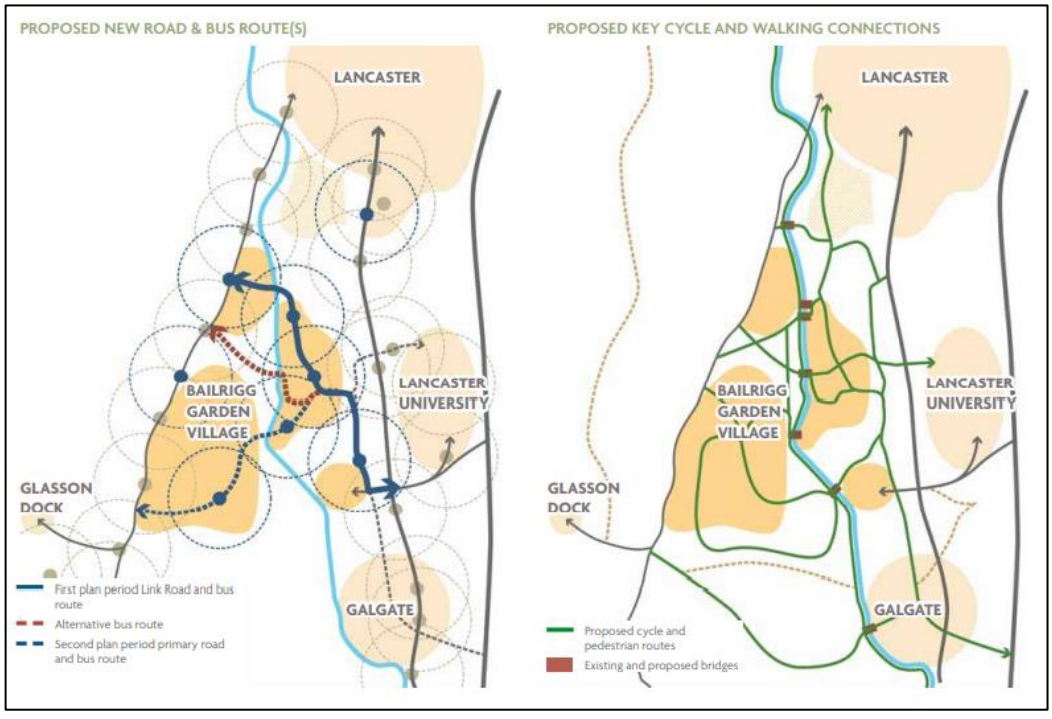
Settlements will be designed to sit lightly and comfortably within the existing drumlin landscape, with building orientations based on natural resources and the site topography.

A network of blue and green infrastructure features will create resilience to flooding considering the effects of climate change, manage water resources sustainably and as far as possible alleviate existing flooding issues.

Health and wellbeing are at the heart of Bailrigg Garden Village. **Sport and outdoor recreation will be encouraged**.

Relevance to this STS:

The Spatial Framework Document as part of the JTP masterplan defines the most appropriate developable areas, and their densities, based on the existing landscape and constraints. The initial movement networks proposed, which work within this framework, provide a spatial dimension to the principles outlined in the Topic Paper and SPD.



Lancaster District Transport Assessment

Overview:

In 2018 WYG undertook a Transport Assessment on behalf of LCiC to assess the likely impact on the existing local highway network of committed development and proposed emerging Local Plan development sites in the Lancaster District.

Part 1 – Initial Assessment

The initial assessment considered 2023 and 2033 scenarios comprising background traffic growth and estimated development traffic flows. It was recognised that the major limitation of the Assessment was the absence of an up-to-date strategic transport model, and hence it was difficult to model the effects of congestion on mode choice and or peak-spreading. The junctions in the vicinity of the BLG which were found to potentially need improvements by 2023 and 2033 as a result of growth are shown below.

Junction	Potential improvements required by	
	2023	2033
A6 Main Road / Stoney Lane / Salford Road – A6 (S) Corridor (Galgate)		
A6 Preston Lancaster Road / Hazelrigg Lane – A6 (S) Corridor		
A6 Scotforth Road / Hala Road / Ashford Rd - A6 (S) Corridor		
A6 Greaves Road / Ashton Road (The Pointer Roundabout) – Lancaster city centre		
A6 / Barton Road – A6 (S) Corridor		
A6 / Penny Street / Thurnham Street – Lancaster city centre		

Part 2 – Mitigation Measures

Part 2 of the Transport Assessment considered the need for mitigation at the 13 junctions that were brought forwards from Part 1. It is important to note that this assessment only focused on identifying supply-side interventions to improve vehicular flow at each junction, rather than looking at modal shift to sustainable transport including public transport, cycling and walking. Some key findings are set out below.

It was considered that whilst the A6 Scotforth Road / Hala Road / Ashford Road junction would operate above its capacity with future development taken account of, there would be limited scope for mitigation without using third-party land.

The Pointer Roundabout already suffers from significant congestion and is likely to be reconfigured in the future to cater for a potential bus rapid transit system or cycle superhighway accessing south Lancaster. One mitigation proposal would be to convert the current roundabout into a signal-controlled junction, although the assessment found that it would still operate just above its capacity in 2023 and 2033.

The A6/Penny Street junction is in Lancaster City Centre and is likely to be reconfigured as part of the City Centre Movement Strategy in the future, as part of the proposed changes to the gyratory system. As such, this was not considered further as part of the Highway Assessment.

Relevance to this STS:

Whilst this is a Sustainable Travel Strategy focussing on active and sustainable modes, it has the potential to improve congested conditions in Lancaster by reducing car-borne trips in favour of alternative modes. It is also useful to understand where there are existing constraints which would make it difficult to reallocate roadspace or provide improved walk, cycle and public transport infrastructure alongside space for private vehicles.

Lancaster District Highways and Transport Masterplan

Overview:

The Transport Masterplan was prepared in 2016 by LCC and sets out plans for how movement in Lancaster will be supported through to the early 2030s, including modal shift through new infrastructure and travel management. Key themes considered include the Arc of Prosperity; connectivity with Morecambe and Heysham; health and wellbeing; public realm; deprivation, inequality and social exclusion; and tackling traffic pressures on the A6 and the city centre gyratory.

Vision:

Away from the city centre, the residential roads, old and new, are quiet as traffic no longer rat runs trying to escape the gyratory system. Walking and cycling are now the norm for many local journeys and car clubs mean that there is far less need to own a car. Ultra-low emission cars are now commonplace as charging is straightforward wherever the car is kept, on or off road. Public transport is also far more reliable and new links to South Lancaster mean that Lancaster University has been able to expand and maintain its prestigious reputation. Those who work in the area almost all commute by sustainable modes: on foot, cycle or using the 'Lancaster Reach' bus rapid transit services.

Key strategies:

Reconfiguration of M6 Junction 33: overcoming constraints in South Lancaster, especially around Galgate, opening up development at Lancaster University, BGV and Whinney Carr.

Caton Road Gateway: linked to the Bay Gateway, and positioning Caton Road as the primary route into Lancaster from the M6. This will introduce a 'heavily managed' environment for traffic in the city centre and allow reconfiguration of the city centre gyratory.

Lancaster Links: a vision of an integrated multi-use cycling network for the district. The vision encompasses a mix of cycling superhighways, quiet roads and greenways aiming to connect South Lancaster, the city centre, Morecambe, Carnforth and Hornby/Wray.

Lancaster Reach: A feasibility study associated with the Bay Gateway led to development of the Lancaster Reach bus rapid transit concept, incorporating Park & Ride at Junction 34, South Lancaster, the city centre and the Hospital. However, bus rapid transit was found unlikely to be feasible in Lancaster.

Ultra-Low Lancaster: creating a district that caters for Ultra Low Emission Vehicles (ULEVs), with a focus on ULEV buses, car clubs, taxis, vans, charging infrastructure and marketing campaigns.

A6 South Lancaster to City Centre Corridor: with some traffic being rerouted via the Bay Gateway and Caton Road links, the A6 would accommodate better facilities for walking, cycling and public transport, including the Lancaster Reach.

City centre strategy, discussed further overleaf.

Relevance to this STS:

The Transport Masterplan sets out important linkages between the BLG and Lancaster at a local level, as well as further afield to other regional centres, highlighting the importance of a coherent and comprehensive movement network. The STS will need to link to and / or enhance the strategies set out by LCC. That said, the HIF bid was only granted in part by Government, and delivery has now been suspended, so there is now a significant shortfall in funding to deliver all of the strategies proposed, including vehicular access to BGV.

Lancaster City Centre Movement and Public Realm Strategy

Overview:

Building on the Highways and Transport Masterplan, the City Centre Movement and Public Realm Strategy (2020) is a collaborative study between LCC and LCiC to reconfigure the city centre gyratory system to reduce through-traffic by private car and promote public transport and active travel. Eight route options were considered for reconfiguring the gyratory and wider movement network, and assessed qualitatively against the themes of inclusivity, ease of movement, quality of place, safety and public health, and economic benefit. The next step is to decide upon a preferred option to take forward to feasibility and design.

Vision:

In 2031 Lancaster city centre is a vibrant and successful core to the district, where earlier issues of poor air quality and congestion have been tackled. Pedestrians and cyclists can move around easily and freely, through safe and attractive public spaces. This is because the centre is largely free of traffic. There is much less through traffic and most of the vehicles that do need to be there are ultra-low emission. The city has become an attractive destination for visitors from near and far.

Route options:

1) Do minimum and keep the existing one-way gyratory, aside from making changes to the Pointer Roundabout. This **scored poorly** against all of the themes, in general because it does not offer a more attractive environment for walking, cycling and public transport.
2) Alter the gyratory to allow two-way traffic for all modes. This **scored poorly** against all of the themes, in general because it does not offer a more attractive environment for walking, cycling and public transport.
3) One lane for private vehicles and one for sustainable modes, both one-way. This **scored better** against some themes, though was considered to perpetuate severance and road safety problems, with political and public acceptance also highlighted as a potential issue.
4) Two-way general traffic on the western side and sustainable modes on the eastern side. This **scored well** against all themes, though similar issues to above were highlighted for the western (vehicular side).
5) Two-way general traffic on the eastern side and sustainable modes on the western side. As with Option 4, this **scored well**, though the western side of the gyratory was considered less attractive for sustainable modes.
6) No though traffic in the city centre, local access only provided. This **scored well** in terms of ease of movement for sustainable modes and an inclusive environment, but could have implications elsewhere in terms of rerouting and air quality.
7) No part of the gyratory open for general traffic. This **scored highly** across all themes and because it covers a wider area, implications for rerouting were considered less significant.
8) City centre clean air zone which charges general traffic using either the eastern or western side of the gyratory, with the other side being for sustainable modes. This **scored very high** against all themes because it was not deemed to worsen severance, air quality etc., but instead generally deter traffic from travelling through the city centre in the first place.

Relevance to this STS:

Whilst the city centre is at the extents of the study area considered in this STS, the connections/linkages to any future strategy need to be facilitated, and the wider implications of rerouting, peak spreading, access restrictions and sustainable mobility infrastructure will be considered.

4. A vision for Lancaster South

4.1 One of the most pressing issues prevalent in the evidence base review was the high level of traffic congestion, particularly around the gyratory system in the city centre and along the A6 corridor around Galgate. This has negative consequences in terms of air quality, safety, and diminishing the quality of the public realm.

4.2 Another common theme is South Lancaster's potential to play a leading role in the economic growth of the district. Lancaster University and Health and Innovation Campus in particular create these conditions, and as such, a transport network in South Lancaster should be designed to maximise connectivity with the city and in rural communities, as well as feed into the 'Arc of Prosperity' which spans across Lancashire.

4.3 All this is within the context that in 2019, LCiC declared a Climate Emergency. To reflect their commitments to tackling the climate crisis, transport interventions must be resilient and adaptable to its impacts. LCiC have been placing significant emphasis on delivery of EV charging infrastructure, electric car clubs, and the electrification of vehicles to help tackle CO2e emissions, particularly in light of the surrounding rural communities who benefit from fewer choices aside from the private car.

Vision and objectives

4.4 Distilling of the significant evidence base, and the themes above, suggests a succinct transport and movement vision for Lancaster South:

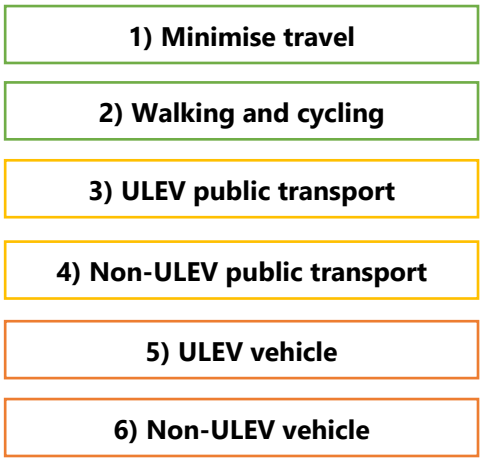
> *By 2033, and beyond, Lancaster South will be thriving, with high levels of sustainable mode share achieved through high quality, low carbon sustainable transport networks, complemented by placemaking that prioritises active and sustainable modes, embeds traffic management and embraces digital connectivity.*

4.5 Table 4-1 sets out the objectives suggested to support the vision and guide development of the STS:

Table 4-1: Objectives for the Lancaster South Sustainable Travel Strategy

Objective	
1)	Minimise the need to travel by providing a wide range of day-to-day facilities on site and delivering growth with gentle density
2)	Through the design of transport networks, streets, and parking within the BLG, make active travel and low carbon transport the most convenient and reliable choice
3)	Deliver dedicated and high-quality active travel and public transport infrastructure in early phases of development, which are commercially viable and also benefit existing communities and journeys
4)	Support economic growth within new and existing communities by improving connectivity between South Lancaster and the wider district, notably the city centre, key employment and education locations, and rural communities to the south
5)	Tackle inequality by ensuring safe, clean, convenient, inclusive and affordable sustainable transport choices for all, including disadvantaged and less connected groups and areas
6)	Support LCiC and LCC's related transport, climate, safety, public health, and placemaking objectives
7)	Plan networks which accommodate trips for a range of purposes and to different destinations, including for education, leisure and shopping as well as for commuting
8)	Advance and exploit shared transport, electrification and ultra-low emission transport technologies, especially where car travel remains the only viable choice for some journeys
9)	Influence travel choices and car dependency through an effective marketing and promotional strategy, integrated with Lancaster University and extending across Lancaster District
10)	Integrate new transport networks sympathetically into the existing drumlin landscape, and considering the surrounding heritage and built form

4.6 The vision and objectives are also underpinned by the user hierarchy set out below:



4.7 The remainder of the STS is centred around this hierarchy and the objectives, under the umbrella of the vision-led approach to planning growth.

5. Baseline conditions

Travel movements in Lancaster District

5.1 The travel to work mode share for Lancaster (the whole district) and England from the 2011 and 2021 Censuses is presented in Table 5-1. It is recognised that commuting trips only constitute around 15% of trips people make in England[5], but this can serve as a useful initial proxy for mode share and potential to effect change.

Table 5-1: Lancaster method of travel to work

	2011		2021	
Mode	**Lancaster**	**England average**	**Lancaster**	**England average**
Underground, light rail, tram[6]	0%	4%	0%	3%
Train	2%	6%	1%	3%
Bus	6%	8%	4%	6%
Taxi	1%	1%	1%	1%
Motorcycle, moped, scooter	1%	1%	1%	1%
Car driver	59%	60%	67%	65%
Car passenger	6%	5%	7%	6%
Bicycle	4%	3%	4%	3%
On foot	15%	11%	14%	11%
Other	1%	1%	1%	2%

5.2 This confirms that whilst Lancaster had a lower car driver mode share in 2011 compared with the national average, this was reversed in 2021. The main source of change was bus trips, followed by walking trips and car passenger trips. Both in Lancaster and nationally, the car driver mode share increased between 2011 and 2021. It is very likely this is a result of the Covid-19 pandemic which was ongoing at the time of the Census, but national studies have shown that public transport use, in particular, has still not quite returned to pre-pandemic levels[7].

5.3 The number of people working from home has also changed over time and this impacts on the number of trips being made in total, as well as by certain modes. In

[5] https://www.gov.uk/government/statistics/national-travel-survey-2019
[6] It is recognised that an underground, light rail or tram system does not exist in or around Lancaster
[7] https://www.gov.uk/government/statistics/transport-use-during-the-coronavirus-covid-19-pandemic/domestic-transport-usage-by-mode

2011, 5% of Census respondents worked from home in Lancaster and 3% across England. In 2021 this rose to 25% in Lancaster and 32% in England.

5.4 Both the City of Lancaster and Morecambe's statuses as Cycling Demonstration Towns between 2005 and 2011 significantly boosted cycling numbers with cycle use across the district increasing by 25% during this period, as well as collisions involving cyclists declining by 25%. Due to the high proportion of the population who work and live within the district (i.e. within relatively short distances), there is good opportunity to increase cycle use further, as well as walking and bus.

5.5 Bus services are extensive within the urban areas primarily linking Lancaster, Morecambe, Heysham and South Lancaster (including Lancaster University). There are also frequent services to Preston and Blackpool, Carnforth and the Lake District. However, some more rural areas are not as well served.

5.6 Lancaster benefits from connectivity by rail, through being located on the West Coast Main Line corridor, though this is not necessarily reflected in the Census commuting data (indicating 1-2% trips by rail). This gives the district access to fast and frequent trains towards London, Birmingham, Manchester, Manchester Airport, Glasgow and Edinburgh. That said, the only train station serving Lancaster is in the city centre, some 5km as the crow flies from the southern extents of the BLG.

5.7 LCC's Highways and Transport Masterplan confirms that the busiest rail station in the district is Lancaster, with over two million people travelling from or to the station. Other stations had far fewer numbers with Morecambe, Carnforth and Bare Lane having around 10% of the users of Lancaster. This reflects the high-quality rail connectivity limited to Lancaster.

5.8 The M6 runs north to south through the district with two junctions serving Lancaster, in close proximity and with relatively easy access to existing communities. The A6 parallels the motorway and provides direct access between the city centre and the south of Lancaster, often accommodating through trips or diverted trips when the motorway becomes congested or is closed.

5.9 Whilst it is a key vehicular route, the A6 is constrained along several sections due to on-street parking, busy junctions, different priorities afforded to pedestrians and cyclists, and proliferation of accesses and side roads, particularly north of Scotforth. It is also a key bus route between the city centre and Lancaster University, with buses operating frequently and at near-full capacity.

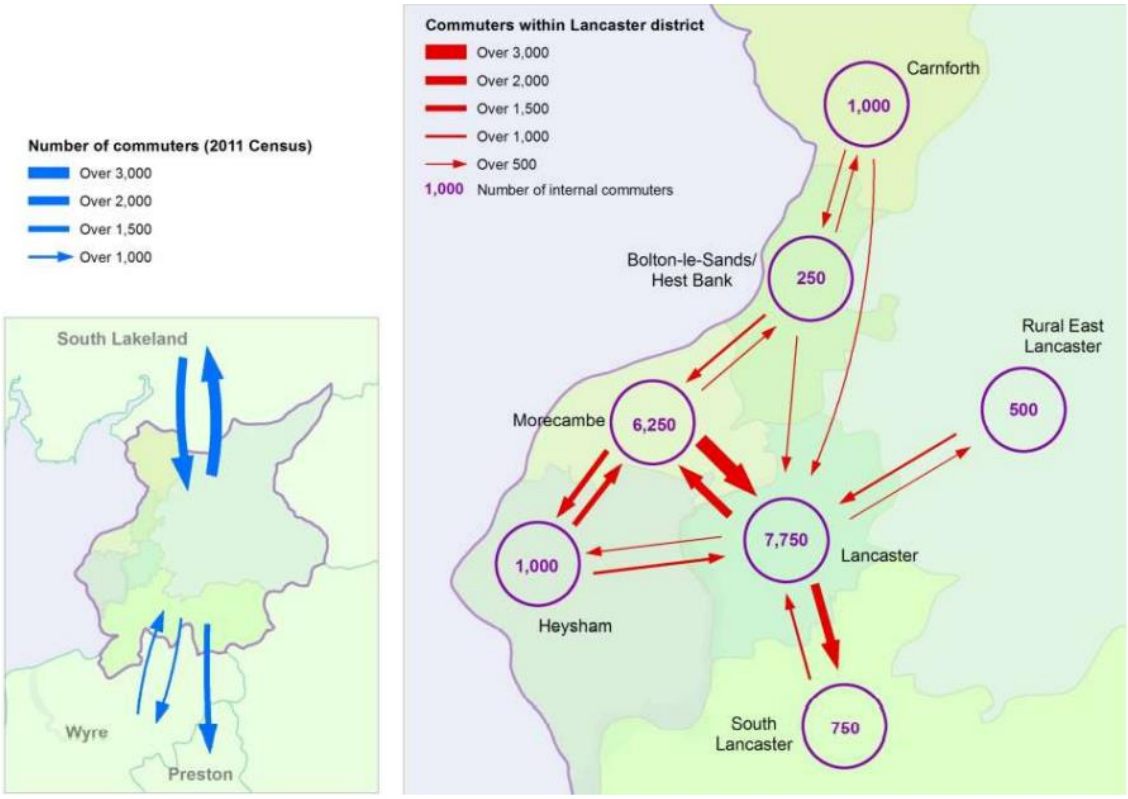
5.10 At present, car is the dominant travel choice for most people, with 75% of households across the district having a car or van available. However, it is important to note that there are areas of particularly low car ownership in Morecambe and parts of the city of Lancaster, which provides good opportunity to promote sustainable travel (recognising

that low car ownership may also reflect social deprivation, and alternatives need to be affordable).

Key destinations

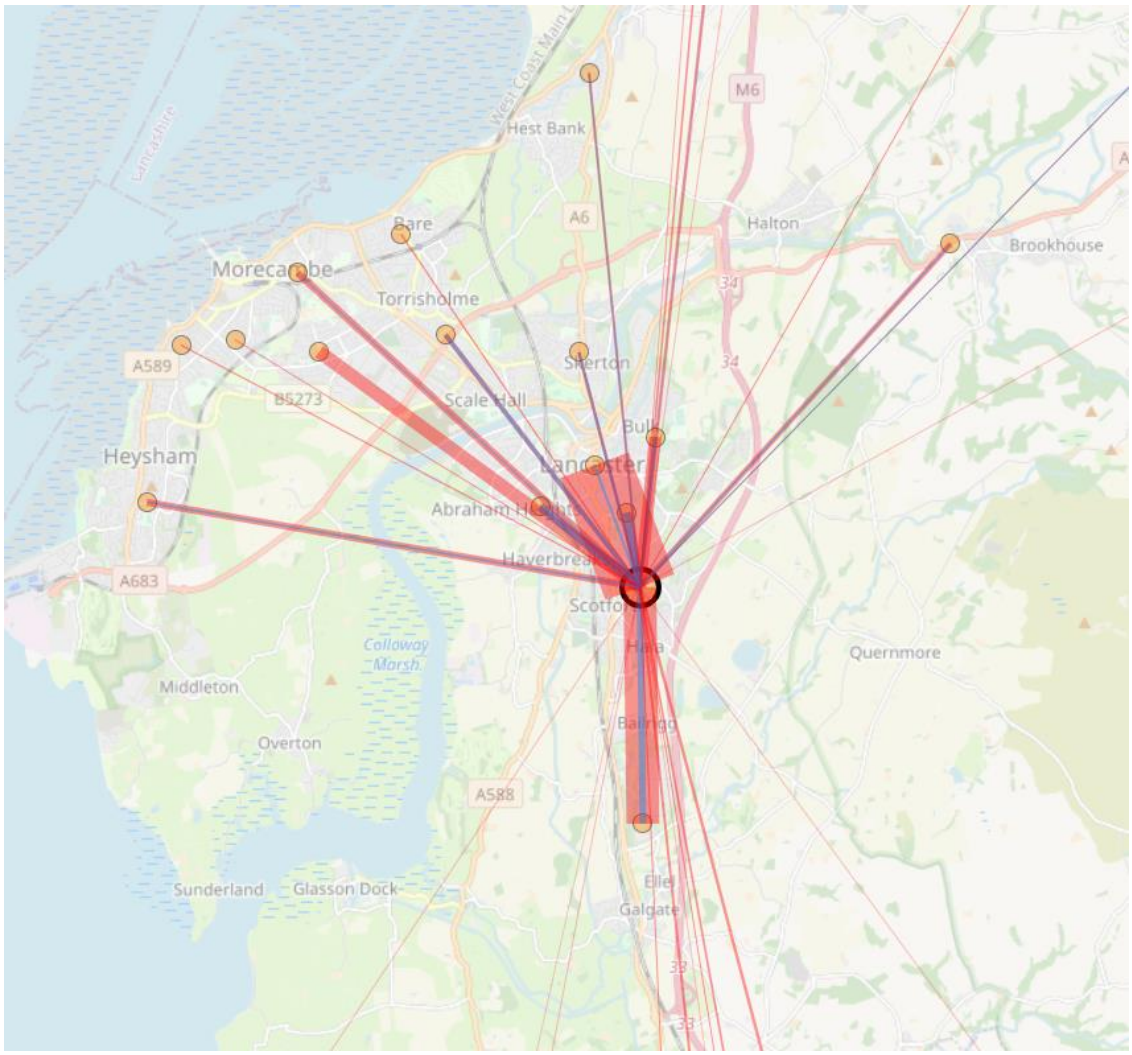
5.11 Regarding travel patterns, significant numbers of commuters travel between Morecambe, Heysham, Lancaster City, and South Lancaster as well as outside the district to South Lakeland to the north and Preston to the south. Overall, Lancaster is a net exporter of labour but 80% of locally employed residents live and work in Lancaster, and Lancaster University is a key element of this pattern. This is highlighted in Figure 5-1, taken from the LCC Highways and Transport Masterplan, and confirmed by Figure 5-2 from Datashine, which represents inbound commuting trips (in blue) and outbound commuting trips (in red) to and from Scotforth, this being the most comparable existing data point to Lancaster South.

Figure 5-1: Numbers of commuters in the district of Lancaster



Source: LCC Highways and Transport Masterplan

Figure 5-2: Datashine commuting patterns from Scotforth



Source: Datashine

5.12 In the context of Lancaster South, the key origins/destinations more widely (informed by the evidence base) are likely to be:

- The city centre
- Lancaster University and Health Innovation Campus
- The University of Cumbria in Lancaster
- Ripley St Thomas C of E Academy (dependent on provision within the BLG)
- Galgate
- The train station – as a point of onward connection
- The M6 – as a point of onward connection
- The Lune Estuary
- The Lancaster Canal corridor

- Significant employers such as Lansil Industrial Estate, Lancaster Royal Infirmary, HMP Lancaster Farms, Glasson Dock

5.13 These destinations will attract a range of trip purposes including commuting, but also education, education escort, leisure and retail, with the surrounding residential areas also serving as destinations for visiting friends/family trip purposes (contributing towards the most significant trip purpose overall, which is 'leisure'[8]).

5.14 The transport networks accommodating and delivered by the BLG will need to have due regard to this range of destinations and the purposes they serve in people's day-to-day lives, aside from just commuting trips. It is also recognised, however, that longer distance trips (such as commuting trips to Preston or leisure trips to South Lakeland) will be more difficult to influence, and that investment should be focussed on capturing the greatest numbers of journeys to the most common destinations. In these instances, facilitating access to e.g. Lancaster train station by modes other than the private car will contribute towards an overall more sustainable pattern of trip making across the city and beyond.

Review of networks

5.15 A high-level review has been undertaken of the existing and aspirational bus and active travel (walking and cycling) conditions in the South Lancaster area, informed by a site visit and a desktop audit. In addition to a qualitative review of the network against several broad questions, the existing and aspirational networks are given a red / amber / green (RAG) score in relation to their performance against each of the eight suggested STS objectives set out in Chapter 4.

Red = Low contributions to objective

Amber = Medium contributions objective

Green = High contributions to objective

Grey = Not relevant at this stage

5.16 The questions/criteria that the active travel network is reviewed against are:

- Does it form a coherent network?
- Does it link to the district's key attractors?
- Is it direct in connecting to key attractors?
- Does it contribute to a high-quality public realm?

[8] https://www.gov.uk/government/statistics/national-travel-survey-2019

- Is the network safe?

5.17 The questions/criteria that the bus network is reviewed against are:

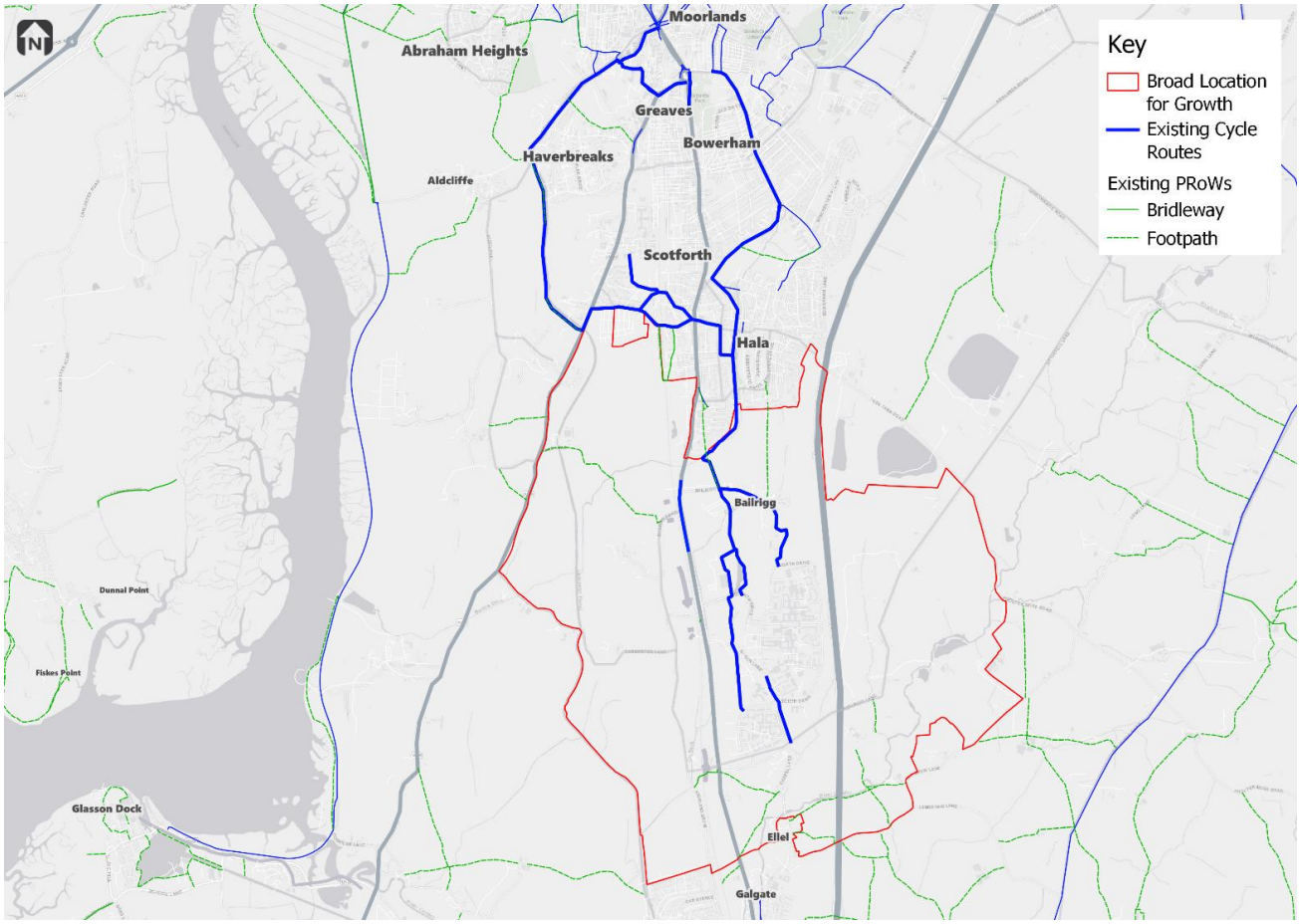
- Are the services frequent?
- Does it link to the district's key attractors?
- Is it direct in connecting to key attractors?
- Are services rendered unreliable by congestion?

5.18 Both networks are then considered in terms of how they contribute to the ten STS objectives. The full review of existing and aspirational networks against the questions is presented in **Appendix A**, with the plans and summary of ratings provided below.

Existing active travel and bus

5.19 Lancaster City Council's active travel network, made up of cycle and Public Right of Way (PRoW) routes, is shown below in Figure 5-3, drawing from data provided by LCiC. This shows Lancaster city centre and how it connects with the BLG and surrounding areas in South Lancaster.

Figure 5-3 Existing active travel network



5.20 There is currently an excellent provision of bus services between South Lancaster and the city centre due to Lancaster University, with more limited services further to the south. This is detailed in Table 5-2:

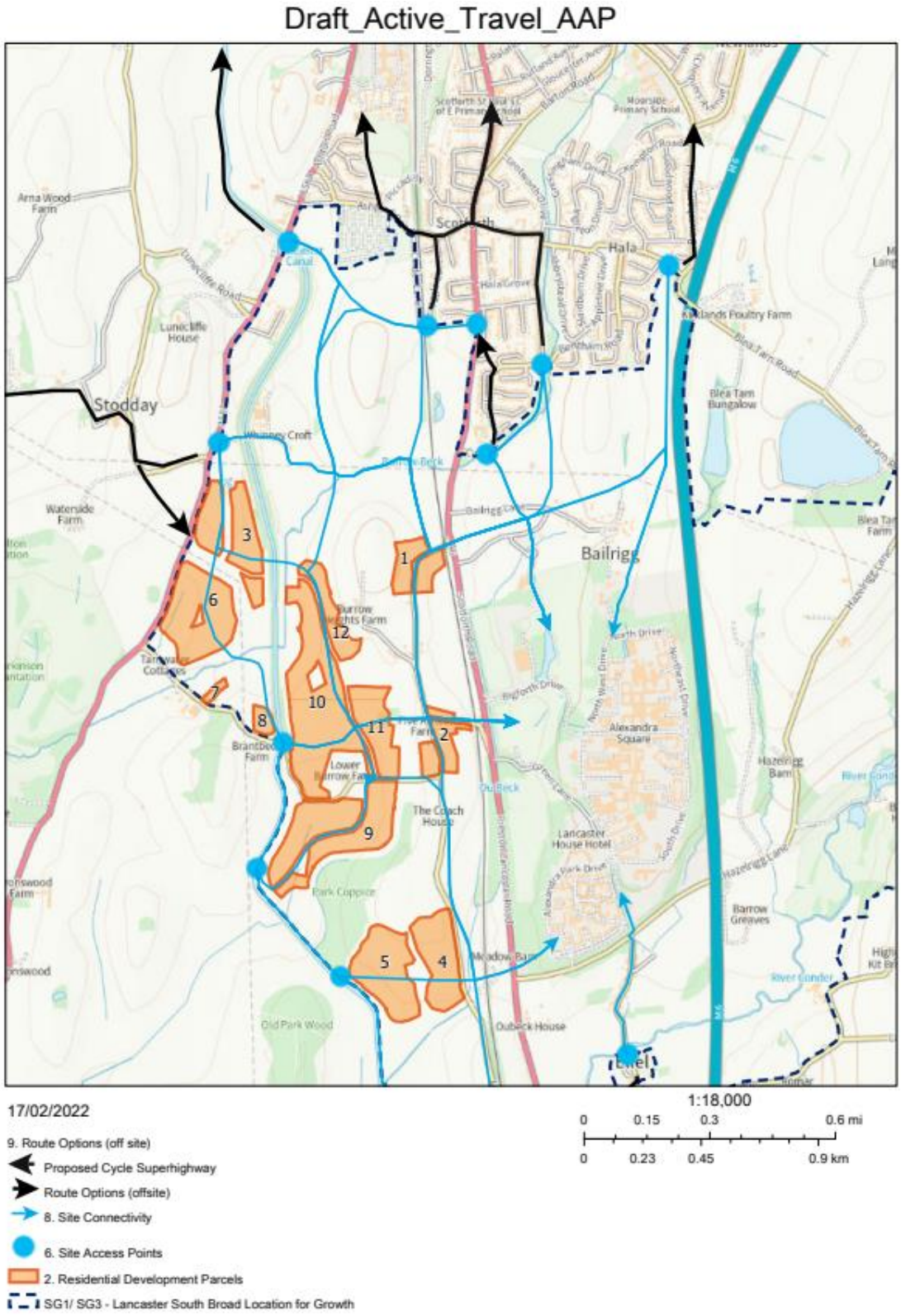
Table 5-2: Bus services connecting South Lancaster and their frequency

Route	Frequency
Seven services connecting South Lancaster to the city centre along the A6 or through Bowerham	5+ every hour
South Lancaster to Preston	Every 30 minutes
South Lancaster to Blackpool	Every hour
City centre and the Fylde Coast via Ashton Road	Every 90 minutes

Aspirational active travel and bus

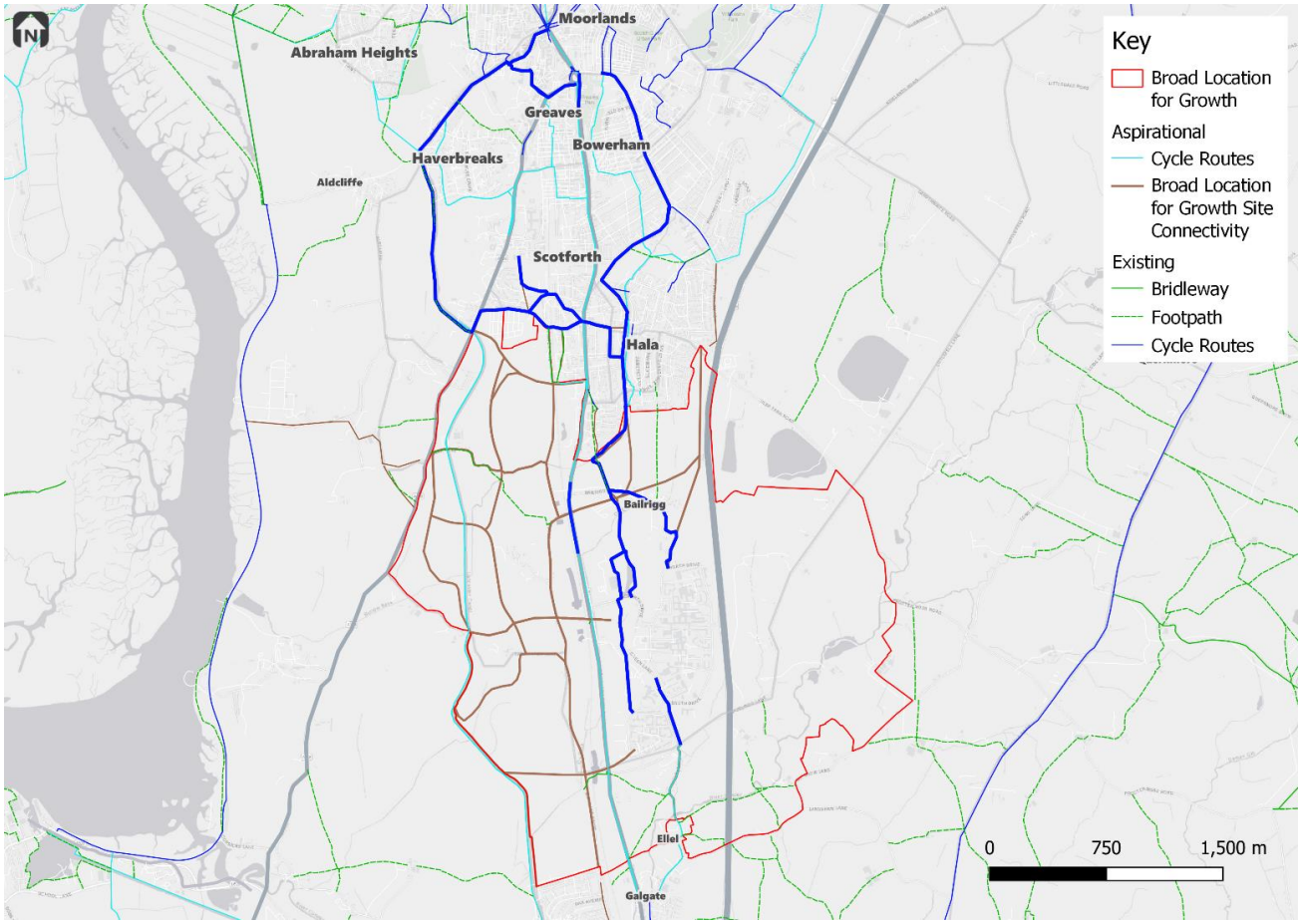
5.21 LCiC and LCC have identified a strategic network (Figure 5-4 overleaf) for the AAP as a starting point, which links proposed residential areas to key attractors.

Figure 5-4: Draft AAP strategic cycle network



5.22 LCiC's wider aspirational cycle network is mapped out below in Figure 5-5, which also shows the potential network suggested by JTP in the Spatial Masterplan Framework Document.

Figure 5-5: Aspirational active travel network



5.23 Proposals for Lancaster's bus network have evolved since the Highways and Transport Masterplan was published in 2016. The concept of a Bus Rapid Transit scheme is no longer considered viable due to a lack of road space along the A6. Instead, enhancements to existing routes and services are sought ('Superbus' routes). This is the bus corridor between Heysham, Morecambe, Lancaster and Lancaster University.

5.24 Bus priority measures are to be provided on Ashton Road and in Bowerham, with funding coming through the BSIP allocation. LCC's plans for a Park & Ride near to J33 of the M6 as part of the HIF scheme are now suspended, and for this reason the aspirational network – whilst having potential – is uncertain and unfunded, and hence is unlikely to deliver the ambition.

5.25 Due to a lack of evidence and support from relevant rail organisations, there is currently no plan to provide a new rail station at Bailrigg.

How do they perform against the eight objectives?

5.26 **Appendix A** includes the detailed review of the networks against the questions posed at the beginning of this section. The networks have also been reviewed using RAG scores in Table 5-3, against the eight STS objectives.

Table 5-3: Existing and aspirational networks RAG scores against objectives

Objective	Existing		Aspirational	
	Active	Bus	Active	Bus
Minimise the need to travel by providing a wide range of day-to-day facilities on site and delivering growth with gentle density				
Through the design of transport networks and streets within the BLG, make active travel and low carbon transport the most convenient and reliable choice				
Deliver dedicated and high-quality active travel and public transport infrastructure in early phases of development, which are commercially viable and also benefit existing communities and journeys				
Support economic growth within new and existing communities by improving connectivity between South Lancaster and the wider district, notably the city centre, key employment and education locations, and rural communities to the south				
Tackle inequality by ensuring safe, clean, convenient, inclusive and affordable sustainable transport choices for disadvantaged and less connected groups and areas				
Support LCiC and LCC's related transport, climate, safety, public health, and placemaking objectives				
Plan networks which accommodate trips for a range of purposes and to different destinations, including for education, leisure and shopping as well as for commuting				
Advance and exploit shared transport, electrification and ultra-low emission transport technologies, especially where car travel remains the only viable choice for some journeys				
Influence travel choices and car dependency through an effective marketing and promotional strategy, integrated with Lancaster University and extending across Lancaster				
Integrate new transport networks sympathetically into the existing drumlin landscape, and considering the surrounding heritage and built form				

Summary

5.27 In terms of RAG scoring, the existing active travel network was considered to have 'medium' contributions to five of the objectives whilst having 'low' contributions to tackling inequality and focusing on marginalised groups, particularly due to the poor cycling and walking conditions on sections of the A6 which has high traffic volumes.

5.28 The existing bus network had 'medium' contributions to all the objectives (excluding those not considered relevant for this review). This reflected some of the strong existing connections between the city centre and Lancaster University, however, also that there is much room for improvement with regards to increasing bus priority along the A6 and frequency to other locations in the district.

5.29 The aspirational active travel network had 'high' contributions to four of the objectives and given an 'amber' rating (medium) to two objectives. This reflected that the aspirational network could connect to other destinations outside South Lancaster more effectively such as rural communities and the Forest of Bowland.

5.30 In summary, the existing east-west active travel connections in the BLG as well as the connections within the city centre are less well developed than the connections between the city centre and the BLG.

5.31 The aspirational bus network received an 'amber' rating for six objectives. Although there were many good propositions outlined in the BSIP, there is also uncertainty over funding streams to deliver public transport improvements specific to the BLG.

5.32 Across active travel and public transport, there is also an overreliance on the A6 to delivery all forms of transport infrastructure – bus, cycling, walking and private vehicle. This is likely to over stretch an already constrained corridor, and ultimately undermine the success of any intervention focussing on any one mode.

6. Creating a sustainable place

6.1 Following the review of the existing network, this chapter looks to the future and to what sustainable travel could look like in South Lancaster. This takes a structured approach by looking at best practice examples, setting out example interventions applicable to the BLG, and then packaging these interventions into three scenarios for South Lancaster which will be used to model mode shift.

6.2 To understand what is needed to deliver sustainable mobility outcomes in South Lancaster, an initial, high-level best practice review of sustainable places and 'what works where' has been undertaken. The result is high levels of walking, cycling and public transport use (compared with many UK cities, including Lancaster) and lower levels of vehicle mode share, as illustrated below in Table 6-1.

Table 6-1: Places achieving high sustainable mode share

City	Country	Year	Population	Walking	Cycling	Public Transport	Private Car
Lancaster	UK	*2011	148,119	16%	5%	9%	61%
Aarhus	Denmark	2018	325,000	7%	22%	28%	43%
Amsterdam	Netherlands	2020	1,528,535	5%	30%	19%	42%
Barcelona	Spain	2020	1,664,182	42%	2%	17%	39%
BedZed	UK	2019	100	11%	11%	61%	17%
Belfast	UK	*2011	60,988	6%	0.9%	7%	65%
Berlin	Germany	2015	3,520,031	31%	13%	22%	30%
Bournemouth	UK	*2011	137,574	8%	3%	7%	41%
Brighton	UK	2011	290,395	14%	3%	16%	27%
Brussels	Belgium	2020	1,208,542	18%	3%	35%	42%
Budapest	Hungary	2018	1,756,000	19%	2%	48%	31%
Cambridge	UK	*2011	123,900	10%	18%	7%	21%
Copenhagen	Denmark	2017	1,307,000	6%	41%	27%	26%
Crawley	UK	2011	77,348	6%	2%	14%	47%
Delft	Netherlands	2013	99,737	24%	39%	10%	27%
Dresden	Germany	2017	512,546	24%	17%	21%	38%
Freiburg	Germany	2016	39,721	29%	34%	16%	21%
Groningen	Netherlands	2008	182,484	15%	31%	10%	30%
Hammarby Sjostad	Sweden	2007	535	3%	14%	78%	5%
Helsinki	Finland	2014	631,695	34%	11%	32%	22%
Houten	Netherlands	2010	43,000	27%	28%	11%	34%
Hull	UK	2011	261,149	13%	9%	15%	53%
Leicester	UK	*2011	242,232	10%	2%	8%	34%
Leipzig	Germany	2018	587,857	3%	37%	23%	36%
Litomerice	Czech Republic	2018	23,980	37%	4%	9%	50%
Ljubljana	Slovenia	2013	284,293	23%	7%	13%	57%

City	Country	Year	Population	Walking	Cycling	Public Transport	Private Car
London	UK	2018	8,899,375	25%	3%	35%	37%
Lyon	France	2015	522969	38%	2%	17%	42%
Madrid	Spain	2016	6,714,000	30%	6%	38%	26%
Malmo	Sweden	2018	351,749	14%	26%	25%	34%
Milan	Italy	2014	1,352,000	18%	10%	41%	29%
Munster	Germany	2016	314,319	22%	39%	10%	29%
Nijmegen	Netherlands	2016	172,000	na	30%	18%	52%
Nottingham	UK	*2011	331,069	9%	2%	12%	27%
Odense	Denmark	2014	178,210	15%	24%	5%	54%
Oslo	Norway	2017	988,873	29%	6%	30%	35%
Oxford	UK	*2011	150,200	11%	10%	11%	22%
Peterborough	UK	*2011	132,318	6%	4%	7%	46%
Pontevedra	Spain	2013	82,900	70%	6%	3%	22%
Poundbury	UK	2011	3,500	23%	3%	10%	64%
Riga	Latvia	2018	614	14%	9%	47%	31%
Rome	Italy	2014	2,863,322	4%	1%	29%	66%
Rostock	Germany	2018	208,886	33%	14%	17%	36%
Seville	Spain	2016	684,234	13%	9%	18%	60%
Southend	UK	2019	183,453	11%	3%	19%	57%
Stockholm	Sweden	2020	978,770	15%	7%	32%	46%
Strasbourg	France	2009	287,228	33%	8%	12%	47%
Tartu	Estonia	2018	157,760	22%	8%	22%	46%
Vienna	Austria	2016	1,897,000	27%	7%	39%	27%
Warsaw	Poland	2017	1,753,977	18%	3%	47%	32%
Zurich	Switzerland	2016	402,762	27%	8%	40%	25%

*2011 Census data is based on commuter trips so does not include all trips, but is a useful proxy.

Good practice case studies

6.3 The best practice review (Table 6-2) identified six broad themes around which sustainably mobility and mode shift can be framed:

1) Placemaking and land use planning
2) Walking and cycling infrastructure
3) Public transport
4) Parking and traffic management
5) Behavioural change
6) Governance, policy and funding

6.4 Metrics and outcomes using publicly available data are presented against a selection of case studies in Table 6-2. It should be noted, however, that quantifying the impact of a single transport / planning intervention is challenging because the places in which they

are delivered do not operate in a vacuum. Isolating the impacts of single interventions is seldom possible, but the case studies demonstrate that:

- Combining multiple measures that are known to contribute to sustainable travel patterns increases their effectiveness as a range of measures is more likely to meet more people's needs, for a wider range of trips.
- Positively influencing travel behaviours depends on human choice, so a range of measures that pull and push (incentivise / disincentivise) people towards desirable travel modes is required.
- Infrastructure investment is vitally important but works best when accompanied by political will and behavioural change measures to help people make more sustainable travel choices.

Table 6-2: Examples of good practice case studies

Themes	Place	Interventions	Outcomes	
Placemaking and land use planning	Houten	Restrict vehicle through-movements in order to make walking and cycling the most direct and convenient travel mode for most journeys. Filtered permeability to promote walking and cycling permeability and make car journeys less direct, through street typology and layout	42% of trips shorter than 7.5km are made by bike, with around 21% completed by foot	Access only street, Vauban 
	Freiburg (Vauban)	Focus on limiting vehicular traffic by creating a compact place that people can cross quickly on foot or by bike, with strong neighbourhood centres. An integrated land use and transport plan has ensured local facilities and jobs are within easy reach by walking or cycling- 'a district of short distances'. Schools, nurseries, a shopping centre, food stores, recreation areas and businesses are within walkable and cycle-able distances for most people.	61% of commuting trips are made by bicycle in car-owning households, with 91% in non-car-owning households	
Walking	Pontevedra	Created a 'Metrominuto' network and map of walking routes with walking itineraries. Banning almost all motor traffic in downtown to allow access only, with speed reducing features such as roundabouts and 20-30kph speed limits.	70% of trips are on foot. 90% reduction in motor traffic in central area	Mariahilferstrasse, Vienna 
	Vienna	Introduction of innovative pedestrian-friendly concepts (shared and pedestrianized zones), further traffic calming measures, easier crossing of main roads and side road crossing treatments. The main shopping street, Mariahilferstrasse was redesigned to include 1.6km of pedestrianisation to accommodate around 70,000 pedestrians a day.	Support for the scheme improved after implementation (53% to 71%), although hard to quantify impact on mode shares	
Cycling	Copenhagen	Copenhagen has one of the most developed cycle networks in the world. The Government has invested over £35-per-head of population each year on cycling since the 1990s, with measures including the creation of PLUSnet, a network of 'Bicycle Superhighways' on very congested routes and allowing bicycles to be taken onto trains and metro. Funding is also directed towards continuous maintenance of cycle tracks to a high standard.	41% of trips to work and education in the city were made by bike; 76% of Copenhagener's feel secure when cycling. 53-76% improved perception of safety following improvements to cycle routes and cycle priority lights	Copenhagen superhighway 
	London	London's cycle superhighways have had a significant impact on the number of cyclists, both as commuters and for leisure. Expansion and upgrade of the cycle network ensured priority for cyclists and reduction of conflicts between pedestrians and cyclists.	A year after opening, there was a 32% increase in cycling along the North-South Cycle Superhighway	

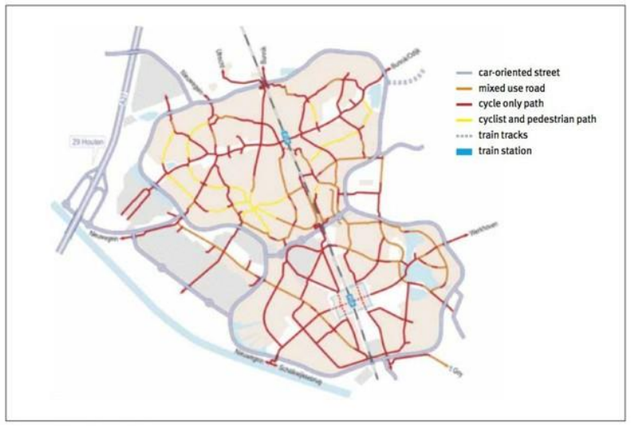
Themes	Place	Interventions	Outcomes	
Public transport	Cambridge (shire)	The Cambridgeshire Guided Busway is a high quality dedicated network with bus priority, direct and quick routes. It follows a route parallel to the A14 which was one of the most congested roads in the country, thereby harnessing a corridor of high demand with potential for modal shift.	Busway data suggests that proximity to high-quality public transport can decrease the share of trips made by car by more than 30%	Cambridgeshire Guided Busway 
	Stockholm (Hammarby Sjostad)	New developments built around a central high-frequency rapid transit line. The development is fairly high density allowing easy access to public transport routes. Public transport ferries run year-round, every ten minutes from early morning to midnight. A tram line runs through the whole length of the development along a central avenue, and several bus lines connect the development with other important destinations. A car club is in operation.	52% public transport mode share, resulting from central tram line. 6% of households are car club members; car journeys account for 21% of mode split	
Parking management	BedZED (London)	Residential parking spaces are not provided with housing and must be paid for separately at an annual charge of £220. Notably, the investment in alternatives is central to the success of these parking schemes – particularly in terms of having well-developed public transport networks available.	Only 54% of households are car owners, around 20-30% lower than surrounding areas in Hackbridge and Sutton	BedZED 
	Freiburg (Vauban)	Residents can choose to own cars and can drop off and pick up at their homes, but they must park their cars in communal multi-storey car parks at the edge of the development. For this they pay a one-off purchase charge based on the construction costs and a monthly charge to cover ongoing maintenance. Households without cars are not subject to charges and do not subsidise the cost of parking provision. All residents nevertheless have access to a local car club when they require a car.	Only 17% of households own a car, compared to around 30% in Rieselfeld (another eco-suburb) and 41% in Freiburg as a whole	
Traffic management	Waltham Forest (London)	Despite significant public opposition, 'Low Traffic Neighbourhoods' were introduced using filtered permeability to promote walking and cycling and make car journeys less direct, through street typology and layout. The high street of Orford Road was closed to traffic during the day time (except for local buses) through the use of modal filters, signage and differential surface finishes.	Overall decrease in traffic on internal roads of around 56%, with a net decrease in traffic of around 10,000 vehicles per day	Waltham Forest 
	Amsterdam (GWL Terrein)	The interior of the entire six-hectare site is car free, with only emergency vehicle access. The entire interior of the development is raised from street level and guarded with bollards. This creates a pleasant and safe environment that promotes walking and cycling, as well as space for children to play and promote community cohesion.	Low car ownership of 190 cars per 1,000 residents; car mode share of 6%	

Themes	Place	Interventions	Outcomes	
Behaviour change	Brighton and Hove	Personalised Travel Planning – improving individuals' awareness of choices available to them - has been approached as a way to 'activate' local residents to using nearby sustainable transport facilities. A PTP-targeted area receives a package of cycle engineering measures approximately a year before the PTP campaign is launched. This means that the PTP can have the maximum impact on moving people onto using already established infrastructure.	Cycling trips increased by 122%, from 1% to 2% of total mode share; walking trips increased 39% (to 19% of total mode share), and car driver trips decreased by 6% (to 50% of total mode share)	Scooter training in Brighton 
	Colchester	Alongside infrastructure measures, introduction of Bikeability training, events and activities delivered by Bike It and Bike Club officers, promotion of cycle-rail interchange with commuters, and delivery of PTP to occupants of new developments.	Colchester has the highest level of total cycling in Essex (7% of commuting trips)	
Governance, policy and funding	Paris (Île-de-France)	The Versement de Transport, a hypothecated transportation tax, enables authorities to levy a tax of between 1.4 and 2.6% on the gross salaries of all employees of companies of more than 11 employees, similar to a Workplace Parking Levy (e.g. Nottingham). The tax applies to employers, not directly to employees. It was originally intended to raise capital for infrastructure, but is now also used to cover the operating costs.	Financed nearly 40% operational cost of public transport; 20% public transport mode share	Traffic monitoring in Stockholm 
	Stockholm	Stockholm charges a congestion tax during fixed hours for vehicles driving into and out of the city centre in order to reduce congestion and improve accessibility by other modes. Alternative fuel vehicles are exempt from the charge. The objective and subjective effects on the traffic system and general environmental and political attitudes formed the basis of strong public support for the scheme.	Traffic levels reduced, and stayed down, by 25%	

Long list of interventions

6.5 Based on the themes and best practice measures arising from the review above, Table 6-3 presents a long list of potential interventions, and how they could be applied to the BLG.

Table 6-3: Long list of interventions

Theme	Example core principles / interventions in sustainable places	Relevance to Lancaster South	Best practice example(s)
Placemaking and land use planning	**Urban density** to increase towards local centres and sustainable transport provision. New residential development to be built around hubs and local centres to create walkable and self-sufficient neighbourhoods.	• 'Gentle' density could be achieved in the BLG, with the densest areas focussed around local centres, mobility hubs and bus halts. Widespread dense development (+60dph) may be difficult / contentious to achieve given the topography and setting of the BLG. • Land parcels BLG can focussed around a network of services/amenities without detracting from other major and minor centres in the district. • Given the high volumes of traffic on the A6, and which potentially could be attracted along the spine road, the network of internal streets and links should be people-focussed and human scale, encouraging trips by active modes within and through the growth area in accordance with the STS user hierarchy. • Early phases should have strong links to the committed developments to the north, Lancaster University, and / or the first services provided on site. A primary school should be delivered in early phases. This gives the best chance of embedding travel habits early on and with reduced public subsidy • The landscape-led nature of BGV will necessitate consideration of blue and green infrastructure and transport networks should work with, not against, the grain of existing green corridors and watercourses.	Filtered permeability in Houten 
	Streets as places not just transport corridors. Increased seating, plants creating sociable places. New development will be designed to overlook streets, open spaces and the sustainable transport corridors.		
	Permeable street layout to integrate with surrounding areas and transport links.		
	10-to-15-minute neighbourhoods which facilitate access from every home to a range of day-to-day services within an easy walking distance.		
	Early phases of development centred around local centres, key services (e.g. schools) and public transport infrastructure (even if viability is challenging initially), such that habits can be influenced early on.		
	Integrate transport networks appropriately with blue and green infrastructure, creating 'green corridors' and greenways.		
Walking	High specification **walking environment** – generous footways, extensive greenery, no obstructions (e.g. parked cars), lighting, continuous footways across side roads.	• Enhancing and making the best use of existing PRoW in South Lancaster as well as the Canal and Lune Estuary footpaths, ensuring that alongside commuting or education trips, it is also attractive to make leisure trips by foot. • Dedicated walking links between Lancaster University and BGV, to facilitate safer and more convenient connections between the two and combat severance of the rail line and A6. • Creating walkable neighbourhoods and internalising trips where appropriate, to reduce adverse impacts to surrounding existing communities. • Facilitating residual longer distance trips by exploiting and enhancing connections to existing infrastructure on the A6, Ashford Road, Ashton Road etc.	Car-free streets in Eddington, Cambridge  High quality, active public realm in Newcastle 
	High quality public realm activated by mixed land uses to encourage social interaction and active spaces.		
	Traffic volumes controlled through careful planning of the street hierarchy and use of measures such as filtered permeability, to create safer and more attractive streets for pedestrians, including school children, the elderly and disabled people.		
	New walking/cycle **links across key constraints** such as water, rail and road.		
	The walking network should also **connect with the surrounding leisure and historic routes**, making use of, and upgrading where necessary, local PRoW.		

Theme	Example core principles / interventions in sustainable places	Relevance to Lancaster South	Best practice example(s)
Cycling	**Additions and improvements to the existing cycle infrastructure to create extensive, well connected and traffic free network**. Add priority for cyclists at side road junctions and provide safe road crossings.	• Dedicated cycling schemes are already proposed by LCC along the BGV spine road as well as along the A6 connecting to the Pointer Roundabout, though the coherence and adherence to LTN 1/20 will be challenging along the A6. • Mobility hubs within the BLG, Lancaster University and at key off-site destinations such as the city centre will encourage the uptake of cycling by providing, for example, e-bike hire (assisting with the challenging topography in parts of South Lancaster). • Nearby settlements such as Galgate and Glasson Dock should also benefit from the enhanced cycling environment through satellite mobility hubs. • Severance over the canal, brooks, rail line and the A6 will need to be tackled for cyclists as well as pedestrians, recognising the level changes associated with bridges or crossings.	Segregated walk / cycle infrastructure, Sheffield and Leeds  
	LTN 1/20 compliant cycle infrastructure which is segregated from pedestrian and traffic, and is coherent, legible and attractive/inclusive for everyone.		
	Development of **sustainable transport corridors**, integrating walking, cycling and public transport.		
	Improvement to **onward cycle connections** to adjacent areas and transport hubs.		
	Establish **mobility hubs** at key points, to provide **secure storage** and interchange between travel modes.		
	Secure and convenient cycle storage at home and at key destinations and workplaces.		
	Ensure **compatibility for cargo, adapted and family-orientated bikes** that are typically larger than traditional bikes.		
	Cycle hire at mobility hubs. Cargo bike hire at key locations.		
Public transport	A high-quality, **high-frequency, affordable, accessible bus network** to offer a 'turn up and go' service on key routes.	• Whilst the Lancaster Reach feasibility study concluded that Rapid Transit as initially envisaged will not be feasible, it highlights the ambition and the Sustainable Travel SPD aims for five buses per hour connecting new strategic development. • The bus gate already proposed on the spine road will ensure public transport is prioritised over vehicles travelling northwest from BGV. Additional modal filters elsewhere on the network would ensure this priority is carried through the core network. • The city centre gyratory reconfiguration could contribute towards provision of a quicker and more direct bus network, where bus is prioritised over private vehicles in the city centre. • All plots in the BLG should be within 400m of a bus stop and/or mobility hub. • If funding can be identified, Park & Ride to the south of the BLG would also intercept off-site / through traffic as early as possible, helping to reduce overall background traffic volumes on the A6 into the city.	Bus only access adjacent to Nottingham train station 
	Key destinations must be served **rapidly and directly**.		
	Connections **to existing or proposed Rapid Transit routes.**		
	Journey time must give an advantage over the private car. Especially important for Park & Ride.		
	Integrated ticketing across operators in a multi-operator scenario, or otherwise the use of simple fare structures using **contactless technology.**		
	Where buses share road space with cars, **segregation/priority for buses on main roads** must be provided.		
	Readiness for alternative forms of bus propulsion including hydrogen and electrification, and consideration over charging/refuelling depots		

<table>
<tr><th>Theme</th><th>Example core principles / interventions in sustainable places</th><th>Relevance to Lancaster South</th><th>Best practice example(s)</th></tr>
<tr><td rowspan="6">Parking management</td><td>Car-free/low car development at appropriate locations near to public transport nodes and local centres, with careful design and management of car parking that reflects the provision of walking, cycling and public transport facilities in the vicinity.</td><td rowspan="12">Parking can serve as a ‘push’ measure alongside the ‘pull’ measures proposed (such as improvements to quality and capacity of sustainable transport networks).
The JTP Spatial Masterplan Framework references minimising car parking and giving priority to other modes, providing parking in rear parking courts and keeping streets free of cars – these principles can be built upon.
A localised and walkable site will mean that fewer car trips will be necessary, and this can form a catalyst for gently reducing car ownership.
Parking provision at destinations (such as employment and Lancaster University) should be carefully considered to ensure car-borne trips from off-site are not encouraged.
EV charging points should be the norm across the site, aligning with LCiC’s EV charging infrastructure SPD (in draft). In accordance with the STS user hierarchy, this enables essential vehicle trips to be made, if/when mode choice is otherwise limited, by a more sustainable form of car-borne travel.</td><td rowspan="6">Parking ‘designed out’ at Newhall, Harlow
 
Unallocated street parking at Dujardin Mews, London
  </td></tr>
<tr><td>Parking provision should wherever possible be unallocated and on-street/off-plot, to ensure that it is efficiently used and can be shared between different land uses / peak times.</td></tr>
<tr><td>Parking should be designed to have minimal impact on the public realm and streetscape, designed ‘into’ a place rather than a place being designed around parking. It should use sympathetic materials, be screened by landscaping and trees, and either located within communal structures or scattered in small clusters, to avoid dominance of surface parking.</td></tr>
<tr><td>Parking standards should be progressive and restrictive, where this is used as a tool in combination with other sustainable mobility interventions, to ensure that over-supply of parking does not encourage car ownership and dependence. The exception to this is accessible parking.</td></tr>
<tr><td>Car parking able to be adapted if no longer needed reframing it as a ‘meanwhile, land-use. A portion of parking areas should be Electric Vehicle ready.</td></tr>
<tr><td>Where practical, parking could be leased on an annual basis rather than sold with a property, coupled with on-street parking restrictions.</td></tr>
<tr><td rowspan="6">Traffic management</td><td>Use of car clubs should be encouraged over private car ownership, soaking up additional demand for vehicle ownership where parking standards are restricted.</td></tr>
<tr><td>Filtered permeability in new and existing areas to ensure travel is quicker, more direct and convenient by active or public transport modes than by the private car.</td><td rowspan="5">Bus gates and other modal filters preventing private vehicle access at key points of access, as well as within the BLG, will create low-car environments.
Introducing friction, lower speeds and bus priority on key routes such as Ashton Road and / or the A6 will deter private vehicles.
LTNs may be relevant within the BLG, though the masterplan should design in filtered permeability rather than introduce road closures retrospectively. Off-site, LTNs may be difficult to achieve in South Lancaster, or specifically near to the A6, as the street patterns are dense and multiple closures would be needed to create effective LTNs which give less priority to vehicles.</td><td rowspan="5">Communal underground waste storage, Eddington, Cambridge
 

Slow speed, low car street, Trumpington, Cambridge
  </td></tr>
<tr><td>Speed limits of 20mph (or lower), implemented on new and existing streets.</td></tr>
<tr><td>Conscious design of low-car / car-free streets through the prevention of through movements, geometric design and parking / access restrictions.</td></tr>
<tr><td>Low Traffic Neighbourhoods using filtered permeability to prioritise walking and cycling and make vehicle journeys less direct</td></tr>
<tr><td>Freight management and consolidation, for example through consolidation centres and co-location of parcel pick-up facilities at mobility hubs, weight limit TROs on internal street network where appropriate</td></tr>
<tr><td>Waste management and consolidation technologies, which remove the requirement for large, slow moving vehicles to traverse all internal roads and hence promote design of human-scale streets. This could look like communal, below ground waste consolidation at central locations in clusters of streets.</td></tr>
</table>

Theme	Example core principles / interventions in sustainable places	Relevance to Lancaster South	Best practice example(s)
Behavioural change	**Robust and well-funded Travel Plans, delivered from the outset**, including measures such as free cycle hire membership, cycle training and PTP. Travel Plan extending over typical 5 year lifetime. **Consideration of setting ambitious mode share targets (aligned with carbon targets)**, reflecting the TCPA's suggested mode share of 60% active and sustainable trips to/from new Garden Communities. **Robust baselining and monitoring plan** to ensure that progress is being understood, targets are met and remedial measures can be identified. **Comprehensive stakeholder and community engagement, that is accessible to all,** to understand local people's perceptions and preferences before investment is made into sustainable mobility infrastructure to serve existing or new communities. **Introduce gamification, street activation and play streets** to encourage healthy lifestyles and community cohesion.	• LCiC's ambitions to achieve up to 30% modal shift for BGV highlight the ambition and political will. This could form a future mode share target against which progress is measured. • Site-wide and plot/land use specific travel planning should be progressed alongside Transport Assessments at the planning stage and not undertaken as a 'tick box' exercise. • As part of the STS, LCiC are engaging with a variety of audiences to understand what could work where, that new infrastructure is provided to facilitate important journeys, and that people will use new facilities if/when provided.	Cycle hire in Manchester  Play street, Murrain Road, London 
Governance, policy and funding	Hypothecated **taxes or levies**, e.g. congestion charging, Workplace Parking Levy **Strong leadership and vision** to achieve target mode share, and to reassure local residents and businesses of the benefits of planned changes. **Reappraisal of conventional cost / benefit analyses, and reapportionment of funding** towards sustainable mobility interventions where they offer clear benefits over highway capacity improvements in terms of air quality, health and wellbeing, access to jobs and inclusivity. **Use of a stewardship model to ensure longevity of new Garden Community assets** such as green spaces, commercial properties, community groups and parking restrictions.	• Potential to introduce a clean air zone as part of the City Centre Strategy, discouraging general through-trips as well as more local trips in and around the city centre. • LCiC and LCC's history of joint working needs to continue and strengthen to ensure that a genuinely successful and transformational development is delivered. • The AAP should reflect the STS and include strong commitment to change, with the parallel Highways Assessment study dealing with residual vehicle impacts resulting from growth. • The HIF funding awarded results in a shortfall for active mode and public transport improvements and developer contributions will need to be used judiciously to maximise impacts for sustainable mobility. • A stewardship body, if successful, can ensure that the Garden Community principles are carried forward in the long-term using a self-sufficient / self-funded model, without being wholly reliant on LCiC or LCC.	Roadspace taken away from vehicles and reallocated as public space, Birmingham  

7. Spatial scenarios

Overview

7.1 Based upon the long list of interventions in Table 6-3 and feedback collated through the stakeholder engagement process, three suggested spatial scenarios have been suggested, each likely to result in progressively higher levels of mode shift. These are set out below, but initially a 'business as usual' scenario is also described, to reflect the baseline position from which mode shift could be achieved:

Business as usual

7.2 Refers to a scenario in which growth at Lancaster South is planned and delivered in a conventional way, reflecting the planning system and approach to transport planning for the last few decades. This approach typically adopts masterplanning principles that are focussed around movement of the private car before place, and off-site interventions that prioritise highway capacity. There is often a degree of 'silo working' leading to a lack of joined up thinking between stakeholders, local authorities, town planners, transport planners and other professionals.

7.3 The outcomes for Lancaster South might look like: suburban sprawl extending out of Hala and Scotforth; increasing congestion, severance and road safety problems along the A6 corridor; rerouting and peak spreading of existing and new car trips, impacting on surrounding settlements and local streets; residents making trips into the city centre because there are insufficient facilities within the BLG; bus services which fail to retain commerciality long term; and developer contributions directed towards expensive highway mitigation at constrained locations such as the Hala Road crossroads, because these are modes and places where impacts are felt most.

7.4 The three mode shift scenarios build on the hypothetical business as usual scenario:

Low

7.5 This reflects a betterment to the business as usual scenario, primarily in assuming that the development itself is masterplanned with the user hierarchy and sustainable mobility outcomes in mind, through introducing low-car streets, parking restrictions, active travel networks and some day-to-day facilities. However more transformational changes that extend beyond the 'red line' and require significant funding, greater public and political acceptance are not generally included, unless already committed.

Medium

7.6 Building upon the Low scenario, this package is more ambitious and has a greater focus on placemaking and managing vehicle demand both on and off site, including

introduction of modal filters. It embraces a reasonable likelihood that a cycle route could be introduced along the A6, but recognises that due to existing constraints and traffic volumes, this might not result in significant mode shift nor increase priority for buses.

High

7.7 Building upon the Medium scenario by offering more ambitious on-site and off-site measures, making bold but necessary changes to the transport network and resulting in the greatest anticipated mode shift. Sustainable transport focussed improvements would be delivered as a priority before highway capacity upgrades and changes would need to be made to existing networks and travel patterns elsewhere in Lancaster, building on the ambitious proposals already in the pipeline (outlined above) to ensure that the most benefit is gained from the interventions. The off-site interventions demonstrably create improved conditions for walking, cycling and public transport, allowing greater confidence in on-site interventions such as reduced car parking levels, more off-plot parking, several car-free streets and a network of car club vehicles.

7.8 In all cases, it should be noted that the scenarios are not firm 'proposals' and have been developed to represent a tangible set of suggested interventions that are proportionate to LciC's aspirational levels of mode shift ranging between 5% and 30%. In practice, further masterplanning and feasibility work may identify that – for example - developable areas are distributed differently; more or less capacity is deliverable (and hence the associated funding / contributions might differ); or that other developments or schemes not yet committed will influence the delivery of BGV in ways that cannot yet be quantified.

Assumptions

7.9 Several constants are assumed for all the scenarios, as follows:

- It is assumed that the necessary highway infrastructure to make the BLG acceptable and accessible is delivered, recognising that the HIF scheme has been suspended. At minimum, the site would be provided with vehicular access onto the adopted highway network and a primary street / spine road through it, as is the case for any new development. Other off-site schemes which were part of the HIF package (e.g. Park & Ride) are still relevant and potentially effective in achieving modal shift, so these are mentioned where they are still deemed important to deliver Lancaster South (albeit that funding is not yet secured).
- It is assumed that the broad developable areas identified for the BLG in JTP's Spatial Masterplan Framework are sensible in terms of topography and constraints, and so it is assumed that these would form the basis of development in the BLG.

Connections to developable areas outside of BGV (but part of the wider BLG) are considered more generally as the allocation is less fixed, with the masterplanning principles outlined in Chapter 6 assumed to apply throughout.

- The alignment and general form of the spine road through BGV, as designed and consulted upon by LCC, is assumed to be the most appropriate alignment based on their feasibility work. This STS does not challenge the alignment of the road, though there may be flex or scope to influence parallel facilities (such as footways and cycleways).
- Committed developments such as the land south of Lawsons Bridge site (19/00332/OUT) are assumed to be delivered in full and in accordance with their approved plans.
- Consultation with LCC's public transport team has resulted in broad agreement over the likely routing and frequency of an enhanced bus route serving the city centre, Lancaster University and BGV, and therefore the same route is reflected in all three scenarios, albeit that further enhancements are suggested in the Medium and High scenarios to render bus more attractive than private car.
- It is assumed that all scenarios embrace digital connectivity (superfast broadband is now the norm in most strategic scale developments), flexibility and future technologies. These factors may in some cases affect mode share, but will more likely affect the number of trips being made (e.g. by facilitating home working) and the extent to which electrification influences transport related emissions.

Low scenario

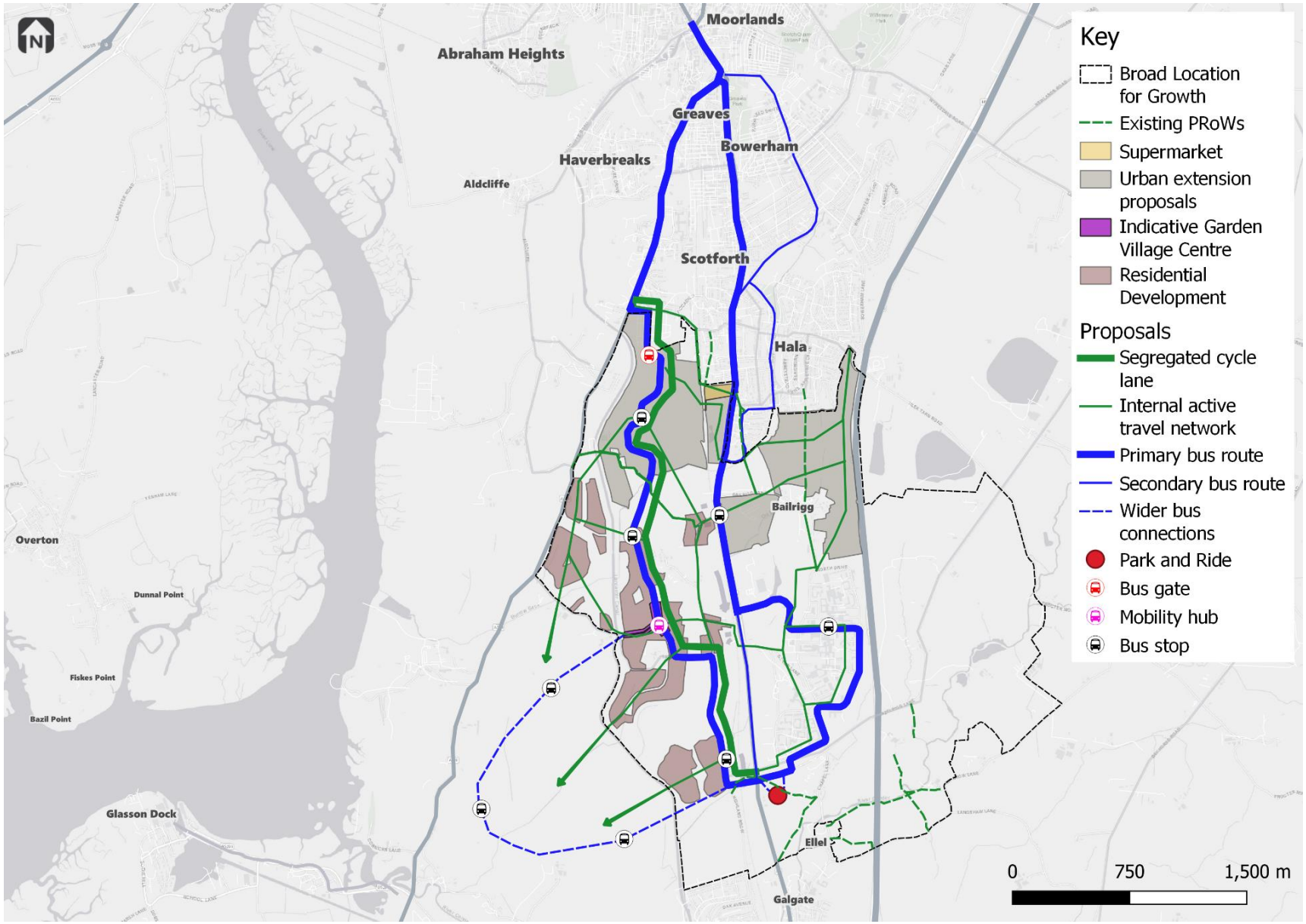
7.10 The Low scenario is as set out above – measures taken to improve connectivity and quality within the site, but fewer to connect it more widely or genuinely disincentives car ownership or use.

7.11 The interventions included in the Low scenario are set out in Table 7-1 and Figure 7-1 overleaf.

Table 7-1: Low scenario interventions

Theme	Intervention
Land use planning	Single local centre, some higher density in local centre
	First phases nearest to existing built up development
	Relatively car-centric layouts
Active travel	Segregated cycle lanes and footways along the spine road
	Connections from site boundary to existing PRoW network, improvements to PRoW network within BGV
Public transport	Extended bus route through BGV and on Ashton Road, connecting to Lancaster University
	Increase the frequency of existing bus services along the A6
Public transport / active travel	Core mobility hub in main local centre, including e-bike hire/charging, car club vehicles and freight consolidation
Public transport	High quality bus stops provided throughout the BLG, aligned with mobility hub and densest areas of development
	LCC deliver Park & Ride to the south of the BLG around Hazelrigg Lane
Public transport / traffic management	Bus gate to the north of BGV
Parking management	On-plot parking, some lower standards in central areas. EV charging throughout
	Destination parking reduced (e.g. in local centre)
Traffic management	20mph zone through main local centre
Behaviour change	Site-wide and plot specific Travel Plans

Figure 7-1: Low scenario



Medium scenario

7.12 The Medium scenario builds upon the Low scenario, offering a more ambitious package which would have a greater impact on mode shift. The Medium scenario has a greater emphasis on traffic management and placemaking than the Low scenario.

7.13 As well as a segregated cycle lane along the BGV spine road, the Medium scenario includes a designated cycle scheme along the A6, connecting the BLG to the city centre. This would be accompanied by ensuring that Ashford Road is more cycle friendly, to direct people coming from BGV on to the A6 scheme. However, current constraints along the A6 such as its width, on-street parking and the presence of high traffic volumes may not ever provide ideal cycling conditions, nor infrastructure, resulting in only modest mode shift. Other interventions include a Toucan crossing over the A6 to the east of the BGV, connecting Lancaster University and Five Ashes Lane, as well as more significant improvements to the PRoW network in comparison to the Low scenario.

7.14 There would be a core mobility hub in the main local centre and at Lancaster University, and three or four satellite mobility hubs servicing BGV, potentially offering secure cycle parking, e-bike hire, car club vehicles other micromobility options and freight consolidation.

7.15 Under this scenario there would also be a greater emphasis on traffic management than the Low scenario. It is suggested that modal filters would be implemented at the eastern extents of Five Ashes Lane and Burrow Road. This would allow pedestrian and cycle only access directly from Lancaster University to BGV over the A6 as well as reduce rat running through BGV.

7.16 Some parking would be provided off-plot at new developments and there would be less destination parking, supported by reduced availability of parking in Lancaster as well (implemented by LCiC / LCC). To maximise benefits, parking restrictions must be introduced alongside other measures so that there are attractive alternatives.

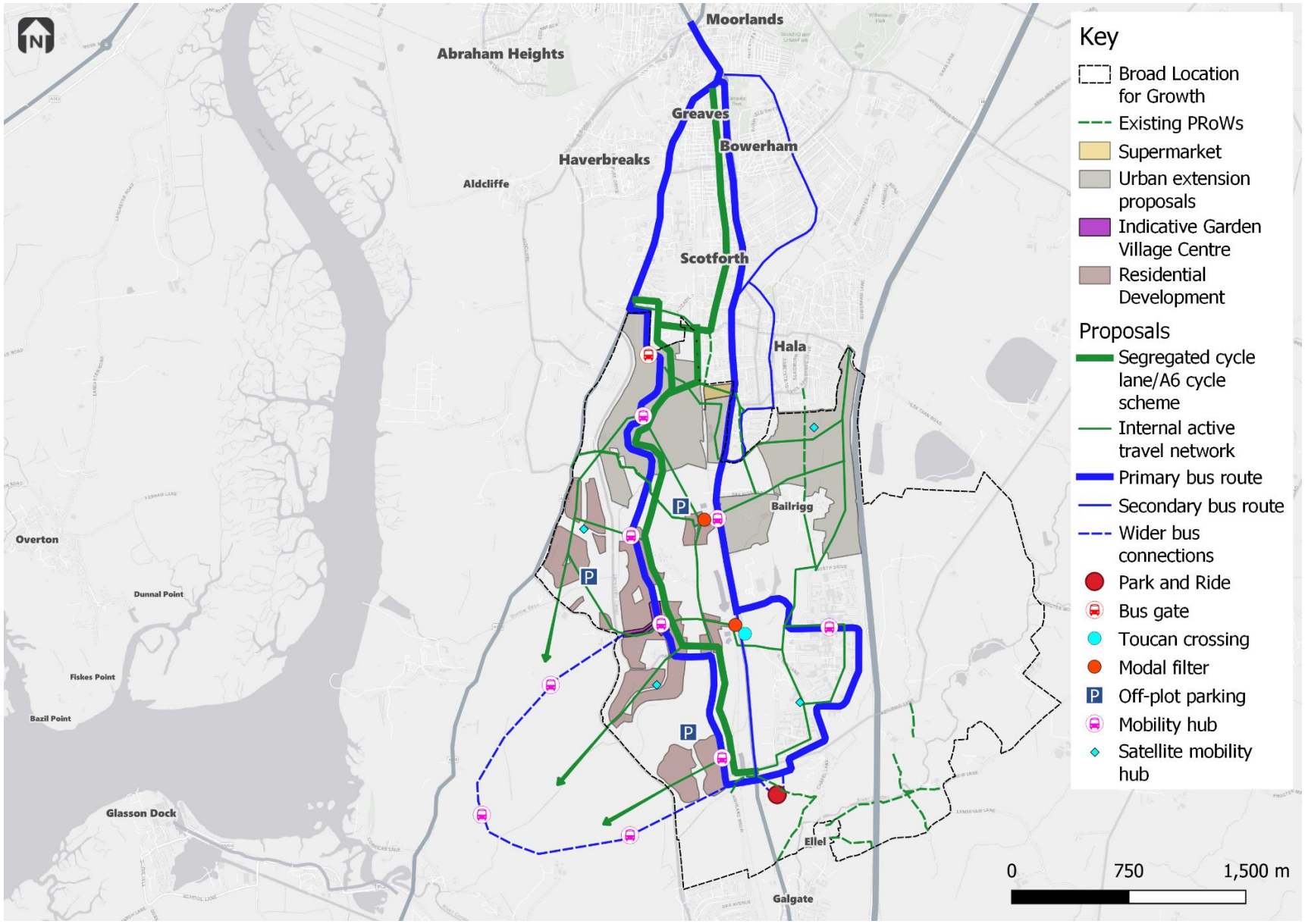
7.17 Under the Medium scenario, the BLG would have multiple local centres in order to increase the number of shorter distance journeys which could be made by active modes. There would also be higher density, particularly in commercial centres, as well as measures to restrict vehicle speeds and enhanced placemaking. Higher density will give the best chance of viability of bus services, car clubs and cycle hire initiatives and therefore the best chance of influencing behaviours early on and with lesser public subsidy.

7.18 The interventions packaged into the Medium scenario are set out in Figure 7-2 and Table 7-2 overleaf.

Table 7-2: Medium scenario interventions

Theme	Intervention
Land use planning	Secondary local centres with a main village centre, higher density (+50dph) in local centres, 15-minute neighbourhood(s)
	20mph streets and enhanced placemaking and public realm
	First phases built around a local centre
Active travel	Segregated cycle lane and footways along the spine road and on primary utility routes
	A6 cycle scheme linking to the Pointer Roundabout
	Direct cyclists down Ashford Road from the northern exit of the BGV to link with the A6 scheme, and supporting measures on Ashford Road
	Toucan crossing between Lancaster University and Five Ashes Lane
	Connections to and improvements to PRoW network
	Filtered permeability between neighbourhoods, facilitating through-access for non-car modes only
Public transport / active travel	Core mobility hubs in the main local centres and at Lancaster University. The main hubs would provide more car club vehicles (than the low scenario), e-bike and e-mobility hire, freight consolidation and potentially retail/community use. The satellite hubs can provide secure cycle and e-mobility parking/charging.
Public transport	High quality bus stops alongside mobility hubs throughout the BLG
	High frequency bus services along the spine road and A6 with bus priority where feasible. Segregated bus lane along the spine road
	LCC deliver Park & Ride to the south of BGV around Hazelrigg Lane. Doubles as a mobility hub providing car club and micromobility options
Public transport / traffic management	Bus gate to the north of BGV
Parking management	Some off plot parking for denser areas, reduced destination parking. EV charging throughout
Traffic management	Modal filter at the eastern end of Five Ashes Lane to allow access for cyclists and pedestrians only over the existing Five Ashes Lane bridge
	A modal filter at the northern extent of Burrow Road to constrain access to the spine road
Behaviour change	Site-wide and plot specific Travel Plans, PTP, longer-term management towards mode shift and carbon targets
Governance, policy and funding	LCC/LCiC introduce Clean Air Zone in city centre
	LCC/LCiC introduce parking management in the city centre
	Stewardship body established for BGV

Figure 7-2: Medium scenario



High scenario

7.19 Both the A6 and Ashton Road have constraints that would make a continuous, conventional lightly segregated cycle scheme difficult. As such, to achieve more ambitious mode shift, vehicle volume and speed reductions would also be needed along one of these corridors. The key active travel intervention in this scenario is creating an active travel corridor along Ashton Road from the northern exit of BGV to the Pointer Roundabout. This would be implemented to significantly reduce vehicle volumes and establish an environment that is attractive for walking and cycling.

7.20 An active travel corridor along Ashton Road could potentially include interventions such as traffic calming, the removal of road markings and enhanced placemaking, as well as a bus gate on the northern section preventing through access to the city centre by vehicle. It would also make the most of the proposed segregated cycle lane along the BGV spine road, which would connect to Ashton Road at its northwestern end.

7.21 The potential bus gate to the north of the Ashton Road corridor would be subject to further consideration of location and operation, and no measures which restrict the movements of existing communities to a significant degree should be implemented without clear evidence of the need for change. It is considered that a traffic management intervention on Ashton Road is more suitable than introducing traffic management on the A6 (as an alternative sustainable travel corridor), as there are numerous accesses and side roads on the A6 which would not only be affected, but also require a very comprehensive Low Traffic Neighbourhood type of scheme to appropriately manage 'rat running' and rerouting.

7.22 The Ashton Road proposals would be accompanied by the A6 cycle scheme as detailed in the Medium scenario, as this would bring dual benefits to BGV and those already living and working along the A6 corridor.

7.23 To connect Lancaster University and BGV, and address east-west severance without mixing pedestrians/cyclists with traffic, a bridge would be provided from Five Ashes Lane over the A6, providing a gateway moment to Lancaster, Lancaster University and BGV.

7.24 Under this scenario, the canal path and route to the Lune Estuary Path would also be upgraded to improve accessibility of leisure routes as well as alternative accesses into the city centre, recognising that leisure trips make up one of the largest proportions of journey types in Lancaster.

7.25 As with the Low and Medium scenarios, high frequency services along the A6 and spine road would be introduced, alongside bus lanes and bus priority junctions where possible, including potentially introducing bus priority at Pointer Roundabout. In

addition, the proposed active travel corridor on Ashton Road would aim to significantly reduce traffic volumes, meaning there would be fewer conflicts between different road users, making the bus more attractive. Another bus gate would be implemented through the development site north of Bailrigg Lane to reinforce filtered permeability principles to the east of the A6 as well.

7.26 This should tie into (and be delivered alongside) the city centre gyratory proposals, assuming that they take the form of reduced permeability for private vehicles and / or a clean air zone. In doing so, a high-quality walk, cycle and bus route would be provided from within the BLG all the way to the city centre and the destinations within it (employment, Hospital, train station, shopping etc.). This ensures that the core requirements of LTN 1/20 with regard to coherence and connectivity are met and creates a genuinely joined up network.

7.27 There would be a network of core and satellite mobility hubs provided so that all residents/workers within BGV are within 400m of a hub. The hubs can provide secure cycle parking, car club and micromobility options, workspaces, retail and freight solutions. Satellite hubs would also be located at the Lune Estuary footpath and Galgate to ensure wider connectivity and that places outside the BLG are not excluded from the improved transport network.

7.28 Supporting strategies such as committing to a mode share target, parking strategies, behaviour change campaigns and consideration of stewardship models would also be critical in ensuring that a holistic, robust strategy is delivered.

7.29 The High scenario interventions are set out in Table 7-3, and Figure 7-3 and Figure 7-4 overleaf.

Table 7-3: High scenario interventions

Theme	Intervention
Land use planning	Multiple local centres, high density (+60ph) in local centres and extending out, Network of 10 – 15-minute neighbourhoods
	20mph streets throughout and exemplary placemaking and public realm
	Key services such as primary school and mobility hub delivered alongside first phases
Active travel	Ashton Road becomes an active travel corridor starting at the northern extents of BGV up to the Pointer Roundabout, with measures that could potentially include traffic calming, 20mph zone, placemaking, removal of road markings
	A6 cycle scheme which connects with BGV from Ashford Road
	Segregated cycle lane and footways along the spine road

Theme	Intervention
	Segregated walking and cycling facilities on primary / secondary roads, plus a network of off-road paths which more directly connect development areas/neighbourhoods and off-site destinations.
	Upgrade the canal path to create improved conditions for walking and cycling, recognising the important role it can play in providing access to the city centre
	Upgrade walking and cycling access to the Lune Estuary footpath
	A walking and cycling bridge connecting Lancaster University with BGV across the A6. A gateway to Lancaster University/BGV/Lancaster
	Filtered permeability between neighbourhoods, facilitating through-access for non-car modes only
	Car free and play streets, with access for loading/unloading only
Public transport / active travel	Core mobility hubs including e-bike and e-mobility hire, cargo bike hire, car club vehicles, freight consolidation and community/retail, complemented by satellite hubs. Funding for provision of bike, e-mobility and car club vehicles at locations off-site (e.g. city centre, train station, P&R, Galgate, Lune Estuary Path) with the aim of ensuring all residents/workers within BGV are within 400m of a hub.
Public transport	High quality bus stops alongside the network of mobility hubs
	High frequency services along the A6 and spine road. Fully segregated bus lane along the spine road with bus priority junctions
	Buses will be afforded faster journey times by virtue of reduced traffic volumes and bus gate on Ashton Road
	LCC deliver Park & Ride to the south of BGV around Hazelrigg Lane
Public transport / traffic management	Bus gate to the north of the spine road and site north of Bailrigg Lane
Parking management	Significant off-plot parking, and more stringent parking restrictions on- and off-site, supported by cycle and micromobility parking as well as a car club scheme. EV charging throughout
Traffic management	Modal filter at the eastern ends of Burrow Road and Five Ashes Lane to allow access for cyclists and pedestrians only to A6
Behaviour change	Site-wide and plot specific Travel Plans, monitoring strategy to baseline and monitor against mode share and carbon targets, PTP
Governance, policy and funding	LCC/LCiC introduce Clean Air Zone in city centre
	LCC/LCiC introduce traffic management in city centre
	LCC/LCiC introduce parking management in the city centre
	Stewardship body established for BGV

Figure 7-3: High scenario

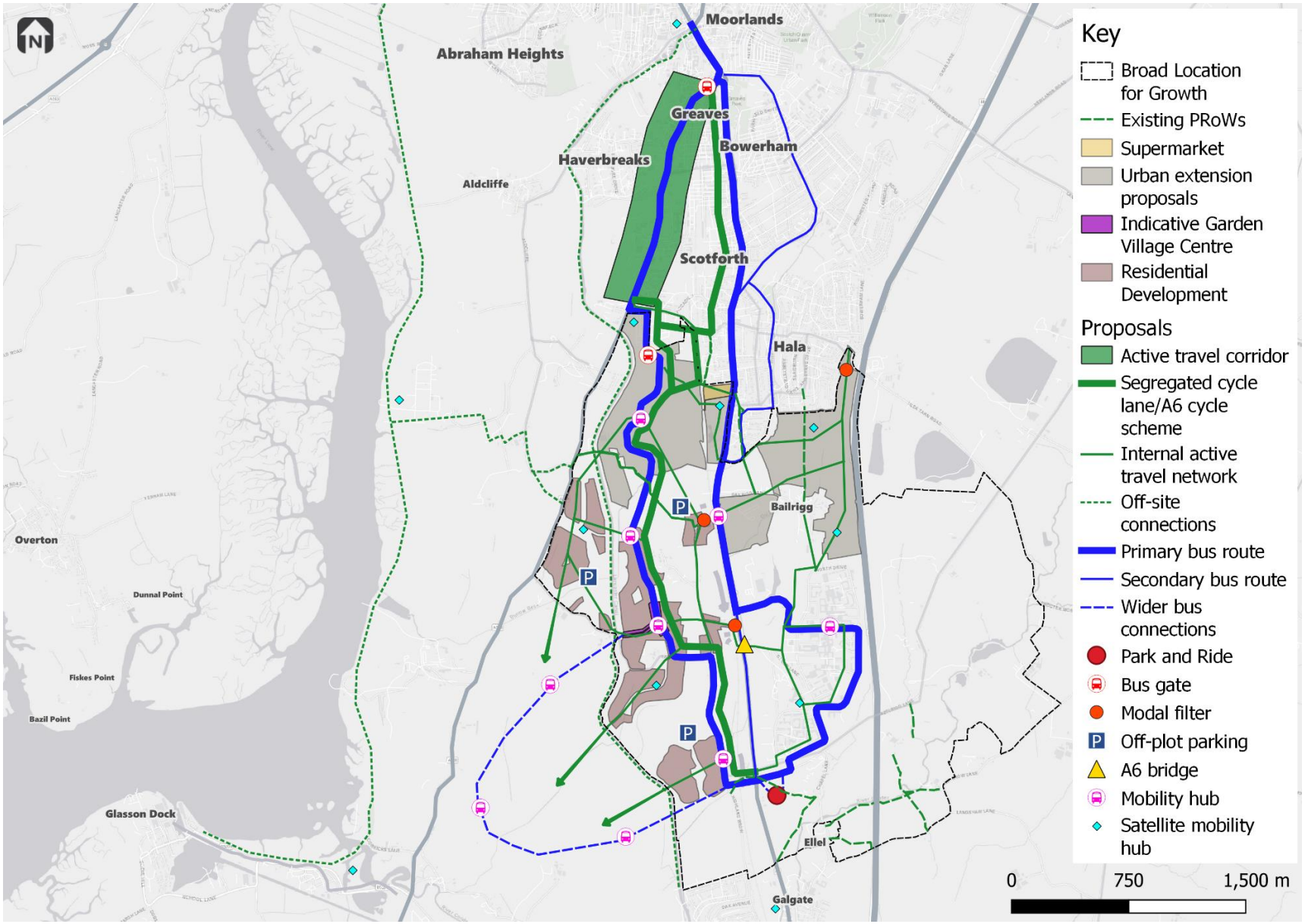
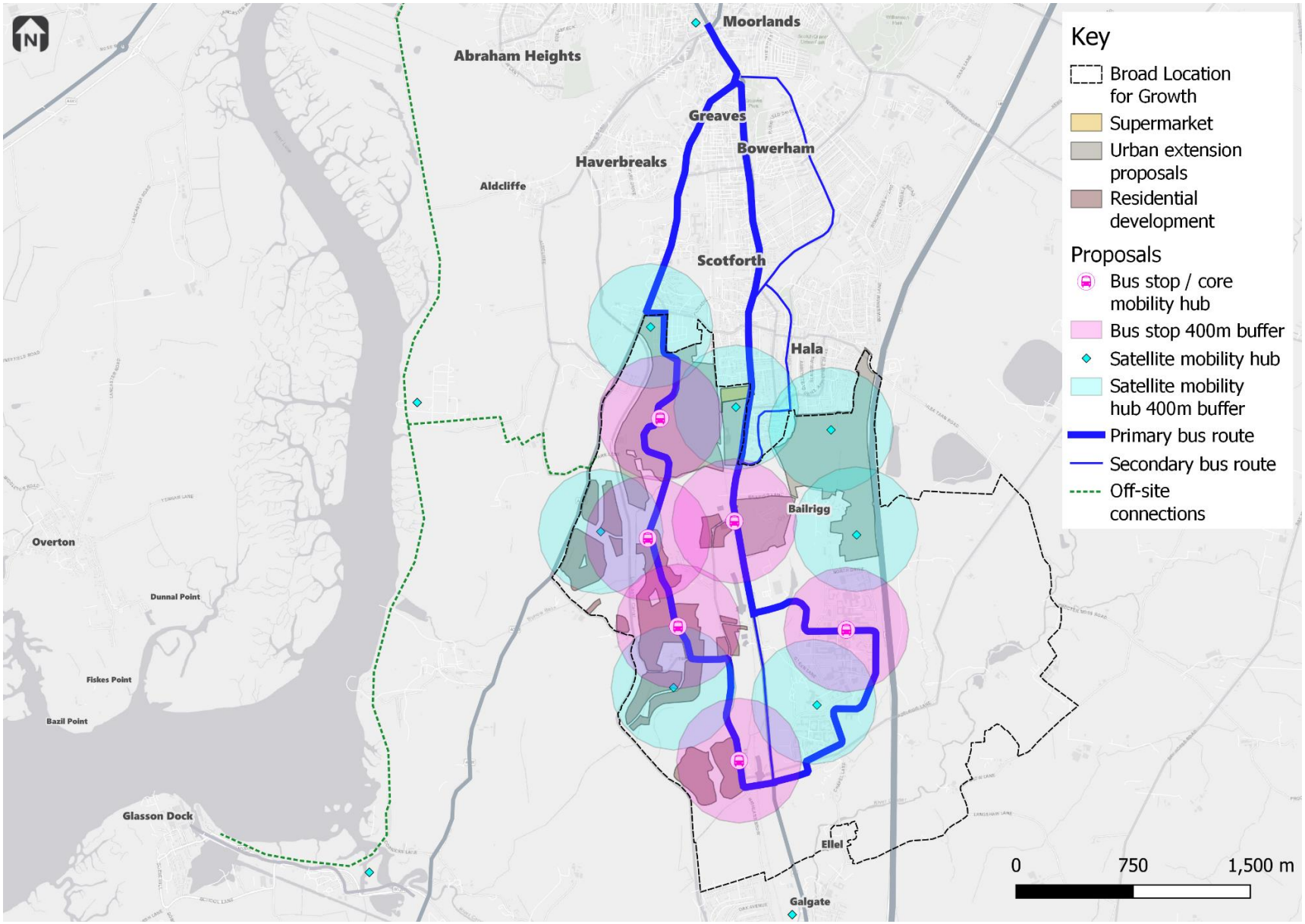


Figure 7-4: High scenario mobility hub network



Summary

7.30 The three suggested levels of intervention incrementally build on the business as usual scenario, and the High scenario would result in the greatest levels of mode shift, still based around interventions that are practical, achievable and in operation already around the UK. The emphasis in the High scenario is on providing the highest quality and most comprehensive package of sustainable mobility focussed improvements rather than an extensive list of highway capacity upgrades that might be associated with development of this scale.

7.31 If necessary highway capacity improvements and access options were listed alongside the interventions (to be determined by the parallel Highways Assessment commissioned by LCiC), there would be a greater number in the Low scenario and fewer in the High scenario – the same number of trips are likely to be made but the apportionment of these to different modes will change. More detail on this is set out in the next section.

7.32 Looking back to the STS objectives and vision set out in Chapter 4, the High scenario is most likely to meet the objectives to the greatest extent, in that it:

- ✓ Minimises the need to travel and makes active, low carbon travel the most convenient and reliable choice
- ✓ Delivers dedicated and high-quality active travel and public transport infrastructure, which also benefits existing journeys (and these should be delivered in early phases of development)
- ✓ Improves connectivity between South Lancaster and the wider district, including the city centre, Lancaster University and rural communities
- ✓ Creates safer, cleaner, more convenient, and more affordable ways to travel, benefitting disadvantaged groups and areas
- ✓ Supports the authorities' climate, safety, health and placemaking objectives
- ✓ Advances and exploits electrification technologies and shared transport
- ✓ Influences travel choices and car dependency through an effective behaviour change strategy
- ✓ Considers a range of trip purposes and destinations, including leisure and education

7.33 The Medium and Low scenarios would work to meet these objectives, but to lesser extents.

8. Scenario testing

Approach

8.1 This chapter sets out what mode shares could be achieved through delivery of the three potential scenarios and presents them as mode shifts away from a conventional business as usual approach (described in the introduction to Chapter 7).

8.2 To understand the potential for the BLG to achieve high levels of active and sustainable mode share as a result of new sustainable transport infrastructure, a bespoke Mode Shift Model (MSM) has been developed. Developed by ITP over several projects, the MSM is a spreadsheet tool that allows the potential impact of proposed infrastructure interventions to be identified. Based on the case study evidence set out in Chapter 5, the MSM outputs at a high level the likely impacts on mode share, trip generation and carbon equivalent emissions of introducing different interventions and infrastructure. It is a tool for embedding the vision-led approach in the planning of large-scale growth.

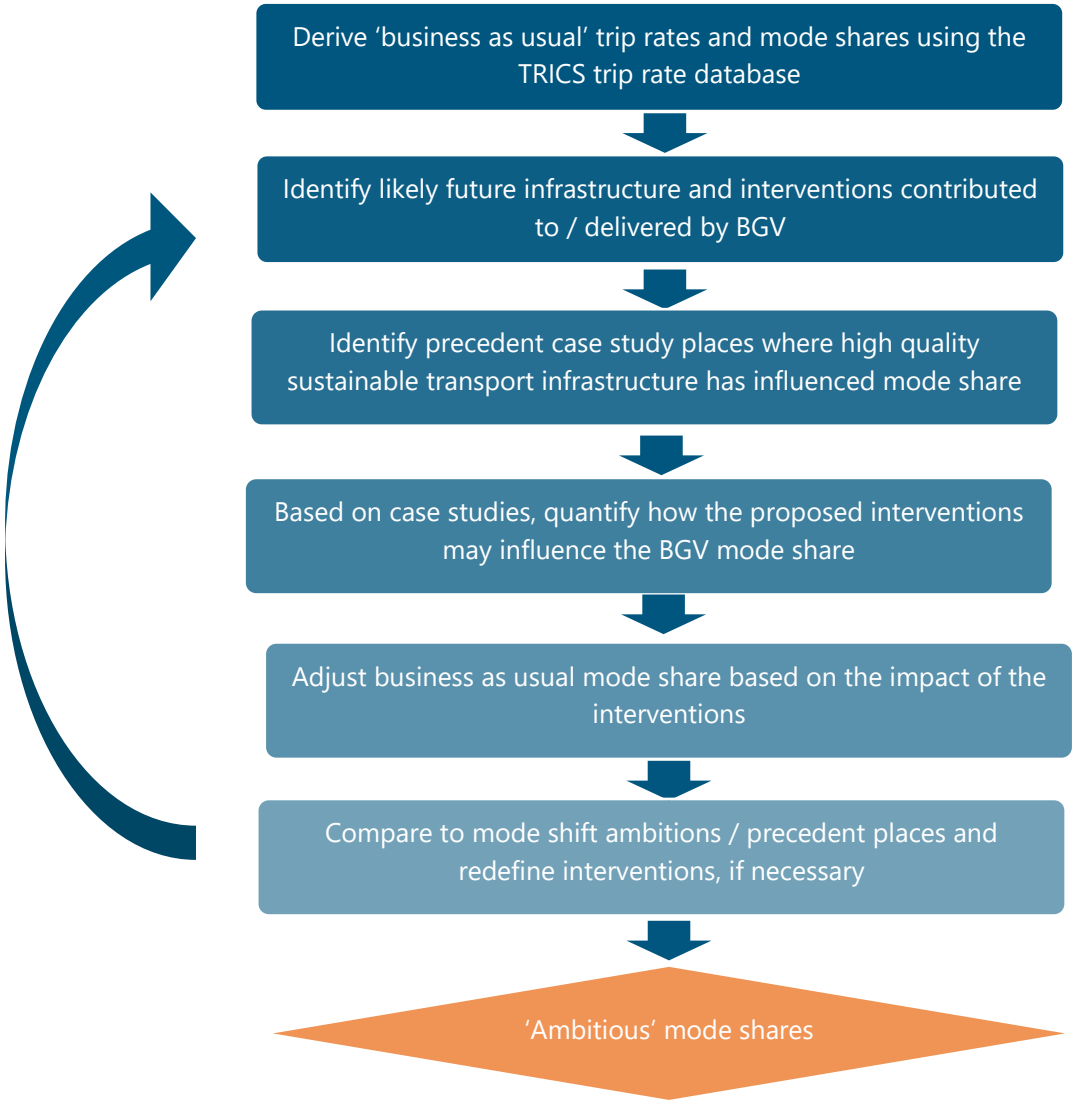
8.3 The outputs can be used in future transport modelling or highways assessments relating to BGV / the BLG, on the basis that the level of vehicle trip generation being modelled is likely to be lower if assumptions about higher levels of active and sustainable trips are made and sustainable transport infrastructure is coded into the assessment.

8.4 The overall MSM approach is illustrated in Figure 8-1 overleaf. More detail on the process, including the baseline trip rates fed into the model, is set out in **Appendix B**, with this chapter providing a non-technical summary. The mode share outputs for each scenario are presented later in this chapter.

8.5 It should be noted that the primary focus of this exercise has been to consider residential land uses and the trips generated by them, given that residential development would represent the most significant amount land use at the BGV. Where mode shift is anticipated for residential trips, it can be assumed that similar magnitudes of shift can be achieved by other land uses/journey purposes, as they too will benefit from the same sustainable mobility-focussed interventions, providing that the broad origins and destinations of trips are similar.

8.6 The internalisation brought about by providing a mix of land uses on site is a principle inherent to the vision-led approach taken in this STS, and should reduce the overall number of external trips (by all modes) made by those living within the BLG.

Figure 8-1: Mode Shift Model approach



8.7 This process has been applied to BGV (as opposed to the wider BLG), as the quantum of development in terms of residential dwellings is broadly quantified and agreed for BGV (3,500 dwellings alongside mixed-uses). The themes against which mode share has been adjusted are:

1) Public transport
2) Active travel
3) Traffic and parking management
4) Placemaking and land use planning

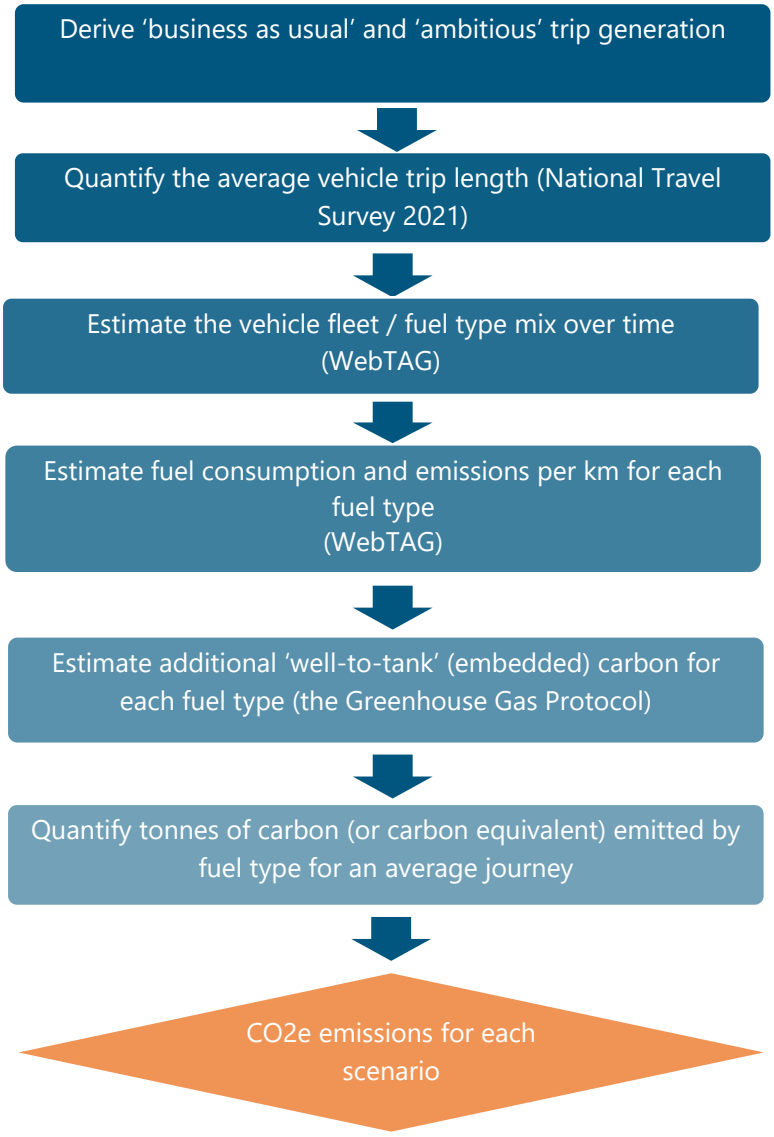
8.8 The other themes identified in this STS (governance and behaviour change) are not any less important, rather their impacts are more difficult to quantify in mode shift terms and they effectively straddle all of the interventions relating to infrastructure. These are

included in the interventions for each scenario described in Chapter 7 and form the foundations of the overall STS suggested in Chapter 9.

Carbon modelling

8.9 The MSM approach outlined above provides an estimation of the total number of vehicles generated in each scenario. As a result, the transport emissions of vehicles associated with the BLG can be estimated using a carbon and carbon equivalent emissions model. As with the MSM, the process for estimating carbon equivalent (CO2e) emissions from development-generated vehicles is summarised at a high level in Figure 8-2, with the detailed calculations shown in **Appendix B** and the results presented later in this chapter.

Figure 8-2: Carbon modelling approach



8.10 For reference, based on the DfT TAG databook (November 2022), Table 8-1 summarises the fleet mixes expected up to 2050, which is taken as the future year in the assessment of the BLG. It is noted that the TAG values could be considered pessimistic, with a relatively high proportion of petrol and diesel vehicle making up the fleet in 2050, even after a ban on internal combustion engine sales in the UK in 2030.

Table 8-1: Fleet mix up to 2050

Fuel type	Year			
	2023	2030	2040	2050
Diesel	41%	22%	10%	8%
Petrol	51%	42%	28%	24%
Electric*	7%	36%	62%	67%

*Electric vehicles comprise fully electric batteries only. TAG aggregates hybrid vehicles into petrol and diesel fuel types.

Outputs

8.11 For comparison purposes, the business as usual trip rates and mode shares are shown in Table 8-2. These are based on unadjusted TRICS trip rates and mode shares, i.e. no assumptions are made about exemplary masterplanning or sustainable mobility interventions; BGV would be developed in a conventional manner.

Table 8-2: Business as usual trip rates and mode shares

Mode	Two-Way Trip Rates			Mode Share			Two-Way Trip Generation		
	AM Peak	PM Peak	Daily	AM Peak	PM Peak	Daily	AM Peak	PM Peak	Daily
Vehicles	0.485	0.423	4.099	77%	79%	76%	1,698	1,481	14,347
Public transport	0.011	0.014	0.166	2%	3%	3%	39	49	581
Active travel	0.135	0.097	1.118	21%	18%	21%	473	340	3,913

8.12 The CO2e emissions from a business as usual scenario are shown in Table 8-3, assuming a 2040 fleet mix to reflect a future year when build out of BGV could realistically be complete. CO2e in this exercise focuses on private car emissions only; CO2e emissions from buses, for example, have not been estimated.

Table 8-3: Business as usual CO2e emissions

Mode	Two-Way Trip Generation			2040 Fleet Mix CO2e Emissions (tonnes)			
	AM Peak	PM Peak	Daily	AM Peak	PM Peak	Daily	Annually
Vehicles	1,698	1,481	14,347	1.4	1.2	11.6	3,481

8.13 Table 8-4 overleaf summarises the MSM and CO2e emission outputs for the three mode shift scenarios; Low, Medium and High. These are all presented based on the full 3,500 dwelling BGV, assuming completion by 2040 or sooner.

8.14 A four-scale rating has been assigned against the four infrastructure themes considered, repeated below for reference:

1) Public transport
2) Active travel
3) Traffic and parking management
4) Placemaking and land use planning

8.15 These scores are based on an appraisal of the interventions proposed in each scenario, and are necessarily high-level given that it is difficult to accurately judge the impact of a specific intervention on mode share across a large-scale development. The rationale for scoring is briefly summarised below:

	Public transport	Active travel	Traffic / parking management	Placemaking and land use planning
Low	Minimal priority on- or off-site, aside from bus gate	Minimal connections off-site, no mobility hub network	City centre measures. No traffic management on-site aside from bus gate	One main local centre, lower density and car-focussed elsewhere
Medium	Minimal priority on- or off-site, aside from bus gate	Few utility connections off site, minor/some mobility hubs	Bus gates, modal filters and some parking management on-site.	All homes with 15 minutes' walk of key services, enhanced streets and public realm
High	More priority on and off-site, though still constrained off-site	High quality utility and leisure connections on- and off-site, supported by mobility hub network	On- and off-site restrictions, parking restricted in appropriate contexts	All homes within 10-15 minutes walk of key services, exemplary streets and public realm. May be difficult / contentious to achieve high density

Table 8-4: MSM outputs

Scenario	Theme rating				Mode	Mode Share			Trip Rates			Trip Generation			2040 CO2e emissions – Tonnes*				Difference in trips between BAU and mode shift scenarios			CO2e savings between BAU and ambitious scenarios - Tonnes			
	1	2	3	4		AM Peak	PM Peak	Daily	AM Peak	PM Peak	Daily	AM Peak	PM Peak	Daily	AM Peak	PM Peak	Daily	Annually	AM Peak	PM Peak	Daily	AM Peak	PM Peak	Daily	Annually
Low	2	1	2	1	Vehicles	70%	73%	70%	0.443	0.388	3.743	1552	1359	13102	1.3	1.1	10.6	3,179	-236	-169	-1,896	-0.1	-0.1	-1.0	-302
					Public transport	6%	7%	7%	0.037	0.037	0.395	131	128	1381					120	85	960				
					Active travel	24%	20%	23%	0.150	0.109	1.245	525	382	4358					116	83	937				
Middle	2	2	3	2	Vehicles	61%	73%	60%	0.385	0.388	3.245	1348	1359	11357	1.1	1.1	9.2	2,756	-409	-169	-3,299	-0.3	-0.1	-2.4	-725
					Public transport	7%	7%	8%	0.043	0.037	0.440	149	128	1542					140	85	1,135				
					Active travel	32%	20%	32%	0.203	0.109	1.698	711	382	5941					269	83	2,164				
High	3	4	4	3	Vehicles	47%	73%	46%	0.298	0.388	2.497	1042	1359	8741	0.8	1.1	7.1	2,121	-657	-169	-5,291	-0.5	-0.1	-4.5	-1,360
					Public transport	10%	7%	12%	0.065	0.037	0.633	226	128	2214					234	85	1,894				
					Active travel	43%	20%	42%	0.269	0.109	2.253	940	382	7886					423	83	3,397				

*Public transport emissions are not modelled in the MSM, though it is acknowledged that they will contribute to CO2e emissions even when the fleet is fully electrified (or using another, alternative form of propulsion).

Themes:

1) Public transport
2) Active travel
3) Traffic and parking management
4) Placemaking and land use planning

Summary

Mode share

8.16 Table 8-5 shows the mode shifts for each scenario from the business as usual scenario.

Table 8-5: Mode shifts from business as usual scenario (daily)

Scenario	Vehicles	Public transport users	Active travel trips
Business as usual	76%	3%	21%
Low	-7%	+4%	+2%
Medium	-16%	+5%	+11%
High	-30%	+9%	+21%

8.17 This demonstrates that the High scenario could result in around 55% of trips being made by active and sustainable modes (~45% by vehicles) and hence that Lancaster South has the potential to achieve mode shares in the region of those set out by the TCPA in their Garden City Principles.

8.18 It should be noted that this high-level exercise has considered all trips associated with BGV, once the site is fully built out and regardless of the trip length. The mode shares therefore represent the end product of well-planned phasing, and are an average across internal trips, trips into Lancaster / surrounding centres, and longer distance trips, e.g. to Preston or the South Lakes.

8.19 In reality, it is likely that trips internal to BGV would achieve an even greater reduction in vehicle mode share, perhaps achieving as low as 20% vehicle mode share in the high scenario by 2040. On the other hand, longer distance trips might still comprise 80% to 90% vehicle trips.

8.20 There will also be notable and material benefits for trips made by existing communities, as new infrastructure and interventions will have positive impacts for other journeys outside of the BLG, for example along Ashton Road and the A6. The net reduction of trips and change in mode share more widely is therefore greater than estimated by the MSM for BGV alone. This will be further impacted by any wider measures introduced across Lancaster, as part of the city centre strategy for example.

Carbon emissions

8.21 The carbon savings would also be significant – acknowledging that the model estimates CO2e emissions at a high level, in the region of 1,300 tonnes of CO2e

emissions from vehicle-borne trips would be saved in the High scenario per annum, as shown in Table 8-6.

Table 8-6: CO2e savings from business as usual scenario (annually)

Scenario	CO2e emissions (tonnes)	CO2e saving (tonnes)
Business as usual	3,481	-
Low	3,179	-302
Medium	2,756	-725
High	2,121	-1,360

8.22 Table 8-7 summarises the above in terms of monetised savings, based on the joint Department for Business, Energy and Industrial Strategy and Department for Energy Security and Net Zero 'Valuation of greenhouse gas emissions: for policy appraisal and evaluation' policy paper[9]. This presents 'Low', 'Central' and 'High' series estimates for carbon values, based on 2020 prices per tonne of CO2e. As such, the values (or indeed costs) of different policy interventions which impact emissions can be quantified and compared, based on three different future estimations of carbon values. It is important to note that the monetised savings scenarios are distinct from the High, Medium and Low mode shift scenarios presented in this STS.

Table 8-7: Monetised savings in CO2e emissions (annually)

STS mode shift scenario	CO2e emissions (tonnes)	'Low series' monetised price	'Central series' monetised price	'High series' monetised price
Business as usual	3,481	£567,451	£1,134,902	£1,702,353
Low	3,179	£518,208	£1,036,415	£1,554,623
Medium	2,756	£449,220	£898,440	£1,347,660
High	2,121	£345,729	£691,457	£1,037,186
Saving between High and business as usual mode shift scenarios		£221,722	£443,445	£665,167

8.23 This demonstrates the notable value saved in monetised CO2e emissions per year (from private vehicle transport alone), if the High mode shift scenario were to be implemented.

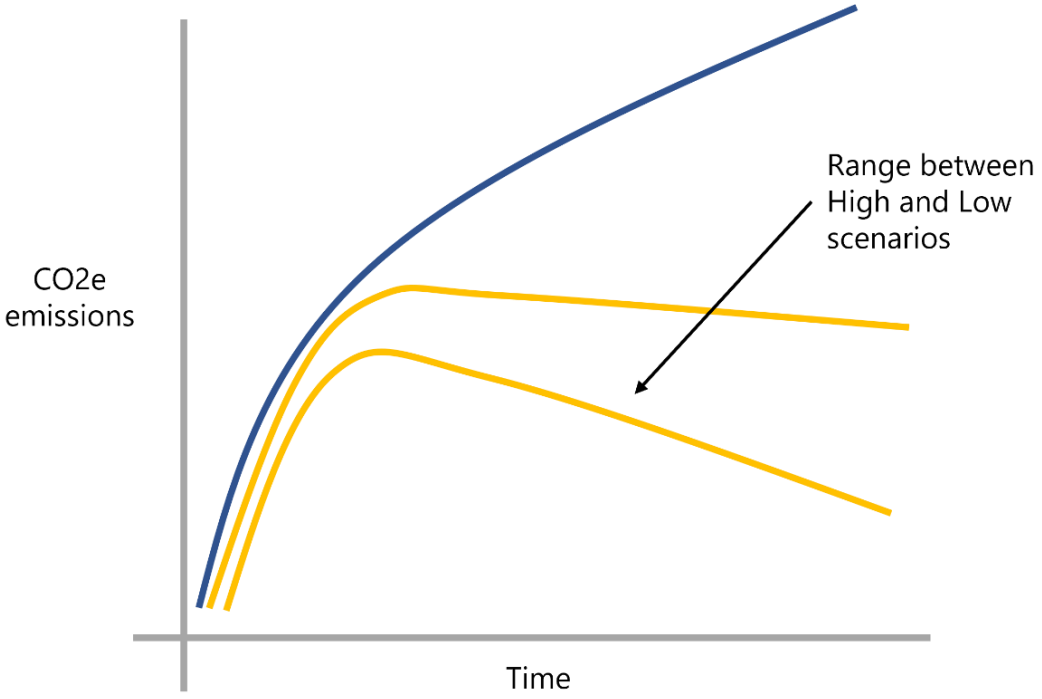
8.24 The savings would likely also be realised sooner in the mode shift scenarios than in the business as usual scenario. The business as usual scenario would likely focus first on

[9] https://www.gov.uk/government/publications/valuing-greenhouse-gas-emissions-in-policy-appraisal/valuation-of-greenhouse-gas-emissions-for-policy-appraisal-and-evaluation#methodology

road and capacity building, positioning phases around the incremental delivery of a spine road. The effects would likely snowball, with car-dependency being baked in from the outset, inducing a cycle of capacity building and increased car use.

8.25 On the other hand, whilst there would be an initial increase in emissions from the current baseline in early phases in the mode shift scenarios, the focus of those is far more on early delivery of sustainable transport infrastructure and positioning around local centres, schools and mobility hubs (with essential vehicle access). As sustainable travel behaviours are embedded, and further active / public transport interventions delivered, the CO2e emissions are likely to peak much more quickly before then declining. This is illustrated indicatively on Figure 8-3.

Figure 8-3: Indicative change in CO2e emissions over time



Note: Values / relationships are entirely indicative

9. Sustainable Travel Strategy

Thinking differently

9.1 This STS has been developed with a **vision-led approach**; one which envisages how a place should look and operate, and then plans the interventions and infrastructure needed to achieve that vision. This recognises the TCPA's Garden City Principles which ask for beautiful, self-sustaining places with vibrant neighbourhoods and streets, integrated transport systems, and 60% of trips to be made by non-car modes.

The evidence base and need for change

9.2 The evidence base review has highlighted the important issues and opportunities relating to movement in Lancaster and the BLG. Our approach recognises that there is a need for change; that growth has to be delivered differently if we are to achieve different outcomes in terms of mode share, healthier lifestyles and reduced carbon. The need to achieve this change is critical in the context of a congested transport network, transport inequalities, limited funding and the climate emergency.

9.3 **The scale of growth being delivered through BGV and the wider BLG offers potential to address these challenges** and create a place which operates as a new community, but also complements existing communities, Lancaster University and Lancaster's economic offer, whilst working to enhance the established landscape. This should be part of a wider, joined-up vision across the city and district, tying into plans for the city centre gyratory and any revised proposals relating to the M6 and J33.

9.4 As a result a vision, user hierarchy and series of objectives have been suggested to guide the development of the STS, all under the umbrella of a vision-led approach:

> *By 2033, and beyond, Lancaster South will be thriving, with high levels of sustainable mode share achieved through high quality, low carbon sustainable transport networks, complemented by placemaking that prioritises active and sustainable modes, embeds traffic management and embraces digital connectivity.*

9.5 Considering the existing transport and movement network in the area against the vision and objectives, there is significant room for improvement if Lancaster South is to deliver transformational growth in the future, with outcomes commensurate with the Garden City Principles.

9.6 A great deal of work has already been undertaken by LCiC, LCC and JTP to address this and to plan upgrades to walking, cycling, public transport and vehicular networks across Lancaster. This STS has built upon those plans, although in light of LCC's decision to suspend the M6 link road scheme, there is opportunity to reframe aspirations and consider afresh how growth could be delivered in the BLG.

Principles for sustainable mobility

9.7 The evidence base and review of best practice has drawn out key principles for sustainable mobility relevant to Lancaster South. Together, these should inform the policy requirements in the AAP, based around:

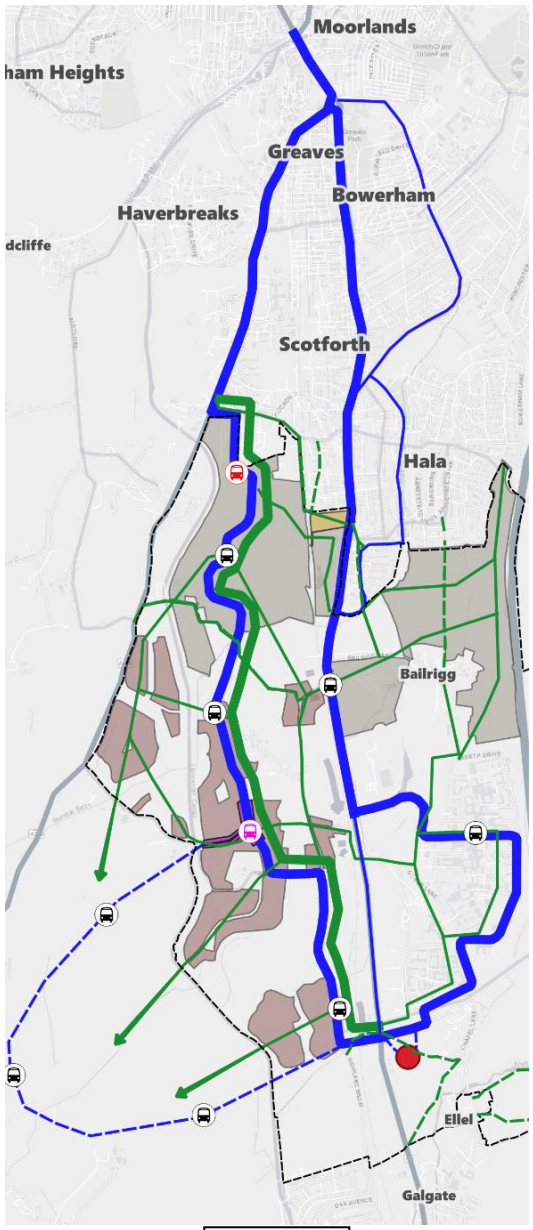
- **Targeting an ambitious active and sustainable mode share**, aiming for the TCPA target of 60% of all trips originating / ending in BGV being made by non-car modes.
- **Definition of a road user hierarchy**, prioritising non-motorised, active modes first, followed by public transport, followed by electric and / or more sustainable forms of vehicle transport.
- **Definition of a parking hierarchy to target overall parking car levels below adopted standards** (to reflect high connectivity), prioritising cycle parking and then unallocated, off-plot car parking to maximise land efficiency and flexibility. Consideration of leased parking and on-street restrictions.
- **Dense utility walking and cycling networks, segregated from each other and from vehicles, providing coherent and direct routes to key destinations.** Complemented by a network of off-road leisure routes.
- **Specific requirements for active and sustainable links / to from:**
  - Lancaster University, over / across the A6
  - The Lancaster Canal path
  - The A6 at Hazelrigg Lane, Five Ashes Lane and Burrow Road
  - Ashford Road, via Uggle Lane and the spine road
  - Ashton Road adjacent to Ashford Road junction
  - The reconfigured city centre gyratory.
- **Provisions for a network of mobility hubs, either directly provided in BGV or contributions towards off-site facilities elsewhere in Lancaster.** Mobility hubs should include cycle parking, e-mobility hire and charging and public transport

interchange and could include cargo bike hire, freight consolidation, and where viable community and retail uses.

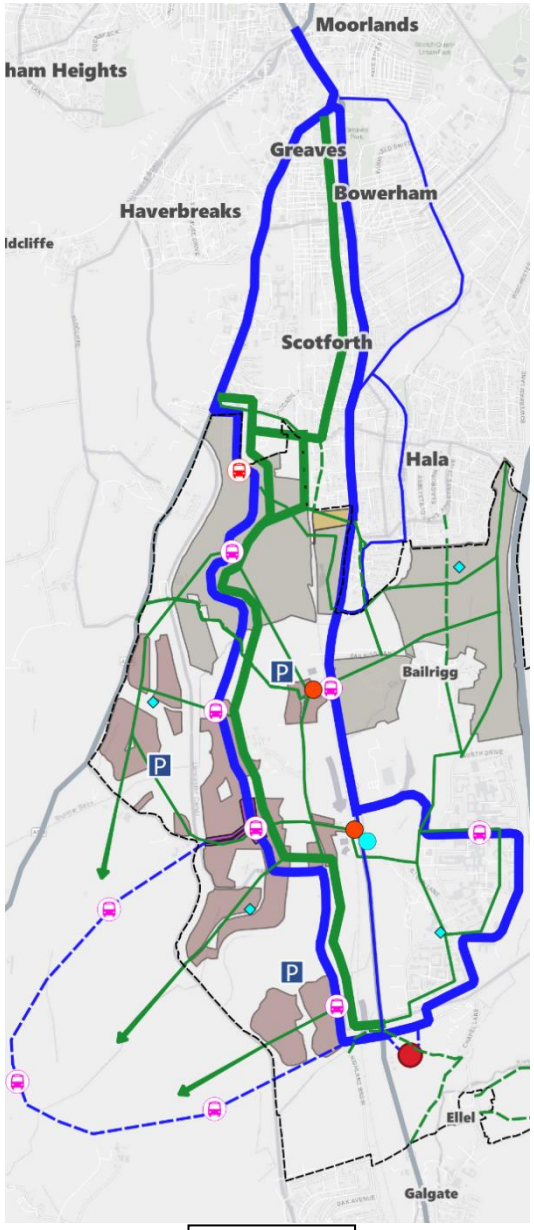
- **Ensuring that all homes are within 400m walking distance (on high quality routes) of a bus stop**, with contributions towards a frequent and affordable service to the city and Lancaster University.
- **Commitment to a travel demand management strategy, which acknowledges that it will be more difficult to travel by car** and commits to filtered permeability, car-free and slow-speed streets, shared transport provision and freight management/consolidation, and aligns with the preferred strategy at the city centre gyratory.
- **Integration with parallel land-use and masterplanning studies,** incorporating principles around high density, mixed-use, rational phasing and respectful of blue and green infrastructure (alongside other wider masterplanning considerations).
- **A clean energy / EV strategy which ideally is more ambitious than national policy / requirements** e.g. Buildings Regulations. Alongside cars, the strategy should consider alternative fuels for buses and their requirements at depots, and should demonstrate that sufficient capacity can be delivered to / generated by the site to accommodate changing forms of vehicle propulsion.
- **Identification of a mechanism for baselining, monitoring and managing trip-making,** to measure the impact of sustainable transport focussed interventions and understand and react to the impacts of new technologies and travel behaviours.
- **Exploration of a stewardship model to provide longevity over the management of public spaces, green infrastructure, community facilities and parking controls**, with lesser reliance on wider public subsidy.
- **Delivery of a transport network which is affordable, commercially viable and sustainable**, reflecting best value for money for LCiC, LCC and partners, as well as developers, and new and existing communities.

What does good look like at Lancaster South?

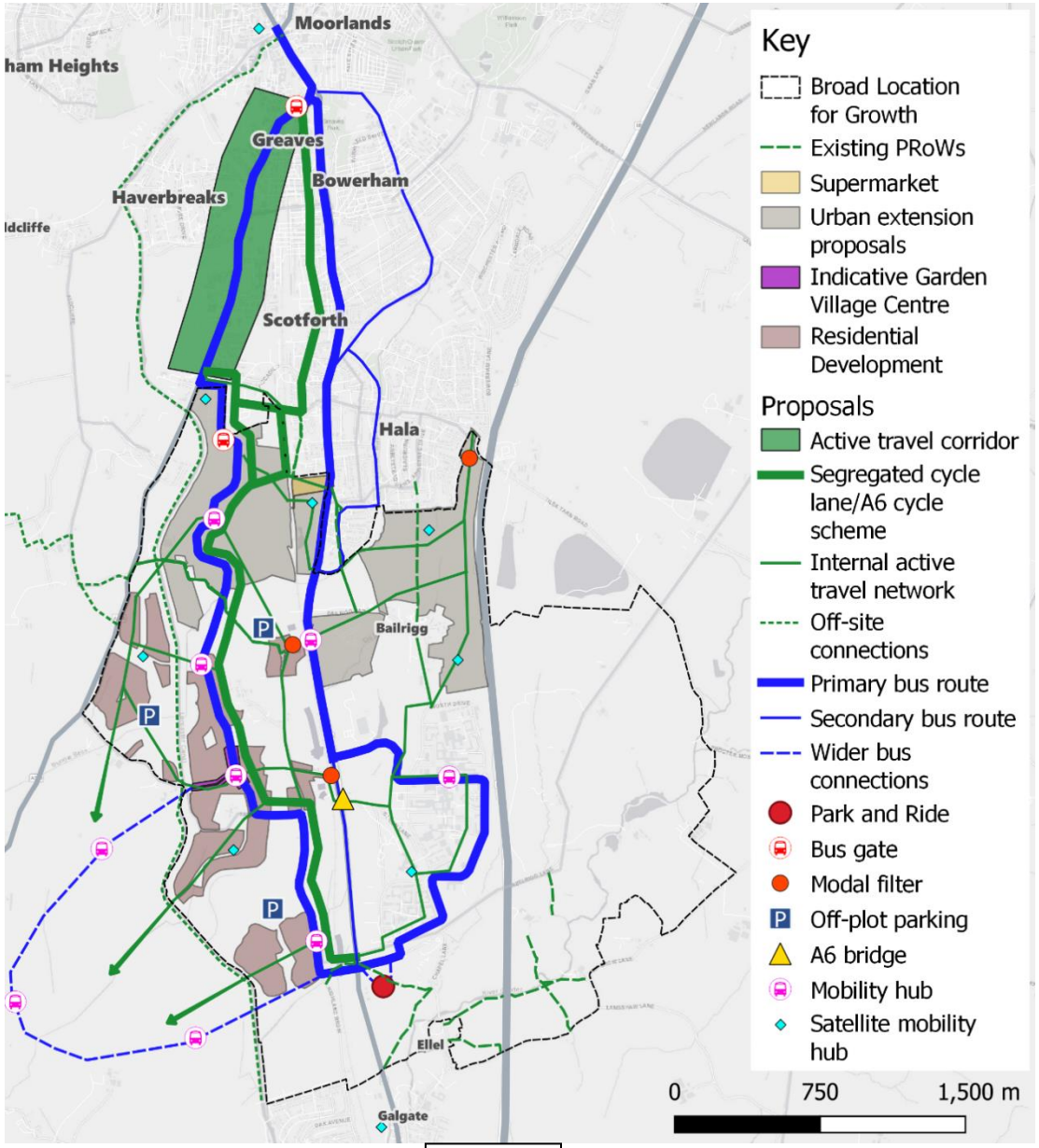
9.8 To achieve a ~30% shift away from private car use, and generate annual carbon savings from vehicles in the order of 1,300 tonnes, the STS modelling suggests a comprehensive strategy incorporating all of the above would be needed. Even to achieve 10% or 20% mode shift, **a move away from conventional development models would be needed**. The three scenarios are visualised overleaf.



Low



Medium



High

How can this be delivered?

9.9 In Lancaster, LCiC and LCC face the challenges of rising construction costs and funding challenges, exacerbating what is already a challenging economic climate. Alongside infrastructure, achieving the highest levels of mode shift will therefore be dependent on **aligned political leadership, continued engagement and a strong behaviour change campaign**, within new and existing communities.

9.10 Aligning the approaches of all stakeholders to make the most of opportunities is critical, even if this means difficult decisions need to be made with regard to the ease of movement of private vehicles and the priorities for the funding that is available. Taking a vision-led approach now, and carrying it through to the planning stage, should result in trip-making being thought about differently from the outset and infrastructure planned around it accordingly. This will guide the level and focus of developer contributions - where these are needed to fund interventions - away from costly highway capacity upgrades which are likely to induce additional demand. The alternative is growth which perpetuates car dependency.

Next steps

Implications of suspending M6 link road delivery

9.11 In light of the recent decision to suspend work to deliver the South Lancaster to M6 road scheme (and associated J33 reconfiguration and Park & Ride), the next steps following preparation of this STS relate to wider considerations than simply progressing the AAP, as was initially envisaged.

9.12 In the scenario where the BGV spine road was to be delivered through HIF, there was a lesser requirement for future developers to construct and fund highway infrastructure, leaving greater flex for delivery of, or contributions towards, sustainable transport focussed improvements. The road building to provide vehicular access to BGV and the wider BLG effectively lessens that potential, meaning that the 'High' mode shift scenario is unlikely to be realisable based on developer funding alone.

9.13 It is also recognised that the residual vehicles that are generated by the BLG will have impacts off-site. Whilst the interventions proposed in this STS will accommodate many trips across all trip purposes, they focus to the greatest extent on internalising trips within Lancaster and facilitating some longer distance trips by train. Where longer distance trips to the south (for example to Preston) are made, these could

unfortunately result in unacceptable impacts on communities such as Galgate (particularly the Air Quality Management Area), given that the bypass included in the HIF package is no longer being delivered. There is also reduced potential to capture inbound vehicle trips at source at J33, as the Park & Ride was a component of the HIF package.

Progressing the AAP

9.14 LCiC's Local Plan 2011-2031 (and the Climate Emergency Review) allocates growth at Lancaster South to address the housing need in the district over the Local Plan period. The Local Plan evidence base demonstrated that BGV represented the best prospect for delivering growth at scale within the timescales required, based on deliverability and availability at that time, and through support of the Government's Garden Communities programme.

9.15 On that basis, recognising the strength of the evidence base and the clear opportunity presented by Lancaster South in terms of its location and future connectivity, progressing the AAP in spite of the highway infrastructure funding gap is a reasonable way forward. The AAP will ensure that a holistic, area-wide strategy across a range of topics is developed and agreed, such that as and when developers seek to submit planning applications (an unfortunate inevitability, and difficult to challenge at appeal in light of the housing need), a clear direction of travel and framework for development is in place. This should work to ensure that piecemeal development that lacks permeability, coherence and cohesion is avoided, with developers ultimately required to work towards the end-goal of a transformational new community, albeit across potentially longer timescales than envisioned through a Garden Community delivery model.

9.16 Additionally, a complete AAP which represents an 'oven ready' strategy for delivery of growth, and the transport infrastructure required to deliver it (informed by LCC's Infrastructure Delivery Plan, this STS and the future Highways Assessment), will be most effective in the ability for LCiC and partners to act quickly as and when new schemes and funding opportunities are released by central Government. These could include future rounds of HIF, Local Growth Deals, DfT major scheme bids and National Highways' Road Investment Strategies, and equally the AAP could inform the identification of Community Infrastructure Levy (CIL) schemes if LCiC pursue this as a mechanism for infrastructure delivery.

A new approach altogether

9.17 The above approach recognises that private sector contributions can seldom wholly be relied upon to deliver the scale of up-front investment needed to transform movement networks within and around strategic development. It also assumes that Lancaster South is indeed the most sustainable and deliverable area of search for housing growth in the district.

9.18 If the challenges presented by planning and funding growth in this location and at this scale become insurmountable, LCiC's upcoming call for sites and Local Plan review could present an opportunity to reappraise which are the most sustainable locations for growth in the district. This may continue to result in the conclusion that Lancaster South has the most potential to deliver strategic growth; as above it presents good opportunity in transport and mobility terms.

9.19 Historically, calls for sites and subsequent Strategic Housing and Land Availability Assessments have focussed on land which is available and deliverable (as is very often the case in the UK planning system). An alternative is to take an initially more agnostic approach that simply identifies areas which have good potential for sustainable mobility outcomes, but which are not yet developed (solving the availability problem once these areas of search are established).

9.20 Alongside other assessments - as part of a wider Sustainability Appraisal - this integration of transport and mobility focussed thinking at earlier stages should enshrine better outcomes from the outset of plan-making. The resulting alternative strategies for Lancaster district could potentially take the form of:

- **Town/city focus**: A series of smaller, more disparate sites, which are typically brownfield, infill or at the edge of existing towns (likely Lancaster, Morecambe, Heysham and Carnforth) and benefit from the existing connectivity of and access to the services already in place in those settlements, with some requirement for new infrastructure and interventions to ensure they improve connectivity and exploit existing opportunities. Often the challenge here is finding enough sites of large enough scale to deliver housing targets. This, possibly more than any other option, would also need to be supported by a robust mechanism to collect contributions to fund schemes which deal with cumulative development, for example via a CIL or using a refined / alternative version of LCC's gravity model.
- **Corridor focus**: Locating sites or groups of sites along key public transport corridors extending from the district's main towns, allowing them to exploit and enhance the connectivity provided by this infrastructure. This may require larger

scale growth to fund connections or enhancements to existing services and ensure patronage is sufficient, however there may be more land available to do so where sites are tapping into the extremities of existing routes (or are centred around a new interchange / station along a route).

- **New settlement**: Focussing growth in a new settlement, if not at Lancaster South then elsewhere in the district where land is available and the conditions will allow for a self-sufficient new community that has links to the district's key towns and can fund and deliver new infrastructure, with sufficient patronage. A comprehensive and bespoke Sustainable Travel Strategy would be needed to demonstrate that this represents a viable alternative for sustainable growth at scale.

9.21 Each potential strategy could be tested at a high level in transport terms prior to focussing efforts on strategic modelling and Transport Assessment. This could be done by way of a spatial connectivity analysis and an associated appraisal of potential for mode shift, similar to the methodology adopted in the assessment of the three mode shift scenarios in this STS.

9.22 In any case, whilst this STS sets the foundations for achieving sustainable growth at Lancaster South to inform the AAP, it equally establishes a wider set of principles which could apply at a high level to several alternative strategies in the region.

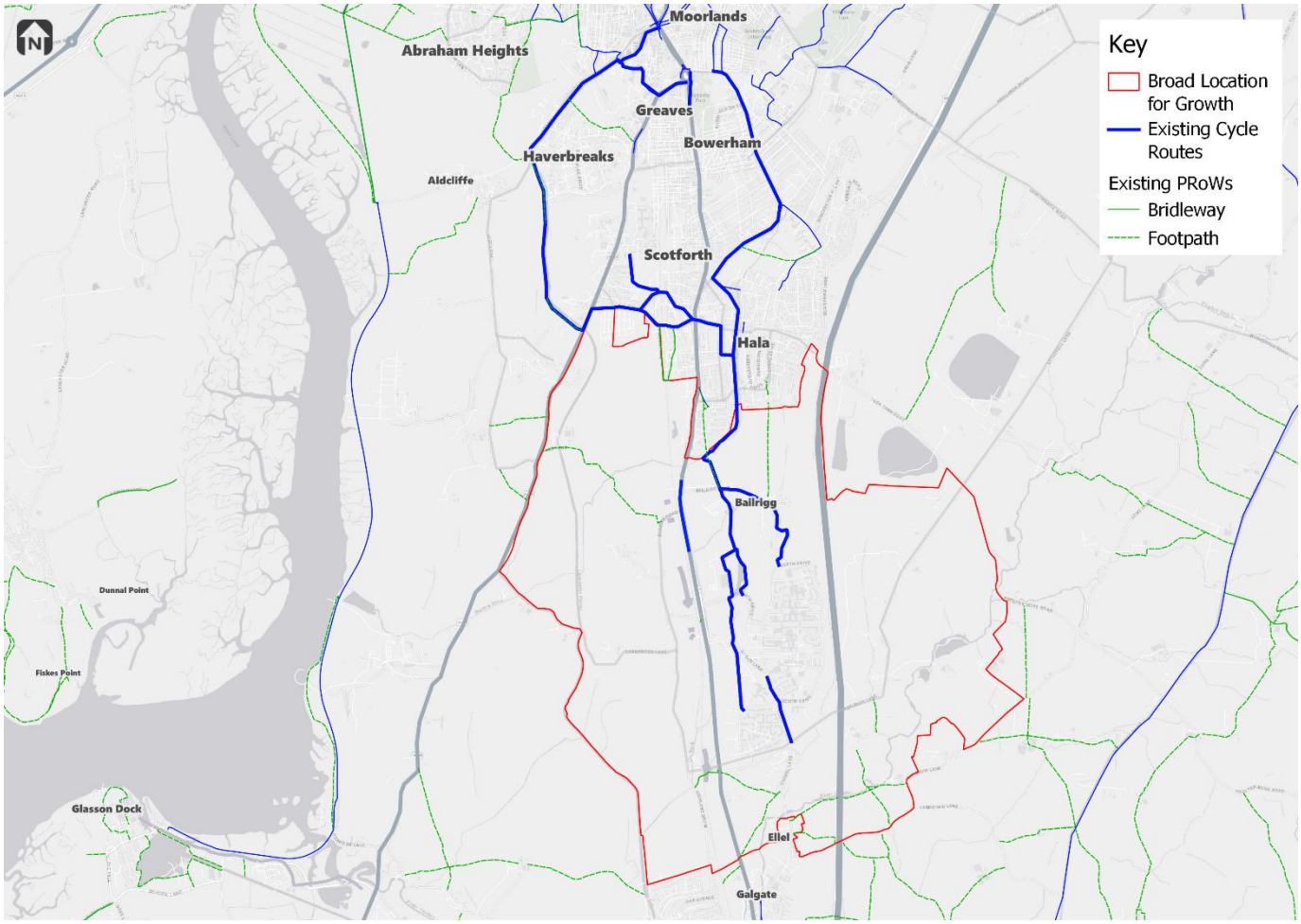
Appendix A

Review of existing and aspirational active travel and bus networks

Existing Network

Active Travel

9.23 Lancaster City Council's active travel network, made up of cycle and PRoW routes, is shown below, drawing from data provided by LCiC. This shows Lancaster city centre and how it connects with the BLG and surrounding areas in South Lancaster.



Does it form a coherent network?

9.24 As per LTN 1/20 a coherent cycle network is one that allows *"people to reach their day-to-day destinations easily, along routes that connect, are simple to navigate and are of a consistently high quality".*

9.25 At present, there are continuous cycle links between the city centre and Lancaster University (albeit the majority of the route is not LTN1/20 standard compliant), which allow easy access between the two locations, as well as between the city centre and Glasson Dock to the west of the BLG. However, the link does not continue south of

Lancaster University towards Galgate, nor to the west at the proposed BGV or to the east towards Quernmore and the Forest of Bowland.

9.26 Although the mapped network does not show an existing cycle link along the A6 in the BLG, Google Maps Street View confirms that there is now a short section of shared cycle/pedestrian track running between the A6 / Bailrigg Lane junction and just to the south of the A6 / Sir John Fisher Drive junction. Although clear signage shows where the route ends, in its current state its lack of continuity along the A6 may discourage cyclists from using the route to access the BLG and Galgate further south.

9.27 Cycling infrastructure is also piecemeal within the city centre, particularly around the gyratory which severs the centre and creates an unpleasant cycling environment. Access to and from the west of the city and the railway station is problematic, as well as from the south and east which leaves very little option other than interacting with the gyratory.

9.28 Regarding walking links, the Lancaster canal towpath provides a continuous link between the city centre and the west of the BLG where BGV is proposed. Lancaster University campus is well-connected to the southern extents of Lancaster city centre as well as within the campus itself. The mapped network shows that there are various fragmented PRoW sections on the boundaries of the BLG, but they do not connect with each other or the cycle links.

Does it link to the district's key attractors?

9.29 As established above, cycle links connect the city centre and its key employment, retail and health destinations with Lancaster University and the Health Innovation Campus as well as the key port of Glasson Dock to the south-west. The canal towpath connects the city centre to the proposed BGV site; however, it is unsurfaced and narrow in places limiting its opportunities for cycling. The existing links east to the Forest of Bowland are also less developed.

Is it direct in connecting to key attractors?

9.30 LTN 1/20 describes directness as when routes provide the shortest and fastest way of travelling from place to place, including minimising delay at junctions. To encourage cycling, cycle routes should preferably be more direct than those available for motor vehicles.

9.31 Figure 5-3 shows that the current cycle links between the south of the city centre and the BLG are not very direct, where the routes travel east through Bowerham and

Scotforth before heading south. A more direct route would be down the A6, which is straight, a shorter distance and quicker than the existing conditions.

9.32 There are footways along the A6 and Ashton Road which provides direct walking opportunities, however, as 'Topic Paper 2 – Travel Transport Securing Modal Shift' outlines, given the distance between the city centre and BLG it is unlikely that walking will be a viable mode of travel in many cases. There are direct cycling and walking links through Lancaster University campus as well as between the city centre and Glasson Dock.

Does it contribute to a high-quality public realm?

9.33 The short section of shared footway / cycleway along the A6 is wide and in good condition which contributes positively to the quality of the public realm, with existing fields adding natural green infrastructure. There is also a high-quality footway running along the A6, just south from the Pointer Roundabout, however, this becomes narrow and cluttered with street furniture in places which makes walking and cycling less desirable. There is also a lack of green infrastructure along the route such as planting and street trees. Further south along the A6 towards Lancaster University, the footway becomes narrow and uneven in parts which creates a hostile environment.

9.34 The cycle route running to the west of the BLG to Glasson Dock is quiet with plenty of greenery making it suitable and enjoyable for both experienced and less experienced cyclists and walkers. There is clear but no unnecessary signage along the route showing it is designed for cyclists without compromising the quality of the public realm.

9.35 The canal towpath provides a scenic route for walking, however, is unsurfaced meaning it is less suitable for cycling. Its limited width in places limits future cycling opportunities as well.

Is the network safe?

9.36 The short section of shared cycling and pedestrian track along the A6 provides a safe active travel route, however, when this ends, and particularly further south towards Galgate along the A6, the lack of infrastructure with heavy fast traffic creates an unsafe cycling environment dominated by motor vehicles. The footpath along the route is narrow and uneven in parts which raises safety concerns particularly for more vulnerable groups such as wheelchair users. However, near the Pointer Roundabout the footpath is wide and segregated from the A6, showing the route's inconsistency.

9.37 Cars and motorbikes are prohibited along the cycle route to Glasson Dock which makes it attractive and safe. There are also wide pavements at the south of and through Lancaster University campus, with 20mph speed limits installed, creating a safe environment for walkers and cyclists.

9.38 There is natural surveillance from housing along the A6 around the Pointer Roundabout with consistent street lighting. However, along the strategic cycle route to Glasson Dock from the city centre, the road is quiet and would be dark at night which may discourage people from using it.

How does it perform against the eight objectives?

9.39 The performance of the existing active travel network against the eight objectives is set out as a RAG score at the end of this section.

Bus

9.40 There is currently an excellent provision of bus services between South Lancaster and the city centre due to Lancaster University, with more limited services further the south. This is detailed below.

Route	Frequency
7 services connecting South Lancaster to the city centre along the A6 or through Bowerham	5+ every hour
South Lancaster to Preston	Every 30 minutes
South Lancaster to Blackpool	Every hour
City centre and the Fylde Coast via Ashton Road	Every 90 minutes

Rail

9.41 Direct bus services between South Lancaster and Lancaster Station are limited, with only one service with an hourly frequency existing, which takes approximately 30 minutes. 4.5km is cyclable, however, there are limited cycle lanes along the A6 and the Lancaster Canal route is less direct.

Are the services frequent?

9.42 As outlined in 'Topic Paper 2 – Travel Transport Securing Modal Shift', there is an excellent provision of seven bus services connecting South Lancaster and the city

centre with at least five running every hour, accounting for the location of Lancaster University and its employment and leisure opportunities.

9.43 The services are less frequent elsewhere with one every 30 minutes from South Lancaster to Preston, one every hour to Blackpool and one every 90 minutes to the Fylde Coast.

Does it link to the district's key attractors?

9.44 As established above, the current bus strategy is focused heavily on connecting the city centre with Lancaster University, which are the area's main attractors. However, services do not connect as well with Quernmore and the Forest of Bowland to the east or Glasson Dock to the west.

Is it direct in connecting to key attractors?

9.45 The bus services connecting Lancaster University with the city centre are direct, going straight up the A6, however, similarly to above, the connections east and west are less well serviced. For instance, to get to Rigg Lane Car Park on the western edge of the Forest of Bowland, the bus would first travel into the city centre and out again, making the journey significantly less competitive than the car.

Are services rendered unreliable by congestion?

9.46 The bus services from Lancaster University into the city centre encounter heavy traffic and congestion on the A6, the Pointer Roundabout and around Galgate, particularly in peak hours. This makes the bus a less competitive mode of transport in relation to the car.

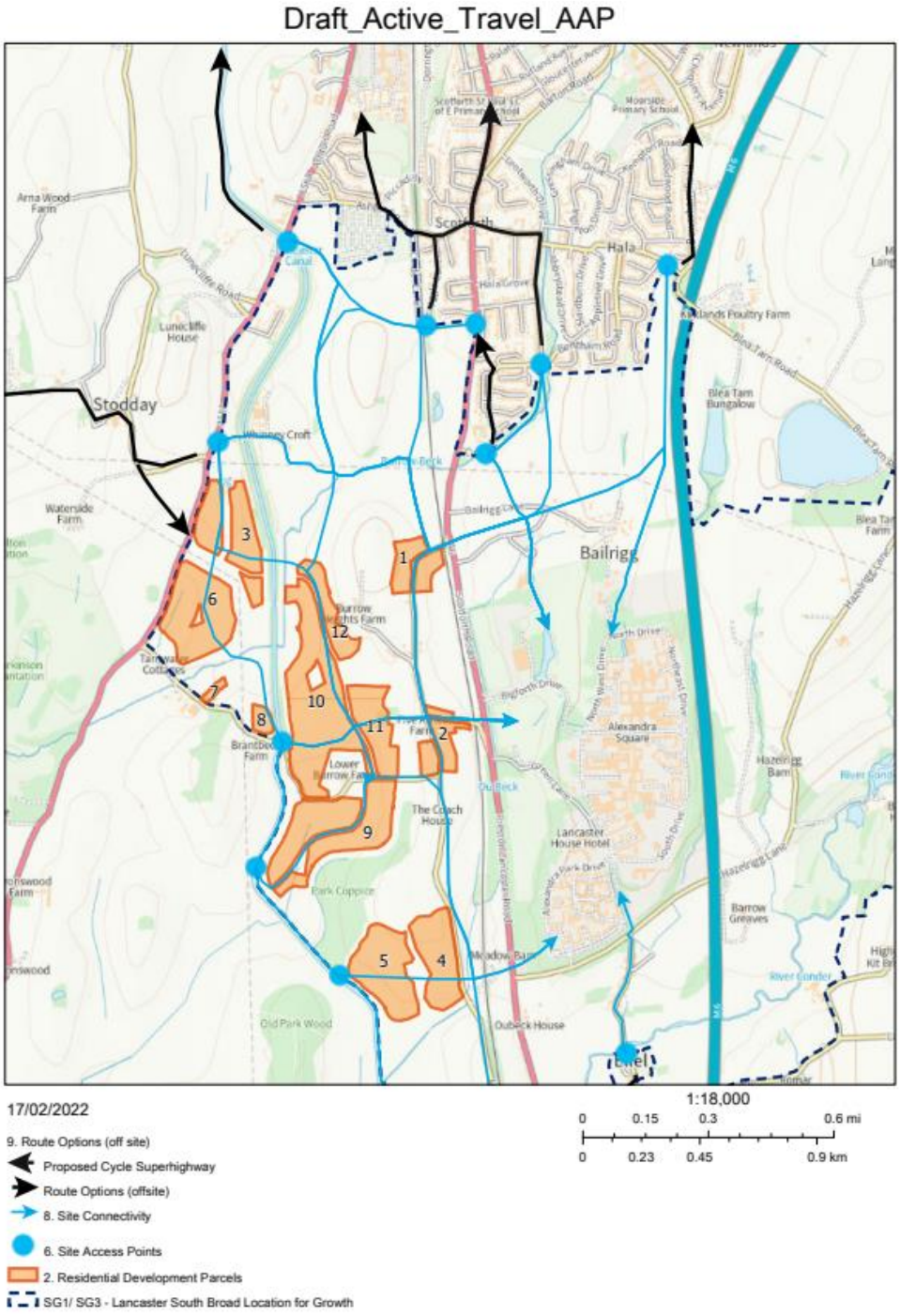
How does it perform against the ten objectives?

9.47 The performance of the existing bus network against the ten objectives is set out as a RAG score at the end of this section.

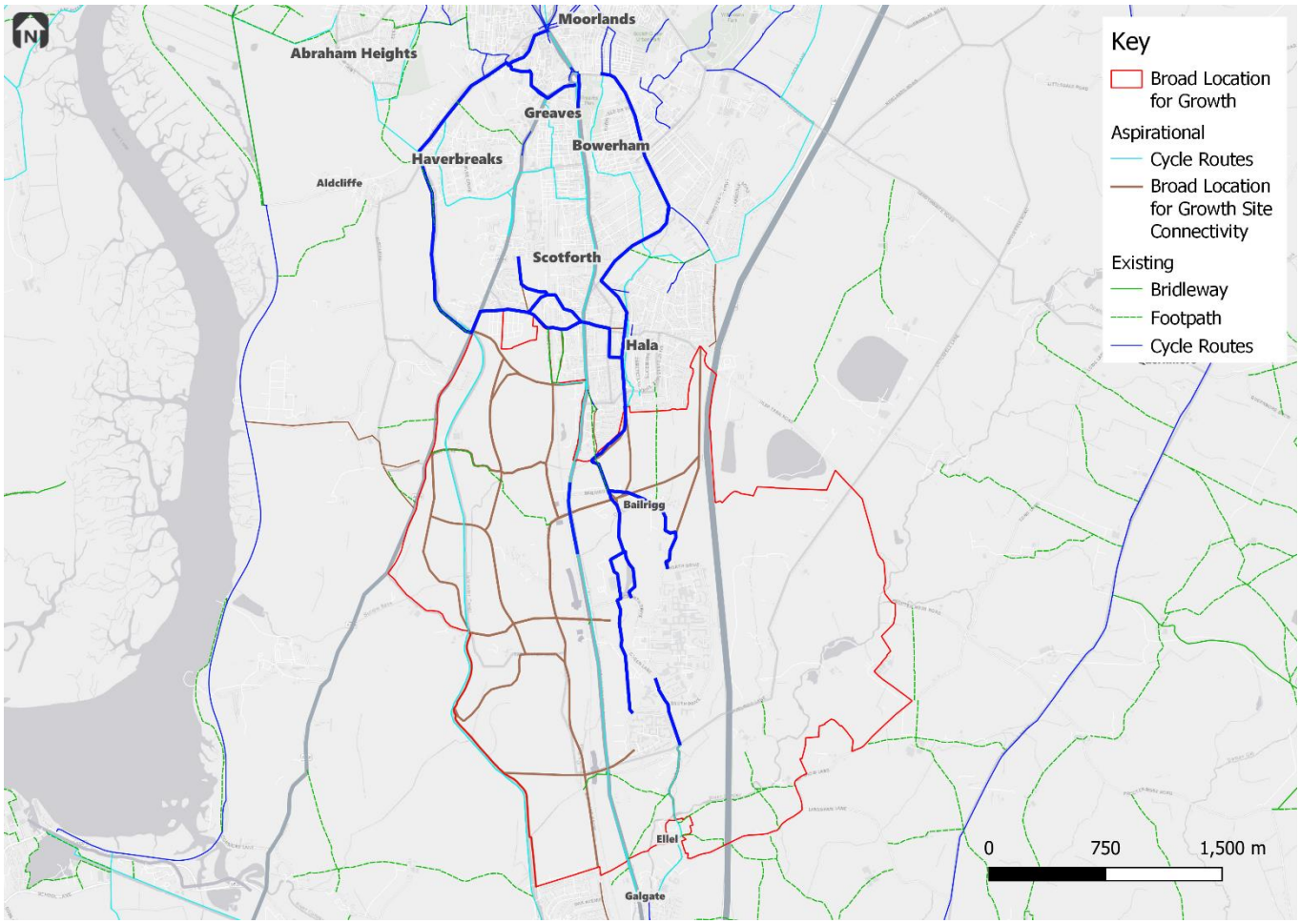
Aspirational Network

Active Travel

9.48 LCiC and LCC have identified a strategic network for the AAP as a starting point, which link proposed residential areas to key attractors.



9.49 LCiC's wider aspirational cycle network is mapped out below, which also shows the potential network suggested by JTP in the Spatial Masterplan Framework Document.



Does it form a coherent network?

9.50 The aspirational network is considerably more coherent than the existing infrastructure, notably within the BLG which would provide east to west as well as north to south connections. The route along the A6 provides one continuous link from north to south, with other routes peeling off it.

9.51 Within BGV, the routes show a clear, continuous network linking the south of the site near Galgate with the southern extents of Lancaster city centre, allowing for day-to-day destinations to be accessed easily. Off-site route options also propose connections to the existing strategic cycle route to Glasson Dock, as well as improved access north into the southern extents of the city centre.

Does it link to the district's key attractors?

9.52 The proposed A6 aspirational cycle route allows people to easily access the key services and facilities in the city centre, which from there provides onward connections to popular destinations such as Morecambe, Carnforth and the South Lakelands.

9.53 The east to west connections across the site also enables easier access for residents of BGV to Lancaster University campus and the employment and leisure opportunities located there.

9.54 However, the aspirational routes do not take into account potential links to Quernmore and the Forest of Bowland to the east or more rural communities to the south.

Is it direct in connecting to key attractors?

9.55 As established, the A6 cycle route provides a much more direct route to the BLG, Lancaster University campus and Galgate. The additional proposed routes to the south of the Pointer Roundabout also provide more direct access than the existing offer which at present guides people via Bowerham and Scotforth.

Does it contribute to a high-quality public realm?

9.56 The short section of shared cycle/pedestrian track along the A6 that has recently been installed contributes positively to the quality of the public realm with wide and well-maintained pavements. A continuous route along the A6 will further improve this if developed to the same standard. There should perhaps be a greater focus on providing more green infrastructure such as street trees and parklets along the A6 route, particularly closer to the city centre where there will be more people located.

9.57 Cycling infrastructure also reduces congestion and encourages more people to cycle and use the infrastructure[10], further positively contributing to the quality of the public realm. To maximise the proposed routes' contributions, it should be designed to the highest standards in accordance with LTN 1/20.

Is the network safe?

9.58 LTN 1/20 highlights that safety for cyclists is largely determined by improved cycling infrastructure, so increasing the quantity of high-quality dedicated infrastructure should be a key priority. This is especially important on the busier roads such as the A6 and around the city centre and Pointer Roundabout where there is heavier motor vehicle traffic.

9.59 As such, the proposed A6 route will contribute positively to safety concerns. This would preferably be a continuous segregated route separated from the main traffic, but due to highway constraints identified by LCC, this is now looking less likely.

[10] Six reasons to build cycle lanes | Cycling UK

How does it perform against the ten objectives?

9.60 The performance of the aspirational active travel network against the ten objectives is set out as a RAG score in Table 5-3 at the end of this section.

Bus

9.61 Proposals for Lancaster's bus network have evolved since the Highways and Transport Masterplan was published in 2016. The concept of a Bus Rapid Transit scheme is no longer considered viable due to a lack of road space along the A6. Instead, enhancements to existing routes and services are sought ('Superbus' routes). This is the bus corridor between Heysham, Morecambe, Lancaster and Lancaster University.

9.62 Bus priority measures are to be provided on Ashton Road and in Bowerham, with funding coming through the BSIP allocation. LCC's plans for a Park & Ride near to J33 of the M6 as part of the HIF scheme are now suspended, and for this reason the aspirational network – whilst having potential – is uncertain and unfunded, and hence is unlikely to deliver the ambition.

9.63 Due to a lack of evidence and support from relevant rail organisations, there is currently no plan to provide a new rail station at Bailrigg.

Are the services frequent?

9.64 At present, there are already frequent services between the city centre and the BLG, around Lancaster University, with over five every hour.

9.65 To enhance existing services, specific routes have been identified in Lancashire County Council's Bus Service Improvement Plan (BSIP) known as 'Superbus' routes. Superbuses in urban areas in effect operate on a 'walk up' basis (at least 5 buses per hour) but will aim to run at least every 10 minutes. The Lancaster University – Lancaster – Lancaster Railway Station route is classified as an 'urban' route, and as such the above frequency will be the target.

Does it link to the district's key attractors?

9.66 As established above, the aspirational bus network in South Lancaster will in many ways build upon and improve the existing network through bus priority measures, which means it will focus on providing frequent services between the city centre and Lancaster University along the A6 corridor, as part of the 'Superbus' route, as well as Lancaster Railway Station. The A6 corridor network will also link with Carnforth to the north and Morecambe to the north-west.

9.67 The BGV Masterplan highlights that bus connectivity through the development (along the new spine road) will be a high priority and essentially act as an extension to the existing network.

9.68 Where the aspirational route is less clear is if it will link to the Forest of Bowland to the east or more rural communities around South Lancaster. The County Council's BSIP highlights that community transport and DRT services will be considered to provide viable public transport solutions to rural communities.

Is it direct in connecting to key attractors?

9.69 The aspirational bus network may be less direct and slower than originally planned, given that the Bus Rapid Transit scheme along the A6 has been dropped, however, proposed bus priority measures along the route and particularly along Ashton Road and in Bowerham will make the bus a more competitive mode of transport than the existing conditions.

Are services rendered unreliable by congestion?

9.70 As established, dropping the Bus Rapid Transit scheme means that there will be more contact with mixed traffic, and along the A6 this gets particularly congested around the Pointer Roundabout and Galgate in peak hours. However, bus priority measures and further improvements to the bus network will help to mitigate this.

9.71 It will need to be accompanied by targeted and well-funded behaviour change programmes to encourage people to not only use public transport instead of cars but also to cycle and walk. This means that buses will need to link effectively with active travel modes.

Other proposals

9.72 Lancashire County Council's BSIP also outlines a number of other proposals which plan to be implemented in Lancaster and the surrounding area, including lowering fares for particular age groups such as under 19s, introducing multi-operator ticketing, improve the bus user experience and ensure sustained marketing support through campaigns and social media.

How does it perform against the ten objectives?

9.73 The performance of all of the above networks is summarised below.

Existing and aspirational networks RAG scores against objectives

Objective	Existing		Aspirational	
	Active	Bus	Active	Bus
Minimise the need to travel by providing a wide range of day-to-day facilities on site and delivering growth with gentle density				
Through the design of transport networks, streets, and parking within the BLG, make active travel and low carbon transport the most convenient and reliable choice				
Deliver dedicated and high-quality active travel and public transport infrastructure in early phases of development, which are commercially viable and also benefit existing communities and journeys				
Support economic growth within new and existing communities by improving connectivity between South Lancaster and the wider district, notably the city centre, key employment and education locations, and rural communities to the south				
Tackle inequality by ensuring safe, clean, convenient, inclusive and affordable sustainable transport choices for all, including disadvantaged and less connected groups and areas				
Support LCiC and LCC's related transport, climate, safety, public health, and placemaking objectives				
Plan networks which accommodate trips for a range of purposes and to different destinations, including for education, leisure and shopping as well as for commuting				
Advance and exploit shared transport, electrification and ultra-low emission transport technologies, especially where car travel remains the only viable choice for some journeys				
Influence travel choices and car dependency through an effective marketing and promotional strategy, integrated with Lancaster University and extending across Lancaster District				
Integrate new transport networks sympathetically into the existing drumlin landscape, and considering the surrounding heritage and built form				

Appendix B

Mode shift and carbon modelling Technical Note

Title	Lancaster South Mode Shift and Carbon Modelling Approach
Date	18/07/23
Author(s)	NS
Project Code	4005
Version	2-1

1. Introduction

1.1 This Technical Note has been produced to outline the process of using the Mode Shift Model to derive mode share targets for the Lancaster South Broad Location for Growth (BLG), based extent and quality of infrastructure and interventions delivery. The approach to estimating carbon equivalent (Co2e) emissions from vehicle trips is also outlined. This Note should be read in conjunction with the main report produced by ITP, titled *Lancaster South Sustainable Travel Strategy*.

1.2 To understand the potential for the BLG to achieve high levels of active and sustainable mode share as a result of new sustainable transport infrastructure, a bespoke 'Mode Shift Model' (MSM) has been developed. Based on the case study evidence outlined in the main report, this models **at a high level** the likely impacts of introducing different interventions and infrastructure at different points in time and across different geographies.

1.3 The process of defining the mode share outputs has then been undertaken in two parts:

1) Establishing baseline 'business as usual' trip rates and mode shares.
2) Applying the bespoke MSM to generate revised alternative, 'ambitious' trip rates and mode shares, to inform the Sustainable Travel Strategy for the BLG.

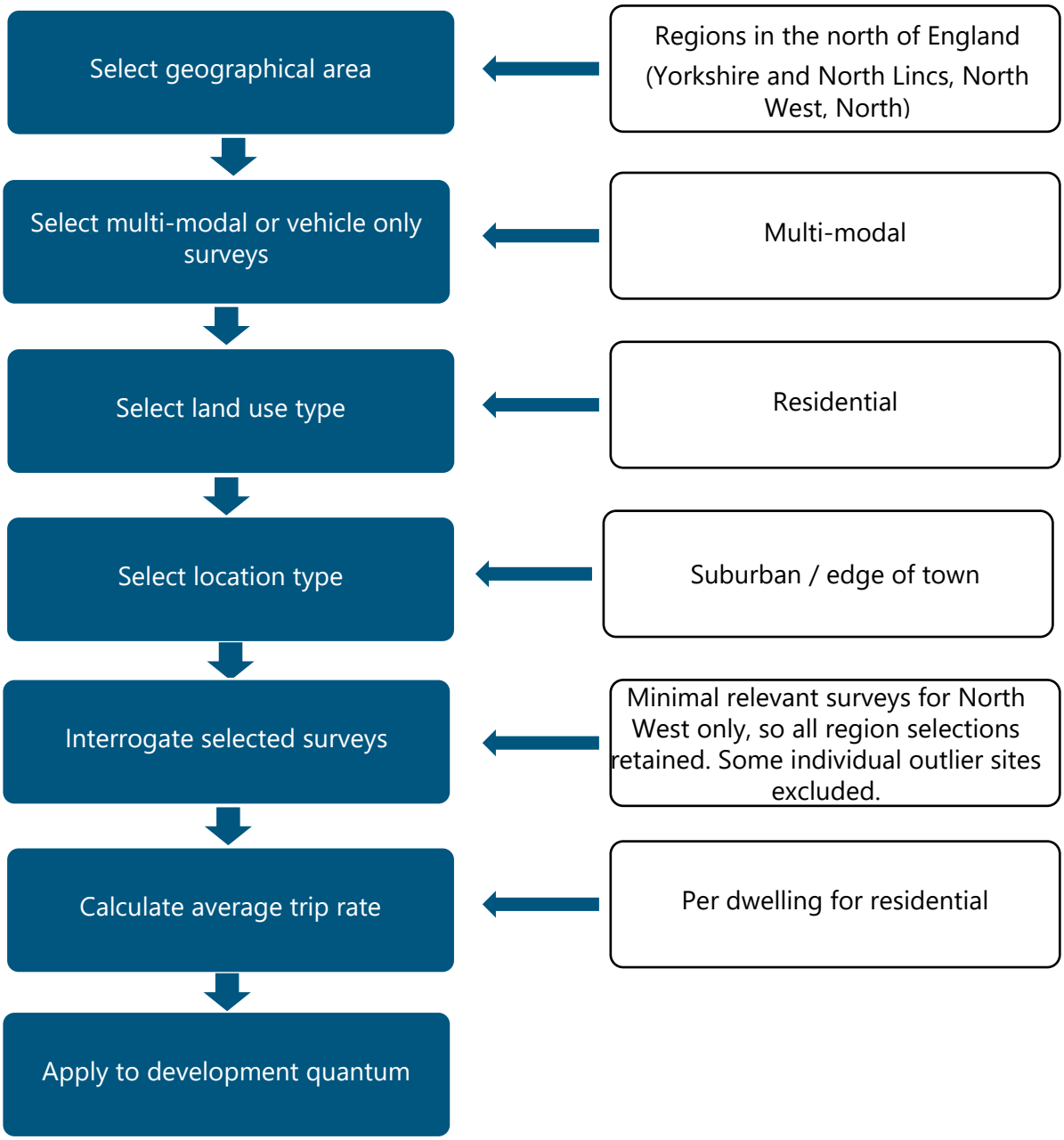
1.4 The process has been used to understand likely impacts of three different packages of interventions in a 2040 future year, set out as three scenarios. The methodology is the same for each scenario, representing 'low', 'medium' and 'high' levels of intervention.

1.5 It should be noted that the primary focus of this has been on residential land uses and the trips generated by them, given they represent the most significant land use at the BLG. There is also less certainty at present over where and what quantum of employment or other land uses would be provided.

2. TRICS 'Business as usual' trip rates and mode share

2.1 'Business as usual' (BAU) trip rates have initially been derived using the TRICS trip rate database. This is an 'industry standard' method for predicting the number of trips generated by a site. TRICS is based on surveys of different land uses around the UK, over a number of years, and is therefore an empirical method of predicting demand, which captures all trip purposes and modes. The TRICS-based trip rate methodology and the inputs selected are summarised in Figure 2-1.

Figure 2-1: TRICS BAU trip rate methodology and inputs



2.2 Based on this, the 'BAU trip rates, providing a starting point for application to the BLG scenarios are shown in Table 2-1. It indicates that, for example, for one residential

dwelling a total of 0.011 public transport users are predicted to be generated in the morning peak hour (and these could be by any public transport mode). For 100 dwellings, 1.1 public transport users would be therefore generated in the BAU scenario.

Table 2-1: BAU residential trip rates and mode shares

Mode	Two-Way Trip Rates			Mode Share			Two-Way Trip Generation		
	AM Peak	PM Peak	Daily	AM Peak	PM Peak	Daily	AM Peak	PM Peak	Daily
Vehicles	0.485	0.423	4.099	77%	79%	76%	1,698	1,481	14,347
Public transport	0.011	0.014	0.166	2%	3%	3%	39	49	581
Active travel	0.135	0.097	1.118	21%	18%	21%	473	340	3,913

2.3 It should be noted that the 'vehicle' trip rate shown in Table 2-1 is not directly comparable with, for example, the car driver mode share provided by Census data. The vehicle trip rate is used to calculate the number of discrete vehicle trips generated by the site. This does not mean that out of all people entering or exiting the site, 76% of them would be driving a car; it means that out of all vehicle, public transport or active travel trips, 76% are vehicles. There will be a proportion of people who are passengers in vehicles and some other vehicle types such as taxis are included at a much lower volume. A 'vehicle' trip rate is also necessary for modelling purposes rather than a 'car driver' trip rate, and relates directly to the TCPA Garden City Principle mode share targets.

2.4 The reason that TRICS trip rates have been chosen as a basis for calculating mode share and trip generation of the scenarios is that they give a reasonable representation of total trips throughout the day and / or during a specific time period. Data from the Census, for example, is a useful proxy where other data is not available, but it only accounts for commuting trips. Whilst these make up a large proportion of peak hour trips, they account for only around 15% of total trips and do not include trips relating to education, shopping, leisure, inbound commuting and delivery/servicing purposes.

2.5 However, TRICS data also comes with limitations. Whilst the TRICS trip rates allow for some consideration of the accessibility of a site, in terms of its geographical location and proximity to urban centres, there is little room to take into account other nuances. This is driven by the fact that TRICS is empirically based and cannot be tailored to reflect the characteristics of the specific site in question. The existing and potential connectivity of the BLG, as outlined in the main report, cannot be captured through this conventional approach.

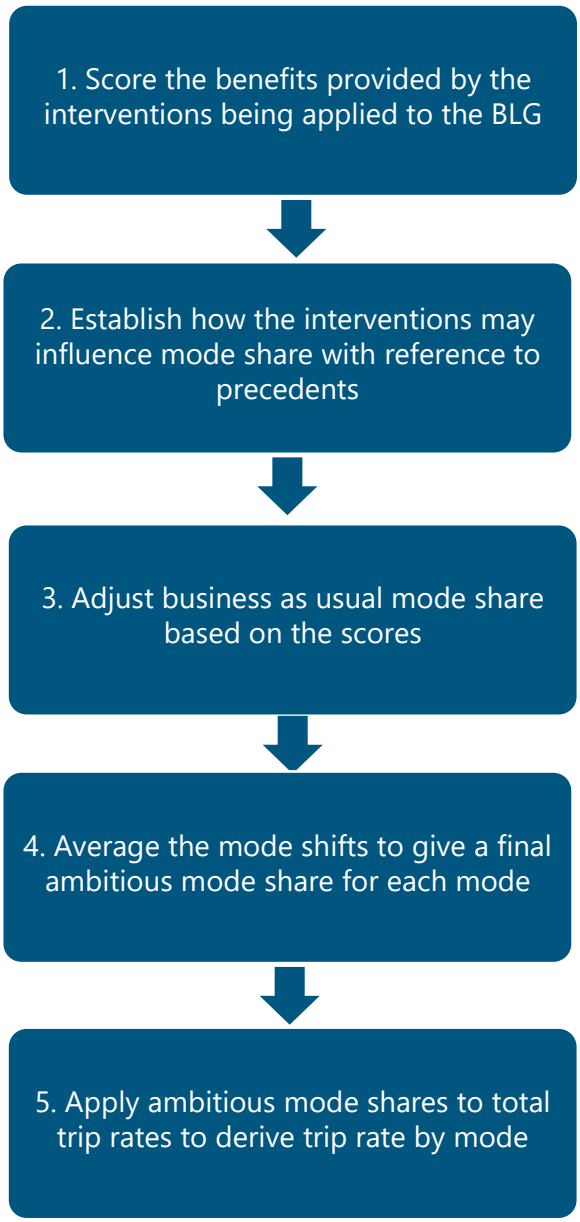
2.6 As a result of this, and on a more fundamental level, use of TRICS trip rates is likely to only perpetuate trip generation and mode share characteristics that have come before. Applying the TRICS data to the BLG would result in predictions of vehicle generation and car driver mode share very similar to the national average, because TRICS does not

have any surveys of recent sites which have adopted a vision-led approach. This is precisely the reason that the MSM has been developed - to understand the implications of improvements to connectivity at a local level.

3. Developing the 'ambitious' trip rates and mode shares

3.1 Alternative, 'ambitious' mode shares have been derived, using the BAU mode share as a basis. These inform the potential final mode shares achieved by the BLG in 2040 as a result of the vision-led approach and introduction of sustainable transport-focussed interventions and infrastructure in each scenario. The overarching methodology adopted in the MSM to define alternative mode shares and trip rates is summarised in Figure 3-1 overleaf.

Figure 3-1: Ambitious trip rate methodology



Stage 1: Score benefits provided by new interventions for each scenario

3.2 Based on the proposed on- and off-site interventions suggested, each scenario (high / medium / low) has been scored using a four-point scale against the themes detailed in Chapter 8 of the main report. For ease of reference, these are replicated below:

1) Public transport
2) Active travel
3) Traffic and parking management
4) Placemaking and land use planning

3.3 The scores are applied based on judgement and experience. The rationale is summarised in brief below for each scenario and each theme.

	Public transport	Active travel	Traffic / parking management	Placemaking and land use planning
Low scenario	Minimal priority on- or off-site, aside from bus gate	Minimal connections off-site, no mobility hub network	City centre measures. No traffic management on-site aside from bus gate	One main local centre, lower density and car-focussed elsewhere
Medium scenario	Minimal priority on- or off-site, aside from bus gate	Few utility connections off site, minor/some mobility hubs	Bus gates, modal filters and some parking management on-site.	All homes with 15 minutes' walk of key services, enhanced streets and public realm
High scenario	More priority on and off-site, though still constrained off-site	High quality utility and leisure connections on- and off-site, supported by mobility hub network	On- and off-site restrictions, parking restricted in appropriate contexts	All homes within 10-15 minutes walk of key services, exemplary streets and public realm. May be difficult / contentious to achieve high density

Stage 2: Influence of interventions on mode share with reference to precedents

3.4 The potential mode shift achievable as a result of interventions is calculated in the MSM by drawing on the case study review outlined in Chapter 6 of the main report. For each theme, places where high levels of mode share are achieved for that theme were identified. For example, places that achieved high walking and cycling mode share were identified under the active travel theme. So far as possible, places which bore

minimal contextual reference to Lancaster and the BLG were not included – for example it was considered very unlikely that the BLG could achieve similar levels of cycling to Amsterdam or Copenhagen, so these are not included under the active travel theme. The extent to which the selected places achieved modal shift from the BAU scenario is quantified and applied in Stage 3 (below).

Stage 3: Adjust TRICS mode share for each theme based on the scores

3.5 Dependent on the score applied for each theme, a mode shift adjustment is made to the TRICS mode share by the MSM. For example, if a scenario achieved a score of 4 for active travel, based on a judgement of on- and off-site walk and cycle provision, the active travel mode share would increase, reflecting more closely the locations identified in the case study review where high active travel mode share was achieved (as above in Stage 2). If it was assigned a score of 2 or 3, the cycling mode share would increase, but to a lesser extent. No changes were made for themes where the scenario achieved a score of 1. This means that no mode shifts are proposed for those themes in those scenarios, and hence the BAU mode share would be perpetuated.

Stage 4: average the mode shift

3.6 Once the shifts referred to above are made, the MSM produces an average of all of the mode shifts, which is then pro-rated to give a summed figure back up to 100%.

3.7 This process was repeated for each theme and for each scenario. An example of the process of the MSM is shown in Table 3-1. This shows the morning peak hour in the Medium scenario.

Table 3-1: Medium scenario scores and mode shifts (AM peak)

Scenario	Theme				Mode	TRICS trip rates	TRICS mode share	Mode shift by theme				Ave	Ambitious mode share
	1	2	3	4				1	2	3	4		
Medium	2	2	3	2	Vehicles	0.485	77%	61%	62%	42%	61%	57%	61%
					Public transport	0.011	2%	14%	2%	7%	2%	6%	7%
					Active travel	0.135	21%	21%	33%	31%	34%	30%	32%

3.8 The scores applied to each themes in each scenario, and the subsequent mode shifts, are presented at the end of this Technical Note.

Stage 5: apply ambitious mode share to trip rates to derive trip rate by mode

3.9 The final stage is to apply the mode shares identified above for each scenario to the TRICS trip rates initially identified using the BAU trip rate methodology.

3.10 Again, the full process for all scenarios is presented at the rear of this Technical Note, whilst the example for the medium scenario in the AM peak is shown in Table 3-2:

Table 3-2: Medium scenario ambitious mode share and trip rates (AM peak)

Scenario	Mode	TRICS Trip Rates	TRICS Mode Share	Ambitious Mode Share	Ambitious Trip Rates
Medium	Vehicles	0.485	77%	61%	0.385
	Public transport	0.011	2%	7%	0.043
	Active travel	0.135	21%	32%	0.203

3.11 The calculation of alternative, ambitious mode shares and trip rates allows for comparison of the number of vehicle, public transport user and active travel trips that would be generated under the BAU and ambitious scenarios, demonstrating that delivery of sustainable-transport focussed infrastructure should reduce vehicle trips and increase trips by other modes. The extent to which this happens depends on how well the scenario scores against the themes, so further reductions in vehicle trips would require greater levels of high quality walk, cycle and public transport interventions. The difference in trip generation is shown, using the medium scenario example, in Table 3-3.

Table 3-3: Medium scenario BAU and ambitious trip generation (AM peak)

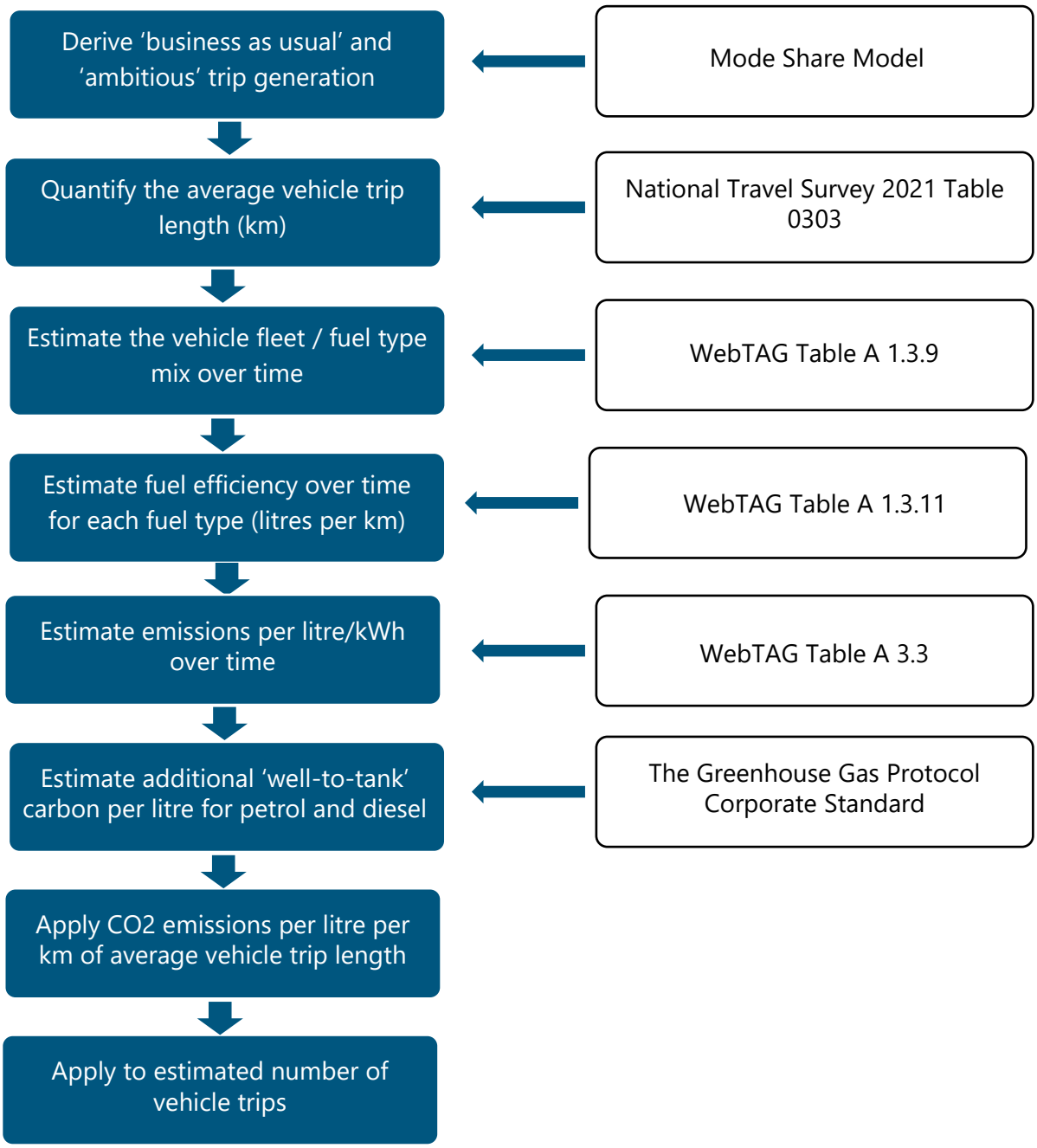
Scenario	Mode	BAU scenario trips	Medium scenario trips
Medium	Vehicles	1698	1348
	Public transport	39	149
	Active travel	473	711

4. Carbon modelling

4.1 A high-level carbon model has been developed, based on standard data inputs from sources such as the DfT's TAG databooks, to estimate the carbon equivalent emissions resulting from vehicle trips generated by the BLG. The process to derive vehicle trip generation for each scenario is the same as that outlined above in this Technical Note.

4.2 The remaining process to convert vehicle trips into carbon emissions (emitted both at source and embedded in the production / transport of vehicles) is summarised in Figure 4-1.

Figure 4-1: Carbon modelling approach



4.3 The inputs derived from the various data sources above are replicated in the data sheet below, with the detailed mode share and CO2e emission calculations and results on the following pages.

Constants

Variable	Emission / distance	Source	
Average car journey (km)	11.84	NTS 2021	7.4 miles converted to km
Average bus journey (outside London, km)	9.12	NTS 2021	5.7 miles converted to km
Annualisation factor	300		
Well-to-Tank diesel (kgCO2e/litre)	0.6099		
Well-to-Tank petrol (kgCO2e/litre)	0.6133		

2040 Cars

Fuel consumption diesel (litres per km)	0.0607
Fuel consumption petrol (litres per km)	0.0644
Fuel consumption electric (kWh/km)	0.1667

Diesel kgCO2e per litre	2.5086
Petrol kgCO2e per litre	2.1100
Electric kgCO2e per kWh	0.0156

Type of vehicle	2040 Fleet mix	Fuel consumed per average trip		CO2e per average trip	
Diesel	9%	0.7188	Litres	0.002242	T
Petrol	28%	0.7628	Litres	0.002077	T
Battery electric	63%	1.9732	kWh	0.000031	T

Detailed model outputs

Business as Usual trip rates (taken from TRICS)

Mode	Morning Peak Hour (08:00 – 09:00)			Evening Peak Hour (17:00-18:00)			Daily	Vehicle, PT and Active Mode Share		
	Arrivals	Departures	Two-way	Arrivals	Departures	Two-way	Two-way	AM Peak	PM Peak	Daily
Vehicles	0.105	0.380	0.485	0.281	0.142	0.423	4.099	77%	79%	76%
Cars			0.436			0.406	3.829			
Taxis	0.008	0.008	0.016	0.001	0.001	0.002	0.056			
HGVs	0.000	0.000	0.000	0.000	0.000	0.000	0.027			
Buses										
Cyclists	0.001	0.032	0.033	0.011	0.004	0.015	0.187	5%	3%	3%
Vehicle Occupants	0.119	0.539	0.658	0.376	0.184	0.560	5.448			
Pedestrians	0.027	0.075	0.102	0.060	0.022	0.082	0.931	16%	15%	17%
Bus / Tram Passengers	0.000	0.010	0.010	0.008	0.005	0.013	0.147			
Rail Passengers	0.000	0.001	0.001	0.001	0.000	0.001	0.020			
Coach Passengers										
Public Transport Users	0.000	0.011	0.011	0.009	0.005	0.014	0.166	2%	3%	3%
People	0.147	0.657	0.804	0.456	0.215	0.671	6.730			
Total Vehicle + PT + Active	*0.133*	*0.498*	*0.631*	*0.361*	*0.173*	*0.534*	*5.383*	*100%*	*100%*	*100%*

Mode Shifts Based on Sustainable Places

Business as Usual Mode Shares			
Value	**Car**	**Public Transport**	**Active**
Minimum	76%	2%	18%
Maximum	79%	3%	21%

Theme		General change to mode shares	Places achieving high sustainable and active mode shares against these themes			
			Place	**Vehicle**	**Public Transport**	**Active**
1	PUBLIC TRANSPORT: e.g. BRT and bus priority; close proximity to halts; mobility hubs and MAAS	Likely to reduce vehicle trips in favour of public transport trips	Hull	53%	15%	22%
			Riga	31%	47%	23%
			Tartu	46%	22%	30%
			Hammarby Sjostad	21%	52%	27%
			Average	38%	34%	25%
			Minimum difference from BAU	-38%	32%	7%
			Maximum difference from BAU	-41%	31%	4%
			Mid point (max BAU adjustment)	***-40%***	***32%***	***5%***
2	ACTIVE TRAVEL: e.g. traffic free cycle networks (on-site); traffic free cycle networks (off-site); traffic calmed / low speed / low traffic volume streets	Likely to reduce car and possibly public transport trips in favour of active travel	Litomerice	50%	9%	41%
			Munster	29%	10%	61%
			Houten	34%	11%	55%
			Odense	54%	5%	39%
			Average	42%	9%	49%
			Minimum difference from BAU	-34%	7%	31%
			Maximum difference from BAU	-37%	6%	28%
			Mid point (max BAU adjustment)	***-36%***	***7%***	***29%***
3	TRAFFIC AND PARKING MANAGEMENT: e.g. constrained car parking levels; robust parking controls; mix of on- and off-plot car parking; filtered permeability providing journey time advantage to walking, cycling and public transport	Likely to reduce vehicle trips in favour of public transport and active travel trips	Pontevedra	22%	3%	76%
			Brighton	27%	16%	17%
			Nottingham	27%	12%	11%
			Average	25%	10%	35%
			Minimum difference from BAU	-51%	9%	17%
			Maximum difference from BAU	-54%	8%	13%
			Mid point (BAU adjustment)	***-52%***	***8%***	***15%***
4	PLACEMAKING AND LAND USE PLANNING: e.g. mix of day to day facilities including open spaces, education, ability to capture on-site trips through work hubs, retail lockers etc (new ways of working / shopping post pandemic)	Likely to reduce all external trips, and vehicle and public transport trips, in favour of active travel	Houten	34%	11%	55%
			Poundbury	64%	10%	26%
			Pontevedra	22%	3%	76%
			Rostock	36%	17%	47%
			Average	39%	10%	51%
			Minimum difference from BAU	-37%	9%	33%
			Maximum difference from BAU	-40%	8%	30%
			Mid point (max BAU adjustment)	***-39%***	***8%***	***31%***

Outputs
3500
dwellings

Public transport
Active travel
Traffic and parking management
Placemaking and land use planning

Scenario	Theme rating				Mode	BAU Two-Way Trip Rates			BAU Mode Share			BAU Two-Way Trip Generation			BAU Co2e emissions - Tonnes (2040 fleet mix assumptions)				Mode Shift by Theme - AM Peak				Mode Shift by Theme - PM Peak				Mode Shift by Theme - Daily				Average			Mode	Ambitious Mode Share			Ambitious Trip Rates			Ambitious Trip Generation			Ambitious Co2e emissions - Tonnes				Mode	Difference in trips between BAU and mode shift scenarios			Co2e savings between BAU and ambitious scenarios - Tonnes			
	1	2	3	4		AM Peak	PM Peak	Daily	AM Peak	PM Peak	Daily	AM Peak	PM Peak	Daily	AM Peak	PM Peak	Daily	Annually	1	2	3	4	1	2	3	4	1	2	3	4	AM Peak	PM Peak	Daily		AM Peak	PM Peak	Daily	AM Peak	PM Peak	Daily	AM Peak	PM Peak	Daily	Annually		AM Peak	PM Peak	Daily	AM Peak	PM Peak	Daily	Annually
Business As Usual	1	1	1	1	Vehicles	0.485	0.423	4.099	77%	79%	76%	1698	1481	14347	1.4	1.2	11.6	3,481																																				
					Public transport	0.011	0.014	0.166	2%	3%	3%	39	49	581																																							
					Active travel	0.135	0.097	1.118	21%	18%	21%	473	340	3913																																							
Low	2	1	2	1	Vehicles	0.485	0.423	4.099	77%	79%	76%	1698	1481	14347	1.37	1.20	11.60	3,481	61%	77%	56%	77%	63%	79%	58%	79%	60%	76%	55%	76%	68%	70%	67%	Vehicles	70%	73%	70%	0.443	0.388	3.743	1552	1359	13102	1.3	1.1	10.6	3,179	Vehicles	-145	-121	-1,245	-0.1	-0.1	-1.0	-302
					Public transport	0.011	0.014	0.166	2%	3%	3%	39	49	581					14%	2%	5%	2%	15%	3%	6%	3%	16%	3%	6%	3%	6%	7%	7%	Public transport	6%	7%	7%	0.037	0.037	0.395	131	128	1381					Public transport	93	79	800				
					Active travel	0.135	0.097	1.118	21%	18%	21%	473	340	3913					21%	21%	27%	21%	18%	18%	24%	18%	21%	21%	27%	21%	23%	20%	22%	Active travel	24%	20%	23%	0.150	0.109	1.245	525	382	4358					Active travel	53	42	445				
Medium	2	2	3	2	Vehicles	0.485	0.423	4.099	77%	79%	76%	1698	1481	14347	1.37	1.20	11.60	3,481	61%	62%	42%	61%	63%	79%	58%	79%	60%	62%	41%	61%	57%	70%	56%	Vehicles	61%	73%	60%	0.385	0.388	3.245	1348	1359	11357	1.1	1.1	9.2	2,756	Vehicles	-349	-121	-2,989	-0.3	-0.1	-2.4	-725
					Public transport	0.011	0.014	0.166	2%	3%	3%	39	49	581					14%	2%	7%	2%	15%	3%	6%	3%	16%	3%	9%	3%	6%	7%	8%	Public transport	7%	7%	8%	0.043	0.037	0.440	149	128	1542					Public transport	110	79	961				
					Active travel	0.135	0.097	1.118	21%	18%	21%	473	340	3913					21%	33%	31%	34%	18%	18%	24%	18%	21%	32%	31%	33%	30%	20%	29%	Active travel	32%	20%	32%	0.203	0.109	1.698	711	382	5941					Active travel	239	42	2,028				
High	3	4	4	3	Vehicles	0.485	0.423	4.099	77%	79%	76%	1698	1481	14347	1.37	1.20	11.60	3,481	50%	41%	25%	51%	63%	79%	58%	79%	50%	40%	24%	50%	42%	70%	41%	Vehicles	47%	73%	46%	0.298	0.388	2.497	1042	1359	8741	0.8	1.1	7.1	2,121	Vehicles	-655	-121	-5,606	-0.5	-0.1	-4.5	-1,360
					Public transport	0.011	0.014	0.166	2%	3%	3%	39	49	581					23%	2%	10%	2%	15%	3%	6%	3%	24%	3%	11%	3%	9%	7%	10%	Public transport	10%	7%	12%	0.065	0.037	0.633	226	128	2214					Public transport	188	79	1,633				
					Active travel	0.135	0.097	1.118	21%	18%	21%	473	340	3913					21%	51%	36%	42%	18%	18%	24%	18%	21%	50%	36%	42%	38%	20%	37%	Active travel	43%	20%	42%	0.269	0.109	2.253	940	382	7886					Active travel	468	42	3,973				

Score	Site is
1	Not achieving against this theme
2	Some way towards achieving this theme
3	Good against this theme
4	Exemplar against this theme

Mode shifts from BAU	Veh	PT	AT
BAU daily	76%	3%	21%
Low daily	-7%	4%	2%
Medium daily	-16%	5%	11%
High daily	-30%	9%	21%

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