Draft Report

June 2019

Leeds Local Cycling and Walking Infrastructure Plan: Phase 1

Contents

1 Introduction

Background

1.1 In 2017 the Government published its first Cycling and Walking Investment Strategy, which sets out an ambition to make cycling and walking the natural choices for shorter journeys or as part of a longer journey. The Strategy's objectives are to:

- Increase cycling activity; doubling the number of cycle stages made each year from 0.8 billion in 2013 to 1.6 billion in 2025
- Increase walking activity to 300 walking stages per person per year
- Reduce the rate of cyclists being killed or seriously injured on England's roads
- Increase the percentage of children aged 5 to 10 that usually walk to school from 49 per cent in 2014 to 55 per cent in 2025

1.2 Local Cycling and Walking Infrastructure Plans (LCWIPs) form part of the Strategy and set out a new, strategic approach to identifying cycling and walking improvements required at the local level. They enable a long-term approach to developing cycling and walking networks so that the Government's objectives can be achieved. The key outputs of LCWIPs are:

- A network plan for cycling and walking, which identifies preferred routes and core zones for further development;
- A prioritised programme of infrastructure improvements for future investment; and
- A report that sets out the underlying analysis carried out and a narrative to support the identified improvements.

The West Yorkshire LCWIP

1.3 Development of the West Yorkshire LCWIP has been co-ordinated by West Yorkshire Combined Authority (The Combined Authority), which has commissioned Steer to support the process. Steer has worked with The Combined Authority, the five West Yorkshire districts, and project partners Mobycon and Living Streets to develop this LCWIP.

1.4 Development of LCWIPs in West Yorkshire forms part of objectives and proposed policies to increase levels walking and cycling set out in the West Yorkshire Transport Strategy. This includes a target of increasing levels of cycling by 300 per cent by 2027 and a target of increasing walking by 10 per cent by 2027.

1.5 LCWIPs also support Transport Strategy Road Network Policy 11 to provide improved cycling infrastructure, and Places to Live and Work Policy 28 to provide safe and convenient walking and cycling networks. The West Yorkshire LCWIP is made up of individual LCWIPs for the five West Yorkshire Partner Councils. They will function and act as standalone LCWIPs, and be brought together into the West Yorkshire LCWIP.

1.6 The West Yorkshire and constituent Partner Council LCWIPs are expected to meet the following overarching objectives:

- To identify the highest-priority local cycling and walking improvements within target areas to enable subsequent scheme development and delivery, as part of a long-term approach to developing local cycling and walking networks
- To support investment that will:
    - help achieve Transport Strategy targets to increase the numbers of people walking and cycling and enable people to make shorter journeys on foot or by bike, offering convenient, healthy and affordable travel options as part of healthy living plans.

1.7 The full development of a comprehensive West Yorkshire LCWIP, with five constituent LCWIPs covering the urban and rural areas of the region, will involve a significant amount of resource and time to deliver. **The resources currently available (including support from DfT) will enable some, but not all, of the work required to carry out the development of a comprehensive Network Plan that provides networks of suitable density and coverage for the whole of West Yorkshire. Development of a West Yorkshire and individual Partner Council LCWIPs is therefore expected to be delivered through several phases of work.**

1.8 This initial phase will focus on specific geographic areas of each Partner Council area, within which Core Walking Zones, routes and cycling network desire lines will be identified, and resulting schemes assessed.

LCWIP phase 1: focus

1.9 A separate scoping report is available which outlines the process undertaken to identify the initial areas of focus for phase 1 of LCWIP development in Leeds.

1.10 Identifying an area of focus for cycling was informed by initial analysis using the Propensity to Cycle Tool (PCT) and Steer's Cycling Potential Index (CPI).

1.11 The PCT assumes potential levels of cycling based on trip distances, hilliness and age profiles. It does not take account of existing or planned infrastructure and therefore to achieve the potential indicated, the necessary quality of cycling infrastructure would need to be in place.

1.12 The PCT can also map different scenarios of change. The "Go Dutch" scenario was used for initial scoping to understand which areas of Leeds district have the greatest potential to increase cycling. This scenario assumes that people will be willing to travel a wider range of trip distances and that greater numbers of old and young people will cycle, which is likely to result from cycling infrastructure being introduced to Dutch standards. The key inputs to this tool developed for the DfT are origin destination journey to work data from the 2011 census, route distance and hilliness.

1.13 The Cycling Potential Index takes into account the socio-demographic profile of the population, as well as hilliness and trip length. This was used to identify the population segments that are most likely to take up cycling in Leeds.

1.14 The scoping also considered a number of other factors. While other areas of Leeds indicated high potential for cycling also, for this LCWIP attention focused on key routes between the city centre and north east Leeds because:

- North east Leeds does not have any rail stations, making public transport options more limited than other parts of the city
- The area lacks a core cycling route

- The A61 and A58 are priority bus corridors, which provides an opportunity to improve cycling infrastructure along with plans to improve bus services
- Additional housing growth in north east Leeds will increase the demand for travel to the city centre from this area

1.15 The LCWIP process also requires the identification of a 'Core Walking Zone' which should typically include significant trip generators such as key employment sites and transport interchanges. For walking journeys, distances travelled are short (typically up to 2km). The scoping discussion sought to define a suitable Core Walking Zone of around 400 metres in diameter that could be connected by key walking routes of up to 2km in length.

1.16 Initial mapping of trip generators confirmed that they are clustered in the more densely populated areas. Leeds city centre has a high density, as do key local centres such as Otley, Yeadon, Cross Gates, Morley and Garforth. At a slightly lower density are Pudsey, Farsley, Bramley and other suburbs within 5km of Leeds city centre. All could form future Core Walking Zones in Leeds.

1.17 Given significant redevelopment plans for Leeds city centre and the relatively limited scope of this initial phase of LCWIP development, the city centre was not considered to be the most appropriate focus area. Instead, it was concluded that greater value could be achieved by focusing on a local shopping centre in a suburb, which is an approach that might be replicated in future.

1.18 Harehills was chosen as the Core Walking Zone for phase 1 of the Leeds LCWIP. It has an important local shopping parade that is also one of the main transport corridors in to the city. It is a densely populated area with high levels of walking and high density of trip generators, and the area is a priority for Public Health for increasing physical activity levels in line with the Inclusive Growth Strategy.

1.19 The high volumes of traffic and severance caused by large junctions and intersections make it a challenge to improve the walking environment in Harehills. Additionally, the surrounding residential areas experience rat running traffic and an unattractive walking environment in many locations. These are issues that that this LCWIP looks to address.

Structure of this report

1.20 Section 2 provides the main body of this LCWIP. Mapping has been provided to Leeds Council separately, in order that it can be incorporated into the Council's plans and policy documents. Section 2 incorporates:

- For north east Leeds, the initial area for LCWIP development in this first phase:
  - A cycling network map showing prioritised desire lines and proposed route alignments for the high priority desire line(s) identified;
  - An initial prioritised list of potential improvements for these routes to help guide future investment when opportunities arise; and
  - Core design outcomes for cycling network development
- For Harehills, the Core Walking Zone in this first phase of LCWIP development:
  - A walking network map showing key walking routes in to and around the area;
  - An initial prioritised list of potential improvements for these routes to help guide future investment when opportunities arise; and
  - Core design outcomes for walking infrastructure

Section 3 presents the stages of analysis that informed the proposed cycling and walking network maps.

2 Leeds LCWIP: Phase 1

2.1 The first phase of the Leeds LCWIP covers:

- An initial area of cycling network development in north east Leeds;
- A Core Walking Zone in Harehills
- Lists of potential infrastructure improvements for walking and cycling

2.2 Figure 2.1 below shows the initial areas of focus for cycling and Figure 2.2 shows the initial area of focus for walking.

Figure 2.1: Leeds LCWIP area of focus for cycling

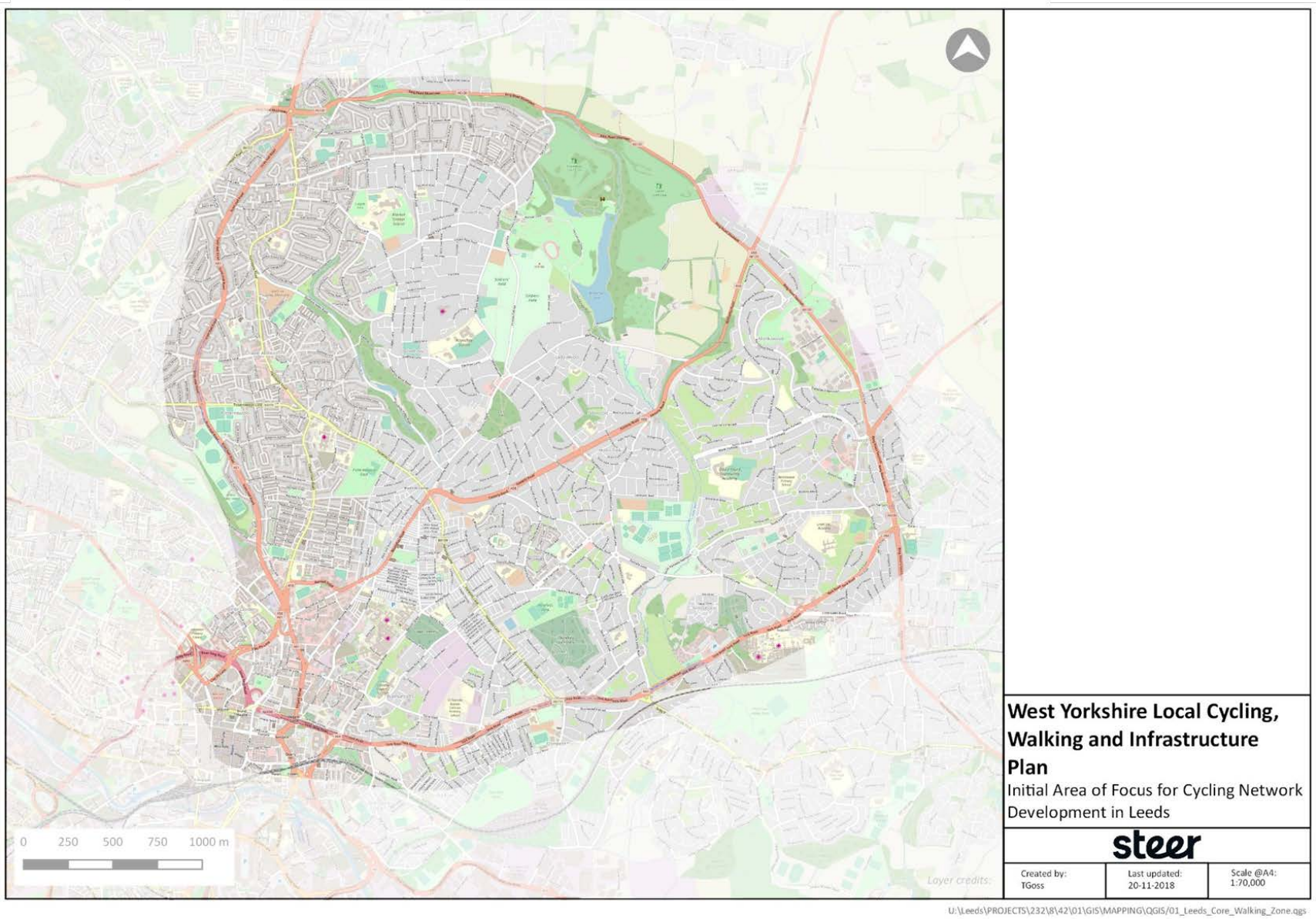
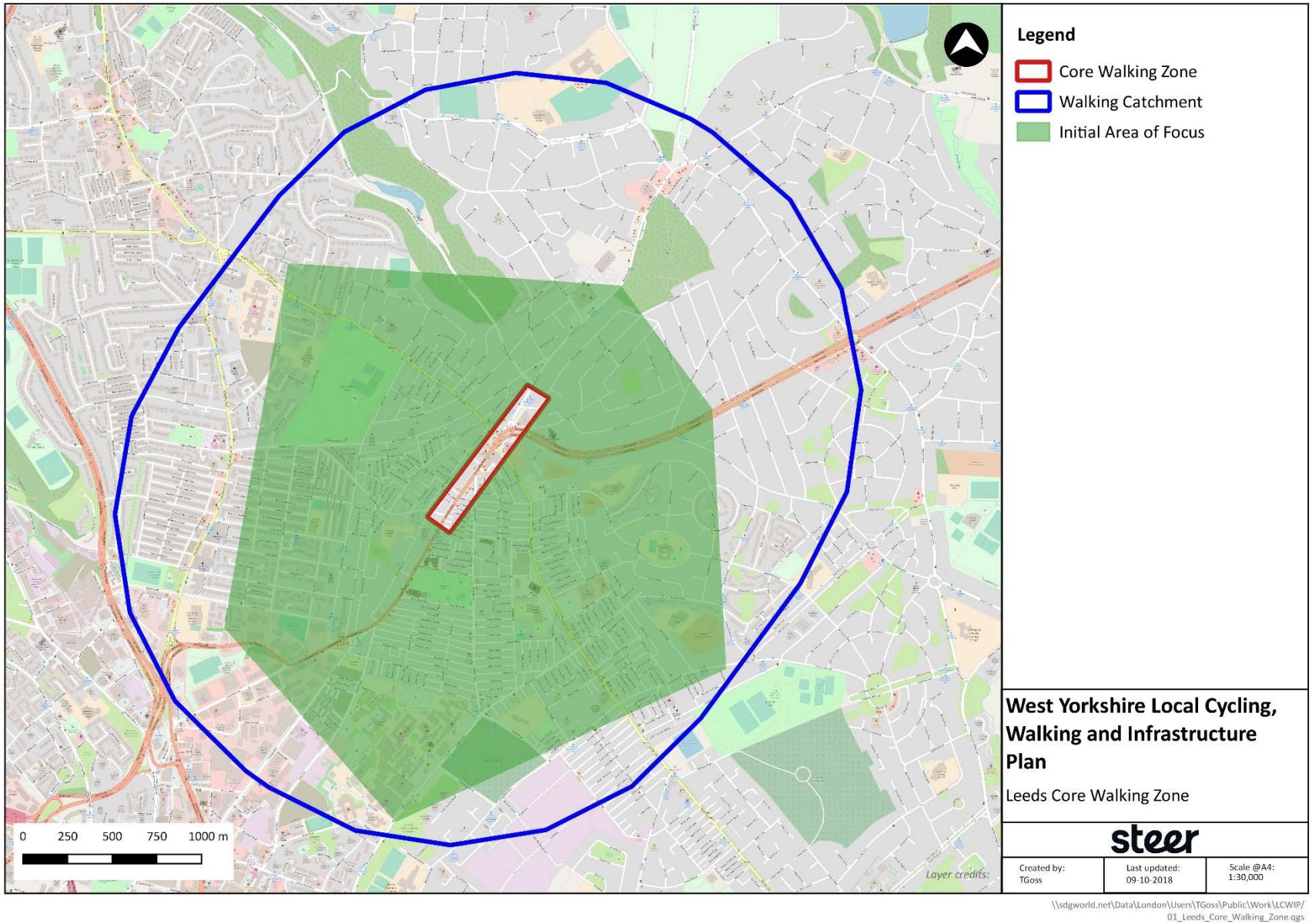


Figure 2.2: Leeds LCWIP area of focus for walking



Cycling

Identifying desire lines

2.3 To develop a cycling network, the first step was to identify the key desire lines between the places that people want and need to travel in Leeds. It should be noted that these are not routes themselves, simply an indication of the most important trip origins and destinations. There may be various possible route alignments between them that should be considered at a subsequent stage of analysis.

2.4 The desire lines identified for north east Leeds are shown in Figure 2.3. These reflect data analysis and stakeholder input to identify existing demand for cycling, potential demand for cycling and links to future growth sites within the cycling catchment area (as described in the supporting analysis section later in this document).

2.5 Data analysis included consideration of population density, employment density, car ownership, journeys to work under 5km proposed growth areas, location and clustering of key trip generators, propensity and potential for cycling, existing and proposed cycling network provision and results of a stakeholder network planning workshop. Table 3.3 in the supporting analysis provides a full account of the data used to identify and prioritise desire lines.

Prioritising desire lines

2.6 The same data was used to rank these desire lines from 1 to 11 (1 being the highest priority) in order of both existing and potential cycle demand.

2.7 In order to determine routes to take forward for further analysis, it was necessary to consider where desire lines might converge. For example, many desire lines run closely in parallel and will therefore use the same corridors to cater for cycling demand in some locations.

Selection of desire lines for detailed assessment

2.8 Two priority cycle routes were selected for further investigation in Leeds, based on consideration of the analysis and Leeds Council's aspirations:

1. Regent Street to Chapel Allerton (to meet desire lines 1 and 5, and partially serve 9)
2. A61 to Oakwood (to meet desire lines 2 and 3, and partially serve 11)

2.9 Two alignment options were identified for each of these potential routes, which are shown in Figure 2.4 and Figure 2.5. Option 1 provides the most direct alignment, which normally utilises primary transport corridors and requires a higher level of intervention. Option 2 provides a less direct route – or route sections – that makes use of secondary transport corridors, back streets, green spaces and waterways.

2.10 Proposed cycling infrastructure improvements and indicative costs for each of these routes and alignment options are provided in Table 2.1. These provide an initial understanding of requirements, based on a desktop review and site visit at key locations. **Delivery of proposed infrastructure will require further feasibility and detailed design work to be undertaken to develop more accurate costs.**

2.11 For the desktop review, the proposed cycling infrastructure required was informed by Table 1.3 of LTN 2/08, which is an approximation based on traffic volumes and speeds. Transport engineers from Steer and Leeds Council then assessed potential requirements at key locations, such as critical junctions.

2.12 Estimated infrastructure costs were informed by Taylor and Hiblin (2017) *Typical costs of cycling interventions: interim analysis of Cycle City Ambition schemes*, which provides guidance on the typical costs of implementing various types of cycling infrastructure in towns and cities across the UK. It was this research that informed the costs provided in the LCWIP guidance. Local costs were used for reference where available.

2.13 Professional judgement was used to gauge the level of intervention required and the associated costs, based on the guidance. Until further feasibility and design work is carried out, these costs should be treated as estimates only, which could be higher or lower when taken forward for delivery. In this document, cost estimates of individual infrastructure elements have been rounded to the nearest £10k and total costs have been rounded to the nearest £100k, which was seen as a suitable level of estimation until further work is carried out.

2.14 It should be noted that costs may differ depending on whether the infrastructure is being delivered as a stand-alone project or as part of a wider package of measures. For instance, there may be cost-savings by delivering complementary schemes at the same time to minimise project management and construction costs. This is beyond the scope of the LCWIP and should be considered when proposals are taken forward for delivery.

2.15 The core design outcomes for cycling infrastructure are set out in Table 2.2. These are well established principles for cycling infrastructure set out in the LCWIP guidance, which have informed the proposed infrastructure improvements and associated cost estimates, to ensure that proposals meet the appropriate quality of infrastructure provision needed to increase cycling.

2.16 More detail on each stage of this process is provided in section 3 – Supporting Analysis.

Figure 2.3: Cycling desire lines in north east Leeds

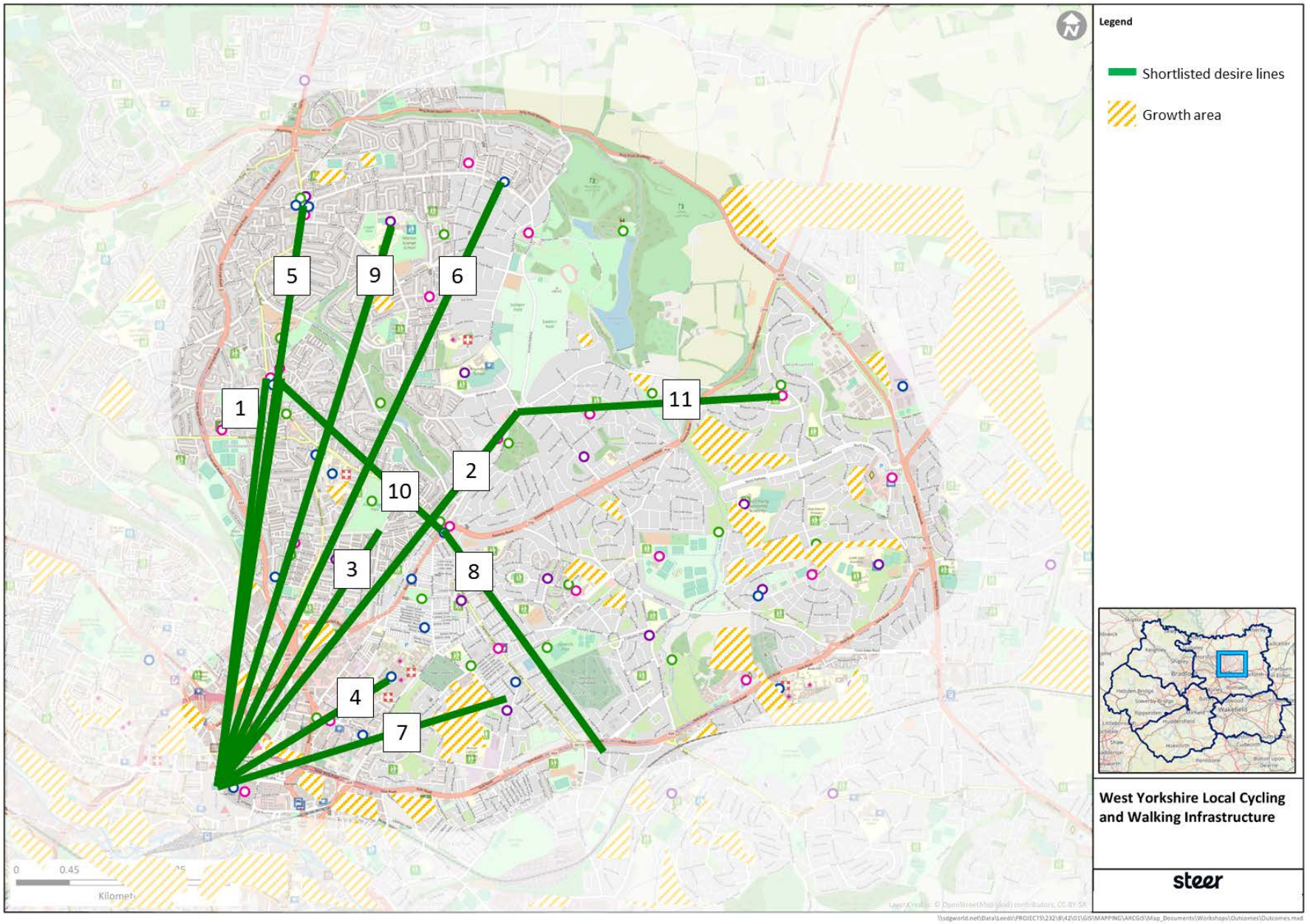


Figure 2.4: Priority cycle route 1: Regent Street to Chapel Allerton

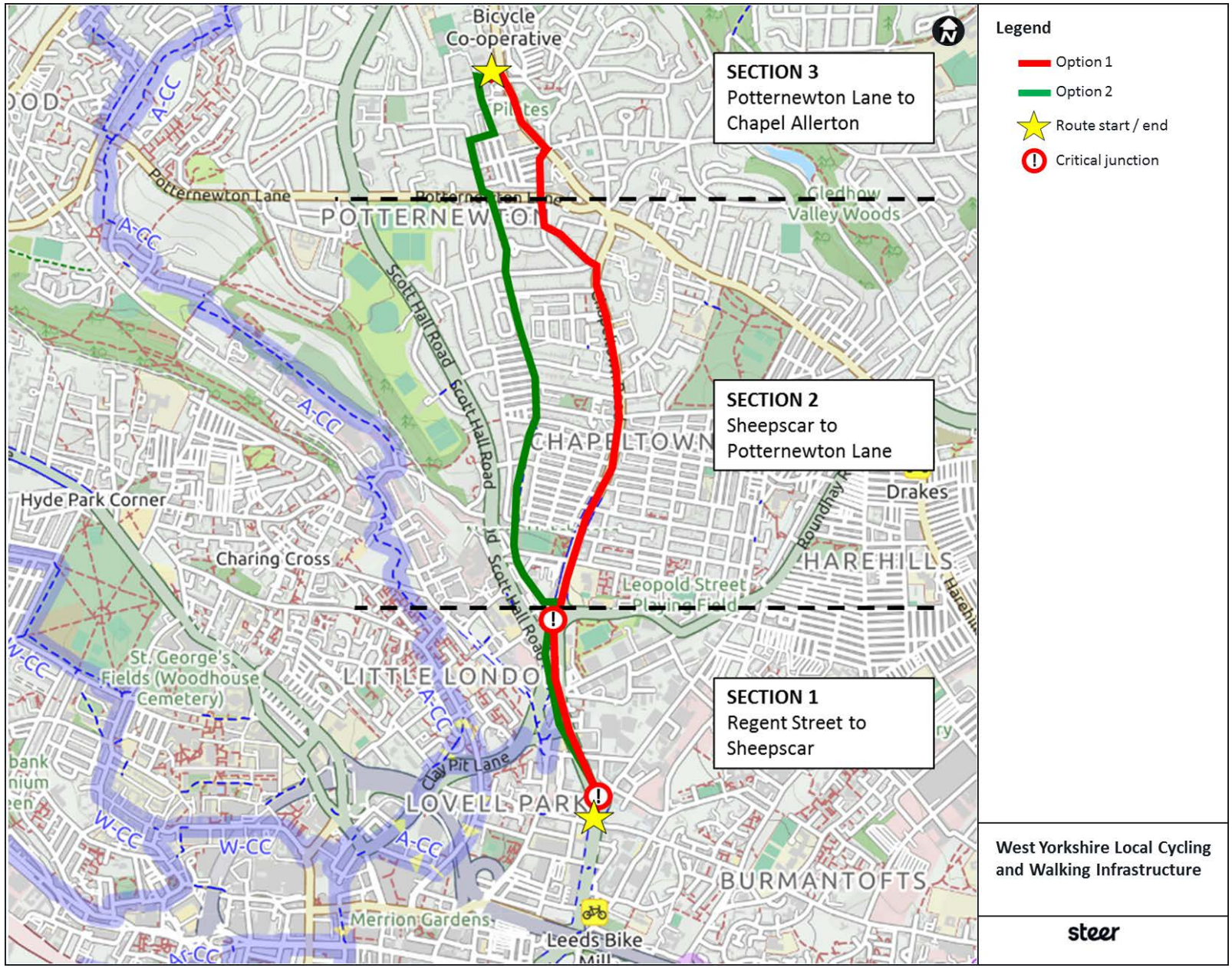


Figure 2.5: Priority cycle route 2: A61 to Oakwood

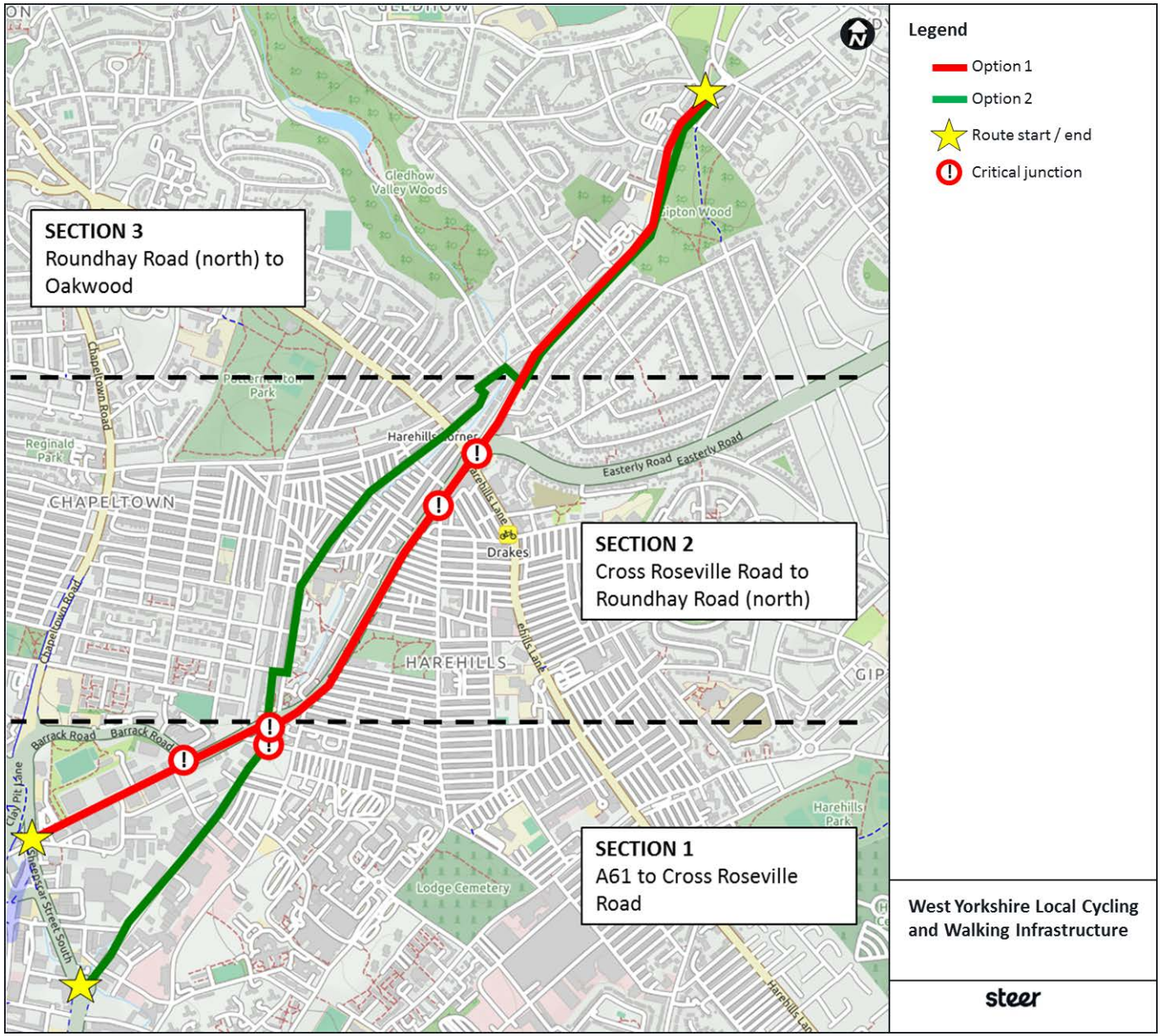


Table 2.1: Proposed cycling infrastructure improvements

Route section	Infrastructure	Indicative cost* (£m)	Infrastructure	Indicative cost* (£m)
	Option 1		**Option 2**	
Regent Street to Chapel Allerton				
1. Regent Street to Sheepscar	Cycle Superhighway-level provision – 445m from Nortech Close to Barrack Road	0.58	Cycle Superhighway-level provision – 1.75km from Nortech Close to the path leading to Sheepscar Way	0.59
	SUB TOTAL	0.58	SUB TOTAL	0.59
2. Sheepscar to Potternewton Lane	Cycle Superhighway-level provision – 1.31km from Barrack Road St Martins Road	1.70	1.67km cycle route of mixed provision from the path leading to Sheepscar Way to Potternewton Lane, including: • Mixed strategic cycle route – 1.24km • Resurfaced cycle route – 0.51km	0.66 (0.57) (0.09)
	Mixed strategic cycle route – 369m from St Martins Rd to Potternewton Lane	0.26		
	SUB TOTAL	1.96	SUB TOTAL	0.66
3. Potternewton Lane to Chapel Allerton	Mixed strategic cycle route – 191m from Potternewton Lane to Harrogate Road	0.13	Mixed strategic cycle route – 580m from Potternewton Lane to Chapel Allerton	0.27
	Cycle Superhighway-level provision – 385m from Harrogate Rd to Chapel Allerton	0.50		
	SUB TOTAL	0.63	SUB TOTAL	0.27
	TOTAL	**3.2**	**TOTAL**	**1.5**
A61 to Oakwood				
1. A61 to Cross Roseville Road	Mixed strategic cycle route – 485m from A61 to A58	0.34	Mixed strategic cycle route – 915m from A61 to Cross Roseville Road	0.64
	Cycle Superhighway-level provision – 258m from A61 to Cross Roseville Road	0.34		
	SUB TOTAL	0.68	SUB TOTAL	0.64

2. Cross Roseville Road to Roundhay Road (north)	Cycle Superhighway-level provision – 1.2km from Cross Roseville Road to Roundhay Road/Gledhow Valley Road	1.56	Mixed strategic cycle route – 1.35km from Cross Roseville Road to Roundhay Road/Gledhow Valley Road	0.95
	Remodelling of one major junction – Easterly Rd/Roundhay Rd	1.6		
	SUB TOTAL	3.16	SUB TOTAL	0.95
3. Roundhay Road (north) to Oakwood	Cycle Superhighway-level provision – 1.04km from Roundhay Road/Gledhow Valley Road to Oakwood	1.35	Cycle Superhighway-level provision – 1.04km from Roundhay Road/Gledhow Valley Road to Oakwood	1.35
	SUBTOTAL	1.35	SUBTOTAL	1.35
	TOTAL	**5.2**	**TOTAL 1.2**	**2.9**

*Indicative costs were informed by Taylor and Hiblin (2017) *Typical costs of cycling interventions: interim analysis of Cycle City Ambition schemes*, which provides guidance on the typical costs of implementing various types of cycling infrastructure in towns and cities across the UK.

Local reference costs were used where available.

All cost estimates are subject to further feasibility and detailed design, and may be higher or lower when taken forward for delivery.

Costs are based on delivery of individual schemes, which may change if delivered as part of a wider programme of works. £100k

'Cycle Superhighway-level provision' is defined as an extended cycle route that enables direct, rapid, safe cycle trips largely segregated from traffic along an arterial route (e.g. a 10km route following an A-road from outer suburbs to a city centre).

'Mixed strategic cycle route' is defined as an extended cycle route to facilitate cycling along a strategic corridor, comprising a mixture of: signed route without dedicated lanes along quieter roads; on-road lanes without physical segregation; physically segregated cycle lanes along busier roads; marked cycle routes away from roads where such alignments are available.

Table 2.2: Core Design Outcomes for cycling infrastructure

The Core Design Outcomes are well established principles for cycling infrastructure set out in the LCWIP guidance, which have informed the proposed infrastructure improvements and associated cost estimates, to ensure that proposals meet the appropriate quality of infrastructure provision needed to increase cycling.

Core Design Outcome	Description
Coherent	The network must be coherent: it must link all the places cyclists want to start and finish their journeys with a route quality that is consistent and easy to navigate. Abrupt changes in the level of provision for cyclists will mean that an otherwise serviceable route becomes disjointed and unusable by the majority of potential users
Direct	Routes for cyclists must provide direct and fast routes from origin to destination. In order to make cycling preferable to driving, routes for cyclists must be at least as direct – and preferably more direct – than that available for private motor vehicles. And indirect route for cyclists may result in some of them choosing the more direct, faster route, even if it is unsuitable for cycling.
Safe	Cycle networks must not only improve cyclists' safety, but also their feeling of how safe the environment is. Consideration must be given to reducing the speeds of motor vehicles to acceptable levels, particularly when cyclists are expected to share the carriageway. The needs for cyclists to come into close proximity and conflict with motor traffic must be removed, particularly at junctions, where the majority of crashes occur.
Comfortable	Smooth surfaces, with minimal stopping and starting, without the need to ascend or descend steep gradients and which present few conflicts with others users creates comfortable conditions that are more conducive to cycling. The presence of high speed, high volume motor traffic affects both the safety and the comfort of the user.
Attractive	Cyclists are more aware of the environment they are moving through than people in cars or other motor vehicles. Cycling is a pleasurable activity, in part because it involves such close contact with the surroundings. The attractiveness of the route itself will therefore affect whether users choose to cycle.

Source: Local Cycling and Walking Infrastructure Plans Guidance, Department for Transport (2017).

Walking

2.17 The LCWIP process aims to identify infrastructure improvements to create a safe, coherent and pleasant walking environment. It includes the creation of a walking network, identification of the issues that prevent people walking and development of specific interventions to overcome local issues.

2.18 In order to identify the interventions required, it is essential that the environment is analysed from a perceptual, human perspective, which accounts for issues such as personal safety. This means that the remit of what constitutes 'infrastructure' for walking needs to be wider than traditional engineering approaches. It will include infrastructure such as pedestrian crossings and footway improvements but might also need to include elements such as lighting, wayfinding, removal of graffiti/litter, seating, public realm improvements and planting.

2.19 To provide this human perspective, the Leeds LCWIP was informed by a street audit led by Steer and Living Streets, the national walking charity. Street audits are a tool for facilitating a roving public consultation whilst walking with audit participants around a pre-defined route. This allows participants to comment on and capture their live experience of walking the route. A follow up session afterwards with a large-scale map captures the most salient points and allows participants to comment on wider areas beyond the audit route.

2.20 Comments from participants are then used to capture the main barriers to walking and to translate these observations into recommendations for infrastructure improvements that will enhance the walkability of the area. The proposed walking network and infrastructure improvements were also informed by data analysis (as described in the supporting analysis section) and additional expert site visits.

2.21 This LCWIP identifies a proposed walking network, proposed intervention sites and a list of proposed infrastructure improvements for Harehills.

Proposed walking network

2.22 Department for Transport LCWIP guidance recommends identification of primary and secondary walking routes within a 2km catchment of the Core Walking Zone. The proposed network and classification of walking routes to serve the Core Walking Zone is shown in Figure 2.6. The routes were identified through consideration of:

- Permeability of the Core Walking Zone from surrounding residential areas
- Addressing key severance points for local communities
- Addressing key safety concerns, including both road and personal safety
- Key corridors that link residential areas to the Core Walking Zone

Proposed infrastructure improvements

2.23 Unlike cycling, the existing walking network is generally comprehensive in terms of provision of segregated routes. Infrastructure interventions focus on improving the walking environment on primary and secondary walking routes into and around the Core Walking Zone along the shopping parade, across large junctions and intersections along this major transport corridor and navigating the surrounding rows of terraced houses.

2.24 The locations of proposed infrastructure improvements are shown in Figure 2.7 with the detail of the proposals shown in Table 2.3. The table includes location-specific interventions referenced to

the numbered interventions areas and area-wide infrastructure improvements across the Core Walking Zone and its catchment.

The Core Design Outcomes for walking infrastructure are shown in Table 2.4. These have informed the proposed infrastructure improvements and associated cost estimates.

Figure 2.6: Harehills Core Walking Zone and key walking routes

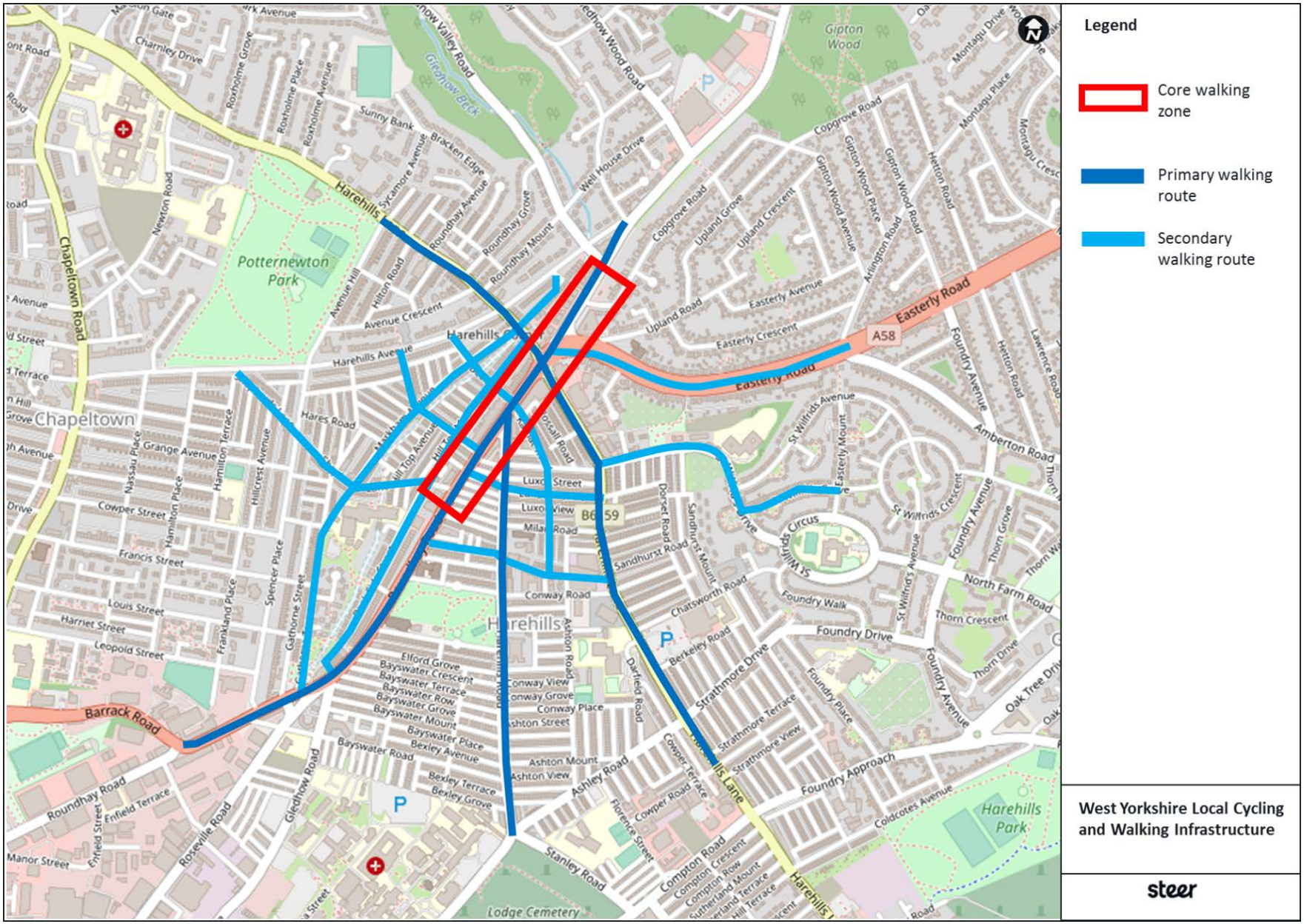


Figure 2.7: Harehills Core Walking Zone and proposed intervention areas

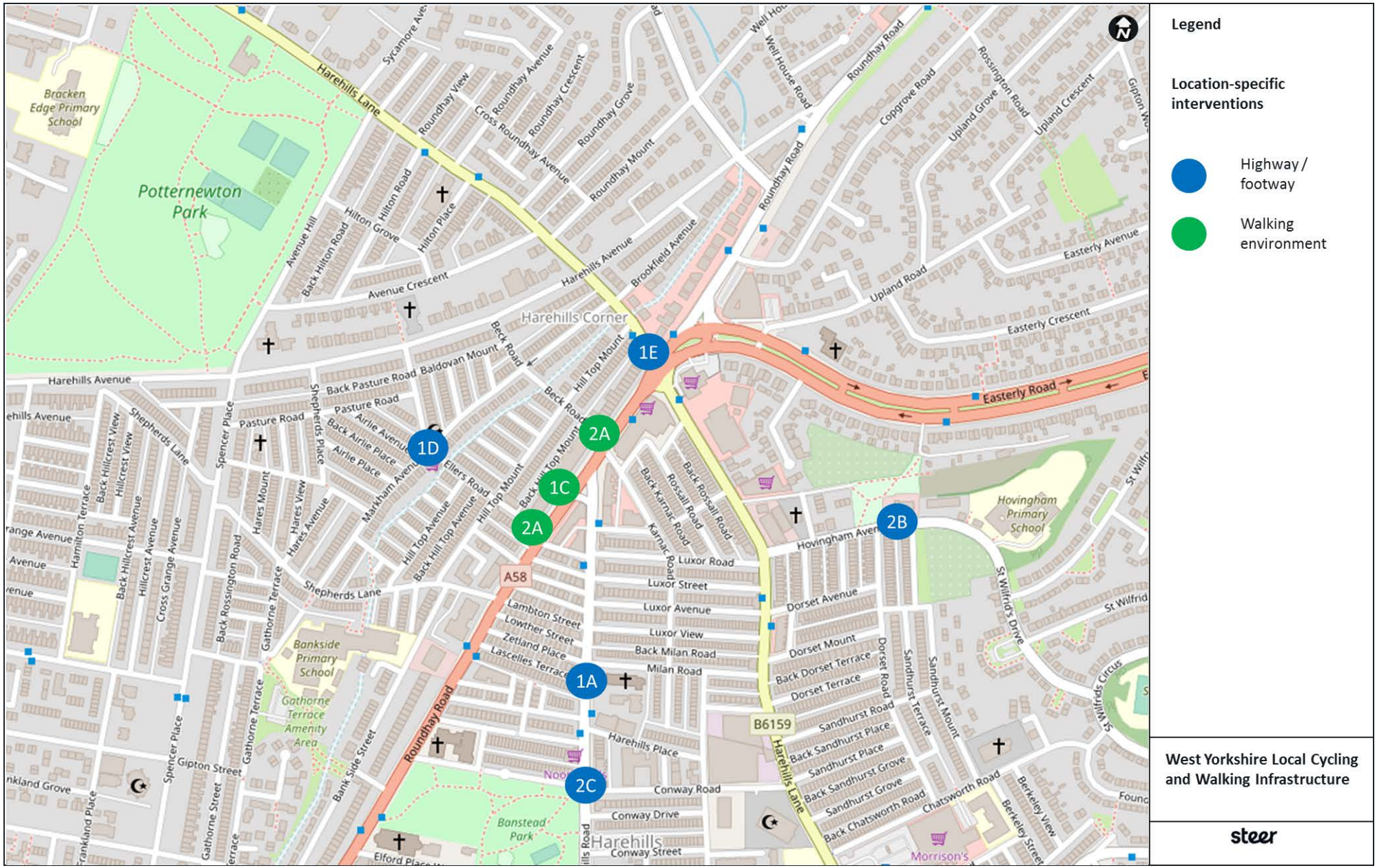


Table 2.3: Harehills proposed walking infrastructure improvements

Intervention	Intervention scale	Infrastructure	Infrastructure type	Cost estimate	Timescale
1a. Upgrades to Harehills Lane filtering scheme **1b. Footway treatment at side roads along Roundhay Road, Harehills Road and Harehills Lane**	Location-specific	a. Continuous footway and bollards (to prevent vehicles encroaching on the footway) at side roads b. Raised table crossings at side roads c. Cycle access through modal filters	a. Highway / footway b. Highway / footway c. Highway / footway	a. £10k-20k per crossing b. £8k-£15k per crossing c. Subject to local study	Medium Medium Medium
1c. Improve pedestrian safety and walking environment along the parade of shops on northwest side of Roundhay Road	Location-specific	a. Bollards to prevent vehicles encroaching on the footway (subject to local study) b. Re-engineered road corridor to provide a wide, unobstructed footway	a. Walking environment b. Highway / footway	a. £150-£350 per bollard b. Subject to local study	Short Long
1d. Improve the public realm at junction of Ellers Road and Markham Avenue	Location-specific	a. New public realm scheme	a. Highway / footway	a. Subject to local study	Medium
1e. Improve pedestrian crossings at the Harehills Lane / Roundhay Road intersection	Location-specific	a. Single-stage crossings across each arm of the junction	a. Highway / footway	a. £50k - £62k per crossing	Medium
2a. Prevent vehicles driving on the footway to access/exit Roundhay Road	Location-specific	a. Bollards at key side road locations to prevent vehicles encroaching on the footway b. Parklet	a. Walking environment b. Walking environment	a. £150-350 per bollard b. £500-£2k	Short Short
2b. Improve crossing points outside of schools	Location-specific	a. Zebra crossing with a raised table outside the ARK Centre	a. Highway / footway b. Highway / footway	a. £20k-£33k	Short Medium

Intervention	Intervention scale	Infrastructure	Infrastructure type	Cost estimate	Timescale
		b. Audit of crossing points at other schools		b. Subject to local study	
2c. Upgrade the Conway Road / Barnstead Terrace crossing	Location-specific	a. Zebra crossing	a. Highway / footway	a. £20k-£33k	Short
3a. Traffic management across the Core Walking Zone	Area-wide	a. Modal filters, continuous footways at side roads, upgraded crossings, removal of vehicle lanes and traffic calming across a similar area	a. Walking environment	a. Subject to local study	Long

*The proposed interventions are intended to be used for prioritising schemes to take forward for delivery, with full design and costing to be done at a later stage. There is no national guidance on cost estimates for walking infrastructure as there is for cycling infrastructure. Indicative cost estimates were informed by Wiltshire Council Highways (2017) *Costs of highway works*, which provides guidance on the typical costs of implementing various types of highway infrastructure. All cost estimates subject to feasibility and design and may be higher or lower when taken forward for delivery. In some instances, cost efficiencies might be found by delivering schemes as part of a holistic area-based approach, rather than on a scheme-by-scheme basis.

Table 2.4: Core Design Outcomes for Walking

The Core Design Outcomes are well established principles for walking infrastructure, which have informed the proposed infrastructure improvements and associated cost estimates, to ensure that proposals meet the appropriate quality of infrastructure provision needed to increase walking.

Design outcome	Description
Comfort	Footways level and in good condition, with no trip hazards.
	Footway widths generally in excess of 2m effective width
	Width on staggered crossings/pedestrian islands/refuges able to accommodate all users without 'give and take' between users or
	No instances of vehicles parking on footways.
Directness	Footways are provided to cater for pedestrian desire lines (e.g. adjacent to road).
	Crossings follow desire lines.
	Crossing of road easy, direct, and comfortable and without delay (< 5s average).
	Crossings are single phase pelican/puffin or zebra crossings.
	Diagonal crossing (pedestrian and all-green phase) available at intersections
	Green man time is of sufficient length to cross comfortably (presume 0.8m/s)
Coherence	Walking network developed to link key trip generators, public transport and residential areas
	Adequate dropped kerb and appropriate tactile paving provision.
	Comprehensive wayfinding with walking times installed throughout core walking zone and along key routes
	Footway and crossing materials consistent throughout core walking zone and along key walking routes
Safety	Appropriate formal crossing points installed at all major road crossings
	Continuous network of footway available throughout core walking zone and along key walking routes
	Appropriate street lighting installed along all key routes
	Footway network maintained to avoid trip hazards
	Traffic calming measures in place in areas of higher pedestrian vulnerability e.g. schools, residential care homes, hospitals etc
Attractiveness	Footway and street furniture maintained to a good standard (clean, safe and accessible)
	Regular litter and waste collection to ensure clean street
	Planting and greenery installed where possible, also to provide shade

Source: adapted from Walking Route Audit tool (WRAT), developed by Local Transport Projects as part of the Welsh Active Travel Guidance.

Supporting analysis

steer

3 Supporting analysis

Cycling network analysis

The LCWIP process and cycle network development good practice

3.1 LCWIP Technical Guidance sets out a recommended approach to developing a cycle network and the data and tools available to do so. Emphasis is placed on using evidence to plan a cycle network that connects places that people need to get to, whether for work, education, shopping or for other reasons.

3.2 As noted earlier, the key outputs for the LCWIP include a cycling network map and a programme of cycling infrastructure improvements

3.3 A review of good practice in cycling network planning, including the LCWIP Technical Guidance (DfT, 2017), London Cycling Design Standards (TfL, 2018) and Strategic Cycling Analysis (TfL, 2017) indicates that cycling networks should be planned to:

- Serve the highest number of current trips;
- Enable the highest number of potentially cyclable trips; and
- Connect the network to areas experiencing high growth.

3.4 For this reason, network development has focused on analysis existing cycling demand, potential cycling demand and growth areas. The methodology, identified cycle network and prioritised infrastructure improvements for Leeds are outlined below.

Methodology

3.5 The following seven steps were taken to develop the cycling network with each step described in further detail below:

1. Data analysis
2. Stakeholder engagement
3. Classifying desire lines
4. Prioritising shortlisted desire lines
5. Identifying a high priority route
6. Selecting route alignment options
7. Appraising route alignment options

Data analysis

3.6 To ensure an evidence-based approach, a wide range of data was gathered and is presented in a background report that forms part of phase 1 of this LCWIP. The data were analysed to understand existing and potential demand for cycling in Leeds (see Table 3.1 and Table 3.2 for a comprehensive list, the insights provided and how they were applied). Analysis focused on four areas:

Local population

3.7 Understanding the characteristics and travel behaviours of the local population, as well as planned development. This information was used to gauge the propensity of people to cycle and the journeys that people are likely to make now and in the future.

Points of interest

3.8 Identifying key destinations that people need to get to – such as schools, hospitals, employment sites, leisure facilities and bus or train stations. When considering that journeys begin at home in residential areas, identifying key destinations and the likely routes between them provide the desire lines for local journeys. These destinations – or points of interest – were also clustered to indicate where they are located in high densities, which is likely to attract more journeys.

Existing cycle demand:

3.9 Understanding where people currently cycle, so that the network can be planned to serve the highest number of current trips by ensuring that these routes are safe and attractive to use. This can be understood by using the Propensity to Cycle Tool (PCT), which shows existing cycle journeys to work using 2011 Census data, as well as the Strava global heatmap, which shows were users of the Strava app currently cycle for all journey purposes. Though the Strava app does not provide a fully representative population sample (it is skewed towards the demographic that uses the app), the data still provides valuable insight, especially as it includes all trip purposes.

Potential cycle demand

3.10 Understanding where there is the highest potential to switch trips made by other modes – especially by private car, so that infrastructure investment can be targeted to locations that will reduce car use and enable the highest number of cycle trips. The PCT 'Go Dutch' modelling data can be used to show where people would be likely cycle if a safe and attractive cycling environment was provided, based on reasonable cycle trip distances and hilliness, as well as encouraging a wider age range of people to do so. This data is especially useful for identifying the highest potential cycling desire lines and route alignment options.

3.11 Steer's Cycling Potential Index can also show where people are more likely to cycle based on social demographics, which is important to understand so that investment is made in places where people that do not currently cycle are most likely to take up cycling as a result. These factors have also been cross-referenced with Leeds Council's planned future cycle network to take in to account local knowledge of where future potential is situated

Stakeholder engagement

3.12 In November 2018, Steer held a workshop with local stakeholders in Leeds, who took part in a hands-on, interactive workshop to give local knowledge and expertise to shape the future cycle network.

3.13 Dutch consultancy Mobycon facilitated the workshop, bringing insights from their experience of cycle network planning in the Netherlands.

3.14 In the first part of the exercise, the Mobycon team worked with workshop participants to identify key origins and destinations for local trips to help identify important cycling desire

lines. The second part of the exercise looked in more detail at the area of focus to identify the most desirable corridors and routes in this area.

3.15 The results provide a visual clue to the importance of specific streets and other traffic-free routes for cycling, which has implications for the type of facility (infrastructure) that's required there.

3.16 Taking into account origins and destinations identified by local stakeholders, and the desire lines between them, Mobycon analysed the results and identified:

- Leeds to Moortown (via Chapel Allerton)
- Leeds to Roundhay (via Harehills and Oakwood)
- Leeds to Monkswood (via Harehills and Oakwood)
- Leeds to Seacroft
- Chapel Allerton to Osmondthorpe (via Harehills)

Table 3.1: Population and points of interest data analysed in developing the cycle network in north east Leeds

Theme	Source	Insight	LCWIP application
Local population	Population density	Identifying trip origins and areas most needing to be served by the network	Provided confidence in identified desire lines and informed alignment optioneering
	Employment density	Identifying trip origins and areas most needing to be served by the network	Provided confidence in identified desire lines and informed alignment optioneering
	Car ownership	Potential for switchable trips by location	Lower car ownership within 2-3km of Leeds city centre and higher further afield. Closer to the centre, cycle infrastructure may increase travel choices and further afield may encourage mode shift
	Journeys to work under 5km	Identifying proportion of journeys within reasonable cycling distance, by area	Most journeys to work in north east Leeds are under 5km, supporting the rationale to invest in cycling infrastructure in this area
	Growth areas	Identifying areas that need to be served by the network in future	Informed shortlisting and prioritisation of desire lines
Points of interest	GIS-identified destinations	Identifying key destinations	Informed plotting / selection of OD mapping
	GIS clustering	Identifying key clusters of destinations	Informed plotting / selection of OD mapping
	POI density	Identifying POI densities to be served by network	Provided confidence in identified desire lines

Table 3.2: Cycle demand data and stakeholder engagement inputs used

Theme	Source	Insight	LCWIP application
Existing cycle demand	PCT 2011 Census (LSOA)	Identifying existing cycling demand for journeys to work	Used to identify and quantify desire lines for existing cycling
Existing cycle demand	Strava	Identifying existing demand for a wider range of trips	Used to identify existing demand for cycling and highlight gaps in Census data
	Existing cycling infrastructure	Identifying existing network to build on	Identified that north east Leeds is lacking in cycling infrastructure. New routes can connect to existing infrastructure on Regent Street / A61
Potential cycle demand	PCT Go Dutch (LSOA)	Identifying potential cycling demand for journeys to work	Used to identify and quantify desire lines and alignment options for potential demand
	CyIPT	Checking for recommended infrastructure improvements and sourcing traffic count data	Used to cross-reference LTN 2/08 guidance on required cycle provision – by traffic volume and speed
	Local planned cycle network	Identifying planned network	Identified connections to Leeds city centre as key to network building, with onward connection to City Connect routes possible in future (inc. orbital route)
	Cycling Potential Index	Hex mapping to show demographic propensity to cycle	Used to sense-check and inform desire line identification and prioritisation
Stakeholder engagement	Workshop nodes	Identifying key POIs for employment, leisure, education and utility	Added to base maps, along with GIS-identified destinations
	Workshop desire lines	Joining nodes to identify desire lines	Provided confidence in identified desire lines and suggests future route extensions
	Mobycon interpretation	Expert input for desire lines, based on interpretation of stakeholder-identified nodes	Provided confidence in identified desire lines and offered alternative interpretation

Classifying and prioritising cycling desire lines in north east Leeds

3.17 LCWIP guidance states that desire lines should be identified and then classified.

3.18 All desire lines – identified through analysis of existing cycle demand, potential cycle demand and the stakeholder workshop – were mapped alongside the growth areas and classified (see Figure 3.1). The desire line analysis can be compared with existing segregated cycling infrastructure in the area of focus shown in Figure 3.2, which shows that existing infrastructure does not align with the desire lines identified.

3.19 Desire lines were then classified as shortlisted (for further consideration) or longlisted (de-prioritised at this stage).

Classifying desire lines

3.20 Desire lines were classified in consideration of:

- **Trip distance –** journeys beyond 5km were longlisted, as they are less likely to be cycled in terms of distance
- **Existing and potential demand** – desire lines with the highest existing and potential demand were shortlisted
- **Links to growth areas** – desire lines that connect to, or would serve journeys from growth areas were prioritised
- **Network density** – a 400m mesh density (distance between routes in a cycle network) is recommended and therefore routes should not be too close together or far apart
- **Contribution to a coherent network** – where possible, routes should connect to one another and serve key movements. North-south and east-west routes are often the foundation of a coherent network and joining up routes across a town centre to form longer routes can benefit the network

Prioritising shortlisted desire lines

3.21 To inform future investment and network development decisions, the shortlisted desire lines were assessed against available evidence and placed in priority order as shown in Table 3.3.

3.22 The desire lines were prioritised in consideration of:

- **Existing cycle demand** – evidence and scale of existing demand from the PCT and Strava;
- **Potential cycle demand** – evidence and scale of potential demand from the PCT and Cycling Potential Index;
- **Workshop output** – identification of desire line by local stakeholders and/or prioritised cycle movement by Mobycon; and
- **Links to growth areas** – whether a direct link to a growth area, or serving a growth area by being situated on a future desire line or within 400m of a growth area.

Figure 3.1: North east Leeds cycling desire line map, including short and longlisted desire lines

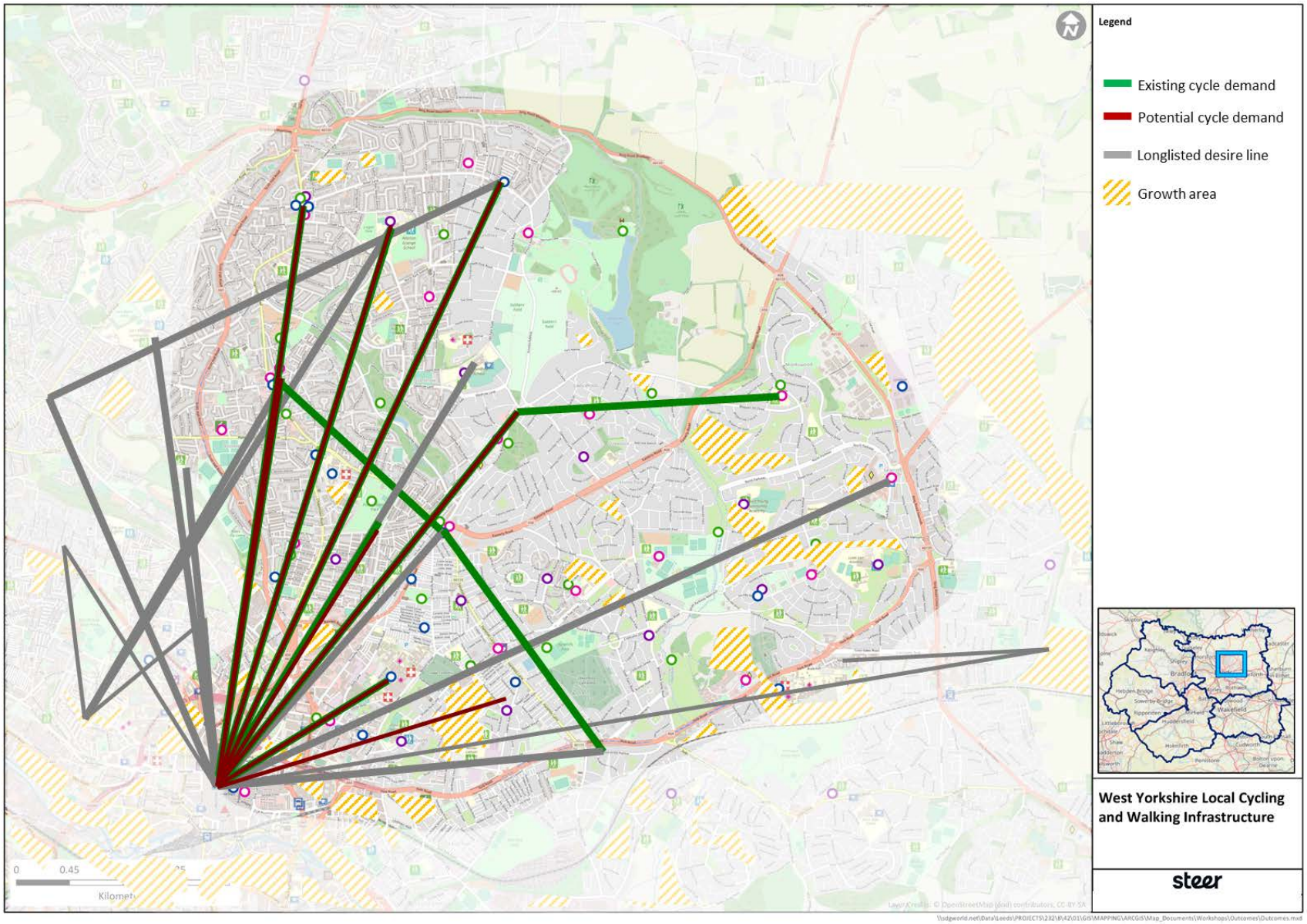


Figure 3.2: Existing cycling infrastructure

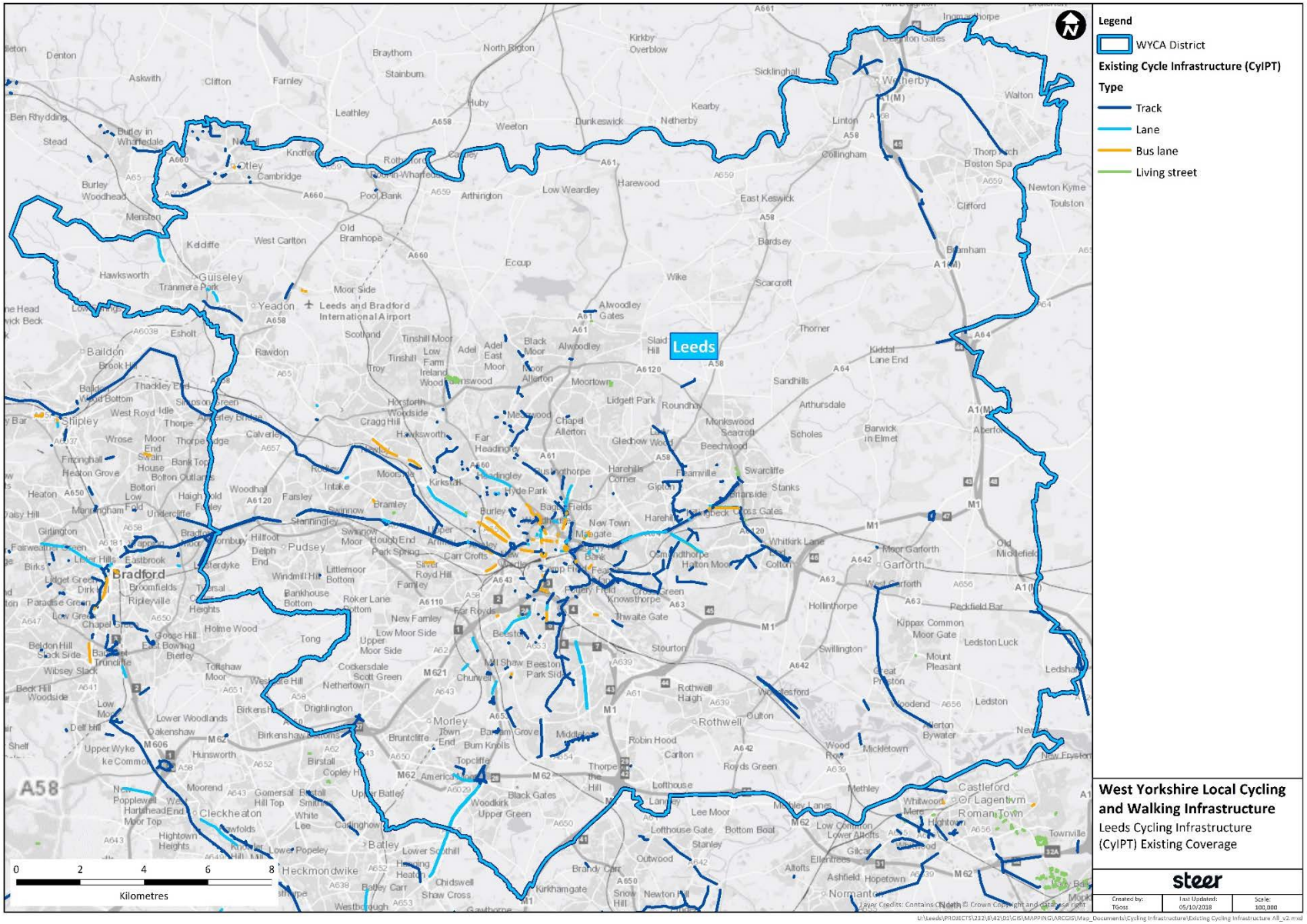


Table 3.3: Shortlisted desire lines in north east Leeds, in order of priority

Desire lines		Existing demand			Potential demand			Demographics		Growth area	Workshop priority	Rationale
		PCT (OD desire line)	PCT (on route sample)	Strava	PCT (OD desire line)	PCT (on route sample)	CPI	Population density	Employment density			
1	Leeds to Chapel Allerton	43	124	H	233	732	M/H	M	M		Yes	High existing and potential demand, identified as priority in workshop
2	Leeds to Oakwood via Harehills	23	123	H	146	796	M	M/H	M/H		Yes	Medium/high existing and potential demand, identified as priority in workshop
3	Leeds to Chapeltown	22	170	M	215	878	M	M	H	Yes		Medium/high existing and potential demand, links to small growth area
4	Leeds to St James's Hospital	19	35	M	200	558	H	M	H		Yes	Medium existing demand and medium/high potential demand, identified as priority in workshop
5	Leeds to Moortown	19	62	M/H	131	373	M/H	M/H	M		Yes	Medium-medium/high existing and potential demand, identified as priority in workshop
6	Leeds to Roundhay	16	52	H	97	385	M/H	M/H	M		Yes	Medium existing and potential demand, identified as priority in workshop
7	Leeds to Burmantofts	10	31	M/L	123	347	M/H	M	M/H	Yes		medium/low existing demand and medium-medium/high potential, links to growth area
8	Harehills to Osmandthorpe	4	43	M/L	N/A	365	M	H	M/H		Yes	Medium/low exscinding demand and medium potential demand, identified as priority in workshop
9	Leeds to Allerton Grange	32	29	M/H	107	198	M/H	M/H	M			Medium-medium/high existing demand and medium-medium/low potential demand
10	Harehills to Chapel Allerton	N/A	25	M/H	N/A	142	H	M/H	M		Yes	Medium existing and potential demand, identified as priority in workshop
11	Oakwood to Monkswood	N/A	28	M	N/A	190	M/H	M	M/L	Yes	Yes	Medium-medium/low existing demand and medium potential demand, close to growth area and identified as priority

Identifying priority routes

3.23 Two priority routes were identified for north east Leeds. This was informed by the prioritisation of shortlisted desire lines and consideration of desire line convergence, where two or more run closely in parallel and may cater for greater cycling demand together as a result. Leeds Council's aspirations were also factored in to decision, notably to prioritise an area of Leeds currently lacking cycling infrastructure, which also has limited public transport options. This will help to build on existing plans for cycling across the city and form a city-wide cycle network. The following two routes were chosen:

- Regent Street to Chapel Allerton
- A61 to Oakwood

3.24 Regent Street to Chapel Allerton sees the convergence of desire lines to Chapel Allerton (1), Moortown (5) and Allerton Grange (9). This route could be extended to Moortown in the future.

3.25 A61 to Oakwood sees the convergence of desire lines to Oakwood (2), Chapel Town (3), Roundhay (6) and Monkswood (11). This route could potentially serve the Core Walking Zone in Harehills also, depending on the alignment taken forward. At Oakwood the route could be extended in various directions, making this a potentially valuable addition to the cycle network.

3.26 The two priority routes make use of existing cycling infrastructure on Regent Street / A61, which provides onward connections to Leeds city centre.

3.27 The routes and their alignment options are shown in Figure 3.3 and Figure 3.5.

3.28 Route alignment appraisal is shown in Figure 3.4 and Figure 3.6.

Selecting route alignment options

3.29 To identify alignment options and to assist in appraisal, the routes were split in to two sections. For each route, alignment Option 1 provides the most direct alignment, which normally utilises primary transport corridors and requires a higher level of intervention. Option 2 provides a less direct route – or route sections – that normally also makes use of secondary transport corridors, back streets, green spaces and waterways.

3.30 The two alignment options were then appraised to inform decision makers as to which might be taken forward for delivery in the future. In some cases, route sections may be interchangeable – such as between Cross Roseville Road and Roundhay Road (north) – which means that there is some flexibility in options.

Appraising route alignment options

Optioneering

3.31 To appraise the alignment options, some of the indicators featured in the Department for Transport's *Route Selection Tool* were considered and assessed to compare options in each route section and across the route as a whole. The key indicators, measurements, sources of data and LCWIP application are outlined in Table 3.4 below.

Table 3.4: Route appraisal inputs and application

Key indicator	Measurement	Source	LCWIP application
Directness	Comparison between alignment lengths	GIS/online mapping	Measure alignments – the shortest is the most direct
Gradient	Profile of gradient	Online cycle route planning tools	Note overall change in gradient and hilliness – the lowest incline and steepness is generally more cyclable
Connectivity per km	Number of adjoining side roads	GIS/online mapping	Count side roads and note their quantity per km – a higher number is a general indication of higher connectivity
Critical junctions	Number across the route (including: potential conflict with heavy / fast traffic, pinch points at junctions, congested conditions reducing visibility, roundabouts without cycle provision)	GIS/online mapping	Count all junctions that meet the critical junction criteria – a lower number means that the existing route is generally safer to cycle, whereas a higher number indicates that more difficult junctions need to be addressed to improve safety, which will impact on feasibility and cost

Figure 3.3: Priority cycle route 1: Regent Streets to Chapel Allerton

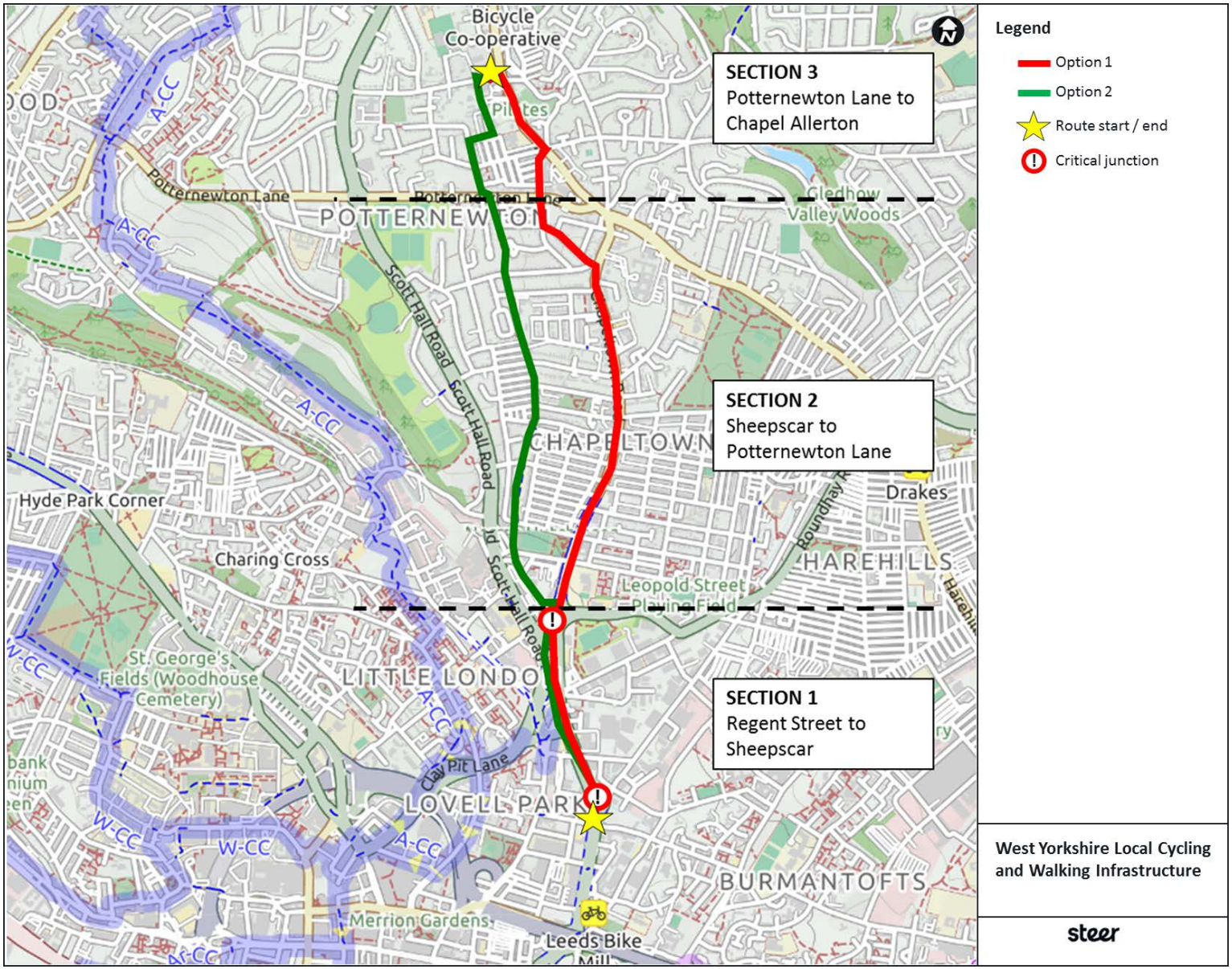


Figure 3.4: Priority cycle route 1 alignment appraisal

FULL ROUTE	Length (km)	Gradient	Connections per km	Critical junctions
Option 1	2.67	↑ 73 m · ↓ 0 m 	24.7	2
Option 2	3.2	↑ 88 m · ↓ 5 m 	18.1	2

SECTION 1	Length (km)	Gradient	Connections per km	Critical junctions
Option 1	0.8	↑ 9 m · ↓ 0 m 	17.5	2 (existing provision)
Option 2	0.8	↑ 9 m · ↓ 0 m 	17.5	2 (existing provision)

SECTION 2	Length (km)	Gradient	Connections per km	Critical junctions
Option 1	1.3	↑ 47 m · ↓ 0 m 	29.2	0
Option 2	1.8	↑ 60 m · ↓ 3 m 	17.7	0

SECTION 3	Length (km)	Gradient	Connections per km	Critical junctions
Option 1	0.57	↑ 25 m · ↓ 0 m 	24.6	0
Option 2	0.6	↑ 19 m · ↓ 1 m 	20.3	0

Figure 3.5: Priority cycle route 2: A61 to Oakwood

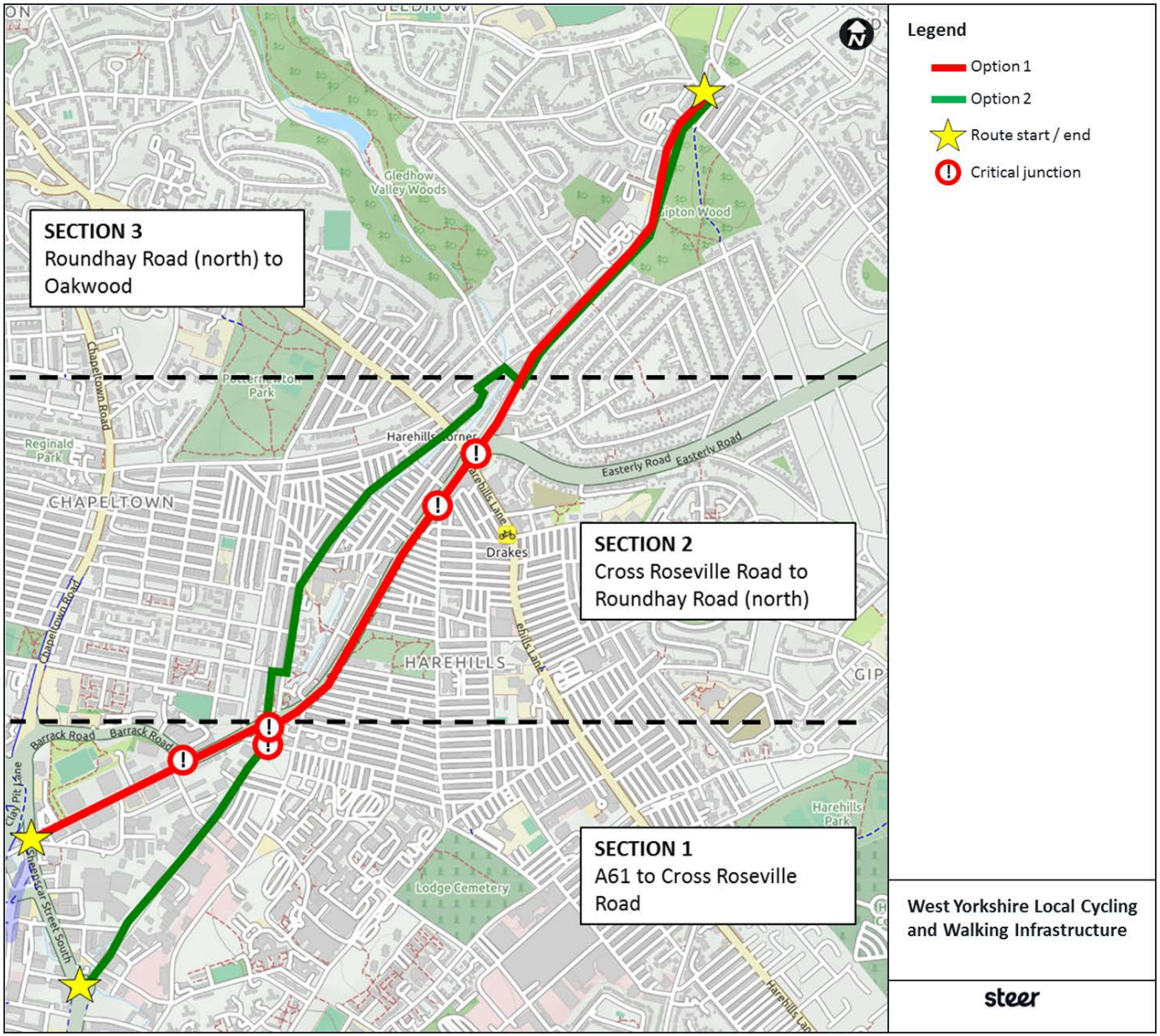


Figure 3.6: Priority cycle route 2 alignment appraisal

FULL ROUTE	Length (km)	Gradient	Connections per km	Critical junctions
Option 1	3	↑ 58 m · ↓ 0 m 	18.3	4
Option 2	3.22	↑ 56 m · ↓ 0 m 	16.8	2

SECTION 1	Length (km)	Gradient	Connections per km	Critical junctions
Option 1	0.76	↑ 5 m · ↓ 0 m 	14.5	1
Option 2	0.89	↑ 7 m · ↓ 0 m 	15.7	2

SECTION 2	Length (km)	Gradient	Connections per km	Critical junctions
Option 1	1.20	↑ 19 m · ↓ 0 m 	30.0	3
Option 2	1.29	↑ 21 m · ↓ 2 m 	24.8	0

SECTION 3	Length (km)	Gradient	Connections per km	Critical junctions
Option 1	1.04	↑ 34 m · ↓ 0 m 	7.7	0
Option 2	1.04	↑ 34 m · ↓ 0 m 	7.7	0

Walking network analysis

The LCWIP process and walking network development good practice

3.32 LCWIP Technical Guidance sets out a recommended approach to developing a future walking network and identifying infrastructure improvements. It stresses that in many cases comprehensive walking networks already exist, but that people may be deterred from walking routes due to severance issues, such as the need to cross roads or because facilities are poorly designed or maintained.

3.33 The main focus of the LCWIP is to improve, and in some cases extend, the existing walking network to encourage more people to take short trips on foot.

3.34 The key outputs of the LCWIP process for walking are:

- A walking network map, showing preferred routes and zones for further development
- A programme of walking infrastructure improvements required to achieve suitable standards

Methodology

3.35 Overall, the steps taken to develop the walking network were:

1. Data analysis
2. Stakeholder engagement
3. Identifying key walking routes
4. Auditing key walking routes and identifying barriers

Data analysis

3.36 To ensure an evidence-based approach, a wide range of data were analysed to determine the key routes and zones for improvements to enable more walking trips (see Table 3.5 for a comprehensive list). Analysis focused on three areas:

Local population

3.37 Understanding the characteristics and travel behaviours of the local population, as well as planned development. This information was used to gauge the walking journeys that people are likely to make now and in the future.

Points of interest

3.38 Identifying key destinations that people need to get to – such as schools, hospitals, employment sites, leisure facilities and bus or train stations. When considering that journeys begin at home in residential areas, the likely walking routes between origins and destinations can be identified. them provide the desire lines for local journeys. These destinations – or points of interest – were also clustered to indicate where they are located in high densities, which is likely to attract more journeys.

Existing walking demand

3.39 Understanding where people currently walk, so that the network can be planned to improve conditions for those that already walk, while making it more attractive to encourage more walking trips. This can be understood by using 2011 Census data, which indicates walking trips to work.

Stakeholder engagement

3.40 A stakeholder street audit was led out by Living Streets – the UK charity for everyday walking – in partnership with Steer. This also provided an opportunity for stakeholder input, which supported the process of developing key walking routes and recommendations for improvements.

3.41 The street audits are a roving consultation exercise, gathering feedback on the local walking environment while walking with local stakeholders. This allowed participants to comment on and capture their live experience of walking the route. A follow-up workshop captured the most salient points and allowed participants to comment on wider issues that might otherwise have been missed. Comments from participants were used to capture the main barriers to walking and to translate observations into recommendations for infrastructure improvements to enhance the walkability of the area as described later in this section.

3.42 The audit took place in December 2017, with attendees including representatives from Steer, Living Streets, Leeds Council, West Yorkshire Combined Authority and various local stakeholders. The area of focus and route was agreed between all parties prior to the audit.

Table 3.5: Data analysed in developing the walking network in north east Leeds

Theme	Source	Insight	LCWIP application
Local population	Population density	Identifying trip origins and areas most needing to be served by the network	Provided confidence in identified routes
	Employment density	Identifying trip origins and areas most needing to be served by the network	Provided confidence in identified routes
	Car ownership	Potential for switchable trips by location	The majority of households do not have access to a car, meaning that improving walking here will enhance travel opportunities
	Journeys to work	Identifying proportion of journeys within reasonable walking distance, by area	Provided confidence in identified routes and potential to switch trips to walking
	Growth areas	Identifying areas that need to be served by the network in future	Informed identification of barriers and programme of improvements needed
Points of interest	GIS-identified destinations	Identifying key destinations	Informed plotting / selection of OD mapping
	GIS clustering	Identifying key clusters and density of destinations	Informed plotting / selection of OD mapping
Existing walking demand	2011 Census	Identifying existing walking demand for journeys to work	Used to identify and quantify desire lines for existing walking trips to work, notably to the core walking zone
Stakeholder engagement	Key routes	Local knowledge of key routes for walking	Incorporated in to network planning
	Barriers	Local knowledge of barriers to walking	Incorporated in to network planning and programme of improvements
	Points of interest	Local knowledge of key destinations in and around the core walking zone	Incorporated in to network planning and programme of improvements
	Living Streets interpretation	Expert development of key routes and programme of improvements	Provided confidence and input in to network planning and programme of improvements

Developing the walking network in Harehills

Identifying key walking routes

3.43 Harehills forms the Core Walking Zone for this initial LCWIP phase. The focus is on key walking routes into Harehills from surrounding areas and pedestrian access through it. As per the LCWIP Technical Guidance, all routes within the area of focus were considered within 2km of the core walking zone.

3.44 There are a number of primary radial routes serving and crossing the Core Walking Zone. These routes have high traffic volumes and footways are often narrow, cluttered and/or interrupted by side roads. Where the primary routes cross they form large junctions and intersections that are currently difficult to navigate on foot.

3.45 Various secondary routes connect the surrounding residential areas to the high street, and two orbital routes connect residential streets together and provide parallel routes to Roundhay Road. These form a dense walking network in places.

3.46 An area-wide approach should be considered across the Core Walking Zone and surrounding areas to address high traffic volumes and rat-running on residential streets. There is some existing filtering that can be upgraded, and this LCWIP provides a new opportunity to review the area as a whole.

3.47 The full list of walking routes were classified as follows:

Walking route	Route type	Street
Primary walking routes	Radial	Roundhay Road
		Harehills Road
		Harehills Lane
Secondary walking routes	Radial	Easterly Road
		Karnac Road
		Hovingham Avenue / St Wilfred's Drive
		Shepherd's Lane
		Ellers Road
	Orbital	Hill Top Mount / Bank Slide Street
		Markham Avenue / Gathorne Terrace
		Banstead Terrace East / Conway Road
		Lowther Street / Back Milan Road

Auditing key walking routes and identifying barriers

3.48 The key walking routes were first audited as part of the stakeholder route audit and workshop activity with additional auditing undertaken by Living Streets Technical Advisor. Local stakeholders and representatives from Steer, Living Streets, WYCA and Leeds Council worked together to assess and agree the primary and secondary routes for Harehills. The group also provided qualitative assessments of the current conditions for walking on each route, the barriers inhibiting more walking trips being made and suggestions for improvements.

3.49 When auditing walking routes, stakeholders were asked to consider attractiveness, comfort, directness, safety and coherence. By noting the nature of any instances where the routes or particular locations along routes did not perform well against these factors, we were able to establish the following main types of barrier:

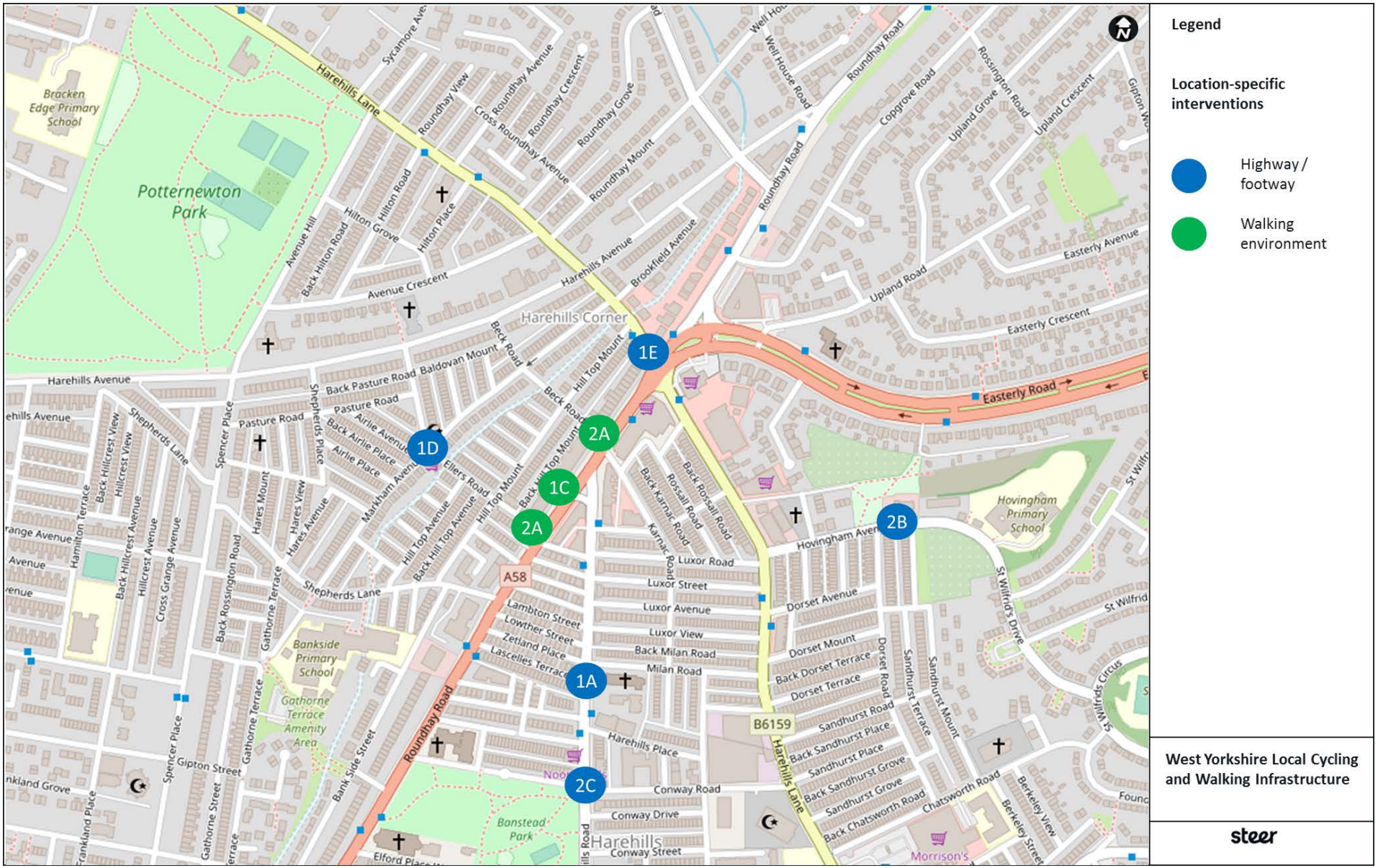
1. High traffic volumes
2. High traffic speeds, especially around corners
3. Poor pavement conditions and maintenance
4. Pavement obstructions
5. Poor or no formal crossing provision
6. Long wait times for crossing
7. Personal safety concerns, including poor lighting and visibility
8. An unattractive walking environment

3.50 On assessment of the identified barriers, the following key intervention sites were prioritised as follows:

1. Existing modal filtering on Harehills Lane
2. Side roads along Roundhay Road, Harehills Road and Harehills Lane
3. Parade of shops on the north-west side of Roundhay Road
4. Junction of Ellers Road and Markham Avenue
5. Harehills Lane / Roundhay Road intersection
6. School crossing points, including the ARK Centre
7. Conway Road / Barnstead Terrace crossing

The key intervention sites are shown in Figure 3.7.

Figure 3.7: Harehills walking intervention sites



Programme of improvements for walking

3.51 Three different interventions have been suggested to improve conditions for walking across Harehills. For each intervention, recommended infrastructure has been outlined, as well as indicative costs and timescales for delivery.

3.52 Table 3.6 comprises a programme of infrastructure improvements for walking in Harehills in order to achieve suitable standards to encourage more walking trips.

Table 3.6: Summary of proposed walking interventions with indicative costs and timescales

Intervention	Intervention scale	Infrastructure	Infrastructure type	Cost estimate	Timescale
1a. Upgrades to Harehills Lane filtering scheme **1b. Footway treatment at side roads along Roundhay Road, Harehills Road and Harehills Lane**	Location-specific	a. Continuous footway and bollards (to prevent vehicles encroaching on the footway) at side roads b. Raised table crossings at side roads c. Cycle access through modal filters	a. Highway / footway b. Highway / footway c. Highway / footway	a. £10k-20k per crossing b. £8k-£15k per crossing c. Subject to local study	Medium Medium Medium
1c. Improve pedestrian safety and walking environment along the parade of shops on northwest side of Roundhay Road	Location-specific	a. Bollards to prevent vehicles encroaching on the footway (subject to local study) b. Re-engineered road corridor to provide a wide, unobstructed footway	a. Walking environment b. Highway / footway	a. £150-£350 per bollard b. Subject to local study	Short Long
1d. Improve the public realm at junction of Ellers Road and Markham Avenue	Location-specific	a. New public realm scheme	a. Highway / footway	a. Subject to local study	Medium
1e. Improve pedestrian crossings at the Harehills Lane / Roundhay Road intersection	Location-specific	a. Single-stage crossings across each arm of the junction	a. Highway / footway	a. £50k - £62k per crossing	Medium
2a. Prevent vehicles driving on the footway to access/exit Roundhay Road	Location-specific	a. Bollards to prevent vehicles encroaching on the footway at key side road locations b. Parklet	a. Walking environment b. Walking environment	a. £150-350 per bollard b. £500-£2k	Short Short
2b. Improve crossing points outside of schools	Location-specific	a. Zebra crossing with a raised table outside the ARK Centre b. Audit of crossing points at other schools	a. Highway / footway b. Highway / footway	a. £20k-£33k b. Subject to local study	Short Medium

Intervention	Intervention scale	Infrastructure	Infrastructure type	Cost estimate	Timescale
2c. Upgrade the Conway Road / Barnstead Terrace crossing	Location-specific	a. Zebra crossing	a. Highway / footway	a. £20k-£33k	Short
3a. Traffic management across the Core Walking Zone	Area-wide	a. Modal filters, continuous footways at side roads, upgraded crossings, removal of vehicle lanes and traffic calming across a similar area	a. Walking environment	a. Subject to local study	Long

*The proposed interventions are intended to be used for prioritising schemes to take forward for delivery, with full design and costing to be done at a later stage. There is no national guidance on cost estimates for walking infrastructure as there is for cycling infrastructure. Indicative cost estimates were informed by Wiltshire Council Highways (2017) *Costs of highway works*, which provides guidance on the typical costs of implementing various types of highway infrastructure. All cost estimates subject to feasibility and design and may be higher or lower when taken forward for delivery. In some instances, cost efficiencies might be found by delivering schemes as part of a holistic area-based approach, rather than on a scheme-by-scheme basis.

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