

West Yorkshire Connectivity Plan

Calder Valley and Bradford: Case for Change

November 2020

Mott MacDonald
Floor 3
1 Whitehall Riverside
Leeds LS1 4BN
United Kingdom

T +44 (0)113 394 6700
F +44 (0)113 394 6701
mottmac.com

West Yorkshire Connectivity Plan

Calder Valley and Bradford: Case for Change

November 2020

Issue and Revision Record

Document reference: 401619 | 04 | J | November 2020

Information class: Standard

This document is issued for the party which commissioned it and for specific purposes connected with the above-captioned project only. It should not be relied upon by any other party or used for any other purpose.

We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose, or containing any error or omission which is due to an error or omission in data supplied to us by other parties.

This document contains confidential information and proprietary intellectual property. It should not be shown to other parties without consent from us and from the party which commissioned it.

Contents

1	Introduction	1	4.3 Connectivity concepts	25
1.1	The role of this Case for Change	1	4.4 Appraisal outcomes	27
1.2	Background to the report	1	4.5 Demand	29
1.3	West Yorkshire's priorities for growth	2		
1.4	Defining the scope and study area	3		
1.5	Calder Valley and Bradford: at a glance	4		
	Calder Valley and Bradford: socio-economic profile	5	5 Conclusion: The Need for Intervention in the Calder Valley and Bradford	31
	Calder Valley and Bradford – connectivity highlights	6	5.1 Introduction	31
			5.2 Connectivity Network	33
2	Spatial context	7	Appendices	37
2.1	Enabling Inclusive Growth	7	A. Spatial context highlights across the regional priorities	38
2.1.1	Deprivation	7	B. Calder Valley and Bradford: Investment Case	43
2.1.2	Isolated communities	8	B.1 Developing interventions	43
2.1.3	Car ownership	8	B.2 Interventions	45
2.2	Boosting Productivity	9		
2.2.1	Employment characteristics	9		
2.2.2	Household income	10		
2.2.3	Growth areas	10		
2.3	Tackling the Climate Emergency	12		
2.3.1	Air quality and Carbon	12		
2.4	Delivering 21 st Century Transport	13		
2.4.1	Active modes	13		
2.4.2	Bus	13		
2.4.3	Rail	14		
2.4.4	Road	15		
2.4.5	Patterns in transport demand	16		
2.5	Summary	17		
3	Corridor aspirations	18		
3.1	Defining aspirations	18		
3.2	Core objectives	18		
3.3	Corridor-specific aspirations	18		
3.4	Measuring objectives	19		
3.4.1	The appraisal process	19		
4	Determining spatial priorities	21		
4.1	Places to connect	21		
4.2	Existing connectivity improvements	23		

1 Introduction

1.1 The role of this Case for Change

This Case for Change report for Calder Valley and Bradford provides an important first step, and part of the evidence, for identifying a connectivity pipeline of future transport investments for this part of the region.

This report provides analysis of transport and socio-economic data, to identify an initial long list of potential transport investments aimed at improving connectivity. The approach takes the view that transport should not be a barrier to people accessing jobs, to businesses choosing to invest here and to improving the health of our residents and visitors. Improvements in transport should be a catalyst for change across all these objectives.

This report's outputs will be integrated with other Case for Change reports, and other workstreams, including proposals to decarbonise transport, Urban Mass Transit market testing, Bus Network Reviews, a Rail Capacity Study, Local Cycling and Walking Infrastructure Plans and a Future Mobility Strategy, to produce a connectivity plan and long term investment programme for the whole of West Yorkshire, to the 2040s.

1.2 Background to the report

The West Yorkshire Combined Authority has adopted a Transport Strategy to 2040. The strategy was a collaboration between the Combined Authority and the West Yorkshire partner councils of Bradford, Calderdale, Kirklees, Leeds and Wakefield and covers the geography of West Yorkshire but recognises the importance of the wider Leeds City Region, and that people and goods travel longer distances across administrative boundaries. The strategy provides a framework of high-level transport policies aimed at delivering a world-class, modern, integrated transport system, that will play a key role in transforming the region's economy and delivering inclusive, sustainable growth.

A daughter document, the Leeds City Region HS2 Growth Strategy, set out the strategic case for change for building on the once-in-a-generation opportunity provided by the arrival of High Speed 2 (HS2) and Northern Powerhouse Rail (NPR) in the region to transform the City Region's economy. The benefits of HS2 and NPR alone cannot drive inclusive growth; a range of factors are essential to create more and better jobs, with a highly skilled workforce to sustain them - and a lack of transport capacity and infrastructure at the City Region and local level will inhibit growth. The HS2 Growth Strategy identified corridors and communities which are in economic need of improved connectivity.

Significant investments in transport are planned through the West Yorkshire Transport Fund, Connecting Leeds and Transforming Cities Fund programmes, and by the rail industry, which will provide the early years of the connectivity pipeline. However, there remains insufficient capacity and resilience in our transport system, particularly to key employment centres, which will constrain business and labour market catchments, and the ability to train and develop the next generation, by restricting access to colleges and universities. The National Infrastructure Commission identified that this is affecting many places across the North of England and will increasingly inhibit economic development and living standards.

An important next step is to support the delivery of our strategies is to develop a plan and pipeline of longer-term investments, which address a full range of strategic and local connectivity needs.

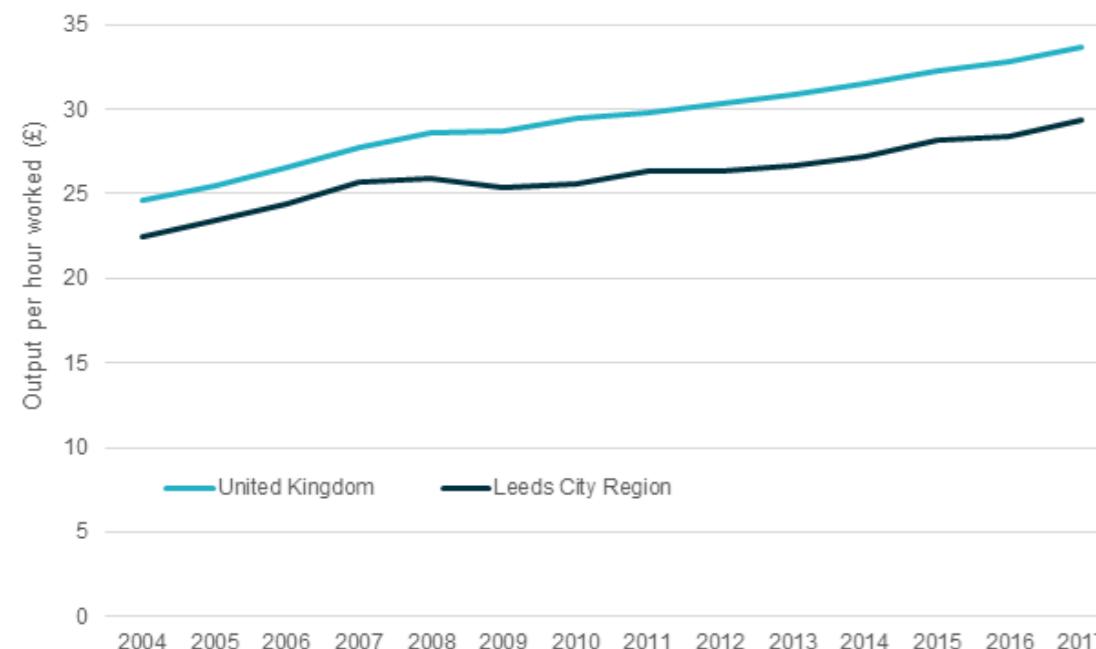
Ten Case for Change reports have been produced with the input of the partner councils which address corridors covering the geography of West Yorkshire and, including parts of the wider City Region, provide detailed evidence of connectivity needs. These Case for Change reports should be read in conjunction with the Connectivity Plan Appraisal Handbook for further detail on background and methodology.



1.3 West Yorkshire's priorities for growth

The emerging Industrial Strategy for West Yorkshire highlights a significant and widening productivity and innovation deficit, as shown in Figure 1. Living standards across the City Region have stalled with several communities facing persistent poverty.

Figure 1: Illustration of productivity gap in West Yorkshire



Source: Office for National Statistics, 2019

The West Yorkshire Transport Strategy recognises that our transport network currently constrains opportunities for growth and is a key factor in shaping experiences of poverty. Our network does not sufficiently support sustainable travel as the obvious choice for many. In the wake of the declaration of a "climate emergency" by all West Yorkshire districts, there is a growing need to de-carbonise our transport network; as the transport sector contributes 27% of Bradford's and 37% of Calderdale's total CO₂ emissions¹. This needs immediate action as transport emissions are expected to grow, constraining West Yorkshire's ability to meet overall emissions targets.

We have four priorities for the region aimed at addressing our key challenges. These are summarised in Table 1.

Table 1: West Yorkshire's four priorities for growth



Enabling Inclusive Growth – Ensuring that economic growth leads to opportunities for all who live and work in the region



Boosting Productivity – Helping businesses grow and bringing new investment into the region to drive economic growth and create jobs



Tackling the Climate Emergency - Growing our regional economy whilst cutting carbon dioxide emissions



Delivering 21st Century Transport - Creating efficient transport infrastructure that makes it easier to get to work, do business and connect with each other

Source: West Yorkshire Combined Authority

¹ UK local authority and regional carbon dioxide emissions national statistics: 2005-2016

1.4 Defining the scope and study area

This section explains the process undertaken to define the corridor from the original scope to an economic area in which to focus the evidence base, develop key connectivity concepts and interventions.

The Leeds City Region HS2 Growth Strategy identifies a network of communities and corridors that will benefit from inclusive growth. Table 2 shows a list of the corridors and the corresponding reports with their approximate extents illustrated in Figure 2. All the Case for Change corridors are shown in Figure 3 with the Calder Valley and Bradford corridor highlighted in red.

Table 2: Reporting Index

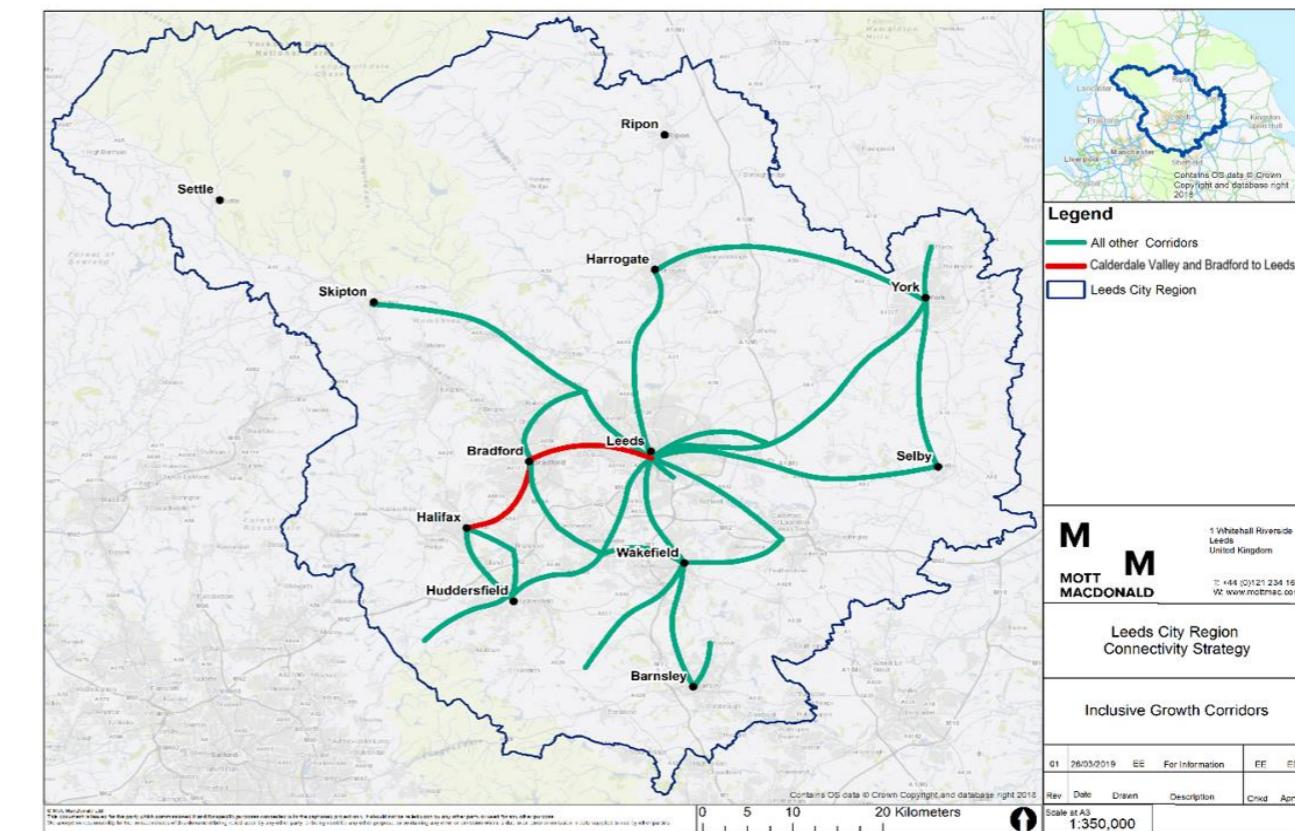
Ref.	Report Name	Original corridor name
1		Strengthening high value assets in the North West of Leeds, the University of Leeds, Kirkstall Forge and the airport
1	Airport, Airedale and Wharfedale: Case for Change	Skipton to Leeds
1		Stimulating development from the city centre into North Bradford towards Shipley, Saltaire and the airport
2	Calder Valley and Bradford: Case for Change	The Calder Valley and Bradford
3	West Kirklees to Calderdale: Case for Change	Huddersfield to Brighouse
3		South West Kirklees (including Slaithwaite) to Brighouse
3		Huddersfield – Halifax
3		Halifax to Brighouse
4	Leeds – Bradford: Case for Change	Leeds Bradford cross connectivity
4		South Bradford and North Kirklees – Bradford
5	Leeds – Huddersfield: Case for Change	Dewsbury / Huddersfield to the HS2 Hub
6	East Kirklees to Wakefield: Case for Change	Dewsbury to Wakefield
6		East Kirklees (including Denby Dale) to Wakefield
6		Five Towns to Wakefield
7	South and East Leeds: Case for Change	Extending the South Bank opportunity to the south of Leeds
7		Accelerating inclusive growth in the East of Leeds towards St James' Hospital and the East Leeds extension
8	North Yorkshire to Leeds: Case for Change	Harrogate to the HS2 Hub
8		York to Leeds
8		Se by to the HS2 Hub
9	Five Towns to Leeds: Case for Change	Five Towns to Leeds
10	Barnsley and Wakefield to Leeds: Case for Change	Barnsley and Wakefield to Leeds
10		North Barnsley to Barnsley

Figure 2 West Yorkshire Connectivity Plan: Reporting Map

- 1 Airedale, Wharfedale & Airport
- 2 Calder Valley
- 3 West Kirklees to Calderdale
- 4 Leeds, Bradford, South Bradford & North Kirklees
- 5 Leeds to Huddersfield
- 6 East Kirklees to Wakefield
- 7 South Leeds & East Leeds
- 8 North Leeds to North Yorkshire
- 9 Five Towns to Leeds
- 10 Leeds to Wakefield & Barnsley



Figure 3: West Yorkshire Connectivity Plan: Corridor Map



The corridor extends in a southwest direction from Leeds to Halifax, including Bradford. It covers an area characterised by densely populated urban areas concentrated in valleys, including Hipperholme, Elland and Brighouse. The defined economic area is shown in the next chapter.

The section between Leeds and Bradford is addressed in another Case for Change for the Leeds to Bradford corridor; therefore, the focus for this report is on the Bradford to Halifax section of the corridor.

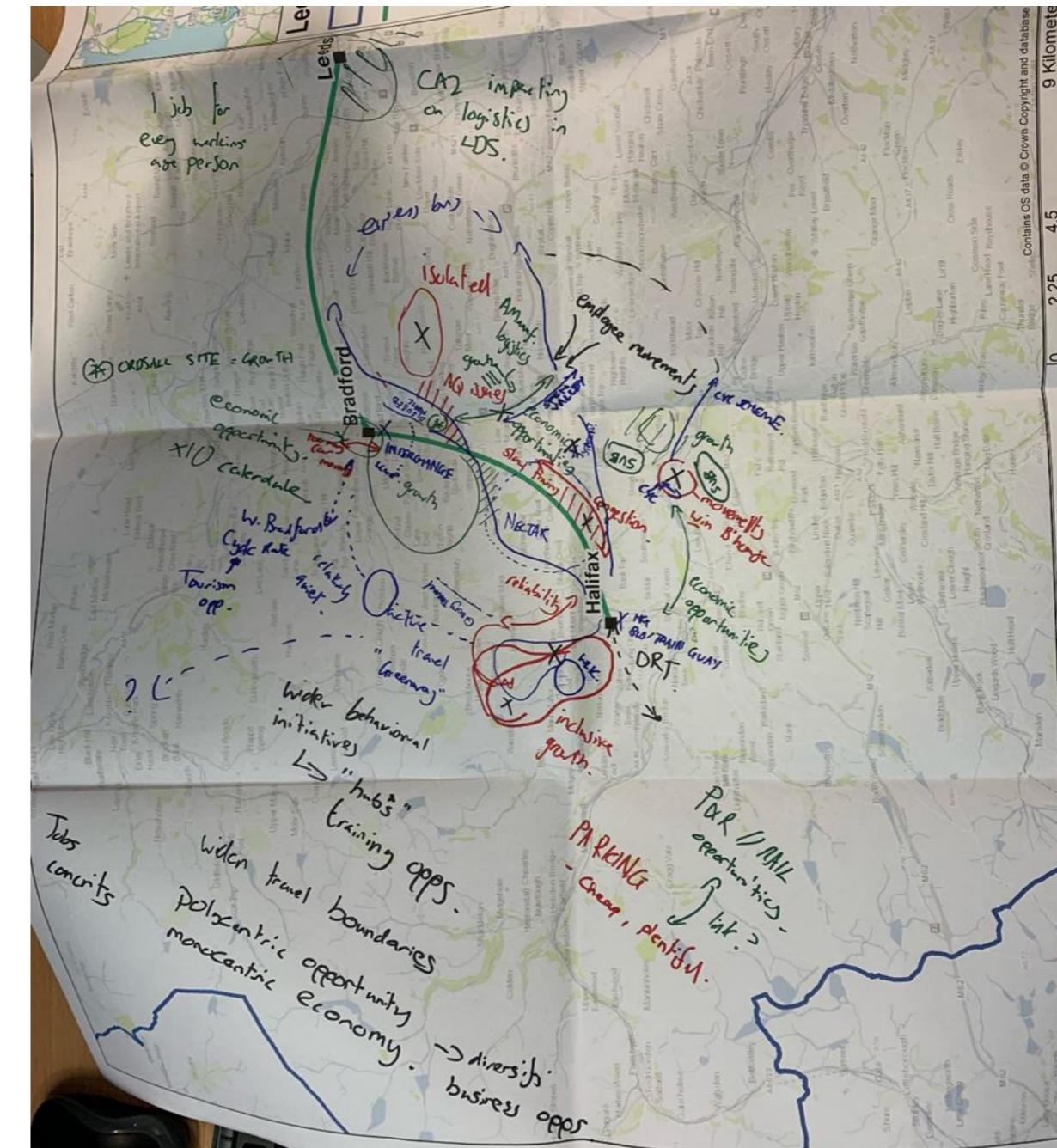
The study area has been defined in consultation with officer representatives from relevant districts, namely Bradford and Calderdale (these will now be referred to as the partners). An initial workshop helped to identify and confirm the key “problems and opportunities” for the study area. An example of the outputs from this is shown in Figure 4.

The findings were then used to define both the extent of the corridor or economic area, the main elements of the accompanying “story map” (which summarises the key issues and opportunities in the spatial context, and sits behind the Case for Change as the data repository and analysis tool) and to develop a set of corridor-specific objectives.

1.5 Calder Valley and Bradford: at a glance

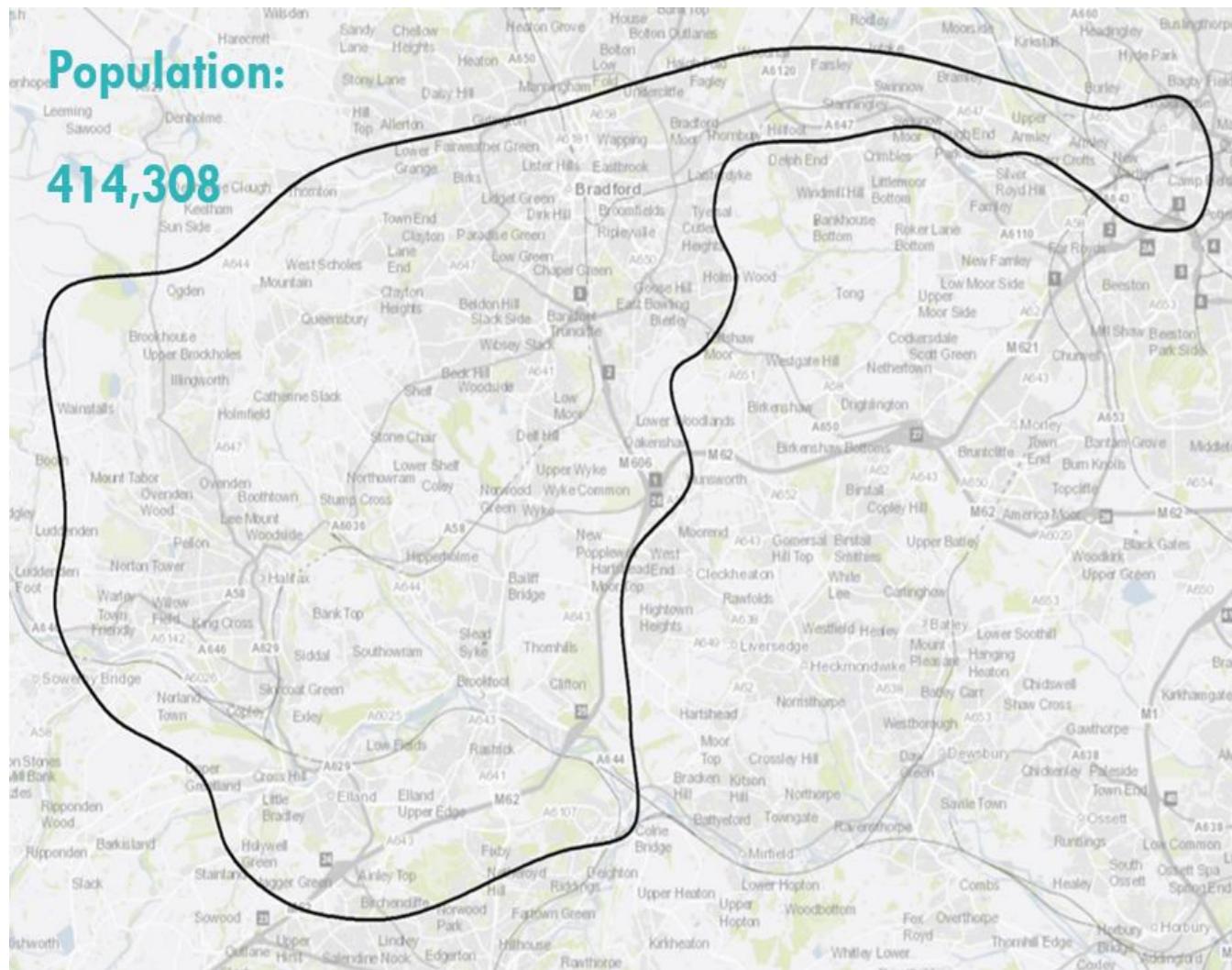
The following two pages provide some highlights for this study area – these cover the key socio-economic features of the geography as well as the connectivity challenges it faces and conclude with prioritised investment proposals to meet these challenges. The 2-page summary is designed as a double sided “lift out” of the key issues and conclusions. Further detail to underpin these summary points is provided in subsequent Chapters.

Figure 4: Example of issues identification and corridor definition from stakeholder workshop



Calder Valley and Bradford: socio-economic profile

This corridor considers movements across the Calder Valley and Bradford. It covers densely populated urban areas concentrated in the valleys, bounded by steep hills. Average household income in the corridor is lower than both national and regional averages and just over half of the population are employed. There is considerable employment and housing growth forecast throughout the corridor and connectivity to future growth sites is fundamental to enable inclusive growth throughout the Leeds City Region.



Total jobs in the corridor:
Over
323,600



Number of Air Quality
Management Areas:
11



Employment sites forecast
in the corridor
124



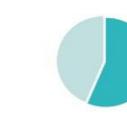
Housing sites
forecast in the corridor
287
(excluding any in Bradford as
sites not yet allocated)



Average household income:
£32,500

Yorkshire and Humber
£36,526

England and Wales
£41,642



% in employment:
56%

Yorkshire and Humber
60%

England and Wales
62%

Places with challenges for:



Income:
Park Ward



Employment:
South Bradford



Health:
Ovenden

Places with opportunities for:



Connectivity:
Low Moor

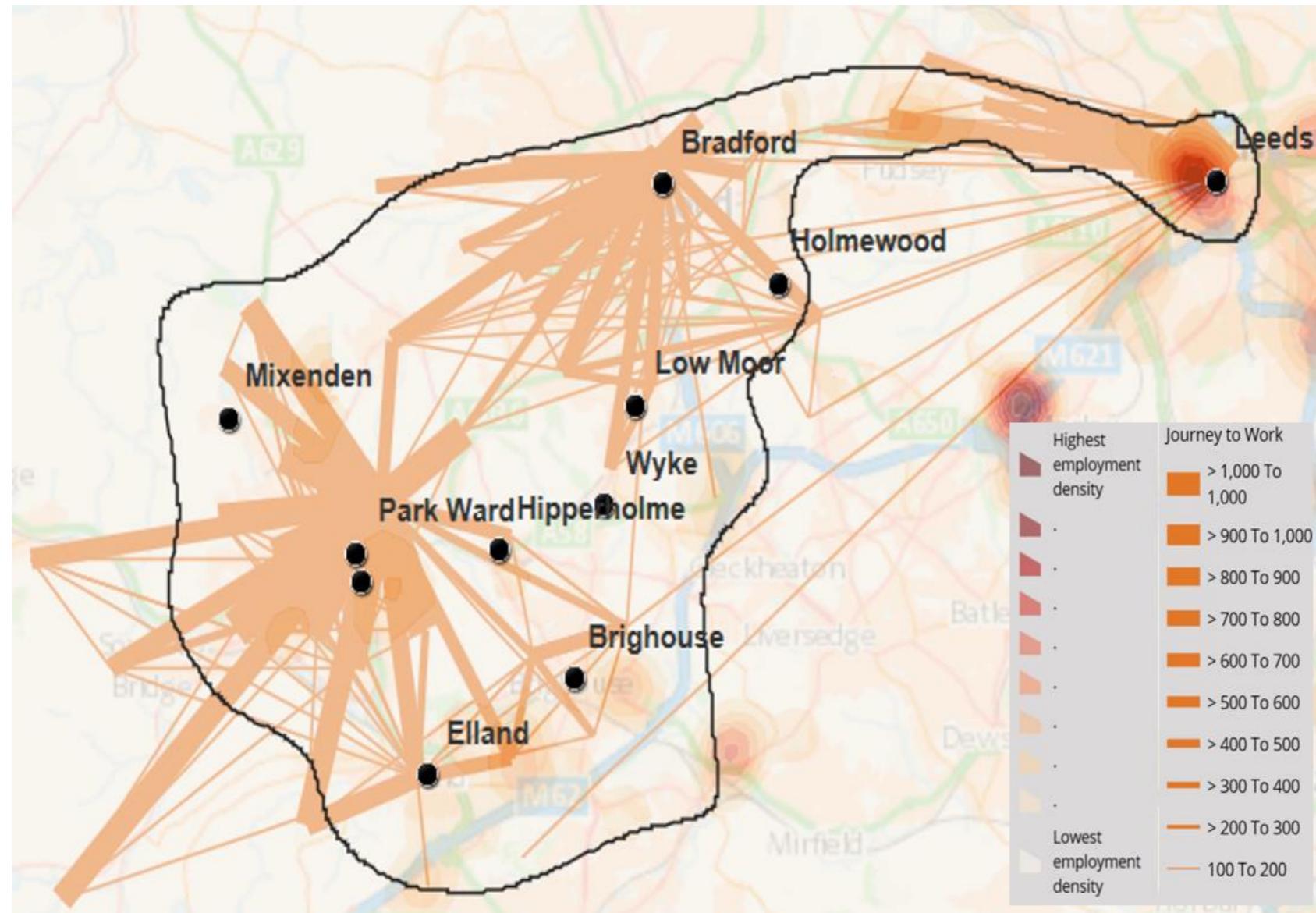


Employment:
Clifton Enterprise Zone



Housing:
Brighouse

Calder Valley and Bradford – connectivity highlights



Key connectivity challenges:

- 190,000 people in the corridor live within an isolated community, approximately 34% of the population. Improving access to employment destinations will help to **boost productivity**
- 300,000 people in the corridor (54%) have access to only one bus service or less per hour outside of peak periods, this restricts the delivery of a **21st century transport system**
- There is a skills gap. Ovenden, Mixenden, Park Ward and South Bradford are in the top 10% most deprived areas for education in England. Improving connectivity to education opportunities, will ultimately help people to find better employment, helping to ensure **inclusive growth**
- High levels of peak-time traffic, and associated congestion particularly on the M62 and at Stump Cross and Hipperholme crossroads must be addressed to **tackle the climate emergency**

Investment is required in improved connectivity, particularly for strategic trips between employment opportunities, including those at Clifton Enterprise Zone and Chain Bar, to the rest of the corridor. Schemes that will best address these connectivity challenges will be taken forward into a West Yorkshire pipeline of interventions to deliver inclusive and clean growth.

People in communities within the corridor, including in Ovenden, Mixenden and Park Ward experience low employment and skills prospects, low household income, and low car ownership, and are within the top 10% of most deprived communities in the UK.

Many job opportunities, often in manufacturing and wholesale and retail trade, rely on car access and are poorly served by other modes. To improve the prospects of these communities, and to boost productivity, they must be better connected to suitable employment opportunities by a range of transport options.

2 Spatial context

This chapter sets out the key spatial challenges for each of our four regional priorities in the corridor. It presents the key outputs from the “story map” for this corridor; this is a web-based Geographical Information System (GIS) data repository and analysis tool, which summarises the key issues and opportunities in the spatial context and sits behind the Case for Change. The story map was developed from a wide range of spatial datasets and the resulting narrative was shared with and shaped by feedback from key stakeholders on top issues, opportunities and local priorities. These are presented alongside the major priorities for the City Region.

Please refer to Chapter 6 of the Appraisal Handbook for a summary of the datasets which form part of the evidence base for the “story map” that supports the development of the Case for Change

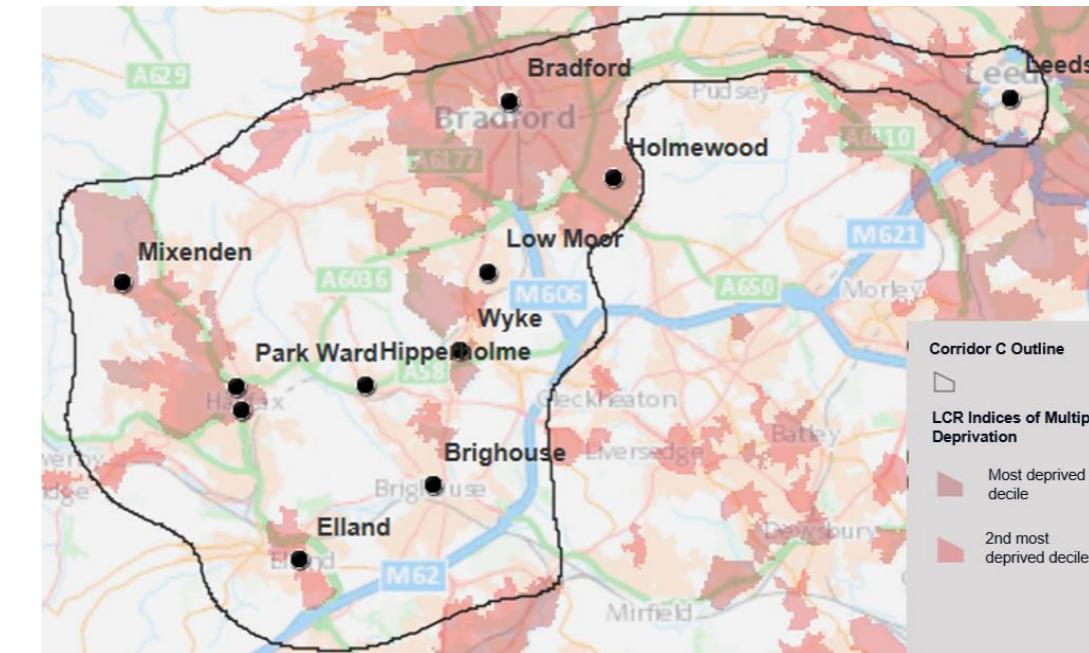
2.1 Enabling Inclusive Growth

2.1.1 Deprivation

Figure 5 shows areas that are within the top two deciles of the indices of multiple deprivation. Deciles are calculated by ranking the 32,844 Lower Super Output Areas (LSOA) in England from most deprived to least deprived and dividing them into 10 equal groups. LSOAs in decile 1 fall within the 10% most deprived LSOAs nationally, whilst LSOAs in decile 10 fall within the 10% least deprived of LSOAs nationally². The index of multiple deprivation is an overall relative measure of deprivation constructed by combining seven domains of deprivation according to their respective weights.³ These include:

- Income Deprivation
- Employment Deprivation
- Education, Skills and Training Deprivation
- Health Deprivation and Disability
- Crime
- Barriers to Housing and Services
- Living Environment Deprivation

Figure 5: Areas of high deprivation



Source: Mott MacDonald

There are pockets of deprivation to the north and west of Halifax (Mixenden, Illingworth, Ovenden and Sowerby Bridge), as well as many areas of Bradford (comprising most of the City within the outer ring road and other communities such as Holmewood). These are associated with poor levels of health and economic activity. Several areas are characterised by communities that contain equality, diversity and inclusion (EDI) hotspots. The corridor is home to a high number and proportion of people from the “protected characteristics groups” as defined by the Equality Act (2010) and Human Rights Act (1998) and as such has a diverse mix of cultures which must be taken into consideration. It is important to ensure that such communities are not adversely impacted by transport initiatives and remain connected to opportunities via appropriate transport options.

Ovenden, Mixenden, Park Ward and South Bradford are in the top 10% deprived areas for education in England. **People in these areas are more likely to suffer from poor connectivity and fewer opportunities to access jobs and education and many will rely on convenient and reliable transport; connecting these areas is vital to enabling inclusive growth⁴.**

² English Indices of Deprivation 2015 – Department for Communities and Local Government

³ ibid

⁴ Tackling transport-related barriers to employment in low-income neighbourhoods (2018) accessed via: <https://www.jrf.org.uk/report/tackling-transport-related-barriers-employment-low-income-neighbourhoods>

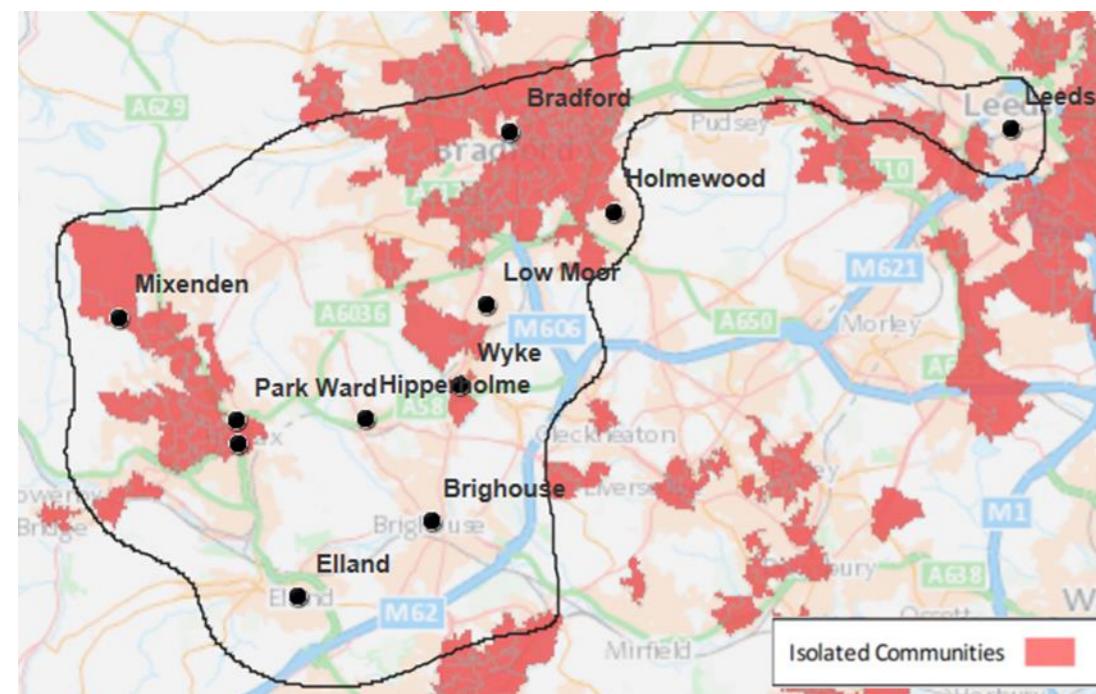
2.1.2 Isolated communities

Isolated communities have high levels of deprivation (are within the top 20% most deprived in England) and can access a lower than average number of employment destinations. Residents find that job opportunities are difficult to access because of public transport journey times, reliability (perceived as well as actual) and affordability⁵.

This measure uses the approach adopted for the Joseph Rowntree Foundation for “*Tackling transport related barriers to employment in low-income neighbourhoods*” and uses Census data (distance travelled to work, and the average number of destinations people can reach for journeys to work across the LCR).

There are several areas surrounding Bradford and to the west of Halifax, as well as Mixenden and Hipperholme, that are defined as “isolated communities” (see Figure 6).

Figure 6: Isolated communities



Source: Mott MacDonald

Around 190,000 people in the corridor live within an isolated community, approximately 34% of the corridor.

Improving connectivity in these areas is fundamental to enabling inclusive growth. People within these communities are unable to access many destinations for work, meaning many people have limited access to job opportunities. Many people in isolated communities also rely on affordable, convenient and reliable transport to access education and job opportunities. Ensuring that these areas are well connected by public transport to access employment and education is therefore fundamental to achieving inclusive growth⁶.

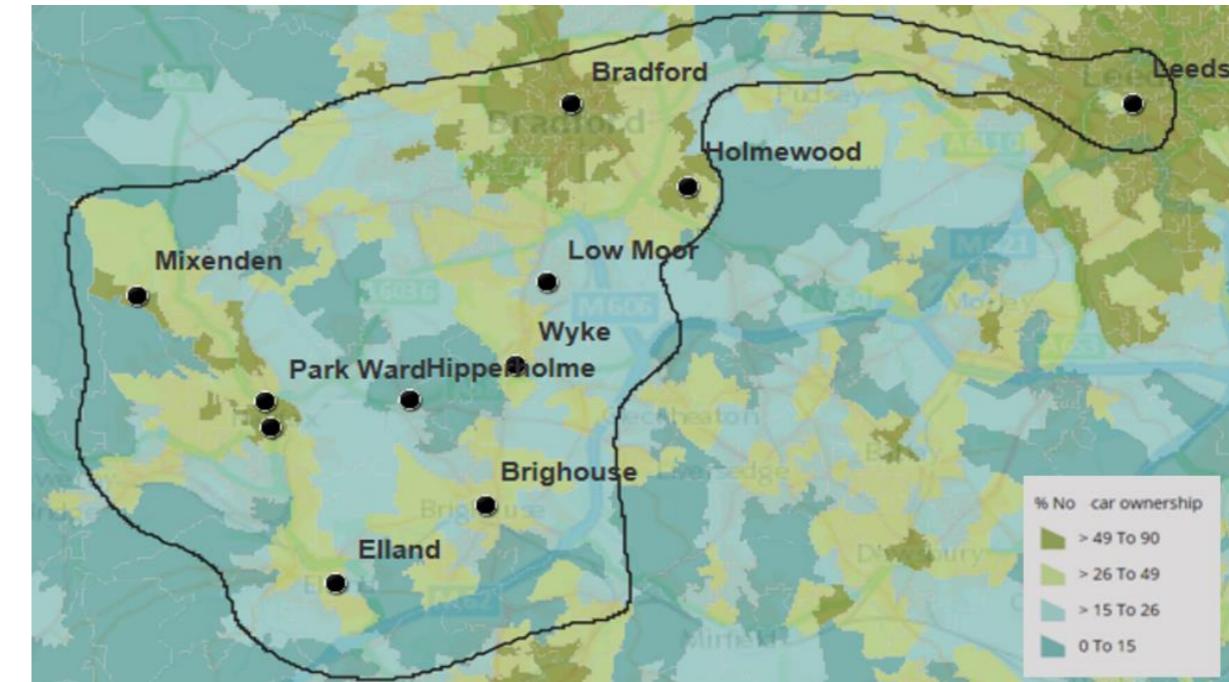
⁵ Tackling transport-related barriers to employment in low-income neighbourhoods (2018) accessed via:
<https://www.jrf.org.uk/report/tackling-transport-related-barriers-employment-low-income-neighbourhoods>

2.1.3 Car ownership

The motorway network ensures that some of these areas are reasonably well connected. However, there are several areas in Bradford through to Holmewood and Halifax, Brighouse and Elland which are characterised by low car ownership (see Figure 7), meaning that not everyone can benefit from the connectivity opportunities this brings.

Ensuring that key employment areas are connected by good public transport links in both peak and off-peak time periods will enable people to access employment without owning a car. A high-quality integrated transport system will also encourage people to choose to travel by public transport rather than car which is fundamental to meeting carbon reduction targets.

Figure 7: % No car ownership



Source: Mott MacDonald

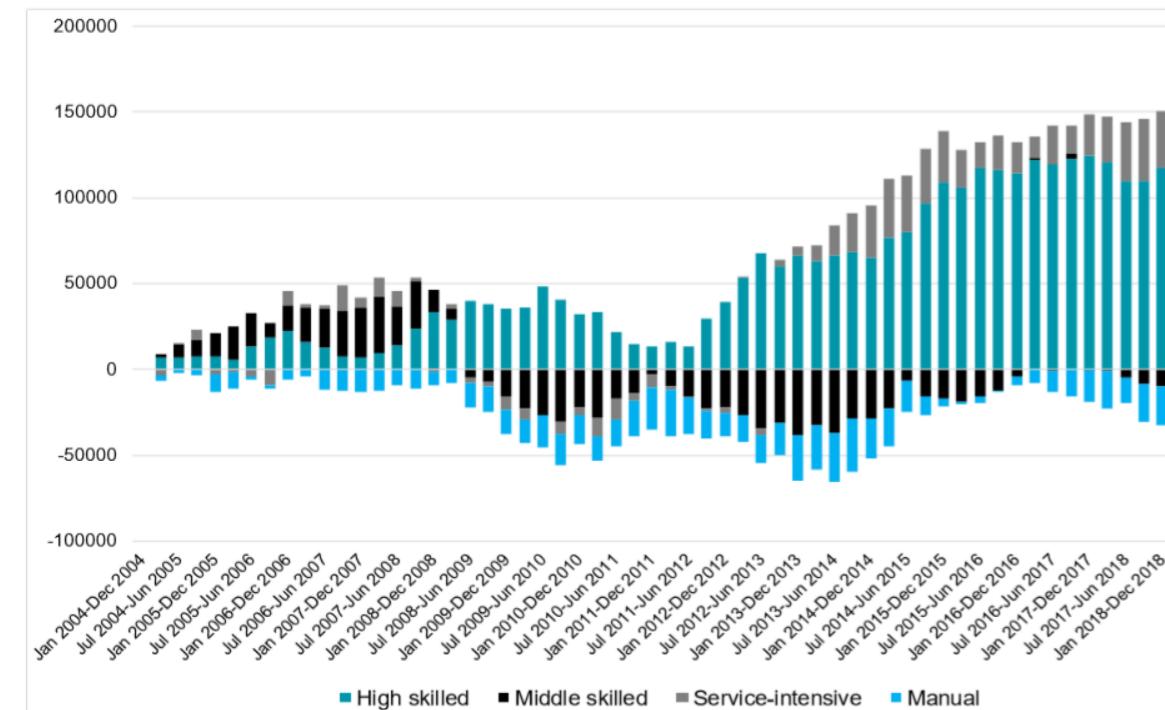
⁶ Tackling transport-related barriers to employment in low-income neighbourhoods (2018) accessed via:
<https://www.jrf.org.uk/report/tackling-transport-related-barriers-employment-low-income-neighbourhoods>

2.2 Boosting Productivity

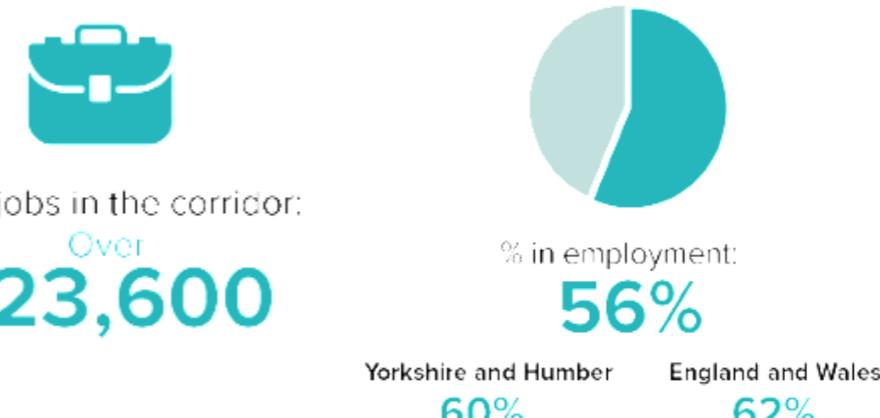
2.2.1 Employment characteristics

The emerging Industrial Strategy for West Yorkshire highlights an increase in highly skilled employment in the City Region (see Figure 8). Opportunities in this corridor include finance, insurance, and manufacturing. This affects commuting flows as these workers often commute further and travel more. Having an effective and reliable transport system is therefore paramount to maximise productivity in the region.

Figure 8: Occupational contribution to cumulative employment growth



The Calder Valley and Bradford corridor has some distinct employment characteristics and strengths.



In terms of number of employees, the financial and insurance activities sector employs 38,761 people, almost two and a half times the national average⁷. The manufacturing sector employs 26,299 people, 1.3 times the national average. Wholesale and retail trades employ the highest number of people, 75,557. This sector operates shift patterns outside of the traditional timetables and schedules of current public transport routes.

The Calderdale Royal Hospital and St. Luke's Hospital are key local employers and sources of important health services within the Calder Valley and Bradford corridor. Other key areas of employment include the M606 corridor between Bradford and Brighouse, and the Calder Valley between Brighouse, Elland and Sowerby Bridge, both of which have a large manufacturing presence.

However, partners have highlighted a lack of connectivity between these job opportunities and areas of economic need. For example, there are some neighbourhoods where manufacturing jobs account for the highest proportion of employment opportunities (such as in Elland and Low Moor) but many residents struggle to access the employment on offer. Similarly, some neighbourhoods include a high proportion of health professionals, but again may suffer connectivity issues that limit opportunities in this area.

Connectivity to these specialisms is fundamental to boosting productivity.

⁷ Business Register and Employment Survey: open access (2017)

2.2.2 Household income

Average total annual household income in the corridor (£32,500) is lower than the average for England and Wales (£41,642) and also that for Yorkshire and Humber (£36,526), and is particularly low in and surrounding Bradford, Mixenden, Elland and Halifax (shown in Figure 9). The gross value added per head (GVA) according to the West Yorkshire Combined Authority for Bradford and Calderdale is 68% and 70% of the UK average. This general measure of prosperity shows the need for action to boost productivity, including better connections in the area to create opportunities to help enhance the economy.

Figure 9: Total annual household income



Source: Mott MacDonald

Connecting areas of deprivation and low annual household income is important to provide opportunities for people to access education and employment and in enabling inclusive growth throughout the corridor.

2.2.3 Growth areas

The Calder Valley and Bradford corridor is subject to considerable growth plans. To maximise the economic benefit and potential that these bring, their connectivity requirements must be considered carefully, and within the context of the existing socio-economic issues. The emerging Industrial Strategy for West Yorkshire highlights that over the past five years business base growth in Leeds has occurred faster than the UK. However, Bradford's and Calderdale's business growth has been slower, at around 19% and 15%. This emphasises, alongside other factors, the need for good transport options connecting Bradford and Calderdale businesses to potential employees and customers.

Figure 10 shows a heatmap of housing growth sites in the Calder Valley and Bradford corridor. Additional housing is mainly proposed in the south east of the corridor, surrounding Brighouse, including the development of two 'Garden suburbs'; Thornhills Garden Village and Woodhouse Garden Village. Proposals in these new communities include over 1900 new homes.

Figure 10: Housing growth sites heatmap

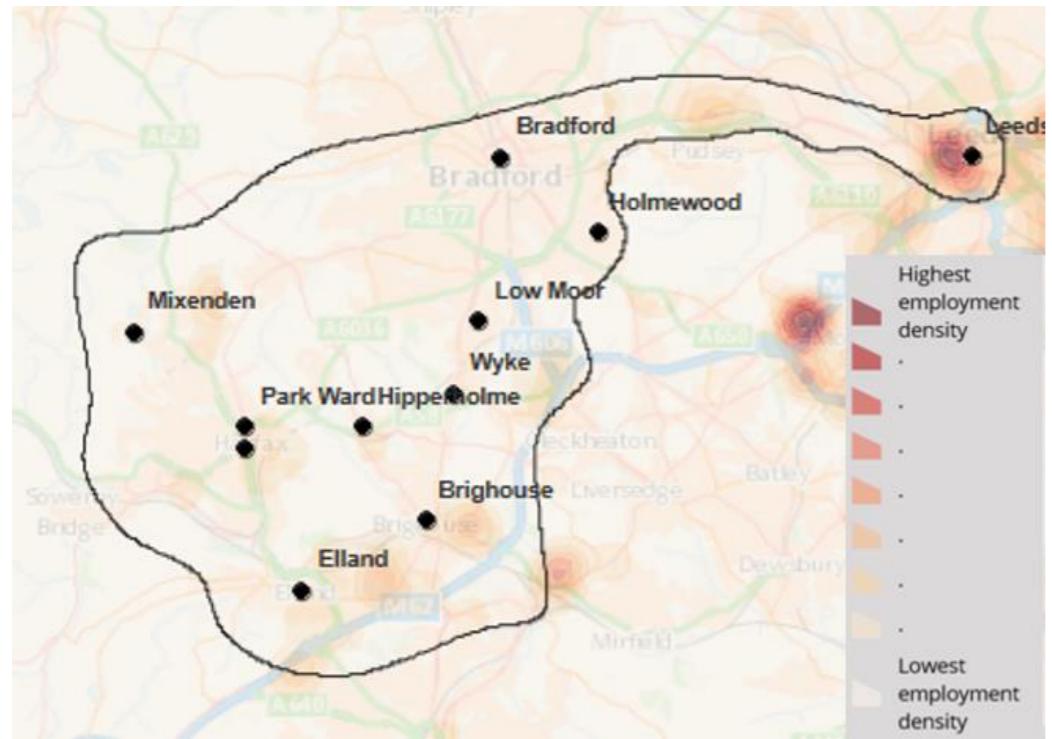


Source: Mott MacDonald

As well as housing growth, employment growth is being promoted in the area; particularly around the Clifton Enterprise Zone between Brighouse and the M62 (1,300 jobs) (see Figure 11). There are also two large employment sites at Chain Bar.

Housing growth in the corridor emphasises the need to improve public transport connectivity to these areas and existing communities, to ensure services are not strained by additional residents and to enable access to employment opportunities for everyone.

Figure 11 Employment growth sites heatmap



Source: Mott MacDonald

2.3 Tackling the Climate Emergency

2.3.1 Carbon emissions

The West Yorkshire Transport Strategy recognises that our transport network currently constrains opportunities for growth and is a key factor in shaping experiences of poverty, but also that our networks do not sufficiently support sustainable travel as the obvious choice for many.

This is reflected in the evidence that the transport sector is the largest emitter of damaging carbon dioxide in the region, with transport contributing 4.9 MtCO₂e/year (millions of tonnes of carbon emissions per year). Transport sector emissions are dominated by emissions from road transport with 4.4 MtCO₂e/year being from road transport⁸, representing roughly 40% of total CO₂ emissions in West Yorkshire (11.1 MtCO₂e/year)⁹. Road transport emissions are dominated by emissions from private cars, vans and lorries - with conventional petrol and diesel internal combustion engines the dominant technology across all vehicle types.

In June 2019 the Combined Authority, in line with all the West Yorkshire partner councils and most Leeds City Region local authorities, formally declared a Climate Emergency. This declaration signals the Combined Authority and partner councils' ambition for the region to become net zero-carbon by 2038, with significant progress being made by 2030. The 2038 target was determined following work by the Tyndall Centre for Climate Change Research, which was commissioned to create a science-based carbon budget for the Leeds City Region that is consistent with the objectives of the UN Paris Agreement on Climate Change (Paris Agreement) and the Intergovernmental Panel on Climate Change (IPCC)¹⁰.

The Combined Authority published, in July 2020, the findings of a Carbon Emissions Reduction Pathways (CERP) study¹¹. This report, produced for the Leeds City Region and York and North Yorkshire local enterprise partnerships, is the first step in identifying the actions needed to create a net zero carbon economy.

While three pathways have been identified through the CERP work, there are several common actions identified in all the pathways, including a series of measures on transport. These modelled pathways all recognise the need for further modal shift to achieve the scale of reduction in carbon emissions from transport required to meet the ambitious net zero target and timeline.

Transport is therefore a critical sector for carbon emissions reduction across West Yorkshire requiring ambitious action that goes beyond current national policy and targets. The CERP asserts that this will require a significant shift in behaviour change and the fast adoption of low carbon technology.

At the time of publication, no further specific evidence on carbon emissions was available (pending release of West Yorkshire Combined Authority Emissions Reduction Pathway study and other work on carbon emissions), however **these influences, once understood, will be critical in understanding and prioritising connectivity requirements in future**.

2.3.2 Air quality

Partners across West Yorkshire, including the Combined Authority, the five district councils, and Public Health England, have developed the West Yorkshire Low Emissions Strategy (2016). The focus of the strategy is "tackling transport emissions as pollution from transport causes most local air quality problems".

The strategy highlights that health effects associated with exposure to air pollution are significant; more deaths are caused by air pollution than preventable liver or respiratory disease. In West Yorkshire in 2013, 5.1% of all deaths (1 in 20 deaths) were caused by exposure to particulate air pollution with up to 6% in some local authority areas. Traffic in our urban centres and on busy roads results in levels of air pollution which have a significant impact on the health of the population, with those having underlying health conditions being most at risk. There are two pollutants of greatest concern: nitrogen dioxide (NO₂) and particulate matter (PM₁₀) which

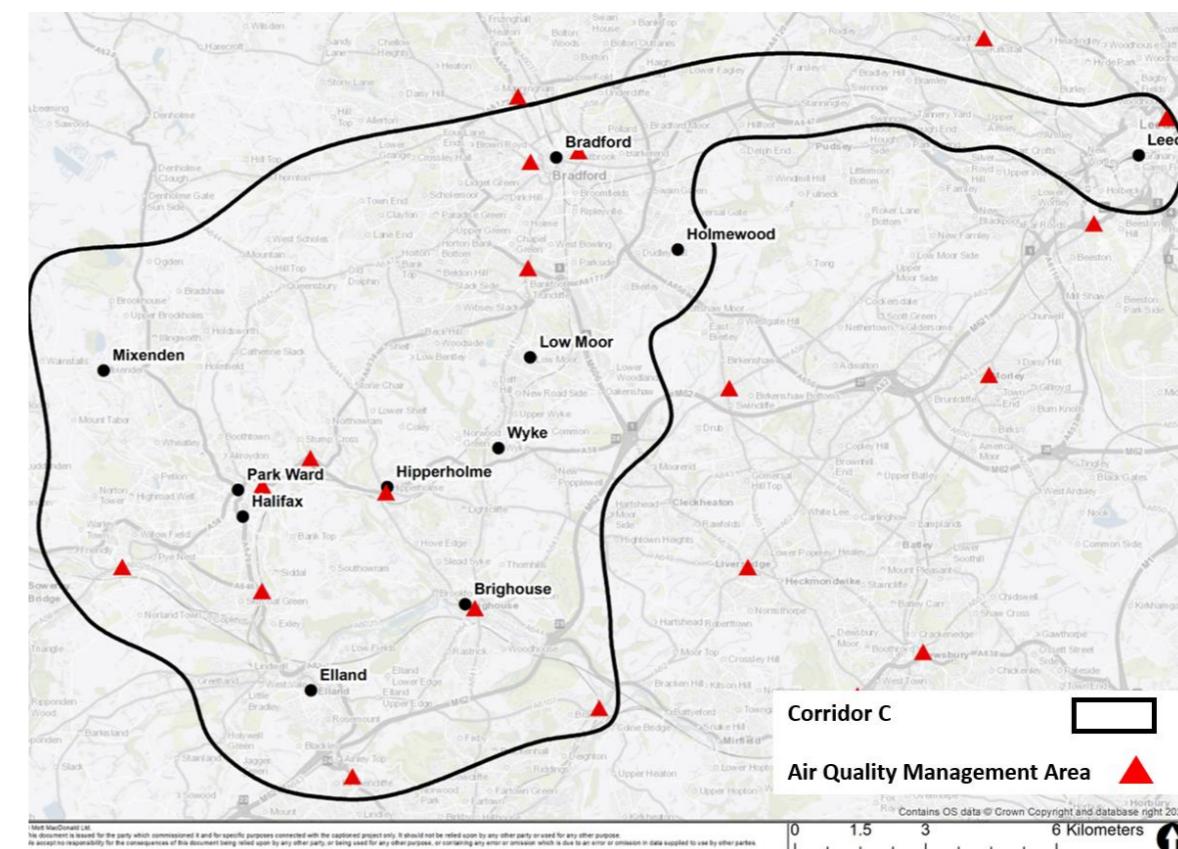
have an adverse impact on health and mainly result from emissions from traffic, particularly exhaust emissions from older diesel vehicles.

Nitrogen dioxide and particulate matter, together with other air pollutants, have been set an upper air quality limit value that the general population should not be exposed to that is legally binding in UK law. Since 1997 each local authority has been carrying out review and assessment of air quality in its area, and where it is found likely that national air quality objectives will not be achieved, an air quality management area must be declared¹².

There are 8 small, localised air quality management areas in the southern part of the corridor, as shown in Figure 12. Air quality has also been highlighted as an issue in Bradford with proposals being developed for a Bradford Clean Air Zone (CAZ). It is proposed that the CAZ would extend to the outer ring road to include Bingley, Saltaire and Keighley, to help reduce transport emissions.

Facilitating sustainable modes of transport will reduce car use, enabling a consequent reduction in traffic congestion and the associated emissions that cause air pollution and poor air quality.

Figure 12: Air Quality Management Areas (AQMAs)



Source: Mott MacDonald

⁸ West Yorkshire Combined Authority, 2020. West Yorkshire Carbon Emission Reduction Pathways Key Findings Report. Available at: <https://westyorkshire.moderngov.co.uk/documents/s16572/Item%2011%20-%20Appendix%201.pdf>

¹⁰ ibid

¹¹ ibid

¹² Department for Environment Food & Rural Affairs at <https://uk-air.defra.gov.uk/aqma/> accessed in October 2020

2.4 Delivering 21st Century Transport

2.4.1 Active modes

The ability for people to frequently and safely cycle and walk has been identified in policy as having a significant role to play in the strategic transport network in West Yorkshire and the wider Leeds City Region.

This corridor is relatively well connected for active travel and has seen recent significant investment in cycling and walking infrastructure along the main routes between Leeds and Bradford, through the Combined Authority's CityConnect programme, with the 23km Leeds Bradford Cycle Superhighway, as well as the off-highway network through Calderdale and the Aire Valley.

The off-highway network in the Calder Valley is of a relatively high standard, with improvements ongoing to the City Connect/ NCN 66 route between Brighouse and Todmorden. This includes the Rochdale Canal towpath between Todmorden and Sowerby Bridge, linking through Hebden Bridge and Mytholmroyd, and the Calder and Hebble Navigation towpath from Sowerby Bridge via Elland to Brighouse. A spur route along the Hebble Trail from Salterhebble provides a link towards Halifax.

Phase 4 of the West Yorkshire Plus Transport Fund A629 corridor scheme is developing proposals to provide a link from the Calder and Hebble towpath at Elland southwards via Ainley Top to Huddersfield. Figure 13 identifies the cycling and walking network in the corridor and highlights the areas that have benefitted from recent investment, as well as showing the need for further provision. There is a lack of on-highway cycle provision between Bradford and Calderdale; with the most significant gaps being links into Halifax town centre from the urban areas around it, which suffer from high levels of severance caused by the road network around the town centre of Halifax and a more challenging topography. The area to the north west of Halifax town centre is the focus of projects to be delivered through the TCF programme as well as a Streets for People project focused on Park Ward.

Although the off-highway network has seen significant improvement through the Calder Valley, this network is constrained by virtue of being predominantly along the canal towpath network. On-highway provision to a high standard would be required to see a significant increase in journeys by bike or on foot.

Figure 13: Cycle network



Source: Mott MacDonald

2.4.2 Bus

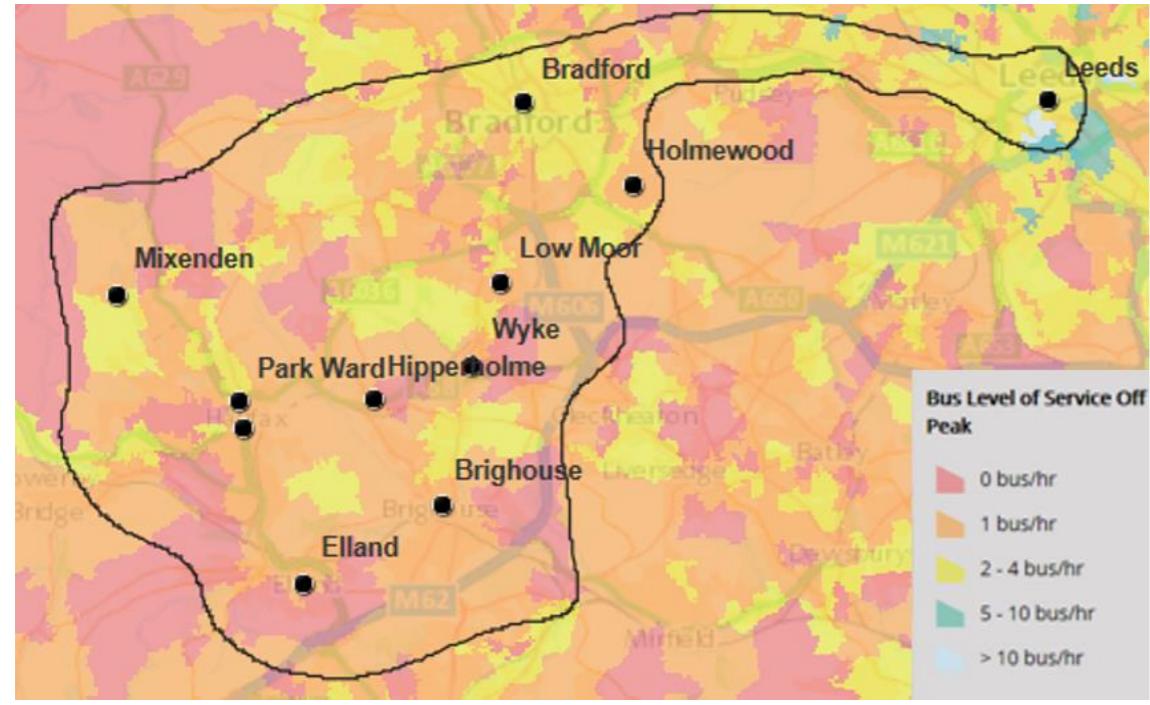
Figure 14 shows levels of bus service during the off-peak period in the corridor. This uses information about service frequencies across all routes at individual bus stops and calculates an average level of service across census output areas. This helps to characterise areas by their level of accessibility alongside comparable socio-economic characteristics outlined in earlier sections.

Most of the corridor is served by just one bus per hour or less, as shown in the orange and red. This pattern limits the population's access to the manufacturing and health service job opportunities, which are likely to operate irregular working hours.

Around 300,000 people in the corridor (54%) have access to only one bus service or less per hour outside of peak periods.

The lack of consistency in bus service throughout the corridor limits connectivity, particularly areas in the south such as the rural areas around Elland and Brighouse, which are forced to rely on other modes. However, there are areas with good bus levels of service (2-4 buses per hour) and connectivity in Mixenden, North Brighouse and between Bradford and Leeds.

Figure 14: Bus level of service – off-peak



2.4.3 Rail

The current passenger rail network consists of:

- The Aire Valley line: Leeds via Shipley to Bradford Forster Square
- The Calder Valley line: Leeds via New Pudsey to Bradford Interchange, continuing via Halifax up the Calder Valley through Sowerby Bridge and Hebden Bridge, then either on to Manchester or via Burnley to central Lancashire
- A link from Bradford via Halifax towards Huddersfield
- A route from Leeds via Dewsbury and Mirfield via Brighouse and Elland to the upper Calder Valley
- Limited services linking Bradford and Halifax via Mirfield to Wakefield and on to London

Timetable information shows that service levels are variable, with some stations on the core network receiving 4 trains per hour, but several stations see only hourly services. At present, direct rail services beyond the lines themselves are limited to Chester, Hull, Wigan, Blackpool and York. Sunday service levels are significantly below weekday levels, and below expected standards (with no trains on the Leeds – Dewsbury – Brighouse – Calder Valley – Manchester route).

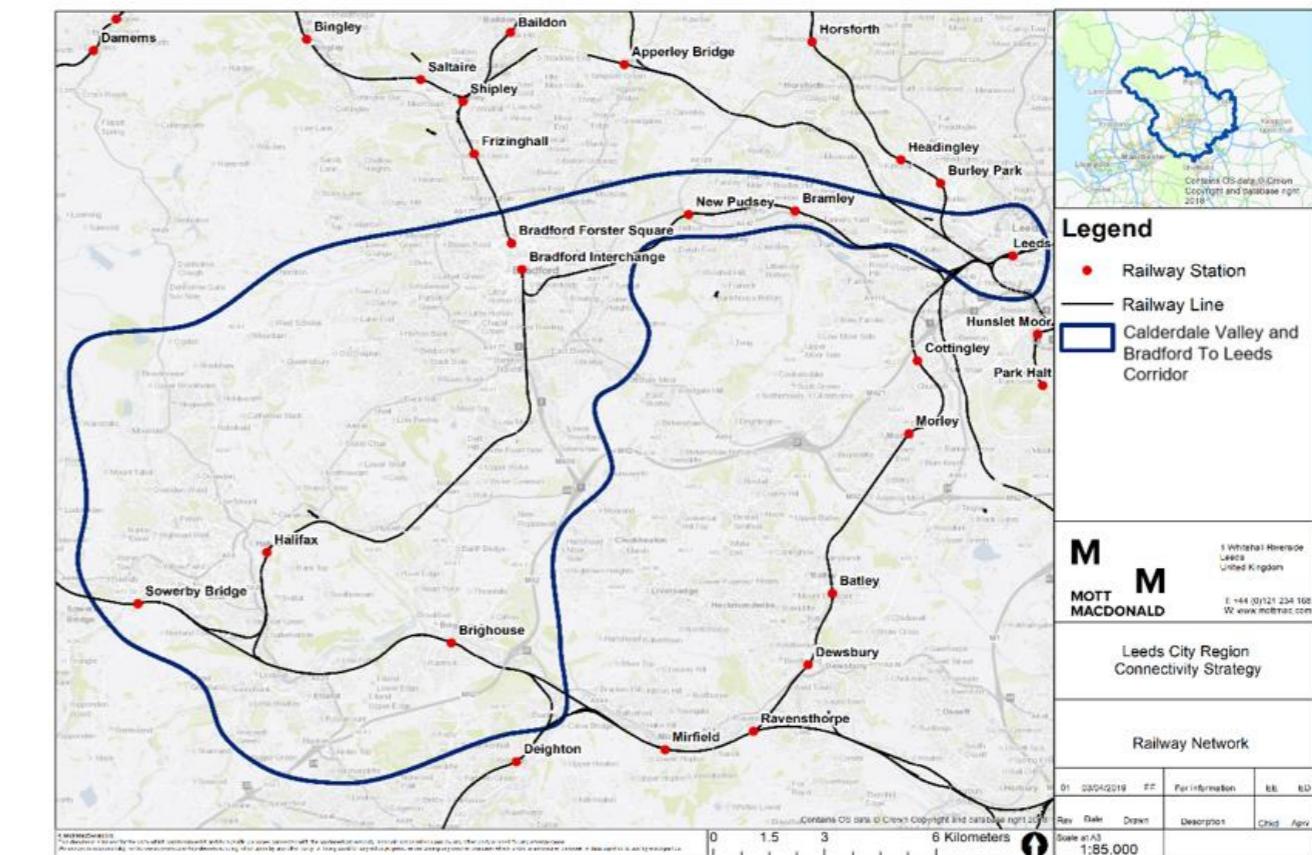
There are freight movements from Wakefield via Brighouse and the upper Calder Valley towards Manchester or central Lancashire, but little elsewhere.

Certain gaps in the network have been highlighted by partners, including the Spen Valley (Bradford towards Dewsbury and Wakefield (via Low Moor, Cleckheaton, Liversedge and Heckmondwike); between Calder Valley to Huddersfield; the isolation of the two Bradford termini from one another (and the need for Calder Valley trains to reverse direction in Bradford); and areas between Bradford and Halifax not served by rail since the cuts to rail services of the late 20th century. Partners have also underlined that the area needs to be connected to Northern Powerhouse Rail and High Speed 2.

Other challenges for rail services in the study area according to passenger surveys include regular overcrowding of trains into and out of Leeds and unreliable services using old rolling stock.

While this report makes recommendations that are directly or indirectly relevant to rail, most rail content will be picked up separately in the Combined Authority's Rail Strategy work. That Rail Strategy sits alongside these Case for Change reports, informed by them and informing them, and this report should be read in conjunction with the Rail Strategy.

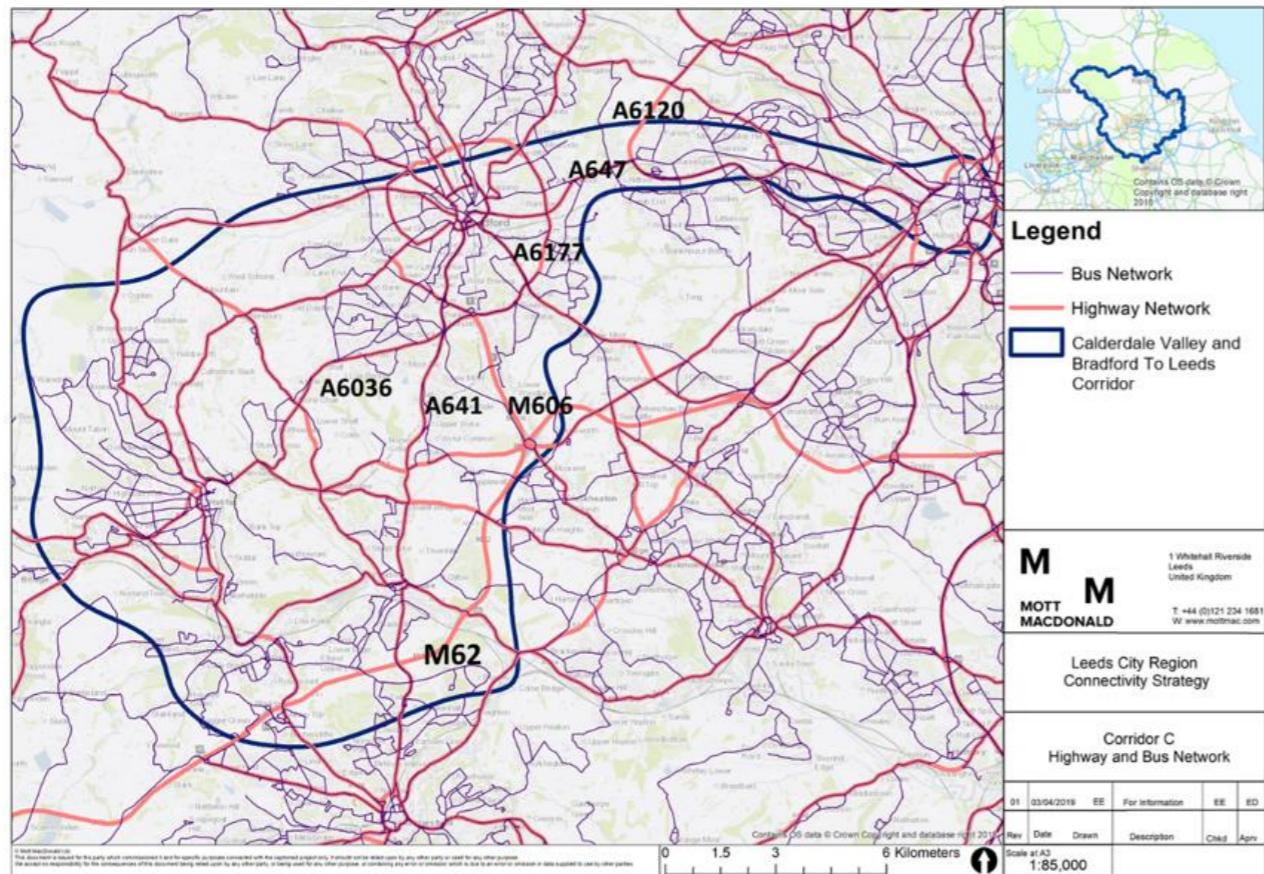
Figure 15: Current Rail Network



2.4.4 Road

Figure 16 presents the road and bus networks throughout the corridor. The strategic road network includes the M62 to the south east of the corridor and the M606 connecting Bradford with the M62. Other key routes include the A6036 connecting Bradford and Halifax as well as the A641 connecting Bradford towards Brighouse. The A6177 circles Bradford connecting key suburbs and the A647 connects Bradford to the Leeds A6120 Ring Road to the east.

Figure 16: Current bus and highway network (A roads and motorway networks)



Source: Mott MacDonald

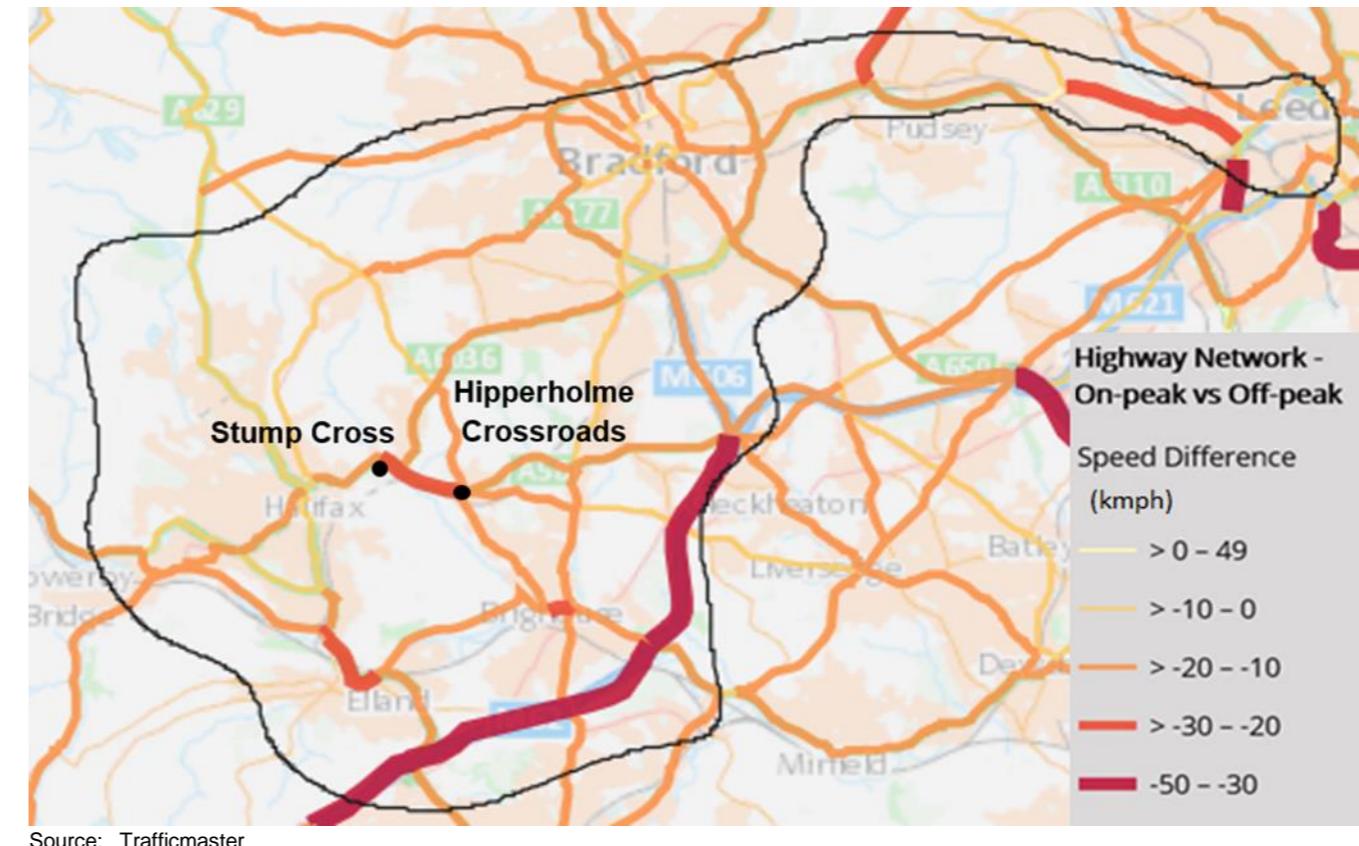
2.4.4.1 Highway network performance

Figure 17 shows the speed difference (kmph) on the highway network between the peak and off-peak. Capacity constraints on the motorway network and junctions limit access to employment opportunities.

There is a large reduction in peak speed along the M62 as well as some delay on the A629 into Elland and at the Stump Cross and Hipperholme crossroads. Such congestion not only inhibits the connectivity of the area but has also contributed towards the declaration of AQMAs at these points. Partners have highlighted that these pinch points on the network act as constraints to further growth and need addressing, including at Stump Cross, where the A58 and A6036 join, and at Hipperholme crossroads.

Introducing more opportunities to travel via public transport will help to reduce capacity constraints on the network, reduce air pollution and enable inclusive growth.

Figure 17: Highway network on-peak vs off-peak speed difference



2.4.5 Patterns in transport demand

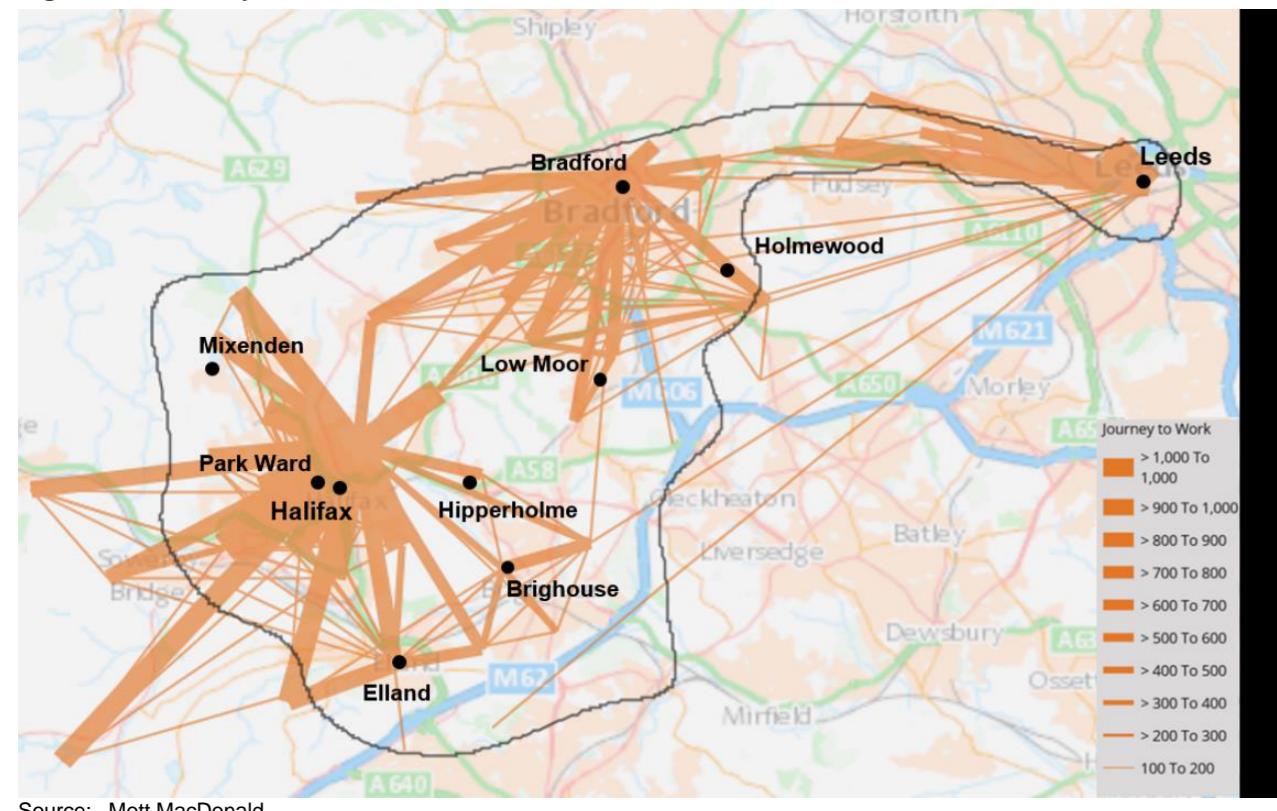
Figure 18 shows the key movements in the area (in the form of journey to work desire lines – person daily trips to work, Census 2011).

These are focused on localised travel into Halifax and Bradford. There are some movements that traverse the town centre of Halifax although the majority end within the town centre itself. The travel to work data also shows that there are few people commuting between Halifax and Bradford and beyond to Leeds. Additionally, the emerging Industrial Strategy for West Yorkshire notes that Bradford (23.7%) and Kirklees (20.4%) have a younger population aged 0-15 than seen nationally (19.1%). This means there is likely to be a future reliance on public transport in the corridor highlighting the need for good public transport options to ensure inclusive growth for all.

Figure 19 and Figure 20 show where new housing and employment sites are located and the current travel to work patterns.

These graphics indicate that there is value in improving connectivity in this area, in order to broaden these limited travel horizons and ensure the area's current and future residents and employees benefit from the growth opportunities that will become available. They also illustrate the potential for travel patterns to change, where demand is likely to increase, and where investment needs to be made in order to connect people to these new growth sites. This is explained in further detail in Chapter 4.

Figure 18: Journey to work desire lines



Note: the study area for this corridor only includes a selection of neighbourhoods within the Leeds/Bradford urban areas and thus not all commuter patterns including movements between the two cities have been captured

Figure 19: Future housing growth and current travel to work desire lines

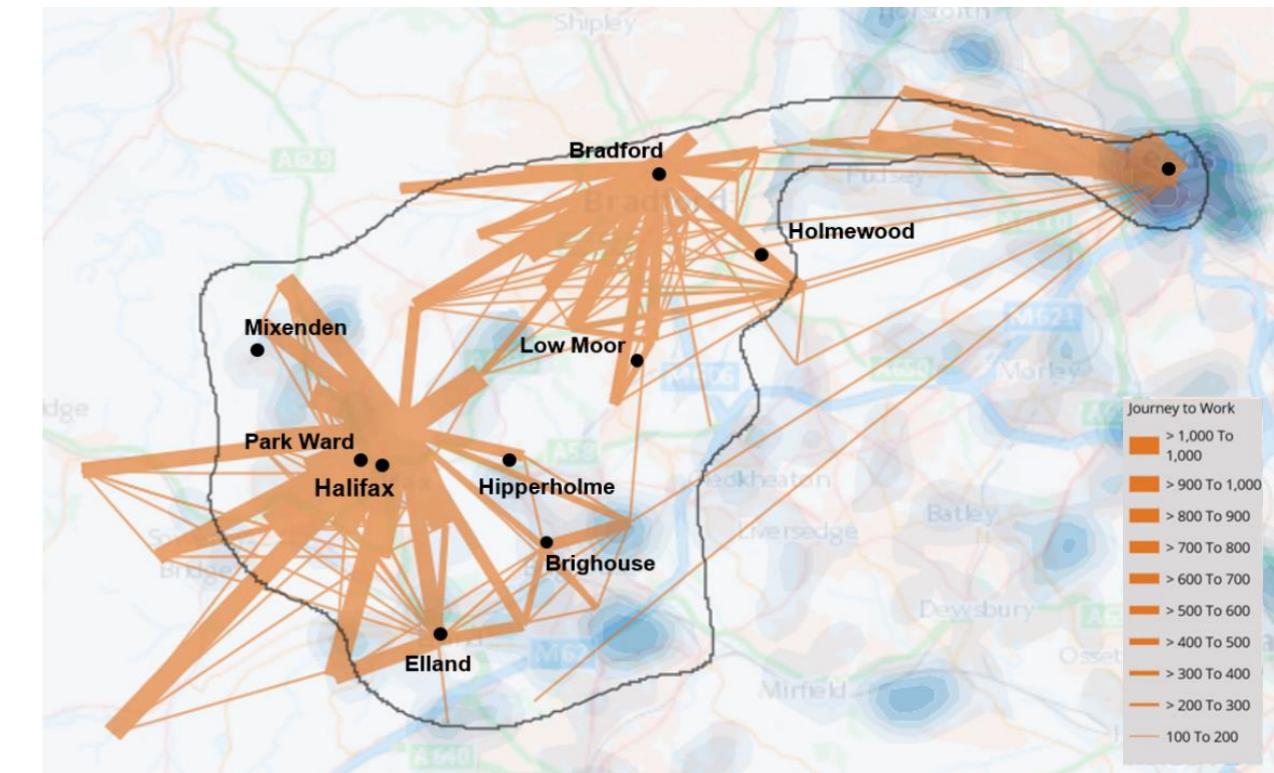
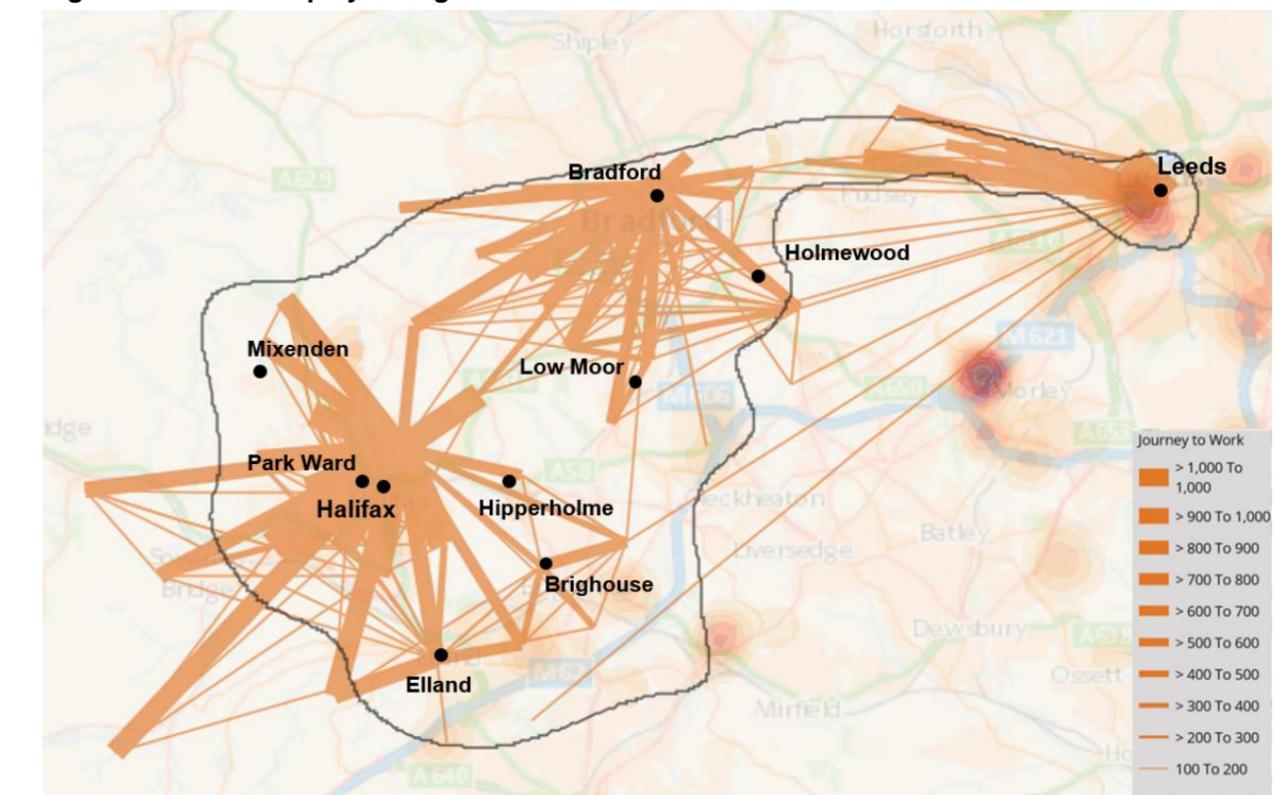


Figure 20: Future employment growth and current travel to work desire lines



Changes are happening in the south east of the corridor surrounding Brighouse including changes in employment locations. With the current rail and bus limitations, alongside lower car ownership, and the significant effect on travel patterns of new development, it is essential that these areas are connected by a range of travel choices to ensure inclusive growth.

Partners from Calderdale indicated that there is an absence of connectivity from those areas of disadvantage to the north and west of Halifax (including Mixenden, Ilkley, Park Ward) to areas of growth and opportunity to the south east of Calderdale.

2.5 Summary

To enable **inclusive growth**, improved connectivity is needed to provide better access to work for people in communities within the corridor, including in Ovenden, Mixenden and Park Ward. These communities are within the 10% most deprived communities in the UK and are characterised by low employment and skills prospects, low household income (22% below national average) and low car ownership.

Employment prospects in the area are diverse, from manufacturing, wholesale and retail trade, to the financial and insurance sector. Employment prospects at Clifton Enterprise Zone and Chain Bar rely heavily on car access, and yet, there are several communities that lie within the corridor including Bradford, South Bradford, Mixenden and Park Ward which are characterised by low car ownership (more than 50% of households do not own a car).

There is therefore a disconnect between jobs located in places that have poor access for people without a car and communities with low car ownership. To improve the prospects of these communities, and to **boost productivity**, employment opportunities must be better connected to communities of the greatest economic need.

There is also a skills gap. Ovenden, Mixenden, Park Ward and South Bradford are in the top 10% most deprived areas for education in England. Improving connectivity to education opportunities will help close this skills gap and help people to find better employment, contributing to opportunities for everyone in the area. Improving productivity through better connectivity to employment and skills will also help improve broader economic indicators.

To help **tackle the climate emergency** and achieve carbon emission targets, congestion and traffic levels on strategic links must be addressed. Options for travel that has lower carbon emissions must be improved, both through cleaner public transport options and an expanded active travel network.

Several areas also suffer from poor air quality; there are 7 small, localised air quality management areas in the southern part of the corridor, including at Stump Cross and Hipperholme crossroads.

The Connectivity Plan for this area will focus upon **delivering 21st century transport** that connects the places of greatest economic need to employment and skills opportunities through greener modes of transport. Ensuring cleaner, greener modes are used will contribute to achieving a zero-carbon economy in the City Region.

The focus should be on:

- Strategic trips connecting economic opportunities in south east Calderdale to the rest of the corridor
- Strategic trips from key transport and employment hubs towards opportunities in Leeds
- Local trips connecting surrounding areas to the opportunities in Bradford

3 Corridor aspirations

This section outlines the processes through which the corridor aspirations have been defined, and how they link to the evidence base and local policy.

Please refer to Chapters 4 and 8 of the Appraisal Handbook for details of how the West Yorkshire Connectivity Plan core objectives have been derived from key policy drivers and how they and corridor-specific aspirations are used in the development of the Case for Change

3.1 Defining aspirations

The core objectives have been derived from strategic visions and ambitions from policy and have been agreed with the West Yorkshire Combined Authority. They ensure that the West Yorkshire Connectivity Plan supports the delivery of the long-term vision for the Leeds City Region – as identified in the LCR HS2 Growth Strategy – as well as the priorities and ambitions outlined in the Strategic Economic Plan (SEP), the LCR HS2 Connectivity Strategy, and the West Yorkshire Transport Strategy 2040. These objectives are applicable to all inclusive growth corridors.

Corridor-specific aspirations have been developed from the key issues, opportunities and priorities identified in the workshop with local officer representatives. These aspirations ensure that the interventions developed align with the priorities of West Yorkshire and its districts. Each intervention is assessed against both the core and corridor-specific aspirations to ensure the best possible fit.

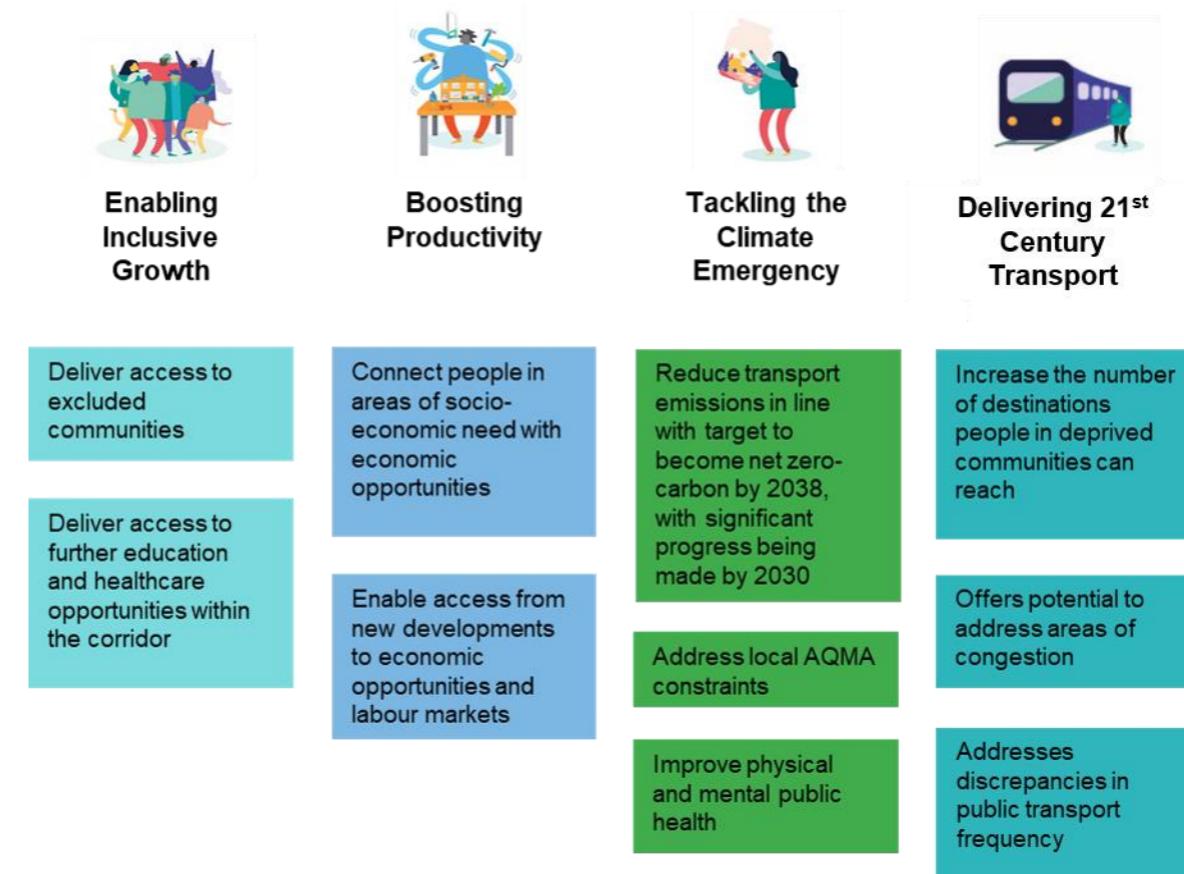
3.2 Core objectives

The West Yorkshire Connectivity Plan core objectives are aligned to the City Region's core priorities, as illustrated below:

The West Yorkshire Connectivity Plan Core Objectives are to:

- Connect people in areas of socio-economic need with economic opportunities
- Enable access from new developments to economic opportunities and labour markets
- Deliver access to further education and healthcare opportunities within the corridor
- Deliver access to excluded communities
- Increase the number of destinations people in deprived communities can reach
- Offer potential to address areas of congestion
- Address discrepancies in public transport frequency
- Reduce transport emissions in line with target to become net zero-carbon by 2038, with significant progress being made by 2030
- Address local AQMA constraints
- Improve physical and mental public health

Figure 21: Alignment of West Yorkshire Connectivity Plan core objectives to the City Region's core priorities



3.3 Corridor-specific aspirations

Drawing on the key issues and opportunities identified from the evidence base, corridor-specific aspirations have been agreed for Calder Valley and Bradford, in consultation with stakeholders from Leeds, Bradford and Calderdale districts.

The Calder Valley and Bradford aspirations are:

- Enable seamless interchanges for all public transport trips within the corridor
- Improve the ability to interchange at train stations within the corridor to other local services, including walking and cycling options
- Expand the walking and cycling network to improve opportunities to address public health
- Ensure more deprived communities are connected to current and future job opportunities
- Ensure more deprived communities can access further education sites
- Address congestion issues to improve public transport journey reliability
- Address public transport frequency issues outside the peak hour
- Tackle emissions and air quality issues in sensitive areas

These all align to current local policy documentation such as the Calderdale Transport Strategy (2016-2031) and the Interim Leeds Transport Strategy (2016).

3.4 Measuring objectives

3.4.1 The appraisal process

The core objectives and corridor-specific aspirations provide the foundation of the West Yorkshire Connectivity Plan options appraisal process, alongside spatial analysis. Interventions are assessed against a set of criteria aligned with the objectives, and the spatial evidence base in a Geographical Information System (GIS) – such as whether the intervention connects to areas of deprivation and employment, housing and education sites. A description of the data that underpins this is detailed in Chapter 7 of the Appraisal Handbook.

The outputs are then fed into Mott MacDonald's Investment Sifting & Evaluation Tool or "INSET" – this is a WebTAG-compliant decision support process, based on multi-criteria analysis. It enables interventions to be assessed and "sifted" against specially defined and flexible parameters which determine how well the interventions meet the objectives and corridor-specific objectives.

INSET is like the Department for Transport (DfT) Early Assessment and Sifting Tool (EAST) but has been built to surpass its capabilities – such as the ability to assess interventions across a full range of themes, including economic, social and environmental indicators, depending on local circumstances, and to reflect on multiple future scenarios.

The appraisal is classified into four assessment themes, all linked to the core policy priorities. These are used to classify the core objectives and have specific scoring criteria – as shown in Table 3. The assessment themes also enable policy makers and scheme promoters to sift interventions that will meet specific policy drivers (e.g. economic growth, social, transport, environmental) enabling them to quickly respond to different funding opportunities as they come forward. Interventions can be assessed individually relative to other Business Case factors such as deliverability.

Table 3: Key themes for multi-criteria assessment

Core objective	Assessment theme	Scoring notes
<ul style="list-style-type: none"> Deliver access to further education and healthcare opportunities within the corridor Deliver access to excluded communities 	Enabling Inclusive Growth 	Based on the number of Equality, Diversity and Inclusion hotspots the intervention connects to as well as health and education sites. This theme helps to address the need to connect people including those in excluded communities to education and health facilities which links to the key objectives in the HS2 Connectivity Strategy.
<ul style="list-style-type: none"> Connect people in areas of socio-economic need with economic opportunities Enable access from new developments to economic opportunities and labour markets 	Boosting Productivity 	Based on the number of housing and employment growth sites the intervention connects to, as well as the affected population for deprivation, low car ownership and the total number of jobs. This helps to identify interventions that best help to improve inclusive growth by connecting people to jobs who are living in areas of deprivation and low car ownership.
<ul style="list-style-type: none"> Reduce transport emissions in line with target to become net zero-carbon by 2038, with significant progress being made by 2030 Address local AQMA constraints Improve physical and mental public health 	Tackling the Climate Emergency 	At the time of assessment, no quantifiable evidence on carbon emissions was available (pending release of West Yorkshire Combined Authority Emissions Reduction Pathway study and other work on carbon emissions) – therefore, based on the broad understanding that significant modal shift alongside fast adoption of low carbon technology will be required, it is assumed that all schemes would inherently contribute to the decarbonisation agenda, unless they are road schemes. As a proxy, scoring was influenced by how many Air Quality Management Areas (where it can be reasonably assumed there will be action to tackle emissions from transport) and touchpoints with the National Cycle Network (which may positively influence mode shift to cleaner modes) the intervention connects to, as well as their performance against the Healthy Streets ^{TM13} principles (again, an influence on positive mode shift to cleaner modes).
<ul style="list-style-type: none"> Increase the number of destinations people in deprived communities can reach Offers potential to address areas of congestion Addresses discrepancies in public transport frequency 	Delivering 21st Century Transport 	Based on how well the intervention connects areas with low levels of existing travel identified as isolated communities as well as areas with a large speed difference between on-peak and off-peak periods on the highway network and those with poor levels of bus service. As these are transportation schemes, a high number of interventions scored well for this theme.

Source: Mott MacDonald

The multi-criteria analysis is done in three "sifts". These are summarised below and the sub-criteria and scoring approach for each is available in Chapter 8 of the Appraisal Handbook.

Sift 1: Early sift. This is based on the potential for the intervention to address the Core Objectives – it is simply scored using a Yes / No outcome against a series of sub-criteria, linked to the spatial data in GIS. On its own, the early sift can be used to rule out interventions at a very high-level; i.e. if it does not address one or more of the four themes or policy priorities or does not meet a criterion or combination of criteria.

¹³ Pedestrians from all walks of life; Easy to cross; Shade and shelter; Places to stop and rest; Not too noisy; People choose to walk, Cycle and use public transport; People feel safe; Things to see and do; People feel relaxed; Clean air.

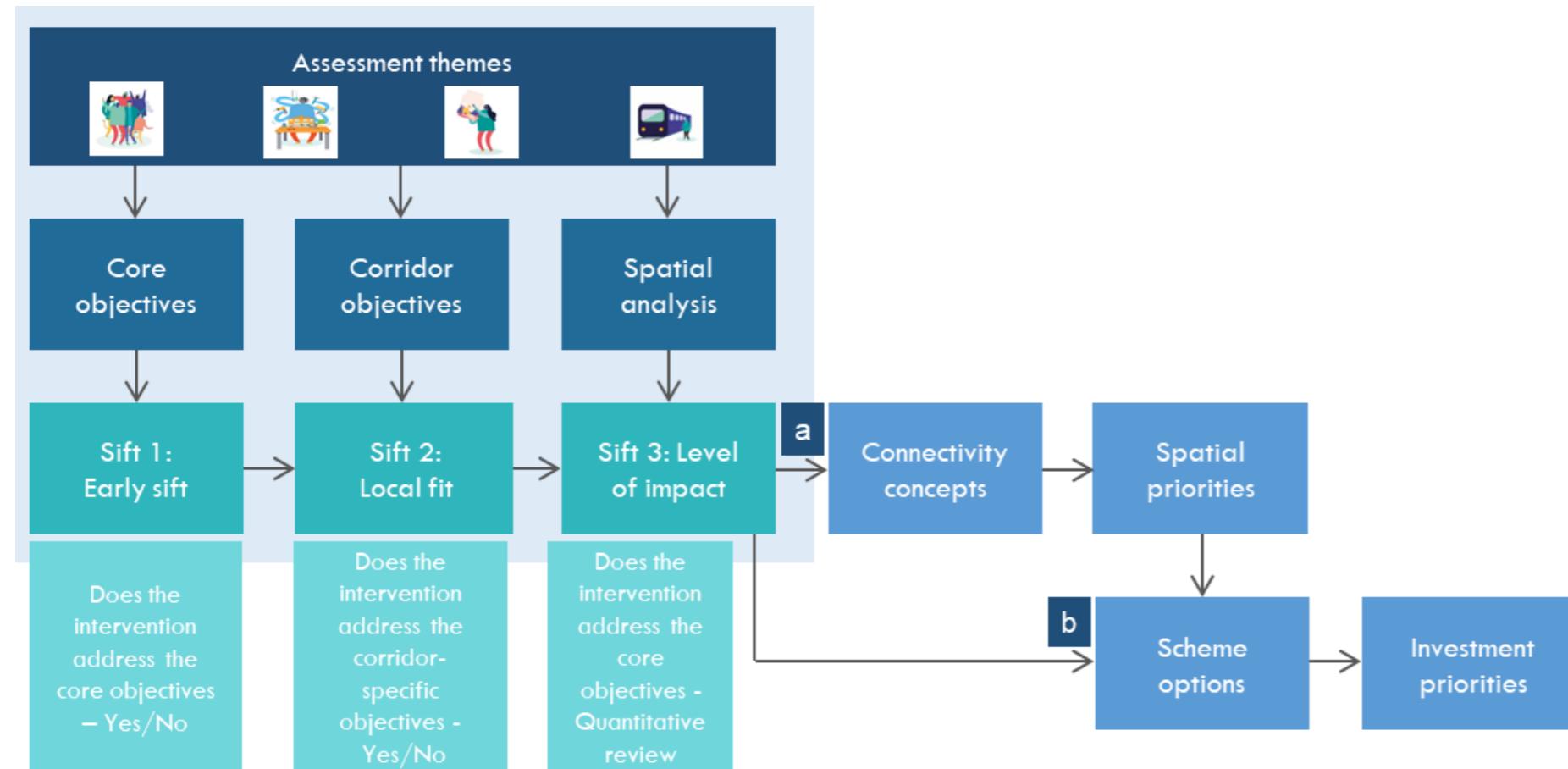
Sift 2: Local fit. This is based on the potential for the intervention to address the corridor-specific objectives – again, it is simply scored using a Yes / No assessment by determining whether an intervention meets a certain criterion (or combination of criteria) and/or whether it is above or below a certain threshold for a given objective.

Sift 3: Level of impact. Like the first sift, this is based on the potential for the intervention to address the Core Objectives identified; however, the third sift has a *quantitative* element, drawing on the spatial evidence from the datasets in GIS. It also introduces a degree of standardisation to mitigate against the scale of intervention, and ensure schemes are tested fairly in terms of their level of impact relative to their size and spatial scale.

The key outcomes from the appraisal are two-fold – (a) a set of spatial priorities determined from several “connectivity concepts” (mode agnostic connections between key places – described further in Chapter 4), and (b) investment priorities determined from several interventions.

The diagram below summarises the appraisal process:

Figure 22: Appraisal process



Source: Mott MacDonald

The core appraisal adopted for Calder Valley and Bradford assumes that all assessment themes have equal weighting or importance. However, the application of the appraisal process is very flexible and can be used to adapt to different requirements (e.g. a change in funding or policy environment). Different weightings can be applied to the four assessment themes. For example, the user can “switch-off”, “switch-on” or change

the weighting that is applied for the assessment themes and criteria to perform sensitivity tests or to simply enable interventions to be filtered for their suitability for future funding streams – such as how they score against specific policy levers, and their readiness or timescales for delivery (e.g. Transforming Cities). Corridor specific objectives can also be “switched-off” to enable a more Leeds City Region focused list of priorities. The appraisal process can also be used to better understand the relative strength or weakness of different interventions and can highlight opportunities to “repackage” schemes for future funding streams.

Please refer to Chapters 8, 9 and 10 of the Appraisal Handbook for the detailed workings of option appraisal process and its outcomes.

4 Determining spatial priorities

In determining spatial priorities, the evidence base and stakeholder workshops enable identification of key **places to connect** and resulting connectivity requirements for the corridor's economic area. From this, "**connectivity concepts**" are defined. At this stage, connectivity concepts do not relate to a specific transport mode or a specific route alignment. However, they do enable a strategic appraisal of whether there is merit in connecting people and places, as well as helping to define spatial priorities within the area. Connectivity concepts will allow further exploration of alignments, transport modes and specific interventions should they meet a series of key objectives.

4.1 Places to connect

Table 4 shows the key places to connect that have been identified, reflecting the inputs of partners and supported by the evidence base.

Key sections of the evidence base that have informed the identification of these places include:

- Section 2.1.1: Deprivation
- Section 2.1.2: Isolated Communities
- Section 2.2.1: Employment Characteristics
- Section 2.2.2: Household Income
- Section 2.2.3: Growth Areas
- Section 0: Rail

The principal characteristic influencing the selection of each place to connect is also shown. Places include key settlements, transport hubs, housing and employment growth zones. These were identified on the "story map" for the Calder Valley and Bradford corridor and are shown in Figure 23. This illustrates the places to connect in the context of the wider rail network (shaded grey lines) and motorway network (shaded blue lines). There are low travel horizons north of Halifax and south of Bradford. Improving connectivity between these places is fundamental to improving travel horizons throughout the corridor.

Table 4: Key places to connect

Key place	Characteristic	Scale / justification
Bailiff Bridge	Bus network	Key place on bus network
Bradford	Housing growth/ Employment growth/Inclusive growth	Slower than average growth emphasises the need for good transport options connecting businesses to potential employees and custom. Approximately 3500 new dwellings and several employment sites planned
Brighouse	Housing growth	Approximately 180 proposed new dwellings
Buttershaw	Inclusive growth	Within the top 10% deprived areas in England
Chain Bar	Employment growth	Approximately 50ha of employment growth allocated
Charlestown	Local Plan site	Included following stakeholder consultation
Clayton	Bus network	Key place on bus network
Cleckheaton	Housing growth/Inclusive growth	Within the top 20% most deprived in England. Over 100 dwellings allocated for development
Clifton Enterprise Zone	Employment growth	Large employment area with 25ha of growth allocated
Eastwood	Local Plan site	Included following stakeholder consultation
Elland	Employment growth/Inclusive growth	Settlement with a proposed rail station, approximately 17 hectares of employment land allocated and within top 20% most deprived in England
Euroway	Employment growth	Large employment site and key local employer

Halifax	Housing growth/ Employment growth/Inclusive growth	Key settlement with a rail station and 568 housing units across 8 sites
Hebden Bridge	Train station	Local transport hub for rail and bus
Heckmondw ke	Inclusive growth	Within the top 20% most deprived in England
Hipperholme	Housing growth	Key settlement within the corridor
Illingworth	Housing growth/employment growth	Located close to areas in the top 10% most deprived in England with 115 dwellings proposed
Leeds	Housing growth/ Employment growth/Inclusive growth	A key hub for HS2 and a core city in the region. Substantial housing and employment development sites, including South Bank
Low Moor	Train station	Key settlement with a rail station
Mixenden	Housing growth/Inclusive growth	Within the top decile for deprivation in England with 100 dwellings proposed
Mytholmroyd	Train station	Local transport hub for rail and bus
Old Town	Local Plan site	Included following stakeholder consultation
Ovenden	Housing growth/Inclusive growth	Within the top decile for health deprivation and indices of multiple deprivation in England. Approximately 470 dwellings allocated
Park Ward	Inclusive growth	Total annual household income is £21,200 and the area is also within the top decile for deprivation in England
Pellon	Bus network	Key place on bus network
Queensbury	Housing growth	Approximately 1000 dwellings allocated
Rastrick	Bus network	Key place on bus network
Ripponden	Bus network	Key place on bus network
Royal Calderdale	Hospital	Key health service within the corridor
Shelf	Housing growth	Approximately 500 new dwellings allocated
South Bradford	Housing growth/Inclusive growth	Only 38% of the population economically active in an area of South Bradford and within the top 20% most deprived in England
Southowram	Local Plan site	Included following stakeholder consultation
Sowerby Bridge	Inclusive growth	Within the top 20% most deprived in England
Thornhills Garden Village	Large housing growth	Approximately 2000 new dwellings allocated as part of a garden village
Thornton	Bus network	Key place on bus network
Todmorden	Train station	Local transport hub for rail and bus
Walsden	Train station	Local transport hub for rail and bus
Woodhouse Garden Village	Housing growth	Approximately 1260 new dwellings allocated as part of a garden village

Figure 23: Places to connect – key attributes



Source: Mott MacDonald

4.2 Existing connectivity improvements

There are several existing proposals scheduled for implementation within the corridor. Figure 24 presents a conceptual map showing the planned highway and active travel corridors and interventions as part of the West Yorkshire Plus Transport Fund (WYPTF) and "CityConnect" interventions funded by the Cycle City Ambition Grant (CCAG). These include several transport projects to improve connectivity on key routes as well as several proposals to enhance the appeal of and access to rail, such as Halifax Station Gateway.

Figure 24 also shows the initial areas being included in the work to develop the Local Cycling and Walking Infrastructure Plan (LCWIP). LCWIP is a planning process and delivery is currently unfunded. A selection of West Yorkshire's Transforming Cities Fund (TCF) schemes are also planned in the area.

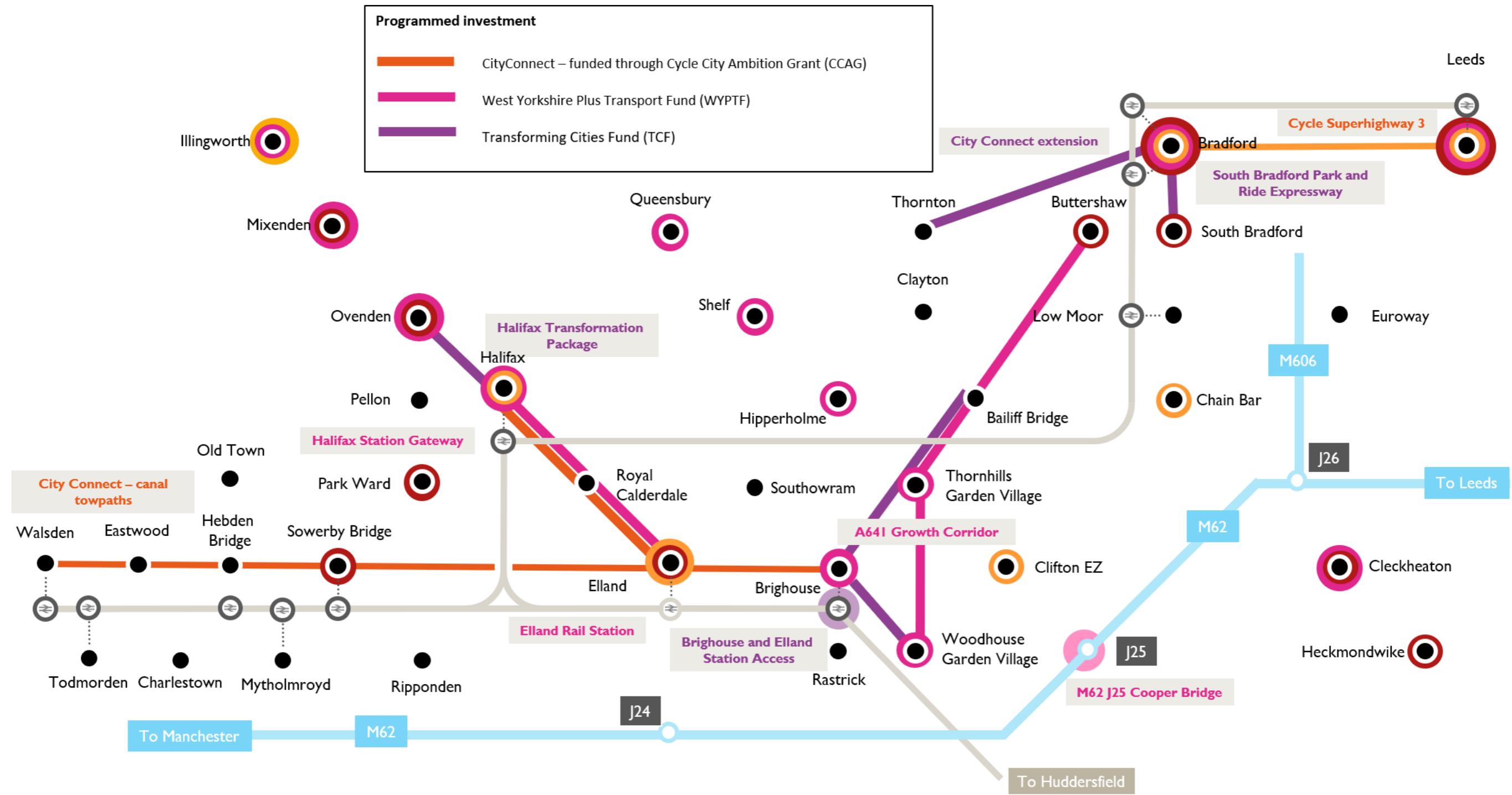
Table 5 provides a description of investment programmes currently scheduled to provide connectivity improvements throughout the corridor.

Table 5: Programmed investment

Programme	Scheme	Description
West Yorkshire Plus Transport Fund	A629 Growth Corridor	The A629 Halifax to Huddersfield Corridor Improvements is a £120.6m transport package comprising multi-modal interventions which will improve journey time reliability, through a combination of road space reallocation and targeted junction improvements.
Cycle City Ambition Grant schemes	Bradford Leeds Cycle Superhighway	23km cycle superhighway route segregated from traffic to encourage more people to cycle and walk in partnership with Leeds City Council and CBMDC.
West Yorkshire Plus Transport Fund	Elland Rail Station	New railway station; pedestrian, cycle and public realm improvements linking the station to Elland town centre; bus-rail interchange providing sustainable access to the station; dedicated station car park, associated highway access arrangements.
West Yorkshire Plus Transport Fund	Halifax Station Gateway	The purpose of Halifax Station Gateway is to improve the appeal and uptake of rail travel for journeys to and from Halifax, attracting new journeys to the rail network and encouraging those making existing journeys to switch mode from car to train.
West Yorkshire Plus Transport Fund	A641 Growth Corridor	To improve efficiency and connectivity for all modes travelling along the corridor between Bradford, Brighouse and Huddersfield; enhancing accessibility to key growth sites, and facilitating economic development across Calderdale, Kirklees and Bradford.
West Yorkshire Plus Transport Fund	M62 J25 Cooper Bridge	Transport interventions at locations along the A644 and A62 will contribute to the main West Yorkshire-plus Transport Fund strategic objectives of increasing employment accessibility.
West Yorkshire Plus Transport Fund	Bradford Station Gateway	Creating a modern building connected to and integrated with the city centre and surrounding developments. It will contribute to the ongoing place shaping that is taking place within Bradford, driven by CBMDC.
Transforming Cities Fund	Halifax, Wa king Cycling and Bus Transformation Package	A package of schemes centred on Halifax Train Station and Bus Station to deliver enhanced walking, cycling and bus infrastructure towards the urban centre of Halifax.
Transforming Cities Fund	Brighouse and Elland Station Access	Delivery of walking and cycling infrastructure improvements adjacent to Brighouse and Elland Train Stations.
Transforming Cities Fund	CityConnect extension to West Bradford	Extension of cycle superhighway from Bradford towards Thornton.
Transforming Cities Fund	Bus Passenger Facilities	Providing 21 st century bus shelter facilities across the Combined Authority .
Transforming Cities Fund	South Bradford Park and Ride Expressway	Create 1000 space car park and terminal building, with two a two lane bus expressway connecting Manchester Road.

Source: West Yorkshire Combined Authority

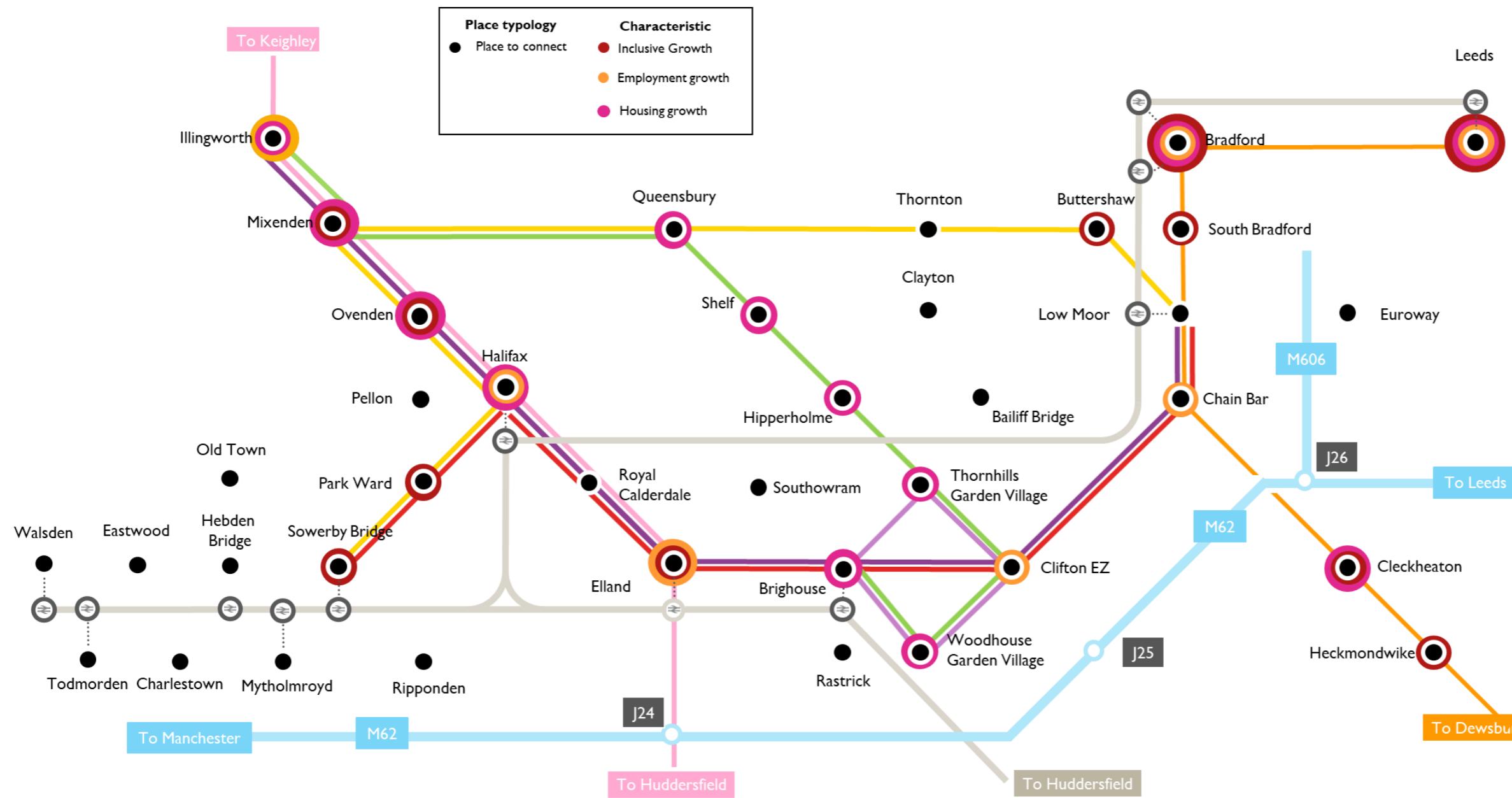
Figure 24: Programmed investment



4.3 Connectivity concepts

Based on the feedback from partners and the spatial analysis (which together provide an assessment of the current transport network and issues, future development plans and investment programmes), several “connectivity concepts” have been defined across the economic area, to demonstrate the need for improved connectivity between key places. At this stage, connectivity concepts do not relate to a specific transport mode or a specific route alignment. However, they do enable a strategic appraisal of whether there is merit in connecting people and places, as well as helping to define spatial priorities within the area. Connectivity concepts are intended to address gaps in the network; hence for this corridor no direct link between Bradford and Halifax is included because direct rail and bus connections already exist. Six connectivity concepts have been defined for the Calder Valley and Bradford corridor, plus one connectivity concept linking Leeds with North Kirklees via Bradford that has been identified and analysed as part of the Leeds to Bradford, South Bradford and North Kirklees Case for Change Report. Some places not connected through the connectivity concept framework have been addressed in other strands of work such as the West Yorkshire Bus Network Review. The connectivity concepts identified are shown in Figure 25 with a brief narrative for each concept provided below.

Figure 25: Connectivity Concepts Calder Valley and Bradford



1 – The Purple Concept (Ilkley – Low Moor)

Concept function	Provides <i>strategic</i> connectivity		
Summary	This concept provides a strategic connection between Ilkley and Low Moor. It connects deprived communities such as Mixenden and Ovenden to the economic opportunities in Halifax and Brighouse. It draws on the existing road network and using sustainable modes will help to alleviate air quality issues along these congested areas.		
Enabling Inclusive Growth	Boosting Productivity	Tackling the Climate Emergency	Delivering 21st Century Transport
<ul style="list-style-type: none"> Connects deprived communities to the north of Halifax and near Low Moor 	<ul style="list-style-type: none"> Improves connectivity to key areas of employment sites and housing sites near Halifax, Elland and Brighouse 	<ul style="list-style-type: none"> Encourages active travel by according with 3 Healthy Streets principles 	<ul style="list-style-type: none"> Provides connectivity through Halifax without using it as a terminus Draws on the connectivity provided by the existing rail network by improving connectivity to Low Moor, Elland and Brighouse train stations
Indicative mode		Bus Rapid Transit / Bus / Demand Responsive Transit	

2 – The Red Concept (Sowerby Bridge – Low Moor – via Brighouse)

Concept function	Provides <i>strategic</i> connectivity		
Summary	This concept provides a strategic connection between Sowerby Bridge and Low Moor. It provides connections to the economic opportunities and growth areas in Halifax, Elland and Brighouse. It draws on the existing and future rail network helping to alleviate air quality issues along these congested areas.		
Enabling Inclusive Growth	Boosting Productivity	Tackling the Climate Emergency	Delivering 21st Century Transport
<ul style="list-style-type: none"> Connects deprived communities to the south west of Halifax and near Low Moor 	<ul style="list-style-type: none"> Improves connectivity to key areas of employment sites and growth sites near Halifax, Elland and Brighouse 	<ul style="list-style-type: none"> This concept intersects with 27% of the corridor's AQMAs, tackling air quality by providing alternatives to car travel 	<ul style="list-style-type: none"> Provides connectivity through Halifax without using it as a terminus Draws on the connectivity provided by the existing rail network by improving connectivity to Low Moor, Elland and Brighouse train stations
Indicative mode		Bus Rapid Transit / Bus / Demand Responsive Transit	

3 – The Pink Concept (Keighley – Huddersfield – via Halifax)

Concept function	Provides <i>strategic</i> connectivity		
Summary	This concept provides a strategic connection between Keighley and Huddersfield. It connects deprived communities to the north of Halifax to the economic opportunities near the M62. It draws on the existing road network and using sustainable modes will help to alleviate air quality issues along these congested areas.		
Enabling Inclusive Growth	Boosting Productivity	Tackling the Climate Emergency	Delivering 21st Century Transport
<ul style="list-style-type: none"> Connects deprived communities to the north of Halifax 	<ul style="list-style-type: none"> Connects employment sites and growth sites near Halifax and Elland 	<ul style="list-style-type: none"> Connects with 3 Healthy Street principles, encouraging active travel 	<ul style="list-style-type: none"> Provides connectivity through Halifax without using it as a terminus Improves connectivity to new rail station at Elland Provides a strategic connection between Keighley and Huddersfield
Indicative mode		High quality bus service	

4 – The Yellow Concept (Sowerby Bridge – Low Moor – via Queensbury)

Concept function	Provides <i>strategic</i> connectivity		
Summary	This concept provides a strategic connection between Sowerby Bridge and Low Moor. It connects deprived communities such as Sowerby Bridge and Ilkley to the economic opportunities in Halifax and transport hub of Low Moor.		
Enabling Inclusive Growth	Boosting Productivity	Tackling the Climate Emergency	Delivering 21st Century Transport
<ul style="list-style-type: none"> Improves connections to deprived communities to the north and south west of Halifax as well as deprived communities near Low Moor 	<ul style="list-style-type: none"> Connects areas of employment with communities with low levels of car ownership 	<ul style="list-style-type: none"> Encourages active travel by intersecting with 4 "touchpoints" of the national cycle network 	<ul style="list-style-type: none"> Enables better connectivity by providing improved access to Low Moor rail station
Indicative mode		Bus Rapid Transit / Bus	

5 – The Lilac Concept (Brighouse Circular)

Concept function	Provides <i>local</i> connectivity		
Summary	This concept provides short distance connections, unlocking the strategic development opportunities within Brighouse. It offers alternatives to the private car, whilst providing connectivity to housing growth sites at Brighouse North and Brighouse South and the Clifton Enterprise Zone.		
Enabling Inclusive Growth	Boosting Productivity	Tackling the Climate Emergency	Delivering 21st Century Transport
<ul style="list-style-type: none"> Connects deprived communities into the north of Brighouse 	<ul style="list-style-type: none"> Provides a connection to strategic development sites surrounding Brighouse 	<ul style="list-style-type: none"> Improves connectivity between various areas with high levels of car use with alternative modes 	<ul style="list-style-type: none"> Improves connectivity to Brighouse rail station as well as enhancing the link to the bus station Helps to reduce severance caused by roads, rail, river and canal in Brighouse
Indicative mode		Bus / Active travel / Demand Responsive Transit	

6 – The Green Concept (Ilkley to Brighouse – via Queensbury)

Concept function	Provides <i>strategic</i> connectivity		
Summary	This concept provides a strategic connection between Ilkley and Brighouse. It connects deprived communities such as Mixenden and Ilkley to the economic opportunities and employment growth around Brighouse.		
Enabling Inclusive Growth	Boosting Productivity	Tackling the Climate Emergency	Delivering 21st Century Transport
<ul style="list-style-type: none"> Connects deprived communities to the north of Halifax and north of Brighouse 	<ul style="list-style-type: none"> Connects strategic development sites surrounding Brighouse 	<ul style="list-style-type: none"> Intersects areas with AQMAs and provides alternative to car use 	<ul style="list-style-type: none"> Provides connectivity to communities around Shelf and Hipperholme Improves connectivity between the bus and rail stations at Brighouse
Indicative mode		Bus Rapid Transit / Bus	

4.4 Appraisal outcomes

Our appraisal process (summarised in 3.4.1) has been applied to the 6 connectivity concepts to define spatial priorities in the Calder Valley and Bradford corridor.

Each of the four assessment theme scores are averaged to provide an overall INSET score of between 0 and 1, where 1 represents a perfect correlation and anything else represents a degree of deviation from that perfect score. Typically, the total scheme scores lie somewhere between the two numbers with the following categories assigned:

Table 6: Scoring ranges

Scores	Ranges
Excellent	0.99 – 1.00
Good	0.75 – 0.99
Average	0.50 – 0.75
Fair	0.25 – 0.50
Low	<0.25

Source: Mott MacDonald

The outcome of the prioritisation for the connectivity concepts is summarised in Figure 26. This analysis excludes the orange concept which has been assessed as part of the Leeds to Bradford, South Bradford and North Kirklees Case for Change Report.

Although all concepts were classified as “Average” overall, there is differentiation within the defined scoring range. Figure 26 highlights that the Purple, Red and Pink concepts demonstrate the best level of fit across all themes and sifts and therefore have the potential to produce the greatest benefit from intervention. Further analysis will therefore focus on the **Purple** and **Red** concepts where additional infrastructure could be considered, alongside the Orange concept which has been prioritised in an adjacent corridor.

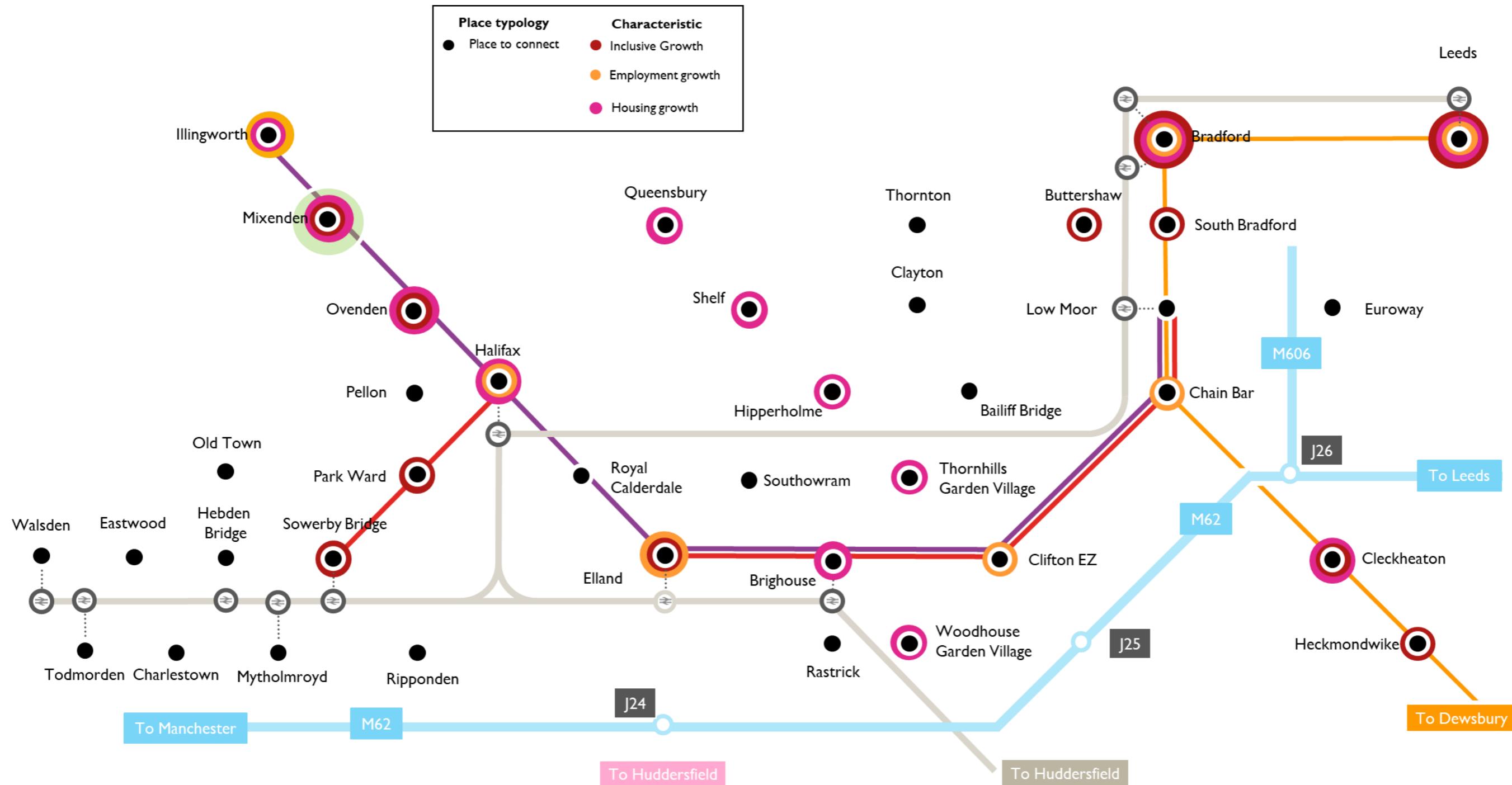
Overall, the Purple and Red connectivity concepts have been identified as the spatial priorities as they are the highest scoring concepts that address connectivity requirements to and within the corridor. These are shown in Figure 27. Delivering improved connectivity along these connectivity concepts will help to increase travel horizons which have previously been limited and help achieve inclusive growth across the Leeds City Region.

Figure 26: Appraisal outcomes for connectivity concepts – ranked

Rank	#	Connectivity concept	Sift 1: Early sift				Sift 1: Early sift Score	Sift 2: Local fit	Sift 3: Level of impact				Sift 3: Level of impact	Overall score
			Enabling Inclusive Growth	Boosting Productivity	Tackling the Climate Emergency	Delivering 21st Century Transport			Enabling Inclusive Growth	Boosting Productivity	Tackling the Climate Emergency	Delivering 21st Century Transport		
1		Ilkley - Low Moor route concept (Purple Concept)	Excellent	Excellent	Excellent	Excellent	Excellent	Average	Fair	Fair	Fair	Average	Fair	Average
2		Sowerby Bridge - Low Moor route concept (Red Concept)	Excellent	Excellent	Excellent	Excellent	Excellent	Average	Fair	Fair	Average	Fair	Fair	Average
3		Huddersfield - Halifax route concept (Pink Concept)	Excellent	Excellent	Excellent	Excellent	Excellent	Average	Fair	Fair	Fair	Average	Fair	Average
4		Sowerby Bridge - Low Moor route concept (Yellow Concept)	Excellent	Excellent	Excellent	Good	Good	Average	Fair	Fair	Fair	Fair	Fair	Average
5		Brighouse Circular route concept (Lilac Concept)	Fair	Excellent	Excellent	Good	Good	Average	Low	Average	Low	Fair	Fair	Average
6		Ilkley - Brighouse route concept (Green Concept)	Fair	Excellent	Excellent	Good	Good	Average	Low	Fair	Low	Fair	Fair	Average

Source: Mott MacDonald

Figure 27: Prioritised connectivity concepts



Source: Mott Macdonald

4.5 Demand

An assessment has been undertaken using the Combined Authority's Urban Dynamic Model (UDM) to estimate the total peak hour trip demand along each of the prioritised connectivity concepts. This presents 2033 forecasts of demand using established assumptions of the development landscape.

A mode technology framework developed by the Combined Authority has then been used to identify what mode of transport might be appropriate based on having a suitable capacity per hour (see Table 7).

Please refer to Section 9.2.2 of the Appraisal Handbook for the detailed workings of demand estimation.

Table 7: Mode technology framework

Mode	Capacity per service	Typical capacity per hour	Potential role
Walking and Cycling	1		Greatest potential for shorter distance journeys, particularly across congested city centre/urban environments.
Demand Responsive Transport	5 - 12	800 - 1,500 passengers	Most suited to low demand areas or periods where a scheduled service would be inefficient with regard to cost and use.
Standard Double Decker Bus	70 – 80	Less than 1,000 passengers	Flexible services which meet local accessibility needs – with very high-density shopping patterns.
Bus Rapid Transit	70 – 80	500 – 2,000 passengers	Limited stops outside of urban centres. Moves large volumes of people relatively short distances within an urban / city centre environment.
Light Rail / Tram / Mass Transit	100 – 200	2,000 – 4,000 passengers	BRT is often typically implemented where there is less demand or as a precursor to Mass Transit.
Suburban Heavy Rail	500 – 700	2,000 – 6,000 passengers	Move large volumes of people over longer distances (eg: 10-30 miles) with limited stops.
Inter Urban / National Heavy Rail	500 - 1000	Up to 27,000 passengers	Centre to centre fast and direct services.

Source: West Yorkshire Combined Authority

The demand analysis provides indicative evidence in identifying the potential for future modes along the connectivity concepts. Lower capacity modes could also be considered elsewhere in the hierarchy to provide a range of integrated transport services that could address these forecast levels of demand. The figures presented here illustrate

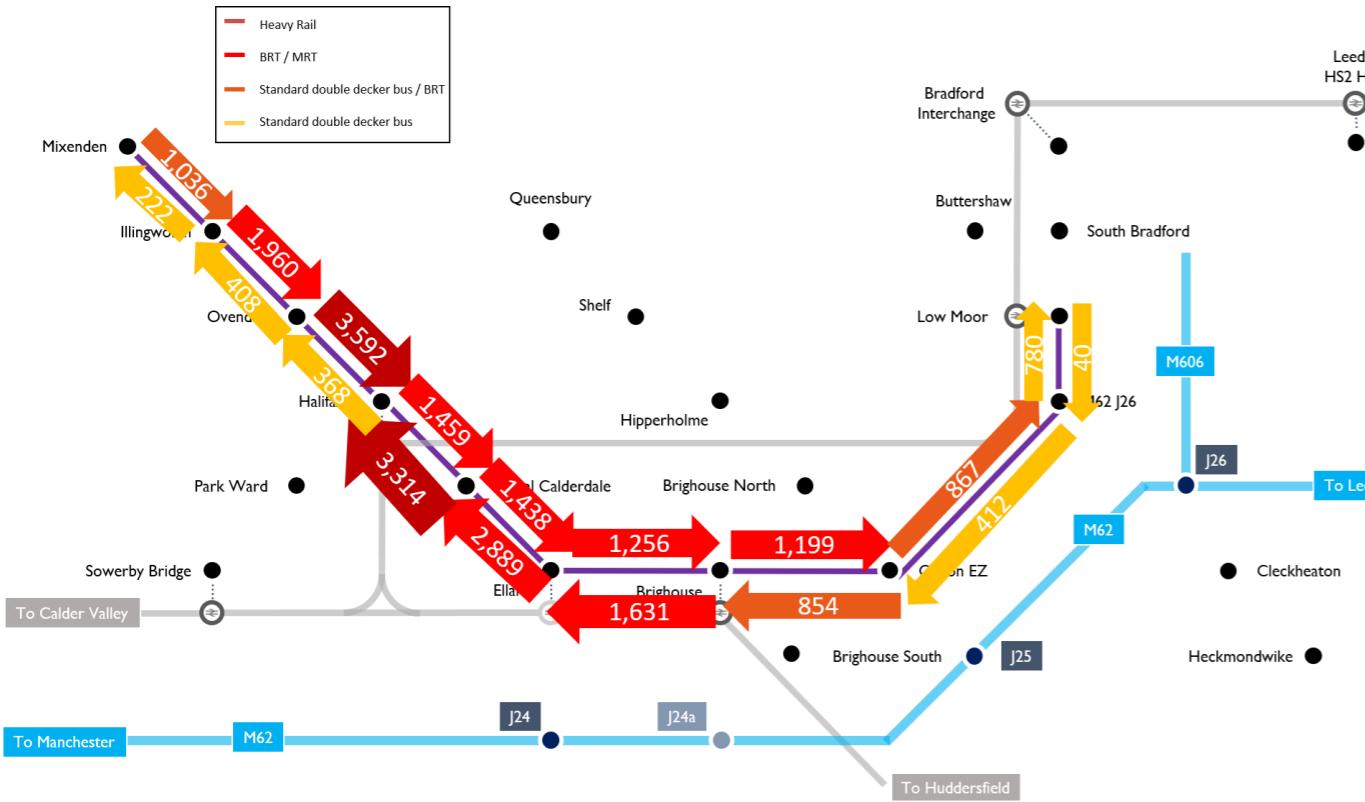
- Unconstrained demand that focuses on the potential of movement between places
- Aggregate flows between each place to connect within the connectivity concept
- Two-way flows to illustrate key attractors on the network
- Variations in demand between places to connect to demonstrate the range of services that could potentially be provided within each connectivity concept.

Figure 28 shows demand in 2033 along the highest scoring connectivity concept: Purple. This provides a strategic connection from Mixenden to Low Moor through Halifax. Future demand is high enough between Mixenden and Chain Bar (M62 J26) to suggest the potential for Bus Rapid Transit (BRT) or Mass Rapid Transit (MRT). Similarly, BRT or MRT may be needed to match demand from Brighouse to Halifax. Parts of this concept, from Ovenden to Halifax and Royal Calderdale to Halifax, has demand high enough to support heavy rail. However, neither Ovenden nor Royal Calderdale have open rail stations and so alternative means such as BRT / MRT would help to increase capacity along this concept. Demand from Low Moor to Clifton Enterprise Zone and from Halifax to Mixenden are the lowest in the corridor indicating options may be more suited for a standard double decker bus service between these areas.

Figure 29 shows demand between Sowerby Bridge and Low Moor, via Brighouse (the prioritised Red concept) in 2033. This shows a high number of people travelling from Halifax to Chain Bar (M62 J26) and from Clifton Enterprise Zone to Halifax, implying the potential for Bus Rapid Transit (BRT) or Mass Rapid Transit (MRT). Demand is high enough from Sowerby Bridge to Halifax to support heavy rail service. Rail infrastructure already exists here so potentially measures could be taken to increase capacity. Again, demand from Low Moor to Clifton Enterprise Zone and from Halifax to Sowerby Bridge is lower, indicating that a standard double decker bus may be more suitable.

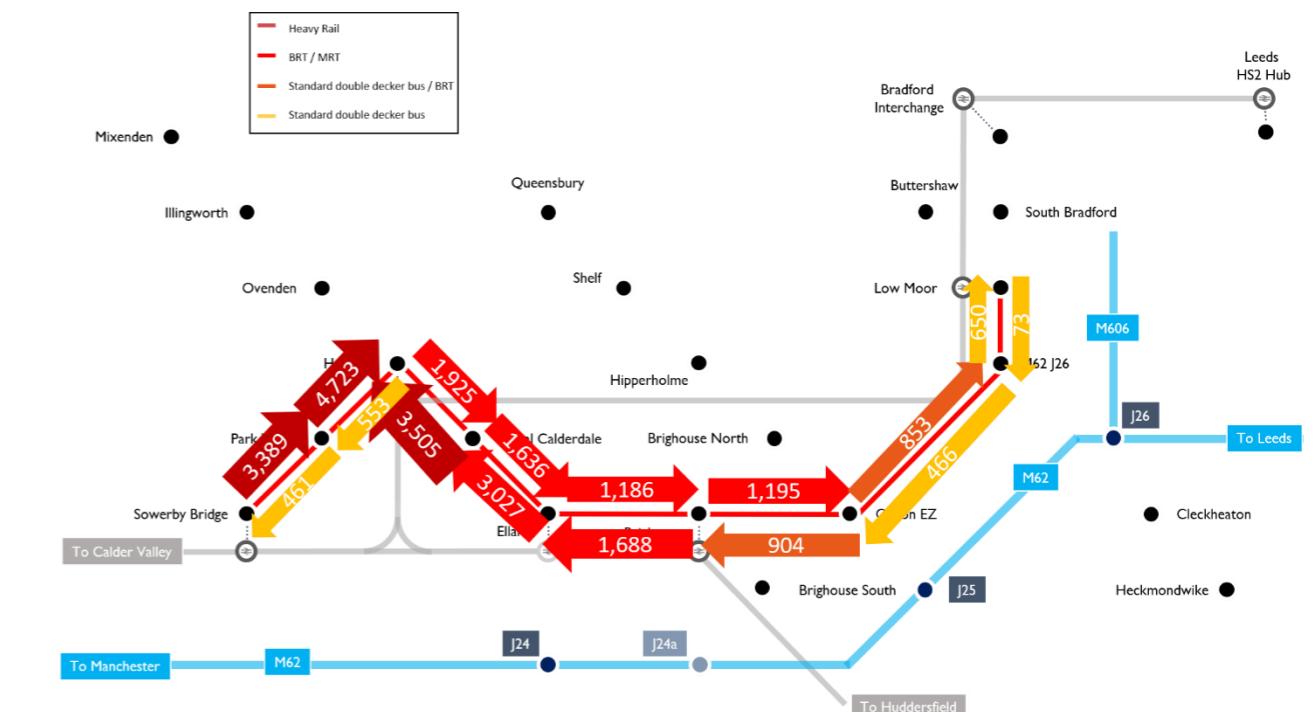
Evidence from other workstreams will inform how a multi-modal transport offer could be provided in these corridors, alongside the indicative high-capacity modes identified above.

Figure 28: Purple Concept – Demand 2033



Source: Urban Dynamic Model (UDM)

Figure 29: Red Concept – Demand 2033



Source: Urban Dynamic Model (UDM)

5 Conclusion: The Need for Intervention in the Calder Valley and Bradford

5.1 Introduction

This Case for Change presents the evidence and strategic narrative for investing in improved connectivity in the Calder Valley and Bradford corridor.

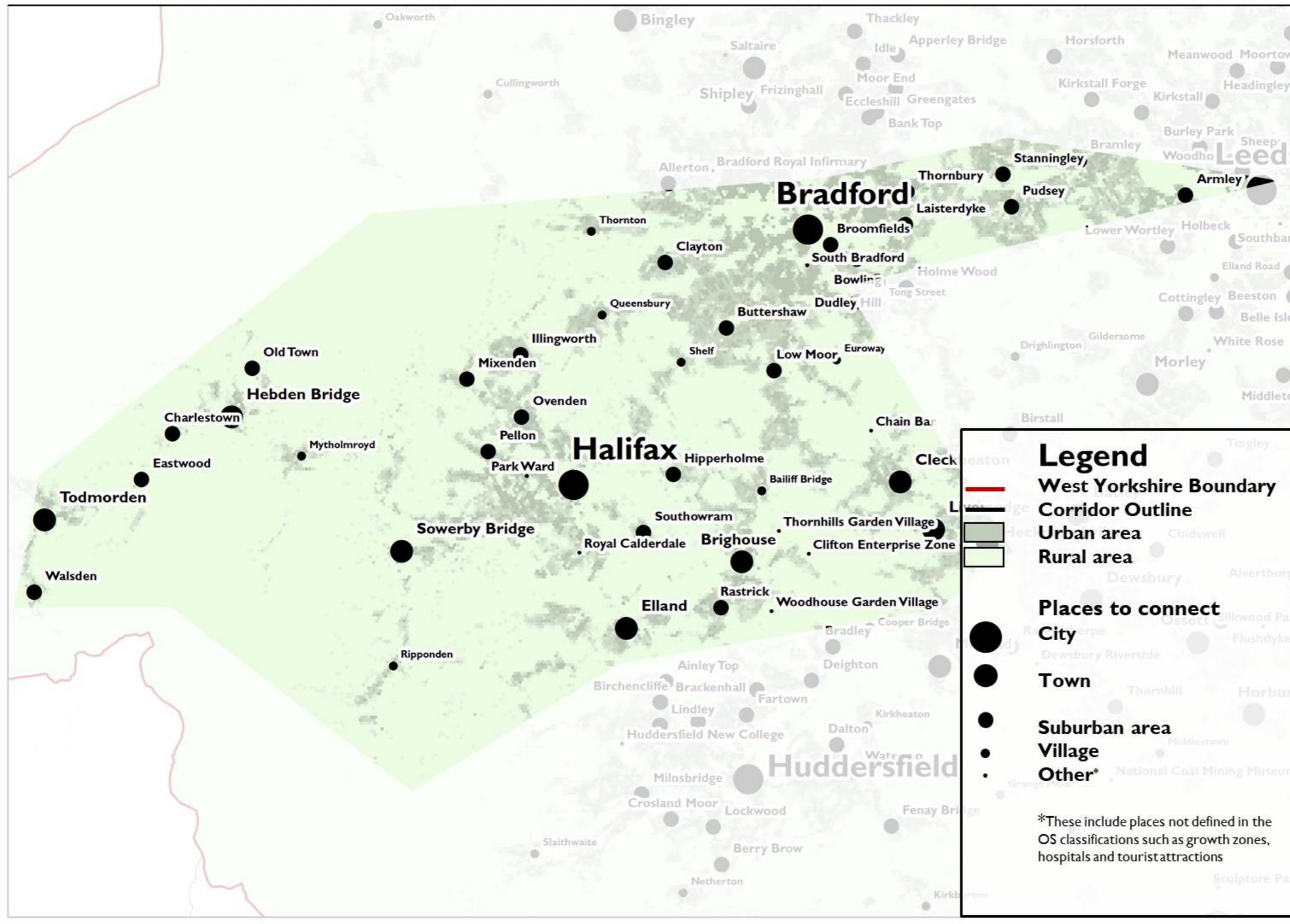
Through evidence review, and engagement from district partners, key places to connect have been identified, and a complementary series of connectivity concepts have been developed to show where there is greatest need to improve connections between people and places in the corridor. These places to connect have been used to support evidence gathering in other workstreams and are shown in Figure 30.

An appraisal of each of the concepts provides evidence to demonstrate which connectivity concepts have the greatest potential to enable inclusive growth, boost productivity, tackle the climate emergency, and deliver a 21st century transport system. The connectivity concepts prioritised through this process focus on making connections between communities to the north and west of Halifax – such as Illingworth, Mixenden, and Park Ward – and emerging economic opportunities in the south east of Calderdale around Brighouse, such as the Clifton enterprise zone. The prioritised concepts also connect Calder Valley communities to Low Moor, and therefore provide connectivity to the economic opportunities that are emerging south of Bradford. A high-level demand analysis has been also undertaken on these concepts to illustrate the potential for higher capacity modes of transport that might support improved connectivity between the key places to connect.

The Case for Change is one of several complementary sources that together, form a complex evidence base. Other evidence sources include:

- West Yorkshire Bus Network Review
- Leeds City Region Rail Vision and Capacity Study
- Leeds City Region Emissions Reduction Pathway
- West Yorkshire Walking and Cycling Strategy
- West Yorkshire Future Mobility Strategy
- West Yorkshire Urban Transit Study
- Ongoing engagement with district partners

Figure 30: Places to Connect Map



5.2 Connectivity Network

This Case for Change report therefore brings together several strands of evidence that have been evaluated and will ultimately inform the development of a package of interventions across several modes.

The emerging multi-modal network on which future interventions will focus provides a framework to address the key connectivity issues and opportunities that have been highlighted through this study and other strands of evidence. This network for the Calder Valley and Bradford is illustrated in Figure 31. This will link with networks developed in other Case for Change reports within the Connectivity Plan to provide a full multi-modal network for West Yorkshire.

Figure 31 Calder Valley and Bradford Connectivity Network

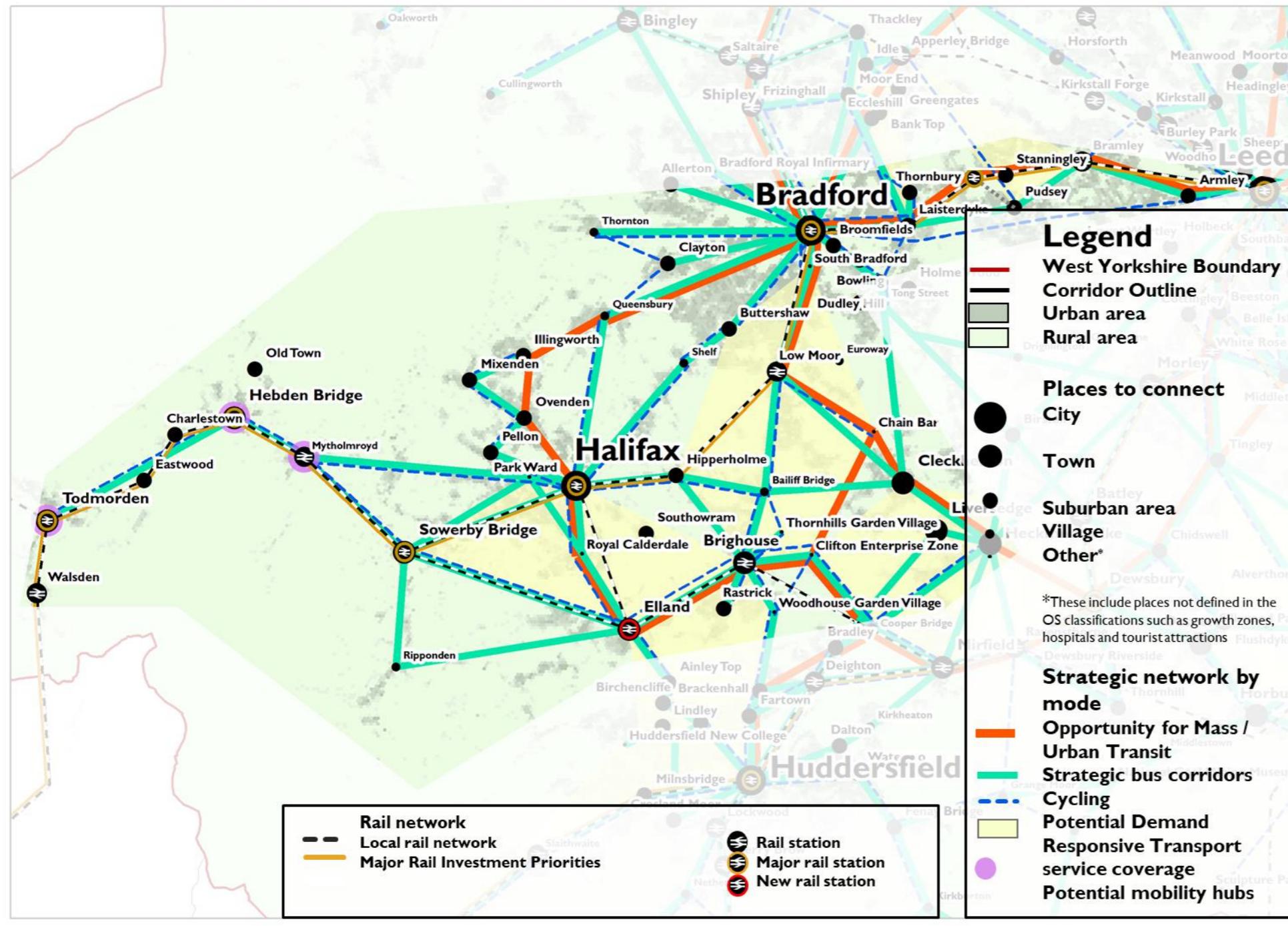
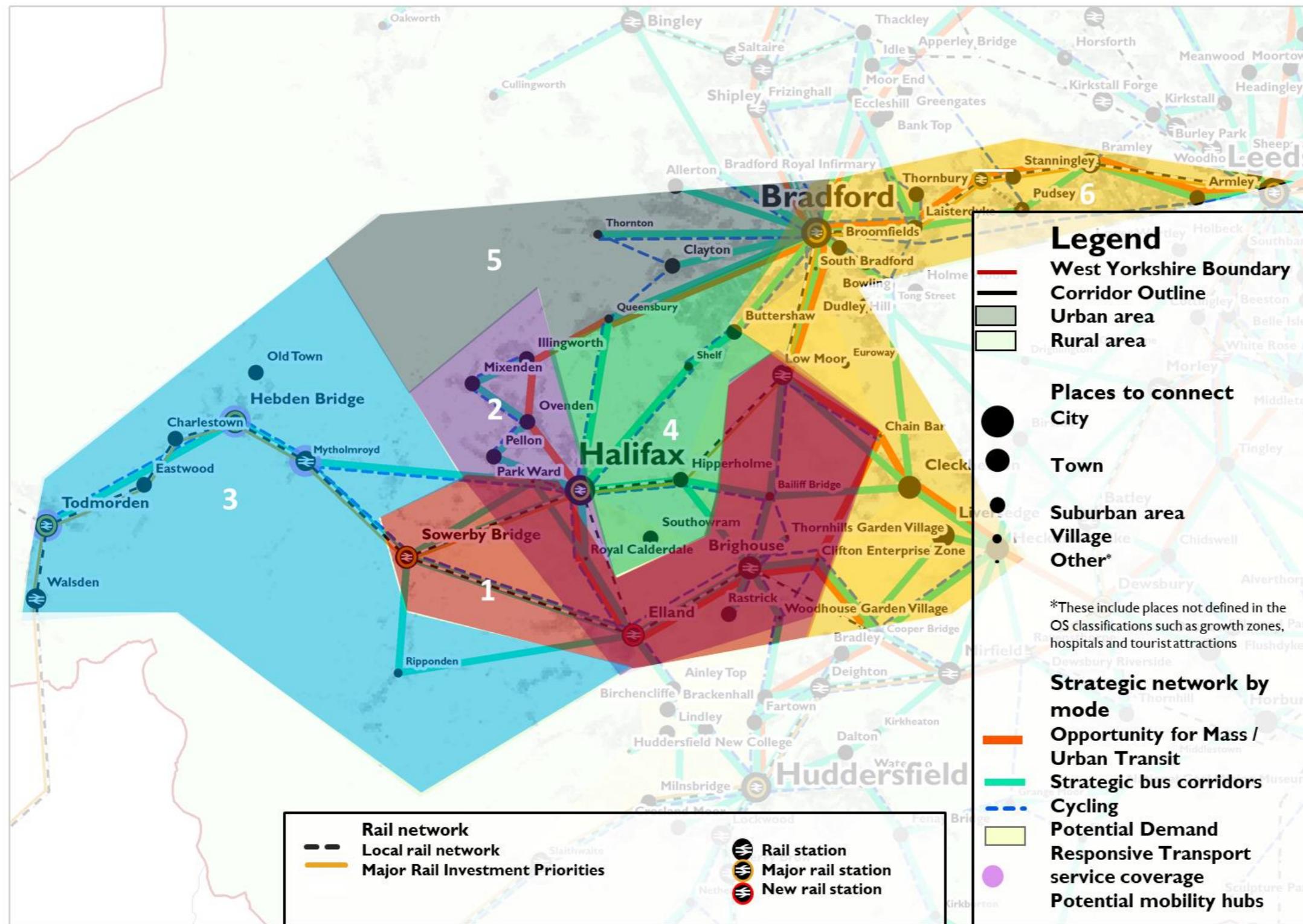


Figure 32 illustrates spatially how the various strands of evidence, including the prioritised connectivity concepts and subsequent demand analysis, provide a rationale for network interventions in the Calder Valley and Bradford. These strands of evidence are summarised alongside West Yorkshire's four strategic priorities in Table 8:

Table 8 Evidence rationale for network interventions

Network Area	Description	Rationale	Evidence Base			
			Enabling Inclusive Growth	Boosting Productivity	Tackling the Climate Emergency	Delivering 21 st Century Transport
1	Red Connectivity Concept	Connects deprived communities in Park Ward and Sowerby Bridge to economic opportunities in and Elland Brighouse.	Enhances connectivity to current employment hubs near Halifax, Elland and Brighouse, alongside future employment areas such as Clifton Enterprise Zone.	Intersects with several Air Quality Management Areas (AQMAs), as well as areas of congestion on the A629.	Demand analysis suggests much of this route could be served by rail and/or mass transit, with a strategic link provided between Low Moor and Brighouse. Much of the route also forms part of the City Connect cycle network along the Calder Valley and this can be enhanced further.	Calder Valley and Bradford Case for Change Report
2	Purple Connectivity Concept	Provides connectivity through Halifax for isolated and deprived communities in Ilkley, Mixenden and Ovenden towards employment opportunities in Elland, Brighouse and South Bradford.	Enhances connections through Halifax towards local employment centres in Elland, Brighouse and the future Clifton Enterprise Zone.	Intersects with areas of poor air quality and congestion on routes in and out of Halifax.	Much of this route could be served by mass transit, with bus linkages to communities on the edges of the network area. The network area could also connect to the National Cycle Network and proposed bus and cycle interventions to the north west of Halifax.	Calder Valley and Bradford Case for Change Report
3	Upper Calder Valley	Provides linkages to rural communities such as Todmorden, Mytholmroyd and Hebden Bridge.	Enables communities in the Upper Calder Valley to access opportunities near Halifax.	High car dependency based on car ownership figures, demonstrating a need to provide wider travel choices in order to encourage mode shift.	Key corridor for boosting rural bus connectivity. A programme of rail improvements have also been identified along the Calder Valley line to improve services and train stations. The canal towpath also forms part of the City Connect cycle network.	West Yorkshire Bus Network Review West Yorkshire Rail Strategy
4	North East Calderdale	Encompasses communities in the south west of Bradford such as Buttershaw which are among the most deprived in England.	Provides the shortest distance connection between the economic centres of Halifax and Bradford.	Area intersects with several AQMAs and congestion hotspots near Hipperholme.	Predominantly bus based interventions along existing corridors between Bradford and Halifax. Planned improvements to the Calder Valley line between Low Moor and Halifax.	Calder Valley and Bradford Case for Change Report West Yorkshire Bus Network Review
5	West Bradford	Connects deprived communities to the west of Bradford, including parts of Clayton and Thornton.	Provides access to the economic centre of Bradford.	A western extension to the City Connect cycle network is included as part of West Yorkshire's Transforming Cities Fund package.	Part of programmed intervention to extend City Connect cycle network to Thornton. Option for a strategic mass transit connection via Queensbury Tunnel as part of strategic connection between Halifax and Bradford.	West Yorkshire Walking and Cycling Strategy Urban Transit Study
6	East Bradford	Links several deprived communities in south and east Bradford, and west Leeds such as Buttershaw, Laisterdyke and Bramley.	Provides onward connections to regional centres of Bradford and Leeds beyond the growth areas of Low Moor and South Bradford.	Intersects with several AQMAs, as well as the proposed Clean Air Zones in Leeds and Bradford.	Forms part of potential mass transit link between Leeds and Bradford, with enhancements to City Connect network and connecting bus routes to areas of need such as Holme Wood.	Leeds to Bradford, South Bradford and North Kirklees Case for Change Report Urban Transit Study

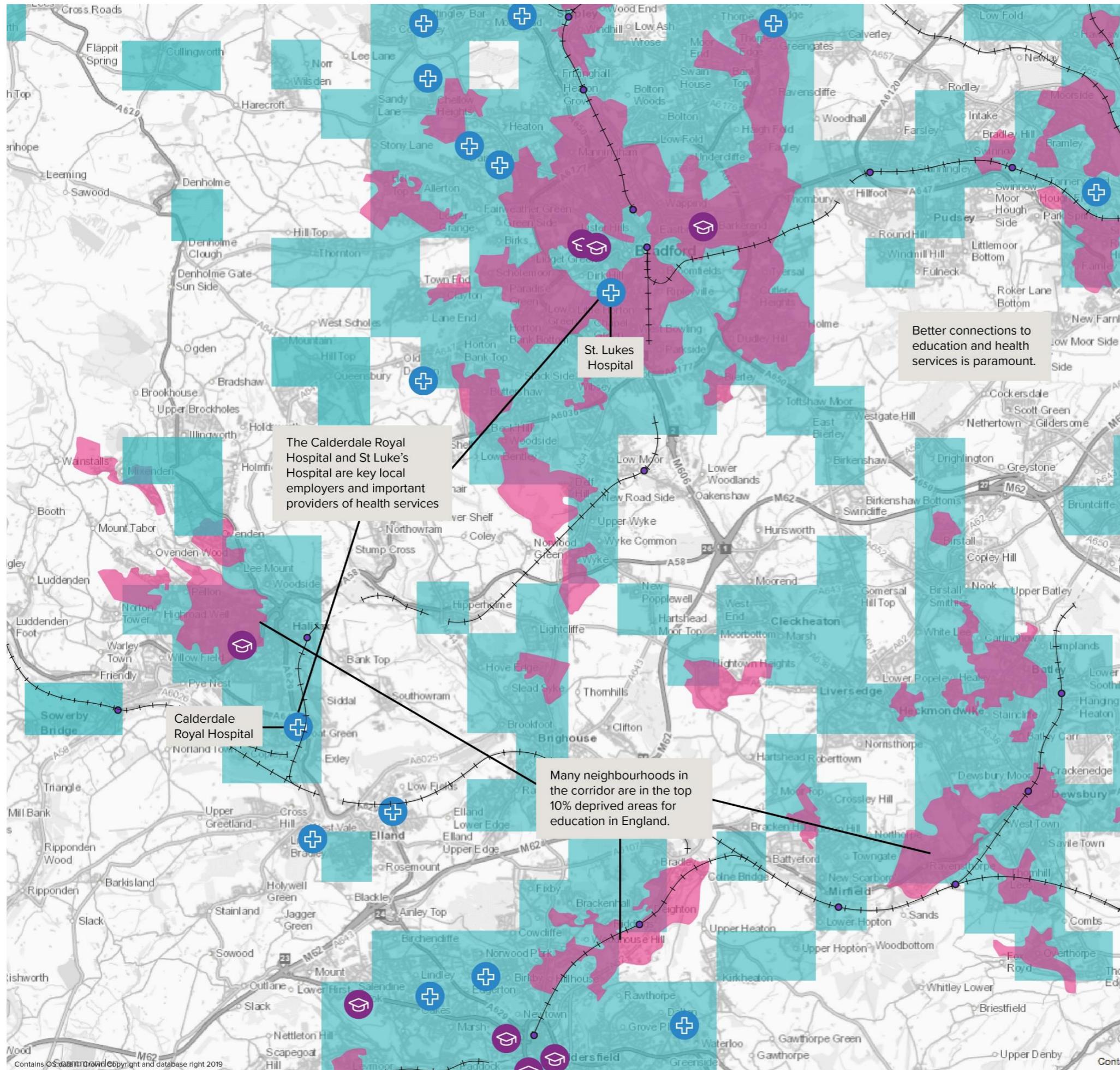
Figure 32 Evidence map for network interventions



Appendices

A. Spatial context highlights across the regional priorities	38
B. Calder Valley and Bradford: Investment Case	43

A. Spatial context highlights across the regional priorities



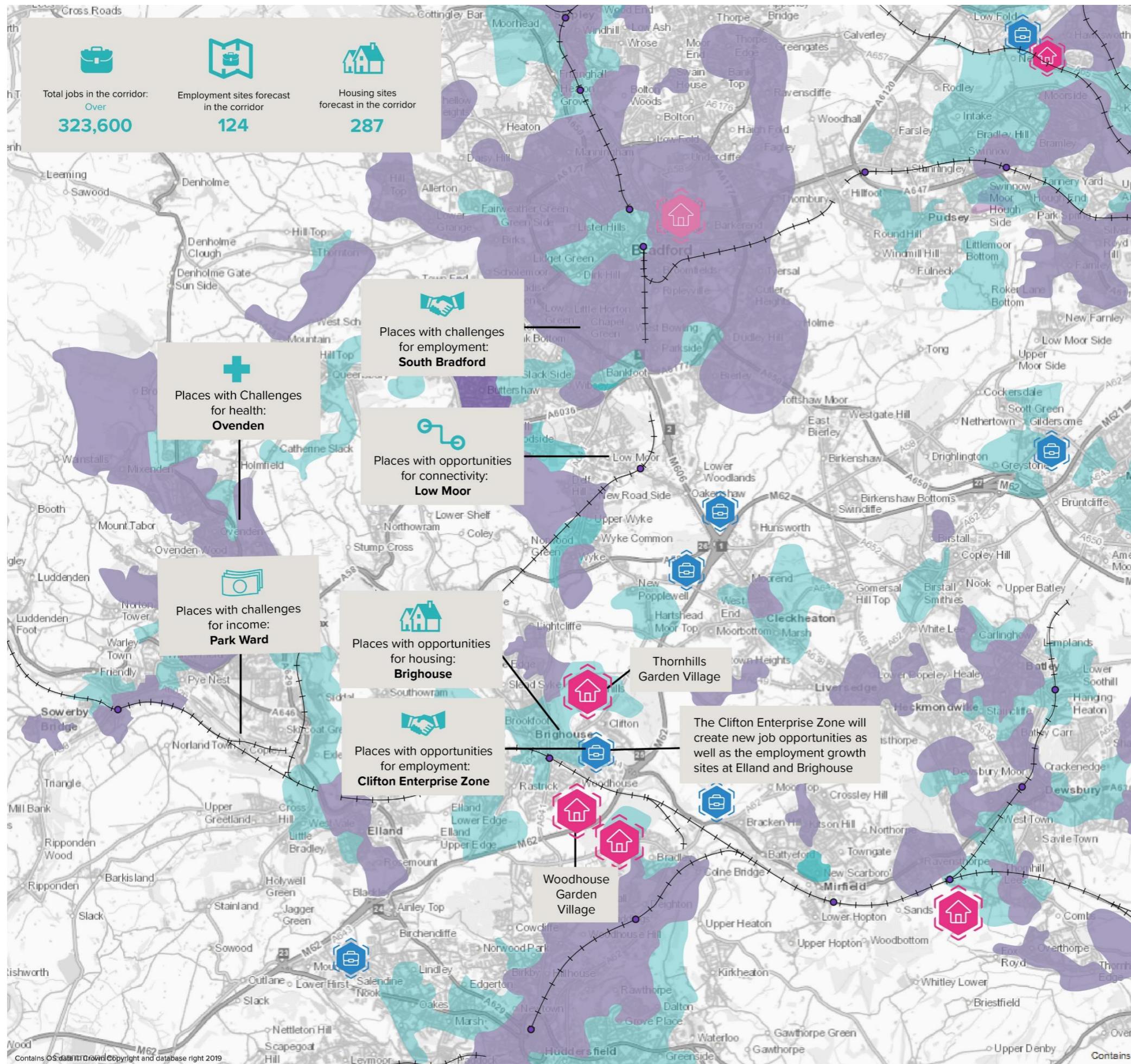
Enabling inclusive growth

- ++ Rail line
- Rail station
- Hospitals
- Higher education services
- Top 10% deprived areas for education in England
- Equality, Diversity and Inclusion (EDI) hotspots

These areas show high concentrations of population, people from "protected characteristic groups" (as defined by the Equality Act 2010, including age, disability, gender reassignment, marriage or civil partnership, pregnancy and maternity, race, religion or belief, sex, sexual orientation), and trip attractor destinations such as schools, hospitals, religious buildings and care homes.

This map shows the inclusivity indicators within the corridor, including education and health services and the spread of Equality, Diversity and Inclusion (EDI) hotspots.

EDI hotspots cover an extensive area of the corridor, particularly in Bradford, Heckmondwike and Halifax, where there are many communities with protected characteristics and specific needs. Consideration of these must be made when improving transport services to ensure growth is felt by all and does not discriminate or divide access between groups of people.



Boosting productivity

Future growth sites

- Employment:** Blue hexagon with briefcase icon.
- Housing:** Pink hexagon with house icon.
- Precise location of Bradford housing sites not yet allocated:** Pink hexagon with house icon.

++ Rail line

Rail station

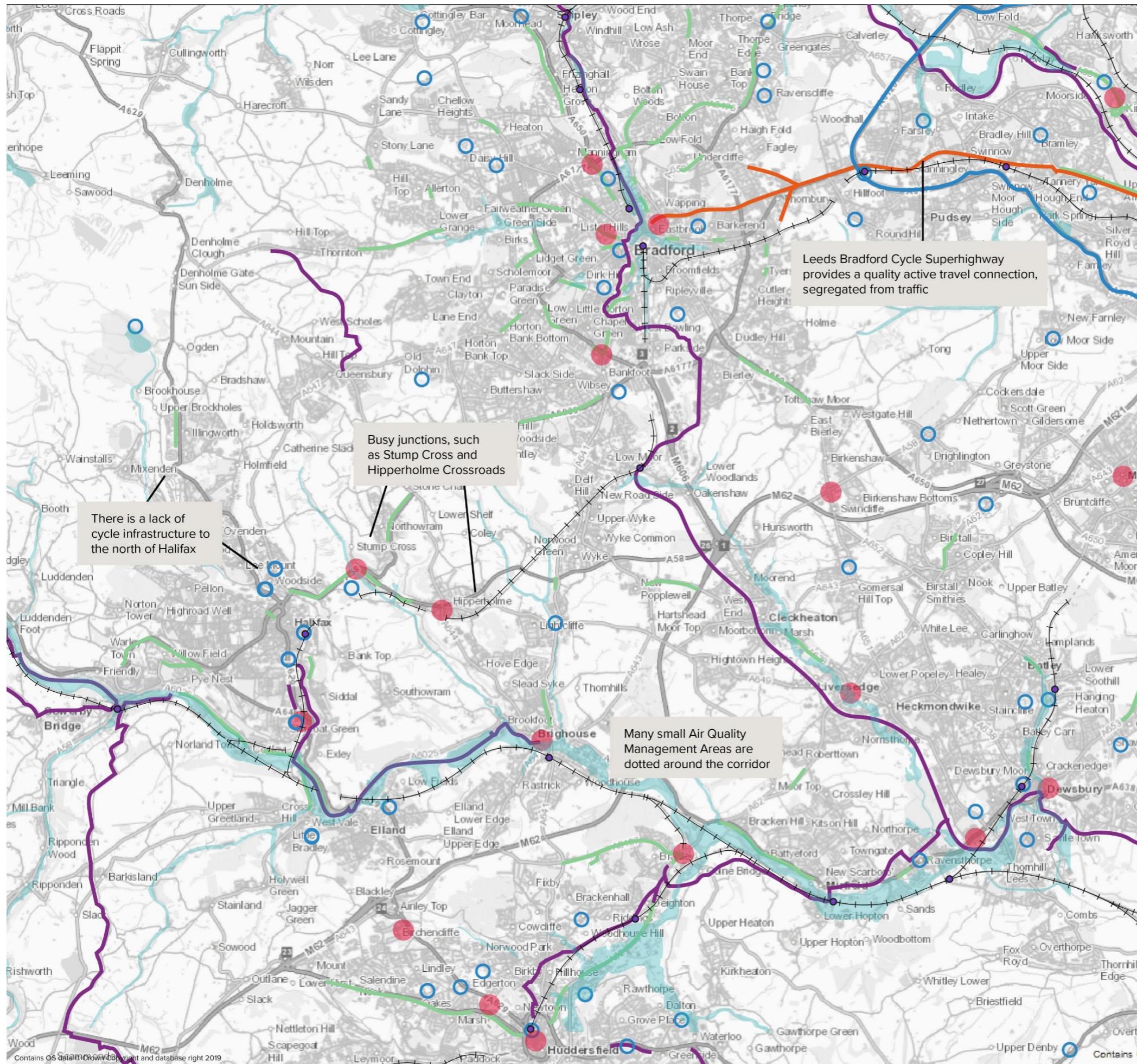
● Top 20% most deprived in England and >26% no car ownership

● >26% no car ownership

This map shows employment and housing growth opportunities and other economic characteristics to understand the corridor's productivity gap.

There are many areas of housing growth, particularly to the north and south of Brighouse. These growth hotspots include two 'garden suburbs'; Thornhills Garden Village and Woodhouse Garden Village, which will create new communities in the corridor. As well as housing growth, employment growth is being promoted in the area; particularly around the Clifton Enterprise Zone and the M62 Junction 26.

There are several areas in the corridor that have low levels of car ownership, including Bradford and surrounding areas, extending to Holmewood, but also in Mixenden, Halifax and Brighouse. It is therefore of utmost importance that these areas are connected by good public transport links, to the current and future housing and employment centres. Better connectivity is therefore critical to ensuring these communities have access to emerging opportunities.



Tackling the climate emergency

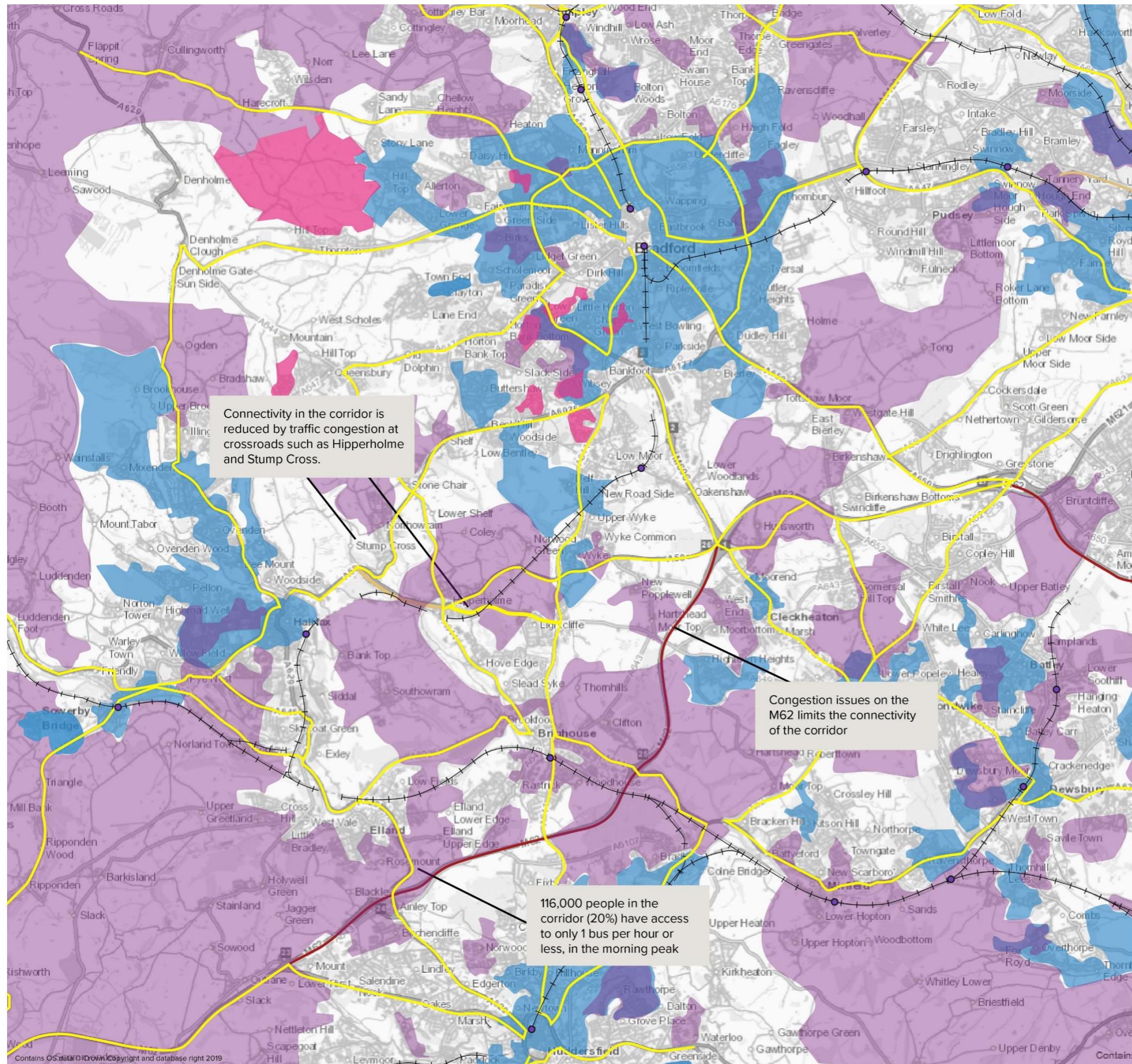
- ++ Rail line
- Rail station
- Clean Air Zone 2025
- National Cycle Network
- Cycle City Ambition Grant
- West Yorkshire National Cycle Lanes
- Points of interest
- Air Quality Management Area
- Flood Zone 3

These areas are assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), as set out in the National Planning Policy Guidance.

This map shows how the corridor currently stands in relation to delivering clean growth, particularly looking at the active travel network and Air Quality Management Areas (AQMAs). The geography of the corridor means that some areas are of high flood vulnerability, which any interventions will need to take into consideration.

There is a range of cycle infrastructure present in the corridor that make up the active travel network. However, a lack of infrastructure to the north of Halifax means that the wider network is not comprehensive. Mixenden and the surrounding areas have no active network. More investment is needed throughout the district to provide a fully connected and quality network that will provide access to key centres and trip attractors / destinations.

Although the area has several AQMAs, these are all very small in size and are scattered across the corridor. These tend to not cover whole urban centres or large communities, but are found at busy junctions, such as Stump Cross and Hipperholme Crossroads.



Creating a 21st century transport system

++ Rail line

● Rail station

● Isolated communities

These are areas where the distance travelled to work and the average number of destinations people can reach for journeys to work across the Leeds City Region, are lower than the national average. This is based on the approach adopted for the Joseph Rowntree Foundation for "Tackling transport related barriers to employment in low-income neighbourhoods".

Bus service provision (in the morning peak)

● Poor (1 bus per hour)

● Non-existent (0 buses per hour)

Congestion: Speed reduction due to peak-time congestion

— Over 30 kmph

— Between 20 – 29 kmph

— Between 10 – 19 kmph

This map shows the existing transport networks, including rail lines and stations, highway congestion and bus service provision.

Bus service provision in the corridor varies. Bradford has a good service, with broadly two to four buses per hour; however, this is not the case in more southern areas of the corridor, including the southern suburbs of Brighouse and Elland. With low levels of car ownership in these areas, communities struggle to have adequate access to services which results in low travel horizons.

There is heavy congestion along the M62, hindering strategic connections to Leeds and Manchester. There is some delay on the A629 into Elland, as well as traffic concerns at Stump Cross and Hipperholme crossroads. This inhibits connectivity in the area.

B. Calder Valley and Bradford: Investment Case

The highest scoring “connectivity concepts” represent the corridor’s spatial priorities. For this corridor these are the Purple and Red concepts as these were the best performing concepts for connectivity *to and within* the corridor. These connectivity concepts are used as the framework for developing interventions that will address the Leeds City Region’s future connectivity requirements and improve travel horizons throughout the corridor.

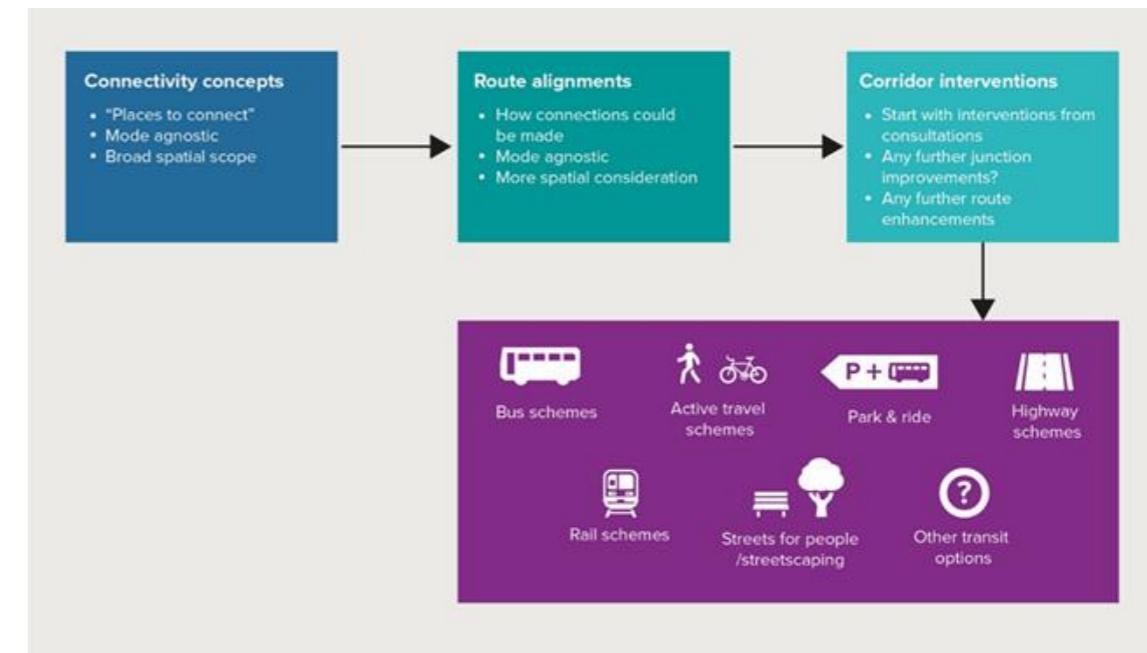
B.1 Developing interventions

Potential route alignments are identified as ways to provide the connections identified within the “connectivity concepts”. For example, potential route alignments could be road corridors, disused railway lines, canal towpaths, watercourses or public rights of way. The route alignments remain conceptual and mode agnostic, but as they are considered in further detail, can become more mode-specific as interventions.

Interventions are identified from stakeholder feedback, consideration of previous feasibility studies, and a detailed desktop gap analysis. The latter looks at existing (current and disused) transport provision and networks and the current pipeline of works in the corridor identify new interventions that will provide the required connectivity opportunities for the future by giving greater breadth and opportunity to travel and increasing travel horizons. Scheme types include: active travel – walking and cycling (both on and off road), bus corridor treatment (bus priority measures and/or road space reallocation), bus service, masterplanning and “Streets for People”¹⁴, Park & Ride, rail, highways, transit concepts (e.g. BRT, tram-train etc.).

The longlist excludes schemes that have been developed as part of other workstreams, although it is possible there will be some overlap if options have been identified independently in both this report and other specific studies (e.g. LCWIP). Some of these schemes have also been accelerated as part of West Yorkshire’s Transforming Cities Fund programme.

The following diagram summarises the process for developing interventions.



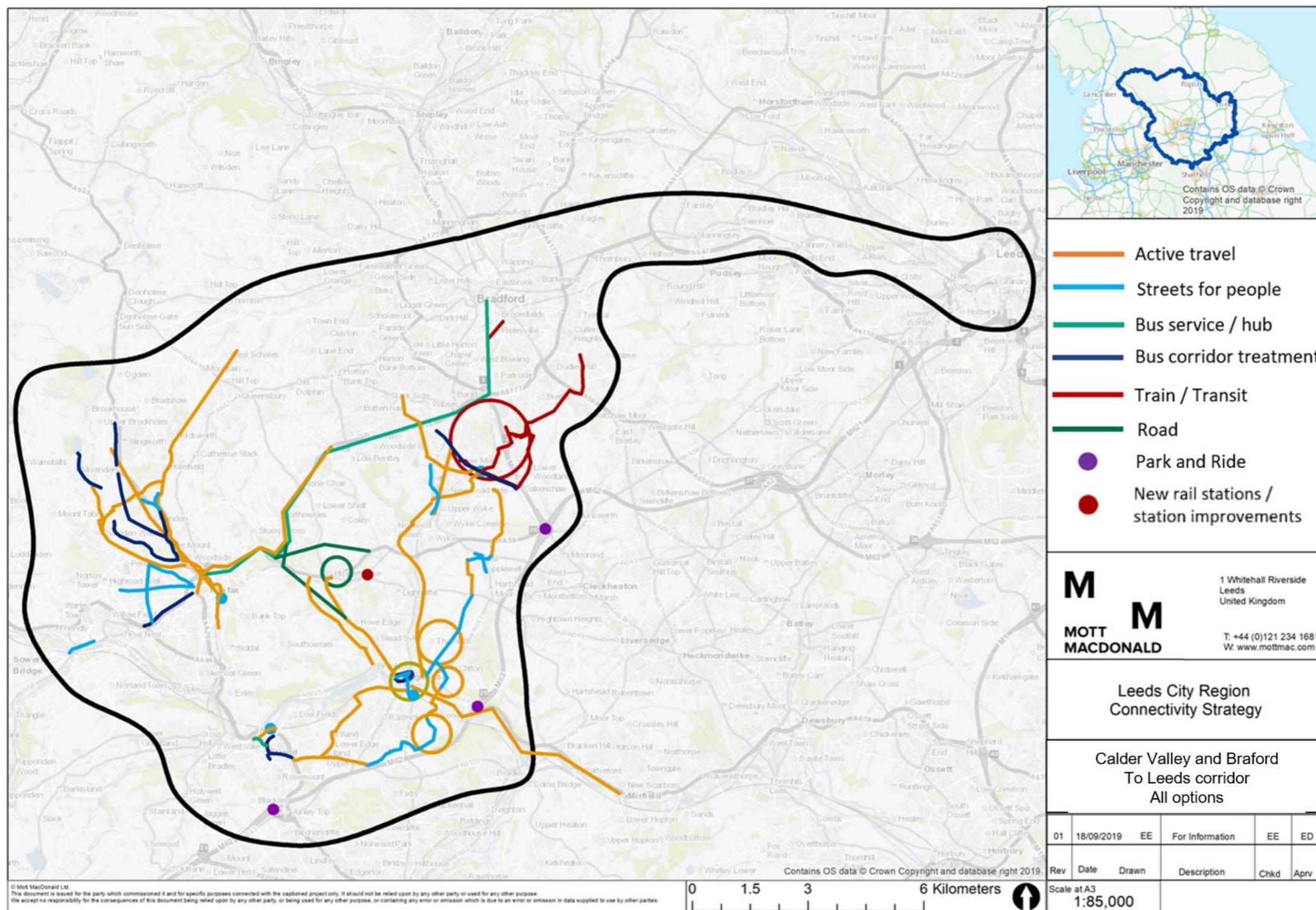
All interventions have been assigned a scheme type, a high-level deliverability and timescale attribute, as follows:

- Scheme types
 - Active travel (on and off-road walking and cycling)
 - Bus corridor treatment (bus priority measures and/or road space reallocation)
 - Bus service
 - Masterplanning / Streets for People - Improved urban realm and accessibility for pedestrians and cyclists
 - Park & Ride
 - Rail
 - Highways
 - Transit concepts (e.g. BRT, tram train etc.)
- Delivery timescales: short, medium, long term
- Technical complexity: low, medium, high
- Connectivity concept: identifies the connectivity concept each scheme aligns to

The result of the process above is a long list of 73 interventions for the Calder Valley to Leeds corridor. The alignments for these are mapped in Figure 33.

¹⁴ Streets for People is a West Yorkshire-led series of design principles that focuses on creating safe and healthy places that take into consideration a number of factors, including traffic management, reducing air pollution, creating places which help people to interact and encouraging sustainable methods of transport such as cycling, walking and public transportation.

Figure 33: Calder Valley and Bradford corridor - all interventions



Source: Mott MacDonald

B.2 Interventions

The initial long-list of options for transport connectivity improvements has been produced by Mott MacDonald consultants. These proposals have been identified through high-level assessment of the evidence. Feasibility work will be required to develop deliverable schemes that best provide the connectivity required. The list has been collated with the long-list outputs of other Case for Change reports and the outputs of aligned workstreams such as the Leeds City Region Rail Vision and Capacity study and the Leeds City Region Emissions Reduction Pathway study to inform the West Yorkshire Connectivity Investment Plan and pipeline. The consolidated initial long-list can be found in Appendix 2 to the WY Connectivity Plan. Programme C - Options for delivery between 2026 – 2040.

