

Manchester North-West Quadrant Study

Stage 3 Report



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1. Executive Summary

1.1 Introduction

- 1.1.1 As part of its Road Investment Strategy (RIS): Investment Plan, December 2014 the Department for Transport (DfT)¹ announced it was commissioning a series of six new strategic studies to address the biggest challenges facing the road network. One of the studies announced was the Manchester North-West Quadrant study, covering junctions 8 to 18 of the M60.
- 1.1.2 The M60 plays a vital part in the life of Manchester and is a critical part of the northern transport network. The North-West Quadrant of the M60 between junctions 8 and 18 contains some of the busiest stretches of road outside the M25. The mix of local traffic and strategic traffic, coupled with the design of the road, further exacerbates congestion and environmental problems.
- 1.1.3 The study objectives were developed to assess and form a preliminary strategic case for improving the transport network in the region; define the intervention specific objectives that the study should seek to address; identify a long list of interventions which could meet the intervention specific objectives and undertake a high level assessment of the potential value for money, benefits and impacts of the different options; short list the better performing interventions; and prepare a Strategic Outline Business Case for the better performing interventions for consideration in the development of future RIS.
- 1.1.4 The North of England is home to over 15 million people², this is nearly a quarter of the UK's population – and generates £290bn in economic output², but only accounting for one fifth of the national GDP.
- 1.1.5 Individually, the economies of the City Regions of the north are strong but, despite this, the North continues to lag behind London and the South East in terms of its economic performance.
- 1.1.6 The One North report³ commissioned by the City Regions of Leeds, Liverpool, Manchester, Newcastle and Sheffield presented a strategic proposition for transport in the north that aims to transform connectivity for economic growth through agglomeration of markets, improving access to skilled labour and stimulating business investment. The case for action, set out in the Highways Plan within the One North report, recognises that the number, capacity and reliability of east-west road connections is a constraint on the economy and acknowledges that there are areas of severe congestion on the existing network, together with a high level of demand for freight from northern ports.

¹ Road Investment Strategy: 2015 to 2020, <https://www.gov.uk/government/collections/road-investment-strategy>, Highways England, December 2014

² Sub-regional GVA, ONS, 2013

³ Leeds, Liverpool, Manchester, Newcastle and Sheffield city regions, One North: A Proposition for an Interconnected North, July 2014

- 1.1.7 The Northern Transport Strategy report (The Northern Powerhouse: One Agenda, One Economy, One North⁴) recognises that the north of England has a number of cities that perform well individually, but lack the transport connectivity needed to drive improved output and employment. The Northern Powerhouse Independent Economic Review (IER)⁵ also identifies a number of reasons as to why improved transport connectivity between cities is important for the north's growth prospects.
- 1.1.8 This report strongly presents the study findings and presents the case for considering further investment to the transport network in and around the Manchester North-West Quadrant.

1.2 The Strategic Case

- 1.2.1 The M60 motorway is no further than 6 miles from Manchester City Centre, as close as the North Circular Road is to central London. It provides Manchester and surrounding areas with an orbital, strategic route, as the M25 does for London, but also provides a more local distribution function similar to the North Circular Road in London. It also provides strategic east-west connectivity from Liverpool and Manchester across the Pennines to Leeds, Sheffield and the north-east.
- 1.2.2 At certain times of the day within the study area the motorway network has insufficient capacity. This lack of capacity, when combined with challenging layouts and topography, results in slow speeds for users, particularly for the large volumes of freight undertaking Trans-Pennine movements, as well as for other users on trips in and around the City Region. These competing pan-northern, city region and local functions mean that the motorway network is heavily used throughout the day and leisure and sporting event traffic can cause congestion and low speeds outside traditional peak periods.
- 1.2.3 Merging and diverging traffic from the motorways which feed into the M60, causes considerable congestion at intersections which lead to; journey time unreliability reflected by large variance in journey times; low average speeds throughout the day and week sometimes falling below 15mph⁶; vehicle delays; and, a poor safety record. Sections of M60 within the study area are also in the worst 10% of the whole of England's motorway network for vehicle hours delay⁷, when incidents or accidents do occur minimal network resilience means increased times for network recovery resulting in prolonged congestion, lost productivity and environmental dis-benefits.

⁴ Transport for the North. The Northern Powerhouse: One Agenda, One Economy, One North, A report on the Northern Transport Strategy, HMSO, March 2015

⁵ Transport for the North, Independent Economic Review: Workstream 1 – Productivity, 2016.

⁶ Analysis of Highways England's TRADS data for May 2014

⁷ South Pennines Route Based Strategy Report, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/365291/South_Pennines.pdf, Highways Agency, 2014

- 1.2.4 Air quality and noise issues impact upon the life of people who live adjacent to the road network. These issues have historically proven a barrier to the development of schemes within the study area resulting in proposals either not being progressed or their scope significantly altered leading to interventions not realising their true potential. Previous schemes have been constrained to improvements mostly within the existing M60 corridor where there are a number of air quality and noise issues, the geographic scope of this study is significantly broader than previous schemes, and therefore could result in wider opportunities to mitigate air quality and noise issues whilst ensuring any proposals can be delivered giving due regard to air quality and noise and ensuring compliance with relevant legislation.
- 1.2.5 Rail routes from Bolton, Liverpool and Leeds are currently some of the most crowded in the UK , outside London, Manchester has the worst crowding and second largest rail patronage in England and Wales. Whilst considerable investment has been made in public transport on rail, Metrolink and bus in the Greater Manchester area, it is challenging for these generally radial services to provide an attractive alternative for many of the orbital, longer distance and disparate movements being made on the motorway network.
- 1.2.6 Future development proposals in and around the study area will create additional residential, employment and distribution trips and will further impact the transportation network thus compounding existing problems.
- 1.2.7 Transport and transport related problems in Manchester’s North-West Quadrant already present barriers to economic growth and will only worsen over the coming years. The case for change is therefore based on the interrelated transportation and economic needs of the north. Importantly, if the capacity constraints on the motorway network in the Greater Manchester area (and their impact on the wider transport network in the north) are not addressed, they will; hold back growth across the region; make the aspirations for the Northern Powerhouse harder to achieve; and, see worsening transport and environmental issues.

1.3 Option development

- 1.3.1 In March 2016 DfT published the Manchester North-West Quadrant Stage 1 Report which reported on the assessment of problems and issues in the study area, and considered the case for intervention. From the problems and issues identified in the Stage 1 Report, Intervention Specific Objectives as set out in Table 1 were developed. These objectives were then used in the assessment of the potential interventions.

⁸ Analysis of DfT, National Statistics, <https://www.gov.uk/government/statistics/rail-passenger-numbers-and-crowding-on-weekdays-in-major-cities-in-england-and-wales-2014>

⁹ Manchester north-west quadrant strategic study: interim report, 7 March 2016, DfT, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/505262/m60-nwq-initial-report.pdf

Intervention Specific Objectives	Category
To facilitate and support the delivery of the Northern Powerhouse by ensuring the Manchester North-West Quadrant enables transformational growth in the employment, housing and economic output of the north	Growth
To improve journey times, reliability, safety and resilience across the study area	Network Performance
To improve connectivity for all users so they are able to access education, employment, business and leisure opportunities	Connectivity
Minimise adverse impacts on the environment and to maximise opportunities for a net improvement to the environment particularly air quality and noise across the study area	Environment

Table 1 – Manchester North-West Quadrant Study Intervention Specific Objectives

- 1.3.2 Given the strategic case, as described above, in terms of economic performance, transportation challenges, air quality and noise and future development, it was considered important to develop more radical and transformational transportation solutions that include and look beyond the existing M60 corridor than those that were considered as part of previous studies in the area
- 1.3.3 Informed by an analysis of the current network and its performance a long list of potential interventions, developed across all transport modes, were sifted against the intervention specific objectives.
- 1.3.4 In order to develop a framework for assessing the interventions a spatial approach was developed which was influenced by the approach contained in Transport for Greater Manchester’s (TfGM’s) emerging 2040 Vision. Interventions were assessed within orbital corridors and geographic sectors to determine the best performing and these were then drawn together into packages for subsequent, more detailed analysis.
- 1.3.5 The packages comprised highways and public transport interventions structured as follows;
 - **Northern Corridor** – providing a new west to east route north of the M62 and M60 to link the Port of Liverpool to the M62 east of the M60
 - **Outer Orbital Corridor** – providing a new orbital route outside of the M60 from the M56 and M62 in the south and west to the M62 in east
 - **Public Transport Max (PTMax)** – an integrated package of public transport measures designed to tackle the problems within the study area without the need for further highways interventions comprising of orbital Metrolink and tram/ train solutions coupled with rail capacity upgrades, park and ride and other public transport improvements.
 - **In-Corridor** – comprising improvements largely within the existing M60 corridor.

- 1.3.6 The Northern Corridor, Outer Orbital Corridor and In-Corridor packages also had associated elements comprising localised highway improvements, public transport improvements and other measures including capacity upgrades and park and ride facilities.
- 1.3.7 All four packages were developed to potentially deliver a range of transformational benefits both within the study area and across the wider north-west region.
- 1.3.8 The Stakeholder Reference Group helped to shape and inform the study and its outcomes.

1.4 Key Findings

- 1.4.1 This report presents a large amount of analysis and a number of findings. These can broadly be summarised as follows, together they form the strategic case for considering further development work to identify the optimal benefits;

A	Greater Manchester is a major driver of economic activity in the north but this analysis suggests that its future development could be constrained by the transport network in the Manchester North-West Quadrant. The Manchester North-West Quadrant is also a key part of the M62 Trans-Pennine corridor, therefore the Manchester North-West Quadrant impacts local, regional, national and international transport movements.
B	The Northern, Outer Orbital and In-corridor packages show significant improvements in journey time and resilience within the study area typical journey time savings for strategic long distance traffic are up to 96 hours a year per person and local M60 traffic are up to 40 hours a year per person.
C	The PTMax package should not be considered further as it does not satisfy all the objectives and offers relatively small benefits in comparison to the other packages. Whilst addressing a number of the intervention specific objectives, the PTMax package does not sufficiently address the existing problems that were identified in the study evidence base. The PTMax package does not have benefits for west to east strategic users and shows little benefits for local M60 users. For these reasons it is recommended that PTMax is not considered a viable solution for this study. The interventions proposed as part of PTMax may solve other challenges and therefore be worthy of consideration under different circumstances. It should be noted that the other packages include significant interventions in terms of public transport.
D	There is potential for all of the schemes to be designed to maximise the scope for environmental enhancement and deliver wider environmental objectives. There will also be a need for comprehensive mitigation packages to be developed to reduce the potential scheme impacts. This will need to be considered in further detail for each scheme at the next stage of the project.
E	The study recommends that the Northern Corridor, Outer Orbital Corridor and In-Corridor packages are further refined to identify the interventions which offer high benefits at a lower cost to develop a package of interventions that satisfy the intervention specific objectives and maximise value for money.

F	From the analysis to date that has been carried out on the packages it should be noted that the Northern Corridor, Outer Orbital Corridor and In-Corridor packages offer benefits not only to the study area, but also to the north of England.
G	The conclusions stated within this report strongly suggest that further work to develop an optimal performing package and constituent interventions should be progressed. The analysis to date has shown that significant benefits could be achieved through major interventions such as those proposed meeting the aims of the study and helping meet the aspirations of the Northern Powerhouse.

2. Study background and objectives

- 2.1.1 As part of its Road Investment Strategy (RIS): Investment Plan, December 2014¹⁰ the Department for Transport (DfT) announced it was commissioning a series of six new strategic studies to address the biggest challenges facing the road network in England.
- 2.1.2 Three studies were announced for the north of England, the Northern Trans-Pennine study, the Trans-Pennine Tunnel Study and this, the Manchester North-West Quadrant strategic study. The study routes are shown in Figure 1 overleaf.
- 2.1.3 The study has explored multimodal options for improving the transport network around Manchester's North-West Quadrant between junctions 8 and 18 of the M60.
- 2.1.4 The study objectives were to assess and form a preliminary strategic case for improving the transport network in the region; define the intervention specific objectives that the study should seek to address; identify a long list of interventions which could meet the intervention specific objectives and undertake a high level assessment of the likely benefits and impacts of the different interventions; short list the better performing interventions; and prepare a Strategic Outline Business Case for the better performing interventions for consideration in the development of a future RIS.
- 2.1.5 The aims of the study were to examine interventions to improve the transport network across all modes, develop conclusions on the benefits and impacts of these options, ensure no deterioration in local air quality, and form a judgement on the wider economic costs and benefits in order to raise growth across the north.
- 2.1.6 The motorway network within Manchester's North-West Quadrant (comprising sections of the M62, M60, M602, M61 and M66) forms part of a key west to east motorway connection across the country. It contains some of the most congested sections of road outside of the M25 with some sections within the study area regularly experiencing speeds of less than 15mph¹¹.
- 2.1.7 The M60 plays a vital part in the life of Manchester and is a critical part of the north-west transport network in England. Out of the top 25 motorway links in terms of traffic flow, five of these are located within the study area¹². The mix of local traffic and strategic traffic, coupled with the design of the road, further exacerbates congestion and environmental problems.
- 2.1.8 The M60 is no further than 6 miles from Manchester City Centre, as close as the North Circular Road is to central London. It provides Manchester and surrounding areas with an orbital, strategic route, as the M25 does for London, but also provides a more local distribution function similar to the North Circular Road in London. The Manchester North-West Quadrant also provides strategic east-west connectivity from Liverpool and Manchester across the Pennines to Leeds, Sheffield and the north-east.

¹⁰ Department for Transport (2015) Road Investment Strategy: post-2020

¹¹ Analysis of Highways England's TRADS data for May 2014

¹² DfT count database for motorway network in the UK for 2014

- 2.1.9 The M60 provides a key transport component linking the labour market to employment opportunities; provides business to business connectivity for both people and freight, particularly those operating in regions such as Liverpool, Manchester and Leeds; provides international connectivity to Manchester Airport and between ports in Liverpool, the Humber and the north-east; and provides access to major leisure destinations such as international sporting venues and the Trafford Centre (shopping and leisure) and its environs. These multiple functions mean that the performance of the motorway network in the Manchester North-West Quadrant has a major impact on the economic performance of Greater Manchester and the wider north.
- 2.1.10 Greater Manchester has an Air Quality Management Area (AQMA) and this covers the whole of the M60 in the study area. Air pollution is a longstanding problem in the study area with much of the problem being caused by road transport. There are approximately forty Noise Important Areas (NIAs) within the study area, many of which are located at junctions around the Manchester North-West Quadrant and road transport is a large contributor to these noise problems.



Figure 1 - North of England Strategic Studies

- 2.1.11 Northern Transport Strategy¹³ published in March 2015, committed to develop schemes to dramatically improve east-west connectivity in the north and supports the aspirations of the study. The Northern Powerhouse Independent Economic Review¹⁴ published in June 2016 outlined that transformational change in economic growth is highly unlikely without a corresponding step change in infrastructure and skills. It considers that transformational improvements to the north's transport connectivity are critical to achieving a transformational economic future. The emerging TfGM 2040 strategy¹⁵, currently under consultation, sets out a vision for transportation in the city region over the next 25 years and has similar aspirations in terms of improving the transportation network to facilitate growth through connectivity. This study is informed by these strategies and is also informed by the Northern Trans-Pennine and Trans-Pennine Tunnel Studies.
- 2.1.12 The study has considered previous transport studies, local transport and spatial strategies, planned growth and committed transport schemes. It has reviewed the current performance and constraints of the existing multimodal transport network, examined options for improving the transport network within and around the Manchester North-West Quadrant and considered a range of options across all modes. This approach was developed to help ensure that motorway, local road network and public transport options can all play their part in enabling transformational growth, improving network performance, improving connectivity and maximising opportunities to improve the environment.
- 2.1.13 The Initial Report¹⁶ set out the case for investment in improvements to the transport network in the Manchester North-West Quadrant which could deliver economic and strategic benefits to the region, its key issues are listed in Table 2 below.

¹³ Transport for the North (2015) The Northern Powerhouse: One Agenda, One Economy, One North

¹⁴ Transport for the North (2016) Northern Powerhouse Independent Economic Review

¹⁵ Transport for Greater Manchester (2016) Transport Strategy 2040 (consultation draft July 2016)

¹⁶ Manchester North-West Quadrant Study (2016) Initial Report

Key Issue	Supporting Evidence
Severe Congestion	The motorway network within the study area has issues with traffic volume, layout and topography and suffers from severe congestion with the majority of sections within the worst 10% nationally for vehicle hours delay . High traffic volumes are observed throughout the day and the week.
Slow Moving Traffic	The high volume of freight vehicles and the road layout and topography means that vehicles can be slow moving, impacting overall network performance.
Radial Public Transport	The existing public transport network is radial in nature so there are significant challenges for it to contribute to the reduction of traffic using the motorway network within the study area due to the disparate origins and destinations of commuters.
Constrained Economic Performance	In the context of achieving Northern Powerhouse aspirations, Greater Manchester will be a major driver of economic activity, however, future performance will be constrained by its transport network, of which the motorway network within the study area is a key element.
Air and Noise Pollution	The environmental considerations – particularly air quality and noise – are significant and have historically presented a constraint to highway improvements in the study area. There are also a number of environmental constraints in the study that will need to be considered as the study evolves.
Poor Safety	The motorways within the study area are in the 20% worst performing sections of the whole of the motorway network. ¹⁷
Continued Network Deterioration	Based on the forecasting work undertaken previously, it is evident that operating conditions will continue to deteriorate on the majority of the motorway network despite a significant number of planned road and public transport improvements.
If the economic aspirations of the Northern Powerhouse are to be achieved a number of radical transport interventions will be required, particularly on the motorway network.	

Table 2 - Key Issues

¹⁷ South Pennines Route Based Strategy Evidence Report, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/365291/South_Pennines.pdf, Highways Agency, 2014

3. The Strategic Case

3.1 Overview

- 3.1.1 The north of England is home to over 15 million people¹⁹ which is three times the population of Norway¹⁸. This is nearly a quarter of the UK's population – and generates £290bn in economic output¹⁹, but only accounting for one fifth of the national GDP.
- 3.1.2 Individually, the economies of the city regions of the north are strong but, despite this, the north continues to lag behind London and the South East in terms of its economic performance.
- 3.1.3 The One North report²⁰ commissioned by the City Regions of Leeds, Liverpool, Manchester, Newcastle and Sheffield presents a strategic proposition for transport in the north that aims to transform connectivity for economic growth through agglomeration of markets, improving access to skilled labour and stimulating business investment. The case for action, set out in the Highways Plan within the One North report, recognises that the number, capacity and reliability of east-west road connections is a constraint on the economy and acknowledges that there are areas of severe congestion on the existing network, together with a high level of demand for freight from northern ports.
- 3.1.4 The Northern Transport Strategy report²¹ (The Northern Powerhouse: One Agenda, One Economy, One North) recognises that the north of England has a number of medium-sized cities that perform well individually, but lack the transport connectivity needed to drive improved output and employment. This is essential to creating a single and well-connected economy in the north, which is a key objective of the Northern Powerhouse.
- 3.1.5 The Northern Powerhouse Independent Economic Review (IER)²² identifies a number of reasons that transport connectivity between cities is important for the north's growth prospects, these are:
- Access to well-paid jobs encourages investment in skills;
 - Locations that are well connected to global markets, and have access to a well-qualified workforce, attract a higher level of foreign investment; and
 - Firms are more likely to specialise and innovate in areas with deep and extensive labour markets.

¹⁸ www.tradingeconomics.com

¹⁹ Sub-regional GVA, ONS, 2013

²⁰ Leeds, Liverpool, Manchester, Newcastle and Sheffield city regions, One North: A Proposition for an Interconnected North, July 2014

²¹ Transport for the North (2015) The Northern Powerhouse: One Agenda, One Economy, One North

3.1.6 The IER demonstrates the potential for a transformational uplift in economic growth where growth in the north increases that of the UK Average (including London). Key findings showed:

- If the north is supported by the right level of investment, there could be a step change in growth of an additional £97bn Gross Value Added (GVA) and 1.56m additional jobs, of which 850,000 would otherwise not exist.
- The north has experienced consistently 15%-25% less per capita spending on public transport than the South-East, compounded over time.
- If the north's economy grew as quickly as the UK average to 2030 instead of at the slower rate experienced in the past two decades, its economic output would be £37bn higher in real terms
- GVA per capita has consistently been some 25% below the rest of England average, and 10-15% below the average when London is excluded.
- There is significant land capacity with both house prices and commercial rateable values significantly lower than those in London
- The north is home to international-class assets, expertise, research and businesses that are genuinely distinctive for the north, are highly productive and can compete at national and international scales. The IER identifies four Pan-Northern 'Prime' Capabilities (Advanced Manufacturing, Energy, Health Innovation and Digital Sectors) plus three key enabling sectors (Financial and Professional Services, Logistics and Education).

3.2 Current Problems

3.2.1 High usage of the motorway network within the study area, combined with challenging layouts and topography characterised by close proximity of junctions and sections of narrow lanes and steep gradients, results in slow speeds. This is particularly the case for the large volumes of freight which uses the motorway network in the study area for through M62 Trans-Pennine movements, and impacts on other road users on trips in and around Greater Manchester.

3.2.2 These competing pan-northern, city region and local functions mean that the motorway network in the Manchester North-West Quadrant is heavily used throughout the day frequently operating above capacity. Traffic using the network for leisure and sporting event purposes can cause congestion and low speeds outside traditional peak periods.

3.2.3 The merging and diverging of traffic from the M62, M602, M61 and M66, which feeds into the M60 in the Manchester North-West Quadrant, leads to considerable congestion at intersections. This has the knock-on effect of impacting through traffic from Liverpool and Warrington and surrounding areas in the west, accessing destinations towards Rochdale, Oldham and Leeds and beyond in the east. This congestion leads to:

- journey time unreliability – 15 of the worst performing 100 motorway sections for the percentage of journeys completed on time are within the study area²³

²³ Reliability of journey on Highways Agency Roads, England: Jul to Sep 2014, <https://www.gov.uk/government/statistics/reliability-of-journeys-on-highways-agency-roads-england-jul-to-sep-2014> , DfT, November

- **high journey times** – with journey times on some sections of the motorway network within the study area taking up to 4.5 times longer compared to a mile a minute network;
- **low speeds** – with speeds dropping below 15mph in the peak periods and below 30mph off peak²⁴;
- **poor safety record** – the SRN within the study area is almost entirely within the top 20% of the worst performing in terms of total casualties per billion vehicle miles .
- **poorer air quality** – At speeds below 25mph, emissions start to increase rapidly as speed continues to decrease .

- 3.2.4 The existing poor performance of the motorway network in the Manchester North-West Quadrant means that the majority of the sections of M60 between junctions 8 and 18 fall within the worst 10% of national motorway links in terms of journey time reliability . Furthermore, when incidents occur there are few viable alternative routes for traffic to use as the alternative routes already experience high levels of congestion and consequently the network takes a long time to recover from issues resulting in prolonged congestion, lost productivity and environmental dis-benefits.
- 3.2.5 On the motorway network in the study area, there are a number of features which exacerbate the situation by contributing (both individually and collectively) to poor reliability, low speeds and long delays and poor safety. These are shown in Figure 2 below.
- 3.2.6 The rail routes from Bolton, Liverpool and Leeds are some of the most crowded in the UK . Whilst considerable investment has been made in public transport on rail, Metrolink and bus in the Greater Manchester area, it is challenging for these generally radial corridors and services to provide an attractive alternative for many of the orbital, longer distance and disparate movements being made on the motorway network within the study area. Based on existing travel demands and distribution patterns, there is only limited scope for public transport to attract further trips from the road network.

24 Analysis of Highways England's TRADS data for May 2014

25 South Pennines Route Based Strategy Evidence Report, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/365291/South_Pennines.pdf, Highways Agency, 2014

26 Interim Advice Note 185/15, Highways England, 2015

27 Manchester North-West Quadrant Study (2016) Initial Report

28 Analysis of Dft, National Statistics, <https://www.gov.uk/government/statistics/rail-passenger-numbers-and-crowding-on-weekdays-in-major-cities-in-england-and-wales-2014>

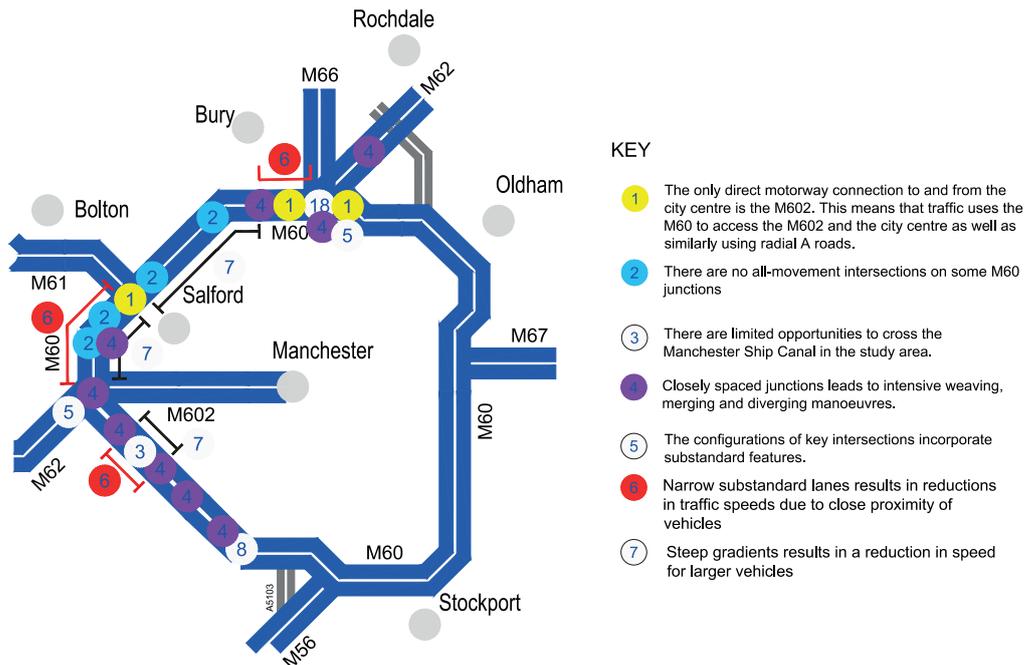


Figure 2 - Existing Motorway Network Alignment & Junction Issues

3.3 Future Development Considerations

- 3.3.1 Considering the future, the developing Greater Manchester Spatial Framework (GMSF) will produce a plan to manage the supply of land for jobs and new homes across Greater Manchester. In addition, there are a number of other committed planned developments within and adjacent to the study area which will have a major impact on the economic potential of Greater Manchester and the surrounding region.
- 3.3.2 These development proposals will create additional residential, employment and distribution trips and will further impact the motorway network and the local roads within the Manchester North-West Quadrant and so adding to the existing problems. TfGM’s 2040 Transport Strategy²⁹ recognises Greater Manchester’s ambitious growth plans over the coming 25 years and is forecasting an additional 350,000 jobs and population increasing within Greater Manchester from 1.25 million in 2011 to more than 1.6 million in 2040. This forecast growth will require at least another 200,000 additional homes and add more than 800,000 trips to the transport network every day.
- 3.3.3 Even taking account of planned improvements both to the road network and to public transport, the anticipated impact of the forecast traffic growth over the next 20 years is that the motorway network within the study area will experience further worsening of the identified problems which will limit economic growth potential of future developments.
- 3.3.4 As set out earlier the M60 within the study area is already operating at capacity and experiences significant operational issues. Committed and planned developments will exacerbate this and could constraint further development aspirations and opportunities as well as impacting potential inward investment to the area.

²⁹ Transport for Greater Manchester (2016) Transport Strategy 2040 (consultation draft July 2016)



Figure 3 - Committed and planned developments

3.4 Environmental Considerations

- 3.4.1 Road transport is a major contributor to air pollution in the study area. Air quality within close proximity to the M60 in the study area is poor with measured concentrations well above the Air Quality Strategy (AQS) Objectives for the key traffic related pollutant nitrogen dioxide (NO₂). The M60 falls within the Greater Manchester Air Quality Management Area which demonstrates the significance of the air quality issues in this area.
- 3.4.2 The existing noise climate within the study area is dominated by the busy M60 and surrounding roads. Noise issues have been identified as a key issue to the population. There are approximately forty Noise Important Areas (NIAs) in the study area.
- 3.4.3 Air quality and noise issues historically have proved a barrier to the development of highway schemes along the M60, this has resulted in schemes either not being progressed or their scope significantly altered leading to these schemes not realising their true potential. This study presents the opportunity to further consider and potentially address transport's contributions to air quality and noise problems within the Manchester North-West Quadrant.

- 3.4.4 There are a number of highly valuable nature conservation sites in the study area including sites designated at a European level, nationally important sites and features including Sites of Special Scientific Interest and areas of ancient woodland as well as locally important sites. The potential effects of options on nature conservation will need to be assessed and appropriately mitigated as the study progresses
- 3.4.5 A number of heritage assets are contained within the study area of varying importance including Scheduled Monuments, Listed Buildings, Conservation Areas and Registered Historic Parks and Gardens. There is also a highly varied landscape comprising a range of features and any options will need to be considered in terms of their effects on the landscape and also the impacts on visual amenity
- 3.4.6 There are a number of water features in the study area including the Rivers Irwell and Glaze and their tributaries, a number of canals and the underlying aquifers. All the options have the potential to impact these features through effects such as changes to flood risk, drainage and water quality.

3.5 Barriers to economic growth

- 3.5.1 Transport and transport related problems in Manchester's North-West Quadrant already present barriers to economic growth as described in this report and will only worsen over the coming years. These barriers arise from a lack of transport capacity within Greater Manchester itself, a relative lack of connectivity to other cities in the north and access to international ports for passenger and freight traffic. These translate into a loss of economic output through the following:
- **Labour Market Connectivity** – The existing transport constraints increase the costs associated with commuting and will inhibit underlying job growth.
 - **Business to Business Connectivity** – The north suffers from limited transport connectivity restricting the frequency and efficiency of business. Across the study area there are both physical (such as highway connectivity, journey times and reliability) and economic barriers restricting trade and business interactions thus inhibiting economic growth potential.
 - **International Connectivity** – Key international hubs within the north, such as Manchester Airport and Port of Liverpool are planning major investment which in turn would impact the transport network. These facilities rely on the Manchester North-West Quadrant and if the problems in the study are will inhibit their ability to function effectively if problems are not addressed.
 - **Freight Connectivity** – Freight and logistics has a key role to play in supporting the north's economic vision and important developments include new warehousing facilities and business parks will drive this. The north of England handles around a third of UK road, rail, distribution centre and port activity against a population that only represents 24% of the UK total³⁰. The existing connectivity issues currently affect freight and logistics and will be aggravated by major investments in the region.

3.6 The Case for Change

- 3.6.1 The case for change is therefore based on the interrelated transportation and economic needs of the north. Importantly, if the capacity constraints on the motorway network in the Greater Manchester area are not addressed:
- growth across the region will be significantly constrained;
 - the aspirations of the Northern Powerhouse will be significantly harder to achieve;
 - existing congestion will get even worse and extend onto other parts of the network;
 - journey times will be more unreliable;
 - air quality and noise will worsen;
 - performance targets for the motorway network will not be met.
- 3.6.2 Greater Manchester is a major driver of economic activity in the north but this analysis suggests that its future development could be constrained by the transport network in the Manchester North-West Quadrant. The Manchester North-West Quadrant is also a key part of the M62 Trans-Pennine corridor, therefore the Manchester North-West Quadrant impacts local, regional, national and international transport movements.
- 3.6.3 In the context of the growing economic disparity between the north and South of England, the case for strengthening the economic connections and infrastructure between the north's great towns and cities has never been stronger.

4. Study Approach

4.1 Introduction

- 4.1.1 As part of its approach this study has considered work carried out by previous studies in the area to develop a strategic case for investment across all modes to help make sure that the motorway, local road and public transport networks all play their part in underpinning the vision for transforming and rebalancing the national economy and establishing the north as a global powerhouse.
- 4.1.2 The study has considered the interventions set out DfT's RIS, TfGM's proposed investments and planned changes to the rail network facilitated by Network Rail.
- 4.1.3 The benefits and impacts of any interventions have been assessed in terms of congestion-relief, reliability, safety and environmental outcomes, and have considered connectivity at local, regional, national and international levels.
- 4.1.4 A key consideration in the appraisal was the value of the wider economics benefits, in particular their impacts on the local labour market and productivity, and the economic geography of the north. The approach to the study has been developed to understand to what extent each of the interventions acts as an enabler to growth in the north and to identify which areas and groups benefit.

4.2 Stakeholder Engagement

- 4.2.1 The study team engaged with a range of stakeholders throughout the process of the study. A Stakeholder Reference Group (SRG) was established to ensure that stakeholder views were understood and properly considered throughout the study process. Stakeholders were invited from a range of organisations as detailed in Appendix A. The SRG met on three occasions during the study to understand and comment on the evidence; agree proposed potential interventions and consider the themes chosen for the assessment.
- 4.2.2 Individual consultations also took place with a number of organisations. also listed in Appendix A. These meetings informed the study evidence base in relation to the specific concerns and requirements of each of the organisations.
- 4.2.3 The initial report and supporting materials have been published on the gov.uk website.

4.3 Intervention Specific Objectives

- 4.3.1 A key task of the study was the identification of the intervention specific objectives to be used during the identification and assessment of options. These intervention specific objectives were informed by the evidence base gathered and were developed by the wider study team. They were then reviewed and agreed by Project Board and the Stakeholder Reference Group. The intervention specific objectives are shown in Table 3.

Intervention Specific Objectives	Category
To facilitate and support the delivery of the Northern Powerhouse by ensuring the Manchester North-West Quadrant enables transformational growth in the employment, housing and economic output of the north	Growth
To improve journey times, reliability, safety and resilience across the study area	Network Performance
To improve connectivity for all users so they are able to access education, employment, business and leisure opportunities	Connectivity
Minimise adverse impacts on the environment and to maximise opportunities for a net improvement to the environment particularly air quality and noise across the study area	Environment

Table 3 - Intervention Specific Objectives

4.4 Development of Interventions

- 4.4.1 Given the study requirement for the M60 to play its part in establishing the north as a global powerhouse, it was imperative that consideration was given to interventions more transformational than those considered as part of previous studies.
- 4.4.2 The evidence base informed the generation of interventions which were developed by the study team and refined based on stakeholder feedback to encompass a wide range of possibilities that spanned scale, transport modes and geography.
- 4.4.3 Interventions were sifted using the intervention specific objectives and the assessment described in the following paragraphs complied with the DfT's TAG process³¹.
- 4.4.4 The large number of interventions posed a challenge to develop a meaningful framework for assessing and presenting the study outcomes. To overcome this, a spatial concept, influenced by the spatial approach contained in TfGM's 2040 Vision³², was developed and presented to stakeholders at the Stakeholder Reference Group.
- 4.4.5 Some policy and future technology interventions that were considered beyond the existing national and regional policy framework and have not been taken forward.
- 4.4.6 Transport interventions were grouped into four orbital themes and three sectors as shown in Figure 4 below.

31 DfT (2014) Transport Analysis Guidance

32 Greater Manchester 2040 Our Vision, TfGM, <http://www.tfgm.com/2040/Pages/strategy/index.html>

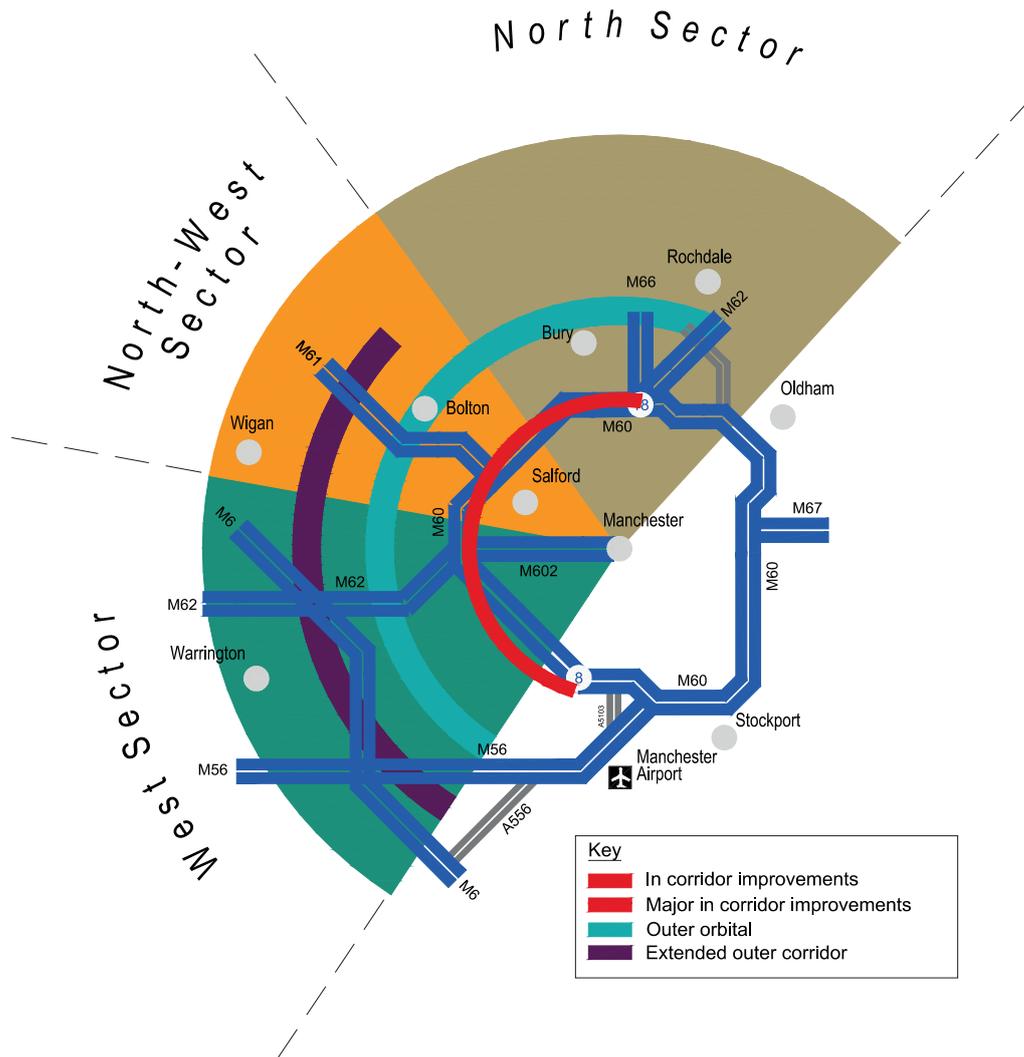


Figure 4 – Spatial Concept

- 4.4.7 Based on evidence collected during the earlier stages of the study it was considered whether public transport could solely deliver the intervention specific objectives set for the study without the need for further highways interventions. A theme named PTMax was developed that considered all feasible public transport interventions that could deliver the intervention specific objectives this forms part of a regional strategy with an overall aim of producing a fully integrated orbital public transport system.
- 4.4.8 The PTMax theme is shown in Figure 5 and includes an Inner orbital Metrolink system (red) with interchanges with Metrolink (yellow) and an Outer orbital Metrolink system (thick red) with park and ride interchanges with the motorway network (pink) and connections to the airport. The complete PTMax theme broadly forms two concentric rings around Manchester.

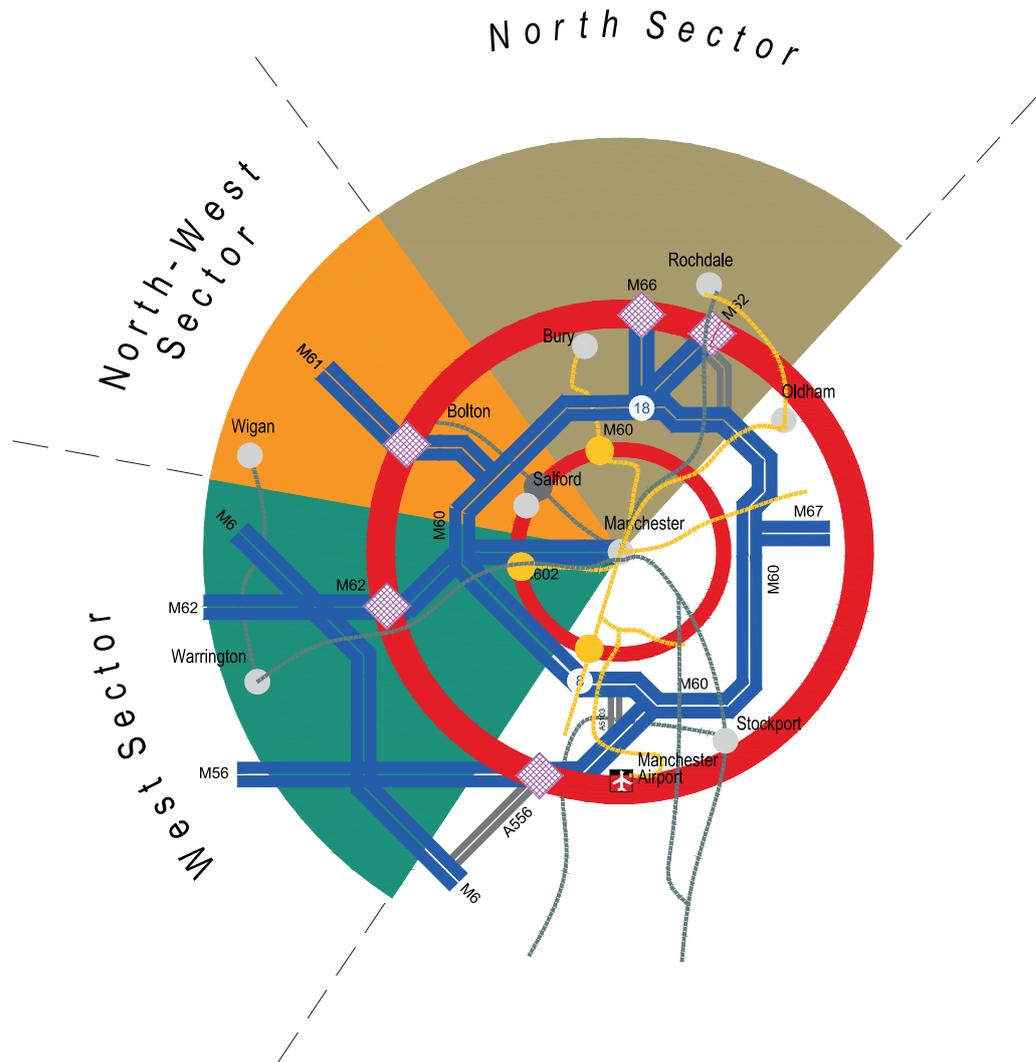


Figure 5 – PTMax Theme

4.4.9 Each theme was then qualitatively assessed and those themes that satisfied the intervention specific objectives as well as contributing towards resolving the issues within the study area were taken forward into the package development stage.

4.5 Development of the Packages

4.5.1 Packages of interventions were subsequently developed based on the sifted interventions and their thematic groupings while recognising the intervention specific objectives. Packages were developed to provide distinctly different approaches to tackling the existing and future challenges within the study area as well as acknowledging the wider aspirations of the Northern Powerhouse. Three broad highways led packages were developed as described below (each of which includes complementary public transport measures) together with a PTMax package.

4.6 Northern Corridor Package

- 4.6.1 The Northern Corridor package is show in Figure 6 below.
- 4.6.2 It includes a new link from the M58/M6 junction to the west of Wigan to the M61 in the vicinity of junction 5. The corridor then utilises the M61 south towards junction 2 before traversing a new link to provide a direct link to the M62 connecting east of M60 junction 18.
- 4.6.3 The route could provide an alternative east-west route from the Port of Liverpool to Yorkshire, the Humber ports and the north-east and provide relief for the Manchester North-West Quadrant by displacing longer distance through trips (particularly for HGVs) onto this new route as well as for those trips from the M61 to M62 east of the study area.
- 4.6.4 More localised improvements to the M60 from junctions 12 to 14 could improve conditions for the remaining traffic in the study area and upgrading the A580 to expressway standards could provide further resilience and capacity for east-west movements.
- 4.6.5 For public transport this package could see increased capacity on the Chat Moss, Bolton and Atherton rail lines with appropriately sited park and ride facilities as well as cross city bus enhancements.
- 4.6.6 Within the package, complementary improvements provide other highway (beyond the motorway network) and public transport improvements to provide alternatives to traversing the most congested parts of the study area as well as enhancing connectivity with orbital connections.

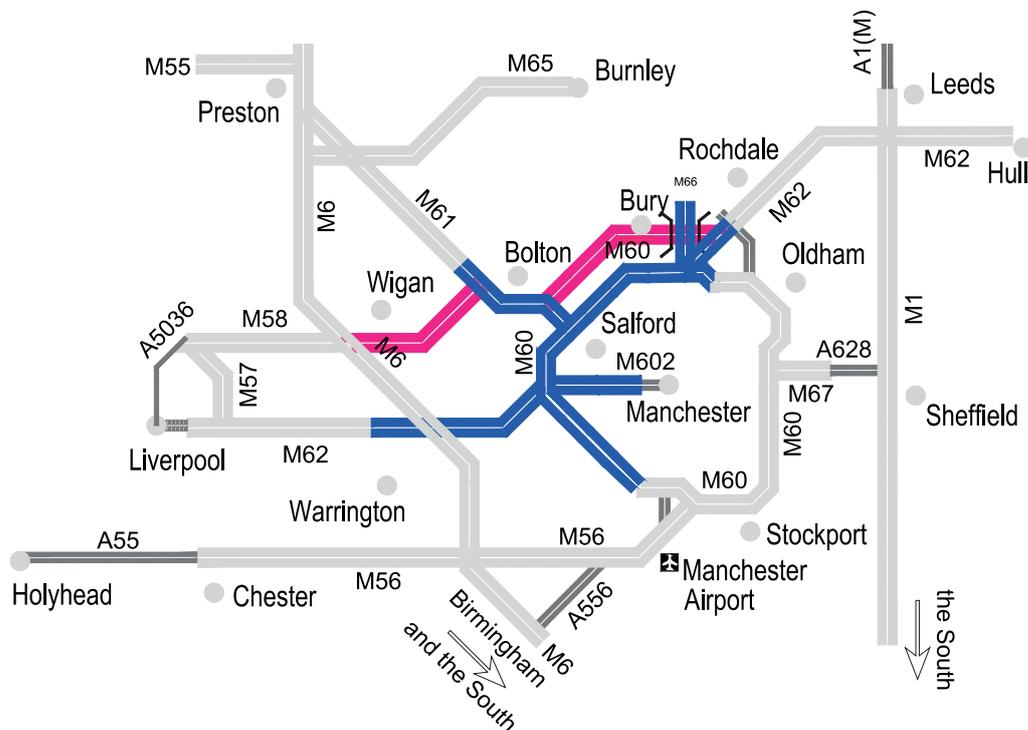


Figure 6 – Northern Corridor Package

4.6.7 Details of how this package could deliver the intervention specific objectives for the study are listed in Table 4 below.

Objective	How this package delivers the objective
Growth	The Northern Corridor Package could provide connectivity to key centres of development, employment and future housing in particular capitalising on the developments at the port of Liverpool which will help to deliver transformational economic growth.
Network Performance	The Northern Corridor Package could provide additional resilience for the motorway and local road networks due to the inclusion of new links which would provide alternative routes and additional capacity. Improvements to the core J12 to J14 section of the Manchester North-West Quadrant would improve network performance.
Connectivity	The Northern Corridor Package could enhance Northern Powerhouse connectivity, significantly improving connectivity to the expanding Port of Liverpool and improving linkages to areas east of the Pennines. Additionally, improving regional connectivity to Port Salford and Trafford Park would help to maximise the growth opportunities these developments offer.
Environment	Provide a step change to public transport provision including park & ride and improved connectivity. This could lead to reduced car usage through the study area helping to relieve existing air quality and noise problems. There is scope to look for opportunities to deliver wider environmental objectives through the package.

Table 4 - Northern Corridor Package delivery of intervention specific objectives

4.7 Outer Orbital Corridor Package

4.7.1 The Outer Orbital Corridor Package is shown in Figure 7 below.

4.7.2 The Outer Orbital Corridor package proposes a new orbital strategic corridor external to the existing M60 linking the M62 west of junction 12 to the M61 to join the M62 east of junction 18 together with an extension of the corridor from the M62 west of junction 12 in a southerly direction to the M56 at its junction with the A556 providing approximately half of a new orbital motorway around the city region as well as a new strategic link from the M6 in Cheshire to Yorkshire.

4.7.3 This corridor could largely remove long distance through movements from the existing M60 within the study area and provide the catalyst for unlocking potential development sites as part of a longer term and significant expansion of the city region.

4.7.4 More localised improvements to the M60 from junctions 12 to 14 could improve conditions for the remaining traffic in the study area.

- 4.7.5 Once complete the removal of through traffic from the existing M60 in the Manchester North-West Quadrant might allow the reassignment of highway capacity for higher occupancy vehicles. In addition this package could see increased capacity on the Chat Moss, Bolton and Atherton lines with appropriately sited park and ride facilities as well as cross city bus enhancements.
- 4.7.6 Within the package, complementary improvements provide other highway (beyond the motorway network) and public transport improvements to the Manchester North-West Quadrant and provide alternatives to traversing the most congested parts of the study area as well as enhancing connectivity with orbital connections.

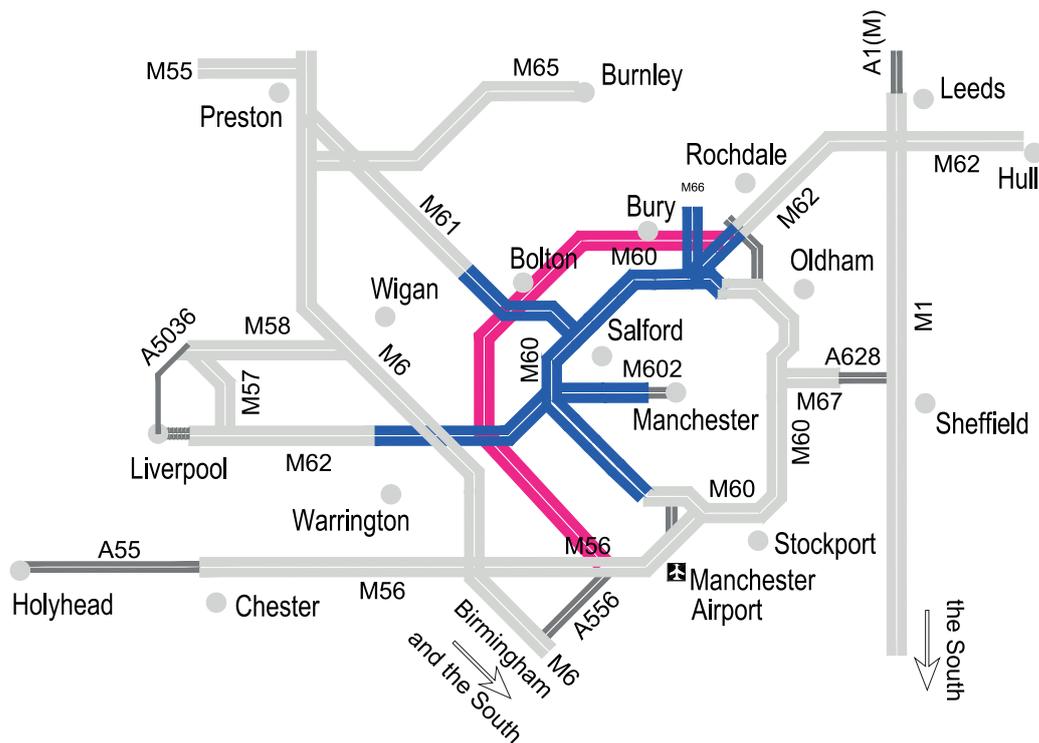


Figure 7 – Outer Orbital Corridor Package

4.7.7 Details of how this package would deliver the intervention specific objectives for the study are listed in Table 5 below.

Objective	How this package delivers the objective
Growth	The Outer Orbital Corridor Package could provide additional strategic infrastructure for significant expansion of Manchester City region to the west and north thereby encouraging growth in these areas.
Network Performance	The Outer Orbital Corridor Package could significantly enhance network performance by removing through traffic from the Manchester North-West Quadrant. It would allow the existing M60 to perform a local distributor function. This package would also provide additional network resilience.
Connectivity	The Outer Orbital Corridor Package could significantly enhance Northern Powerhouse connectivity within the city region by providing new direct connections across the north as a whole.
Environment	Provide short term, quick win improvements to specific locations on the M60 whilst also providing longer term public transport improvements to encourage modal shift within the study area thereby relieving existing air quality and noise problems. There is scope to look for opportunities to deliver wider environmental objectives through the package.

4.8 PTMax package

4.8.1 The PTMax Package is shown in Figure 8 below.

4.8.2 The PTMax package comprises an integrated package of public transport measures designed to tackle the problems within the study area but avoiding further highways interventions.

4.8.3 The concept for PTMax was based on an inner and outer orbital high quality public transport alignments (denoted in yellow), with extensive opportunity for interchange with other public transport modes; rail capacity enhancements on the radial corridors (denoted in pink); and park and ride at strategic locations.

4.8.4 The new orbital routes could provide an alternative to orbital car movements in the Manchester North-West Quadrant as part of an ambitious public transport network around the whole of Manchester.

4.8.5 It should be noted that these interventions are beyond those presently envisaged in TfGM and Network Rail infrastructure programmes or train operator franchise commitments, but have been developed to test whether the intervention specific objectives can be met with a public transport led package without major highway intervention.

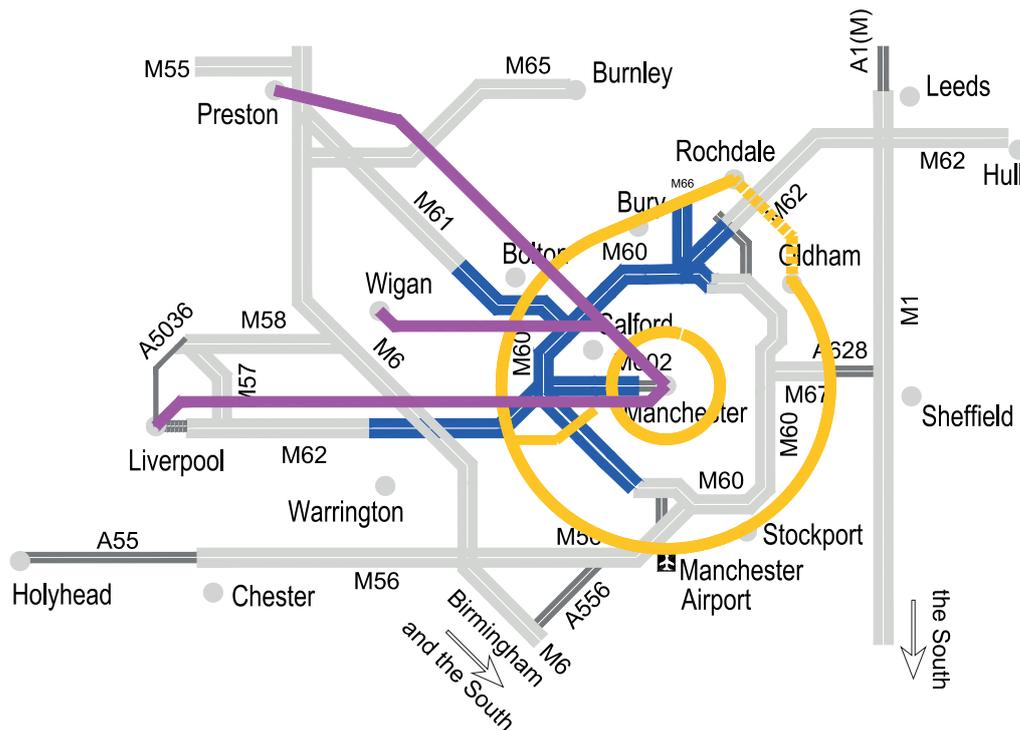


Figure 8 - PTMax Package

4.8.6 Details of how this package would deliver the intervention specific objectives for the study are listed in Table 6 below.

Objective	How this package delivers the objective
Growth	Increase connectivity to employment and business opportunities throughout Greater Manchester.
Network Performance	Provide significant additional public transport capacity which could improve network performance for both public transport and the road network.
Connectivity	Provide significantly improved public transport connectivity particularly for orbital movements.
Environment	Encourage modal shift from car to public transport which could help improve the environmental situation in the Manchester North-West Quadrant.

Table 6 - PTMax Package delivery of intervention specific objectives

4.9 In-Corridor Package

4.9.1 The In-Corridor Package is shown in Figure 9 below.

4.9.2 The In-Corridor Package comprises a programme of improvements to significantly enhance the capacity, performance and resilience of the M60 within the study area.

4.9.3 Improvements could be largely within the existing corridor and firstly comprise junction improvements whilst more significant enhancements of new through capacity from the M62 west of junction 12 to the M61 and onto the M62 east of junction 18 is created.

5. Likely Benefits, Opportunities and Costs

- 5.1.1 This section outlines the likely benefits, opportunities and costs of the packages. An assessment of the packages was carried out on the direct user benefits, the wider economic impacts and the environmental impacts. The packages were assessed using standard DfT Transport Appraisal Guidance (TAG) and is consistent with appraisal of Highways England's Major Projects.
- 5.1.2 Journey times and speeds were measured for strategic long distance users between M62 junction 19 (Heywood / Middleton) and M62 junction 9 (Warrington), and for local M60 users between M60 junction 18 (Simister) and M60 junction 12 (Eccles). These were chosen as the first acts as a proxy for the potential savings for users travelling through the study area (east-west connectivity) and the second for local users using the M60 for more localised trips.

5.2 Northern Corridor Package

Intervention Specific Objective	Likely Benefits & Opportunities
Growth	<p>Economic benefits delivered by the Northern Corridor package are derived from businesses improving their productivity through the ability to trade more effectively with each other and accessing a larger labour. There are also some benefits to the economy as a result of lower transport costs. The economic benefits from this package are located throughout Greater Manchester and across the north which will help to support the delivery of the Northern Powerhouse. The initial assessment indicates that the Northern Corridor Package provides the third greatest economic benefits compared to the other packages.</p>
Network Performance	<p>Journey Time The Northern Corridor Package delivers over 11.9 million hours a year in time savings to both businesses and commuters. These quicker journeys are experienced by users on long distance strategic movements (such as between Liverpool and Leeds) as well as local users within the study area (such as between Wigan and Bolton). There are also additional benefits to other roads users such as those travelling between Manchester and Stockport demonstrating the far reaching consequences of resolving the issues in the Manchester North-West Quadrant. The initial assessment indicates that the Northern Corridor Package provides the second greatest benefits for users.</p> <p>Strategic long distance users:</p> <ul style="list-style-type: none"> ■ Quicker journeys of up to 5 minutes which saves 40 hours a year per person . <p>Local M60 users:</p> <ul style="list-style-type: none"> ■ Quicker journeys of up to 3 minutes which saves 24 hours a year per person. <p>Resilience Additional resilience to strategic east-west movements is created by offering an alternative route to current users of the M62. This package also offers some resilience benefits for local M60 users as recovery time after incidents in the Manchester North-West Quadrant should be shortened due to some users rerouting leading to shorter queues for local M60 users.</p> <p>Safety A reduction in traffic on the existing M62 and M60 with some traffic being attracted to the Northern Corridor route could be beneficial in terms of safety. This could reduce the likelihood of incidents occurring for traffic travelling on the M60 within the Manchester North-West Quadrant.</p>

Intervention Specific Objective	Likely Benefits & Opportunities
Connectivity	<ul style="list-style-type: none"> ■ The new strategic east-west link offered by the Northern Corridor package provides improved connectivity. This benefits businesses, in particular freight operators who will be able to access the northern ports (such as Liverpool and Hull) more effectively. This corridor also offers greater employment opportunities and connects leisure outlets. ■ The connectivity improvements are mainly focussed across the north of Greater Manchester including Wigan, Bolton and Bury. ■ A small number of areas suffer from connectivity dis-benefits; probably due to the reconfiguration of junctions 13 and 14 on the M60 and the resulting impact on local traffic.
Environment	<ul style="list-style-type: none"> ■ This package has the potential to impact designated environmental features including ecological sites, cultural heritage features, water resources and the landscape/townscape. ■ The air quality impacts of the Northern Corridor package will largely be driven by the proximity of new offline interventions to properties. There is currently poor air quality in the Manchester North-West Quadrant, further assessment will be needed at future stages of the project. ■ The noise assessment identifies that some properties are likely to experience an increase in noise levels whereas other properties are likely to experience a decrease in noise levels and this depends on where traffic flows change and where interventions are introduced. Further assessment will be required to understand the levels of change and the measures that may need to be included in the interventions to reduce noise effects. ■ The analysis has adopted a worst case scenario so at future project stages it will be possible to develop mitigation measures that can avoid or reduce environmental impacts. There will also be scope to deliver environmental enhancements.

5.3 Outer Orbital Corridor Package

Intervention Specific Objective	Likely Benefits & Opportunities
Growth	<p>The economic benefits delivered by the Outer Orbital Corridor package are generally derived from businesses improving their productivity. There are also some benefits to the economy as a result of lower transport costs associated with this package. The economic benefits are spread throughout Greater Manchester and across the north which will help to support the delivery of the Northern Powerhouse. The initial assessment indicates that the Outer Orbital Corridor Package provides the second greatest economic benefits compared to the other packages.</p>
Network Performance	<p>Journey Time 5.3.1 The Outer Orbital Corridor Package delivers over 11.3 million hours a year of time savings to businesses and commuters. These benefits are experienced by users on long distance strategic movements as well as local users within the study area such as between Warrington and Bolton. There are also additional benefits to other road users such as those travelling between Manchester and Stockport demonstrating the far reaching consequences of resolving the issues in the Manchester North-West Quadrant study area. The initial assessment indicates that the Outer Orbital Corridor Package provides the third greatest benefits for users.</p> <p>Strategic long distance users:</p> <ul style="list-style-type: none"> ■ Quicker journeys of up to 5 minutes which saves 40 hours a year per person. <p>Local M60 users:</p> <ul style="list-style-type: none"> ■ Quicker journeys of up to 3 minutes which saves 24 hours a year per person. <p>Resilience This package offers resilience to strategic east-west movements by offering an alternative route in terms of east west via the Outer Orbital Corridor. If there is an incident in the Manchester North-West Quadrant then these long distance users can reroute along the Outer Orbital Corridor. This package offers some resilience benefits for local M60 users as recovery time after incidents in the Manchester North-West Quadrant should be shortened as some users reroute leading to shorter queues for local M60 users.</p> <p>Safety This package would lead to a reduction in traffic in the Manchester North-West Quadrant with traffic being attracted to the new Outer Orbital route which could therefore be beneficial in terms of safety for users travelling on the M60 within the Manchester North-West Quadrant.</p>

Intervention Specific Objective	Likely Benefits & Opportunities
Connectivity	<ul style="list-style-type: none"> ■ Within this package there is a new strategic east-west link (from M62 J9 to M62 J19) and a new north-south link (from the M56 to the M61). This will provide benefit to business users such as freight operators through providing enhanced connectivity. This package offers new direct links which will increase the ability to access education, employment, business, and leisure opportunities. ■ The connectivity improvements are mainly in the west of Greater Manchester following the route of the proposed Outer Orbital including locations such as Carrington and Bolton. It also benefits areas outside Greater Manchester. ■ A small number of areas suffer from connectivity dis-benefits; probably due to the reconfiguration of junctions 13 and 14 on the M60 and the resulting impact on local traffic.
Environment	<ul style="list-style-type: none"> ■ This package has the potential to impact designated environmental features including ecological sites, cultural heritage features, water resources and the landscape/townscape. ■ The air quality impacts of the Outer Orbital Corridor package will largely be driven by the proximity of new offline interventions to properties. There is currently poor air quality in the Manchester North-West Quadrant and further assessment will be needed at future stages of the project. ■ The noise assessment identifies that some properties are likely to experience an increase in noise levels whereas other properties are likely to experience a decrease in noise levels and this depends on where traffic flows change and where interventions are introduced. Further assessment will be required to understand the levels of change and the measures that may need to be included in the interventions to reduce noise effects. ■ The analysis has adopted a worst case scenario so at future project stages it will be possible to develop mitigation measures that can avoid or reduce environmental impacts. However, this package will potentially require the greatest level of mitigation due to the scale and location of the interventions in relation to environmental sites. Interventions in this package have the potential to significantly affect the mosslands to the west of the M60 which are designated at a European level.

5.4 PTMax Package

Intervention Specific Objective	Likely Benefits & Opportunities
Growth	<p>5.4.1 The economic benefits delivered by the PTMax package are mainly derived from businesses improving their productivity through being able to access a larger labour pool as a result of the interventions proposed. However public transport has minimal direct impact on the freight and logistics industry and so this reduces the total economic benefits that this package can offer. As such the initial assessment indicates that the PTMax package provides the lowest economic benefits compared to the other packages.</p>
Network Performance	<p>Journey Time 5.4.2 5.4.2The PTMax Package generates over 1.6 million hours of time savings a year for businesses and commuters which is significantly less than the other packages. This is due to the package being unable to meet the demands of all of the trips that travel through the Manchester North-West Quadrant. These benefits are mainly experienced by local users within the study area. There are no significant benefits to users on long distance strategic movements. As such the initial assessment indicates that the PTMax package provides the lowest user benefits compared to the other packages.</p> <p>There were no journey time savings for both long distance users and local M60 users as a result of this package.</p> <p>Resilience The PTMax package could create some resilience to the public transport network within the Greater Manchester region when issues arise elsewhere on the networks as the orbital improvements would provide alternative routes. It could also provide an alternative mode of transport for commuters should issues arise on the highway network. This could mean that recovery times after incidents in the Manchester North-West Quadrant are shortened as some people use public transport leading to shorter queues for local M60 users.</p> <p>Safety This package reduces some traffic on the existing motorway network within the study area. It is therefore considered that this package would result in some benefits in terms of safety within the Manchester North-West Quadrant but not to the extent of the other packages</p>

Intervention Specific Objective	Likely Benefits & Opportunities
Connectivity	<ul style="list-style-type: none"> ■ This package provides greater travel opportunities for commuters between towns in Greater Manchester allowing access to wider employment opportunities. The package provides enhanced connectivity for education, employment, business and leisure opportunities by connecting these areas. ■ The package offers some benefits to businesses however would not provide any direct benefits to freight operators. ■ This package does not provide any new or improved long distance east-west connectivity. ■ The PTMax Package improves connectivity however these benefits are concentrated in a much smaller area compared to the other packages.
Environment	<ul style="list-style-type: none"> ■ The air quality impacts of the PTMax package will largely be driven by the proximity of new interventions to properties. There is currently poor air quality in the Manchester North-West Quadrant and a further air quality assessment will be needed at future stages of the project. ■ The noise assessment identifies that there are properties that are likely to experience an increase in noise levels based on where new interventions are introduced. Further noise assessment will be required to understand the levels of change and the mitigating measures that may need to be included as part of the interventions in order to reduce noise effects. ■ The analysis has adopted a worst case scenario so at future project stages it will be possible to develop mitigation measures that can avoid or reduce environmental impacts.

5.5 In-Corridor Package

Intervention Specific Objective	Likely Benefits & Opportunities
Growth	<p>The economic benefits delivered by the In-Corridor package are generally derived from businesses improving their productivity. There are also some benefits to the economy as a result of lower transport costs associated with this package. The economic benefits are located throughout Greater Manchester and across the north which will help to support the delivery of the Northern Powerhouse. The initial assessment indicates that the In-Corridor Package provides the greatest economic benefits.</p>
Network Performance	<p>Journey Time 5.5.1 The In-Corridor Package delivers over 11.9 million hours of time savings a year to businesses and commuters. These benefits are experienced by users on long distance strategic movements as well as local users within the study area such as between Salford and Manchester. There are also benefits to users outside the study area such as those travelling between Manchester and Trafford demonstrating the far reaching consequences of resolving the issues in the Manchester North-West Quadrant study area. The initial assessment indicates that the In-Corridor Package provides the greatest benefits, particularly for long distance movements.</p> <p>Strategic long distance users:</p> <ul style="list-style-type: none"> ■ Quicker journeys of up to 12 minutes which saves 96 hours a year per person. <p>Local M60 users:</p> <ul style="list-style-type: none"> ■ Quicker journeys of up to 5 minutes which saves 40 hours a year per person. <p>Resilience This package offers resilience to strategic east-west movements by offering additional lane capacity and routes along the existing corridor. This package also increases resilience to local M60 users by the provision of the additional lane capacity and routes. If an incident occurs then this package provides road users the option to reroute which will improve incident recovery time.</p> <p>Safety This packages reduces traffic on the existing motorway network within the study area, but would significantly increase traffic on the new links. This would improve safety for users on the M60 within the Manchester North-West Quadrant.</p>

Intervention Specific Objective	Likely Benefits & Opportunities
Connectivity	<ul style="list-style-type: none"> ■ This package provides stronger east-west connectivity which will benefit businesses, in particular freight operators undertaking long distance trips. The corridor improvements offer greater travel opportunities for commuters allowing access to increase employment opportunities ■ Connectivity improvements from this package are spread across Greater Manchester, showing strong benefits in places such as Bolton and Middleton. Connectivity improvements also spread beyond Greater Manchester to Merseyside and West Yorkshire. The In-Corridor package is the strongest performing package in terms of connectivity. ■ A small number of areas suffer from connectivity dis-benefits; probably due to the reconfiguration of junctions 13 and 14 on the M60 and the resulting impact on local traffic.
Environment	<ul style="list-style-type: none"> ■ This package has the potential to impact designated environmental features including ecological sites, cultural heritage features, water resources and the landscape/townscape. ■ The air quality impacts of the In-Corridor package will largely be driven by the proximity of new interventions to properties. There is currently poor air quality in the Manchester North-West Quadrant and further air quality assessment will be needed at future stages of the project. ■ The noise assessment identifies that some properties are likely to experience an increase in noise levels whereas other properties are likely to experience a decrease in noise levels and this depends on where traffic flows change and where interventions are introduced. Further assessment will be required to understand the levels of change and the measures that may need to be included in the interventions to reduce noise effects. ■ The analysis has adopted a worst case scenario so at future project stages it will be possible to develop mitigation measures that can avoid or reduce environmental impacts.

5.6 Costs

- 5.6.1 The capital costs associated with each package (shown in Table 8) have been developed using cost estimates in line with the Highways England Cost Estimating Manual for the highways interventions and by the study consultants for the public transport interventions based on published cost data. These costs are initial estimates and are considered to be conservative in value.

Package	Highways Interventions	Public Transport Interventions	Package Totals
	2014 Cost Estimates	2014 Cost Estimates	2014 Cost Estimates
Northern Corridor	£4,058m	£1,617m	£5,675m
Outer Orbital Corridor	£5,384m	£1,972m	£7,356m
PTMax	-	£4,128m	£4,128m
In-Corridor	£4,406m	£1,972m	£6,378m

Table 8 – Cost Estimates of the Packages (base cost, plus project risk and uncertainty at 2014 prices)

5.7 Role of future transport technologies

- 5.7.1 Technology within transportation is rapidly changing. The emergence of connected and autonomous vehicle technology coupled with alternative models of vehicle ownership and usage (both in the private and public transport) could change the driving experience and existing patterns of usage. The move from petrol and diesel to hybrid and electric engines will bring about environmental improvements particularly in terms of air quality at the point of use. At the moment it is difficult to predict how such technologies will impact the transportation network or what the rate of large scale commercialisation of new solutions will be. Further horizon scanning activities will be required during further work stages to assess these emerging technologies and the role they have to play in the refinement of packages.

6. Conclusion and Next Steps

- 6.1.1 Failure to act will have a major impact on achieving transformational economic growth as part of the Northern Powerhouse and will see existing problems worsen.
- 6.1.2 The Northern Corridor, Outer Orbital Corridor and In-Corridor packages show significant improvements on the M60 and wider transport network within the study area and satisfy the intervention specific objectives that were defined by the study. This includes quicker journeys through the North-West Quadrant, saving up to 96 hours a year per person. They address the existing and future problems and should be considered for further development.
- 6.1.3 From the analysis that has been carried out to date the Northern Corridor, Outer Orbital Corridor and In-Corridor packages offer benefits not only to the study area, but also to the north of England.
- 6.1.4 There are some low performing interventions in the Northern Corridor, Outer Orbital Corridor and In-Corridor packages. Removal of these interventions and refining the analysis will improve quantified estimates of benefits and value for money assessments.
- 6.1.5 The PTMax package should not be considered further as it does not satisfy all the objectives and offers relatively small benefits in comparison to the other packages. Whilst addressing a number of the intervention specific objectives, the PTMax package does not sufficiently address the existing problems that were identified in the study evidence base. The PTMax package does not have benefits for west to east strategic users and shows little benefits for local M60 users. For these reasons it is recommended that PTMax is not considered a viable solution for this study.
- 6.1.6 The interventions proposed as part of PTMax may solve other challenges and therefore be worthy of consideration under different circumstances. It should be noted that the other packages include significant interventions in terms of public transport.
- 6.1.7 There is potential for all of the interventions to be designed to maximise the scope for environmental enhancement and deliver wider environmental objectives. There will also be a need for comprehensive mitigation within packages to be developed to reduce the interventions' impacts. This will need to be considered in further detail for each scheme at the next stage of the project.
- 6.1.8 Technology within transportation is rapidly changing and scale of the potential impacts is difficult to predict at the current time. Further horizon scanning activities will be required to assess the role technology may have in helping to resolve the issues in the Manchester North-West Quadrant.
- 6.1.9 The conclusions above strongly suggest that further work to develop an optimal performing package and constituent interventions should be progressed. The analysis to date has shown that significant benefits could be achieved through major interventions such as those proposed meeting the aims of the study and helping meet the aspirations of the Northern Powerhouse.

Appendix A – Stakeholder Engagement

The organisations invited to the Stakeholder Reference group are listed in Table A-1 below

Blackburn with Darwen Borough Council	Liverpool Chamber of Commerce
Bolton Metropolitan Borough Council	Liverpool City Council
British Horse Society	Liverpool LEP
Campaign for Better Transport	Manchester Airport
Campaign to Protect Rural England- (CPRE)	Manchester City Council
Camping and Caravanning Club	Mersey Travel
Caravan Club	National Trust
Confederation of British Industry	Natural England
Cheshire & Warrington LEP	Network Rail
Cheshire East Council	Oldham Metropolitan Borough Council
Confederation of Passenger Transport	Peel Group
Cycle Touring Club	Ramblers Association
Environment Agency	Road Haulage Association
Freight Transport Association	Rochdale Borough Council
Friends of the Earth	Salford City Council
Federation of Small Businesses	St Helens Metropolitan Borough Council
Greater Manchester Chamber of Commerce	Stockport County Council
Greater Manchester Combined Authority	Sustrans
Greater Manchester Police	Trafford Metropolitan Borough Council
Historic England (English Heritage)	Transport for Greater Manchester
Knowsley Borough Council	Warrington Borough Council
Lancashire County Council	Wigan Metropolitan Borough Council
Lancashire County Council	Wildlife Trust
Lancashire LEP	

Table A-1 : Organisations Invited to the SRG

As well as the SRG individual consultation has taken place with the following organisations:

- Manchester Airport Group
- Peel Holding
- Intu Trafford Centre
- HIMOR Group and Trafford Borough Council
- Environment Agency
- Natural England

A Local Authority Working Group was established which consisted of members of all the Greater Manchester Authorities. The purpose of this group was to seek engagement from members in relation to the evidence base, interventions and to understand future developments that could benefit from the outcomes of the study.

Appendix B - Glossary

AQMA	Air Quality Management Area
AQS	Air Quality Strategy
DfT	Department for Transport
GDP	Gross Domestic Product
GVA	Gross Value Added
HGV	Heavy Goods Vehicle
IER	Independent Economic Review
LEP	Local Enterprise Partnership
NIA	Noise Improvement Area
NNR	National Nature Reserve
Northern Powerhouse	<p><i>“The Northern Powerhouse is the bringing together of the northern cities, creating modern high speed transport links between those cities, making sure that they have strong civic leadership, bringing investment to them, and as a result creating a North of England that is greater than the individual parts.”</i></p> <p>Rt Hon George Osborne MP, Building a Northern Powerhouse, Chengdu, China, 24 September 2015</p>
RIS	Road Investment Strategy
SRG	Stakeholder Reference Group
SRN	Strategic Road Network
TAG	Transport Analysis Guidance
TfGM	Transport for Greater Manchester
TfN	Transport for the North

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