Warrington Local Plan Testing

Transport Model Testing of the WBC Proposed Submission Version Local Plan and Highway Schemes in the Infrastructure Delivery Plan

Warrington Borough Council

Project number: 60566721

13 March 2019

Quality information

Prepared by	Checked by	Verified by	Approved by
Laura Appleton Principal Consultant Transportation	Ian Taylor / Frank Mohan	Frank Mohan Regional Director Transportation	Frank Mohan Regional Director Transportation

Revision History

Revision	Revision date	Details	Authorized	Name	Position
1	19/10/18	1st Draft			
2	12/11/18	2nd Draft following initial WBC Comments			
3	11/02/19	3rd Draft containing updated modelling results from Jan 19 Trajectory			
4	13/03/19	FINAL			

Distribution List

# Hard Copies	PDF Required	Association / Company Name

Prepared for:

Economic Regeneration, Growth & Environmental Directorate
Warrington Borough Council
Floor 3, New Town House, Buttermarket Street, Warrington WA1 2NH

Prepared by:

Laura Appleton
Principal Consultant
Transportation

AECOM Infrastructure & Environment UK Limited
1 New York Street
Manchester M1 4HD
United Kingdom

T: +44 161 601 1700
aecom.com

Table of Contents

Figures

Tables

1. Introduction

1.1 Background

Warrington Borough Council (WBC) use a transport model to help estimate and assess future year traffic conditions, inform transport related policy and scheme decision making, as well as informing wider planning decision making.

AECOM were appointed by WBC to build the model in July 2016. The model is referred to as the Warrington Multi Modal Transport Model 2016 (WMMTM16).

The model has been used to provide supporting evidence in the development of WBCs Local Plan. WBC is preparing a spatial strategy for the Warrington Local Plan which is currently under review. The Proposed Submission Version Local Plan (PSVLP) is expected to involve substantial development over the next 20 years requiring investment in infrastructure to support both the delivery of this development as well as addressing known congestion issues in the Borough.

As the PSVLP is expected to impose significant pressure on the transport network, it will be particularly important that soundly based evidence justifies the associated transport strategy, for the final consultation of the preferred spatial strategy prior to an Examination in Public (EIP).

1.2 Context

The PSVLP sets out the Council's favoured approach to delivering the housing and employment land necessary to meet its growth targets.

The PSVLP has been developed taking account of identified need, the capacity of areas within the Borough to accommodate development and the 'call for sites' exercise which identified where developers had aspirations to bring sites forward. Further details are provided in the supporting evidence base for the PSVLP.

The level of growth assessed within this report is in line with the published PSVLP and comprises the following development over the next twenty years:

- 20,284 homes split between existing urban (65%) and green belt (35%) sites; and
- 379 hectares of employment land split between urban (35%) and green belt (65%) locations.

Note: The final published PSVLP differs slightly from the figures quoted here and used in this assessment. The final published figures are 20,790 homes (an increase of 2.5%) and 362 hectares (a reduction of 4.5%). The differences are not considered material to the findings of this report. The differences arose due to the timing of final refinements to the PSVLP and the need to complete the level of analysis necessary to complete this document. Therefore the figures tested are correct as of 31st January 2019.

The WMMTM16 has been used to forecast the impact of this pattern of development growth on the transport network in Warrington.

The purpose of the testing is to ensure that the transport impacts of the development and associated highway interventions are deliverable, attractive to encourage mode change, whilst addressing existing known congestion issues. The model has been used to identify and assess the transport impacts of the PSVLP growth in Warrington.

1.3 Purpose of the Report

This report sets out the work undertaken to develop the PSVLP future year forecast scenario against which to test a number of schemes, development options, and transformational policy interventions being considered in WBC's PSVLP.

1.4 Related Documents

In the context of this project, no particular scheme is being appraised but there is a need to clearly set out the context, background and technical requirements of the model to be built.

Please refer to the AECOM report *"Warrington Transport Model: Data Collection Report (MDCR), January 2017"* for more information relating to the methodology, collection and analysis of existing data and the additional data collection exercise undertaken in June/July 2016.

The AECOM report *"Warrington Transport Model: Model Validation Report, December 2017"* presents the work undertaken to calibrate the model and its assessment with how well it performs against observed data.

1.5 Report Structure

Following this introduction, the rest of the report is set out as follows:

- **Chapter 2** presents an overview of the characteristics of the WMMTM16 modelling tool;
- **Chapter 3** summarises the Development Scenario and sets out the details of the PSVLP in terms of scale, trajectory, and location of development;
- **Chapter 4** summarises the Infrastructure and policy interventions required for the delivery of the PSVLP;
- **Chapter 5** presents details of the Transport Model Process and describes how these forecasts have been built into the transport model;
- **Chapter 6** presents the results of the Transport Model Testing based on a number of Borough wide metrics; and
- **Chapter 7** brings together the findings of the work in a series of conclusions and recommendation.

2. Overview of the WMMTM16

2.1 Context

This chapter covers the key features of the WMMTM16 model in terms of scope, time periods, demand segmentation, and the structure and interfaces of the model suite.

2.2 Overview

The WMMTM16 is a multi-modal transport model of the Borough that has been developed to represent the existing transport networks and levels of performance. Furthermore it has been designed to understand the impact of land use changes, such as new housing and employment development, in the future and help assess the need for, and impact of, transport infrastructure projects.

The model has been developed in accordance with guidance provided by the Department for Transport (DfT), known as WebTAG (see www.gov.uk/guidance/transport-analysis-guidance-webtag for details), and independently audited to ensure it is fit for purpose.

The model represents morning, evening and inter peak periods and can forecast future year traffic flows on the highway network and passenger numbers on bus and rail networks. It includes a demand model which considers five modes of travel:

– Car;
– Rail;
– Bus and coach,
– Freight (Light Goods Vehicles, LGV, and Heavy Goods Vehicles, HGV); and
– Active modes (walk, cycle).

The model has been designed to maximise the use of observed data from the base year, 2016, and then look at incremental changes in supply and demand to forecast the future based on assumptions about changes in population, land use, infrastructure etc.

2.3 Model Scope

The model is required to be sufficiently detailed and robust to accomplish the following:

– Represent the existing transport networks within Warrington and performance at present;
– Understand the traffic impact of the site specific allocations of the Proposed Submission Version Local Plan on the local highway network and the impact this has on public transport usage; and
– Develop realistic mitigation measures (both highway and public transport) to support these allocations and test them to understand their benefit and their impact on traffic patterns - these results can then be fed into a transport strategy and associated infrastructure planning.

2.4 Model Software

The WMMTM16 has been developed using SATURN modelling software, version 11.3.12W (N4 Multi) for highway assignment modelling aspects integrated with EMME 4.29 software for public transport and demand modelling aspects.

2.5 Model Time Periods

The base year for the model is 2016 and represents an average neutral “weekday” in June.

Analysis of automatic traffic count (ATC) data collected for the purposes of model development has revealed the peak hours for highway movements. These have been applied to the WMMTM16 and are shown in **Table 1**.

Please refer to the AECOM report *"Warrington Transport Model: Model Specification Report (MSR), November 2016"* for more details.

Table 1. Modelled Time Periods

Period Name	Model Time Period	Modelled Hour
AM Peak Period	07:45 – 09:15	Average hourly
Inter-peak Period	10:00 – 16:00	
PM Peak Period	16:30 – 18:00	

2.6 User Class Segmentation

The demand model is more-heavily segmented than the supply models. It considers five modes of travel:

- Car;
- Rail;
- Bus and coach,
- Freight (Light Goods Vehicles, LGV, and Heavy Goods Vehicles, HGV); and
- Active modes (walk, cycle).

It models two person types based on categories of household car-ownership (car available / no-car available) and five travel purposes:

- Home-based commuting;
- Home-based employer's business;
- Home-based other;
- Non-home-based employer's business; and
- Non-home-based other.

The highway model assigns the demand across five user classes:

- Car (commuting);
- Car (business);
- Car (other purposes);
- LGV; and
- HGV.

The public transport (PT) model represents bus and rail modes only. The model does not include school buses, or coach services.

2.7 Assignment Technique & Generalised Costs

2.7.1 Assignment Technique

SATURN can operate as either a conventional traffic assignment model or as a combined simulation and assignment model in which junction interactions are represented in detail.

SATURN uses the SATALL module to iterate between successive loops of the SATASS module (which assigns the user class matrices to the network in accordance with Wardrop's First Principle of Traffic Equilibrium (using the Frank-Wolfe algorithm) and SATSIM module (which takes the flows derived by

SATASS and calculates the revised flow/delay relationships at each junction within the simulated area) until the resulting travel times and flows do not change significantly (that is, the process has ‘converged’).

The use of the combined SATASS-SATSIM routine enables the impact of blocking back and downstream flow metering to be robustly assessed.

Wardrop’s User Equilibrium is based on the following proposition:

‘Traffic arranges itself on congested networks such that the cost of travel on all routes used between each origin-destination pair is equal to the minimum cost of travel and unused routes have equal or greater costs.’

2.7.2 Generalised Cost Parameters

The assignment generalised cost formulations (expressed as PPM and PPK – pence per minute and pence per kilometre) were derived using WebTAG’s data book as published in March 2017. The parameters PPM and PPK vary with each user class and time period and these are shown in **Table 2**.

The model base year is 2016 with all monetary values calculated at 2010 prices.

Table 2. User Classes and Value of Time/Distance 2016 (perceived values)

		AM		Inter Peak		PM	
User Class	Class Name	Value of Time (PPM)	Value of Distance (PPK)	Value of Time (PPM)	Value of Distance (PPK)	Value of Time (PPM)	Value of Distance (PPK)
1	Car Commute	20.2	6.12	20.56	6.12	20.38	6.12
2	Car Business	30.17	13.45	30.97	13.45	30.71	13.45
3	Car Other	13.95	6.12	14.85	6.12	14.6	6.12
4	LGV	21.1	13.1	21.1	13.1	21.1	13.1
5	HGV	50.16	46.53	50.16	46.53	50.16	46.53

SOURCE: WebTAG DataBook, March 2017

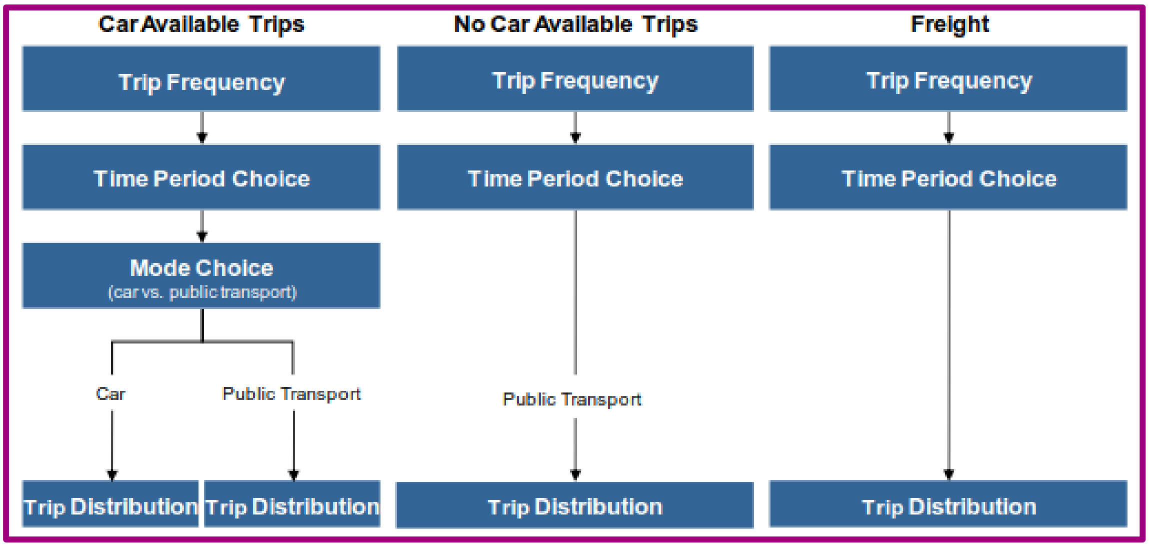
2.8 Variable Demand Approach

A key objective of the WMMTM16 project is to provide a multi-modal platform for transport scheme assessment. The variable demand model (VDM) approach that has been adopted adheres to WebTAG Unit M2 guidance and models the following key travel choices:

- **Route (trip frequency)** – This choice process adjusts total demand from each production zone based on the changes in the cost of travel from that zone;
- **Time period** - This choice process adjusts, for each production zone, relative proportions of demand assigned to each time period, based upon the relative changes in cost of travel from that zone and time period;
- **Mode choice** (car vs. public transport) - This choice process adjusts, for each production zone and time period, relative proportions of demand assigned to each of the two modes, car and public transport, based upon the relative changes in travel cost for these zones, time periods and modes; and
- **Trip distribution** (destination choice) - This choice process adjusts, for each production zone, mode and time period, relative proportions of demand assigned to each attraction zone, based upon the relative changes in cost of travel in that time period and by that mode between those two zones.

The choice models are applied as shown in the structure illustrated in **Figure 1**, which is consistent with guidance provided in WebTAG Unit M2.

Figure 1. Mode Choice Model Structure



The software required to run the VDM comprises:

- SATURN Version 11.3.12W (N4 Multi) – Highway Assignment Software;
- EMME Version 4.2 – PT Assignment Software; and
- EMME Version 4.2 – VDM software.

For full details of the demand model development, please refer to Chapter 10 in the AECOM report *"Warrington Transport Model: Model Validation Report, October 2017".*

3. Forecast Demand - The Development Scenario

3.1 Context

Transport model forecasts are used to help predict the impact of future schemes, policies and land use changes on the operation of the network. The forecasts rely on various assumptions which have associated degrees of uncertainty. WebTAG recommends the use of an Uncertainty Log to record these uncertainties in a structured manner.

WebTAG Unit M4 provides guidance on how to structure the Uncertainty Log and how the classification of potential schemes and land use changes can inform a core scenario and alternative scenarios.

For WMMTM16 the approach to forecasting is based on a ‘core’ growth scenario using the WBC Proposed Submission Version Local Plan (PSVLP) Development assumptions.

The WMMTM16 uncertainty log is in two parts:

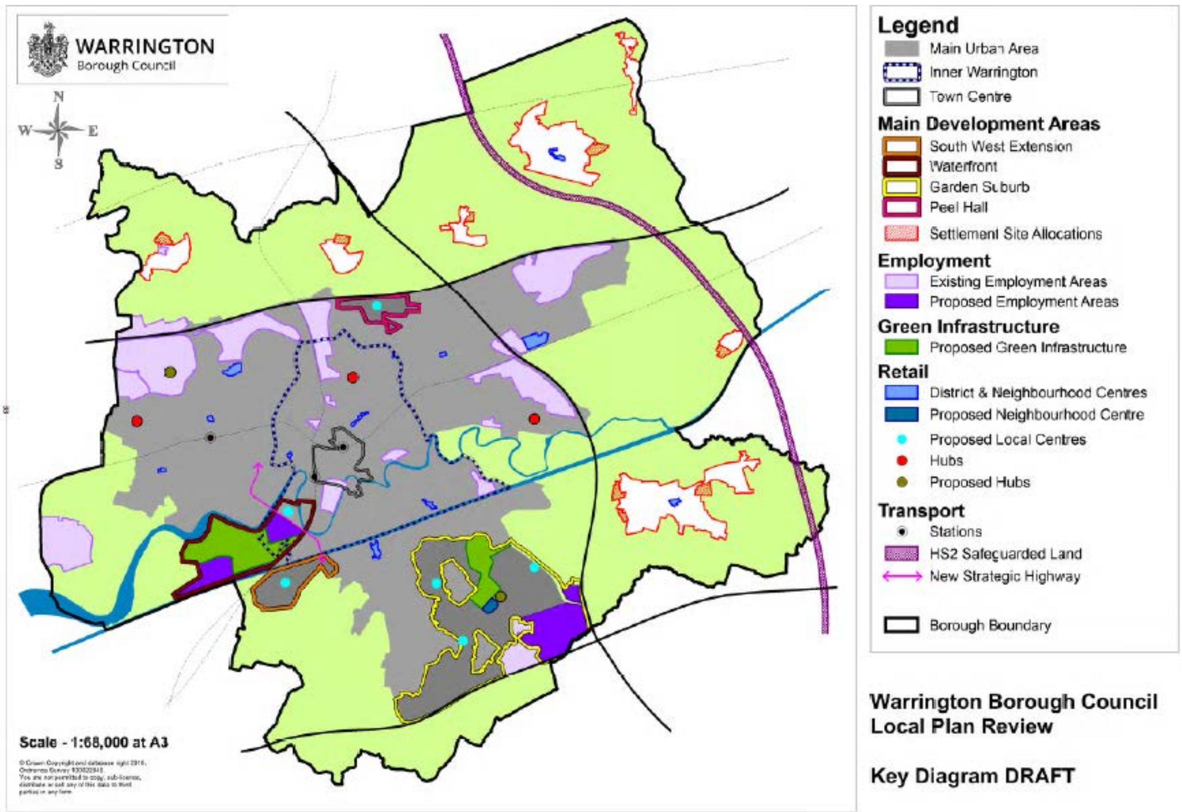
– Part 1 details the demand supply to be considered that was derived from WBC’s PSVLP Development proposal; and

– Part 2 details the infrastructure that WBC deemed relevant to the modelled area to support the implementation of the PSVLP growth.

This chapter covers Part 1 of the Uncertainty Log and the key features of the demand component of the WMMTM16 forecasts; WBC’s PSVLP development including the allocation of housing land within the existing urban area and the Green Belt as well as the assumptions on employment land allocations.

The PSVLP considers a number of areas within the Borough and these are illustrated in **Figure 2**.

Figure 2. PSVLP Areas for Growth



In developing the PSVLP, WBC has taken the decision to plan for a level of growth in accordance with the Cheshire and Warrington Local Enterprise Partnership's (LEP) Strategic Economic Plan. This reflects the Council's ambitions for growth as set out in the *"Warrington Means Business[1]"* regeneration programme, Warrington's past track record of economic success and the scale of private sector interest wanting to invest in Warrington.

The PSVLP has been designed to open up major brownfield sites for development at the same time as developing new sustainable communities within the Borough.

The Council is therefore proposing a housing target of 945 homes per annum over the 20 year Plan period and an overall employment land target of 362 hectares.

In identifying land to meet Warrington's need for housing and employment, the Council has first sought to maximise the capacity of the existing urban area to accommodate new development.

The Council has undertaken a detailed assessment of urban capacity through its Strategic Housing Land Availability Assessment (SHLAA) and Economic Development Needs Assessment (EDNA). It has also identified the significant additional capacity that can be delivered through the regeneration plans for the Town Centre, Warrington Waterfront and wider Inner Warrington area. This has involved a detailed masterplanning exercise undertaken in partnership with Warrington & Co, the Council's economic development partnership. Please refer to the WBC report *"Urban Capacity Statement, July 2017"* for more details on this assessment.

Through this process the Council has confirmed a total urban capacity for 13,367 homes and 122 hectares of employment land.

3.2 The Preferred Development Option

The WMMTM16 Uncertainty Log has been developed alongside WBC's PSVLP and call for sites response. **Table 3** presents the total number of residential houses proposed and the total employment land available for development during the 20 year Plan period. These totals have been taken forward into the development of the WMMTM16 Uncertainty Log.

The PSVLP identifies a number of areas of growth (as shown in **Figure 2**). Four of the key growth areas include; the Town Centre, the Waterfront, the Garden Suburb, and the South West Urban Extension. These four areas are complemented by additional development throughout the existing urban area and the outlying settlements. At this stage, growth is proposed in areas rather than identification of specific sites and locations. This growth split between employment land and residential sites is shown in **Table 3** and **Figure 3. Table 3** is further broken down in **Table 4** (housing) and **Table 5** (employment). Each table presents the development projection by source of data and broad location.

Table 3. Summary of the PSVLP Housing and Employment Totals by Year Allocation

Year	Period	Employment Sites (Ha)	Residential Sites (No. Dwelling Units)
1-5 years	2016 – 2021	80.1	3,773
6-10 years	2021 – 2026	141.39	7,341
11-15 years	2026 – 2031	98.78	5,777
16-20 years	2031 - 2036	58.93	3,393
TOTAL		**379.25**	**20,284**

Source: WBC, Jan 19

[1] Warrington Means Business (Dec 2016), Warrington & Co. – Warrington's Economic Growth & Regeneration Programme

Figure 3. Proportion of Employment and Residential Sites by Year

Figure 3 illustrates how the PSVLP is marginally 'front-loaded' in terms of development, with 58% and 55% of employment and housing respectively proposed in the first 10 years of the Plan period.

For housing development, a breakdown of the total by growth area is presented in **Table 4**. For employment, this is shown in **Table 5.**

Table 4 shows the PSVLP is proposing 13,627 homes in the existing urban areas with the remainder from Green Belt release. In terms of the split between the existing urban area and the Green Belt, this represents 66% development within the wider urban area, and 33% in the Green Belt.

For employment, the PSVLP is proposing 122 hectares in the Plan period in existing urban areas with the remainder in the Green Belt. In this case however, a greater proportion of employment development is proposed for the Green Belt area at 68%, with 32% proposed for the wider urban area.

Table 4. Summary of PSVLP Housing Totals by Growth Areas

Area	Residential Sites (No. Dwelling Units)	Proportion (% 'contribution')
Town Centre	4,007	20%
Wider Urban Area	4,133	20%
Waterfront	2,542	13%
Garden Suburb (HCA Sites)	930	5%
Settlement Areas	221	1%
Other Areas	90	0.4%
Small Sites Allocation	1,444	7%
Total URBAN	**13,367**	**66%**
Garden Suburb (Green Belt)	4,201	21%
South West Urban Extension (Green Belt)	1,631	8%
Settlement Areas (Green Belt)	1,085	5%
Total GREEN BELT	**6,917**	**34%**
TOTAL	**20,284**	**100%**

Source: WBC, Jan19

Table 5. Summary of PSVLP Employment Totals by Growth Areas

Area	Employment Sites (Ha)	Proportion (% 'contribution')
Town Centre	26.73	7%
Wider Urban Area	95.52	25%
Settlement Areas	0	0%
Total URBAN	**122.25**	**32%**
Waterfront (Green Belt)	110.15	29%
Garden Suburb (Green Belt)	116.80	31%
Other Areas (OMEGA Green Belt)	30	8%
Total GREEN BELT	**256.95**	**68%**
TOTAL	**379.2**	**100%**

Source: WBC, Jan19

3.3 Implementation of the Development Scenario within the WMMTM

The Development Scenario prepared for, and reported on within this report, is designed specifically to examine the full impacts of the proposed expansion of Warrington detailed within the PSVLP. As such it does not fit within the definition of a WebTAG core scenario as the total demand is not constrained to NTEM[2] growth and all proposed developments have been assumed to occur within the specified time frame.

To ensure that a realistic set of growth factors was applied, the following broad approach was adopted:

- For housing developments the trip rates for new sites has been taken to be the observed trip rate included in the model, based on base year matrix totals and zonal population estimates.
- For employment sites the trip rates have been based on observed trip rates from matrix totals and estimates of existing square metres of employment space at a zonal level.

This process makes maximum use of local data, and is able to reflect the relative trip rates and mode splits for sites in urban, suburban and rural areas within the Borough.

For each of the scenarios, for trips starting or finishing within Warrington, the forecast growth is directly related to the assumptions made about housing (and employment) changes noted above. Each housing development is allocated to the appropriate model zone and trip rates applied using observed information gathered as part of the base model development.

As with all aspects of the model process, we have used observed local data as much as possible, so the trip rates and distribution of trips applied to the developments take account of the observed patterns in the relevant area. This means that the number of trips per household will vary depending on where the development is located although the changes are generally quite small. Similarly the pattern of trips from the developments will alter depending on where they are located. To illustrate this point, the distribution pattern for the development areas is shown in **Table 6**.

[2] The National Trip End Model (NTEM) model forecasts the growth in trip origin-destinations (or productions-attractions) up to 2051 for use in transport modelling.

Table 6. Distribution Pattern for Development Areas

Development Area	Proportion of Trips to		
	Town Centre	Other Warrington	External
Garden Suburb	8.8%	55.6%	35.6%
South West Warrington	21.9%	34.0%	44.1%
Outlying Settlements	9.6%	19.2%	71.2%
West Warrington	7.7%	40.5%	51.8%
Urban Extension	9.5%	46.9%	43.6%

Source: WMMTM16 (2036 values)

The forecast growth in the PSVLP represents an increase in the region of 22% in the number of households in Warrington compared to the present day[3].

Figure 4 and **Figure 5** show how the distribution of the employment sites presented in the uncertainty log is allocated to model zones for both 2026 and 2036 respectively. **Figure 6** and **Figure 7** present the residential allocations for 2026 and 2036 respectively.

[3] A recent Office of National Statistics (ONS) estimate indicated a figure for 2014 of 91,505. By December 2017, the LLPG Gazetteer, from the ONS Residential Address Points database indicated that this had grown to 95,672 households. Assuming a mid-range estimate of these two growth projections, this would suggest that the current total number of households is of the order of 93,500.

Figure 4. 2016 to 2026 Employment Allocation of PSVLP Growth (hectares) to Model Zones

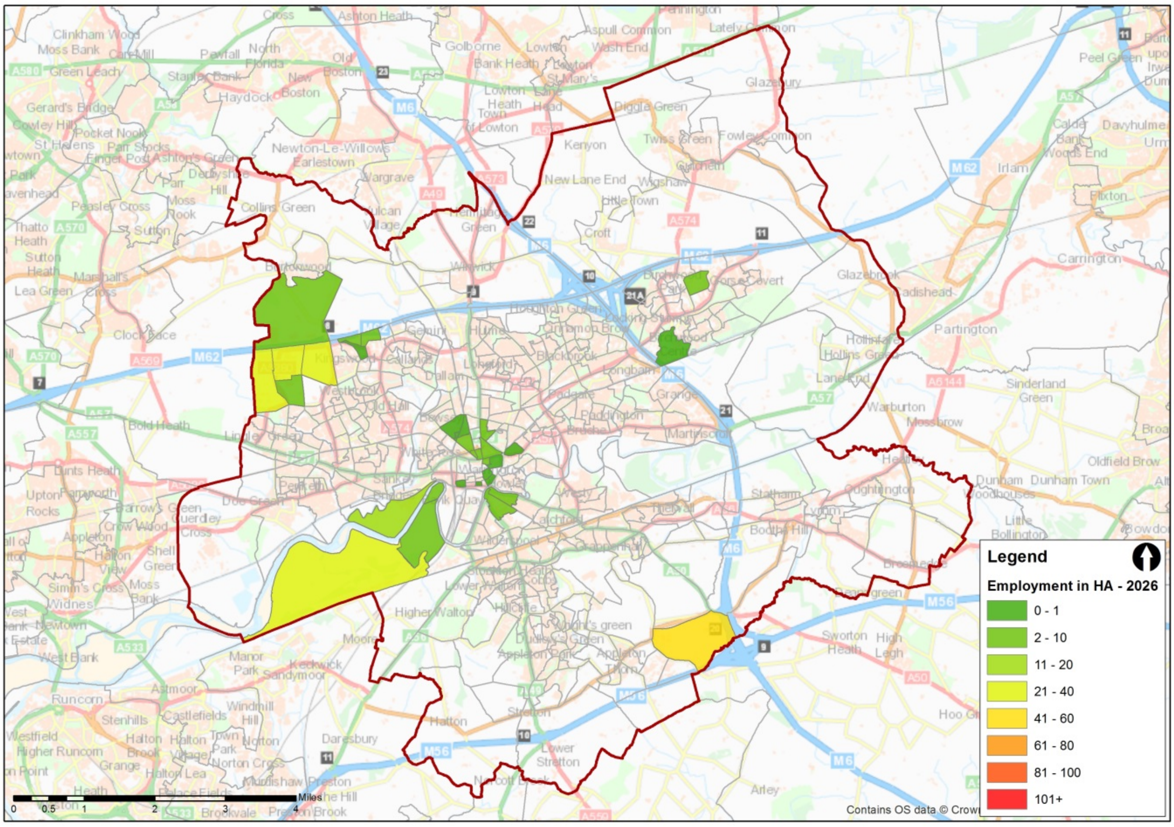


Figure 5. 2016 to 2036 Employment Allocation of PSVLP (hectares) to Model Zones

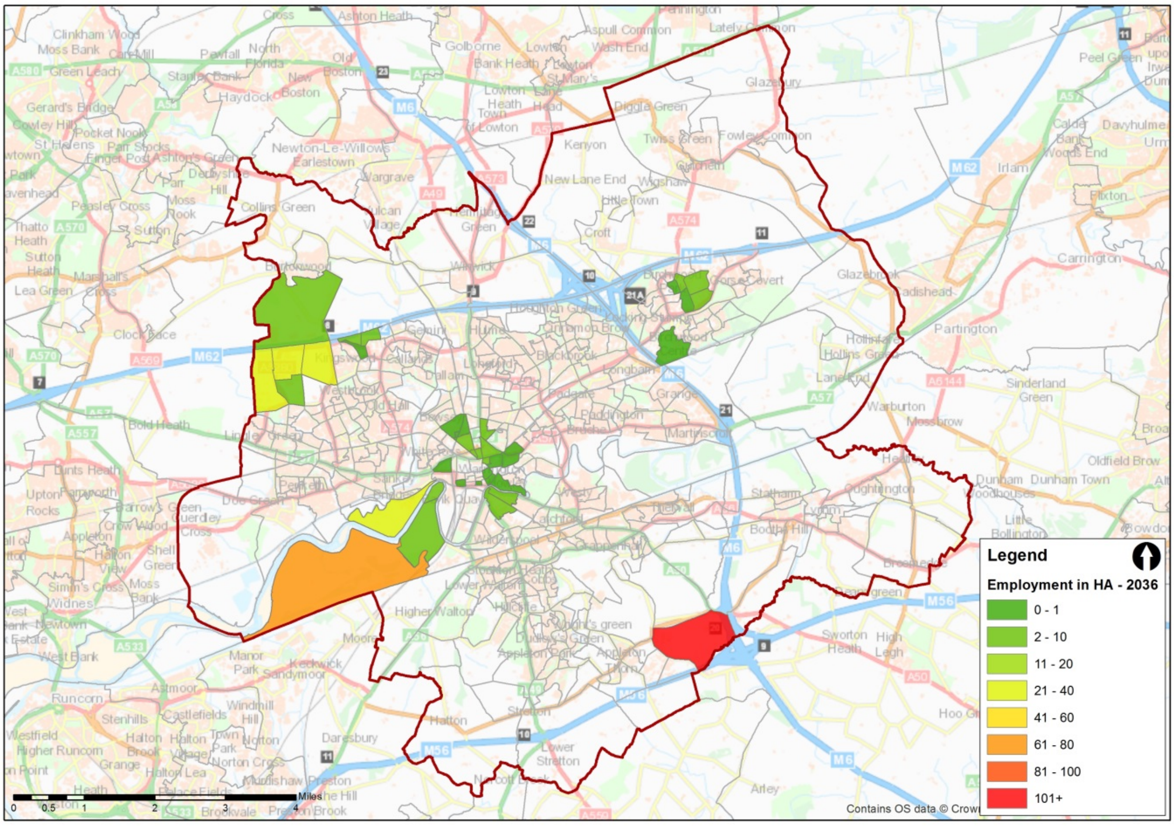


Figure 6. 2016 to 2026 Residential Allocation of PSVLP Growth (dwellings) to Model Zones

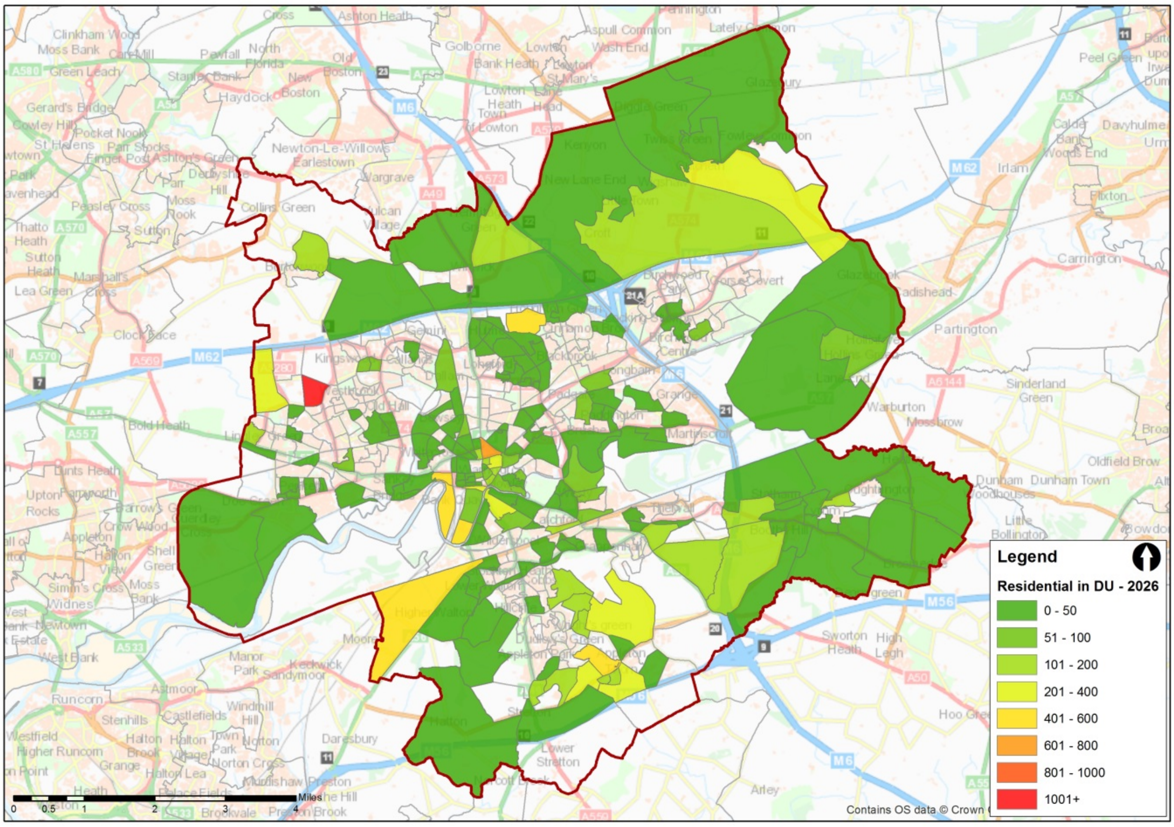
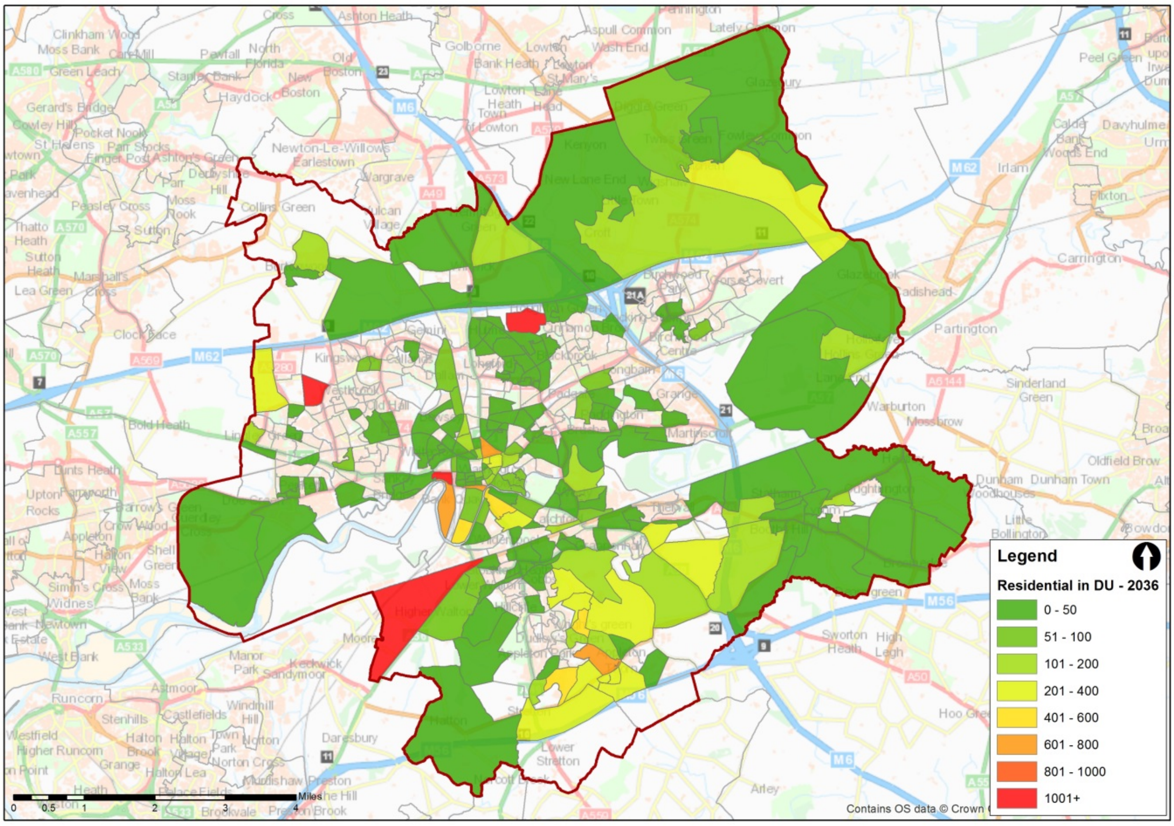


Figure 7. 2016 to 2036 Residential Allocation of PSVLP Growth (dwellings) to Model Zones



4. Forecast Supply – Transport Infrastructure & Policy Interventions

4.1 Context

This chapter covers Part 2 of the WMMTM16 Uncertainty Log and the key features of the supply component of the WMMTM16 forecasts; supporting infrastructure and policy interventions needed in order to be able to support the level of growth identified in the PSVLP.

In order to support the level of growth identified in the PSVLP, there is a need for investment in the transport network as well as a consideration for policies that deliver transformational behavioural change.

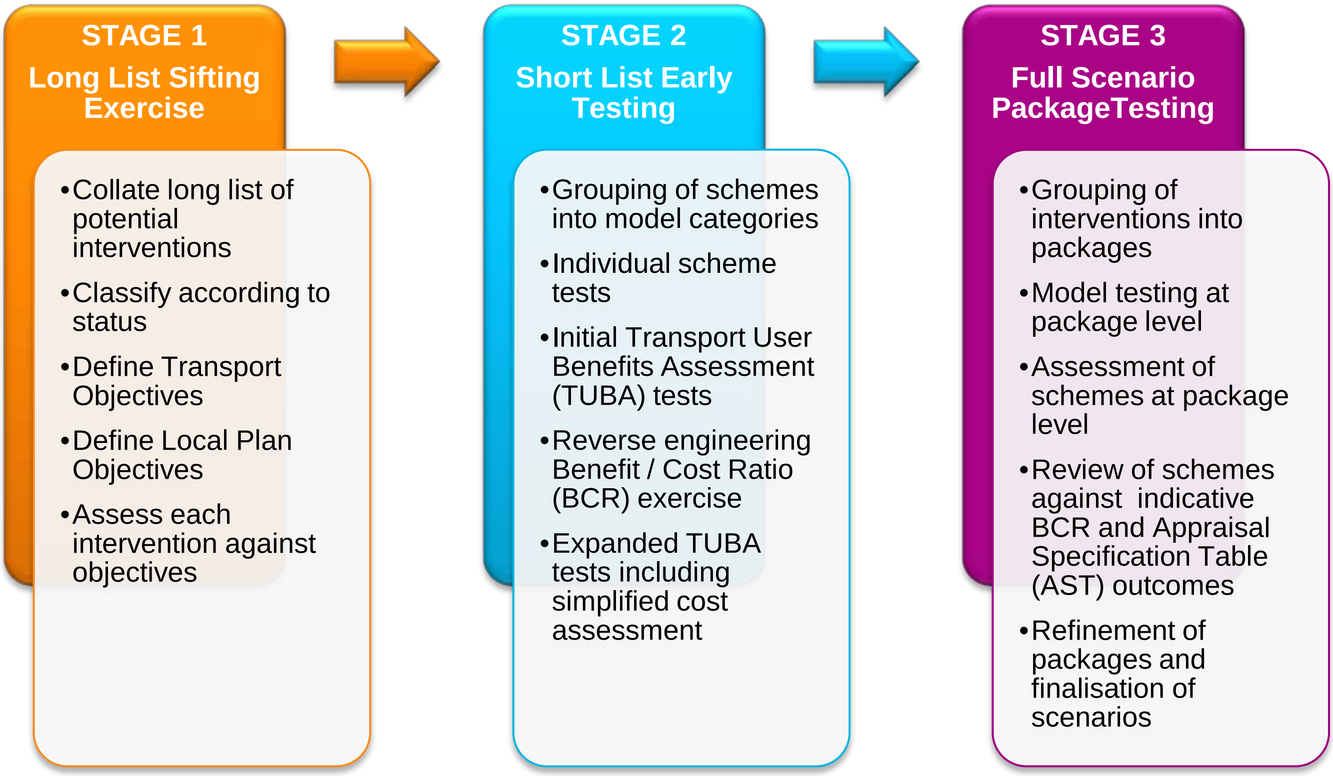
4.2 Scenarios

Three transport infrastructure and policy scenarios have been considered:

- **Scenario 1**
  - This scenario considers all the developments (land use changes) outlined in Chapter 3 with only committed highway infrastructure included.
- **Scenario 2**
  - As Scenario 1 plus a number of additional highway infrastructure schemes that are required to enable the PSVLP growth to occur in a number of locations.
- **Scenario 3**
  - As Scenario 2 plus 2 policy interventions in addition to those already committed.

The creation of these scenarios is the result of a multi-criteria assessment review of a long list of potential highway infrastructure schemes and policy interventions that could be implemented within the Borough. The potential interventions underwent a series of sifts with increasing levels of detailed analysis at each stage to derive the final scenario combinations. The key stages in this process are detailed in **Figure 8**.

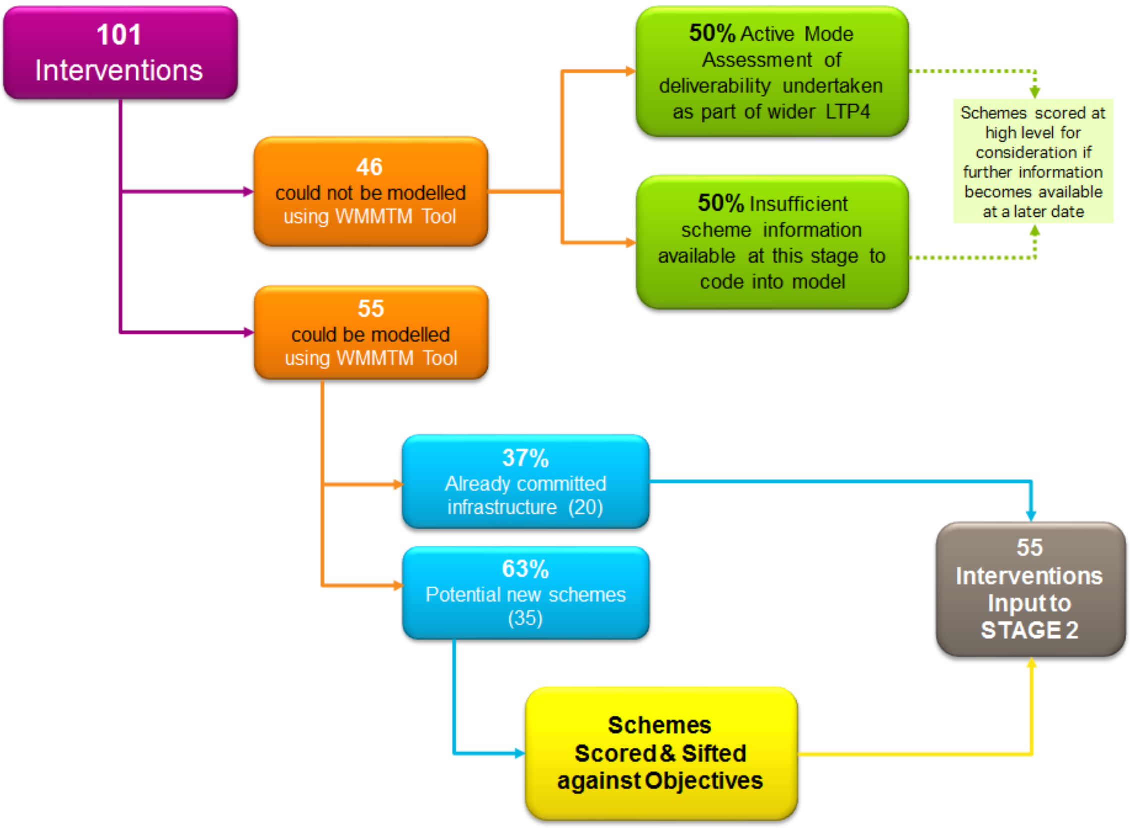
Figure 8. Process to Develop Final Scenario Packages



4.2.1 Stage 1 – Long List Sifting

Figure 9 summarises the process of sifting the long list of interventions against a number of model and wider policy objectives.

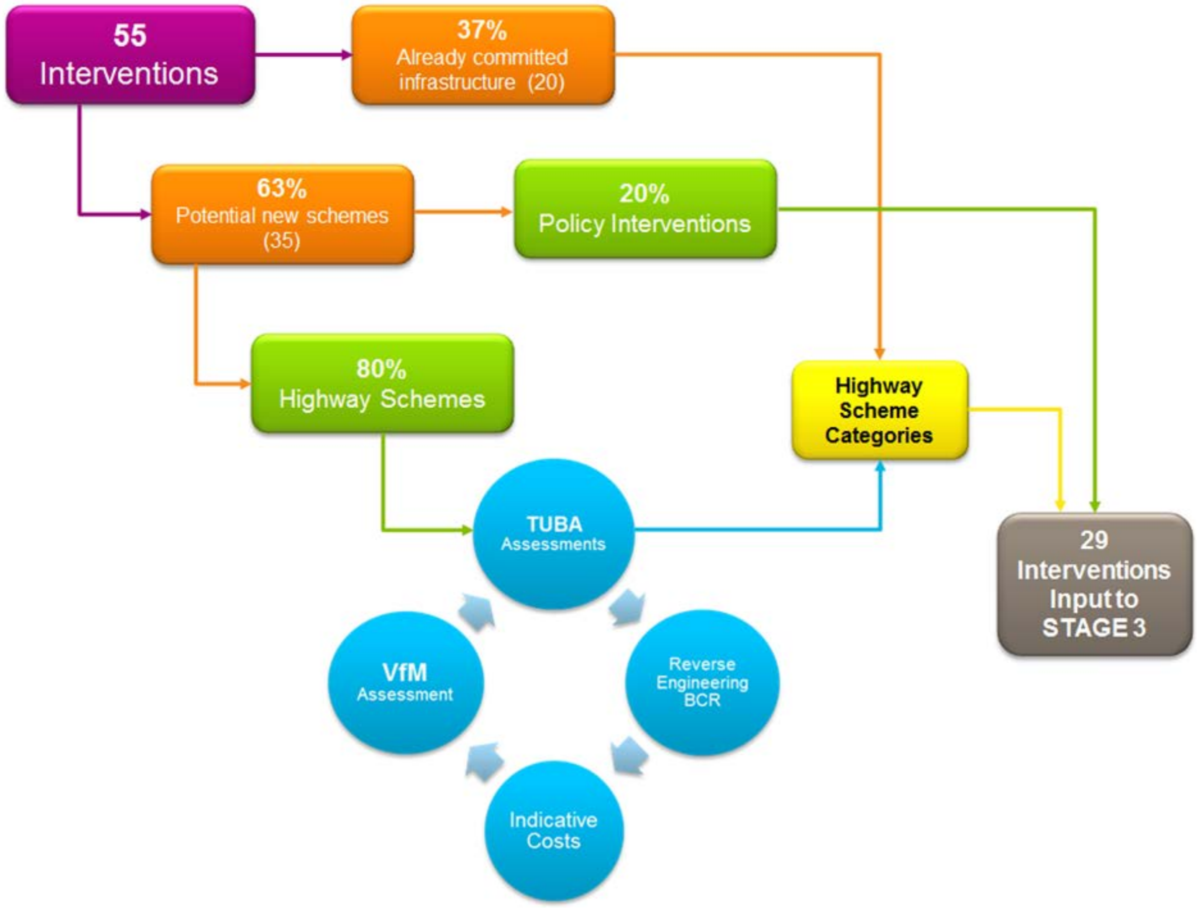
Figure 9. STAGE 1 Process Diagram



4.2.2 Stage 2 – Initial Short List Testing

Following Stage 1, **Figure 10** summarises the process of early scheme assessment and refinement.

Figure 10. STAGE 2 Process Diagram



Highway schemes were tested in the model in isolation to assess their respective impacts, and enable refinements to model coding and optimisation of the scheme design.

Each of the highway schemes was then run through a TUBA assessment with results giving a reasonable indication of which schemes were likely to deliver user benefits before any costs were taken into account.

The TUBA assessment was a 2-step process

- Step 1
  - Simple single year assessment looking at user benefits of 2036 only;
  - No costs assumed;
  - No BCR generated;
  - User benefits only, no wider benefits assumed.

Step 1 enabled further coding updates to be made to optimise scheme performance before undergoing more detailed assessment in Stage 2.

- Step 2
  - Expansion of Step 1 into a full 60 year benefit appraisal period;
  - Calculation of a ‘target’ Present Value of Costs (PVC) based on each scheme achieving a BCR of 2.0; and
  - This PVC was then converted into 2018 prices (assuming scheme opening in 2036).

- Step 2 produced results that gave early indication of those schemes that were producing greater benefits than dis-benefits.
- Schemes could then be allocated using WebTAG Value for Money (VfM) bands:
  - **Very High (>4)**
  - **High (2-4)**
  - **Medium (1.5-2)**
  - **Low (1-1.5)**
  - **Poor (<1)**

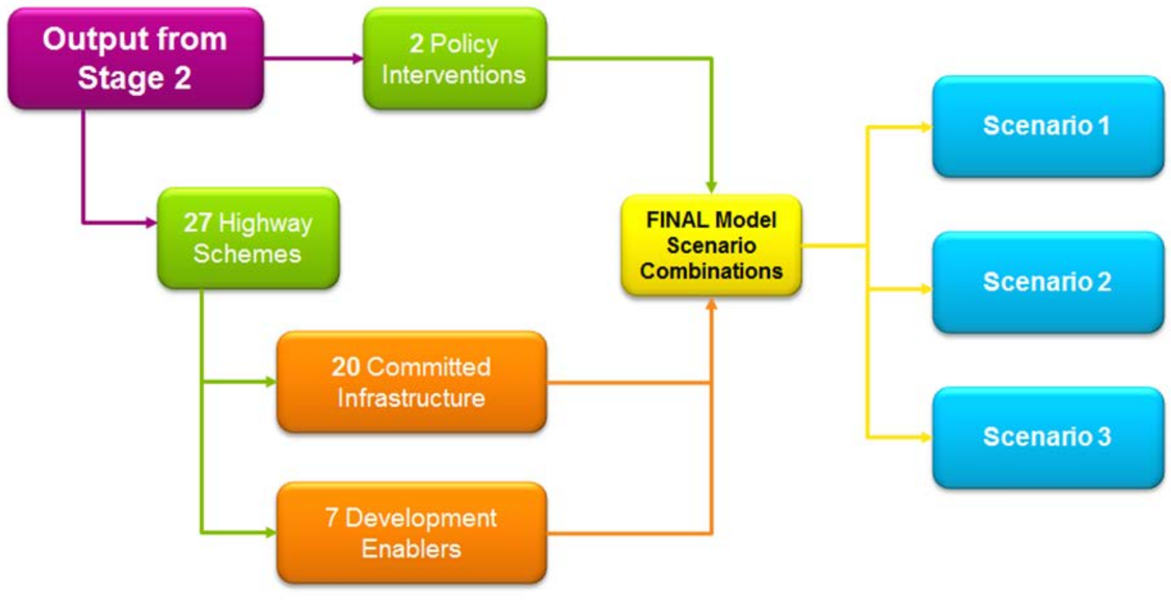
This step identified the schemes that were potentially worth considering and testing in more detail beyond this modelling exercise. It also enabled initial grouping of schemes into categories based on likelihood:

- Committed;
- Development enablers; and
- 'Other' interventions.

4.2.3 Stage 3 –Scenario Testing

The results of the initial testing of packages based on the 'likelihood' categories in Stage 2 start to show the relative contributions of groups of schemes to potential user benefits. This grouping was further refined and finalised in Stage 3 (**Figure 11**).

Figure 11. STAGE 3 Process Diagram



Once the highway schemes were finalised, testing began on combining the highway components with the wider policy interventions. From this, the final scenarios were produced. These are presented in **Table 7**.

Table 7. Final Scenario Combinations

Scenario	What's Included	Plus
Scenario 1	WMMTM16 Base Year Network + PSVLP Growth	+ 18 Committed Highway Infrastructure Schemes
Scenario 2	WMMTM16 Base Year Network + PSVLP Growth + 20 Committed Highway Infrastructure Schemes	+ 7 Highway Infrastructure Schemes to support PSVLP development
Scenario 3	WMMTM16 Base Year Network + PSVLP Growth + 20 Committed Highway Infrastructure Schemes + 7 Highway Infrastructure Schemes to enable PSVLP development	+ 1 Mass Transit Package + 1 'Go Dutch' Cycling Strategy

4.3 Transport Infrastructure

This section provides details on the schemes included in each modelled scenario.

4.3.1 Committed Infrastructure

In this context, an infrastructure scheme is considered 'committed' if it is included in a WBC programme of work and has funding sources identified and agreed. These schemes are either:

- Constructed during the time since the development of the 2016 base model;
- Currently being constructed; or
- Confirmed and programmed to be constructed during the forecasted period.

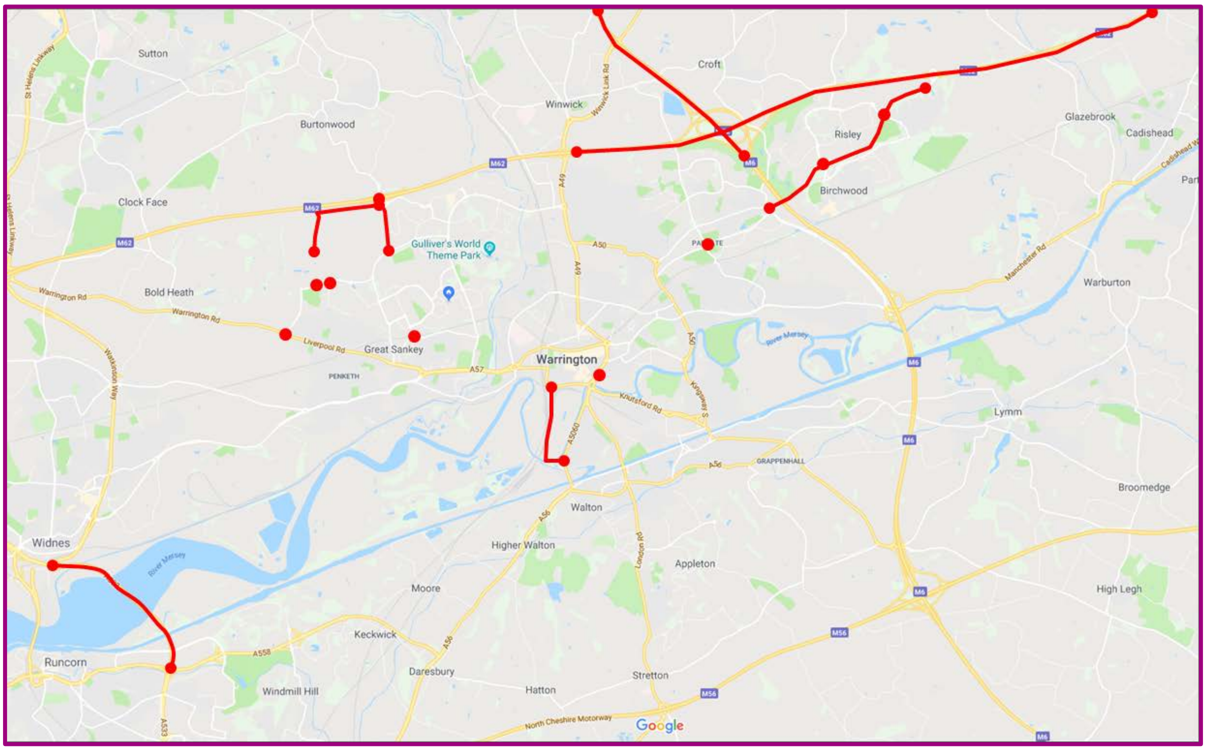
There are 18 committed infrastructure schemes included in the 3 scenarios. These are presented in **Table 8**.

Table 8. Committed Infrastructure

Scheme Name	Opening Year
Mersey Gateway Bridge	Built - 2017
Great Sankey Hub Junction	Built - 2017
Mersey Street Junction	Built - 2017
Skyline Drive	Built - 2016
Warrington East Phase 1	Built - 2017
M62 Junction 8 Improvements	Built - 2018
Omega Local Highway Schemes Phase 2A (Burtonwood Road / Kingswood Road)	Built - 2018
Omega Local Highways Phase 2B (A57 / Lingley Green Avenue Junction)	2020
Centre Park Link	2020
Warrington West Rail Station	2019
Warrington East Phase 2	2020
Omega Local Highways Schemes Phase 1 (Omega Boulevard)	2020

Scheme Name	Opening Year
Omega Local Highways Phase 3 (Zone 3-6 Junction Improvements)	2021
Warrington East Phase 3	2020
RIS1 - M62 Junctions 10-12 Smart Motorway	2020
RIS1 - M6 Junctions 21A-26 Smart Motorway	2022
RIS1 - M56 J11a Junction Improvements	2026
SMP – M6 J16-19	Built - 2019

Figure 12. Location of Committed Infrastructure



4.3.2 Development Enablers / Dependent Development

According to WebTAG Unit A2.2, Section 3.1.3 dependent development refers to:

> *"…a specific plot of land, which requires a complementary transport investment in order for a residential or non-residential development to proceed; in the absence of a transport scheme, the transport network would not provide a 'reasonable level' of service to new and/or existing users."*

A development could be considered dependent if there is a lack of access to the site, or the local transport network is not sufficient to handle the resultant travel demand. There is no precise definition of 'reasonable level of service' in WebTAG, such that decisions about dependency are judgement based. However, the guidance notes that if additional traffic can be accommodated by the network without significant increases in the costs of travel for existing users, then the network can be assumed to provide a reasonable level of service.

The selection of an appropriate scheme should take account of the need to resolve the dependency as well as the wider aims for the transport scheme.

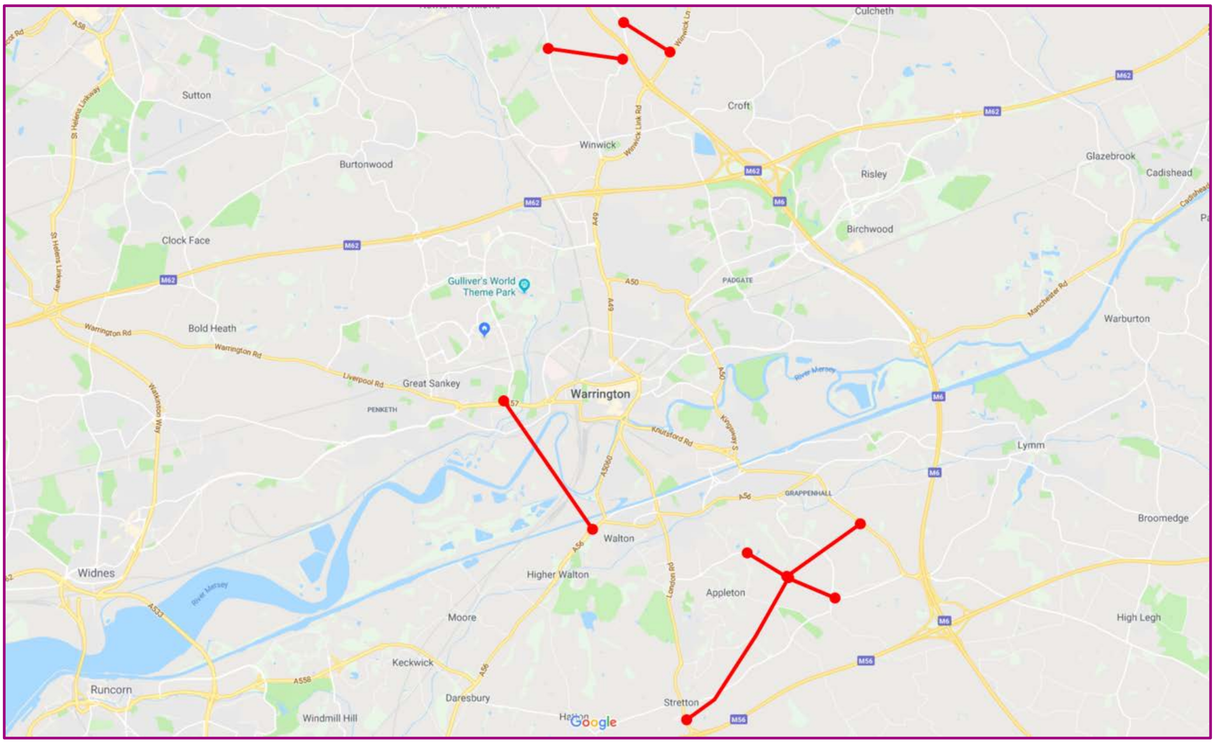
In Scenario 2 onwards, seven highway infrastructure schemes have been identified as 'development enablers'; schemes that are designed to open up areas of proposed development as well as alleviating pressures on the existing network. These schemes are seen to be the critical 'do minimum' level of infrastructure required to provide access to key sites outside of the existing urban area and are presented in **Table 9**.

As set out in Section 6 there remain a number of locations across the Borough where transport interventions are still potentially required over the Plan period as a result of either existing network conditions or the impact of planned growth, such locations are listed within the Infrastructure Delivery Plan (IDP) for the Proposed Submission Version Local Plan as concepts at this stage.

Table 9. Highway Infrastructure Schemes Deemed 'Development Enablers'

Scheme Name	'Needed by'
Warrington Western Link (Red Route)	2026
Warrington South Strategic Infrastructure – Cat & Lion Bypass	2026
Warrington South Strategic Infrastructure – Wrights Green Link	2026
Warrington South Strategic Infrastructure – Howshoots Link	2026
Warrington South Strategic Infrastructure – Wrights Green to A50 Link	2026
Parkside Link A	2026
Parkside Link B	2026

Figure 13. Indicative Location of Development Enablers



4.4 Policy Interventions and Transformational Change

In addition to the transport infrastructure that supports the PSVLP growth, there is a wider objective by WBC to promote more sustainable, active modes of travel and induce behavioural change within the Borough.

In Scenario 3 only, two policy interventions have been identified as strategies that are designed to provide alternate modes of travel within the Borough. These are presented in **Table 10**.

Table 10. Policy Interventions

Scheme Name	'Considered in'
Mass Transit Package	2036
Go Dutch Cycling Strategy	2036

Each of these interventions is discussed in more detail below.

4.4.1 Mass Transit Package

Mass Transit is a system of large-scale, integrated public transportation in an area, comprising of a multitude of modes. It is the transportation of people by means of buses, trains, or other vehicles running on fixed routes. It is potentially more economical, eco-friendly and less time consuming. In addition it is the most competent way of reducing the ever growing traffic congestion of a developing area. The drawback of the system is the necessity to travel on a fixed rather than an individually selected schedule and to board and disembark from the system only at certain designated locations.

The main idea behind a mass transit system is to reduce the number of vehicles on the road by providing a larger facility which carries higher number of passengers thus reducing or eliminating congestion.

The Council is considering a Mass Transit intervention as part of their Proposed Submission Version Local Plan Strategy and Infrastructure Delivery Plan but these proposals have not yet been developed to an extent to enable detailed modelling at this stage. The following assumptions have been applied to assess the impact a system could have on the highway network and highway users:

- 6 high level corridors/routes assumed (shown in **Figure 14**);
- Any trip with an origin or destination within 800m of these corridors would consider using Mass Transit;
- Mass transit would achieve a 20% market share of this potential demand;
- Services would reduce capacity for highway users;
  - At signalised junctions this was represented by the inclusion of an additional 6 seconds of all red time in each signal cycle. The junctions affected are shown in **Figure 15**.
  - No changes were made at non signalised junctions or to lane layouts, although it might be expected that at some locations there would be a greater impact on highway capacity.
- Any benefits assumed are to existing car users only. Costs and benefits to new and existing Mass Transit users have not been assessed at this stage.

Figure 14. Mass Transit Corridors

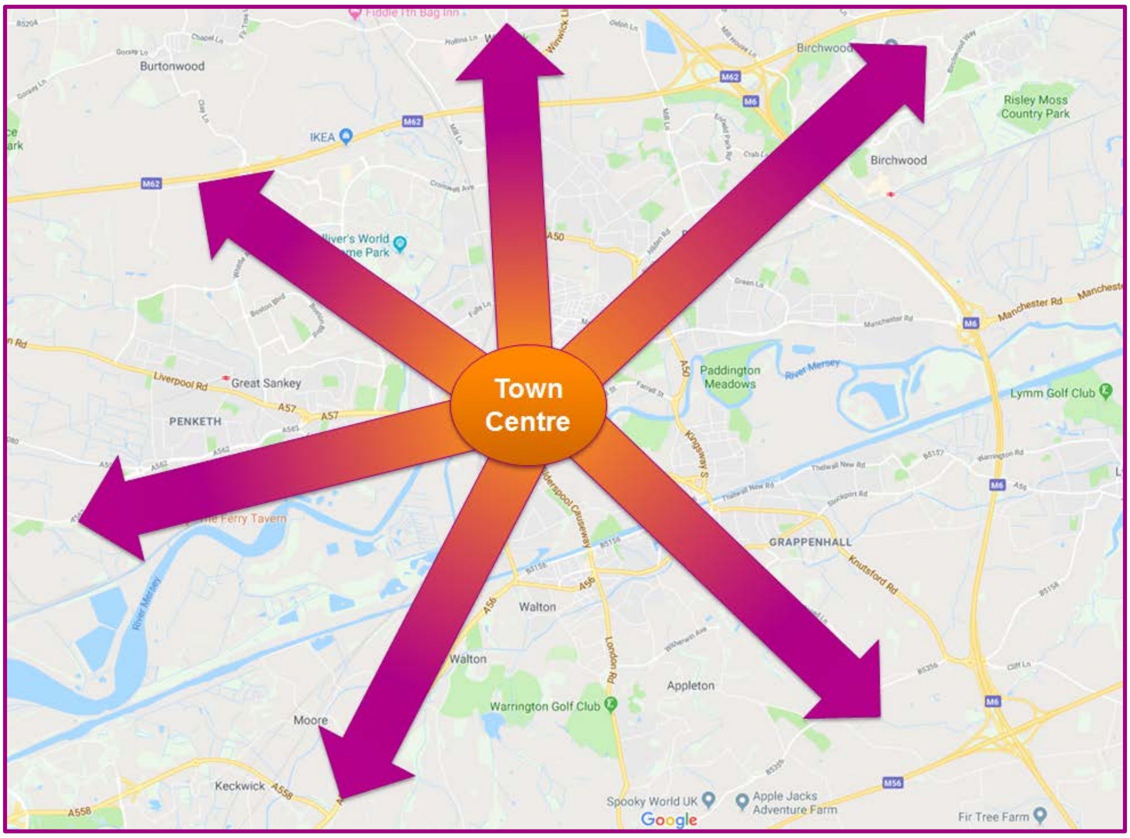
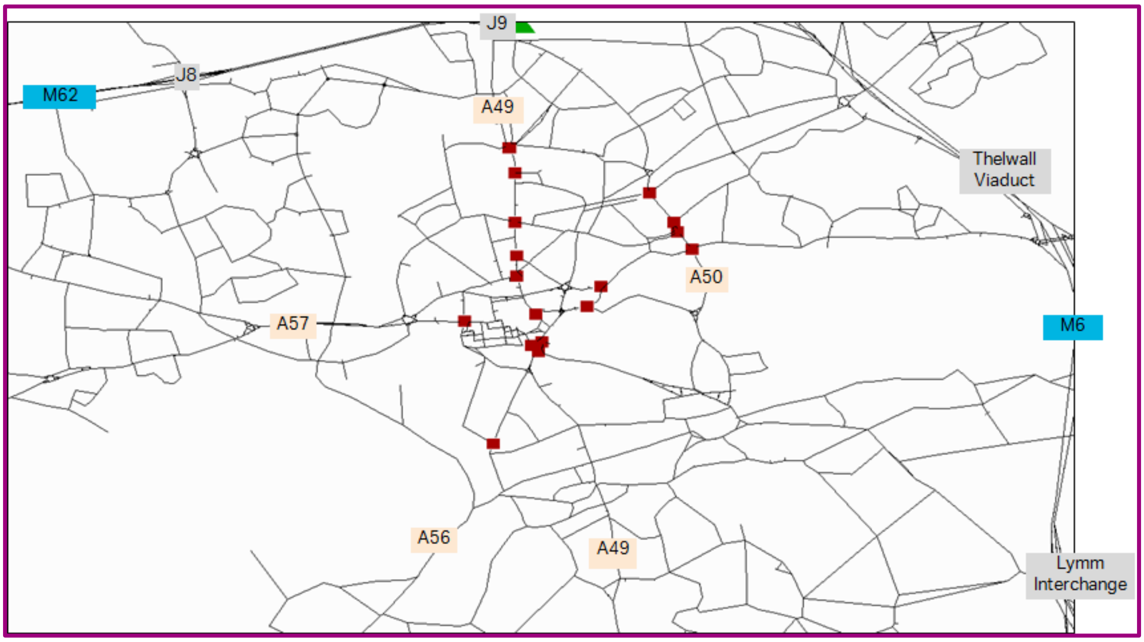


Figure 15. Signalised Junctions Affected by Mass Transit Network



4.4.2 Go Dutch Cycling Package

A 'Go Dutch' strategy involves a major shift in cycling investment and infrastructure. The crucial aspect of the strategy involves taking highway capacity away from car users and allocating it to cycle users.

This strategy tries to implement the model in operation in the Netherlands, in the form of cycle tracks offering a very high degree of priority and segregation for cyclists, designed to encourage higher levels of cycling. They are designed around people's needs, rather than being 'squeezed in' within existing infrastructure. In short, the Dutch model provides three separate transport networks:

– People travelling slowly (pedestrians);
– Medium-speed people (people cycling); and
– People travelling at high speed (motor vehicles).

In this way, cycling is acknowledged as distinct from other modes and is allocated its own dedicated space and is able to accommodate everyone's needs. Key design characteristics include:

– Distinct from pedestrian space - By definition, cycle tracks (as opposed to on-road cycle lanes) are separated from traffic lanes and pedestrians by a barrier.
– High quality surfaces - They are built like a road, not a pavement. They have a smooth concrete or asphalt surface, with proper foundations to stop tree roots coming up, and they are usable even at high speeds.
– Separation from the road - The higher the speed of the traffic, the greater the separation should be between the tracks and the main carriageway although, for safety, bikes should still be visible to car drivers.
– Junction design - The Dutch guidelines are designed to mitigate the problems experienced by cyclists at junctions as far as possible. For example, sharper corners are used to avoid cars speeding through, cycle crossings are raised, bike lanes are coloured, cyclists can wait in front of the traffic, etc. Traffic signals are also designed to include an additional green light phase especially for cyclists, and have favourable wait times at the junction.
– Roundabouts – a unique design and involve a physically separate track round the side, with various features to enable easy crossing by cyclists.

As this proposal has not yet been developed to an extent to enable detailed modelling at this stage, the following assumptions have been applied to assess the impact a system could have on the highway network and highway users (WebTAG unit A5.1 provides guidance on how modelling may be used to estimate future demand for active travel modes).

The following key assumptions were applied from Approach 2 in WebTAG A5.1, section 2.3:

- The transfer from car to cycle can occur for home-based trips of up to 8km (5 miles) in length (WebTAG guidance assumed 7.5 miles or less);
- Assumed Warrington local road network only (main network within motorway box, excluding the motorway itself);
- Of these short distance trips, only 40% would actually consider transferring to cycle;
- The default proportion of the population who currently cycle is assumed to be 2%;
- The strategy assumed that segregated cycling facilities would be created to cover the whole Borough area (See Table 1, WebTAG Unit A5.1, Section 2.3);
- The cycle facilities would have no impact on link capacity (assumed to be segregated wherever possible) but would affect junction capacity which we have reflected in the model by reducing the amount of green time available to other road users; and
- Any benefits assumed are to existing car users only. Costs and benefits to new and existing cyclists have not been assessed.

Applying these assumptions, this resulted in an additional 4.2% transfer of home based trips from car to cycle (6.2% in total, assuming 2% already cycle). This equates to approximately 10,200 new cycle trips per day in the network.

5. Transport Model Process

5.1 Context

The model has been designed to maximise the use of observed data from the base year, 2016, and then look at incremental changes in supply and demand to forecast the future based on assumptions about changes in population, land use, infrastructure etc.

Transport model forecasts are used to help predict the impact of future schemes, policies and land use changes on the operation of the network. The forecasts rely on the infrastructure that WBC deemed relevant to the modelled area to support the implementation of the PSVLP growth.

The model forecasts have been designed to demonstrate the extent to which transport patterns and network conditions could change over time as a consequence of increased demand and infrastructure changes for the two forecast years of 2026 and 2036.

5.2 Implementation of the Scenarios

Figure 16, **Figure 17**, and **Figure 18** illustrate the components that make up each modelled scenario (shown in green) and then the process from building the model through to generating model outputs. These figures demonstrate that whilst the components change between scenarios, the process of model assignment, and extraction of outputs remains the same.

Figure 16. Components of, and Model Process in Scenario 1

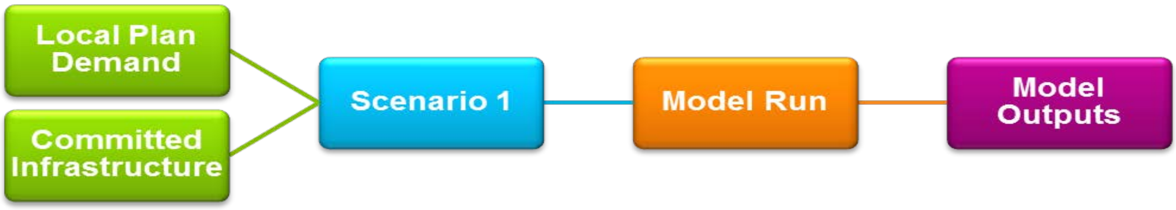


Figure 17. Components of, and Model Process in Scenario 2

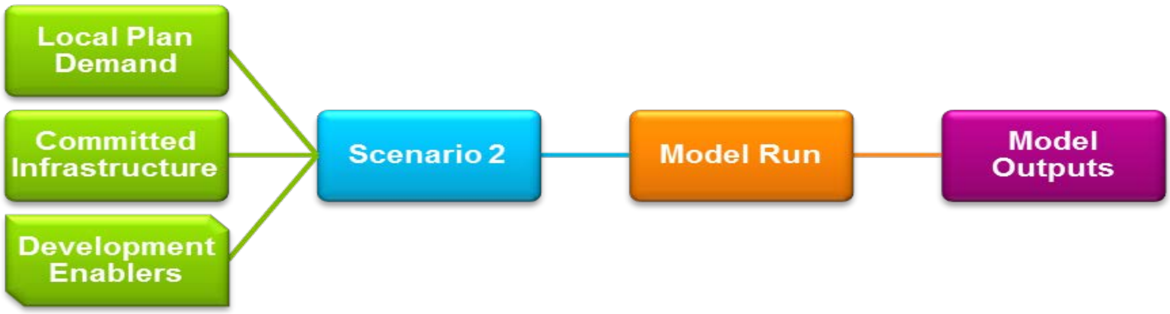
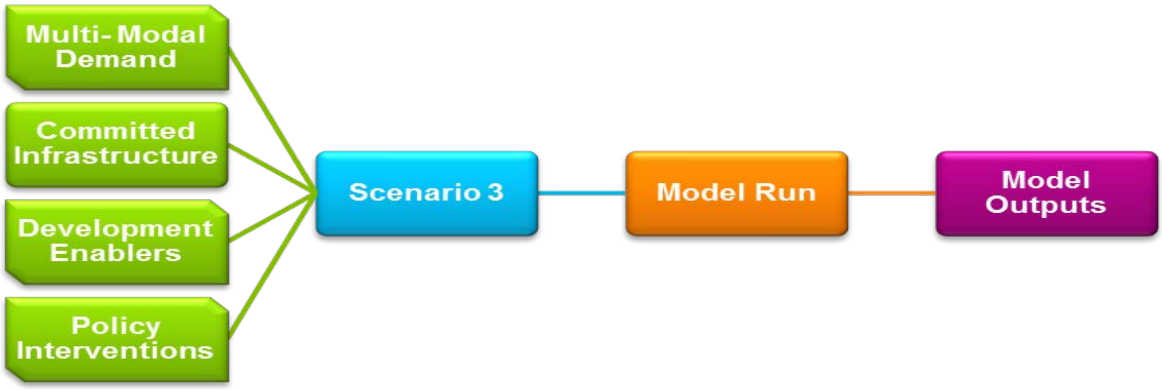


Figure 18. Components of, and Model Process in Scenario 3



6. Transport Model Results

6.1 Introduction

The WMMTM16 model produces detailed outputs for every transport link (road section, bus route etc.) taking account of a range of variables including:

- Forecast year;
- Time period;
- Mode of travel (car, bus etc.);
- Vehicle type; and
- Trip purpose (travel to work, leisure etc.).

This level of detail is very useful when it comes to identifying specific local detailed impacts but is not appropriate when seeking to take a high level view on the relative merits of different scenarios.

We therefore developed a number of key performance indicators (KPIs) that can aggregate model output to a level suitable for the task at hand.

It is important to consider the sensitivity of the model when looking at the model outputs; transport models use an equilibrium process to predict the mode, pattern and route of trips in response to changes in travel cost. The model is deemed to have reached a stable solution when flows or costs do not change significantly between each model run or iteration. These checks are undertaken at a model wide level and so there can still be some small variation in outputs which are not a direct result of the scenario being tested.

The results presented in this report relate to a forecast year of 2036.

6.2 Key Performance Indicators

The KPIs that have been developed for this testing process are summarised in **Table 11**.

Table 11. Model KPIs

KPI	Description
Delays	Looking at a combination of factors including: – Change in total vehicle hours delay; and – Delays on links and at nodes.
Travel Time	Looking at a combination of factors including: – Change in total vehicle hours; and – Changes in travel time along key routes.
Flows	Total car based flow across the canal screenline and the impact of additional crossings. Total car based flows across the Inner Cordon and the impact of additional links.
Demand Impacts	Impact of policy interventions on demand across the network.

The remaining sections of this chapter present the results of each scenario's performance against the KPIs.

6.3 Delays

This metric calculates the total vehicle hours delay time on each link within each scenario. **Table 12** presents the result of this metric for each modelled peak and a 12-hour 'daily' total and then the percentage change between each scenario. The percentage change in the Scenario 1 column represents the change relative to the 2016 base model. This shows the level of growth that the PSVLP demand is adding to the network by 2036.

Figure 19 to **Figure 21** show the delay hotspots at junctions for each of the modelled scenarios for the AM, **Figure 24** to **Figure 26** present the PM results. These plots only show the local network, with motorway links excluded. Motorway links are excluded as the relative levels of flow on those links would mask more local effects.

Figure 22 and **Figure 23** present a comparison between scenarios and compare the changes in delay on model links for the AM, with **Figure 27** and **Figure 28** providing equivalent information for the PM.

Table 12. Total Vehicle Hours Delay on Local Highway Network (excludes motorways)

Time Period	2016 Base Model	Scenario 1 2036	Scenario 2 2036	Scenario 3 2036	Total Change S1 to S3
AM	**2,186**	**3,280**	**3,060**	**2,640**	**-640**
AM % Change (to Base)	-	+50%	+40%	+21%	**-20%**
AM % Change (to previous Scenario)	-	n/a	-7%	-14%	
IP	**1,175**	**1,720**	**1,640**	**1,470**	**-250**
IP % Change (to Base)	-	+46%	+40%	+24%	**-15%**
IP % Change (to previous Scenario)	-	n/a	-5%	-10%	
PM	**2,299**	**3,440**	**3,220**	**2,800**	**-640**
PM % Change (to Base)	-	+50%	+40%	+22%	**-19%**
PM % Change (to previous Scenario)	-	n/a	-6%	-13%	
'Daily'	**14,950**	**22,120**	**20,900**	**18,470**	**-3,650**
Daily % Change (to Base)	-	+48%	+40%	+24%	**-17%**
Daily % Change (to previous Scenario)	-	n/a	-6%	-12%	

<u>Analysis of Metric</u>:

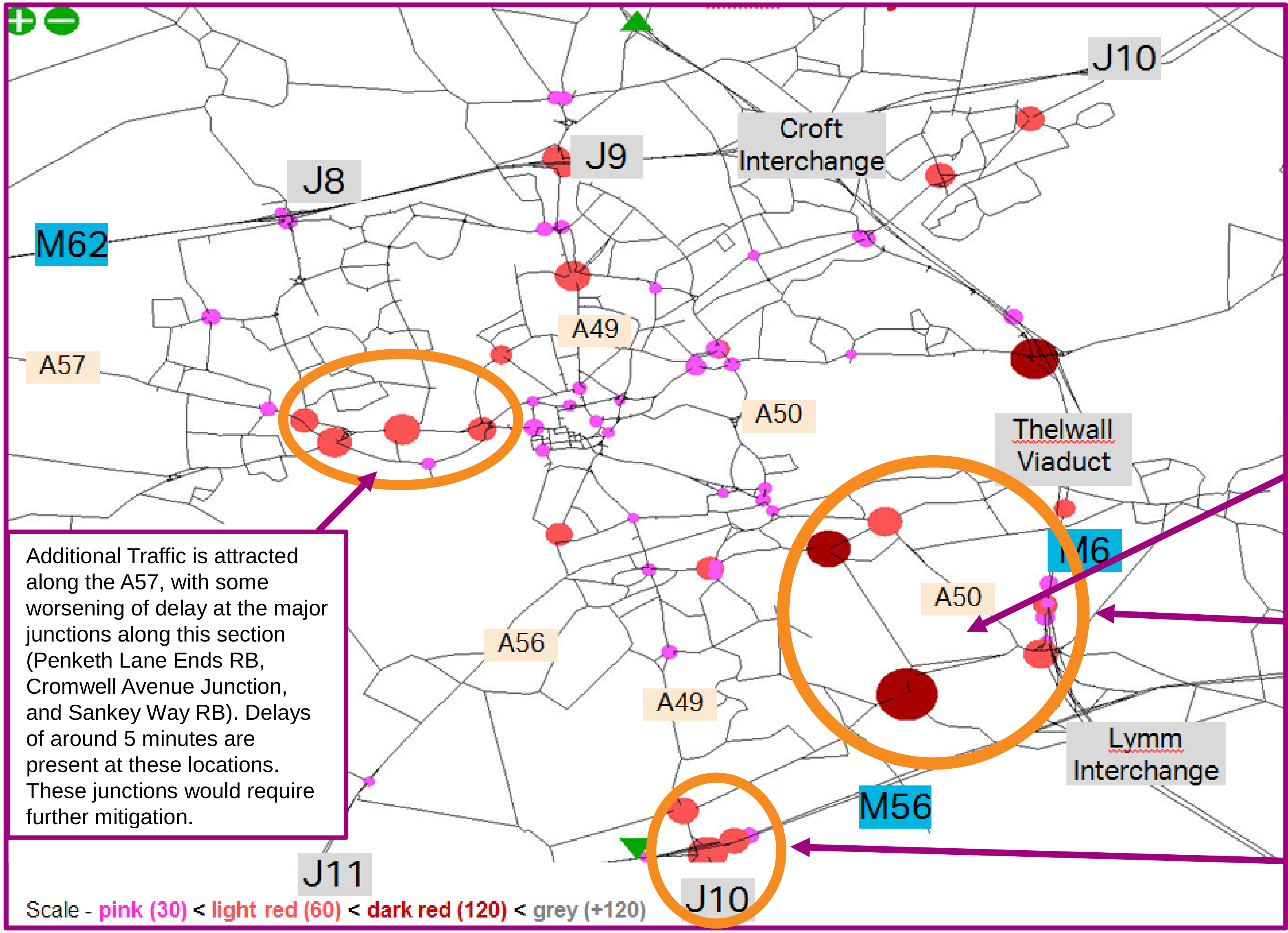
Delay on the local highway network worsens relative to the 2016 base in each of the 3 future year scenarios to 2036. Implementing those schemes that are currently in the committed pipeline (scenario 1) produces an increase of 50% in the AM, 46% in the IP and 50% in the PM Peak.

Adding in the schemes to enable development as well as the policy interventions, (Scenario 3) this impact is reduced to 21% in the AM, 24% in the IP and 22% in the PM relative to the base model.

This demonstrates that Scenario 3 offers the greatest benefits to vehicle delay in the local network.

Comparing across Scenarios, by implementing a full strategy alongside the PSVLP growth (Scenario 3) rather than just the existing committed infrastructure (Scenario1), cumulative reductions in vehicle hours delay between 15% (in the IP) and 20% (in the AM) are possible. The step change in improvements is greatest between Scenario 2 and Scenario 3 where the implementation of the policy interventions comes into effect.

Figure 19. Scenario 1 - AM 2036 - Node Delay (seconds)

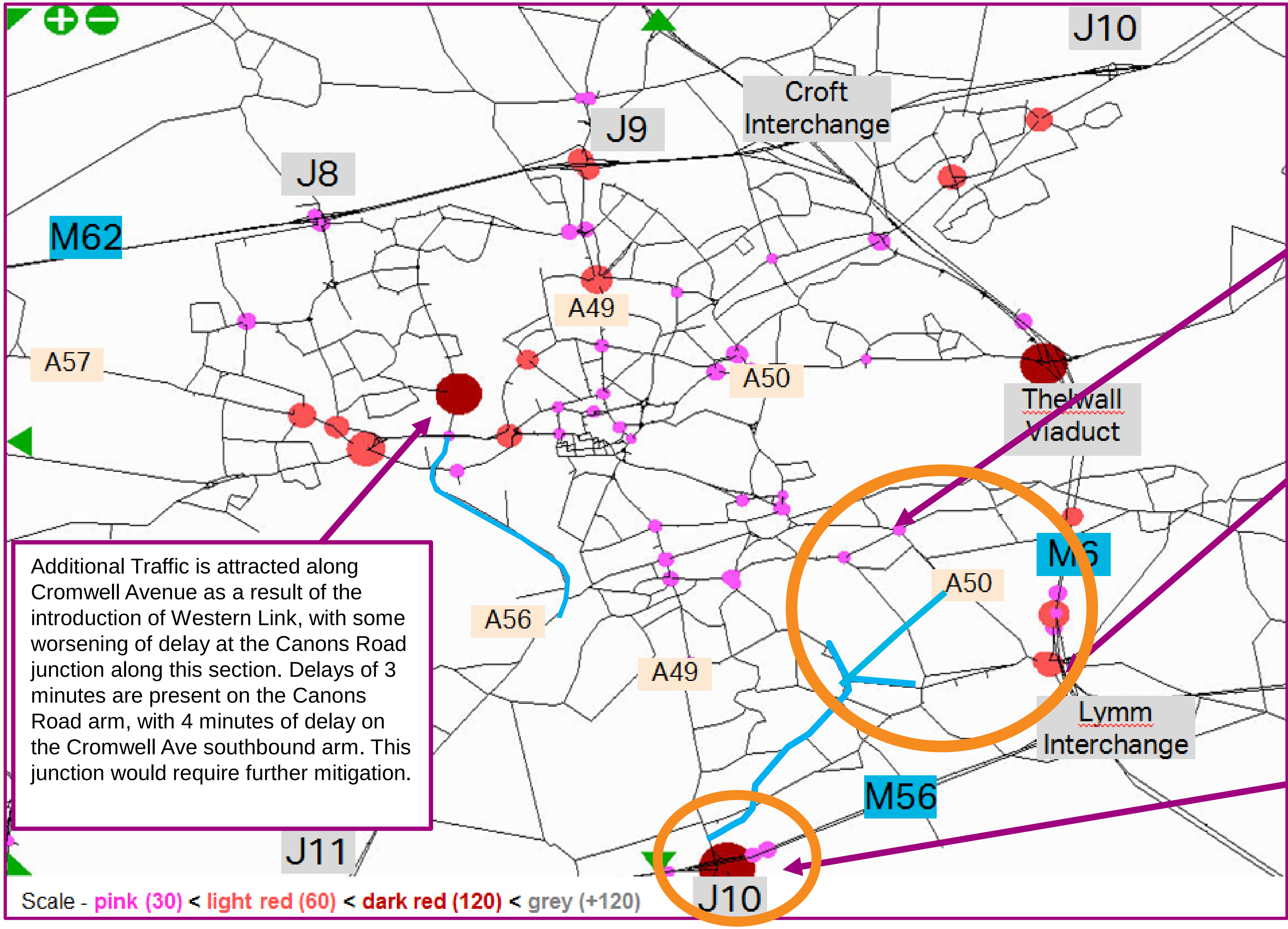


With only committed infrastructure included in Scenario 1, there are large delays at key junctions in the SE, affecting the A49, A50 and A56.

- Delays of 5 minutes are evident at the Cat & Lion junction (B5356 Stretton Road arm)
- Delays of 5 minutes are evident on the B5356 Grappenhall Lane arm at the junction with Barleycastle Lane
- Delays between 3-5 minutes are present on arms at junctions along the A56 Chester Road in Grappenhall (junctions with Broad Lane and Knutsford Road affected).

Key Motorway junctions are also affected – M56 J10 and M6 J20
M56 J10 - M56 Westbound off-slip and the A559 Northwich Rd are the two arms affected here. The delays at both of these arms is a result of added circulatory demand on the roundabout coming from the A49 (London Rd), limiting the ability of traffic to enter the roundabout. Delays are between 1-3 minutes on individual arms.

Figure 20. Scenario 2 - AM 2036 - Node Delay (seconds)



Additional Traffic is attracted along Cromwell Avenue as a result of the introduction of Western Link, with some worsening of delay at the Canons Road junction along this section. Delays of 3 minutes are present on the Canons Road arm, with 4 minutes of delay on the Cromwell Ave southbound arm. This junction would require further mitigation.

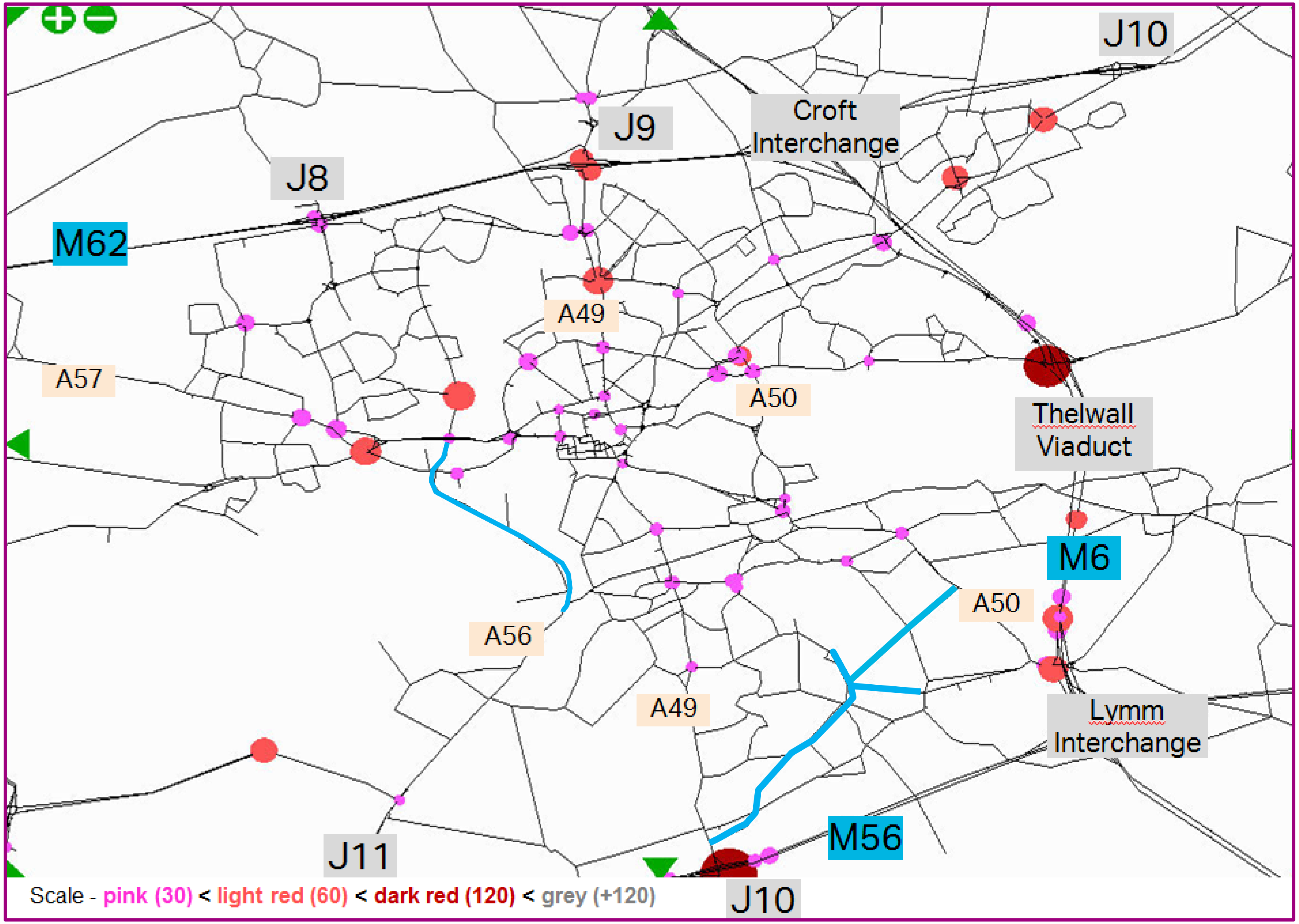
Following the introduction of the Critical Development Enabling Schemes, the delays in the SE are reduced:
- Delays on arms at junctions along the A56 Chester Road in Grappenhall (junctions with Broad Lane and Knutsford Road) are reduced to less than 3 minutes in both locations.
- Delays on the B5356 Grappenhall Lane arm at the junction with Barleycastle Lane are reduced to less than 2 minutes on arms in this area.

There is some small improvement in delay at M6 J20 (compared to Scenario 1) as a result of the additional schemes but does not remove the delay completely. This junction requires further mitigation.

There is some worsening of delay at M56 J10 as a result of the SE schemes but this is confined to two entry arms of the roundabout (M56 Westbound off-slip and the A559 Northwich Rd). The delays at both of these arms is a result of added circulatory demand on the roundabout coming from the A49 (London Rd), limiting the ability of traffic to enter the roundabout. Delays are between 2-3 minutes.

The Cat & Lion Junction improves as a result of the Cat & Lion bypass scheme being implemented (less than 2 minutes delay in this scenario).

Figure 21. Scenario 3 - AM 2036 - Node Delay (seconds)

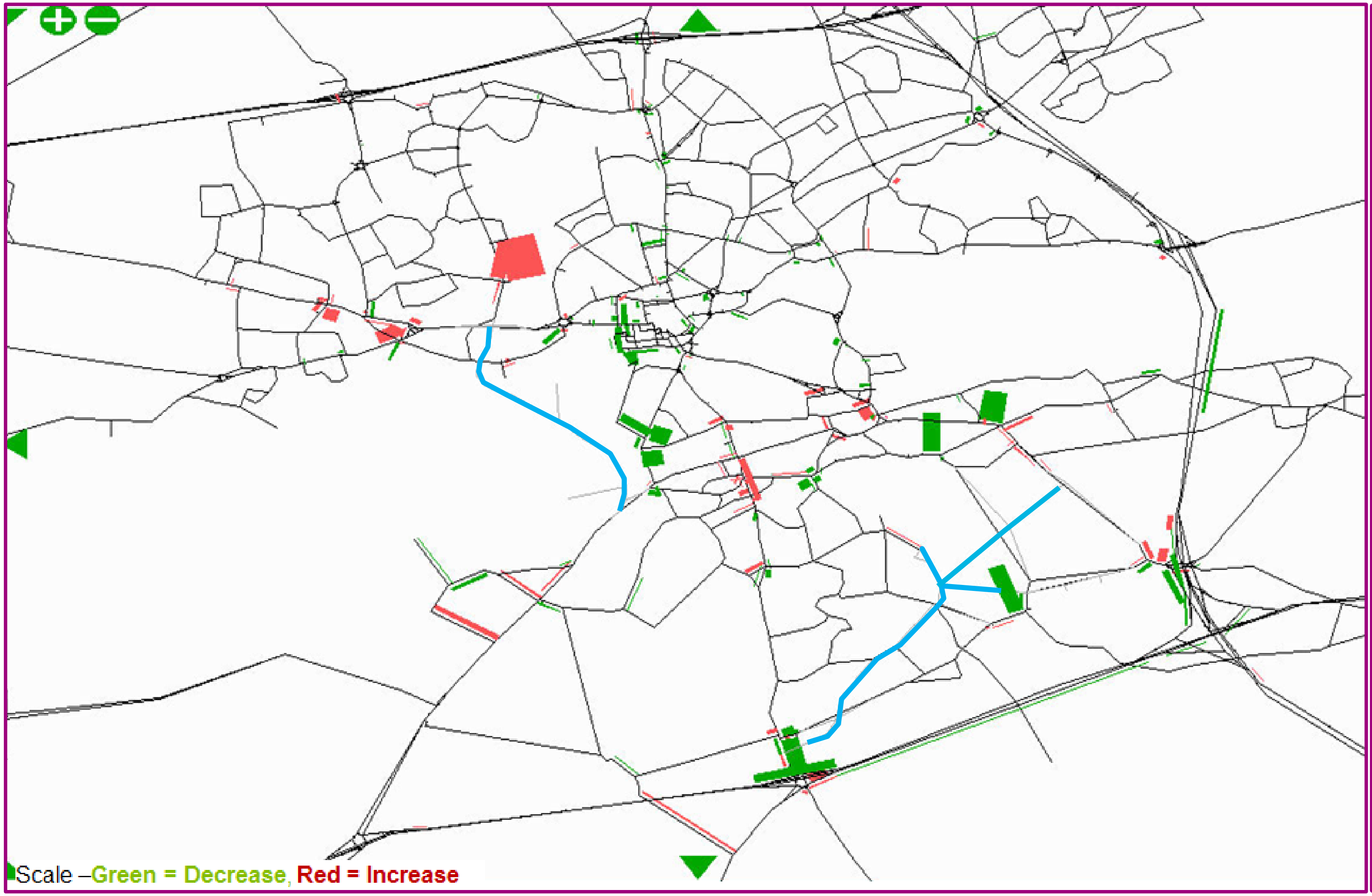


Following the introduction of Mass Transit and a 'Go Dutch' cycling strategy, highway demand on the network is reduced, resulting in improvements in delay across the Borough.

There remains a number of junctions and corridors with localised congestion issues and these would require further mitigation (for example, the A49 Corridor).

Delays at M56 J10 as a result of the SE schemes remain in this scenario.

Figure 22. Changes in Link Delay (seconds) following the introduction of the Critical Development Enablers (Comparison of Scenario 1 vs. Scenario 2, AM 2036)

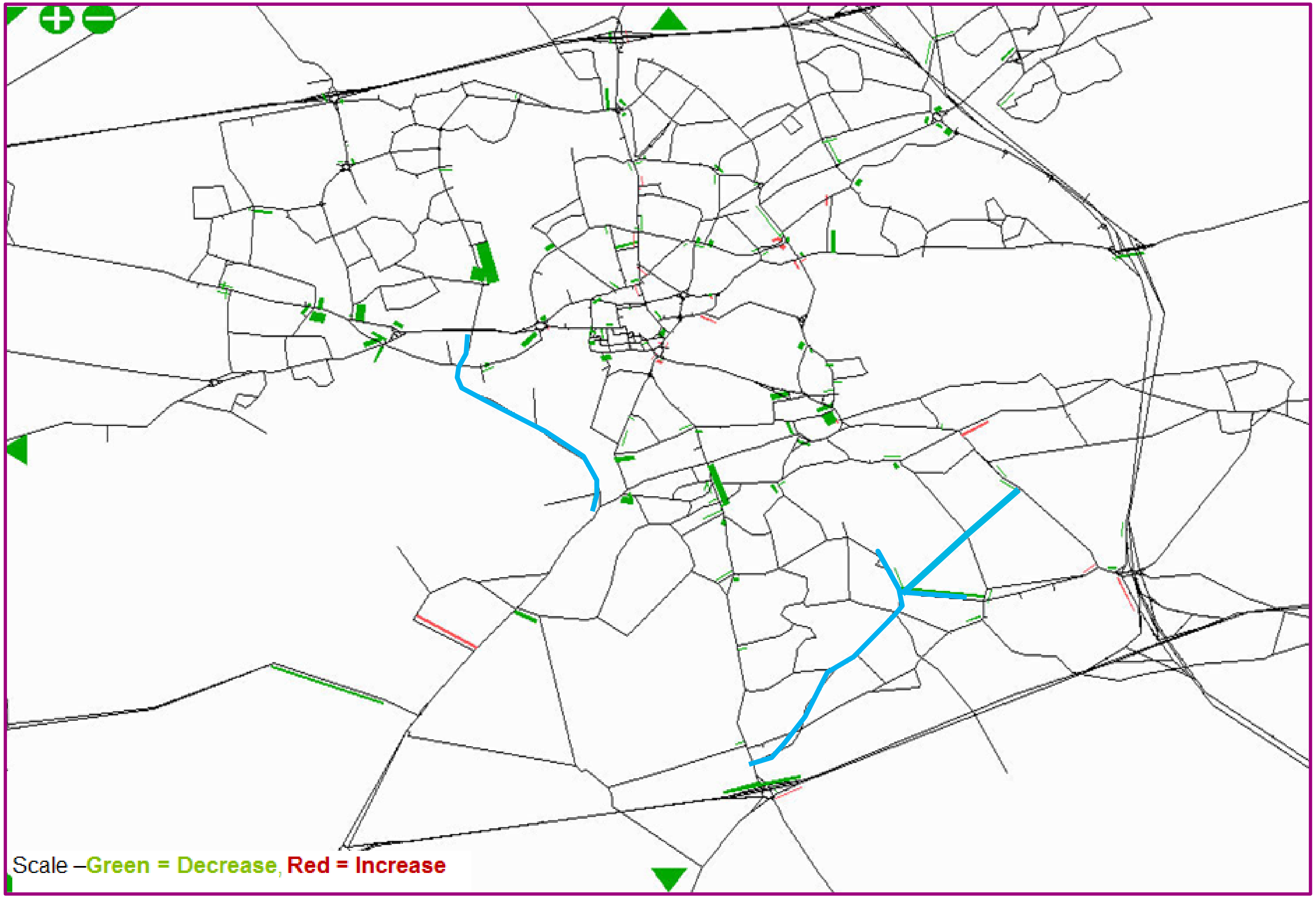


Scenario 2 produces greater improvements in link delay when compared to Scenario 1.
- Up to 3 minutes of improvement along the A56 Chester Road in Grappenhall (Broad Lane junction and Knutsford Road junction)
- Up to 3 minutes of improvement along the B5356 Stretton Road at the Cat & Lion junction.

There are only a small number of locations where delay is worse in Scenario 2; Cromwell Avenue junction with Canons Road (as a result of Western Link attracting higher flows along this route), and Cliff Lane Roundabout (as a result of the additional connection with the SE infrastructure enabling easier access to M6 J20).

- Delays at the Cromwell Ave / Canons Road junction are in the region of an additional 3 minutes on the Cromwell Avenue southbound arm.
- Up to 1 additional minute of delay on the approach to M6 J20 at Lymm Interchange from the A50.

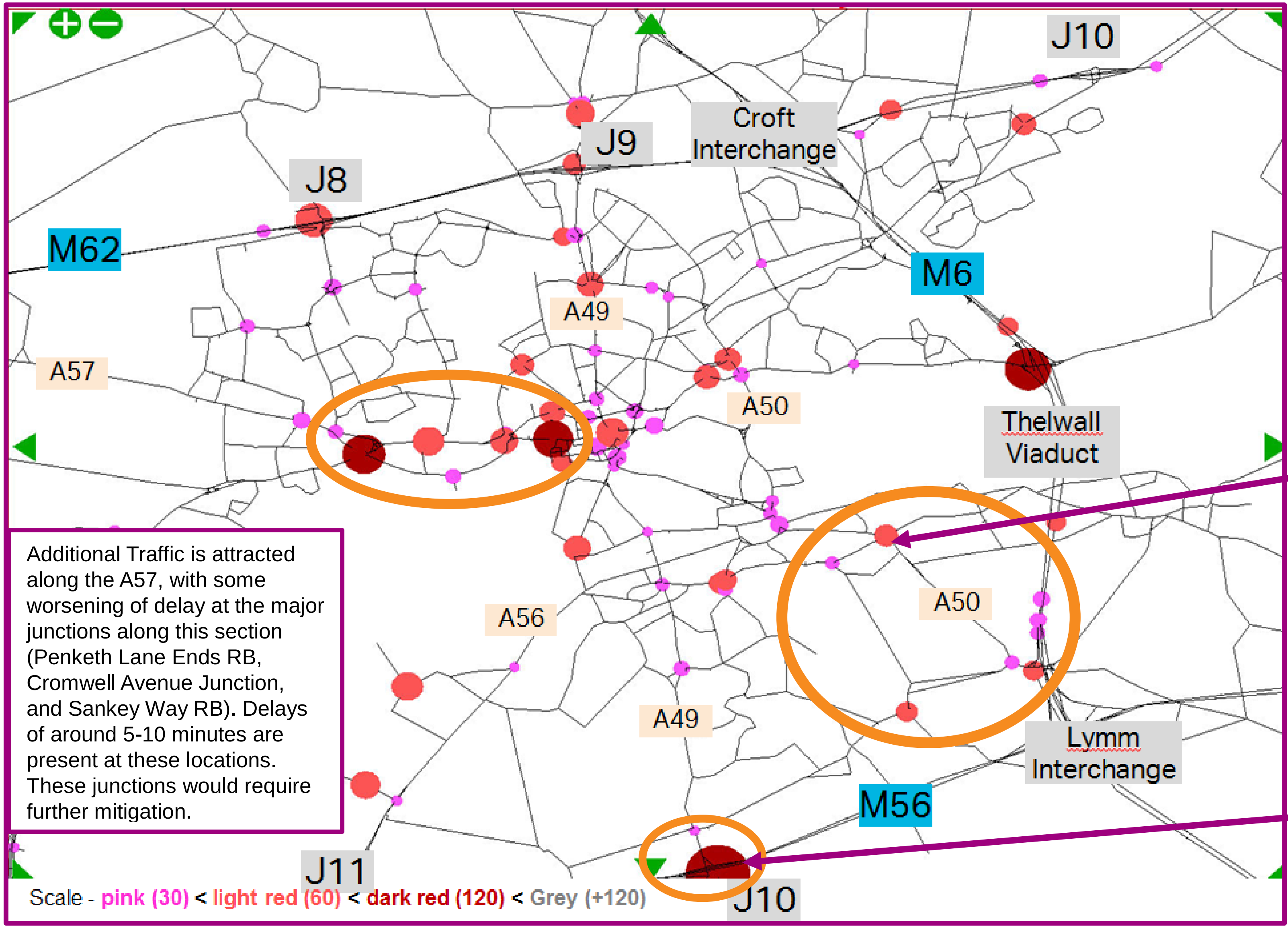
Figure 23. Changes in Link Delay (seconds) following the introduction of the Critical Development Enablers (Comparison of Scenario 2 vs. Scenario 3, AM 2036)



Further improvements in link delay are evident when adding in the 2 policy interventions which reduce highway demand across the network.

Very few locations experiencing a worsening of delay relative to scenario 2. Where previously Scenario 2 produced additional delay in a number of locations, the multi-modal strategy helps alleviate these issues.

Figure 24. Scenario 1 - PM 2036 - Node Delay (seconds)



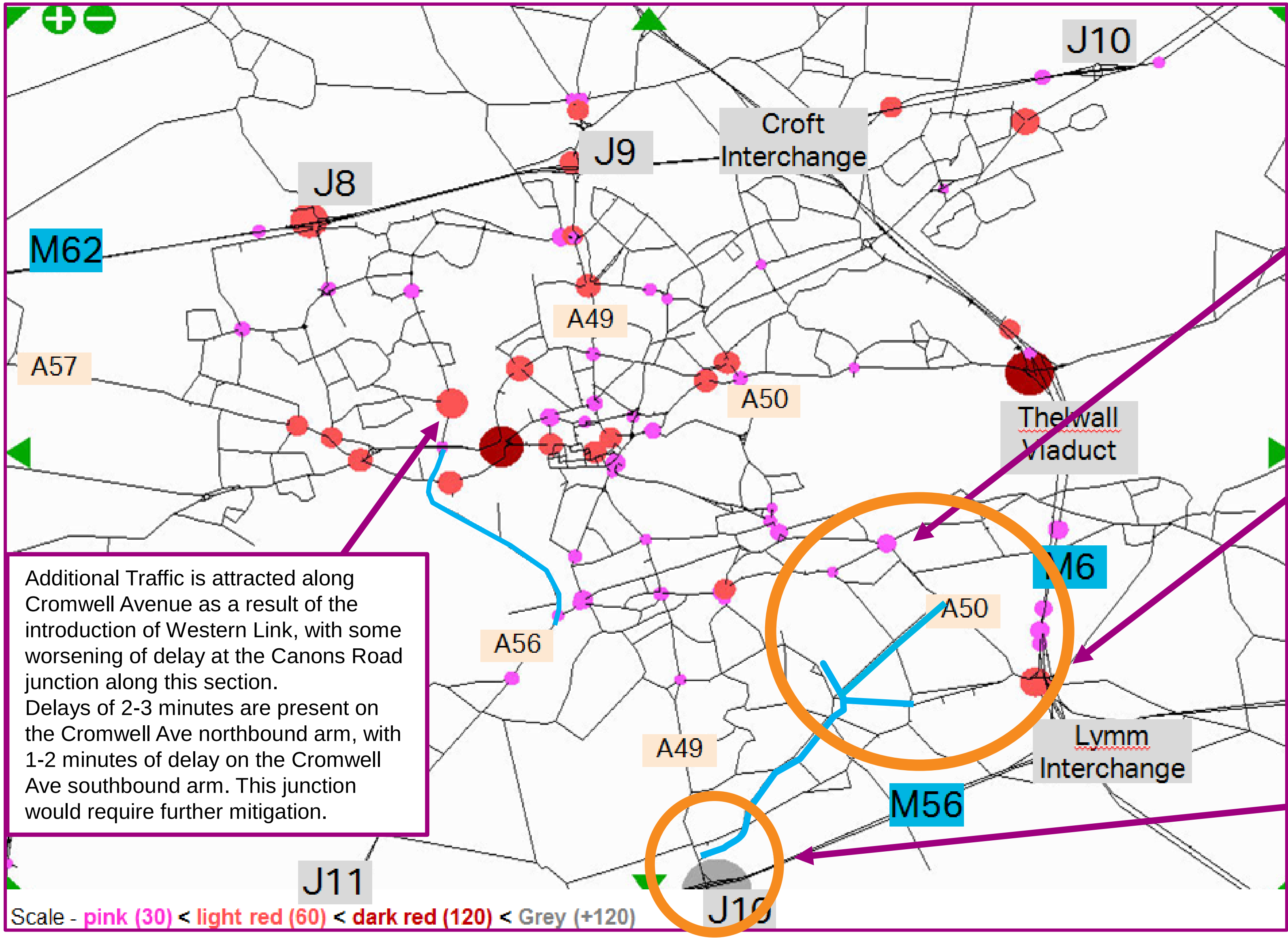
With only committed infrastructure included in Scenario 1, there are delays at key junctions in the SE, affecting the A49, A50 and A56.
- 2-3 minutes of delay along the B5356 Grappenhall Lane / Barleycastle lane arms.

- 5 minute delays evident on the Broad Lane arm of the junction with A56 Chester Road (in Grappenhall)

- 2 minute delays on the A50 Knutsford Road northbound arm at the junction with A56 Chester Road (in Grappenhall)

Key Motorway junctions are also affected – M56 J10 and M6 J20
- M56 J10 - M56 Westbound off-slip and the A559 Northwich Rd are the two arms affected here. The delays at both of these arms is a result of added circulatory demand on the roundabout coming from the A49 (London Rd), limiting the ability of traffic to enter the roundabout. Delays are between 2-4 minutes on these arms.
- M56 J20 – A50 Cliff Lane RB and M6 J20 Northbound off-slip are 2 of the arms affected. Delays between 1-2 minutes

Figure 25. Scenario 2 - PM 2036 - Node Delay (seconds)



Additional Traffic is attracted along Cromwell Avenue as a result of the introduction of Western Link, with some worsening of delay at the Canons Road junction along this section.
Delays of 2-3 minutes are present on the Cromwell Ave northbound arm, with 1-2 minutes of delay on the Cromwell Ave southbound arm. This junction would require further mitigation.

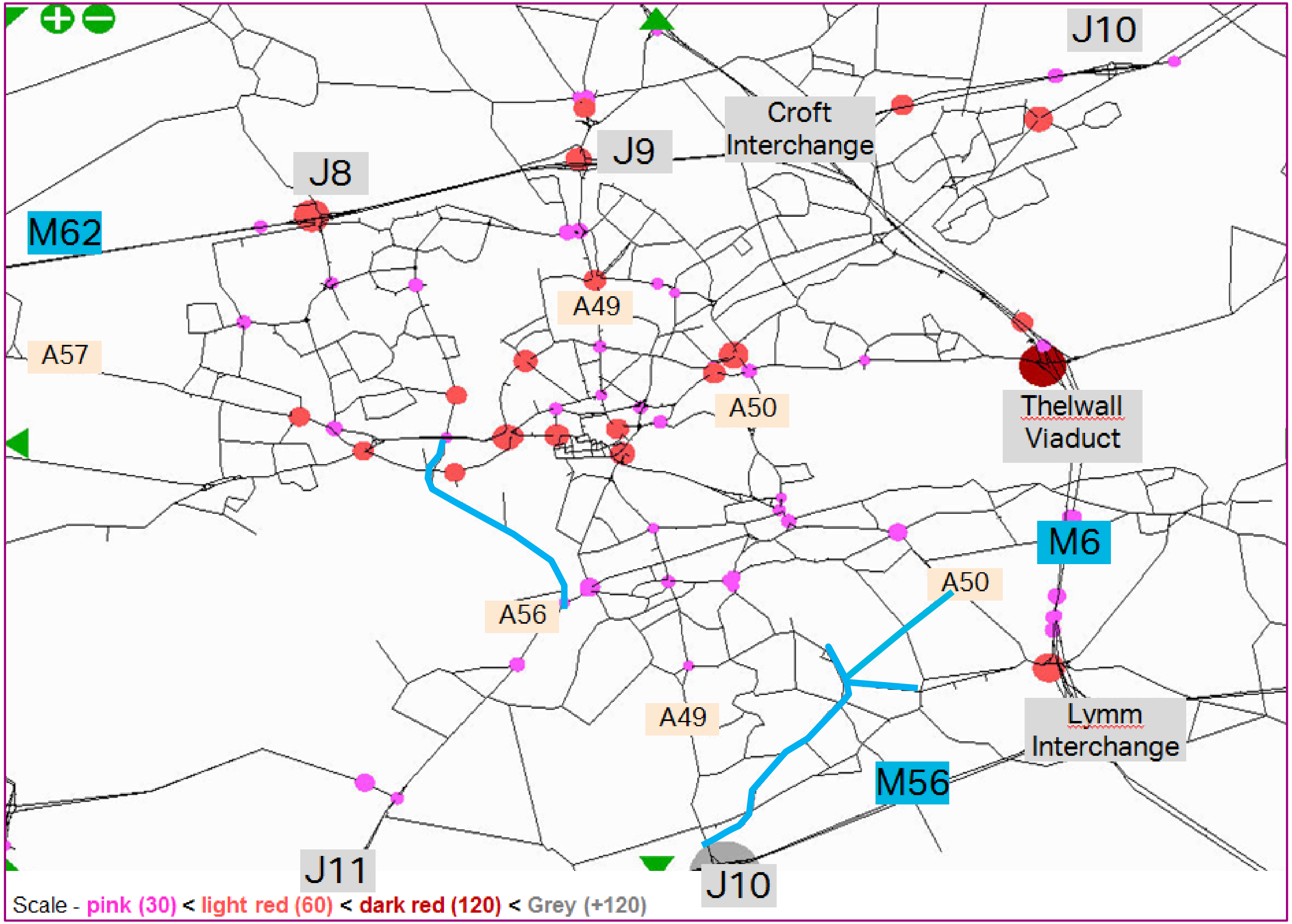
Following the introduction of the Critical Development Enabling Schemes, the delays in the SE are reduced but there is still evidence of a 5 minute delay on the Broad Lane arm of the junction with A56 Chester Road (in Grappenhall).
- Delays at the A50 Knutsford Road junction with A56 Chester Road (in Grappenhall) are now less than 2 minutes on any arm.
- Delay along the B5356 Grappenhall Lane / Barleycastle lane arms are now less than 1 minute on any arm..

There is some small deterioration in delay at M6 J20 (now approximately 2 minutes on the gyratory compared to 1 minute in Scenario 1) as a result of the additional schemes. This junction requires further mitigation.

There is some worsening of delay at M56 J10 as a result of the SE schemes.
- M56 J10 - M56 Westbound off-slip and the A559 Northwich Rd are the two arms affected here. The delays at both of these arms is a result of added circulatory demand on the roundabout coming from the A49 (London Rd), limiting the ability of traffic to enter the roundabout. Delays are between 2-4 minutes on these arms.

The Cat & Lion Junction improves as a result of the Cat & Lion bypass scheme being implemented (previously 3 minutes delay in Scenario 1, now less than 2 minutes delay).

Figure 26. Scenario 3 - PM 2036 - Node Delay (seconds)

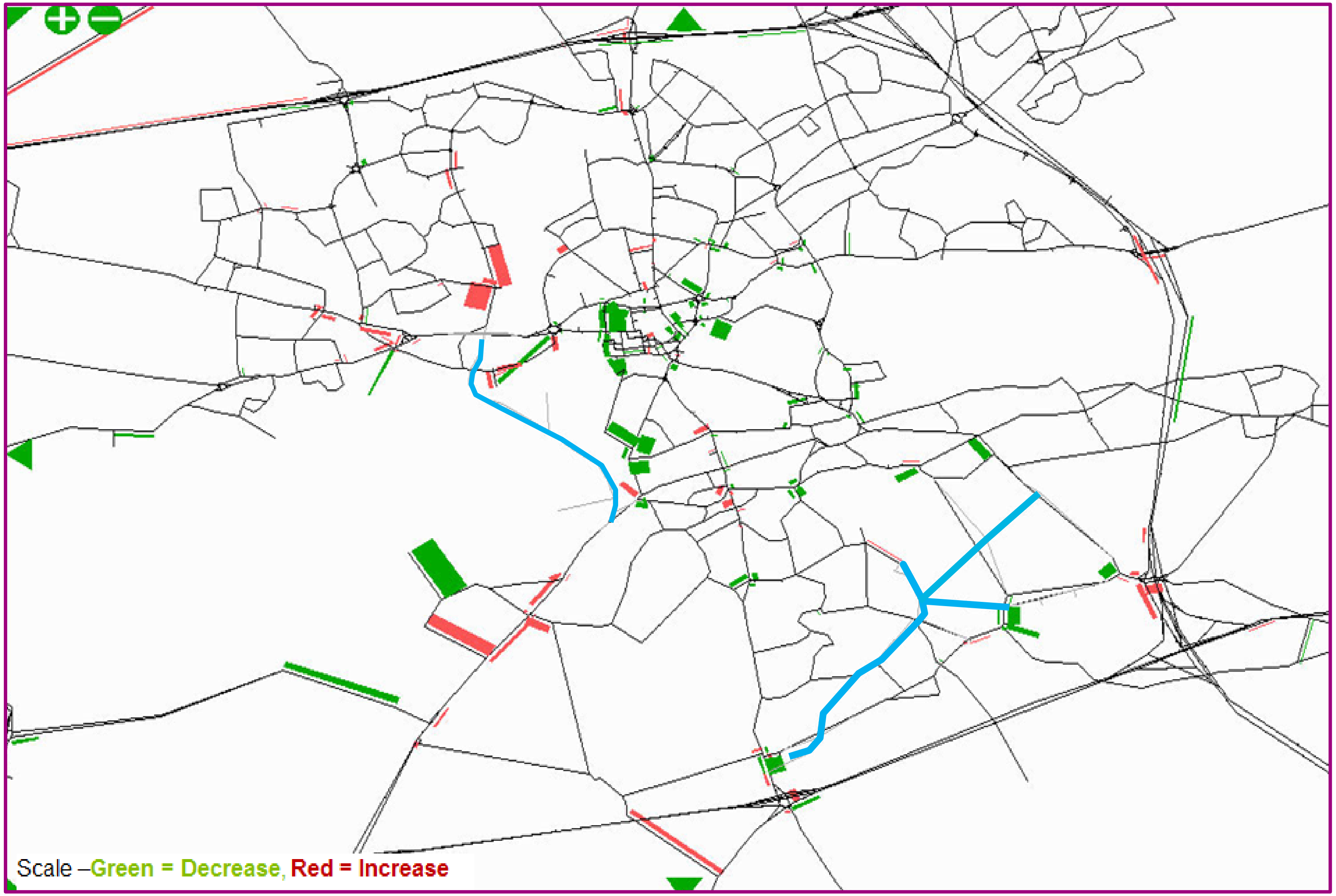


Following the introduction of Mass Transit and a 'Go Dutch' cycling strategy, highway demand on the network is reduced, resulting in improvements in delay across the Borough.

There remains a number of junctions and corridors with localised congestion issues and these would require further mitigation (for example, the A49 Corridor and the junctions surrounding the Town Centre).

Delays at M56 J10 as a result of the SE schemes remains in this scenario.

Figure 27. Changes in Link Delay (seconds) following the introduction of the Critical Development Enablers (Comparison of Scenario 1 vs. Scenario 2, PM 2036)

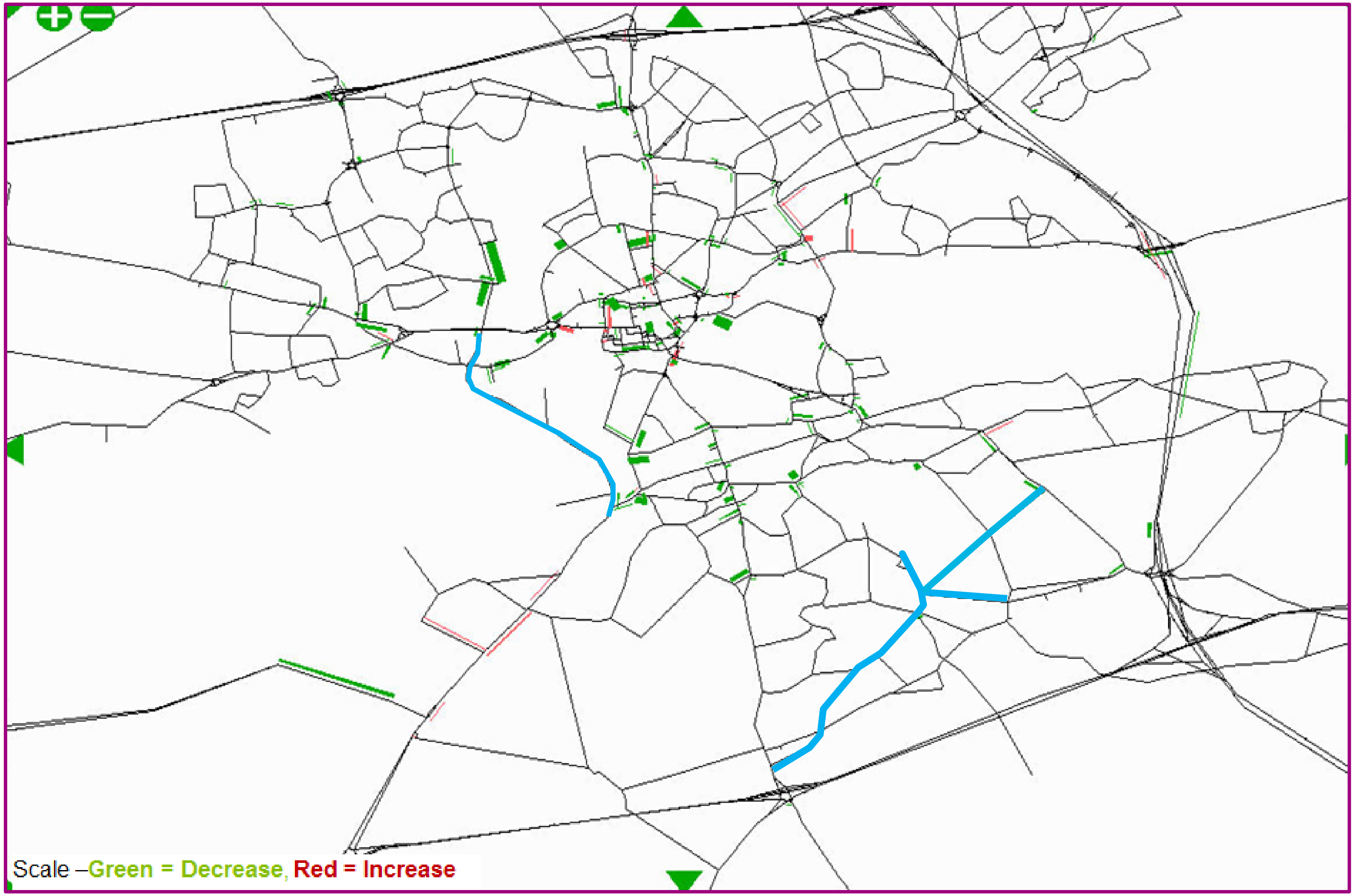


Similar patterns to the AM are observed in the PM; Scenario 2 produces greater improvements in link delay when compared to Scenario 1.
- Up to 1 minute of improvement along the A56 Chester Road in Grappenhall (Broad Lane junction and Knutsford Road junction)
- Up to 1 minutes of improvement along the B5356 Stretton Road at the Cat & Lion junction.

There are only a small number of locations where delay is worse in Scenario 2; Cromwell Avenue junction with Canons Road (as a result of Western Link attracting higher flows along this route), and Cliff Lane Roundabout (as a result of the additional connection with the SE infrastructure enabling easier access to M6 J20).
- Delays at the Cromwell Ave / Canons Road junction are in the region of an additional 1-2 minutes on the Cromwell Avenue southbound arm.
- Up to 1 additional minute of delay on the gyratory of M6 J20 at Lymm

In addition to these locations, Scenario 2 produces more delay along the side roads on the A56 Chester Road. It is likely that, as a result of the attractiveness of Western Link, flows along Chester Road are greater in Scenario 2 which is impacting the ability of traffic to exit the side road onto Chester road, thereby generating additional delay on these links.

Figure 28. Changes in Link Delay (seconds) following the introduction of the Critical Development Enablers (Comparison of Scenario 2 vs. Scenario 3, PM 2036)



Again, similar patterns to the AM are observed in the PM; Scenario 3 produces greater improvements in link delay when compared to Scenario 2.

Further improvements in link delay are evident when adding in the 2 policy interventions which reduce highway demand across the network.

Very few locations experiencing a worsening of delay relative to scenario 2. Where previously Scenario 2 produced additional delay in a number of locations, the multi-modal strategy helps alleviate these issues.

6.4 Travel Time

The impact of the scenarios on travel times has been assessed in two ways:

- Total vehicle hours metric; and
- Travel time on a number of routes across the Borough.

6.4.1 Total Vehicle Hours

Total vehicle hours is an aggregate of all modelled road based (excluding bus) travel time for each of the modelled time periods. It is a proxy for overall economic performance as time savings are the key driver of transport benefits.

Total vehicle hours was collected for the modelled simulation area only so as to remove any external area influences and maintain focus on impacts solely across the Borough. This approach does mean that the metric will not reflect the full impacts of any scenario which focuses development away from the Borough centre, or any impact on the motorways.

Table 13 presents the results for each scenario by time period and a 'daily' total and the percentage variation between each scenario.

Table 13. Total Vehicle Hours on Local Highway Network (excludes motorways)

Time Period	2016 Base Model	Scenario 1 2036	Scenario 2 2036	Scenario 3 2036	Total Change S1 to S3
AM	**7,050**	**8,970**	**8,810**	**8,140**	**-830**
AM % Change (to Base)	-	+27%	+25%	+15%	**-9%**
AM % Change (to previous Scenario)	-	n/a	-2%	-8%	
IP	**4,700**	**6,140**	**6,060**	**5,650**	**-490**
IP % Change (to Base)	-	+31%	+29%	+20%	**-8%**
IP % Change (to previous Scenario)	-	n/a	-1%	-7%	
PM	**7,380**	**9,280**	**9,130**	**8,430**	**-850**
PM % Change (to Base)	-	+26%	+24%	+14%	**-9%**
PM % Change (to previous Scenario)	-	n/a	-2%	-8%	
'Daily'	**54,580**	**70,360**	**69,320**	**64,390**	**-5,970**
Daily % Change (to Base)	-	+29%	+27%	+18%	**-8%**
Daily % Change (to previous Scenario)	-	n/a	-1%	-7%	

Percentage change between each scenario should be treated as additional to previous scenario

Analysis of Metric:

This vehicle hours metric takes into account changes in demand. For example, there is a reduced demand in Scenario 3 (due to the assumed transfer from car onto Mass Transit and cycling, thus there will be an overall reduction in vehicle hours. Similarly, 2036 values will be higher than the 2016 base simply because demand is higher in the future.

As is seen with vehicle hours delay, total vehicle hours on the local highway network also worsens relative to the 2016 base in each of the 3 future year scenarios. Implementing only those schemes that are currently in the committed pipeline (Scenario 1), this is an increase of 27% in the AM, 31% in the IP and 26% in the PM Peak.

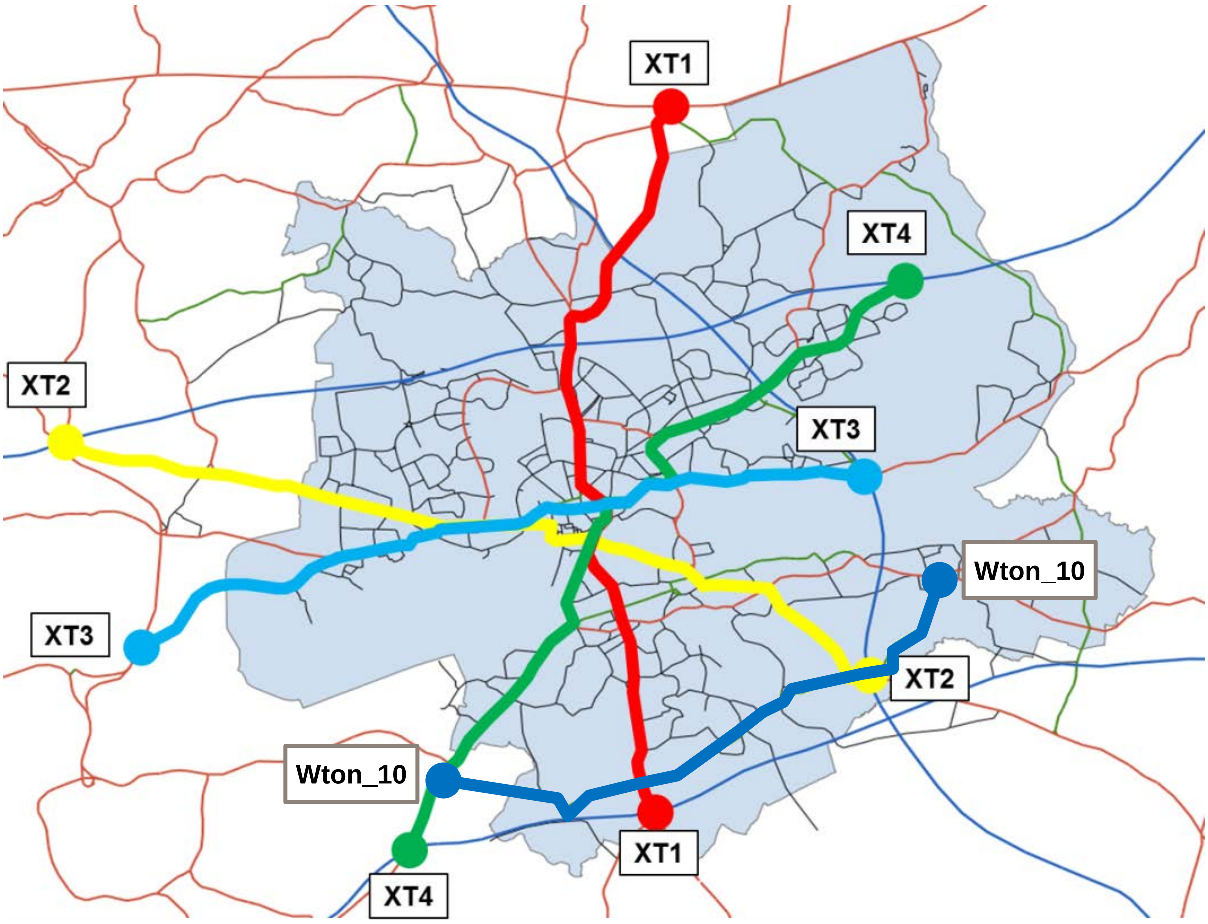
Adding in the schemes to enable development as well as the policy interventions (Scenario 3), this impact, is reduced to 15% in the AM, 20% in the IP and 14% in the PM. This demonstrates that Scenario 3 offers the greatest benefits to vehicle hours travelled in the local network.

Comparing across Scenarios, by implementing a full strategy alongside the PSVLP growth (Scenario 3) rather than just the existing committed infrastructure (Scenario1), cumulative reductions in vehicle hours travelled of 8-9% (in each of the peaks) are possible. The step change in improvements is greatest between Scenario 2 and Scenario 3 where the implementation of the policy interventions comes into effect.

6.4.2 Journey Times

Travel times have been assessed on four key cross-town journey time routes, as well as the local route between Lymm and Daresbury, as shown in **Figure 29**.

Figure 29. Journey Time Routes Considered



The end-to-end journey times for each of the routes are shown in **Table 14** for the AM, and **Table 16** for the PM. Percentage changes for each Scenario relative to the Base model are shown in **Table 15** for the AM and **Table 17** for the PM.

Table 14. Travel Time, AM

Route	2016 Base Model	Scenario 1 2036	Scenario 2 2036	Scenario 3 2036	S3 vs. Base
XT1 – A49 NB	2,152 secs **36 mins**	2,366 secs **39 mins**	2,287 secs **38 mins**	2,250 secs **38 mins**	+4.6%
XT1 – A49 SB	2,116 secs **35 mins**	2,306 secs **38 mins**	2,154 secs **36 mins**	2,131 secs **36 mins**	+0.7%
XT2 – A57/A50 EB	1,858 secs **31 mins**	2,117 secs **35 mins**	1,887 secs **31 mins**	1,853 secs **31 mins**	-0.3%
XT2 – A57/A50 WB	1,647 secs **27 mins**	1,856 secs **31 mins**	1,822 secs **30 mins**	1,730 secs **29 mins**	+5.0%
XT3 – Widnes to M6 EB	1,328 secs **22 mins**	1,349 secs **22 mins**	1,354 secs **23 mins**	1,318 secs **22 mins**	-0.8%
XT3 – M6 to Widnes WB	1,376 secs **23 mins**	1,441 secs **24 mins**	1,378 secs **23 mins**	1,367 secs **23 mins**	-0.6%
XT4 – M56 to M62 NB	1,610 secs **27 mins**	1,745 secs **29 mins**	1,709 secs **28 mins**	1,654 secs **28 mins**	+2.7%
XT4 – M62 to M56 SB	1,560 secs **26 mins**	1,783 secs **30 mins**	1,683 secs **28 mins**	1,659 secs **28 mins**	+6.3%
Wton 10 – Lymm to Daresbury WB	1,181 secs **20 mins**	1,420 secs **24 mins**	1,149 secs **19 mins**	1,147 secs **19 mins**	-2.9%
Wton 10 – Daresbury to Lymm EB	1,013 secs **17 mins**	1,448 secs **24 mins**	1,129 secs **19 mins**	1,119 secs **19 mins**	+10.5%

Table 15. Percentage Change to the 2016 Base Model Travel Time, 2036 AM

Route	2016 Base Model	Scenario 1 2036	Scenario 2 2036	Scenario 3 2036
XT1 – A49 NB	2,152 secs	9.9%	6.3%	4.6%
XT1 – A49 SB	2,116 secs	9.0%	1.8%	0.7%
XT2 – A57/A50 EB	1,858 secs	14.0%	1.5%	-0.3%
XT2 – A57/A50 WB	1,647 secs	12.6%	10.6%	5.0%
XT3 – Widnes to M6 EB	1,328 secs	1.5%	1.9%	-0.8%
XT3 – M6 to Widnes WB	1,376 secs	4.8%	0.1%	-0.6%
XT4 – M56 to M62 NB	1,610 secs	8.4%	6.1%	2.7%
XT4 – M62 to M56 SB	1,560 secs	14.3%	7.9%	6.3%
Wton 10 – Lymm to Daresbury WB	1,181 secs	20.2%	-2.7%	-2.9%
Wton 10 – Daresbury to Lymm EB	1,013 secs	43.0%	11.4%	10.5%

Table 16. Travel Time, PM

Route	2016 Base Model	Scenario 1 2036	Scenario 2 2036	Scenario 3 2036	S3 vs. Base
XT1 – A49 NB	2,630 secs **44 mins**	2,776 secs **46 mins**	2,449 secs **41 mins**	2,409 secs **40 mins**	-8.4%
XT1 – A49 SB	1,999 secs **33 mins**	2,143 secs **36 mins**	2,033 secs **34 mins**	2,006 secs **33 mins**	+0.3%
XT2 – A57/A50 EB	1,885 secs **31 mins**	2,077 secs **35 mins**	1,919 secs **32 mins**	1,873 secs **31 mins**	-0.6%
XT2 – A57/A50 WB	1,901 secs **32 mins**	2,147 secs **36 mins**	2,035 secs **34 mins**	1,950 secs **32 mins**	+2.6%
XT3 – Widnes to M6 EB	1,320 secs **22 mins**	1,405 secs **23 mins**	1,330 secs **22 mins**	1,298 secs **22 mins**	-1.6%
XT3 – M6 to Widnes WB	1,472 secs **25 mins**	1,637 secs **27 mins**	1,612 secs **27 mins**	1,613 secs **27 mins**	+9.6%
XT4 – M56 to M62 NB	1,573 secs **26 mins**	1,683 secs **28 mins**	1,789 secs **30 mins**	1,777 secs **30 mins**	+13.0%
XT4 – M62 to M56 SB	1,709 secs **28 mins**	1,985 secs **33 mins**	1,934 secs **32 mins**	1,989 secs **33 mins**	+16.3%
Wton 10 – Lymm to Daresbury WB	1,071 secs **18 mins**	1,361 secs **23 mins**	1,112 secs **19 mins**	1,100 secs **18 mins**	+2.7%
Wton 10 – Daresbury to Lymm EB	944 secs **16 mins**	1,075 secs **18 mins**	1,051 secs **18 mins**	1,043 secs **17 mins**	+10.5%

Table 17. Percentage Change to the 2016 Base Model Travel Time, 2036 PM

Route	2016 Base Model	Scenario 1 2036	Scenario 2 2036	Scenario 3 2036
XT1 – A49 NB	2,630 secs	5.5%	-6.9%	-8.4%
XT1 – A49 SB	1,999 secs	7.2%	1.7%	0.3%
XT2 – A57/A50 EB	1,885 secs	10.2%	1.8%	-0.6%
XT2 – A57/A50 WB	1,901 secs	12.9%	7.0%	2.6%
XT3 – Widnes to M6 EB	1,320 secs	6.4%	0.7%	-1.6%
XT3 – M6 to Widnes WB	1,472 secs	11.2%	9.5%	9.6%
XT4 – M56 to M62 NB	1,573 secs	7.0%	13.7%	13.0%
XT4 – M62 to M56 SB	1,709 secs	16.1%	13.2%	16.3%
Wton 10 – Lymm to Daresbury WB	1,071 secs	27.1%	3.8%	2.7%
Wton 10 – Daresbury to Lymm EB	944 secs	13.9%	11.3%	10.5%

Analysis of Metric:

In both the AM and PM, at least half of the journey time routes assessed in Scenario 3 show either a similar journey time as the 2016 base model or an improvement. Where Scenario 3 routes show a worsening relative to the base model, the times still represent a better travel time compared to Scenarios 1 or 2.

Scenario 1 shows that the committed infrastructure is not sufficient to alleviate the added congestion that the PSVLP demand adds to the network with increases between 3-6 minutes along routes in any time period. Implementing Scenario 2 shows that the critical development enabling schemes contribute to alleviating congestion on the network and improving some journey times relative to Scenario 1.

Scenario 3 shows improvements in journey times for all routes when compared to Scenario 1 or 2.

6.5 Canal Screenline Flows

This metric looks at the total vehicle trips crossing the Ship Canal screenline. This screenline reflects the key pinch point for the network in Warrington. The screenline sums the total flow for each of the four Ship Canal crossings in Warrington, plus any new crossings as a result of development infrastructure, such as the Western Link. **Table 18** and **Table 19** present the 2-way total flows across the screenline by each peak time period.

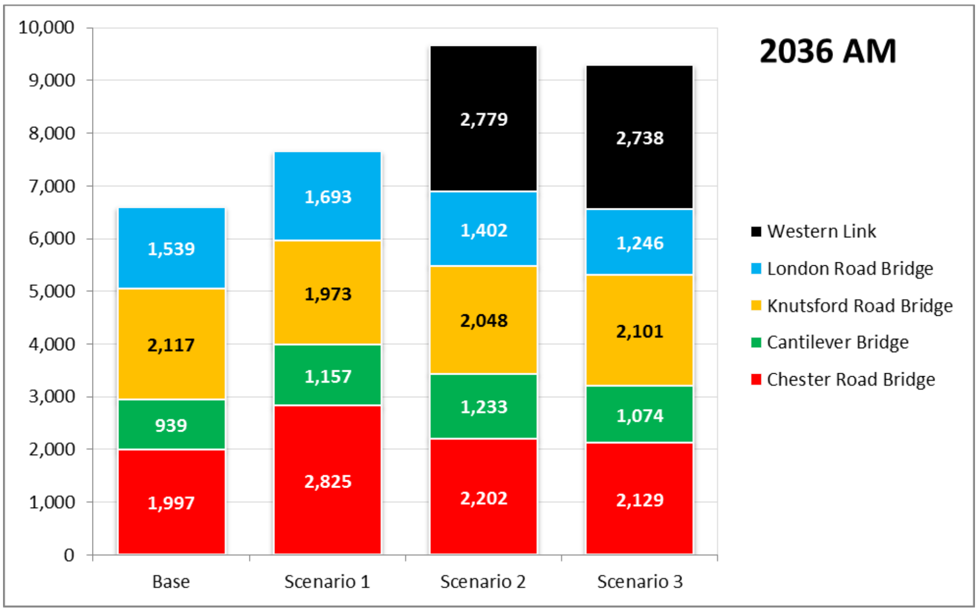
Figure 30 and **Figure 32** shows the AM and PM ship canal crossing 2-way totals for each crossing in each modelled scenario.

Table 18. Ship Canal Crossing, 2036, AM

Crossing	2016 Base Model	Scenario 1 2036	Scenario 2 2036	Scenario 3 2036	Total Change S1 to S3
Chester Road Swing Bridge	1,997	2,825 41%	2,202 10%	2,129 7%	-696 -25%
London Road Swing Bridge	1,539	1,693 10%	1,402 -9%	1,246 -19%	-447 -26%
Knutsford Road Swing Bridge	2,117	1,973 -7%	2,048 -3%	2,101 -0.8%	+127 6%
Cantilever Bridge	939	1,157 23%	1,233 31%	1,074 14%	-84 -7%
Total Warrington (Existing)	**6,592**	**7,649 16%**	**6,884 4%**	**6,549 -1%**	**-1,099 -14%**
Western Link	-	-	2,779	2,738	**+2,738**
Combined Warrington Total	**6,592**	**7,649 16%**	**9,663 47%**	**9,287 41%**	**+1,639 +21%**
Silver Jubilee Bridge	4,877	1,564 -68%	1,353 -72%	1,345 -72%	-218 -14%
Mersey Gateway	0	4,633	4,421	4,367	-266
Thelwall Viaduct	16,916	18,491 9%	18,437 9%	18,404 9%	-87 -0.5%
Warburton Bridge	798	878 10%	856 7%	853 7%	-25 -3%
M60	13,213	17,924 36%	17,876 35%	17,856 35%	-69 -0.38%
Total Other (Existing)	**35,804**	**43,491 21%**	**42,943 20%**	**42,826 20%**	**-665 -2%**
Total (Warrington Existing + Other Existing)	**42,397**	**51,139 21%**	**49,827 18%**	**49,375 16%**	**-1,764 -3%**
All Crossings Total	**42,397**	**51,139 21%**	**52,606 24%**	**52,113 23%**	**974 2%**

** Percentage change in each scenario is a percentage change to the base model flow*

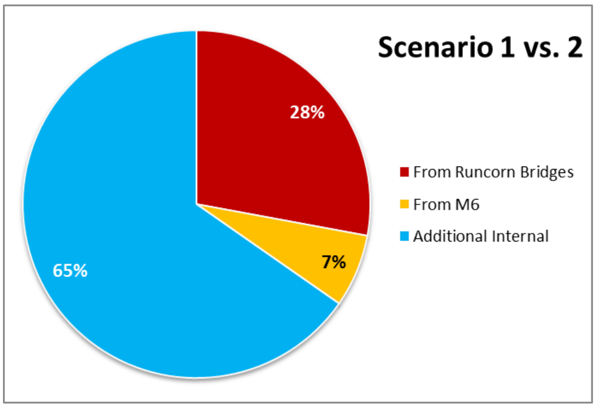
Figure 30. 2036 AM Ship Canal Crossing Flows (2-way, Warrington Crossings)



The total volume of traffic crossing the Ship Canal within central Warrington increases with the introduction of the Western Link. This additional crossing increases the network capacity for cross canal trips within the central area of the borough and the cause of this increase is a combination of the attraction of existing trips from outside the area, and the generation of additional cross canal trips within the area. The pie charts in **Figure 31** and **Figure 33** show the relative contribution of each of these factors in each time period.

Of the external trips, the large majority are drawn from the Halton crossings with a smaller percentage drawn from the M6. In both scenarios, the greatest impact is of new canal crossing trips. In the main, this does not represent totally new trips rather, it is drivers that previously travelled to a destination on the same side of the canal as their origin now having the option, through reduced congestion, to travel to an alternative destination across the canal.

Figure 31. Western Link Re-Distribution of Flows (AM)



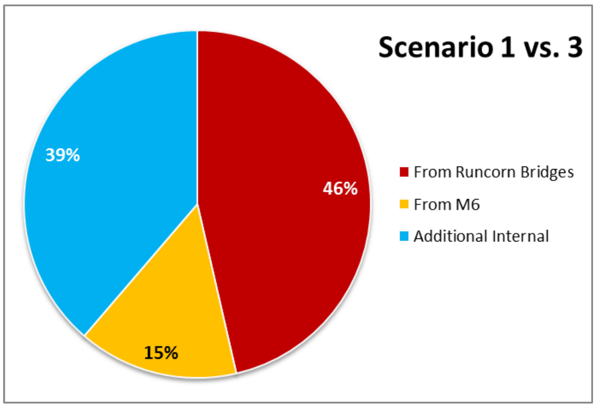


Table 19. Ship Canal Crossing, 2036, PM

Crossing	2016 Base Model	Scenario 1 2036	Scenario 2 2036	Scenario 3 2036	Total Change S1 to S3
Chester Road Swing Bridge	1,880	2,754 46%	2,133 13%	2,189 16%	-564 -20%
London Road Swing Bridge	1,495	1,691 13%	1,404 -6%	1,191 -20%	-501 -30%
Knutsford Road Swing Bridge	1,859	2,039 10%	2,049 10%	2,052 10%	13 0.7%
Cantilever Bridge	1,148	1,352 18%	1,353 18%	1,250 9%	-101 -8%
Total Warrington (Existing)	**6,381**	**7,836 23%**	**6,939 9%**	**6,682 5%**	**-1,153 -15%**
Western Link	0	0	2,893	2,796	2,796
Combined Warrington Total	**6,381**	**7,836 23%**	**9,832 54%**	**9,478 49%**	**1,643 21%**
Silver Jubilee Bridge	5,467	2,081 -62%	1,952 -64%	1,941 -64%	-140 -7%
Mersey Gateway	0	5,030	4,753	4,721	-309
Thelwall Viaduct	16,233	18,083 11%	18,092 11%	18,014 11%	-68 -0.4%
Warburton Bridge	903	1,107 23%	1,099 22%	1,093 21%	-14 -1%
M60	13,290	17,476 31%	17,538 32%	17,521 32%	46 0.3%
Total Other (Existing)	**35,894**	**43,776 22%**	**43,433 21%**	**43,291 21%**	**-485 -1%**
Total (Warrington Existing + Other Existing)	**42,275**	**51,612 22%**	**50,372 19%**	**49,973 18%**	**-1,638 -3%**
All Crossings Total	**42,275**	**51,612 22%**	**53,265 26%**	**52,769 25%**	**1,158 2%**

** Percentage change in each scenario is a percentage change to the base model flow*

Figure 32. 2036 PM Ship Canal Crossing Flows (2-way, Warrington Crossings)

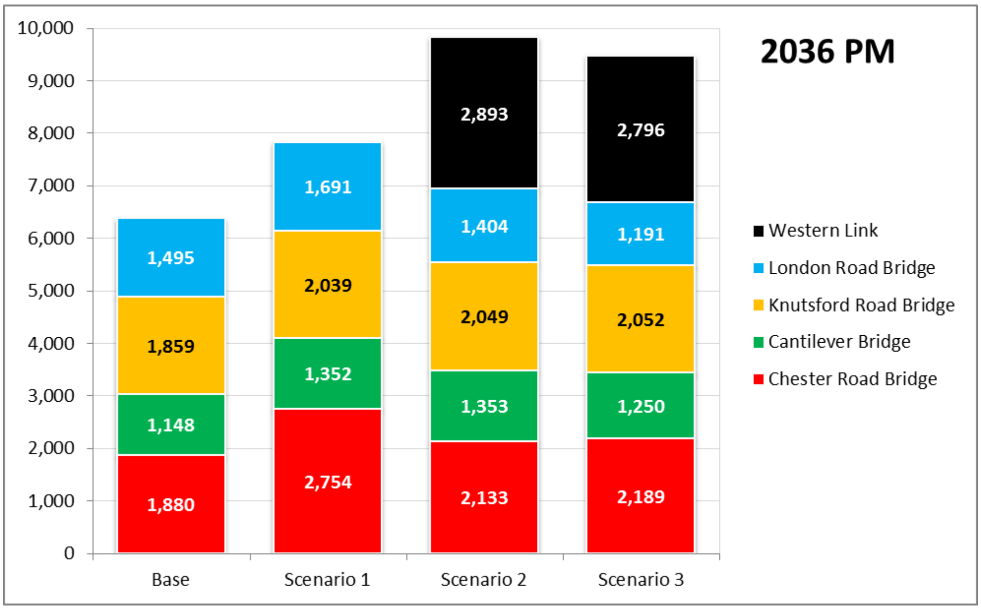
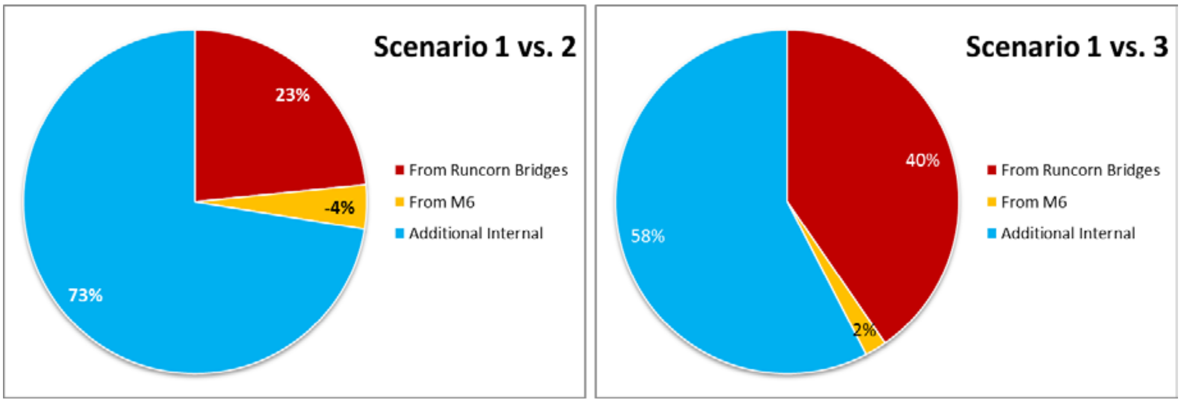


Figure 33. Western Link Re-Distribution of Flows (PM)



<u>Analysis of Metric</u>:

This metric shows the following:

- In Scenario 1, without any additional supporting infrastructure, growth across the 4 existing Ship Canal crossings increases significantly relative to the Base model. A growth of 16% in the AM and 23% in the PM

- In Scenario 1, the Chester Road Swing Bridge shows the most significant growth at 41% in the AM and 46% in the PM relative to the Base model.

- In Scenario 2, following the introduction of the Western Link (as part of the supporting development infrastructure), the growth across the 4 existing ship canal crossings is reduced, to only 4% in the AM and 9% in the PM (increases between 290-560 in the peak hour period).

- In Scenario 2, following the introduction of the Western Link (as part of the supporting development infrastructure), the London Road and Knutsford Road swing bridges experience a reduction in traffic flow between 3-9% in the AM, and 6% in the PM (London Road only).

- When comparing Scenario 2 to Scenario 1, the Chester Road and London Road swing bridges experience significant reductions in flow (in both time periods) of approximately 22% on Chester Road, and 17% on London Road.

- However, in Scenario 2, by providing a new crossing in Western Link, the total northbound/southbound flow across the Ship Canal significantly increases by 47% in the AM and 54% in the PM as Western Link attracts new demand onto the local network. In Scenario 2, the Western Link crossing along accounts for 29% of the total crossing flow in either peak period.

- Similar patterns to those observed in Scenario 2 are also observed in Scenario 3 with the total northbound/southbound flow across the Ship Canal increasing as Western Link attracts new demand onto the local network. This is lower than Scenario 2 as the impact of the multi-modal model has taken some car demand off the network.

- The impact of the multi-model model scenario shows improvements in congestion (i.e. a reduction in flow) across 3 of the 4 existing crossings; in the AM and PM, flow across the London Road Swing Bridge is reduced by 19-20% relative to the base model. The Knutsford Road Swing Bridge experiences no growth in the AM and only 10% in the PM (less than 200 additional trips).

- Comparing across the scenarios, by implementing a multi-modal strategy, a 14-15% reduction in flow across the existing crossings is observed in the peaks. Most of this demand moves onto using the Western Link infrastructure but by encouraging modal shift onto Mass Transit or cycling, congestion can be alleviated at the existing crossings, particularly at the Chester Road and London Road Swing Bridges.

6.6 Cordon Flows

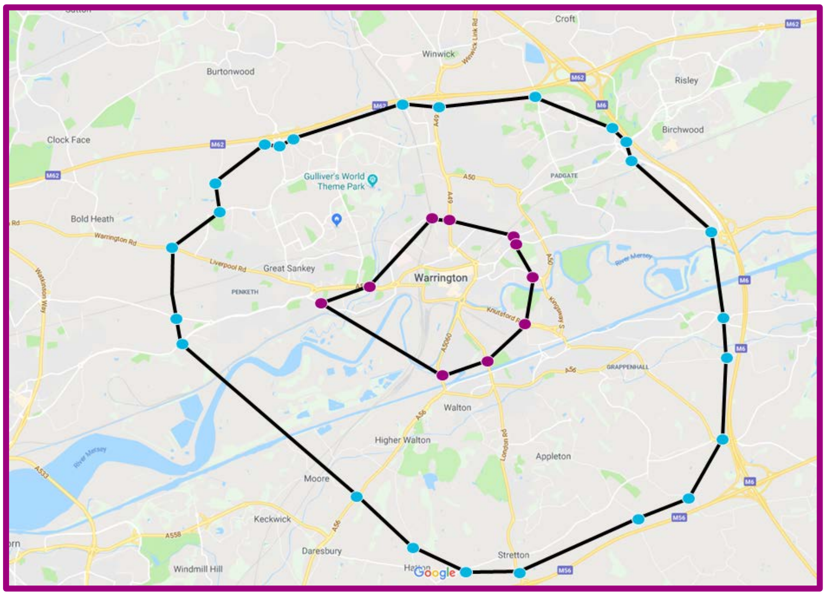
This metric looks at the total car based flow across an Inner and Outer Cordon. Cordon movements will reflect the extent to which traffic enter/exit Warrington by car modes. Combined with the Screenline Flow metric, this will aid in the assessment of trip distribution patterns and mode share.

Higher levels of flow across the inner cordon will, assuming no network modifications, result in increased congestion and may therefore be viewed as a negative outcome. But it would also indicate an increase in the attractiveness of locations within the cordon; a likely positive outcome therefore for the town centre economy.

Figure 34 shows the location of the two cordons and the sites assessed, whilst **Table 20** presents the total flows across the Inner Cordon by direction, and time period. This table compares the same number of links that are present in the base model, plus the impact on the Inner Cordon once the new scheme infrastructure is added (Centre Park Link). **Table 21** presents the comparison for the Outer Cordon.

These tables demonstrate that, as with the canal crossing flows, the inner cordon experiences a reduction in flow when compared across the Scenarios (daily total reductions of up to -18%). Growth between the base model and Scenario 1 is greatest once the additional scheme (Centre Park Link) is considered (growth increases to 26-37%). **Table 21** shows that whilst there is growth in the forecast scenarios relative to the 2016 Base, there is little variability between the scenarios themselves. The inner cordon shows a 9-18% reduction in daily flows crossing the cordon between Scenarios 1 and 3, whilst there is only a 1-2% reduction on the outer cordon.

Figure 34. Inner and Outer Cordon - Site Location



Inner Cordon Sites	Outer Cordon Sites
Knutsford Road	A56 Chester Rd
Wilderspool Causeway	Warrington Rd Hatton
Chester Road	Hatton Lane
Longshaw Street	A49 Tarporley Road
Winwick Road A49	Arley Road
Hallfields Road	Barleycastle Lane
Smith Drive	A50 Cliff Lane
Old Liverpool Road (East)	Stockport Road
Sankey Way (East)	Manchester Road
Padgate Lane (West)	Stockport Road
Manchester Road (West)	Harpers Road

Inner Cordon Sites	Outer Cordon Sites
Farrell Street (North West)	Birchwood Way
Centre park link	Fearnhead Lane
	Crab Lane
	Mill Lane
	Winwick Road
	A562 Widnes Road
	A5080 South Lane
	A57 Liverpool Road
	Skyline Drive
	A57 Liverpool Road
	A5080 South Lane
	A562 Widnes Road

Table 20. Inner Cordon Flows

Inner Cordon	2016 Base Model	Scenario 1 2036	Scenario 2 2036	Scenario 3 2036	Total Change S1 to S3
AM Inbound	8,834	11,149 +26%*	10,301 +17%	9,665 +9%	**-1,484** **-13%**
IP Inbound	6,669	8,977 +35%	8,013 +20%	7,321 +10%	**-1,656** **-18%**
PM Inbound	6,738	8,597 +28%	7,718 +15%	7,177 +6%	**-1,420** **-16%**
'Daily' Inbound	**70,041**	**92,457** **+32%**	**83,124** **+19%**	**76,512** **+9%**	**-15,945** **-17%**
AM Outbound	6,092	7,694 +37%	7,514 +23%	6,997 +15%	**-697** **-9%**
IP Outbound	6,506	8,247 +36%	7,851 +21%	7,154 +10%	**-1,093** **-13%**
PM Outbound	9,198	10,420 +21%	10,145 +10%	9,460 +3%	**-960** **-9%**
'Daily' Outbound	**68,477**	**91,008** **+33%**	**81,443** **+19%**	**74,764** **+9%**	**-16,244** **-17%**

**percentage shown in scenario columns show percentage change relative to the Base model flow.*
**'Daily' totals represents a 10-hour period (1.5 hours for each peak, plus 7 hour Interpeak)*

Table 21. Outer Cordon Flows

Outer Cordon	2016 Base Model	Scenario 1 2036	Scenario 2 2036	Scenario 3 2036	Total Change S1 to S3
AM Inbound	11,888	14,651 +23%	14,971 +26%	14,604 +23%	**-47 -0.3%**
IP Inbound	9,054	11,623 +28%	11,612 +28%	11,339 +25%	**-284 -2%**
PM Inbound	11,697	13,864 +19%	14,245 +22%	14,143 +21%	**+279 +2%**
'Daily' Inbound	**98,754**	**124,133 +26%**	**125,106 +27%**	**122,495 +24%**	**-1,638 -1%**
AM Outbound	11,324	13,714 +21%	14,097 +24%	14,022 +24%	**+308 +2%**
IP Outbound	8,678	11,007 +27%	11,051 +27%	10,786 +24%	**-221 -2%**
PM Outbound	12,346	14,614 +18%	14,782 +20%	14,402 +17%	**-212 -1%**
'Daily' Outbound	**96,255**	**119,540 +24%**	**120,676 +25%**	**118,136 +23%**	**-1,404 -1%**

**percentage shown in scenario columns show percentage change relative to the Base model flow.*
**'Daily' totals represents a 10-hour period (1.5 hours for each peak, plus 7 hour Interpeak)*

6.7 Demand Impacts

This section reviews the impact of the changes in model demand across the network as a result of the scheme infrastructure and the growth in the PSVLP. This section will review the following metrics:

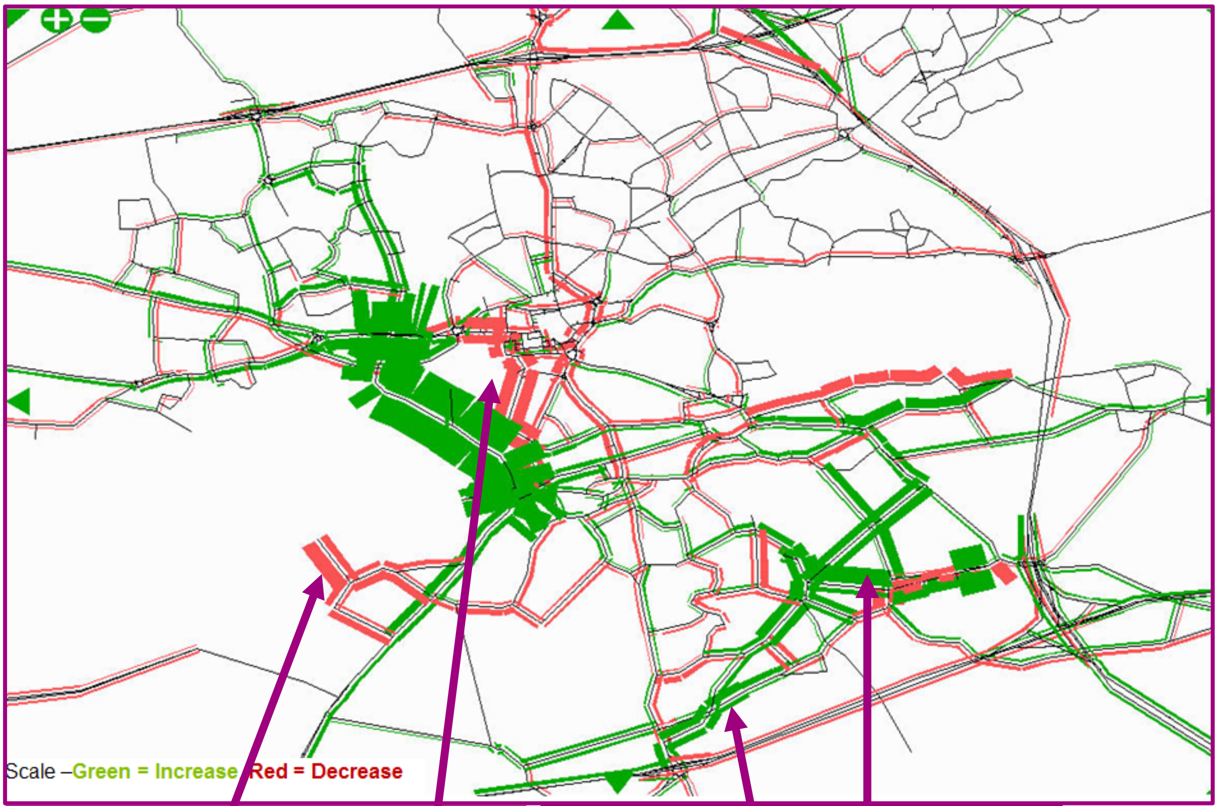
- Changes in modelled flow across the network and how the schemes re-distribute demand;
- Select Link Analysis which assesses the routing of demand that uses the new infrastructure; and
- Multi-modal assessment – a review of the impacts on highway users as a result of implementing a multi-modal strategy (Scenario 3).

6.7.1 Flow Difference Plots

Figure 35 and **Figure 36** compare the flow patterns between Scenarios 1 and 2 for 2036 AM and PM peaks. These figures show the impact of introducing the critical development enabling infrastructure schemes and how they affect the local distribution of trips in the Borough. The Western Link scheme has a wider strategic attractiveness than the South East infrastructure schemes which is predominantly used by the new development trips in the area to access the existing network. In these plots, green links represent an increase in flow along the link; red is a reduction in flow on a link.

Figure 37 and **Figure 38** provide comparisons between Scenario 2 and Scenario 3 and illustrate the impact that the multi-modal strategy has on the wider network. Again, green links represent an increase in flow along the link; red is a reduction in flow on a link.

Figure 35. Change in Vehicle Flow Between Scenario 1 and Scenario 2, AM 2036

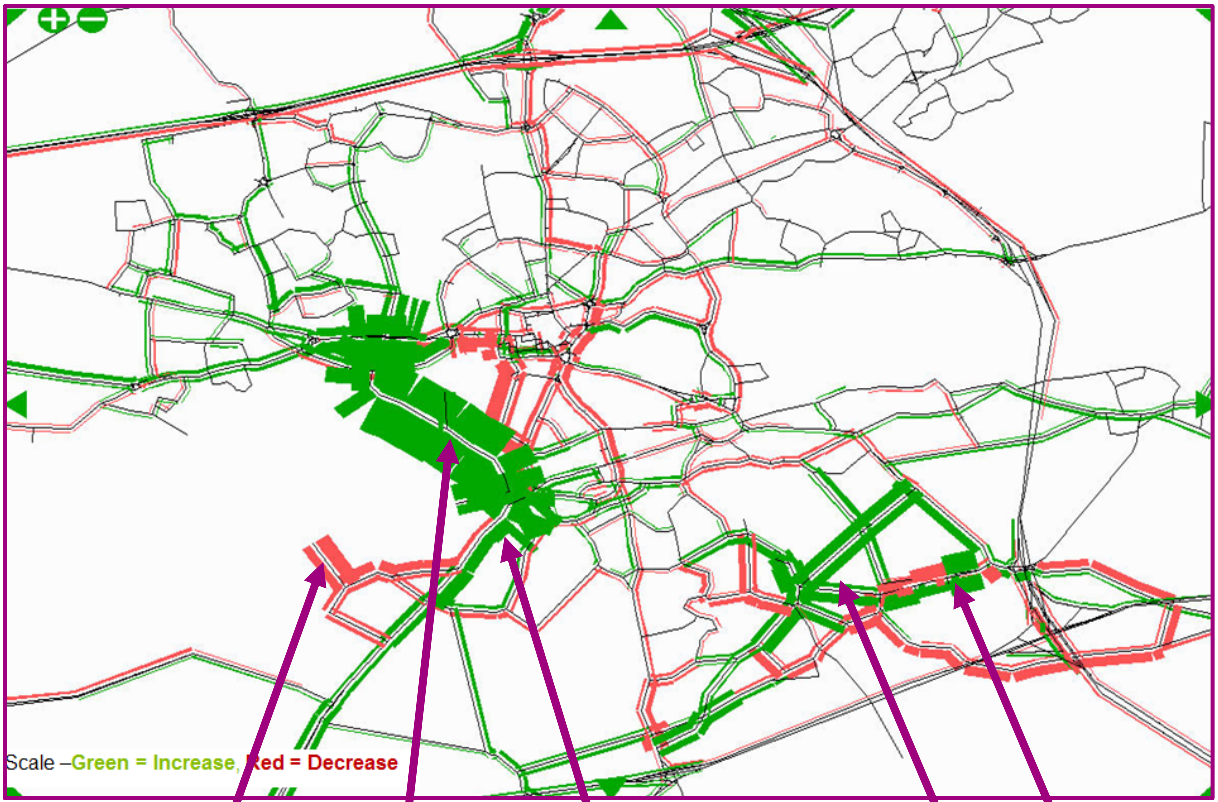


500-600 fewer PCUs using the Town Centre and Centre Park Link area once Western Link is open in Scenario 2. This represents approximately one third to one half of the trips using Western Link in Scenario 2 (increases between 1,100 – 1400 PCUs)

Circa. 250-500 fewer PCUs using local network off Chester Road as the access point into development sites has moved onto Western Link in Scenario 2

Increases along the New SE infrastructure range from 300 additional PCUs (at the southern end) to nearly 700 towards the junction with Barleycastle Lane

Figure 36. Change in Vehicle Flow Between Scenario 1 and Scenario 2, PM 2036



Similar patterns present in the PM models, with Circa. 500-800 fewer PCUs using local network off Chester Road as the access point into development sites has moved onto Western Link in Scenario 2.

500-600 fewer PCUs using the Town Centre and Centre Park Link area once Western Link is open in Scenario 2. This represents approximately one third to one half of the trips using Western Link in Scenario 2 (increases between 1,200 – 1500 PCUs)

Additional traffic from Western Link adds a further 400-500 PCUs along Chester Road Southbound.

In the PM, 300-600 PCUs are now using the SE infrastructure in Scenario 2, with increases of 300-400 PCUs along Grappenhall Lane from the M6 J20

Figure 37. Change in Vehicle Flow Between Scenario 2 and Scenario 3, AM 2036

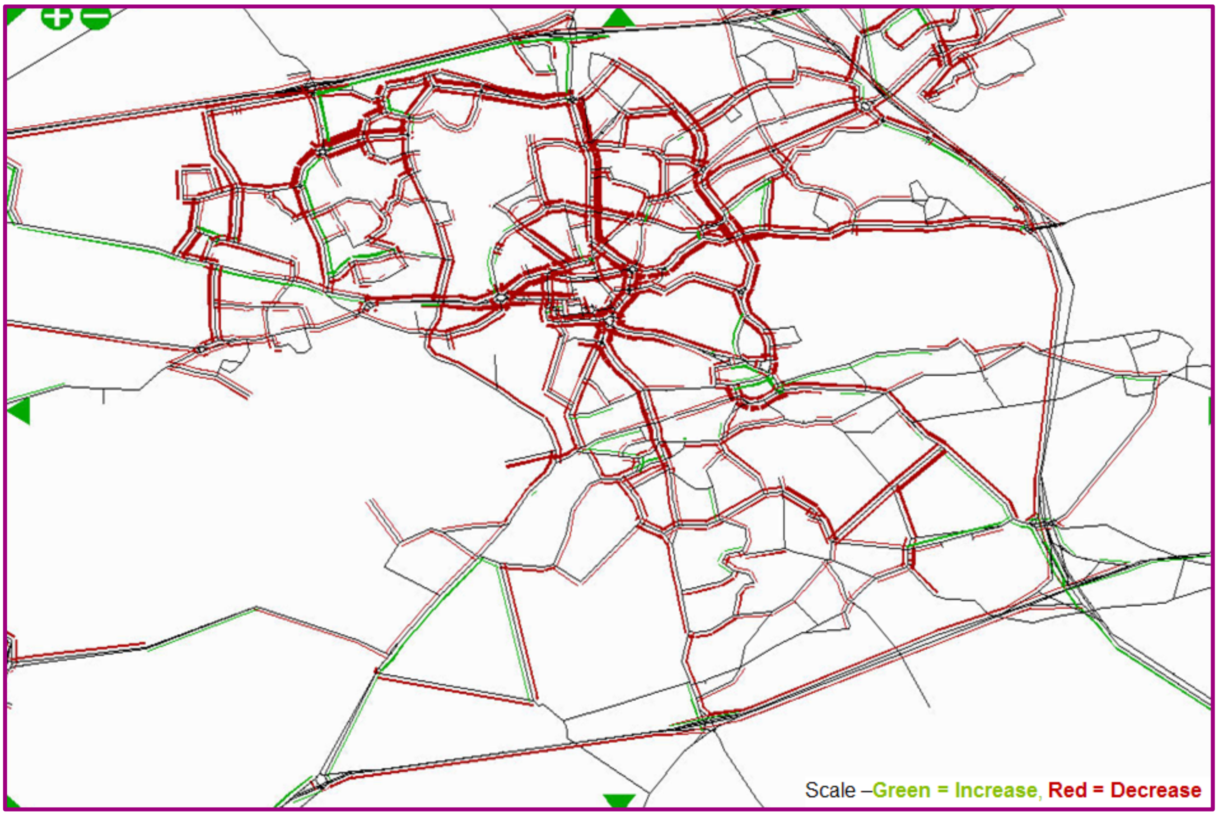
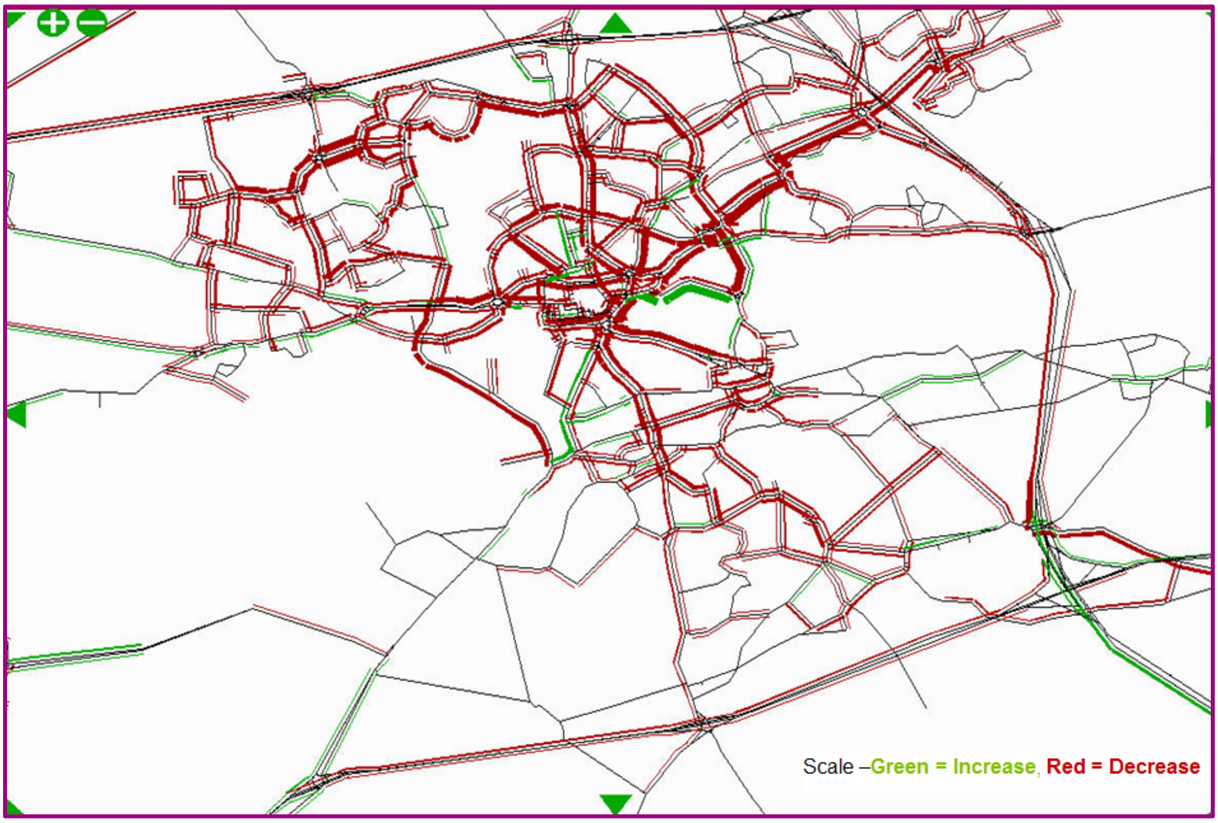


Figure 38. Change in Vehicle Flow Between Scenario 2 and Scenario 3, PM 2036



6.7.2 Select Link Analysis – Routing of Traffic Using New Links

Figure 39 is an example which demonstrates how the new development enabling infrastructure is used by vehicles in the model. It shows that, in the South East, the main use of the Cat & Lion Bypass scheme is primarily by the growth areas for direct access to the M56. The plot shows that the new link is not used as a 'rat running' route by existing traffic and serves as an access link opening up the new areas of development.

Figure 39. OD Trip Patterns of Vehicles Using New SE Infrastructure, AM 2036, Scenario 2

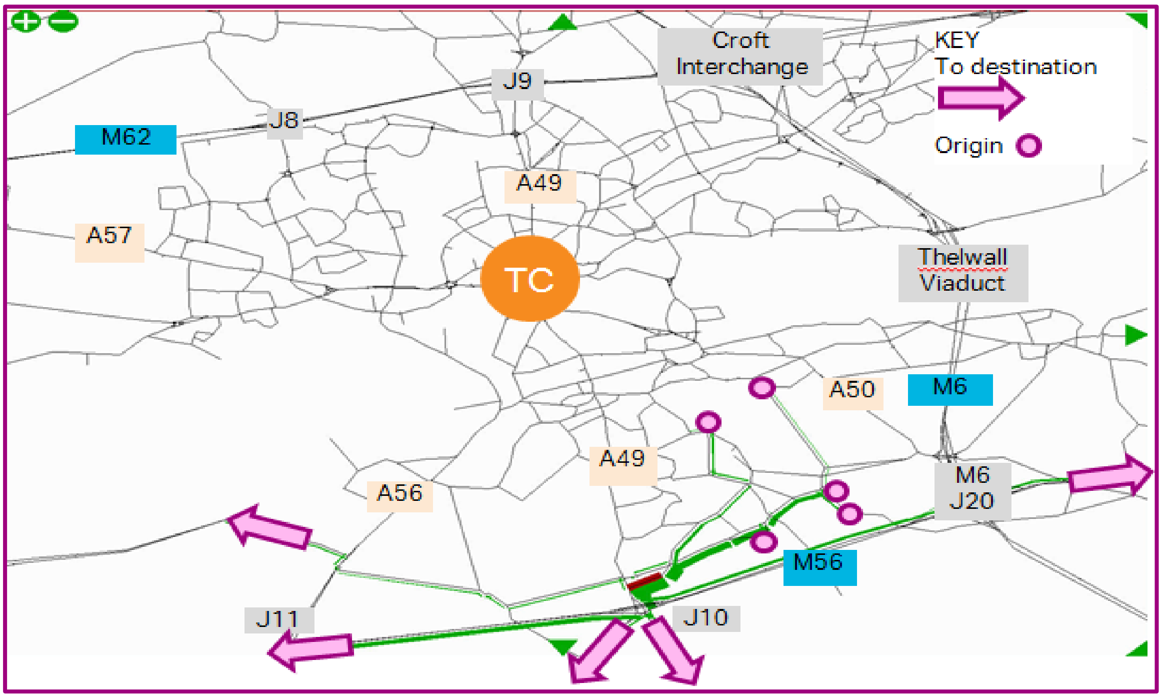
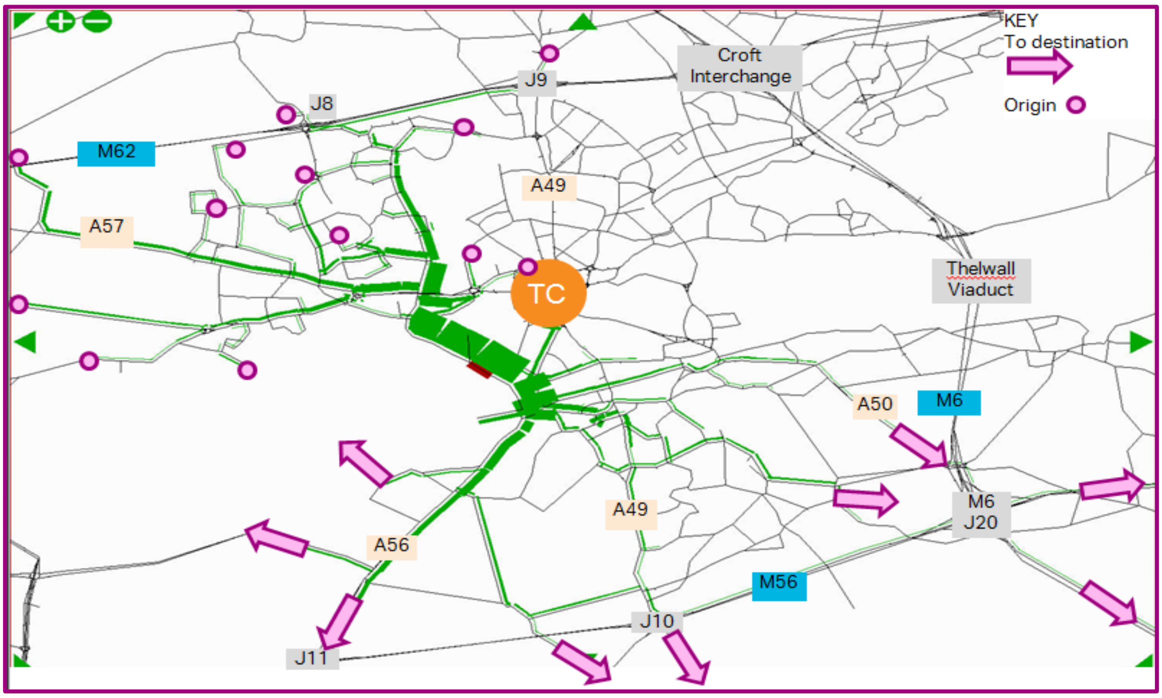


Figure 40 illustrates the strategic routing of the Western Link. Again this demonstrates that the development dependant infrastructure opens up the development areas in the South West, as well as providing an alternate route over the Ship Canal.

Figure 40. OD Trip Patterns of Vehicles Using New Western Link (southbound), AM 2036, Scenario 2



6.7.3 Multi-Modal Demand Impacts

This metric reviews the impacts (on highway users) as a result of implementing a multi-modal strategy (Scenario 3). **Table 22** presents the reduction in car person trips in the model, by trip purpose and time period generated by the shift from car to an alternate mode (mass transit or cycle).

This option suggests there is a reduction in car trips of 11-12% that can be achieved through the implementation of a multi-modal strategy. A reduction between 8-10,000 car person trips in the AM and PM peaks has shown to have an impact on delay and congestion on the local network. The strategy will have wider-ranging benefits, such as health and air quality that have not been assessed here.

Table 22. Reduction in Car Person Trips by Modelled Time Period (Scenario 3 vs. Scenario 2)

Purpose	AM	IP	PM	Total
Commute	-3,429 **-11.8%**	-7,844 **-13.4%**	-2,815 **-11.4%**	**-14,088** **-12.5%**
Business	-164 **-3.8%**	-989 **-5.2%**	-244 **-5.4%**	**-1,397** **-5.0%**
Other	-5,156 **-11.5%**	-24,673 **-11.8%**	-6,783 **-12.0%**	**-36,612** **-11.8%**
Total	**-8,750** **-11.2%**	**-33,506** **-11.7%**	**-9,843** **-11.5%**	**-52,098** **-11.5%**

Figure 41 and **Figure 42** highlight the model links where flow has been reduced by 10% or more by the implementation of the Mass Transit and cycling interventions. **Figure 41** highlights the links for Scenario 3, 2036 AM whilst **Figure 42** presents the equivalent for the PM. Both figures show large proportions of the local network where flows are reduced, particularly along key corridors and within the Town Centre.

Figure 41. Impact of Mass Transit & Cycle Interventions, Links with Flow Reductions of 10% or More, AM 2036

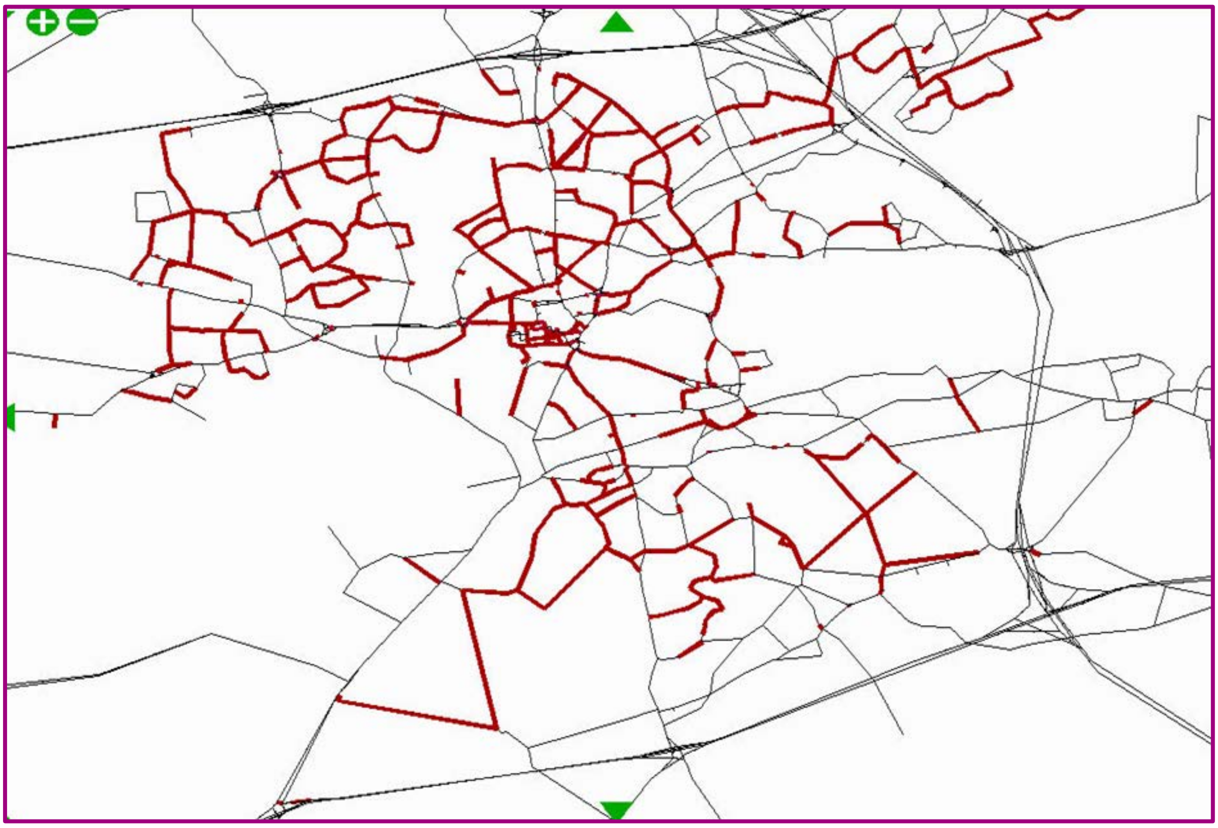
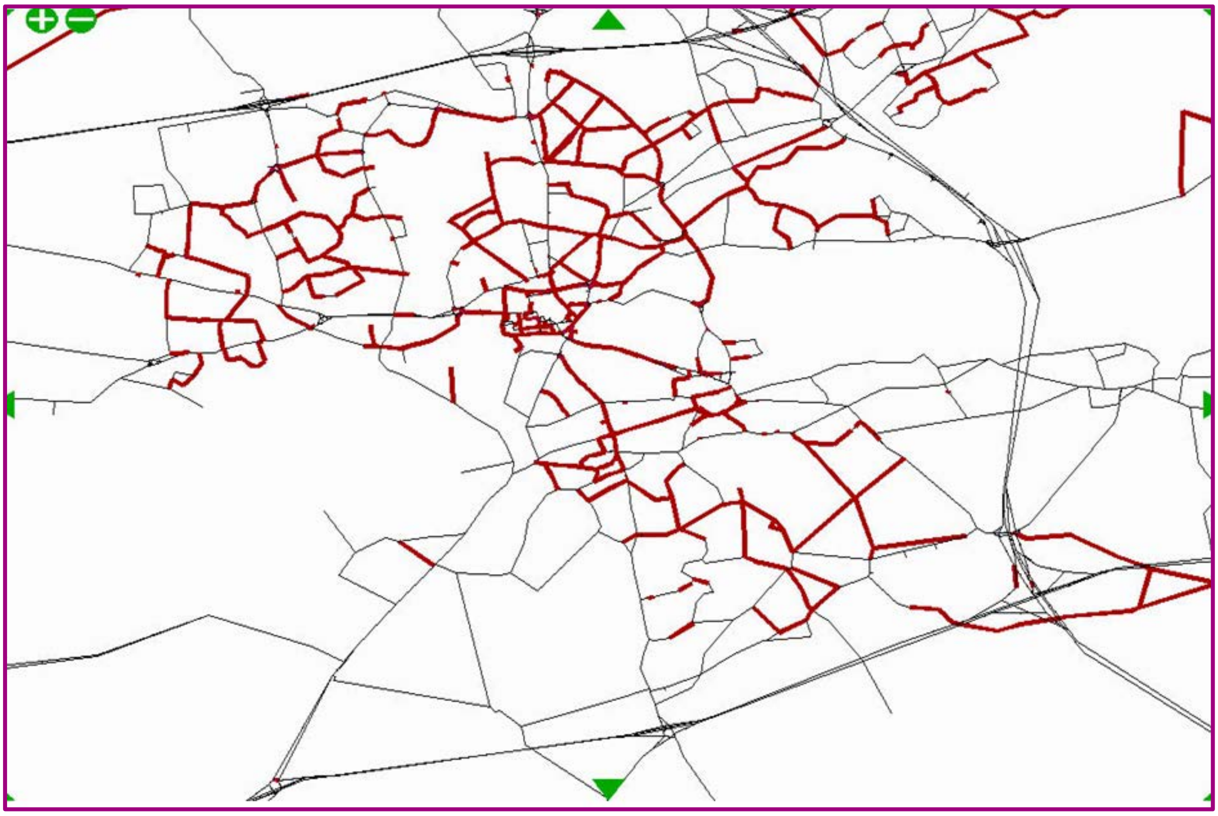


Figure 42. Impact of Mass Transit & Cycle Interventions, Links with Flow Reductions of 10% or More, PM 2036



7. Summary & Recommendations

7.1 Summary

This document has reported on the transport impacts of Warrington Borough Council's (WBC) Proposed Submission Version Local Plan (PSVLP). The purpose of the testing is to ensure that the transport impacts of the development and associated highway infrastructure are deliverable, transformational, whilst addressing existing known congestion issues. The model has been used to identify the critical transport interventions to support the planned growth in Warrington.

The testing has been undertaken using the transport model known as WMMTM16. The WMMTM16 is a multi-modal transport model of the Borough that has been developed to represent the existing transport networks and levels of performance. The model has been developed in accordance with guidance provided by the Department for Transport (DfT) and independently audited to ensure it is fit for purpose.

The key issue driving the need for this testing is the requirement for supporting evidence in the development of WBCs PSVLP. WBC is preparing a spatial strategy for the Warrington Local Plan which is currently under review. The PSVLP is expected to involve substantial development over the next 20 years requiring investment in infrastructure to support both the delivery of this development as well as addressing known congestion issues in the Borough.

As the PSVLP is expected to impose significant pressure on the transport network, it is particularly important that soundly based evidence justifies the associated transport strategy, for the final consultation of the preferred spatial strategy prior to an Examination in Public (EIP).

The PSVLP sets out the council's favoured approach to delivering the housing and employment land necessary to meet its growth targets.

The PSVLP has been developed taking account of identified need, the capacity of areas within the Borough to accommodate development and the 'call for sites' exercise which identified where developers had aspirations to bring sites forward.

The level of growth assessed within this report is in line with the DLP and comprises the following development over the next twenty years:

- 20,284 homes split between existing urban (65%) and green belt (35%) sites; and
- 379 hectares of employment land split between urban (35%) and green belt (65%) locations.

Note: The final published DLP differs slightly from the figures quoted here and used in this assessment. The final published figures are 20,790 homes (an increase of 2.5%) and 362 hectares (a reduction of 4.5%). The differences are not considered material to the findings of this report.
The differences arose due to the timing of final refinements to the DLP and the need to complete the level of analysis necessary to complete this document.

Now that the core transport model forecasts have been prepared, based on a land use scenario consistent with the published PSVLP, the strategies for delivery have now also been assessed. This report has summarised the result of that testing.

7.2 Conclusions

Three transport infrastructure and policy scenarios have been considered in this assessment:

- **Scenario 1**
  - This scenario considers all the developments (land use changes) outlined in Chapter 3 with only committed highway infrastructure included (20 schemes).

– **Scenario 2**
  - As Scenario 1 plus critical additional highway infrastructure schemes that are required to enable the PSVLP growth to occur in a number of development locations.
– **Scenario 3**
  - As Scenario 2 plus the 2 policy interventions (Mass Transit and 'Go Dutch' cycling).

The analysis of the transport model testing and the summary results in **Table 23** has shown that there are distinct variations between the scenarios in terms of the metrics used to assess the performance of the transport network. The scale of these variations is most evident between Scenario 1 and 2 where the impact of only delivering committed infrastructure presents a number of issues on the local network, such as increases to journey times across the Borough, added congestion at the Ship Canal crossings and additional delay across the network and at key junctions.

In all instances, Scenario 1 represents a scenario that is unable to sustain the additional demand generated by the PSVLP. Delays in the local network worsen significantly (compared to 2016 levels) and this has a resulting impact on travel time across the Borough as well as the demand using the existing Ship Canal crossings. There is an increase of over a third crossing the inner cordon.

In Scenarios 2 and 3 however, by delivering the supporting development infrastructure, the impact of the PSVLP growth is better mitigated. These scenarios show that whilst delays on the local network increase from the 2016 base, they are smaller increases relative to Scenario 1. The additional highway infrastructure in these options helps alleviate some of the pressures on the existing Ship Canal crossings, with only a fractional worsening to the 2016 base conditions (less than 10% in Scenario 2).

By implementing a full multi-modal transformational strategy in Scenario 3, the impact on highway users as a result of the mode shift is further improved. Fewer car users on the highway network results in half the additional delay compared to Scenario 1, and a 10% improvement in overall travel time (as there are also fewer car trips being made). Journey times are maintained to those observed in the 2016 base model in 10 of the 20 routes assessed, and the pressures on the existing Ship Canal crossings are lessened when compared to Scenario 1 and 2.

Table 23. Impact of 2036 Scenarios Relative to the 2016 Base Model

Metric	Scenario 1	Scenario 2	Scenario 3
Network Delays (Daily)	+48%	+40%	+24%
Network Travel Time (Daily)	+29%	+27%	+18%
Journey Times	95% Worse 5% Same or Better	65% Worse 35% Same or Better	50% Worse 50% Same or Better
Existing Canal Crossing Flows – AM	+16%	+4%	-1%
Existing Canal Crossing Flows – PM	+23%	+9%	+5%
Inner Cordon Flows – Inbound	+32%	+19%	+9%
Inner Cordon Flows – Outbound	+33%	+19%	+9%
Outer Cordon Flows – Inbound	+26%	+27%	+24%
Outer Cordon Flows – Outbound	+24%	+25%	+23%

7.3 Recommendations

Scenario 3 represents the preferred package, providing a series of critical enabling highway improvements alongside a transformation of the cycling and public transport networks in the Borough. This scenario has shown that the highway network operates satisfactorily whilst there are still a number of issues on the transport network for which a solution is still to be determined.

As a strategic model, the WMMTM identifies areas or corridors where there may be issues on the network. Under Scenario 3 these known remaining hotspots, such as the A49 Corridor will require further assessment and targeted interventions throughout the course of the Plan's delivery. These locations are referenced in the Infrastructure Delivery Plan and draft Local Transport Plan 4 and will be the subject of future study and included in future revisions of the Local Plan where appropriate.