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Preferred Development Option

Transport Model Testing of Alternative Scenarios

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Quality information

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1. Introduction

1.1 Context

Warrington Borough Council (WBC) has now prepared its Preferred Development Option (PDO) as part of the Local Plan review process. The PDO sets out the council's favoured approach to delivering the housing and employment land necessary to meet its growth targets.

The PDO 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.

Details are provided in the consultation document produced by WBC[1] but in summary, the PDO sets out the following over the next twenty years:

- 24,800 homes split between urban (62%) and green belt (38%) sites; and
- 389 hectares of employment land split between urban (31%) and green belt (69%) locations.

The recently developed transport model for Warrington (WMMTM16) has been used to forecast the impact of this pattern of development growth on the transport network in Warrington.

The model was not available during the consultation stage of the PDO development although likely transport impacts were considered as part of the wider process.

Now that the core transport model forecasts have been prepared, based on the PDO, the alternative scenarios which arose during the development of the PDO have now also been assessed. This report summarises the result of that testing.

The purpose of the testing is to demonstrate that the PDO does not result in a breakdown of the Warrington transport network and to demonstrate that the transport impacts of the alternative scenarios are not materially better than the PDO.

The next stage in the process will then be to use the model to identify the necessary transport interventions to mitigate the impacts of the planned growth in Warrington.

1.2 Structure

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

- Chapter 2, The Development Scenarios, sets out the differences between the PDO and the alternative scenarios in terms of size and location of development;
- Chapter 3, Transport Model Process, describes how these forecasts have been built into the transport model;
- Chapter 4, Transport Model Testing, summarises the outcomes of the model testing based on borough wide metrics; and
- Chapter 5, Sector Based Analysis, provides further information on outcomes at a more detailed, area based, level; and

[1] Warrington Borough Council Local Plan Preferred Development Option Regulation 18 Consultation - July 2017

- Chapter 6, Conclusions and Recommendations, brings together the findings of the work and sets out what happens next.

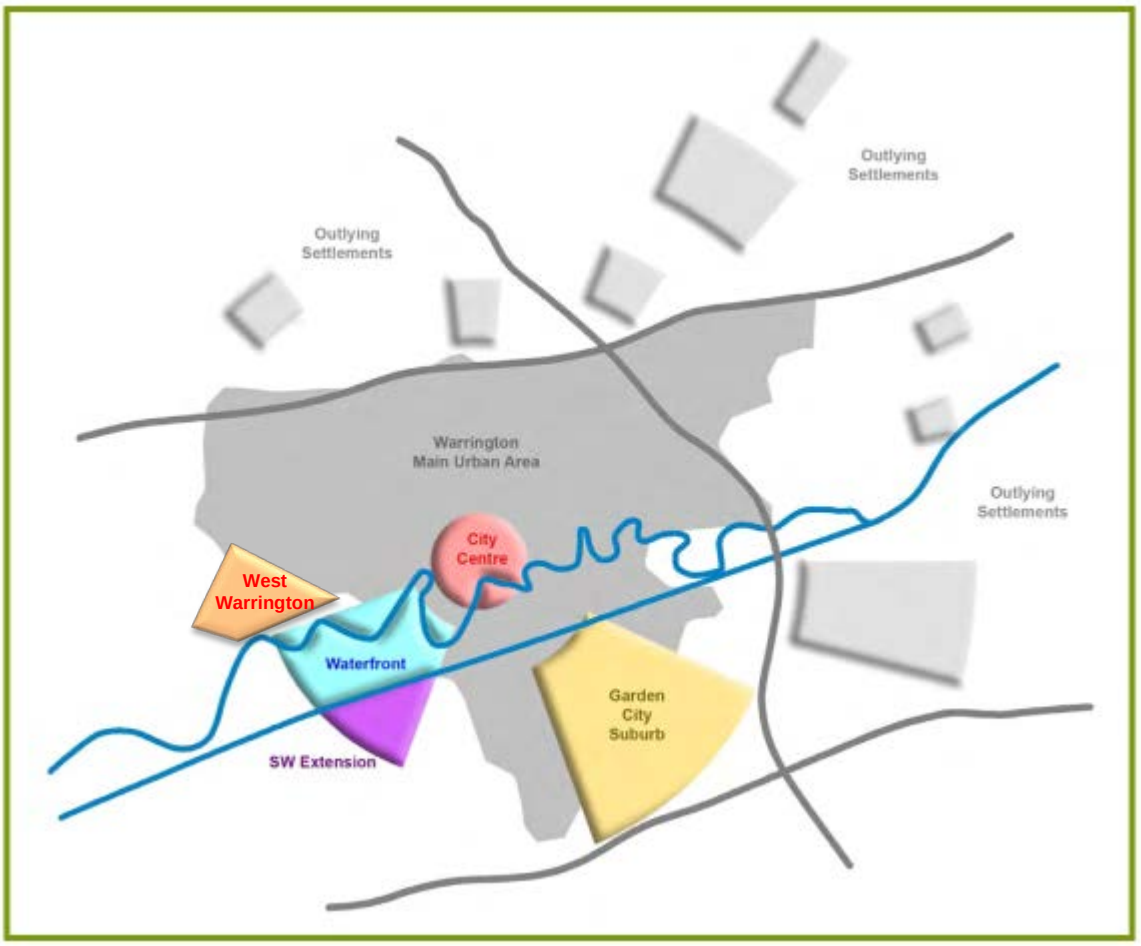
2. The Development Scenarios

2.1 Overview

The sensitivity tests, or scenarios, only reflect changes in the allocation of housing land within the Green Belt; the assumptions for the existing urban area and employment land have remained constant as per the PDO.

The PDO documentation considered a number of areas within the Borough and these are illustrated in Figure 1.

Figure 1 PDO Areas for Growth



As noted in Section 1.1, the total growth in household numbers covered by the plan is 24,800. For context, the number of households in Warrington at time of the 2011 census was 85,140. 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 2016 total number of households is of the order of 93,500.

Taking this 93,500 estimate then, the PDO growth of 24,800 households reflects an increase of approximately 25%.

2.2 The Scenarios

Six alternative scenarios have been identified which reflect changes in the location and scale of housing development forecast. The changes only materially impact upon five of the areas in the Borough:

- Garden City Suburb;
- South West Warrington;
- Outlying Settlements;
- West Warrington; and
- Urban Extension (involving a more dispersed pattern of Green Belt release adjacent to the main urban area).

The scenarios are labelled S2 to S7 in subsequent sections and tables. The distribution of households by area in the PDO and each of the six scenarios are summarised in Table 1 with changes relative to the PDO then presented in Table 2.

The tables illustrate that the total number of households remains constant throughout and that distribution around the Borough is the significant factor.

Table 1 Household Numbers by Scenario

	PDO	S2	S3	S4	S5	S6	S7
Garden City Suburb	6,324	7,324	3,198	8,000	6,324	4,000	2,293
South West Warrington	1,831	1,831	902	0	0	1,831	647
Outlying Settlements	1,190	0	4,900	1,190	1,190	1,190	1,190
West Warrington	0	0	0	0	2,243	2,243	1,850
Urban Extension	0	0	0	0	0	0	3,210
Remainder	15,429	15,429	15,429	15,429	15,429	15,429	15,429
Total	**24,774**	**24,584**	**24,429**	**24,619**	**25,186**	**24,693**	**24,619**

Source: WBC

Table 2 Absolute Changes in Household Numbers by Scenario (relative to PDO)

	PDO	S2	S3	S4	S5	S6	S7
Garden City Suburb	-	+1,000	-3,126	+1,676	0	-2,324	-4,031
South West Warrington	-	0	-929	-1,831	-1,831	0	-1,184
Outlying Settlements	-	-1,190	+3,710	0	0	0	0
West Warrington	-	0	0	0	+2,243	+2,243	+1,850
Urban Extension	-	0	0	0	0	0	+3,210
Remainder	-	0	0	0	0	0	0
Total	**-**	**-190**	**-345**	**-155**	**+412**	**-81**	**-155**

Source: WBC

3. Transport Model Process

3.1 Overview of the Model

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, 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.

For information relating to the methodology, collection and analysis of existing data and the additional data collection exercise undertaken in June/July 2016, please refer to:

- ***"Warrington Transport Model: Data Collection Report (MDCR), January 2017"***

For information relating to the work undertaken to calibrate the transport model and the assessment of how well it performs against observed data, please refer to:

- ***"Warrington Transport Model: Model Validation Report (MVR), December 2017"***

For information relating to the future year assessment of the Local Plan Preferred Development Option and its impact on the network, please refer to:

- ***"Warrington Transport Model: Model Forecasting Report (MFR), February 2018"***

3.2 Implementation of the Scenarios

The Scenarios prepared for, and reported on within this report, are designed specifically to examine the full impacts of the proposed expansion of Warrington detailed within the Local Plan. 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 be very likely to occur within the specified time frame.

[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.

To ensure that a realistic set of growth factors was applied, and that the overall process was compatible with NTEM, 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 scenario then, 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 use 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 3.

Table 3 Distribution Pattern for Development Areas

Development Area	Proportion of Trips to		
	Town Centre	Other Warrington	External
Garden City Suburb	9.1%	56.1%	34.8%
South West Warrington	21.7%	36.4%	41.8%
Outlying Settlements	9.5%	19.7%	70.7%
West Warrington	12.8%	45.8%	42.3%
Urban Extension	20.6%	41.5%	37.8%

Source: WMMTM16 (2036 values)

As noted previously, the forecast growth in the PDO represents an increase of around 25% in the number of households in Warrington compared to the present day. The elements of that growth subject to area variation in these scenario tests is around 9,400, or about 10% of the current total.

This means that one would expect to see very little difference at the aggregate level from the model testing of these scenarios with changes limited to quite local impacts.

For example, according to Table 3, diverting development to the outlying settlements would result in the largest reduction in trips into central areas since the settlement areas have the highest proportion of external destinations (70.7%). All other development areas have a broadly similar distribution, although high proportions of new trips from all areas travel to zones outside Warrington. Thus, removing the South West Warrington Extension as in Scenario Options 4 to 7 would be expected to reduce demand for trips to the town centre area since this zone has the highest proportion of town centre trips at 21.7%.

4. Transport Model Testing

4.1 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.

4.2 Key Performance Indicators

The Key Performance Indicators (KPIs) that have been developed for this testing process are summarised in Table 4.

Table 4 Model KPIs

KPI	Description
Vehicle Hours	Sum of all car based travel time
Vehicle Kms	Sum of all car based trip kilometres
Trip Length	Trip length distribution of all car trips within Warrington
	As above but just for trips related to new developments
Public Transport Mode Share	Proportion of trips made by public transport (PT)
	Total PT trip volumes
Average Speed	Average Speed across the model simulation area
Canal Screenline	Total car based flow across the canal screenline
	As above but for bus passenger numbers
Cordon	Total car based flow inbound and outbound on inner cordon
	As above but for bus passenger numbers
Journey Times	Travel times on the 4 key cross-town journey time routes

Source: AECOM

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

4.3 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.

Table 5 presents the results for each scenario by time period and a 'daily' total and the percentage variation from the PDO as reported in the WMMTM16 MFR.

Table 5 Total Vehicle Hours

By Period		PDO	S2	S3	S4	S5	S6	S7
AM Peak	Result	32,648	32,637	32,379	32,665	32,552	32,453	32,445
	vs. PDO		-0.03%	-0.82%	0.05%	-0.29%	-0.60%	-0.62%
Inter Peak	Result	24,805	24,756	24,594	24,803	24,728	24,664	24,624
	vs. PDO		-0.20%	-0.85%	-0.01%	-0.31%	-0.57%	-0.73%
PM Peak	Result	33,842	33,801	33,582	33,797	33,774	33,657	33,642
	vs. PDO		-0.12%	-0.77%	-0.13%	-0.20%	-0.55%	-0.59%
'Daily' Total	Result	273,373	272,947	271,098	273,312	272,586	271,812	271,498
	vs. PDO		-0.16%	-0.83%	-0.02%	-0.29%	-0.57%	-0.69%

Source: *WMMTM16 model*

Note: *Daily total reflects an estimate of a typical 12-hour weekday*

Analysis of Metric:

The results suggest Scenario 3 is the best performing scenario with the largest reduction in vehicle hours travelled compared to the PDO. However, this option diverts 4,900 dwellings to the outlying settlements. The largest proportion of trips in the settlements have a destination outside of the Borough and this is reflected in the reduced travel hours as these settlements are closer to an external area compared to the urban area or suburb.

The metric is also impacted by the fact that the assessment is of the model simulation area only. Therefore trips are spending less time in the simulation area to get to their destination as the outlying settlements are already on the edges of the model simulation area and trips likely to be heading further afield. This is of particular relevance for Scenario 3 where the metric does not fully capture all of the impacts for those developments remote from the Borough Centre.

Across any alternate scenario the relative difference compared to the PDO is minor; less than 1% difference in any time period or the daily total.

Summary: Negligible variation between scenarios

4.4 Distance – Total Vehicle Kilometres

This metric identifies changes in overall distance travelled as a consequence of changes in trip length. Again, data has been collected for the modelled simulation area only so as to

remove any external area influences and maintain focus on impacts solely across the Borough.

Table 6 presents the results for each scenario by time period and a 'daily' total and the percentage variation from the PDO as reported in the WMMTM16 MFR.

Table 6 Distance - Total Vehicle Kms

By Period		PDO	S2	S3	S4	S5	S6	S7
AM Peak	Result	1,792,821	1,792,715	1,789,366	1,793,056	1,792,324	1,790,294	1,789,670
	vs. PDO		-0.01%	-0.19%	0.01%	-0.03%	-0.14%	-0.18%
Inter Peak	Result	1,572,000	1,570,788	1,567,693	1,571,332	1,570,836	1,569,117	1,568,520
	vs. PDO		-0.08%	-0.27%	-0.04%	-0.07%	-0.18%	-0.22%
PM Peak	Result	1,830,977	1,830,765	1,826,080	1,831,055	1,830,899	1,828,173	1,827,501
	vs. PDO		-0.01%	-0.27%	0.00%	0.00%	-0.15%	-0.19%
'Daily' Total	Result	16,439,693	16,430,735	16,397,018	16,435,487	16,430,686	16,411,520	16,405,400
	vs. PDO		-0.05%	-0.26%	-0.03%	-0.06%	-0.17%	-0.21%

Source: WMMTM16 model

Note: Daily total reflects an estimate of a typical 12-hour weekday

Analysis of Metric:

This metric also suggests Scenario 3 is the best performing scenario with the largest reduction in vehicle kilometres travelled compared to the PDO. Again, this metric is being impacted by the fact that 4,900 dwellings are diverted to the outlying settlements, resulting in trips having a shorter distance to travel to a likely external destination compared to the PDO.

If Scenario 3 is excluded, Scenario 7 shows to be performing the best compared to the PDO. This option is a dispersed distribution across sites adjacent to the existing urban area so trips here are likely to have a destination much closer to the Town Centre or another part of the Borough rather than External.

Overall, across any alternate scenario the relative difference compared to the PDO is minor; less than 0.3% in any time period or daily total.

Summary: Negligible variation between scenarios

4.5 Average Trip Length

This metric identifies any reduction in the proportion of shorter distance trips as a consequence of the planning options – even if not directly reflected in model, shorter distance trips should be more prone to using active travel modes and could be used as an indicator of propensity to change.

Trip lengths for this metric have been assessed in two ways; firstly, trip lengths for the whole model simulation area (as per all other metrics), but also in terms of the average trip length for 'new trips' only. For this second assessment, we have isolated the trips in the matrix that are newly generated trips as a result of a development being present.

Table 7 presents the results for each scenario and the percentage variation from the PDO.

Table 8 presents the proportion of shorter distance trips (less than 4km and less than 10km) and thereby offering an opportunity for mode shift to PT or an active mode.

Table 9 presents the same information as Table 7 but for the 'new trips' only, including a breakdown by trip purpose.

Table 7 Average Car Trip Length (all day)

	PDO	S2	S3	S4	S5	S6	S7
All day	10.82	10.98	10.87	11.02	10.97	10.97	10.90
vs. PDO		1.53%	0.53%	1.86%	1.44%	1.44%	0.81%

Source: WMMTM16 model

Table 8 Proportion of Short Distance Car Trips

% of trips	PDO	S2	S3	S4	S5	S6	S7
< 4km	44.3%	43.8%	44.0%	43.6%	43.4%	43.4%	43.8%
< 10km	69.8%	69.2%	69.4%	69.0%	69.2%	69.2%	69.5%

Source: WMMTM16 model

Table 9 Average Car Trip Length for New Trips Only

Trip Purpose	PDO	S2	S3	S4	S5	S6	S7
Commute	11.43	11.71	10.47	11.87	11.52	10.93	10.00
Business	14.43	13.81	12.43	14.24	14.25	13.31	13.00
Other	7.70	8.31	8.04	8.28	8.13	8.09	7.67
All Purposes	9.27	9.78	9.10	9.86	9.62	9.33	8.72
vs. S1		5.5%	-1.8%	6.4%	3.8%	0.6%	-6.0%

Source: WMMTM16 model

Analysis of Metric – All trips:

This metric shows that Scenario 1 (the PDO spatial option) is the best performing scenario with the shortest average car trip length and therefore likely to be the highest in terms of propensity to shift from car to active travel modes or PT. Scenario 1 contains the highest proportion of trips less than 4km and less than 10km.

Overall, across any alternate scenario the relative difference compared to the PDO is minor; less than 2% in any time period or daily total.

Summary: PDO the best performing option but limited variation between scenarios

Analysis of Metric – New trips:

This metric shows that Scenario 7 (existing urban area extension) is the best performing scenario for new development trips. This is likely to be due to the proximity of existing trip attractors as part of current urban settlement patterns. However, the scale of significance is still relatively small (average trip length difference is less than 0.5 km).

Overall, across any alternate scenario the relative difference compared to the PDO is small; less than 7% in any time period or daily total, with only 2 spatial options performing better than the PDO

Summary: Scenario 7 performs best

4.6 Public Transport Trips and Mode Share

Complementing the Average Trip Length metric, the PT mode share measure looks at the proportion of trips made by public transport (PT) in each scenario; presented both by all purposes and commuting only. It was anticipated that this metric would not alter significantly as no changes were being made to any PT infrastructure or schemes between the scenarios. This metric is reflecting the relative attractiveness of PT as a consequence of the selected planning option.

Table 10 presents the results of this assessment in terms of mode share and Table 11 presents the results in terms of absolute volumes of public transport trips.

Table 10 Proportion of PT Trips

Mode Choice	PDO	S2	S3	S4	S5	S6	S7
% PT (all purposes)	5.78%	5.77%	5.82%	5.75%	5.81%	5.81%	5.85%
vs. PDO		-0.17%	0.69%	-0.52%	0.52%	0.52%	1.21%
% PT (commute)	6.64%	6.63%	6.69%	6.61%	6.65%	6.65%	6.72%
vs. PDO		-0.15%	0.75%	-0.45%	0.15%	0.15%	1.20%

Source: WMMTM16 model

Table 11 shows the change in mode share in relation to the overall changes in PT demand.

Table 11 PT Trip Volumes

Mode Choice	PDO	S2	S3	S4	S5	S6	S7
PT (all purposes)	28,468	28,476	28,282	28,409	28,630	28,602	28,568
vs. PDO		0.03%	-0.65%	-0.21%	0.57%	0.47%	0.35%
PT (commute)	8,247	8,255	8,181	8,231	8,270	8,258	8,263
vs. PDO		0.10%	-0.81%	-0.19%	0.28%	0.14%	0.19%

Source: WMMTM16 model

Analysis of Metric:

The variation in PT share is low with all scenarios in the range of 5-6% for all trips and 6-7% for commuting. This low variation is not surprising as these tests have not assumed any new PT schemes serving the development areas. It is not, therefore, a measure of the potential for an area to be served by PT in the future.

Scenario 7 performs the strongest as by extending the urban area, development here has access to existing PT services and corridors.

Scenarios 2 and 4 perform worse than the PDO. These two options both have the highest concentrations of development in the Garden City Suburb (7,324 and 8,000 respectively). This highlights the lack of (currently planned) new and existing PT services in this location and reflecting high car ownership.

The total volume of public transport trips only varies by 200.

Summary: Scenario 7 performs marginally better but negligible variation

4.7 Average Speed

This metric was assessed to highlight any variation in travel speed across the network. Combined with Total Vehicle Hours and Distance, average speed is an indicator of delay / congestion in the model area. Table 12 presents the results of this assessment for each scenario for both the AM and PM peaks.

Table 12 Average Speed (kph) in Model Simulation Area

	PDO	S2	S3	S4	S5	S6	S7
AM	54.9	54.9	55.3	54.9	55.1	55.2	55.2
vs. PDO		0.0%	0.7%	0.0%	0.4%	0.5%	0.5%
PM	54.1	54.2	54.4	54.2	54.2	54.3	54.3
vs. PDO		0.2%	0.6%	0.2%	0.2%	0.4%	0.4%

Source: WMMTM16 model

Analysis of Metric:

This metric shows very little variation at the network wide level (typically less than 0.5%).

Summary: Negligible variation between scenarios

4.8 Canal Screenline Flows

This metric looks at the total trips crossing the Ship Canal screenline. This screenline reflects the key pinch point for the network in Warrington. The results are presented separately for vehicles and buses (in terms of passenger numbers).

4.8.1 Canal Screenline - Vehicles

The screenline sums the total flow for each of the four Ship Canal crossings in Warrington. Table 13 and Table 14 present the total flows across the screenline by direction, and time period.

Table 13 Screenline Flows - Northbound Vehicles Across Ship Canal

Vehicles		PDO	S2	S3	S4	S5	S6	S7
AM Peak	Flow	4,727	4,730	4,537	4,683	4,616	4,598	4,512
	vs. S1		0.08%	-4.01%	-0.93%	-2.35%	-2.72%	-4.55%
Inter Peak	Flow	3,932	3,917	3,778	3,907	3,845	3,803	3,762
	vs. S1		-0.38%	-3.91%	-0.63%	-2.21%	-3.28%	-4.33%
PM Peak	Flow	4,079	4,075	4,054	4,078	4,058	4,041	4,017
	vs. S1		-0.08%	-0.61%	-0.01%	-0.51%	-0.93%	-1.51%
'Daily' Total	Flow	40,732	40,628	39,334	40,493	39,926	39,579	39,124
	vs. S1		-0.25%	-3.43%	-0.59%	-1.98%	-2.83%	-3.95%

Source: WMMTM16 model

Table 14 Screenline Flows - Southbound Vehicles Across Ship Canal

Vehicles		PDO	S2	S3	S4	S5	S6	S7
AM Peak	Flow	3,711	3,694	3,810	3,704	3,765	3,792	3,848
	vs. S1		-0.45%	2.66%	-0.19%	1.44%	2.19%	3.69%
Inter Peak	Flow	4,204	4,217	4,073	4,168	4,108	4,109	4,088
	vs. S1		0.31%	-3.11%	-0.86%	-2.27%	-2.27%	-2.77%
PM Peak	Flow	4,787	4,805	4,562	4,721	4,627	4,641	4,571
	vs. S1		0.39%	-4.70%	-1.37%	-3.34%	-3.05%	-4.50%
'Daily' Total	Flow	42,175	42,268	41,070	41,812	41,347	41,410	41,241
	vs. S1		0.22%	-2.62%	-0.86%	-1.96%	-1.81%	-2.21%

Analysis of Metric:

This metric shows that daily flows vary by only up to 4% by direction. The largest reduction in flow observed is in Scenario 7. This is due to the dispersed nature of the spatial option where development is spread across the borough rather than in a single location such as the South East in the PDO. Scenario 3 also shows greater than 3% reduction in flow. As development is concentrated in the settlements in this option, fewer trips are coming into the Town Centre.

In the southbound there is a similar pattern but 4 of the 6 alternate options show an increase in flow in the AM compared to the PDO.

Overall, across any alternate scenario the relative difference is small with variations in the order of 200 vehicles per hour.

Summary: Scenarios 3 and 7 have the lowest flows but only slight variation between scenarios

4.8.2 Canal Screenline Flows – Bus Passengers

Table 15 and Table 16 present the total flows across the screenline by direction, and time period.

Table 15 Screenline Flows - Northbound Bus Passengers Across Ship Canal

Passengers		PDO	S2	S3	S4	S5	S6	S7
AM Peak	Flow	124	126	113	126	119	115	114
	vs. S1		1.61%	-8.87%	1.61%	-4.03%	-7.26%	-8.06%
Inter Peak	Flow	133	134	123	130	126	127	122
	vs. S1		0.75%	-7.52%	-2.26%	-5.26%	-4.51%	-8.27%
PM Peak	Flow	158	160	153	156	154	156	155
	vs. S1		1.27%	-3.16%	-1.27%	-2.53%	-1.27%	-1.90%
'Daily' Total	Flow	1,644	1,662	1,536	1,626	1,575	1,575	1,539
	vs. S1		1.09%	-6.57%	-1.09%	-4.20%	-4.20%	-6.39%

Source: WMMTM16 model

Table 16 Screenline Flows - Southbound Bus Passengers Across Ship Canal

Passengers		PDO	S2	S3	S4	S5	S6	S7
AM Peak	Flow	89	89	88	88	89	89	88
	vs. S1		0.00%	-1.12%	-1.12%	0.00%	0.00%	-1.12%
Inter Peak	Flow	158	160	153	156	154	156	155
	vs. S1		1.27%	-3.16%	-1.27%	-2.53%	-1.27%	-1.90%
PM Peak	Flow	93	94	85	83	81	90	83
	vs. S1		1.08%	-8.60%	-10.75%	-12.90%	-3.23%	-10.75%
'Daily' Total	Flow	1,494	1,509	1,437	1,434	1,434	1,473	1,443
	vs. S1		1.00%	-3.82%	-4.02%	-4.02%	-1.41%	-3.41%

Analysis of Metric:

This metric shows limited variation in terms of bus passenger numbers. Scenario 2 has the highest number, but only very slightly ahead of the PDO.

Summary: Scenario 2 and the PDO have the highest passenger numbers but only limited variation between scenarios

4.9 Cordon Flows

4.9.1 Car Trips

This metric looks at the total car based flow across the Inner Cordon as defined in the Model Validation Report. 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. Table 17 and Table 18 present the

total flows across the Inner Cordon by direction, and time period. Figure 2 shows the location of the two cordons and the sites assessed.

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 in increase in the attractiveness of locations within the cordon; a likely positive outcome therefore for the town centre economy.

Figure 2 Inner and Outer Cordon Location

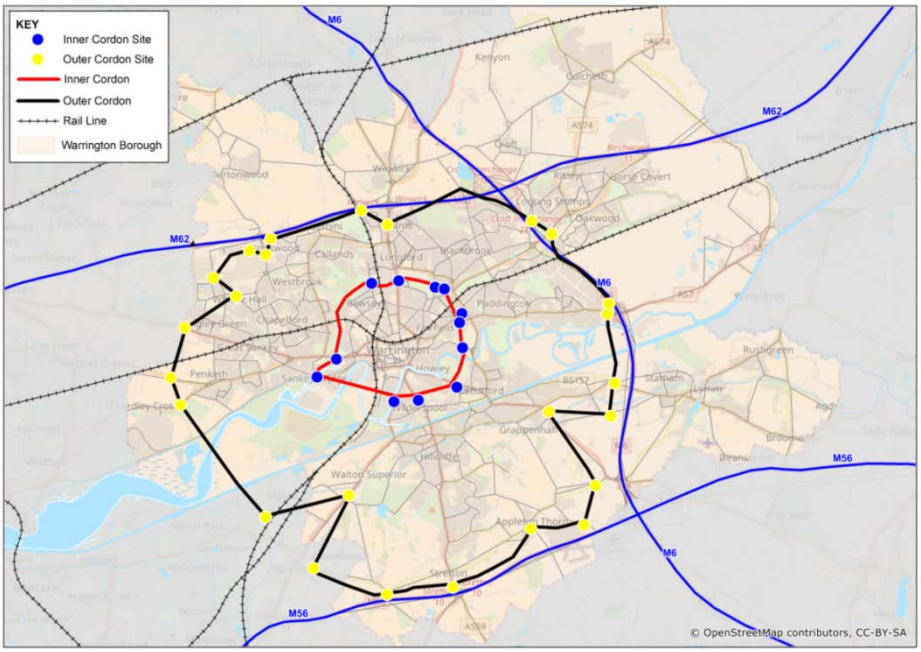


Table 17 Inner Cordon Flows – Cars Inbound

		PDO	S2	S3	S4	S5	S6	S7
AM Peak	Flow	10,454	10,389	10,426	10,431	10,432	10,428	10,441
	vs. S1		-0.63%	-0.27%	-0.22%	-0.21%	-0.25%	-0.13%
Inter Peak	Flow	8,657	8,593	8,504	8,575	8,567	8,558	8,542
	vs. S1		-0.74%	-1.77%	-0.95%	-1.03%	-1.15%	-1.33%
PM Peak	Flow	7,873	7,859	7,802	7,860	7,869	7,845	7,825
	vs. S1		-0.18%	-0.91%	-0.17%	-0.06%	-0.36%	-0.62%
'Daily' Total	Flow	88,090	87,520	86,870	87,461	87,424	87,313	87,190
	vs. S1		-0.65%	-1.38%	-0.71%	-0.76%	-0.88%	-1.02%

Source: WMMTM16 model

Table 18 Inner Cordon Flows – Cars Outbound

Inner Cordon Outbound		PDO	S2	S3	S4	S5	S6	S7
AM Peak	Flow	7,822	7,829	7,797	7,837	7,825	7,821	7,840
	vs. S1		0.10%	-0.31%	0.20%	0.04%	-0.01%	0.24%
Inter Peak	Flow	8,381	8,323	8,231	8,283	8,282	8,293	8,276
	vs. S1		-0.68%	-1.78%	-1.16%	-1.18%	-1.05%	-1.25%
PM Peak	Flow	10,397	10,363	10,269	10,322	10,319	10,328	10,313
	vs. S1		-0.33%	-1.23%	-0.73%	-0.75%	-0.67%	-0.81%
'Daily' Total	Flow	85,992	85,552	84,720	85,221	85,187	85,272	85,161
	vs. S1		-0.51%	-1.48%	-0.90%	-0.94%	-0.84%	-0.97%

Source: WMMTM16 model

Analysis of Metric:

This metric shows that the PDO has the highest levels of flow in the inbound direction compared to any other scenario. In the outbound there is a similar pattern but 4 of the 6 alternate options show a small increase in flow in the morning compared to the PDO.

Overall, across any alternate scenario the relative difference compared to the PDO is small; less than 1.5% in any time period, which is in the order of 150 vehicles.

Summary: Scenarios 3 has the lowest flows but only slight variation between scenarios

4.9.2 Cordon Flows – Bus

This metric looks at the same information but in terms of bus passenger numbers. Table 19 and Table 20 present the total bus passenger numbers across the Inner Cordon by direction, and time period.

Table 19 Inner Cordon Flows – Bus Passengers Inbound

		PDO	S2	S3	S4	S5	S6	S7
AM Peak	Flow	941	938	939	939	953	952	959
	vs. S1		-0.32%	-0.21%	-0.21%	1.28%	1.17%	1.91%
Inter Peak	Flow	878	878	874	876	881	880	875
	vs. S1		0.00%	-0.46%	-0.23%	0.34%	0.23%	-0.34%
PM Peak	Flow	483	482	477	473	473	480	478
	vs. S1		-0.21%	-1.24%	-2.07%	-2.07%	-0.62%	-1.04%
'Daily' Total	Flow	9,540	9,528	9,492	9,492	9,564	9,576	9,561
	vs. S1		-0.13%	-0.50%	-0.50%	0.25%	0.38%	0.22%

Source: WMMTM16 model

Table 20 Inner Cordon Flows – Bus Passengers Outbound

Inner Cordon Outbound		PDO	S2	S3	S4	S5	S6	S7
AM Peak	Flow	473	473	472	473	469	469	469
	vs. S1		0.00%	-0.21%	0.00%	-0.85%	-0.85%	-0.85%
Inter Peak	Flow	791	791	785	786	783	784	783
	vs. S1		0.00%	-0.76%	-0.63%	-1.01%	-0.88%	-1.01%
PM Peak	Flow	762	762	757	761	762	761	766
	vs. S1		0.00%	-0.66%	-0.13%	0.00%	-0.13%	0.52%
'Daily' Total	Flow	8,451	8,451	8,397	8,418	8,391	8,394	8,403
	vs. S1		0.00%	-0.64%	-0.39%	-0.71%	-0.67%	-0.57%

Source: WMMTM16 model

Analysis of Metric:

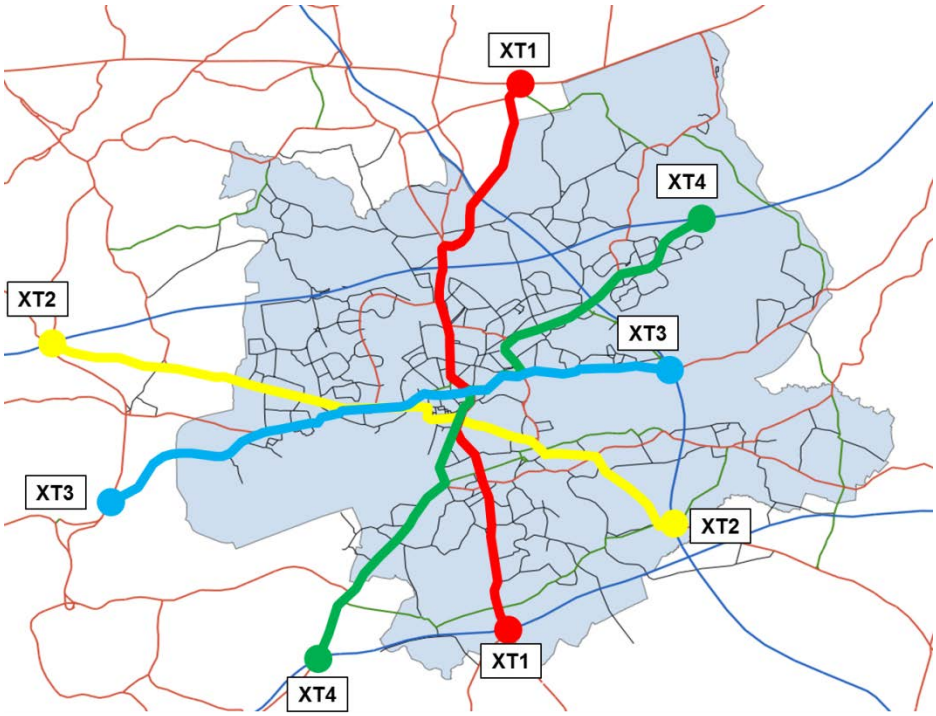
This metric shows that the PDO has the highest levels of bus passengers crossing the inner cordon at the daily level but there is limited variation between scenarios.

Summary: PDO has the highest passenger numbers but only slight variation between scenarios

4.10 Journey Times

Travel times have been assessed on the four key cross-town journey time routes, as shown in Figure 3.

Figure 3 Cross-Town Journey Time Routes



The end-to-end journey times for each of the routes is shown in Table 21 and Table 22.

Table 21 AM Peak Journey Times (mins)

Route / Dir.		PDO	S2	S3	S4	S5	S6	S7
XT1 (A49)	NB	40.13	40.17	39.39	40.10	39.77	39.51	39.45
	SB	38.29	38.43	37.57	38.68	38.35	37.89	38.21
XT2 (A57/A50)	EB	35.99	36.11	35.84	36.23	36.40	36.15	35.84
	WB	31.77	31.59	31.08	31.25	32.18	31.31	31.05
XT3 (A562/A57)	EB	22.62	22.57	22.56	22.53	22.51	22.92	22.90
	WB	24.99	24.98	24.93	24.99	25.31	24.89	24.93
XT4 (A56/A574)	NB	29.40	29.36	28.85	29.14	29.02	29.09	28.90
	SB	30.07	30.00	29.76	29.78	29.73	29.73	29.72

Source: WMMTM16 model

Table 22 PM Peak Journey Times (mins)

Route / Dir.		PDO	S2	S3	S4	S5	S6	S7
XT1 (A49)	NB	46.44	46.47	46.19	46.66	46.36	46.14	46.21
	SB	35.86	36.07	35.05	35.79	35.51	35.27	35.00
XT2 (A57/A50)	EB	34.76	34.89	34.58	34.72	34.64	34.54	34.51
	WB	36.64	35.74	36.27	36.62	36.74	35.58	35.58
XT3 (A562/A57)	EB	23.17	23.14	23.09	23.10	23.16	23.17	23.18
	WB	28.16	28.15	28.08	28.03	28.15	28.02	28.75
XT4 (A56/A574)	NB	28.14	28.14	28.01	27.97	27.93	28.08	27.96
	SB	34.57	35.12	33.46	33.02	34.87	35.21	36.73

Source: WMMTM16 model

Analysis of Metric:

This metric shows that there is limited variation between scenarios in terms of journey time; with less than +/- 2% difference on average across the four routes between scenarios.

Scenario 3 has the lowest journey times reflecting that development is concentrated on the edges of the borough. This alleviates some congestion along the 4 cross-town routes but at the expense of more disparate travel patterns.

Summary: Limited variation

4.11 Metrics Summary

Table 23 presents a summary of each of the metric results by scenario.

The tables presented in this chapter demonstrate that at a network wide level, the transport impacts of the alternate scenarios are not materially different to the PDO. This is not surprising in the context of the scale of change being considered. To recap from Chapter 2, the PDO growth reflects an increase of around 25% in the quantum of housing numbers but

the areas subject to variation in these scenarios amount to 38% of that increase, therefore less than 10% of the current total.

In some cases the ‘best’ option for a particular scenario may be considered obvious e.g. reducing overall vehicle hours implies less congestion. But for other metrics, such as the volume of trips entering the cordon referred to in section 4.9, the issue is not as clear. Less trips will typically mean less pressure on the transport network but also less economic activity in the borough.

Table 23 Summary of Metric Results by Scenario

Metric	Units	PDO	S2	S3	S4	S5	S6	S7
Vehicle Hours	PCU hrs/hr	273,373	272,947	271,098	273,312	272,586	271,812	271,498
Vehicle Kilometres	PCU km/hr	16,439,693	16,430,735	16,397,018	16,435,487	16,430,686	16,411,520	16,405,400
Trip Length – all trips	km	10.82	10.98	10.87	11.02	10.97	10.97	10.90
< 4km	%	44.3	43.8	44.0	43.6	43.4	43.4	43.8
< 10km	%	69.8	69.2	69.4	69.0	69.2	69.2	69.5
Trip Length – new trips	km	9.27	9.78	9.10	9.86	9.62	9.33	8.72
% PT – all purposes	%	5.78	5.77	5.82	5.75	5.81	5.81	5.85
% PT - commute	%	6.64	6.63	6.69	6.61	6.65	6.65	6.72
PT volumes – all	no.	28,468	28,476	28,282	28,409	28,630	28,602	28,568
PT volumes - commute	no.	8,247	8,255	8,181	8,231	8,270	8,258	8,263
Avg. Speed	AM kph	54.9	54.9	55.3	54.9	55.1	55.2	55.2
	PM kph	54.1	54.2	54.4	54.2	54.2	54.3	54.3
Canal Daily 2-way	Vehs	82,907	82,896	80,404	82,305	81,273	80,989	80,365
Canal Daily 2-way	Bus Pax	3,138	3,171	2,973	3,060	3,009	3,048	2,982
Cordon Inner Daily	Vehs	174,082	173,072	171,590	172,682	172,611	172,585	172,351
Cordons Inner Daily	Bus Pax	17,991	17,979	17,889	17,910	17,955	17,970	17,964
Journey Times	Index(1)	32.56	32.56	32.17	32.41	32.54	32.34	32.43

Source: WMMTM16 model

Notes:

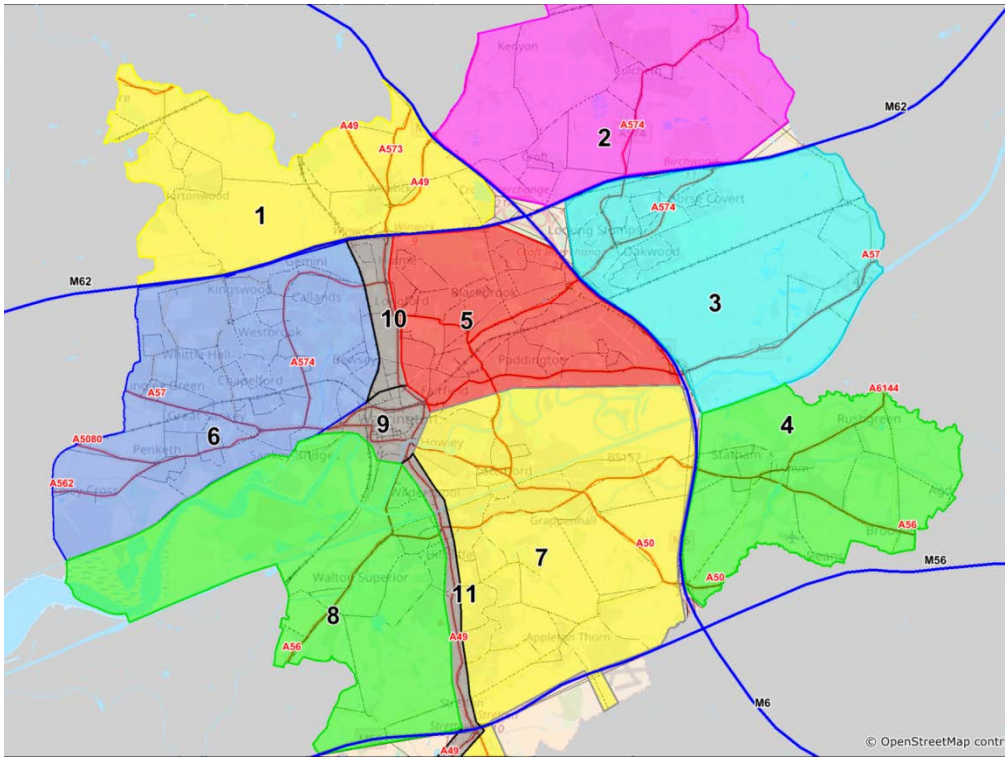
(1) *Index reflects average journey time across all relevant routes and periods*

5. Sector Based Analysis

5.1 Introduction

As the metrics at a Borough level were not demonstrating significant change between scenarios, the Borough was split into 11 smaller sections with a focus on node-based outputs within each sector to assess the degree of localised impacts between scenarios. The sector system used is shown in Figure 4.

Figure 4 Sector System for Metric Analysis



A description of each sector is provided in Table 24 together with an indication of the extent of the model area included in each sector.

Table 24 Description of Sectors Used for Analysis

Sector	Description	Zones	%	Nodes	%	Links	%
1	Settlements / North of M62 - Burtonwood & Winwick	12	2%	105	5%	211	5%
2	Settlements / North East of M62 / M6 - Croft & Culcheth	7	1%	103	5%	230	5%
3	Settlements / East of M6 - Birchwood & Hollins Green	43	9%	171	8%	358	8%
4	Settlements / North East of M6 /M56 - Lymm	24	5%	111	5%	243	6%
5	NE Warrington	94	19%	425	20%	902	21%
6	NW Warrington	127	26%	444	21%	891	20%
7	SE Warrington	99	20%	323	15%	688	16%
8	SW Warrington	35	7%	128	6%	247	6%
9	Town Centre	31	6%	166	8%	346	8%
10	A49 Corridor North	11	2%	61	3%	121	3%
11	A49 Corridor South	5	1%	64	3%	143	3%
	TOTAL	**488**		**2,101**		**4,380**	

5.2 Sector Metrics

The following metrics have been used to analyse the sector results from the model for 2036:

- Total vehicle hours in each sector;
- Total vehicle kilometres travelled within each sector;
- Total network delay by sector as a function of vehicle hours delay;
- Average speed by sector;
- Total delay seconds at nodes (junctions) within each sector; and
- Volume/capacity ratios at nodes (junctions) within each sector.

The remainder of this chapter presents the results of each of these metrics.

5.2.1 Total Vehicle Hours by Sector

This metric calculates the total vehicle hours on each link within each sector. It excludes the motorway network and therefore is not comparable with Table 5. Table 25 presents the total vehicle hours for the PDO and then the percentage change for each of the alternate scenarios.

Table 25 Vehicle Hours by Sector Relative to PDO

Sector	PDO	S2	S3	S4	S5	S6	S7
1	4473.0	-1.6%	0.9%	-1.7%	-0.9%	-0.9%	-0.9%
2	2,722.6	-2.2%	3.6%	-1.0%	-1.0%	-1.2%	-1.0%
3	6,867.2	-0.5%	0.5%	-0.2%	-0.3%	-0.3%	0.0%
4	2,620.6	-1.9%	2.0%	0.5%	-0.3%	-1.4%	-1.8%
5	11,654.0	-0.7%	-1.0%	-0.5%	-0.8%	-1.1%	-0.4%
6	12,854.2	-0.9%	-1.2%	-1.0%	2.4%	2.5%	1.9%
7	18,306.9	0.6%	-4.7%	3.0%	-0.9%	-4.1%	-4.8%
8	3,725.9	0.2%	-3.1%	-2.6%	-4.0%	-1.5%	-2.4%
9	9292.5	-0.7%	-2.7%	-1.7%	-1.8%	-1.7%	-2.0%
10	5,606.0	-1.2%	-0.9%	-1.0%	-1.0%	-1.2%	-0.9%
11	5,159.9	1.8%	-6.4%	3.1%	-1.4%	-5.0%	-5.9%
Total	**83,282.8**	**-0.4%**	**-2.0%**	**0.1%**	**-0.6%**	**-1.5%**	**-1.7%**

Source: WMMTM16 model

Analysis of Sector Metric:

The results suggest Scenario 3 is the best performing scenario with the largest reduction in vehicle hours travelled compared to the PDO at 2%. However, this option diverts 4,900 dwellings to the outlying settlements as reflected in the increase in hours in sectors 1 to 4 and the corresponding reduction in sectors 5 to 11. Increased travel times for trips from these outlying settlements to areas outside the borough, e.g. Manchester, are not included in this analysis.

Scenario 4 (8,000 dwellings in the Garden City Suburb) is the only option where total vehicle hours increases relative to the PDO. As demonstrated earlier, this variation is minor (0.1%).

Scenarios 6 and 7 which offer the most widespread spatial distribution pattern of the developments both perform well and suggest reductions in total vehicle hours compared to the PDO are possible with a dispersed distribution.

Average change to the PDO for any scenario is in the region of -1%, the maximum and minimum recorded changes are -6.4% and 3.6% respectively. Both of these are observed in Scenario 3.

5.2.2 Total Vehicle Kilometres by Sector

This metric calculates the total vehicle kilometres travelled on each link within each sector. It excludes the motorway network and therefore is not comparable with Table 6. Table 26 presents the total vehicle kilometres (in 000's) for the PDO and then the percentage change for each of the alternate scenarios.

Table 26 Vehicle Kms by Sector Relative to PDO

Sector	PDO	S2	S3	S4	S5	S6	S7
1	163.2	-1.4%	0.8%	-1.0%	-0.8%	-0.9%	-0.5%
2	152.9	-1.8%	2.9%	-0.8%	-0.8%	-1.0%	-0.8%
3	388.6	-0.3%	0.1%	-0.2%	-0.2%	-0.4%	-0.2%
4	94.2	-1.8%	2.1%	0.5%	-0.3%	-1.3%	-1.6%
5	460.0	-0.4%	-0.5%	-0.3%	-0.5%	-0.7%	0.0%
6	413.7	-0.6%	-0.9%	-0.7%	2.1%	2.0%	1.5%
7	854.3	0.2%	-1.8%	0.6%	-0.2%	-1.5%	-1.8%
8	147.2	0.4%	-2.6%	-2.2%	-2.9%	-0.9%	-1.8%
9	156.6	-0.5%	-1.9%	-1.0%	-1.0%	-0.9%	-1.3%
10	127.1	-0.7%	-0.7%	-0.6%	-0.7%	-0.8%	-0.6%
11	187.6	0.6%	-3.0%	0.8%	-0.8%	-2.3%	-3.2%
Total	**3,145.4**	**-0.3%**	**-0.8%**	**-0.2%**	**-0.2%**	**-0.7%**	**-0.8%**

Source: WMMTM16 model

Analysis of Sector Metric:

Similarly, the results for this metric suggest Scenario 3 and 7 are the best performing scenarios with the largest reduction in vehicle kilometres travelled compared to the PDO at -0.8%. However, these options both involve a dispersed development pattern. Scenario 3 diverts 4,900 dwellings to the outlying settlements around the Borough as reflected in the increase in kilometres travelled in sectors 1 to 4 and the corresponding reduction in sectors 5-11, whilst Scenario 7 places development adjacent to the main urban area and so proximity to the town centre is closer than those options with development further afield. This is demonstrated in a more even spread of the reduction in vehicle kilometres travelled as all but one sector show a reduction. Only sector 6 (west Warrington) shows an increase in vehicle kilometres travelled compared to the PDO.

Average change to the PDO for any scenario is in the region of -0.6%, the maximum and minimum recorded changes are -3.2% and 2.9% respectively. Both of these are observed in Scenario 3 and 7.

5.2.3 Total Network Delay by Sector

This metric calculates the total vehicle hours delay time on each link within each sector. Table 27 presents the result of this metric for a 12-hour weekday for the PDO and then the percentage change for each of the alternate scenarios.

Table 27 Total Network Delay by Sector Relative to PDO

Sector	PDO	S2	S3	S4	S5	S6	S7
1	1,277.0	-1.7%	0.6%	-3.2%	-1.1%	-0.9%	-1.8%
2	223.9	-2.9%	4.0%	-1.6%	-1.6%	-2.0%	-2.1%
3	1,443.0	-0.4%	1.4%	0.3%	-0.2%	0.7%	1.1%
4	187.3	-2.2%	0.6%	1.4%	-0.4%	-3.4%	-3.6%
5	3,482.1	-1.1%	-1.8%	-0.8%	-1.2%	-1.7%	-1.1%
6	4,032.4	-1.7%	-2.0%	-1.8%	2.4%	3.1%	2.2%
7	6,057.7	1.0%	-8.3%	7.2%	-2.1%	-7.3%	-8.1%
8	738.9	-0.4%	-5.0%	-5.7%	-9.1%	-2.9%	-5.8%
9	4,324.6	-1.1%	-3.8%	-2.4%	-2.7%	-2.7%	-2.9%
10	2,537.9	-1.8%	-1.3%	-1.3%	-1.5%	-1.7%	-1.3%
11	1,824.3	3.6%	-10.0%	6.2%	-2.1%	-7.8%	-7.9%
Total	**26,129.0**	**-0.4%**	**-3.9%**	**0.9%**	**-1.4%**	**-2.7%**	**-3.1%**

Source: WMMTM16 model

Analysis of Sector Metric:

This metric shows both the change in vehicle hours delay between each scenario as well as the vehicle hours delay as a function of total vehicle hours.

Scenarios 3, 6 and 7 show the largest overall reductions in delay compared to the PDO (between -2.7% and -3.9%). The largest reductions are driven by sectors 7, 8, and 11 (all south east Warrington). This corresponds with the fact that these 3 scenarios contain the lowest numbers of development in the South East (<4,000).

Scenario 4 is the only option which performs worse than the PDO with an increase in delay. This is driven by 6.2% and 7.2% increases in delay in sectors 11 and 7 respectively. Both these sectors are in the South East of the borough and this scenario has the largest number of housing development in the South East (8,000).

Average change to the PDO for any scenario is in the region of -2%, the maximum and minimum recorded changes are 7.2% and -10% respectively. Both of these are observed in Scenario 3 and 4.

Table 28 Total Network Delay by Sector as a Proportion of Total Time

Sector	PDO	S2	S3	S4	S5	S6	S7

1	28.5%	28.5%	28.4%	28.1%	28.5%	28.6%	28.3%
2	8.2%	8.2%	8.3%	8.2%	8.2%	8.2%	8.1%
3	21.0%	21.0%	21.2%	21.1%	21.0%	21.2%	21.3%
4	7.1%	7.1%	7.0%	7.2%	7.1%	7.0%	7.0%
5	29.9%	29.8%	29.6%	29.8%	29.8%	29.7%	29.7%
6	31.4%	31.1%	31.1%	31.1%	31.4%	31.5%	31.5%
7	33.1%	33.2%	31.8%	34.4%	32.7%	32.0%	31.9%
8	19.8%	19.7%	19.5%	19.2%	18.8%	19.5%	19.1%
9	46.5%	46.4%	46.0%	46.2%	46.1%	46.1%	46.1%
10	45.3%	45.0%	45.1%	45.1%	45.1%	45.0%	45.1%
11	35.4%	36.0%	34.0%	36.4%	35.1%	34.3%	34.6%
Total	**31.4%**	**31.4%**	**30.8%**	**31.6%**	**31.1%**	**31.0%**	**30.9%**

Source: WMMTM16 model

Analysis of Sector Metric:

When this metric is analysed against the total vehicle hours, the percentage change from the PDO is much smaller. On average, vehicle hours delay represents approximately one third of the total vehicle hours travelled. The change between scenarios is not significant.

The PDO average stands at 31.4%, the lowest proportion is scenario 3 at 30.8%, and the largest proportion is scenario 4 at 31.6%. This is also driven by the number of housing in the South East.

Sectors 2 and 4 have the lowest proportions of delay (less than 10% across any scenario), whilst sectors 9 and 10 (Town Centre and North A49) have the highest proportion of delay at over 45% in any one scenario.

5.2.4 Average Speed by Sector

This metric calculates the average speed (kph) for each link within each sector. Table 29 presents the results for the PDO and then the percentage change for each of the alternate scenarios.

Table 29 Average Weekday 12-hour Speed (kph) by Sector

Sector	PDO	S2	S3	S4	S5	S6	S7
1	36.5	0.2%	-0.1%	0.7%	0.1%	0.1%	0.4%
2	56.1	0.4%	-0.6%	0.2%	0.2%	0.2%	0.2%
3	56.6	0.2%	-0.4%	0.0%	0.1%	-0.1%	-0.1%
4	35.9	0.1%	0.0%	0.0%	0.0%	0.1%	0.2%
5	39.5	0.3%	0.5%	0.2%	0.3%	0.4%	0.5%
6	32.2	0.4%	0.4%	0.4%	-0.2%	-0.5%	-0.4%
7	46.7	-0.4%	3.1%	-2.4%	0.7%	2.7%	3.1%
8	39.5	0.2%	0.5%	0.5%	1.1%	0.5%	0.6%

Sector	PDO	S2	S3	S4	S5	S6	S7
9	16.9	0.2%	0.9%	0.7%	0.8%	0.9%	0.7%
10	22.7	0.5%	0.3%	0.3%	0.3%	0.4%	0.3%
11	36.4	-1.3%	3.7%	-2.2%	0.7%	2.9%	2.8%
Total	**37.8**	**0.1%**	**1.2%**	**-0.3%**	**0.4%**	**0.8%**	**0.9%**

Source: WMMTM16 model

Analysis of Sector Metric:

Similarly to the global metric, average speed does not vary significantly between scenarios. There is some variability between sectors, such as sectors 2 and 3 (Culcheth/Croft settlements and Birchwood/ Hollins Green settlement area which have the highest average speed at 56 kph (35mph). Sectors 9 and 10 (town centre and north A49) have the lowest average speed between 16-23 kph (10-15mph).

Generally, the average speeds appear low relative to speed limits across the network which suggests a high level of congestion and delay on the network.

The main sectors driving any change are sectors 7 (South East) and 11 (South A49) which are all in the South East of the Borough and directly affected by the number of development in the Garden City Suburb.

Across any scenario, the change in average speed is within 1kph and therefore not significant.

5.3 Sector Metrics Summary

The sector tables presented in this chapter demonstrate that even at a sector level, the transport impacts of the alternate scenarios are not materially different to the PDO. There are demonstrable variations between sectors as a result of the locations of development but these are logical and not of a significant scale so as to impact the overall model performance.

6. Conclusions and Recommendations

6.1 Overview

This document has reported on the transport impacts of Warrington Borough Council's (WBC) Preferred Development Option (PDO) relative to other scenarios considered during its development. The testing has been undertaken using the recently completed 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 model was not available during the consultation stage of the PDO development although likely transport impacts were considered as part of the wider process. The purpose of the testing is to ensure that the transport impacts of these other scenarios are not materially better than the PDO.

6.2 Conclusions

The analysis of the transport model testing has shown that there are variations between the scenarios in terms of the metrics used to assess the performance of the transport network.

However the scale of these variations is small at the Borough wide level which is understandable in the context of the variation in housing numbers between the scenarios. The PDO reflects an increase in household numbers of approximately 25% over the existing situation but only a proportion of this varies between scenarios; approximately 10% of the existing housing total.

In terms of the seventeen metrics used, and summarised in Table 23, Scenario 3 ranks top most frequently (six metrics) and the PDO second (4 metrics). However Scenario 3, which includes the largest proportion of development in the outlying settlements, results in a more dispersed travel pattern with impacts outside of the modelled area.

Overall the variation is small and we would conclude that there is no evidence, from the model, that the transport impacts of the other scenarios are materially better than the PDO.

A more detailed analysis has been undertaken by breaking the area down into sectors – these are illustrated in Figure 4. This shows more local variation between the scenarios but again no clear winner in terms of performance.

We can also conclude that the performance of the transport network does not become unsustainable as a consequence of the PDO. There will be localised issues that arise which will require policy or infrastructure interventions and work is underway to develop a transport plan to support the implementation of the PDO.

6.3 Recommendations

The testing has shown that the transport impacts of the other scenarios under consideration during the development process are not materially better than the PDO. From a transport modelling perspective there is no reason why the PDO forecast should not be adopted as the demand scenario.

We recommend that the PDO forecast is therefore adopted as the demand scenario for the Borough.

Work should now proceed to use the model to help develop a potential pipeline of transport interventions to ensure efficient operation of Warrington's transport network in the future.