highways england

Lower Thames Crossing

Traffic Forecasting Report

Volume 1

Statutory consultation 2018

Contents

Figures

Tables

Model Run References used in this report:

Core Growth	DM	=	CM6
	DS	=	C8E
Low Growth	DM	=	LA6
	DS	=	LAE
High Growth	DM	=	HA6
	DS	=	HAE

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Executive Summary

The Lower Thames Area Model (LTAM) is designed for use in forecasting the impact of providing a new road crossing of the River Thames between Gravesend and Tilbury on the performance of the highway network. LTAM is used to assess the changes in traffic flows, travel times, speeds and levels of congestion on the road network.

The methods used to build the LTAM model and the match between the model and the observed traffic flows and journey times is described in the LTAM Local Model Validation Report, which can be viewed at www.lowerthamescrossing.co.uk/publications. This Traffic Forecasting Report (TFR) describes how the model has been used to forecast the number of vehicles using the road network in the future, where they are travelling to/from and the journey times in the future on different parts of the road network.

The base year LTAM model reflects travel patterns and conditions on the road network for an average weekday in March 2016. The modelled hours are:

- AM peak hour (07:00 – 08:00);
- Average inter peak hour (09:00 – 15:00); and
- PM peak hour (17:00 – 18:00).

At the time of starting the use of the LTAM to prepare traffic forecasts, the date of opening of the Lower Thames Crossing is likely to be between 2025 and 2027. For the purposes of traffic forecasting an opening year of 2026 has been modelled.

Traffic forecasts were also prepared for 2041 as this is 15 years after opening. The forecasts for 2041 are known as the project design year forecasts and the engineers use these traffic forecasts when designing the scheme. Forecasts were also produced for 2031 in order to provide more detailed information on the trajectory of traffic growth and the changes in the time and distance of trips on the network for use in the economic appraisal of the new crossing. A set of traffic forecasts were also produced for 2051 as this is the furthest date into the future for which traffic growth forecasts are published by the DfT.

In each of the forecast years, the representation of the highway network in the model is updated to include all changes to the network that have funding or are more than likely to be built. This includes all schemes included in Highways England's Road Investment Strategy Phase 1 and some local authority schemes. These committed future schemes are listed in this report.

The growth in the number of car trips in the area is obtained by using the detailed traffic growth forecasts produced by the DfT in their National Trip End Model and published as TEMpro 7.2 traffic growth forecasts. More detailed information on location of concentrations of new trips in the future is added into the model by explicitly including those major new developments in the study area that are near certain or more than likely to be built. The overall increase in the number of trips for each forecast year in the model matches the overall level of growth predicted by the DfT's National Trip End Model.

The percentage growth in light goods vehicles and heavy goods vehicles is taken from the DfT's Road Traffic Forecasts, published in 2015 (RTF15). Again, explicit consideration is taken on the amount of commercial vehicles from major new developments in the area that are more than likely to be built in the future. These sites are listed in this report.

The LTAM is a variable demand model. For each model year the model is used to forecast how travellers will change their behaviour as a result of changes in the levels of congestion, the cost of fuel, the fuel efficiency of the fleet and change in incomes (which affects people's ability to afford the trips they wish to make).

The transport model is first used to forecast the change in the number of trips in the area by applying the traffic growth factors taken from the DfT's TEMpro software and the DfT Road Traffic Forecasts 2015. These are called the reference case matrices in the forecasting report.

The model is then used to forecast the routes that drivers will take, given the higher levels of traffic on the network and their behavioural responses to the change in the time and cost of their planned trips. These forecasts are prepared using a road network which does not include the Lower Thames Crossing but does include those other changes to the network which are more than likely to happen.

The modelled behavioural responses included in LTAM include changes to the frequency with which people make the same trip, the possibility of switching to/from rail, changes in the time of day they travel (from say the middle of the day into a peak period) and changing where they travel to/from. In the TFR these forecasts are known as the Do Minimum scenario.

The LTAM is then used to model what is likely to happen when the Lower Thames Crossing is operational. The proposed scheme is included into the highway network and again travellers can respond by changing trip frequency, the mode of transport used, the time of day at which they travel and where they travel to/from. These forecasts are known as the Do Something scenario.

The outputs from the transport model show how many vehicles are expected to use each part of the road network. This information is then used to predict the environmental impacts of traffic (on noise and air quality). The speed on each section of the network and the length of journeys is calculated in the model. This is used to measure the performance of the road network and to provide details on the location and level of congestion.

The TFR provides information on the volumes of traffic at key points on the transport network in the future and journey times on the network. LTAM predicts that when the Lower Thames Crossing is opened there will be a reduction in the number of vehicles using the existing Dartford Crossing and a rise in the overall number of vehicles crossing the Thames using either crossing. The traffic flows at Dartford and the Lower Thames Crossing are presented in Table 1 below using passenger car units (pcu). A heavy goods vehicle has a pcu factor of 2.5 as it uses more road space than a car, which has a pcu factor of 1. For the purposes of producing the traffic forecasts it is assumed that charges will be applied at the Lower Thames Crossing and that these will be the same as those charged at Dartford.

Table 1 Predicted peak and inter-peak two-way hourly flows at the Dartford Crossing and the Lower Thames Crossing (PCUs)

Period	Year	Without New Crossing	With New Crossing	
		Dartford	Dartford	New Crossing
AM Peak Hour	2016	14,290		
	2026	15,920	12,180	7,620
	2041	16,220	13,960	8,710
Inter-Peak Hour	2016	11,340		
	2026	13,750	9,820	5,850
	2041	15,400	11,700	7,060
PM Peak Hour	2016	13,220		
	2026	15,130	11,450	6,970
	2041	16,020	12,970	7,920

The TFR presents information on which trips will remain using the Dartford Crossing and which trips will use the Lower Thames Crossing in future. It also describes the changes in flows on other parts of the network, showing which areas experience a decrease in traffic volumes and reduced levels of congestion and those areas where the volume of traffic is likely to rise.

The forecasting work undertaken using LTAM has been checked by specialist staff within Highways England while it was carried out to ensure that the work followed the DfT's guidance on preparing traffic forecasts as set out in WebTAG. They have also certified that the LTAM was built following the appropriate technical guidelines and is suitable for forecasting the changes on the performance on the strategic highway network and major local roads in the area when a new river crossing is provided between Kent and Essex.

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1 Introduction

1.1 The Purpose of the Traffic Forecasting Report

1.1.1 This report, the Traffic Forecasting Report (TFR), describes the methodologies and tools adopted to generate the traffic forecasts used to support the scheme development. It provides details of the assumptions used in the forecasting process and presents the traffic forecasts required for economic, environmental and operational assessments. One of its key aims is to demonstrate that the procedures adopted in producing the forecasts are consistent with good practice and the advice given by the Department for Transport (DfT) in WebTAG and within the Design Manual for Roads and Bridges (DMRB).

1.1.2 The report draws upon previous project deliverables plus a series of technical notes which have already been provided to Highways England throughout the model development and traffic forecasting process.

1.2 Scheme Background

1.2.1 The Lower Thames Crossing (the 'Project') is a proposed new motorway connecting Kent, Thurrock and Essex through a tunnel beneath the River Thames. The Project will provide over 90% additional road capacity across the River Thames east of London.

1.2.2 The Project is classified as a Nationally Significant Infrastructure Project (NSIP), as defined by the Planning Act 2008 and was identified by HM Treasury as one of the top 40 priority investments in its National Infrastructure Plan 2013.

1.2.3 The Lower Thames Crossing Project is being developed as part of the Government's £15 billion Road Investment Strategy over the period 2015-2020.

1.3 The Project

1.3.1 The Lower Thames Crossing will comprise:

- approximately 14.5 miles (23km) of new motorway connecting to the existing road network from the A2/M2 to the M25;
- two 2.5-mile (4km) tunnels, one southbound and one northbound;
- three lanes in both directions with a maximum speed limit of 70mph;
- improvements to the M25, A2 and A13, where the Lower Thames Crossing connects to the road network;
- new structures and changes to existing ones (including bridges, buildings, tunnel entrances, viaducts, and utilities such as electricity pylons) along the length of the new road; and
- a free-flow charging system, where drivers don’t need to stop but pay remotely, similar to that at the Dartford Crossing.

1.4 Statement of Scheme Objectives

1.4.1 Highways England’s five strategic objectives are to:

- support economic growth;
- provide a safe and serviceable network;
- provide a more free-flowing network;
- deliver an improved environment; and
- provide an accessible and integrated network.

1.4.2 Taking account of these objectives, Highways England and DfT have agreed Project Objectives and Requirements for LTC and these are presented below in Table 1.1.

Table 1.1 – LTC Scheme Objectives and Requirements

Scheme objectives	
Economic	1. To support sustainable local development and regional economic growth in the medium to long term 2. To be affordable to government and users 3. To achieve value for money
Community & environment	4. To minimise adverse impacts on health and the environment
Transport	5. To relieve the congested Dartford Crossing and approach roads and improve their performance by providing free-flowing north-south capacity 6. To improve the resilience of the Thames crossings and the major road network 7. To improve safety

1.5 Structure of This Report

1.5.1 This TFR has been developed and structured in accordance with the requirements of Highways England's Project Control Framework (PCF). Subsequent sections of this document are structured as follows:

- Section 2 provides a summary of the previous work undertaken;
- Section 3 provides a description of the Uncertainty Log used and the forecast years adopted;
- Section 4 describes the derivation of the forecast year demand;
- Section 5 discusses how the forecast year networks have been constructed;
- Section 6 provides an overview of the equilibrium demand forecasts;
- Section 7 describes the data output to support economic appraisal activities;
- Section 8 describes the data output to support environmental assessment activities;
- Section 9 describes the data output to support operational assessment activities; and
- Section 10 provides an overall summary and conclusions on the work undertaken.

1.5.2 The associated executive summary and abbreviations are also included as supporting text. The appendices are provided in a separate report, this is titled Traffic Forecasting Report – Appendices, which can be viewed at www.lowerthamescrossing.co.uk/haveyoursay.

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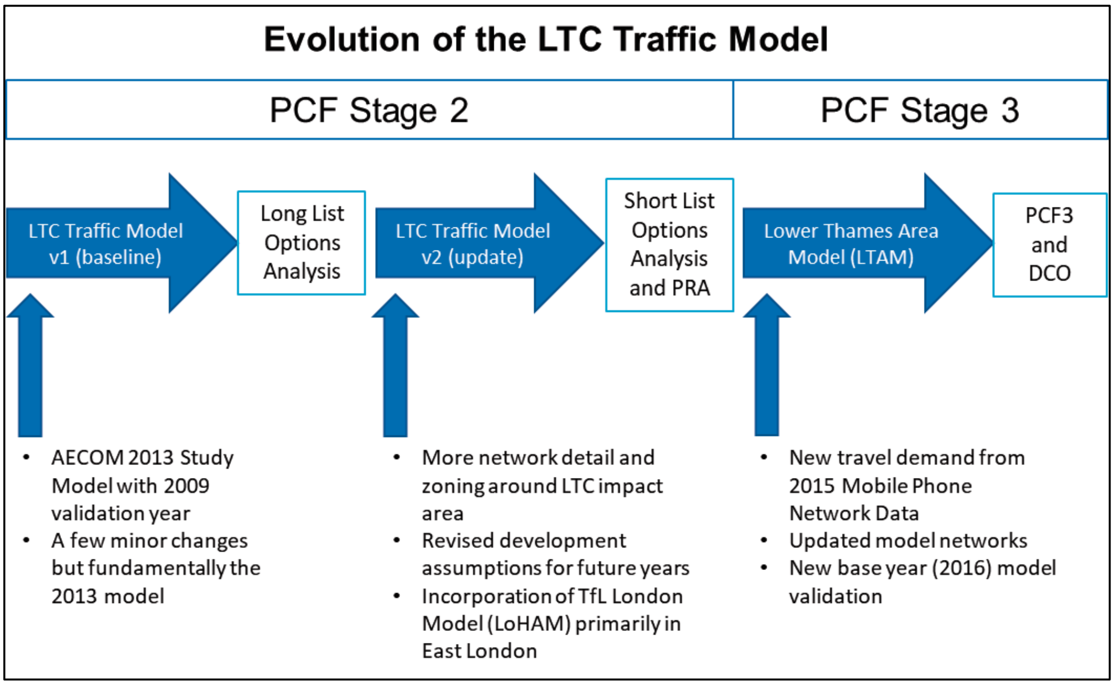
2 Summary of Previous Work

2.1 The Background to the Lower Thames Area Model (LTAM)

2.1.1 The traffic modelling approach adopted for the appraisal of the Lower Thames Crossing (LTC) Options Phase of the Highways England Project Control Framework (PCF) was determined by the project programme requirements, the level of detail required at each stage of the analysis and the availability of existing traffic models. These three criteria led to a three-stage modelling approach being adopted as illustrated in Figure 2.1.

Figure 2.1 – Traffic Modelling Approach for LTC Options Appraisal



2.1.2 Versions 1 and 2 of the LTC model (LTC V1 and LTC V2) are derived from the model developed by AECOM for the Review of Lower Thames Crossing Capacity Study in 2013. These two versions of the LTC model have been used for the PCF Stage 2 Option Selection, LTC V1 for the long list appraisal and LTC V2 for the appraisal of the short-listed options. A modified version of the LTC V2 model (Version 2.1) was used to appraise the five Post-Consultation Appraisal Routes. The LTC Version 2.1 model included several network enhancements, incorporated new values of time based on DfT's October 2015 consultation and revisions to the methodology for the production of future year trip ends.

2.1.3 For the LTC Project Development Phase, to meet PCF Stage 3 and Development Consent Order (DCO) submission requirements, a further update of the model is necessary as the original base traffic data used for LTC V2 and LTC V2.1 is more than six years old. DfT WebTAG guidance states that the base traffic survey data on which models are validated should not be more than six years old. This LTC model update is called the Lower Thames Area Model (LTAM) and uses recent (near exclusively post 2014) traffic flow and trip demand data. The updated LTAM base year model (March 2016) provides a more robust basis from which to forecast future traffic flows.

2.1.4 To achieve these objectives, the model has been developed so as to be able to predict the impact of the proposal, both in the immediate vicinity of the scheme, and also on other potentially impacted routes. The forecasts produced by the model are then to be utilised to inform economic, operational and environmental appraisal activities which make up the core of the business case for implementing the scheme.

2.1.5 A detailed description of the development of the base year LTAM model is provided in the Local Model Validation Report, which can be viewed at www.lowerthamescrossing.co.uk/publications. A summary of this is provided in the sections below.

2.2 Overview of the Modelling Approach

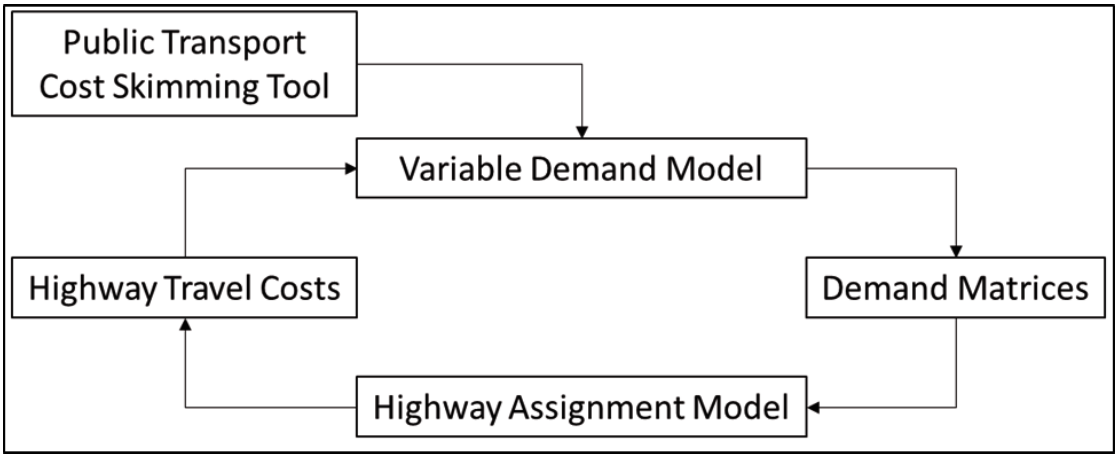
2.2.1 There are two primary modelling components required:

- The **Variable Demand Model (VDM)** which is used to predict the future levels of demand for travel; and
- The **Highway Assignment Model (HAM)** which is used to predict a variety of different characteristics of travelling on the highway network such as traffic flows, speeds, delays, routes and journey costs etc.

2.2.2 Connecting these two modelling components enables the impact of proposed transport interventions and growth (or decline) in demand for travel to be combined to provide a forecast of future travel conditions. The main modelling connection involves the VDM predicting the amount and pattern of travel in the future and the HAM estimating the associated costs of this travel.

2.2.3 It is understood from generic economic theory of supply and demand that as costs increase demand decreases and vice versa. The outcome of this is an iterative process of supply and demand which needs to be run until an equilibrium point is identified to a defined level of convergence. This process is illustrated in Figure 2.2 below.

Figure 2.2 – Lower Thames Area Model (LTAM) Overall Model Structure



2.2.4 DIADEM (Dynamic Integrated Assignment and DEmand Model) software has been identified as the most appropriate tool for the VDM component. DIADEM was originally developed for the DfT by Mott MacDonald but is now supported by Atkins. The aim of DIADEM is to provide a relatively simple mechanism for combining the complex procedures of a demand model with externally developed highway assignment models. DIADEM Version 6.3.3 has been used for this model.

2.2.5 The VDM has been developed with five main mechanisms. These are trip generation (which is undertaken outside of DIADEM), trip frequency, main time period choice, modal choice and trip distribution. The model is applied as an incremental model and has been calibrated to expected elasticities using the WebTAG illustrative parameters.

2.2.6 SATURN (Simulation and Assignment of Traffic in Urban Road Networks) has been identified as the most appropriate tool for building the LTAM HAM. SATURN is jointly developed by the Institute for Transport Studies, University of Leeds and Atkins. As a “conventional” traffic assignment model it can deal with local, large conurbation, regional or even national models thus making it appropriate for the modelling of the LTC. SATURN software Version 11.3.12W has been used for this model.

2.2.7 The public transport cost skimming tool provides public transport costs for use in the demand model. The model used here was originally developed by Peter Brett Associates (PBA) for Highways England for use in the development of the Regional Traffic Models (RTM). This has been rezoned to the LTAM zone system. In DIADEM, PT Costs are assumed to be fixed, i.e. they are not modified after each iteration of the model. For this reason, they are not included within the supply demand equilibrium loop but are simply an exogenous data import to the VDM. The PT cost skimming tool is developed in PTV VISUM Version 15.

2.2.8 The supply demand model mechanism is an iterative process. The model needs to run until an equilibrium point has been reached to a desired level of convergence. The recommended criterion for measuring convergence between the supply and demand models is the demand/supply gap (%Relative GAP). This is defined in WebTAG Unit M2 Section 6.3.4 as:

$$\frac{\sum_a C(X_a^n) D\left(C(X_a^n)\right) - X_a^n}{\sum_a C(X_a^n) X_a^n} * \; 100$$

Where:

X_a^n	is cell a in the previous assignment matrix for iteration n;
$C(X_a^n)$	is cell a in the previous generalised costs resulting from assigning that matrix;
$D(C(X_a^n)$	is cell a in the matrix output by the demand model based on costs $C(X_a^n)$; and
a	represents every combination of origin, destination, demand segment, time period and mode.

2.2.9 WebTAG suggests that many models should be able to achieve a %GAP of less than 0.1% although in more problematic cases values of 0.2% are also considered acceptable.

2.3 Highway Assignment Model

Model Coverage - Geographical

2.3.1 The method used to identify the LTAM model coverage is summarised below.

2.3.2 When redefining the geographical coverage of the LTAM there were several key objectives:

- To produce a model that can support economic, environmental and operational assessments in line with WebTAG requirements;
- To minimise modelling noise and improve convergence; and
- To minimise model run time whilst ensuring compliance with the requirements of WebTAG.

2.3.3 During model scoping, to identify whether these objectives have been met, there are two key considerations:

- To identify the likely area of impact of the scheme; and
- WebTAG guidelines.

Identifying the Likely Region of Impact of the Scheme

2.3.4 To identify the likely region of impact of the scheme existing model forecasts, using the LTC V2 model were used. Forecasts were provided for a with and without scheme scenario. To show the maximum possible impact of LTC, an assumption was made to use only the 2041 forecast year (central growth). The comparisons were undertaken between the Do Minimum and Do Something model runs used to inform the Preferred Route Announcement (PRA).

2.3.5 A range of different criteria were used to identify the likely impacted links including DMRB Air Quality Screening and DMRB Traffic Screening criteria.

WebTAG Guidelines

2.3.6 WebTAG defines the model coverage in the following terms:

- The **Fully Modelled Area** (FMA) which consists of an area of detailed modelling where significant impacts of the intervention are certain, and the rest of the fully modelled area which covers the area where the impacts of the intervention are quite likely but relatively weak in magnitude; and
- The **External Area** where the impacts are assumed to be so small as to be negligible.

2.3.7 The fully modelled area is categorised by small zones, detailed networks and comprehensive representations of junction behaviour.

2.3.8 Due to the requirement for the HAM to connect to the demand model for forecasting purposes, and for the demand model to function appropriately, the full cost of travelling to external zones needs to be incorporated. It is generally accepted that this will be at a much lower level of detail. The main requirement for the external network, in terms of network and zoning detail, is that routing into the fully modelled area needs to be realistic and to enable appropriate (re)routing outside of the modelled area. The external network is therefore required for potential alternative destinations to be represented and the full length of trips to be included for extracting costs. The external area covers the rest of the UK. It has been coded as buffer network with much larger zone sizes and fixed speeds.

2.3.9 Considering the impacted link analysis described above and the requirements of WebTAG, the fully modelled area for the LTAM has been defined as shown in Figure 2.3 below.

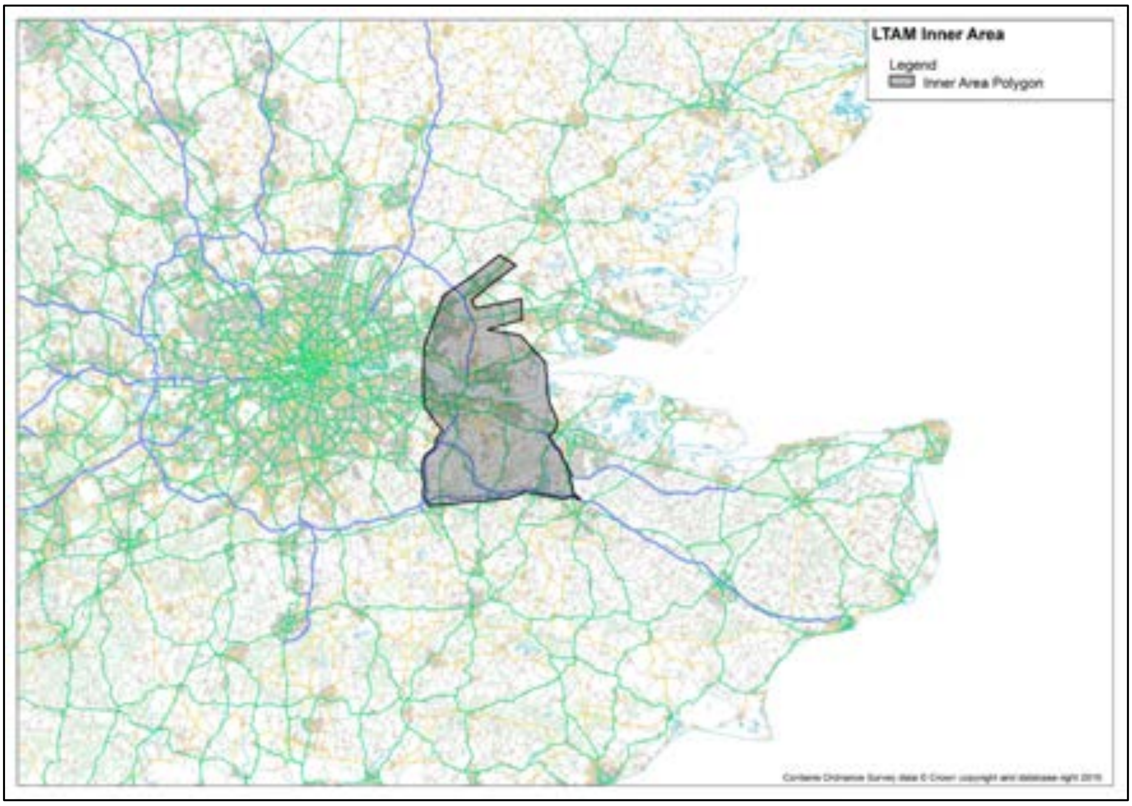
Figure 2.3 – LTAM Fully Modelled Area

2.3.10 This area extends over the entire M25 orbital route together with its junctions with major roads such as the M3, M4, M1, M11, A1, and M40. It also extends to cover most of Essex, Kent and the eastern part of Greater London. This modelled area is considered appropriate for use with the LTAM. It covers the primary links predicted to be likely to be impacted by the scheme.

2.3.11 The area outside of the FMA was determined as the External Area (EA).

2.3.12 Within this FMA a smaller area, considered particularly important when assessing potential LTC options, has been identified. This “Inner Model Area” is shown in Figure 2.4.

Figure 2.4 – LTAM Inner Model Area



2.3.13 Model calibration and validation statistics provided later in this section will be presented both from the entire model area and inner model area perspective. The primary target is to achieve a high standard of model calibration and validation within the Inner Model Area.

Model Coverage - Temporal

2.3.14 In order to decide the temporal dimensions of the LTAM a series of detailed analysis was undertaken. The key decisions required were as follows:

- Defining the model month and year; and
- Defining the peak hours and peak periods.

Defining the Model Month and Year

2.3.15 This analysis focussed on three main aspects:

- Definition of a neutral/representative month;
- Source of origin destination demand data; and
- Localised issues affecting network performance.

2.3.16 The analysis undertaken shows that the most appropriate month to use for the LTAM is **March 2016**.

Defining the Peak Hours and Peak Periods

2.3.17 The analytical approach compared the peak hours and peak periods at the existing Dartford Crossing with the peak hours and periods in the wider model area. The key decisions required were to identify:

- whether a peak hour or average hour model would be most appropriate; and
- which hours each model peak hour and peak period should represent.

2.3.18 For the first of these points WebTAG suggests that where traffic patterns illustrate that there is a distinct peak hour within the peak period that a peak hour model should be developed. Furthermore, actual peak hour models are therefore to be preferred in most circumstances. Peak hour models have the following advantages:

- traffic flows and congestion at peak times will be more robustly modelled, which will not be the case if average conditions are lesser congested; and
- a peak hour is more representative of a situation in reality. While traffic counts and journey times can, in principle, be averaged over the peak hours, it is hard to judge the plausibility of the routes modelled for a period which does not exist in reality.

2.3.19 There are very few specific circumstances where an average peak period model would be preferred over an actual peak hour model. These are:

- capacity on the network is more than adequate to cater for forecast demand in the base year and forecast years; and/or
- traffic levels are approximately constant throughout the period; and/or
- a substantial proportion of the trips in the fully modelled area are longer than one hour (although this may be more appropriately handled through modelling longer time periods or through dynamic methods).

2.3.20 Only the third point has any relevance to the LTAM.

2.3.21 Analysis of available traffic count data is the best way to determine whether these peaks exist and also the hours which should be reflected in each modelled period.

2.3.22 The methodology undertaken followed a three-step process as follows:

- identify the peak hour;
- identify the peak period; and
- calculate the difference between the actual peak hour and the average peak period to decide whether a peak or average peak model is necessary.

2.3.23 This analysis showed that if an average hour rather than a peak hour assignment model was used this would underestimate congestion by between 3-9%. It is therefore necessary to develop peak hour assignment models for the morning and evening peaks as follows:

- The morning peak hour is 07:00-08:00;
- The inter peak period is an average hour from 09:00-15:00; and
- The evening peak hour is 17:00-18:00.

2.3.24 For the demand model where it is necessary to represent the full 24 hours of a day the following time periods were identified:

- The morning peak period is 06:00-09:00;
- The inter peak period is from 09:00-15:00;
- The evening peak period is 15:00-18:00; and
- The off peak period is 18:00-06:00.

2.3.25 Table 2.1 below shows the correspondence between the three highway assignment model periods and the four demand model periods.

Table 2.1 – Correspondence between Highway Assignment Model and Demand Model Time Periods

Demand Model Period	Highway Assignment Model Period
AM Peak (06:00-09:00)	AM Peak Hour (07:00-08:00)
Inter Peak (09:00-15:00)	Inter Peak Average Hour (09:00-15:00)
PM Peak (15:00-18:00)	PM Peak Hour (17:00-18:00)
Off Peak (18:00-06:00)	Factored version of the HAM Peak Hours*

* The AM, IP and PM matrices are combined using appropriate time period specific factors to produce a 12-hour matrix. This is then factored to represent the total traffic in the off peak and then an average is derived to represent an average off peak hour.

Model Coverage – Segmentation

2.3.26 "Segmentation" is the division of travel, traveller and transport attributes into different categories so that all travellers in the same category can be treated in the same way. The segmentation used in the LTAM needs to be considered both with respect to the VDM and the HAM. As is often the case, the LTAM has different segmentation between the two.

2.3.27 A detailed review of current guidance was undertaken in order to inform the segmentation used within LTAM. From the VDM perspective WebTAG (Unit M2, Table 2.1) presents the minimum segmentation required for a multi-stage demand model. Table 2.2 provides these categories and a commentary on their applicability for the LTAM.

Table 2.2 – Minimum Segmentation for a Multi-Stage Demand Model

Source: WebTAG Unit M2

Attribute	Segmentation	Comments for LTAM
Household type and traveller type	Two categories: travellers categorised into car-available/no-car-available or by household car ownership into car-owning/non-car-owning. Models that only need to deal with road traffic will include only those travellers who have a car available. If a local trip generation model is being developed, a more detailed segmentation into household structure employed members, etc. is very desirable and used in NTEM, but this finer level of segmentation need not be carried through to the subsequent stages.	The model will only deal with road traffic therefore only travellers with a car available are included.

Attribute	Segmentation	Comments for LTAM
Value of time (VOT)	Variation of VOT across the population is important but can usually be addressed sufficiently through the trip purpose split. However, for schemes specifically involving charging, some additional segmentation by willingness-to-pay or income may be required. In this case three separate income ranges – high, medium and low (with different VOT) with demand distributed evenly across the groups – will be adequate. Where there is a large range of trip distance, it is desirable to allow VOT to vary with trip distance.	As the scheme is a charging scheme, three categories of income have been applied to non-work trip purposes. NTS data is used to define these categories. VOT will not be varied with trip distance.
Trip Purpose	3 categories: Commuting/Employers Business/Other: these categories are likely to have different elasticities and different distributions in both time and space, and substantially different values of time.	LTAM adopts the three categories. Employers Business and Other are also segmented by Home Based-and Non-Home-Based.
Modes	2 categories: Car/Public Transport. It is usually necessary to have a base of trips that can transfer to and from car.	Car and public transport modes are included.
Road vehicle types	2 categories: Car/other, where “other” may include freight and bus/coach as a fixed-flow matrix for assignment.	Car, LGV and HGV are included. Bus/Coach is included in the HGV segment.

2.3.28 Applying these principles leads to the LTAM VDM having the following demand segments:

1. Home-based Employer’s Business;
2. Home-based Commute Low income;
3. Home-based Commute Medium income;
4. Home-based Commute High income;
5. Home-based Other Low income;
6. Home-based Other Medium income;
7. Home-based Other High income;
8. Non-home-based Employer’s Business;
9. Non-home-based Other Low income;

10. Non-home-based Other Medium income;
11. Non-home-based Other High income;
12. LGV;
13. HGV;
14. Port Trips (Sea and Air) Employers Business;
15. Port Trips (Sea and Air) Other Low income;
16. Port Trips (Sea and Air) Other Medium income; and
17. Port Trips (Sea and Air) Other High income.

2.3.29 This list of different demand segments is simplified somewhat in the LTAM HAM. WebTAG guidance (Unit M3.1) suggests that vehicle operating costs vary by vehicle type and values of time vary by the purpose of the trip being made. It also states that values of time may also vary by income group. It therefore suggests that cars on business, other cars, LGVs and HGVs should be treated as individual user classes and assigned separately. Non-work car demand should also be split by income band where tolling and charging schemes are to be assessed. Taking these points into consideration the LTAM HAM has the following user classes/segments:

1. Cars – Employers Business;
2. Cars – Commute Low Income;
3. Cars – Commute Medium Income;
4. Cars – Commute High Income;
5. Cars – Other Low Income;
6. Cars – Other Medium Income;
7. Cars – Other High Income;
8. Light Goods Vehicles; and
9. Heavy Goods Vehicles.

Summary of Data Collection

2.3.30 A series of existing transport models were identified and reviewed to ascertain their potential use in developing the networks for the LTAM. The associated strengths and weaknesses of each model were identified.

2.3.31 Given these strengths and weaknesses of each of the available source models a plan was devised for which of the source models would be used for different areas in the LTAM network. This is provided in Table 2.3 below.

Table 2.3 – LTAM Use of Selected Available Model Network Data

Data	Most Appropriate Model
Primary source of highway network data outside the M25.	LTC V2.1
Primary source of highway network data inside the M25.	RXHAM
Supplementary model highway network on SRN corridors	SERTM
Supplementary model highway network in Kent.	M20STM
Primary source of public transport network data	SERTM

2.3.32 Additional network coding, where none of the source models was considered to have enough detail, was coded from scratch.

2.3.33 The primary source of public transport network data came from the SERTM. A public transport cost skimming tool has been developed in PTV VISUM covering the entirety of England and connected to the combined, detailed RTM zoning systems. This tool was sourced from the SERTM developers and recoded to the LTAM zoning system.

2.3.34 A series of existing datasets were identified and reviewed to ascertain their potential use in developing the demand matrices for the LTAM. Again, the associated strengths and weaknesses of each of these datasets were identified.

2.3.35 Table 2.4 below sets out how the different origin-destination datasets have been used in the development of the LTAM.

Table 2.4 – Origin-Destination Demand Datasets – Use in Development of LTAM

Dataset	LTAM Use
South East Regional Traffic Model (SERTM) Prior Matrices	These are the primary source of origin destination data used in the development of the LTAM demand matrices.
Lower Thames Crossing Version 2.1 Model Matrices (LTC V2.1)	These matrices were considered too old for use in the development of the LTAM matrices and were therefore not used.
Highways England Trip Information System (TIS)	Extracts have been requested from the TIS. Select link outputs were used for verification of Dartford crossing movements. Matrices used for deriving OD-PA factors for use in development of demand model matrices from calibrated highway assignment model matrices.
National Travel Survey (NTS) Data	This data was used as the primary source for identifying appropriate income segmentation bands and factors to apply to the SERTM demand matrices to produce the income segmented matrices for LTAM.
TrafficMaster Origin-Destination Data	This data has already been used to develop the LGV component of the SERTM matrices. Its use above that was not considered to be appropriate for the development of the LTAM.
Census Journey to Work Data	This dataset has been used extensively during the development of the SERTM prior matrices. Further use during the development of the LTAM matrices was not considered as being required.
Base Year Freight Matrices (BYFM)	This dataset has already been used to develop the HGV component of the SERTM matrices. It has also been used in the development of the LTAM LGV and HGV matrices to develop tripend estimates for important sea port locations.
DARTCharge User Survey	This has been used as a verification dataset to compare the LTAM predicted distribution pattern of flows across the existing crossing with those observed in the survey.
South East Regional Traffic Model (SERTM) Public Transport (Rail) Matrices	These are the primary source of public transport origin destination data used in the development of the LTAM.

2.3.36 There were a range of different traffic count data sources identified and assessed for their potential use in the development of the LTAM. Any gaps in this dataset were identified and additional surveys commissioned. Some of the data was aggregated into a series of screenlines covering strategic movements throughout the model area. Some sites were nominated as non-screenline locations. Figure 2.5 provides a graphical representation of these screenlines. Figure 2.6 shows the count data used in calibration. Figure 2.7 shows the count data used in validation.

Figure 2.5 – All LTAM Screenlines and Cordons

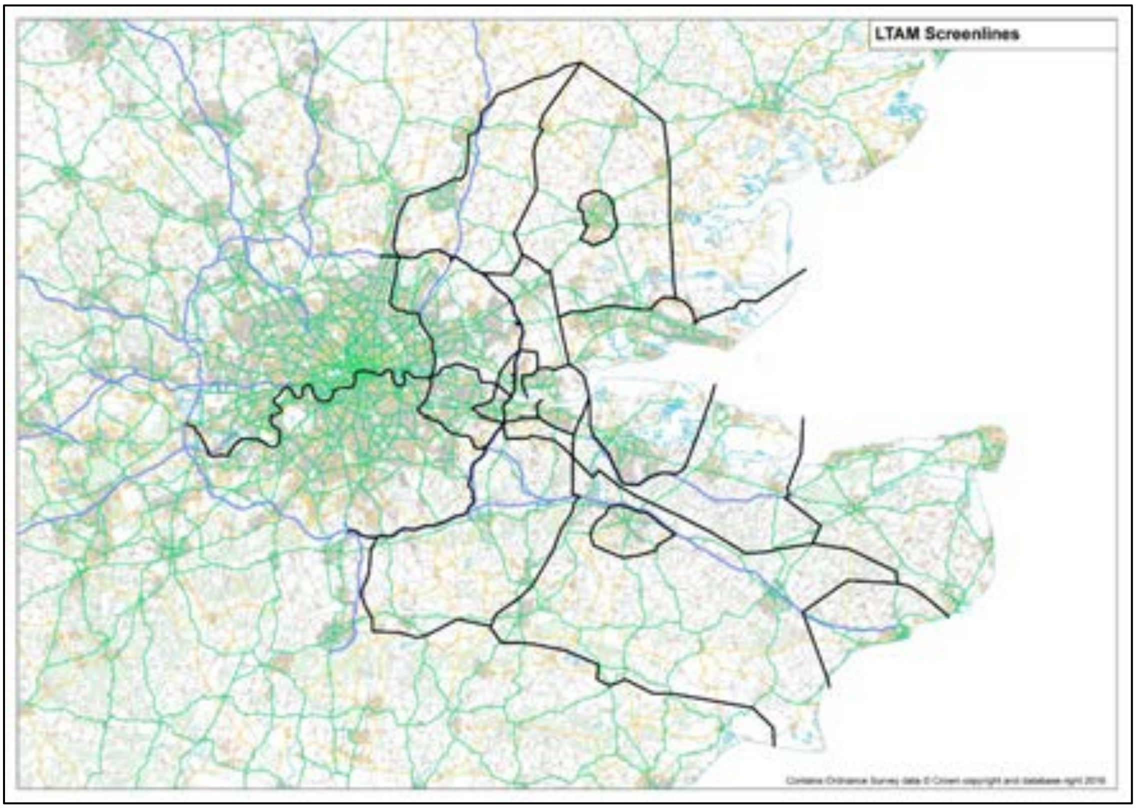


Figure 2.6 – Count Sites used in Model Calibration

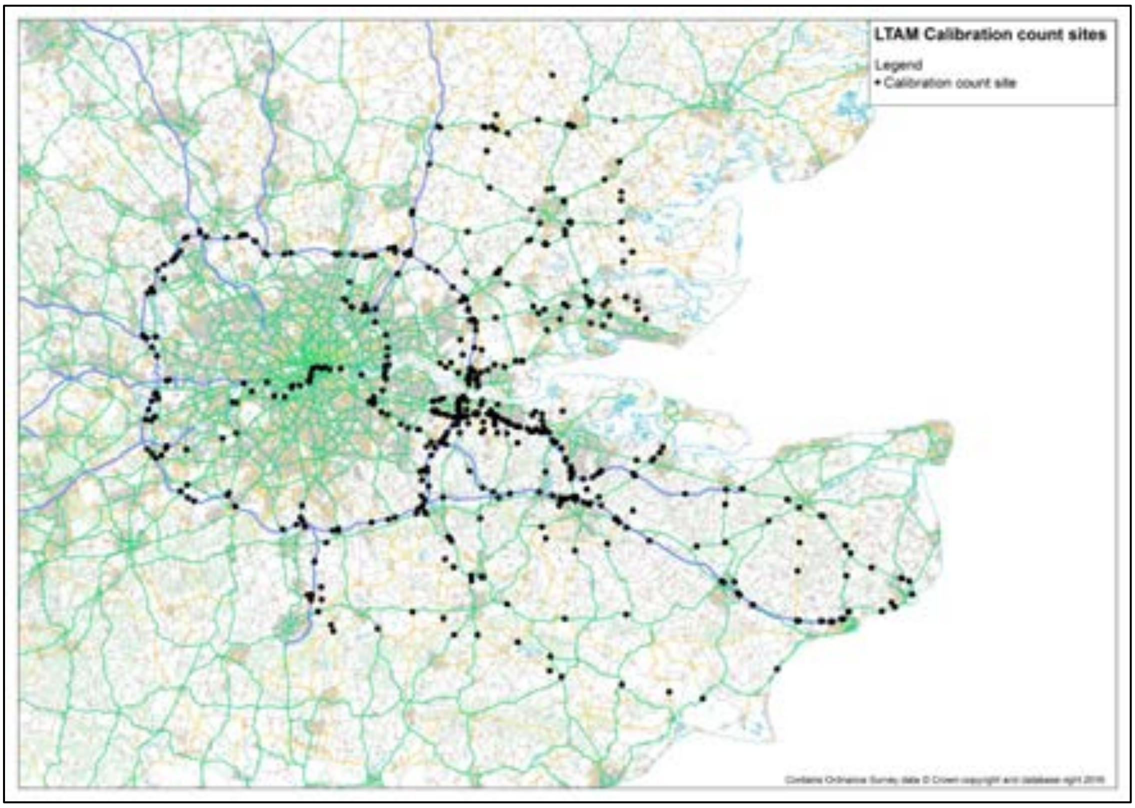


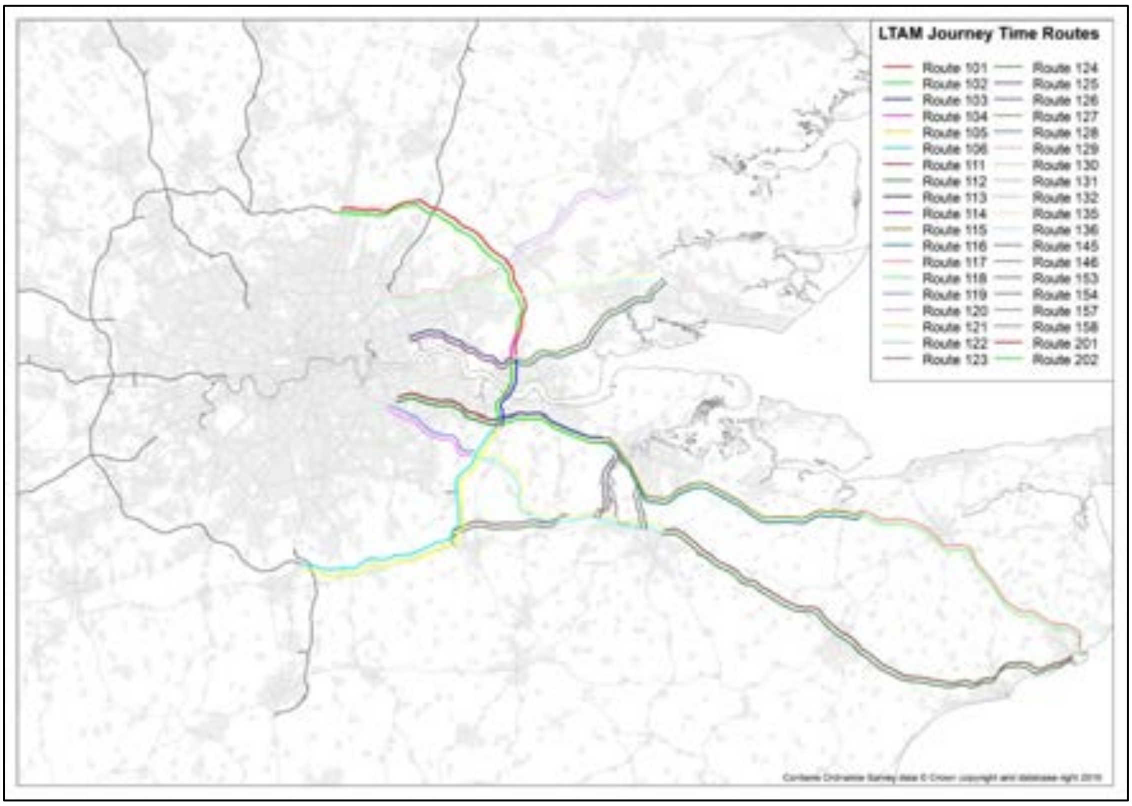
Figure 2.7 – Count Sites used in Model Validation

2.3.37 There were three different journey time datasets available for use in developing the LTAM:

- Trafficmaster Journey Time Database – this was used as the primary source of journey time data during the calibration of LTAM;
- HATRIS Journey Time Database – this dataset has been used to supplement the TrafficMaster journey time data as a verification dataset; and
- Dartford Crossing Bluetooth Journey Time Surveys – this dataset has been used to supplement the TrafficMaster journey time data as a verification dataset specifically at Dartford Crossing.

2.3.38 A series of journey time routes have been defined covering the primary corridors of interest. These are shown in Figure 2.8.

Figure 2.8 – LTAM Strategic Journey Time Routes



Network Development

2.3.39 The SERTM zoning structure (DF3 release) was taken as the starting point for developing the LTAM zoning system. The 2306 zones in the SERTM were aggregated/disaggregated to form the 963 zones in the LTAM. Figure 2.9 shows the zones in the external area. Figure 2.10 shows the zones in the FMA.

Figure 2.9 – LTAM Zoning Structure

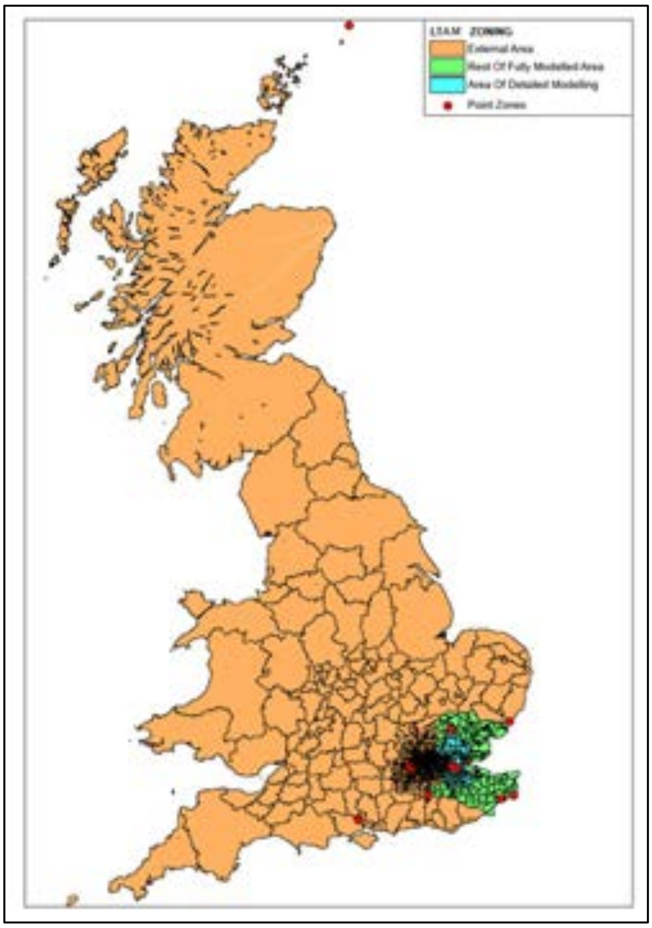
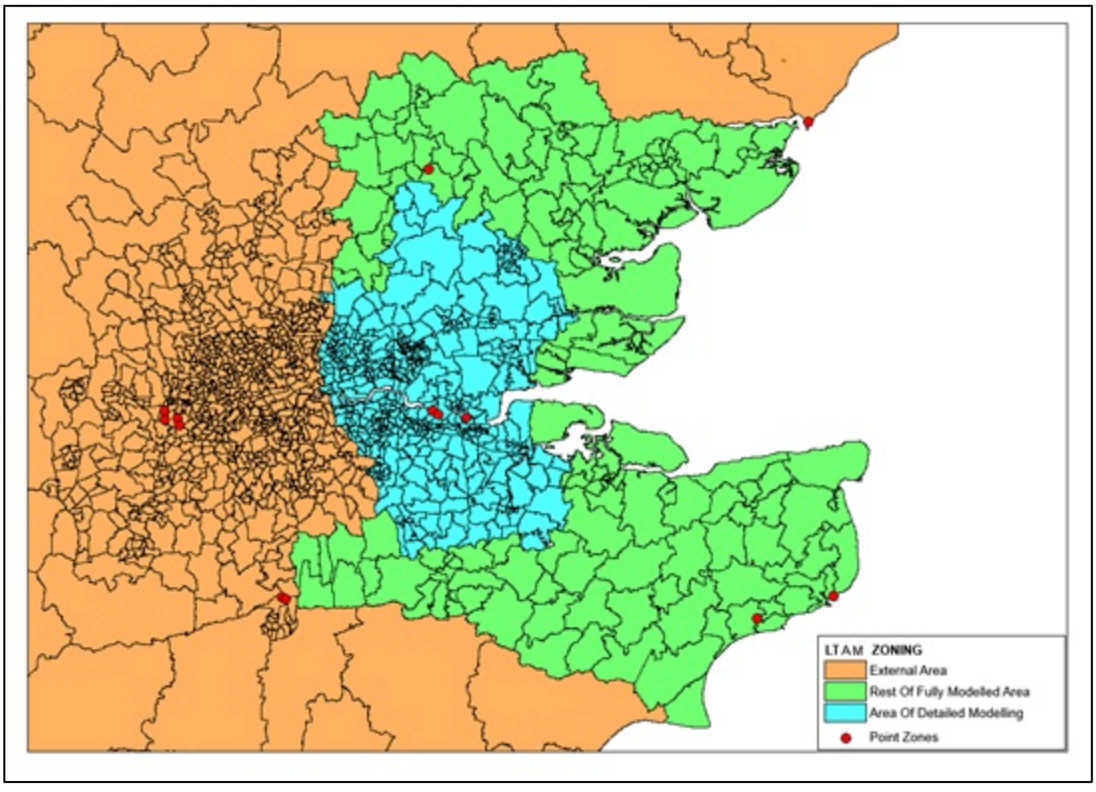


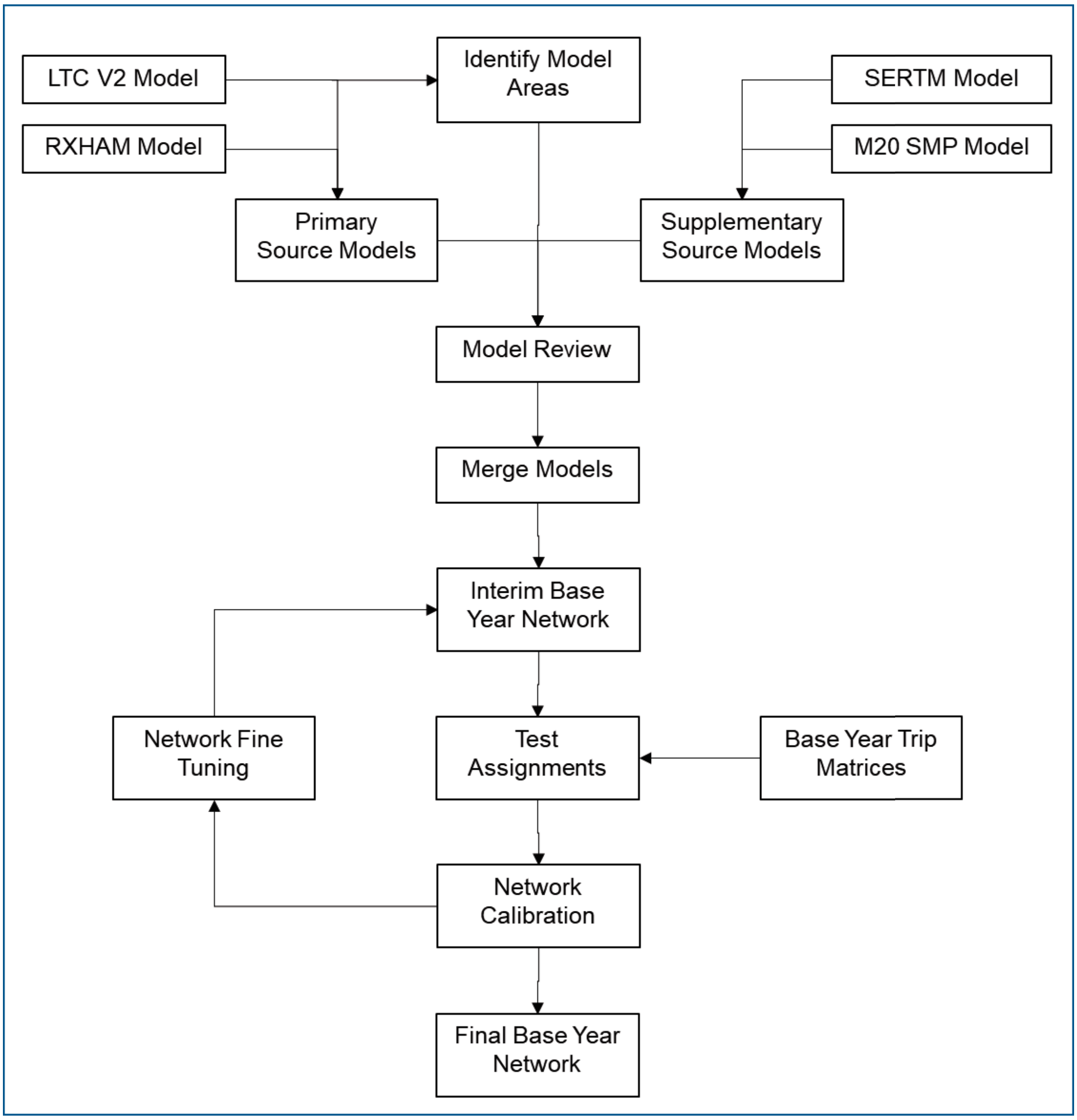
Figure 2.10 – LTAM Zoning Structure Within the FMA



2.3.40 Ports and large development zones were allocated as point zones within the LTAM zoning structure (shown as red circles in Figure 2.9 and Figure 2.10).

2.3.41 Figure 2.11 below shows the overall network development process referencing the available network datasets described above.

Figure 2.11 – Overall LTAM Network Development Process



2.3.42 Figure 2.12 to Figure 2.14 provide plots of the final LTAM model network at different zoom levels.

Figure 2.12 – LTAM Highway Network – Zoomed In

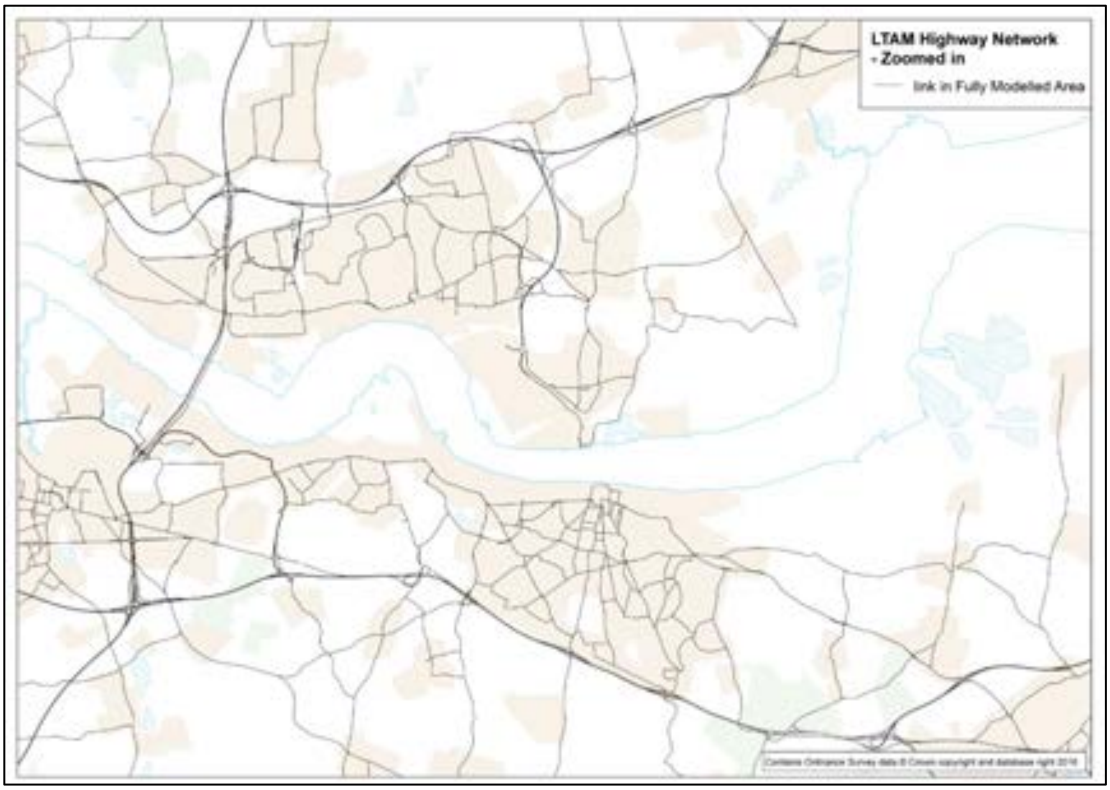


Figure 2.13 – LTAM Highway Network – Fully Modelled Area

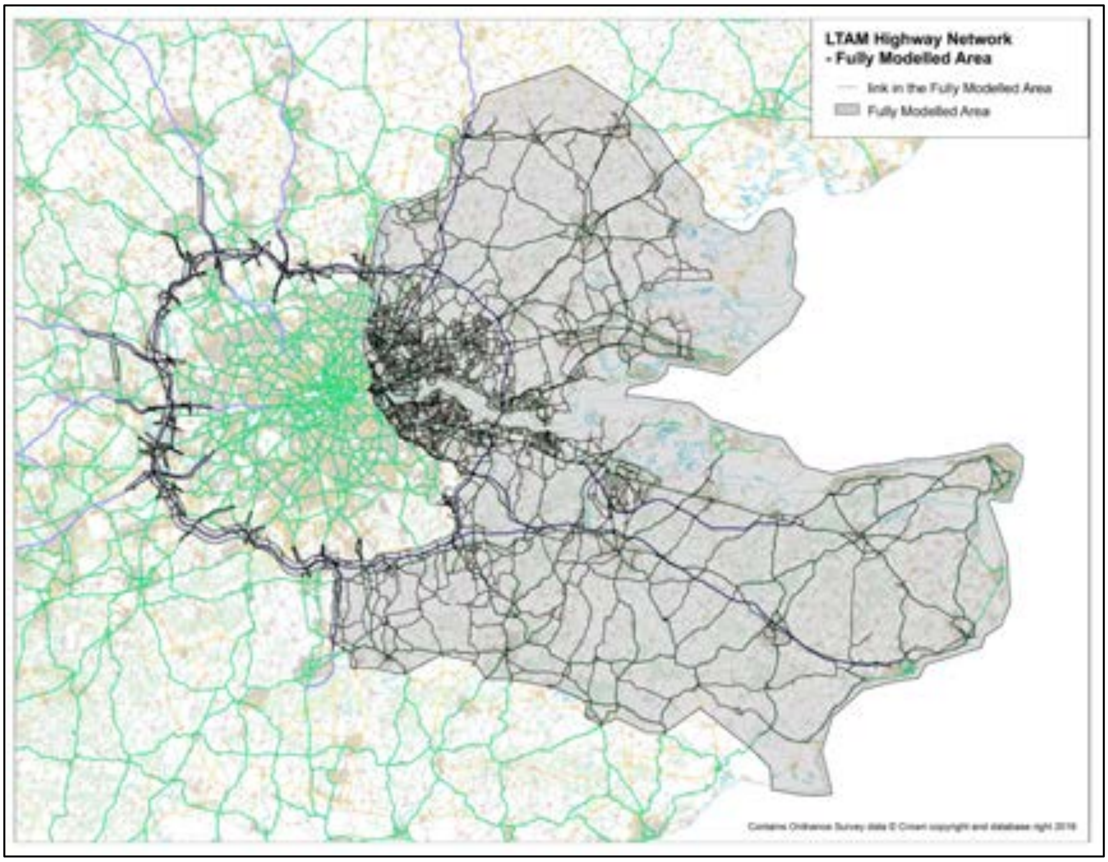
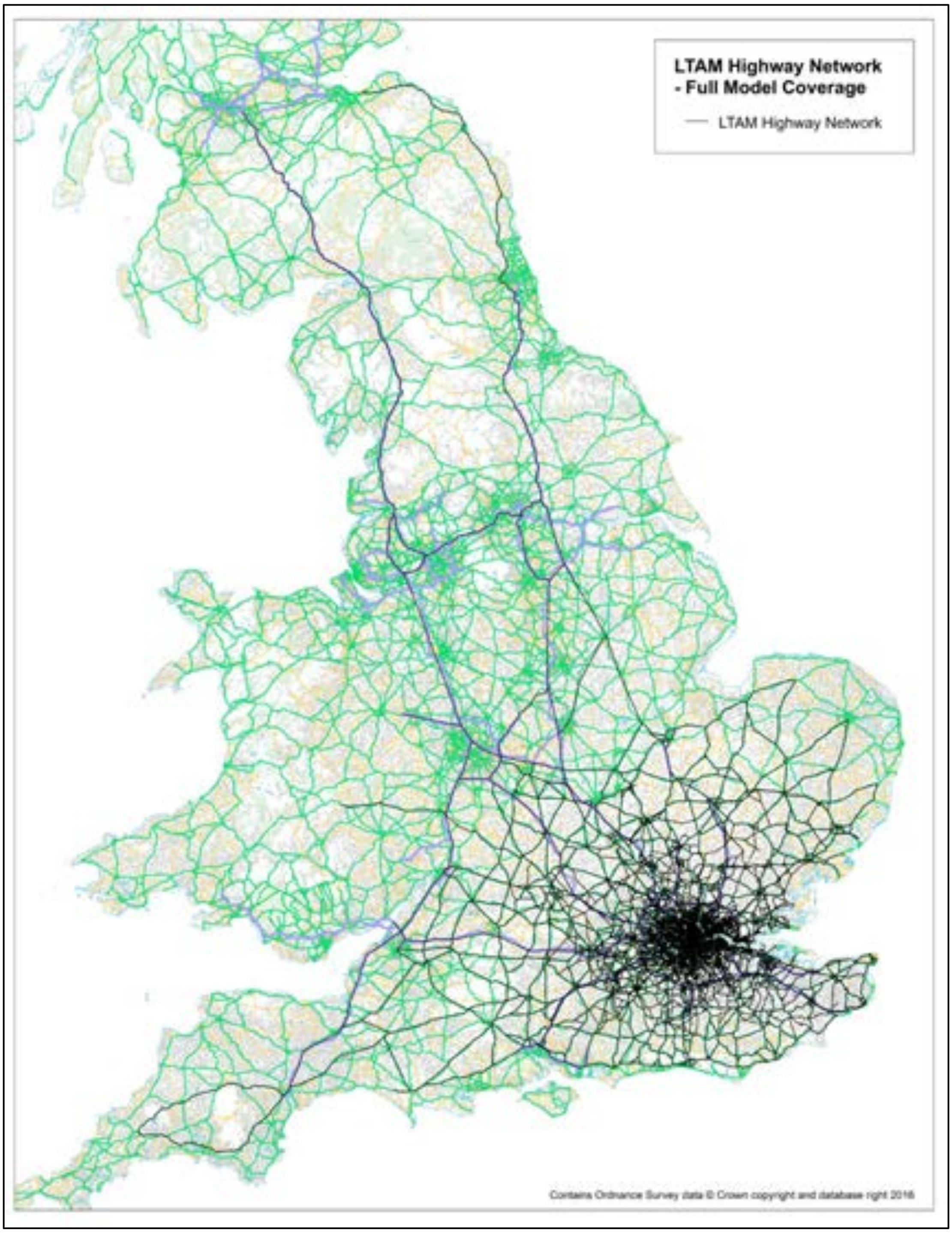


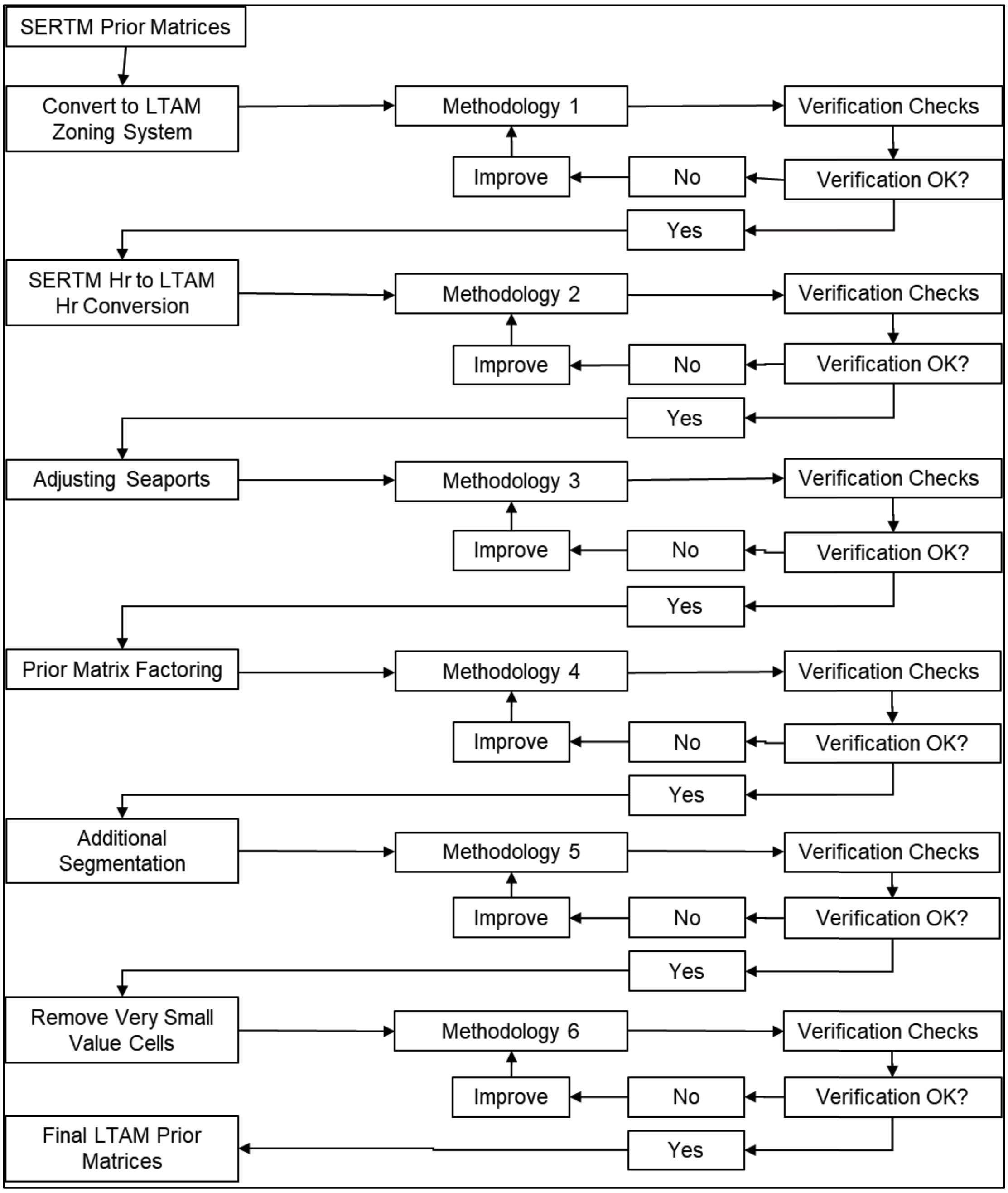
Figure 2.14 – LTAM Highway Network – Full Model Coverage



Matrix Development

2.3.43 The primary source of data for developing the LTAM demand matrices was the SERTM prior matrices. Figure 2.15 shows the methodology used to convert the SERTM prior matrices into prior matrices suitable for use in LTAM.

Figure 2.15 – The LTAM Highway Prior Matrix Development Process



2.3.44 These prior matrices were then further refined using matrix estimation (ME) techniques. The final post ME matrix totals are provided in Table 2.5.

Table 2.5 – Final LTAM Post ME Matrix Totals (PCU's)

Userclass	AM	IP	PM
Car Employers Business	446,694	388,554	534,331
Car Commute Low Income	416,776	189,264	476,659
Car Commute Medium Income	843,955	290,776	914,413
Car Commute High Income	718,557	207,267	740,132
Car Other Low Income	650,678	1,155,317	1,126,453
Car Other Medium Income	694,080	922,839	1,134,021
Car Other High Income	555,396	619,518	858,565
Car Total	4,326,135	3,773,534	5,784,574
LGV	728,254	627,316	524,914
HGV	374,760	372,671	234,571

Model Calibration and Validation

2.3.45 The LTAM HAM has been calibrated according to WebTAG principles. The primary calibration and validation criteria involve comparisons of modelled traffic flows against observed flows and modelled travel times against observed journey times. Table 2.6 to Table 2.11 provide a summary of the individual count site observed vs modelled flows for cars and all vehicles combined for each time period for the calibration sites.

Table 2.6 – Modelled Vs Observed Individual Count Comparison Calibration Sites AM Peak Cars

		Cars			
	No. Sites	No. Sites GEH<5	No. Sites DMRB Pass	No. Sites Overall Pass	% Sites Overall Pass
Screenline	480	418	437	439	91%
Non-Screenline	420	364	376	377	90%
Total	900	782	813	816	91%
Inner Model Area	309	285	292	294	95%

Table 2.7 – Modelled Vs Observed Individual Count Comparison Calibration Sites AM Peak All Vehicles

	No. Sites	All Vehicles			
		No. Sites GEH<5	No. Sites DMRB Pass	No. Sites Overall Pass	% Sites Overall Pass
Screenline	480	370	389	395	82%
Non-Screenline	420	354	364	365	87%
Total	900	724	753	760	84%
Inner Model Area	309	273	284	285	92%

Table 2.8 – Modelled Vs Observed Individual Count Comparison Calibration Sites Inter Peak Cars

	No. Sites	Cars			
		No. Sites GEH<5	No. Sites DMRB Pass	No. Sites Overall Pass	% Sites Overall Pass
Screenline	480	432	441	442	92%
Non-Screenline	420	384	394	394	94%
Total	900	816	835	836	93%
Inner Model Area	309	294	297	298	96%

Table 2.9 – Modelled Vs Observed Individual Count Comparison Calibration Sites Inter Peak All Vehicles

	No. Sites	All Vehicles			
		No. Sites GEH<5	No. Sites DMRB Pass	No. Sites Overall Pass	% Sites Overall Pass
Screenline	480	397	405	415	86%
Non-Screenline	420	372	383	383	91%
Total	900	769	788	798	89%
Inner Model Area	309	287	293	293	95%

Table 2.10 – Modelled Vs Observed Individual Count Comparison Calibration Sites PM Peak Cars

	No. Sites	Cars			
		No. Sites GEH<5	No. Sites DMRB Pass	No. Sites Overall Pass	% Sites Overall Pass
Screenline	480	409	422	424	88%
Non-Screenline	420	364	371	372	89%
Total	900	773	793	796	88%
Inner Model Area	309	280	287	289	94%

Table 2.11 – Modelled Vs Observed Individual Count Comparison Calibration Sites PM Peak All Vehicles

	No. Sites	All Vehicles			
		No. Sites GEH<5	No. Sites DMRB Pass	No. Sites Overall Pass	% Sites Overall Pass
Screenline	480	385	389	397	83%
Non-Screenline	420	359	367	369	88%
Total	900	744	756	766	85%
Inner Model Area	309	276	278	282	91%

2.3.46 These tables show that overall the LTAM is able to predict levels of flow by cars and all vehicles combined which compares favourably with observed flow levels. This is the case on screenline sites, non screenline sites and in total. In particular, in the inner model area the comparison is very close with between 91% and 96% of sites passing the WebTAG criteria.

2.3.47 Table 2.12 to Table 2.17 provide a summary of the individual count site observed vs modelled flows for cars and all vehicles combined for each time period for the validation sites.

Table 2.12 – Modelled Vs Observed Individual Count Comparison Validation Sites AM Peak Cars

	No. Sites	Cars			
		No. Sites GEH<5	No. Sites DMRB Pass	No. Sites Overall Pass	% Sites Overall Pass
Screenline	64	23	32	32	50%
Non-Screenline	144	93	100	101	70%
Total	208	116	132	133	64%
Inner Model Area	56	42	44	45	80%

Table 2.13 – Modelled Vs Observed Individual Count Comparison Validation Sites AM Peak All Vehicles

	No. Sites	All Vehicles			
		No. Sites GEH<5	No. Sites DMRB Pass	No. Sites Overall Pass	% Sites Overall Pass
Screenline	64	24	31	31	48%
Non-Screenline	144	92	98	99	69%
Total	208	116	129	130	63%
Inner Model Area	56	38	44	44	79%

Table 2.14 – Modelled Vs Observed Individual Count Comparison Validation Sites Inter Peak Cars

	No. Sites	Cars			
		No. Sites GEH<5	No. Sites DMRB Pass	No. Sites Overall Pass	% Sites Overall Pass
Screenline	64	22	29	31	48%
Non-Screenline	144	103	110	112	78%
Total	208	125	139	143	69%
Inner Model Area	56	47	47	49	88%

Table 2.15 – Modelled Vs Observed Individual Count Comparison Validation Sites Inter Peak All Vehicles

	No. Sites	All Vehicles			
		No. Sites GEH<5	No. Sites DMRB Pass	No. Sites Overall Pass	% Sites Overall Pass
Screenline	64	17	27	27	42%
Non-Screenline	144	101	104	107	74%
Total	208	118	131	134	64%
Inner Model Area	56	44	45	46	82%

Table 2.16 – Modelled Vs Observed Individual Count Comparison Validation Sites PM Peak Cars

	No. Sites	Cars			
		No. Sites GEH<5	No. Sites DMRB Pass	No. Sites Overall Pass	% Sites Overall Pass
Screenline	64	24	27	29	45%
Non-Screenline	144	79	87	89	62%
Total	208	103	114	118	57%
Inner Model Area	56	40	45	45	80%

Table 2.17 – Modelled Vs Observed Individual Count Comparison Validation Sites PM Peak All Vehicles

	No. Sites	All Vehicles			
		No. Sites GEH<5	No. Sites DMRB Pass	No. Sites Overall Pass	% Sites Overall Pass
Screenline	64	23	25	26	41%
Non-Screenline	144	86	91	93	65%
Total	208	109	116	119	57%
Inner Model Area	56	43	44	44	79%

2.3.48 These tables show that the LTAM is predicting flows that accord well with observed values at the validation locations, in particular in the inner model area with between 79% and 88% of sites achieving the WebTAG targets. The comparison over the entire model area is less good but these are at less critical locations.

2.3.49 Table 2.18 to Table 2.20 provide overall summary statistics for the modelled Vs observed journey times.

Table 2.18 – Modelled Vs Observed Journey Time Summary Statistics AM Peak

	Lights		Heavy	
Difference	No Pass	%Pass	No Pass	%Pass
<15% or less than 1 min diff	35	92%	32	84%
<30%	3	8%	6	16%
>30%	0	0%	0	0%
Total	38		38	

Table 2.19 – Modelled Vs Observed Journey Time Summary Statistics Inter Peak

	Lights		Heavy	
Difference	No Pass	%Pass	No Pass	%Pass
<15% or less than 1 min diff	38	100%	38	100%
<30%	0	0%	0	0%
>30%	0	0%	0	0%
Total	38		38	

Table 2.20 – Modelled Vs Observed Journey Time Summary Statistics PM Peak

	Lights		Heavy	
Difference	No Pass	%Pass	No Pass	%Pass
<15% or less than 1 min diff	34	89%	29	76%
<30%	4	11%	9	24%
>30%	0	0%	0	0%
Total	38		38	

2.3.50 These tables demonstrate that overall the LTAM is predicting journey times on key routes that compare favourably with observations. This is in particular the case for light vehicles where the WebTAG target of 85% of routes is achieved in all time periods. The HGV comparison is less good. This is due to the inability of SATURN to capture the speed differential between lights and HGV's. In any case the journey time validation comparisons are considered to be acceptable in all time periods.

2.3.51 The analysis presented above demonstrates that the LTAM HAM predicts traffic flows and journey times across strategic routes to an appropriate level. The HAM is therefore considered to be appropriate for use in forecasting the potential impacts of proposed LTC schemes.

2.4 Variable Demand Model

Requirement for a VDM

2.4.1 The purpose of a variable demand model is to establish the extent of travel suppression in the 'without-scheme' case and the extra traffic that is expected to be induced in the 'with-scheme' case.

2.4.2 As explained in WebTAG Unit M2, the benefit from schemes can be substantially altered by changes in demand that are caused by the scheme. Paragraph 2.2.4 of that guidance unit states that preliminary quantitative estimates of the potential effects of variable demand on both traffic levels and benefits should be made if it is thought that a fixed demand assessment will be appropriate.

2.4.3 As per paragraph 2.2.1 of WebTAG Unit M2, it may be acceptable to assess a scheme on the basis of fixed demand assignments if the following criteria are satisfied:

- The scheme is quite modest either spatially or financially and is also quite modest in terms of its effect on travel costs; schemes with a capital cost of less than £5 million can generally be considered as modest; or meets the following two points:
    - There is no congestion or crowding on the network in the forecast year (10 to 15 years after opening), in the absence of the scheme; and
    - The scheme will have no appreciable effect on travel choices (e.g. mode choice or distribution) in the corridor(s) containing the scheme.

2.4.4 The Lower Thames Crossing scheme does not satisfy any of the above criteria:

- The scheme involves making network changes over a wide area, not merely in the immediate vicinity of the crossing itself;
- The without-scheme situation is expected to be highly congested due to the fact that the Dartford Crossing is at capacity in the base year, and the introduction of the scheme is expected to provide important congestion relief;
- The amounts of re-routing caused by the introduction of the scheme – as a result of the increase in cross-river capacity that is introduced by it – are

expected to be large, with consequent large changes in travel costs relative to the without-scheme situation; and

- The introduction of the new option for crossing the river can reasonably be predicted to have an appreciable effect on travellers' mode and/or distribution choices.

2.4.5 In summary, the size, scope and predicted effect of the scheme on travel costs and routing lead to the conclusion that an appropriate appraisal of its impacts can only be carried out through the use of a variable demand model.

Model Structure

2.4.6 The different types of demand responses that are available in DIADEM for logit models are:

- Trip frequency – i.e. how many trips are made, which therefore allows for demand suppression and generation;
- Macro time period – i.e. whether to travel in, say, the AM peak, Interpeak, PM peak or Off Peak periods;
- Mode – i.e. whether to travel by car or PT; and
- Distribution (destination choice) – i.e. whether to travel to one destination or another.

2.4.7 Two types of distribution model may be used:

- Singly constrained – in which a segment's trip ends are fixed for one end of a trip; and
- Doubly constrained – in which a segment's trip ends are fixed at both ends, i.e. for both total zonal origins (or productions) and total zonal destinations (or attractions).

2.4.8 In LTAM, all of the available responses are included for at least some of the demand segments. Table 2.21 summarises the responses that are used with each of the demand segments.

Table 2.21 – The Hierarchical Demand Responses used with each of LTAM's Variable Demand Segments

Segment Index	Abbreviation	DIADEM Demand Method	Response Hierarchy
1	HBEB	Incremental PA	Time Period Mode Singly Constrained Distribution
2	HBW L		Time Period Mode Doubly Constrained Distribution
3	HBW M		
4	HBW H		
5	HBO L		Frequency Time Period Mode Singly Constrained Distribution
6	HBO M		
7	HBO H		
8	NHBEB	Incremental OD	Time Period Mode Singly Constrained Distribution
9	NHBO L		Frequency Time Period Mode Singly Constrained Distribution
10	NHBO M		
11	NHBO H		
12	LGV	Fixed	N/A
13	HGV		
14	Port Trips EB		
15	Port Trips O L		
16	Port Trips O M		
17	Port Trips O H		

Model Calibration

2.4.9 The standard way to verify that a variable demand model's behaviour is realistic before using it to perform forecast year traffic predictions is to run a series of realism tests that involve changing the costs of using the two main modes, highway and PT, and to assess whether the responses are in accordance with observations.

2.4.10 As discussed in section 6.4 of WebTAG Unit M2, the method used to assess the acceptability of a model's responses is to calculate its demand elasticities and verify that they are within certain ranges. The elasticities are calculated by making a small proportional change to a relevant cost across the whole model and calculating the resulting proportional change in the amount of travel that is associated with that cost.

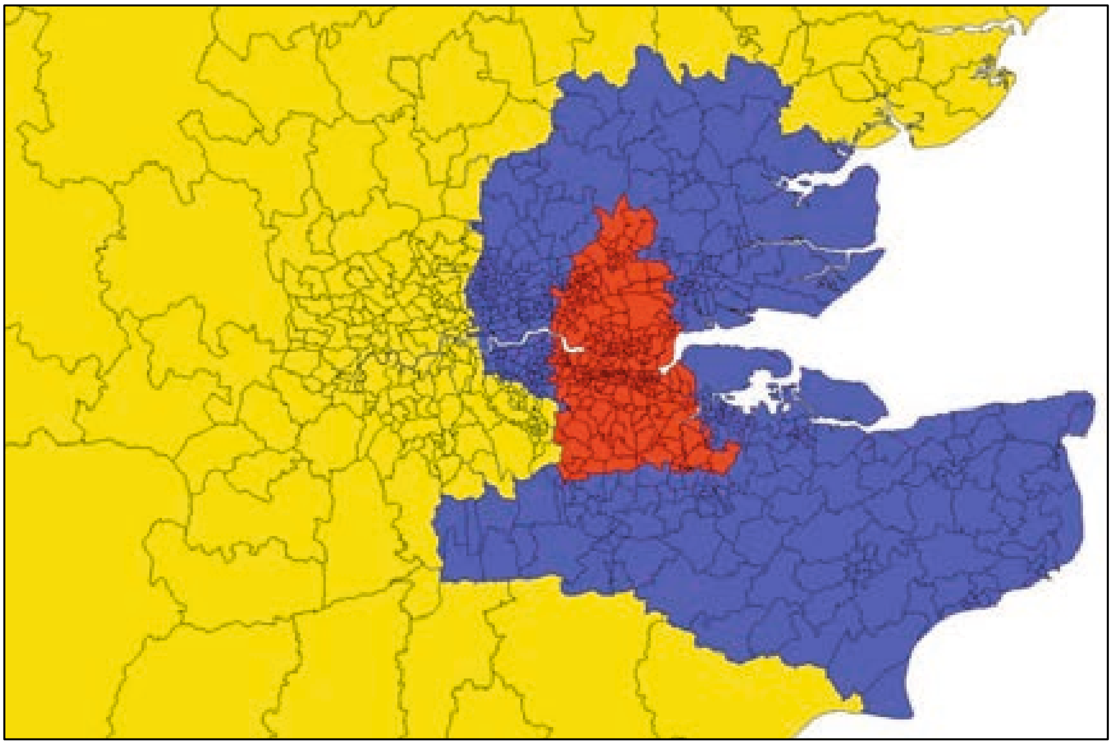
2.4.11 The realism tests that are required by WebTAG are the responses due to changes in highway fuel cost and public transport fares. Additionally, the elasticity of demand in response to car journey time changes is also required, but this can be approximately obtained from the car fuel price elasticity, which is the approach we have used.

2.4.12 Other requirements set out in WebTAG for the calculation of demand elasticities are:

- They must be calculated using the base year model;
- If distance-based cost damping is being used in the model, the realism tests must be performed with its effects included. A sensitivity test may be performed in which the cost damping is turned off, to be able to assess its impact;
- The elasticities must be calculated from the outputs of a converged model; and
- A demand-weighted average of the elasticities calculated for individual time periods and journey purposes should be reported in addition to the individual values themselves.

2.4.13 In the calculation of both fuel price and PT fare elasticities, the matrix-based values have been obtained for movements from origins in the Fully Modelled Area to all destinations, including external zones. This classification of movements is the same as was used in SERTM for the calculation of the fuel price elasticities and we have retained it for those calculations. The area classification used is illustrated in Figure 2.16.

Figure 2.16 – LTAM's Inner (red), Fully Modelled (blue) and External (yellow) Areas



Fuel Price Realism Test

2.4.14 The fuel price realism test was conducted by increasing the fuel components of the base year vehicle operating cost parameters by 10% by modifying the fuel costs in the WebTAG Databook.

2.4.15 Fuel price elasticities must be calculated in two ways:

- Based on the trip matrix and distance skims; and
- Based on network link flows and distances.

2.4.16 For the matrix-based elasticity, pcu-kms for each OD pair were obtained separately for each time period and user class by multiplying the trip matrices by the average distances skimmed from the assignment outputs. These were then summed over all destination zones for origin zones in the FMA only to obtain the final pcu-kms value used in the rest of the calculation.

2.4.17 For the network-based elasticity, the method used was to extract pcu-kms by multiplying actual link flows for each user class in each time period by the link length, for links in the simulation network only. The total for each time period and user class was used in the rest of the calculation.

2.4.18 The realism test scenario was run to convergence with DIADEM's relative gap criteria set to 0.05% for the whole model and 0.20% for the chosen sub-area. Convergence was achieved after 8 demand/supply loops.

2.4.19 Because the calculations make use of highway assignment model outputs, elasticities were obtained for each time period and each of the 7 user classes that correspond to the 11 variable demand segments. The disaggregate data were also combined to obtain elasticities at the level of journey purpose without income segmentation, and further combined into values for each journey purpose over a whole day and for each time period over all purposes. These values are summarised in Table 2.22.

Table 2.22 – Elasticities for Each Individual User Class

Matrix-Based Elasticity	Business	Commute Low	Commute Med	Commute High	Other Low	Other Medium	Other High
AM	-0.11	-0.29	-0.16	-0.07	-0.70	-0.39	-0.21
IP	-0.11	-0.31	-0.20	-0.11	-0.57	-0.34	-0.22
PM	-0.11	-0.30	-0.17	-0.08	-0.57	-0.31	-0.19
OP	-0.16	-0.31	-0.21	-0.14	-0.65	-0.42	-0.30
Network-Based Elasticity	Business	Commute Low	Commute Med	Commute High	Other Low	Other Medium	Other High
AM	-0.06	-0.36	-0.19	-0.04	-0.83	-0.44	-0.22
IP	-0.11	-0.43	-0.27	-0.11	-0.75	-0.43	-0.25
PM	-0.08	-0.42	-0.22	-0.06	-0.73	-0.39	-0.20
OP	-0.20	-0.49	-0.33	-0.21	-0.90	-0.58	-0.41

2.4.20 The final matrix-based elasticities after aggregation over income segments are shown in Table 2.23, while the corresponding values from the network-based calculations are shown in Table 2.24. Because the off peak (OP) period data are unvalidated and are an estimate based on factoring the IP matrices, the elasticities have been reported in each table both with and without the inclusion of that time period's pcu-kms.

Table 2.23 – Final Matrix-Based Fuel Price Elasticities of PCU Kilometres

Internal Zones to All Destinations (OD, Matrix Calculation)				
Car Elasticity	Business	Commuting	Car Other	Total
AM	-0.11	-0.15	-0.42	-0.27
IP	-0.11	-0.19	-0.38	-0.31
PM	-0.11	-0.16	-0.35	-0.25
OP	-0.16	-0.21	-0.46	-0.38
Total	-0.12	-0.17	-0.40	-0.31
Excl OP	-0.11	-0.17	-0.38	-0.28

Table 2.24 – Final Network-Based Fuel Price Elasticities of PCU Kilometres

Simulation Network (Network Calculation)				
Car Elasticity	Business	Commuting	Car Other	Total
AM	-0.06	-0.15	-0.45	-0.28
IP	-0.11	-0.24	-0.47	-0.38
PM	-0.08	-0.18	-0.41	-0.29
OP	-0.20	-0.31	-0.62	-0.51
Total	-0.11	-0.21	-0.50	-0.37
Excl OP	-0.08	-0.19	-0.45	-0.33

2.4.21 Guidance states that the trip-km elasticities with respect to fuel price are expected to satisfy the following criteria:

- The average elasticity of car use with respect to fuel cost should lie in the range -0.25 to -0.35;
- The side of -0.30 on which the elasticity lies – i.e. closer to -0.25 or -0.35 – should be appropriate for the area covered by the model, taking into account such attributes as levels of income and average trip lengths;

- The pattern of elasticities calculated over all purposes is expected to show that peak period values are lower than interpeak values, which are lower than off peak values;
- Employer's Business trips are expected to have elasticities close to -0.1;
- Trips for discretionary purposes, such as Other, are expected to have elasticities close to -0.4; and
- Commuting trips are expected to have elasticities that are near to the average.

2.4.22 By comparing the LTAM fuel price elasticities with the guidance, the following comments can be made:

- The overall all-day elasticity over all purposes is -0.31 from the matrix calculation and -0.37 from the network calculation. Excluding the unvalidated OP period leads to a matrix-based value of -0.28 and a network-based value of -0.33. These elasticities are within or close to the expected range;
- The all-purpose elasticities are lower in the peaks than in the interpeak, which are in turn lower than the elasticities in the off peak. This is true of both the network- and matrix-based values;
- The all-day elasticity for EB trips is -0.12 from the matrix calculation and -0.12 from the network calculation. These are both close to the expected value. The variation of the EB elasticity across the time periods displays the expected behaviour;
- The all-day elasticity for Other trips is -0.40 from the matrix calculation and -0.50 from the network calculation. The value from the network calculation is particularly high due to the contribution of the unvalidated off peak period. Excluding that period leads to values of -0.38 and -0.45, respectively, for matrix and network calculations. These are close to the expected value of -0.40; and
- The Commuting elasticities are -0.17 from the matrix calculation and -0.21 from the network calculation. These lie outside the range reported by WebTAG, though from the network calculation the IP and OP elasticities lie within or close to the expected range.

Journey Time Realism Test

2.4.23 Journey time elasticities are difficult to obtain accurately, and so an approximate method is used, which relates them to the fuel price elasticities and the values of VOT and VOC.

2.4.24 WebTAG states that the journey time elasticities should be checked "to ensure that the model does not produce very high output elasticities (say stronger than -2.0)".

2.4.25 The final values calculated for each user class are shown in Table 2.25, together with the assignment hours and kilometres and other parameters used in their calculation. These have been calculated using the pcu-kms extracted from the simulation network, and so they are consistent with the values shown earlier for the network-based fuel price elasticities.

Table 2.25 – Journey Time Elasticities and the Data Used in their Calculation

Period	User Class	pcu-hrs	pcu-kms	ppm	ppk	aT/bK	pcu-km elasticity	Journey time elasticity
AM	HBEB	18,229	978,056	30.1	13.23	2.54	-0.065	-0.17
AM	HBW L	8,946	410,735	9.28	6.59	1.84	-0.357	-0.66
AM	HBW M	20,367	993,097	15.61	6.59	2.91	-0.186	-0.54
AM	HBW H	22,242	1,162,762	27.21	6.59	4.74	-0.045	-0.21
AM	HBO L	18,284	845,592	7.59	6.59	1.49	-0.830	-1.24
AM	HBO M	21,775	1,082,343	13.07	6.59	2.39	-0.441	-1.06
AM	HBO H	24,648	1,316,561	20.81	6.59	3.55	-0.218	-0.77
IP	HBEB	8,867	529,843	30.84	12.64	2.45	-0.107	-0.26
IP	HBW L	4,757	234,924	9.43	6.36	1.80	-0.428	-0.77
IP	HBW M	7,743	415,460	15.86	6.36	2.79	-0.268	-0.75
IP	HBW H	7,656	439,825	27.65	6.36	4.54	-0.109	-0.49
IP	HBO L	20,556	1,041,904	8.09	6.36	1.51	-0.754	-1.14
IP	HBO M	20,993	1,166,952	13.92	6.36	2.36	-0.429	-1.01
IP	HBO H	20,686	1,224,439	22.17	6.36	3.53	-0.255	-0.90
PM	HBEB	14,995	814,534	30.53	13.28	2.54	-0.077	-0.19
PM	HBW L	10,812	513,853	9.32	6.61	1.78	-0.420	-0.75
PM	HBW M	21,776	1,127,207	15.66	6.61	2.75	-0.216	-0.59
PM	HBW H	24,427	1,376,484	27.3	6.61	4.40	-0.056	-0.25
PM	HBO L	25,078	1,101,846	7.95	6.61	1.64	-0.733	-1.20
PM	HBO M	29,331	1,414,116	13.69	6.61	2.58	-0.392	-1.01
PM	HBO H	31,167	1,623,460	21.79	6.61	3.80	-0.197	-0.75
OP	HBEB	3,162	211,398	30.84	12.64	2.19	-0.198	-0.43
OP	HBW L	1,710	94,820	9.43	6.36	1.60	-0.490	-0.79
OP	HBW M	2,828	169,808	15.86	6.36	2.49	-0.326	-0.81
OP	HBW H	2,787	178,128	27.65	6.36	4.08	-0.207	-0.84
OP	HBO L	7,271	419,416	8.09	6.36	1.32	-0.901	-1.19
OP	HBO M	7,447	466,742	13.92	6.36	2.10	-0.582	-1.22
OP	HBO H	7,430	493,630	22.17	6.36	3.15	-0.412	-1.30

2.4.26 All of the values calculated for the journey time elasticity are negative, so that increasing journey time leads to fewer trips, as expected, and are all less strong than -2.0.

Public Transport Fare Realism Test

2.4.27 The public transport fare elasticity is calculated from the proportional change in public transport trips as a result of an increase in public transport fares, in contrast to the pcu-km-based highway elasticity. These PT fare elasticities must be calculated from the demand matrices and reported by time period and journey purpose.

2.4.28 The method used to calculate these elasticities was to increase the values of the fares used inputted to DIADEM by 10% for all OD pairs and to examine the resulting changes in the numbers of PT trips for each demand segment. All other inputs to the model, such as the PT travel times, values of time and vehicle operating costs were unchanged from their base model values.

2.4.29 The scenario was run to convergence with DIADEM's relative gap criteria set to 0.05% for the whole model and 0.20% for the chosen sub-area. Convergence was achieved after 12 demand/supply loops.

2.4.30 The final PT fare elasticities are shown in Table 2.26 for home-based purposes and Table 2.27 for non-home-based purposes.

Table 2.26 – Final PT Fare Elasticities – Home-Based Purposes

Purpose	Ref Trips (24 hrs)	VDM trips (24 hrs)	Elasticity
HBEB	132,091	130,083	-0.16
HBW	1,369,408	1,355,093	-0.11
HBO	212,014	198,768	-0.68

Table 2.27 – Final PT Fare Elasticities – Non-Home-Based Purposes

Purpose	Time Period	Ref Trips (period)	VDM trips (period)	Elasticity
NHBEB	AM	33,832	33,105	-0.23
	IP	46,384	45,417	-0.22
	PM	24,176	23,740	-0.19
	OP	20,817	20,418	-0.2
	All Day	125,210	122,681	-0.21
NHBO	AM	8,329	7,591	-0.97
	IP	27,672	25,161	-1
	PM	32,369	29,617	-0.93
	OP	12,573	11,517	-0.92
	All Day	80,943	73,888	-0.96

2.4.31 Guidance suggests a range of -0.2 to -0.9 within which the PT fare elasticities are expected to lie. It is stated that the pattern of elasticities across purposes and time periods will show the same general features as expected of the fuel price elasticities, though it is recognised that there is little empirical evidence on which the patterns are based.

2.4.32 The PT fare elasticities obtained from the LTAM realism test shows that EB and Commuting values are lower than those for Other, which is in line with expectation. The Commuting elasticity is quite low and lies outside of the range suggested by the guidance, though we believe it is plausible for rail travel to work in the south east of England to be fairly inelastic with respect to cost. The NHBO elasticity is high but close to the boundary of the expected range. For the NHB purposes, for which we have calculated elasticities by time period, there is not much evidence of the peak elasticities being generally lower than those in the non-peak periods, but the values are fairly constant between periods.

Final Demand Model Parameters

2.4.33 The final parameters used in LTAM are shown in Table 2.28 for all demand responses with the exception of time period choice. Note that the distribution model parameters are shown with negative signs, as this is the way in which their values need to be entered into DIADEM.

2.4.34 All of the distribution and mode choice parameters are the ‘median’ values in Tables 5.1 and 5.2 of WebTAG Unit M2, which are intended to be used as a starting point for calibration, and which are also the final values used in SERTM.

2.4.35 As suggested by paragraph 5.6.17 of WebTAG Unit M2, macro time period choice has been set for all variable demand segments to have the same sensitivity to costs as mode choice. As time period choice is immediately above mode choice in the nested logit tree, this is achieved by setting the value of θ for the time period response to 1.0 for all demand segments.

2.4.36 WebTAG does not contain any recommended values for the frequency response, and so the values used in LTAM were taken from the Design Freeze 2 version of SERTM. Note that the Design Freeze 3 version of SERTM removed all frequency responses.

Table 2.28 – The Final Distribution, Mode and Frequency Response Parameters Used in LTAM (time period θ = 1 for all segments)

Segment	Distribution		Other Responses (mode-independent)	
	Car	PT	Mode	Frequency
HBEB	-0.067	-0.036	0.45	-
HBW (L, M, H)	-0.065	-0.033	0.68	-
HBO (L, M, H)	-0.090	-0.036	0.53	0.087
NHBEB	-0.081	-0.042	0.73	-
NHBO (L, M, H)	-0.077	-0.033	0.81	0.066

2.5 The LTAM Base Plus Model

2.5.1 A primary objective of a proposed LTC is to reduce congestion at the existing Dartford Crossing. In order for LTAM to predict this impact in as robust a way as possible it is necessary to pay careful consideration to how Dartford Crossing is represented in the base year, and subsequently in forecast years. Key to this method is the representation of the Dartford Traffic Management Cell (TMC) which is used to manage traffic flow at the existing crossing. The method adopted is summarised below.

2.5.2 A Traffic Management Cell (TMC) is in operation at the entrance to the northbound tunnels at Dartford. It enables the operators to monitor vehicles and traffic conditions and “intervene” in order to ensure safe operation. There are generally three types of TMC intervention:

- **Extractions** – this is where a vehicle approaches the tunnels in the wrong lane. One example of this is Dangerous Goods Vehicles (DGV) which are only allowed through the western tunnel. Therefore, if one approaches the tunnels in lanes 3 or 4, which means it could only use the eastern tunnel, the TMC is used to extract the DGV from the regular flow and enable it to switch into the western tunnel approach. Similarly, vehicles over 4.8m high cannot use the western tunnel so if they approach in Lanes 1 and 2 they also need to be extracted;
- **Escorts** – DGV’s are not allowed through the tunnels alongside the general traffic flow. DGV’s are held in a queuing station adjacent to the tunnels and at regular intervals are escorted through the western tunnel in convoy. The TMC is used to hold the regular flow of vehicles until the DGV’s have cleared the tunnel; and
- **Flow Metering** – This is used where significant queuing occurs. If these queues start to block back towards the exit of the tunnels at the north side of the river the TMC is used to regulate the flow of vehicles entering the tunnel at the south side of the river so that queueing does not occur in the tunnel.

2.5.3 It is clear from analysis of the available journey time and traffic flow data that northbound demand over the crossing is heavily constrained by the reduced capacity in the tunnels. Analysis of the TMC operation data shows that TMC operation for flow metering was substantial during the model month of March 2016 leading to further reductions in capacity. Much of this flow metering was associated with roadworks at M25 J30/A13 which were in place throughout the model month but were removed in December 2016.

2.5.4 The LTAM is an incremental model which means that it "pivots" from a fixed baseline condition. If the actual base of March 2016 is used as this fixed point for pivoting then, because of the capacity issues at Dartford in the model month, when the forecast models are run it could underestimate the flow at Dartford and therefore substantially underestimate the benefits of introducing a new Lower Thames Crossing. It is therefore important to remedy this problem in the model.

2.5.5 The adopted method to deal with this was to create a "Base Plus" network where the roadworks at M25 J30/A13 are removed and the TMC flow metering is reduced to present day levels. The calibrated VDM was then run using the base plus network conditions. Theory suggests that the VDM will increase the demand in the matrices, due to the increase in capacity at the crossing. These output matrices and associated travel costs are then used as the fixed point that the forecast scenarios are "pivoted" from. This approach is similar to that adopted when the Highways England Regional Traffic Models are used for forecasting to take into account the effect of roadworks that were in place when data was collected.

2.5.6 Table 2.29 shows the average hourly flow values in PCU's and the average speed from January 2017 to June 2017 for each time period in each direction. The values for March 2016 are also included for comparison purposes.

Table 2.29 – 2017 Monthly Average Hourly Flow Values (PCU) and Average Speed (M25 J1b to J31) (km/h)

Direction	Month	Flow in PCU/Hr			Speed in km/h		
		AM (07:00-08:00)	IP (Avg 09:00-15:00)	PM (17:00-18:00)	AM (07:00-08:00)	IP (Avg 09:00-15:00)	PM (17:00-18:00)
SB	Mar-16	7633	5531	6777	72.0	77.9	70.2
	Jan-17	7086	5246	6269	73.2	77.8	64.1
	Feb-17	7343	5730	6635	70.2	76.8	63.4
	Mar-17	7624	5796	6801	72.3	79.8	70.7
	Apr-17	7873	6127	6973	71.9	79.4	71.8
	May-17	7813	5900	6798	73.0	78.1	70.8
NB	Mar-16	6760	6103	6251	60.1	62.3	47.9
	Jan-17	6359	5839	5684	57.1	61.6	57.6
	Feb-17	6682	6182	6160	55.7	57.5	54.0
	Mar-17	6887	6330	6329	54.6	61.0	55.2
	Apr-17	6875	6529	6723	57.4	53.1	48.0
	May-17	6743	6400	6308	54.9	58.3	55.4

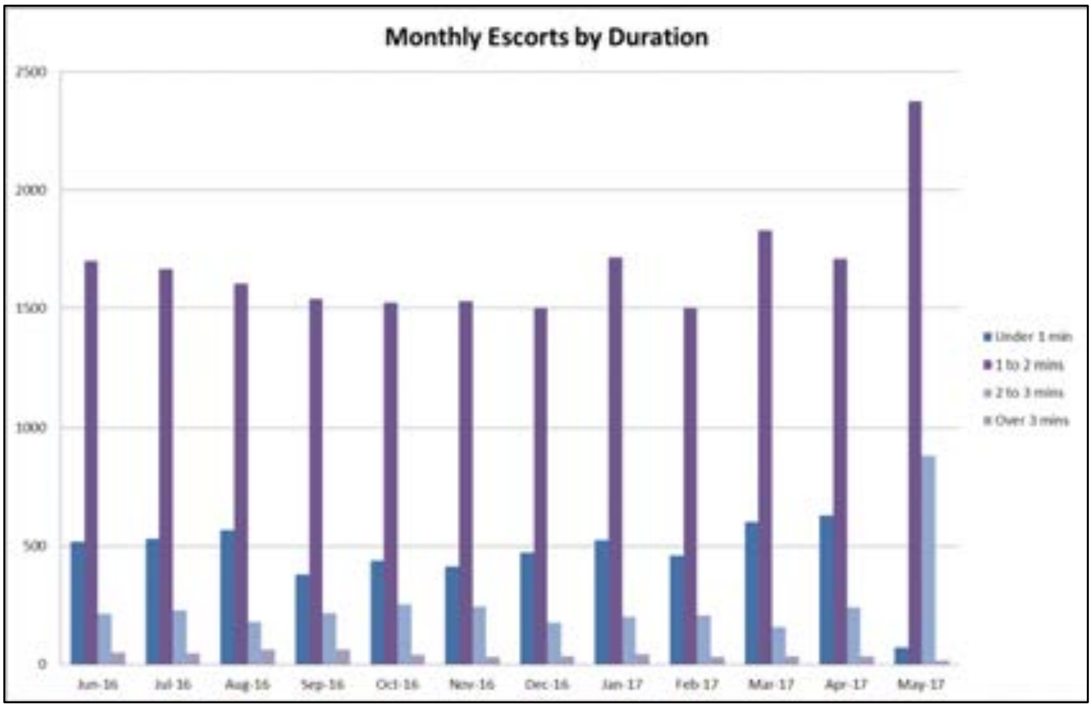
2.5.7 Although the roadworks at M25 J30/A13 were removed in December 2016 there was an active speed restriction of 50 mph in place until March 2017. Easter fell in April in 2017. It was therefore decided to use May 2017 as the representative month for the Base Plus model.

2.5.8 The analysis presented in Table 2.29 shows that in May 2017 flow values northbound at the crossing have increased substantially over March 2016 in the Inter peak with flows in the AM and PM being similar to those in March 2016. In the AM and Inter Peak the average speed has decreased. In the PM the average speed has increased.

2.5.9 In the southbound direction flows have increased slightly in the AM and Interpeak direction, potentially due to the removal of the A13 roadworks. Speeds are relatively similar to those in March 2016.

2.5.10 Figure 2.17 shows the distribution of escort durations as extracted from the Dartford Crossing TMC Dashboard.

Figure 2.17 – Dartford Crossing TMC – Monthly Escorts by Duration



2.5.11 As can be seen, May 2017 escorts are slightly higher in number to previous months, and with a higher proportion of durations between one and three minutes and a much lower proportion of durations under one minute. It is therefore necessary to increase the average duration of an escort from 90 seconds in the actual base to 120 seconds in the Base Plus. The rate of escorts should be left constant.

2.5.12 Table 2.30 shows the average rate of escorts and the level of delay associated with them assuming a 120 second duration for each occurrence. The percentage of red time is shown along with the length of red time assuming a 120 second signal cycle time.

Table 2.30 – Average Rate of Escorts per Model Period and Associated Level of Delay (Base Plus)

Time Period	Rate Per Hour	Duration (secs)	% Red	Red Time (secs)
AM	4	120	13%	16
IP	4.75	120	16%	19
PM	3.5	120	12%	14

2.5.13 Table 2.31 shows the actual base Dartford capacity calculations for comparison purposes. Table 2.32 shows the updated Dartford capacity calculations assuming extractions remain the same, the escort duration has been increased and flow metering substantially reduced.

Table 2.31 – Overall Dartford Crossing Capacity Calculation (Northbound) – Actual Base Network (March 2016)

Time Period	Tunnel	Maximum Capacity (PCU/Hr)	TMC Signal Times (Based on 120 second cycle time) Extra ctions Red	Escorts Red	Flow Metering Red	Total Red	Total Green	Green Factor	Effective Capacity (PCU/Hr)	Base Year Obs Flow (PCU/Hr)	Base Year V/C Ratio
AM	Western	3650	0	12	3	15	105	0.88	3194		
	Eastern	3850	0	0	3	3	117	0.98	3754		
	Total	7500							6948	6760	0.97
IP	Western	3650	0	14	3	17	103	0.86	3125		
	Eastern	3850	0	0	3	3	117	0.98	3754		
	Total	7500							6879	6102	0.89
PM	Western	3650	0	11	17	28	93	0.77	2814		
	Eastern	3850	0	0	17	17	103	0.86	3305		
	Total	7500							6118	6250	1.02

Table 2.32 – Overall Dartford Crossing Capacity Calculation (Northbound) – Base Plus Network (May 2017)

Time Period	Tunnel	Maximum Capacity (PCU/Hr)	TMC Signal Times (Based on 120 second cycle time) Extra ctions Red	Escorts Red	Flow Metering Red	Total Red	Total Green	Green Factor	Effective Capacity (PCU/Hr)	May 2017 Flow	May 2017 V/C Ratio
AM	Western	3650	0	16	0.5	17	104	0.86	3148		
	Eastern	3850	0	0	0.5	1	120	1.00	3834		
	Total	7500							6982	6743	0.97
IP	Western	3650	0	19	0	19	101	0.84	3072		
	Eastern	3850	0	0	0	0	120	1.00	3850		
	Total	7500							6922	6400	0.92
PM	Western	3650	0	14	5	19	101	0.84	3072		
	Eastern	3850	0	0	5	5	115	0.96	3690		
	Total	7500							6762	6308	0.93

2.5.14 It is important to ensure that the Base Plus model still replicates observed conditions at the crossing after the capacity constraint has been lifted. Table 2.33 shows the flow comparison between the March 2017 observed flows and the Base Plus modelled flows at Dartford in the AM and PM Peak hours.

Table 2.33 – Dartford Crossing Base Plus Traffic Flow Calibration Statistics (Veh/Hr) (Model Run Ref – BP6)

Direction	Time Period	Observed	Modelled	Difference	Difference %
SB	AM	6003	5928	-75	-1.2%
	PM	5740	5789	49	0.9%
NB	AM	5322	5343	21	0.4%
	PM	5176	5210	34	0.7%

2.5.15 Table 2.34 shows the average speed comparison between the March 2017 Bluetooth journey time data and the Base Plus modelled speed in the AM and PM Peak hours.

Table 2.34 – Dartford Crossing Base Plus Average Speed Comparison Statistics (M25 J1b – J31) (km/Hr) (Model Run Ref – BP6)

Direction	Time Period	Observed	Modelled	Difference	Difference %
SB	AM	73.0	71.6	-1.4	-1.9%
	PM	70.8	74.0	3.2	4.5%
NB	AM	54.9	54.6	-0.3	-0.5%
	PM	55.4	61.3	5.9	10.6%

2.5.16 Table 2.33 and Table 2.34 show that the Base Plus model reproduces vehicular flows and speeds in line with those observed in May 2017. It is therefore considered that the Base Plus model is a robust base upon which to produce the forecasts for LTAM.

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3 The Uncertainty Log and Forecast Years

3.1 The Uncertainty Log

3.1.1 The Uncertainty Log, supplied in Appendix A, provides information on the latest assumptions regarding planned developments and transport schemes in the vicinity of the LTC scheme. The assumptions are based on the information provided by Highways England, local authorities and London boroughs in the LTC model area. This process adopted is summarised below.

3.1.2 The development assumptions are used to explicitly model development trips to be included in the future year matrices for the LTAM forecast model. The transport schemes' assumptions are also used to code forecast networks as appropriate.

3.1.3 The Uncertainty Log has been prepared in accordance with WebTAG Unit M4 and draft DMRB guidance Volume 5, Section 1, Part 2. The primary purpose for developing the Uncertainty Log is to provide the spatial distribution of planned developments and transport schemes by using Local Authority planning data for housing and employment developments as well as Highways England transport schemes.

Area Covered by the Uncertainty Log

3.1.4 WebTAG Unit M4 requires that uncertainty should be assessed in relation to developments located in the 'vicinity of the scheme being appraised'.

3.1.5 The draft DMRB guidance in Volume 5, Section 1.2-Traffic Forecasting for Major Schemes defines that the local area for trunk road improvement schemes should include the following:

- all district/unitary council areas through which the scheme passes, either in whole or in part; and
- any adjacent district/unitary council areas where the results of the appraisal and design are likely to be sensitive to different development scenarios in those areas.

3.1.6 The Uncertainty Log developed for the LTC v2 model has been used as a starting point for the LTAM Uncertainty Log. The land use development data from the LTC v2 Uncertainty Log has been updated based on the latest information provided by local authorities.

3.1.7 The Uncertainty Log for the A2 Bean & Ebbsfleet junction improvement scheme has also been considered for the developments and network supply assumptions in Dartford and Gravesham area. This information was updated after consultation with Dartford and Gravesham boroughs.

3.1.8 The phasing of the planned developments has been either based on the phasing information provided by the local authorities or for the developments for which this information was not available, it is based on judgement depending on the local plan period and size of the development.

3.1.9 The Highways England schemes included comprise those identified in the Road Investment Strategy (RIS). They were initially taken from the SERTM but then updated based on more recent information. The local authority schemes from SERTM were reviewed and those that would impact the LTC scheme were included depending on their likelihood of being built.

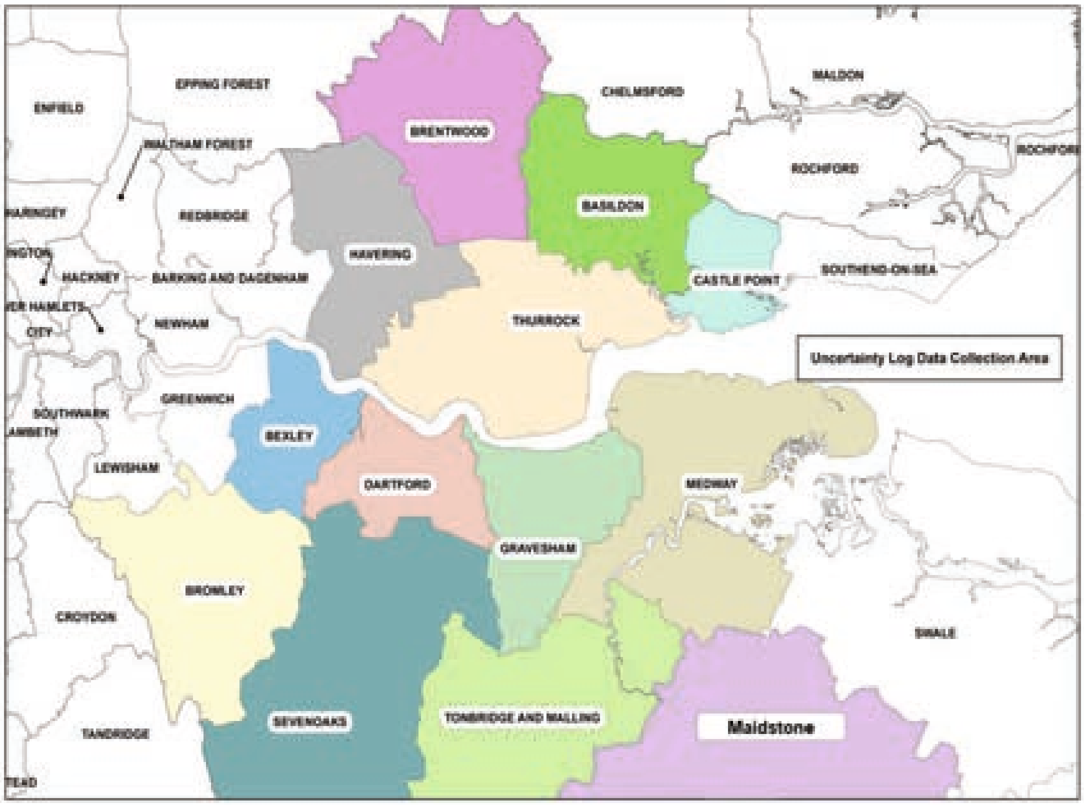
3.1.10 In addition to these schemes, any other major local authority schemes that have significant impact on the LTC scheme and M25 have also been taken into consideration and judgement made in selecting these schemes to be included in the Uncertainty Log.

3.1.11 Based on the criteria mentioned above, the following local authorities have been consulted for their planned developments:

- Essex
  - Basildon;
  - Brentwood;
  - Castle Point; and
  - Thurrock.
- Kent
  - Dartford;
  - Gravesham;
  - Maidstone;
  - Medway;
  - Sevenoaks; and
  - Tonbridge & Malling.
- Greater London
  - LB Bexley;
  - LB Bromley; and
  - LB Havering.

3.1.12 The study area for collecting data for the planned development schemes is shown in Figure 3.1.

Figure 3.1 – LTAM Study Area for Planned Developments' Data Collection



Justification for the Developments/Schemes Included

3.1.13 The DMRB guidance provides information on developments to be included in the Uncertainty Log. Many developments will be too minor to have any impact on the forecasts and judgement would be required for selecting the developments to be included. For land use developments in the study area, any development that generates more than 1,000 additional trips (200 dwellings) per week day will be included in the Uncertainty Log.

3.1.14 For the employment development, any development that exceeds the following limits will be considered for the Uncertainty Log:

- B1 'Office Development' – 10,000m^2 Gross Floor Area (GFA);
- B2 'Industrial Estate' – 1,500m^2 Gross Floor Area; and
- B8 'Warehousing' – 5,000m^2 Gross Floor Area.

3.1.15 Since the guidance has not provided the threshold for other land use types, (retail, local shops, schools etc), any development over 1,500m^2 has been included in the Uncertainty Log.

3.1.16 The status of all the schemes (development schemes and network schemes) have been classified according to the WebTAG classification presented in Table 3.1, which is taken from WebTAG Unit M4 Forecasting and Uncertainty – November 2014.

Table 3.1 – WebTAG Classification of Future Inputs (WebTAG Unit M4, Table A2)

Probability of the Input	Status	Core Scenario Assumption
Near certain: The outcome will happen or there is a high probability that it will happen.	Intent announced by proponent to regulatory agencies.	This should form part of the core scenario.
	Approved development proposals.	
	Projects under construction.	
More than likely: The outcome is likely to happen but there is some uncertainty.	Submission of planning or consent application imminent.	This should form part of the core scenario.
	Development application within the consent process.	
Reasonably foreseeable: The outcome may happen, but there is significant uncertainty.	Identified within a development plan.	These should be excluded from the core scenario but may form part of the alternative scenarios.
	Not directly associated with the transport strategy/ scheme, but may occur if the strategy/scheme is implemented.	
	Development conditional upon the transport strategy/scheme proceeding.	
	Or, a committed policy goal, subject to tests (e.g. of deliverability) whose outcomes are subject to significant uncertainty.	
Hypothetical: There is considerable uncertainty whether the outcome will ever happen.	Conjecture based upon currently available information.	These should be excluded from the core scenario but may form part of the alternative scenarios.
	Discussed on a conceptual basis.	
	One of a number of possible inputs in an initial consultation process.	
	Or a policy aspiration.	

3.1.17 From a Highways England perspective, guidance was received in early 2018 which stated that all schemes included within a published Roads Investment Strategy (RIS) should be considered as being “more than likely” and should therefore be included within the core scenario.

3.2 Forecast Years and Scenarios in LTAM

Forecast Years in LTAM

3.2.1 The forecast years for the LTAM were defined at an early stage of the model development process. These were identified as:

- Opening year – 2026;
- Intermediate year – 2031;
- Design year – 2041; and
- Horizon year – 2051.

Scenarios to be Modelled in LTAM

3.2.2 The core scenario, as described in WebTAG Unit M4, forms the primary evidence for the scheme appraisal. In addition to the core scenario, alternative scenarios are undertaken. These consist of low and high growth scenarios which are defined so as to represent national uncertainty.

3.2.3 The alternative scenarios are required to inform the appraisal as to whether, under high demand assumptions, the scheme is still effective or under low demand assumptions, the scheme is still economically viable.

3.2.4 Local uncertainty generally relates to uncertainty around whether proposed land use developments or infrastructure schemes will go ahead. Local uncertainty is not currently modelled using LTAM for the appraisal of LTC. The rationale behind this is that all developments and infrastructure schemes included within the Uncertainty Log fall within the “Near Certain” or “More Than Likely” categories thus removing the need to consider local uncertainty.

3.2.5 The schemes which are included in each scenario depends on their status in the planning stage based on the WebTAG guidance as shown in Table 3.2.

Table 3.2 – Forecast Scenarios

Scenario	Supply (Network Schemes)	Demand	
		Developments and Schemes	NTEM Constraint
Core	Near Certain and More than Likely schemes	Near Certain and More than Likely developments	Standard NTEM
High Growth	Near Certain and More than Likely and Reasonably Foreseeable schemes	Near Certain and More than Likely and Reasonably Foreseeable developments	NTEM plus WebTAG High Growth Increment
Low Growth	Near Certain and More than Likely schemes	Near Certain and More than Likely developments	NTEM minus WebTAG Low Growth Increment

3.2.6 The methodology used to apply the WebTAG high and low growth increment is discussed under Section 7.6.

3.2.7 The developments and schemes included in the Uncertainty Log are provided in Appendix A. As can be seen, all of the developments and transport schemes were identified to fall within the Near Certain or More than Likely category. This means that they are all included within the core scenario.

3.2.8 An overall plot showing all developments in the LTAM study area is provided in Figure 3.2. A zoomed in version for Dartford, Gravesham and Thurrock is provided in Figure 3.3. A zoomed in version showing the developments in Maidstone, Medway, Tonbridge and Malling is provided in Figure 3.4. Transport schemes are shown in Figure 3.5.

Figure 3.2 – Overall Development Locations in LTAM Study Area

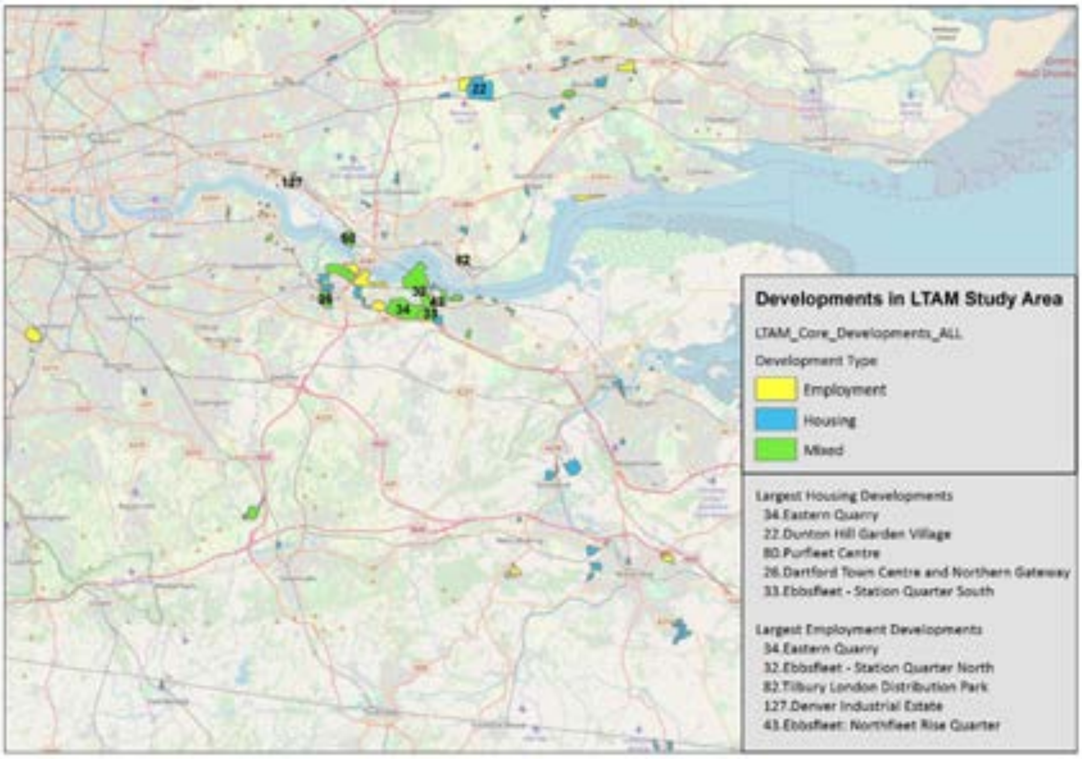


Figure 3.3 – Development Locations in Dartford, Gravesham and Thurrock

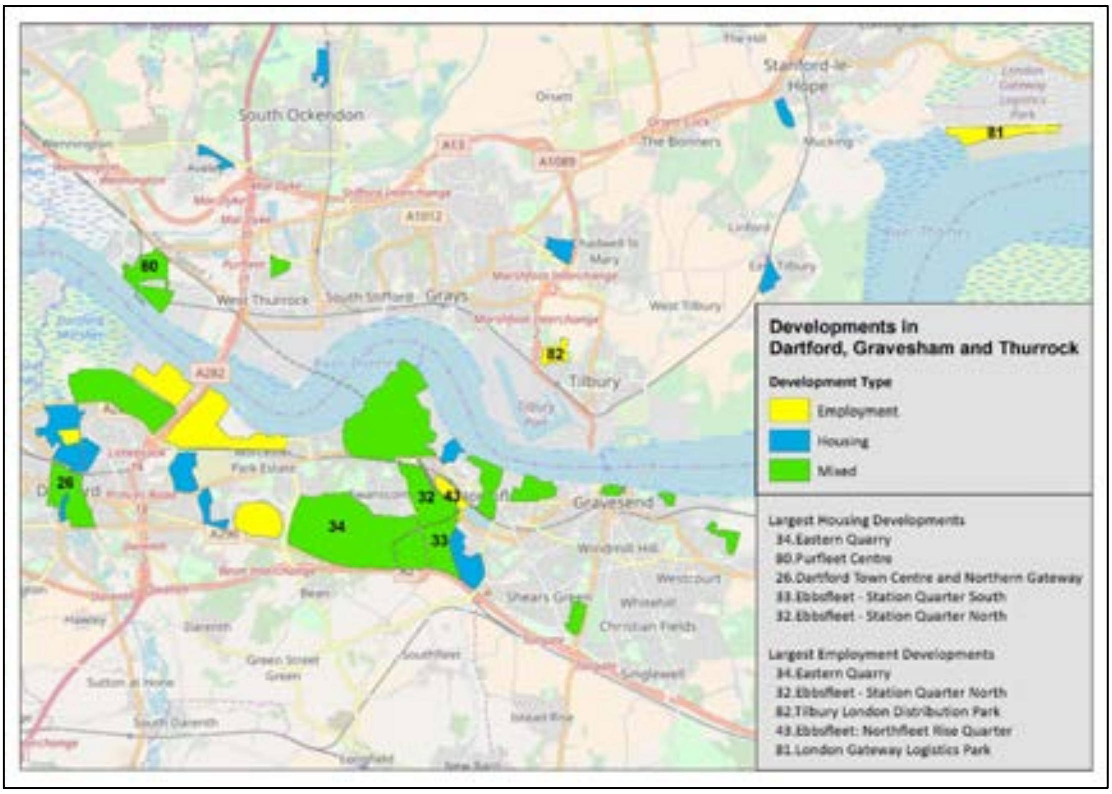


Figure 3.4 – Development Locations in Maidstone, Medway, Tonbridge and Malling

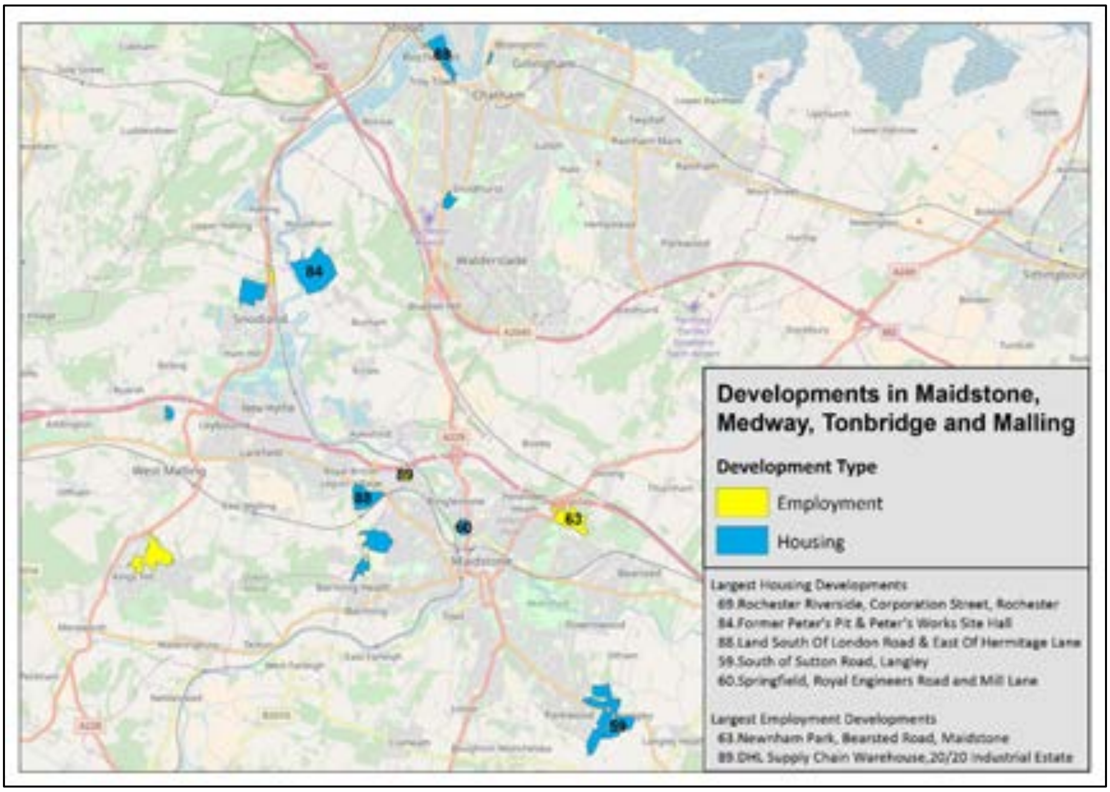
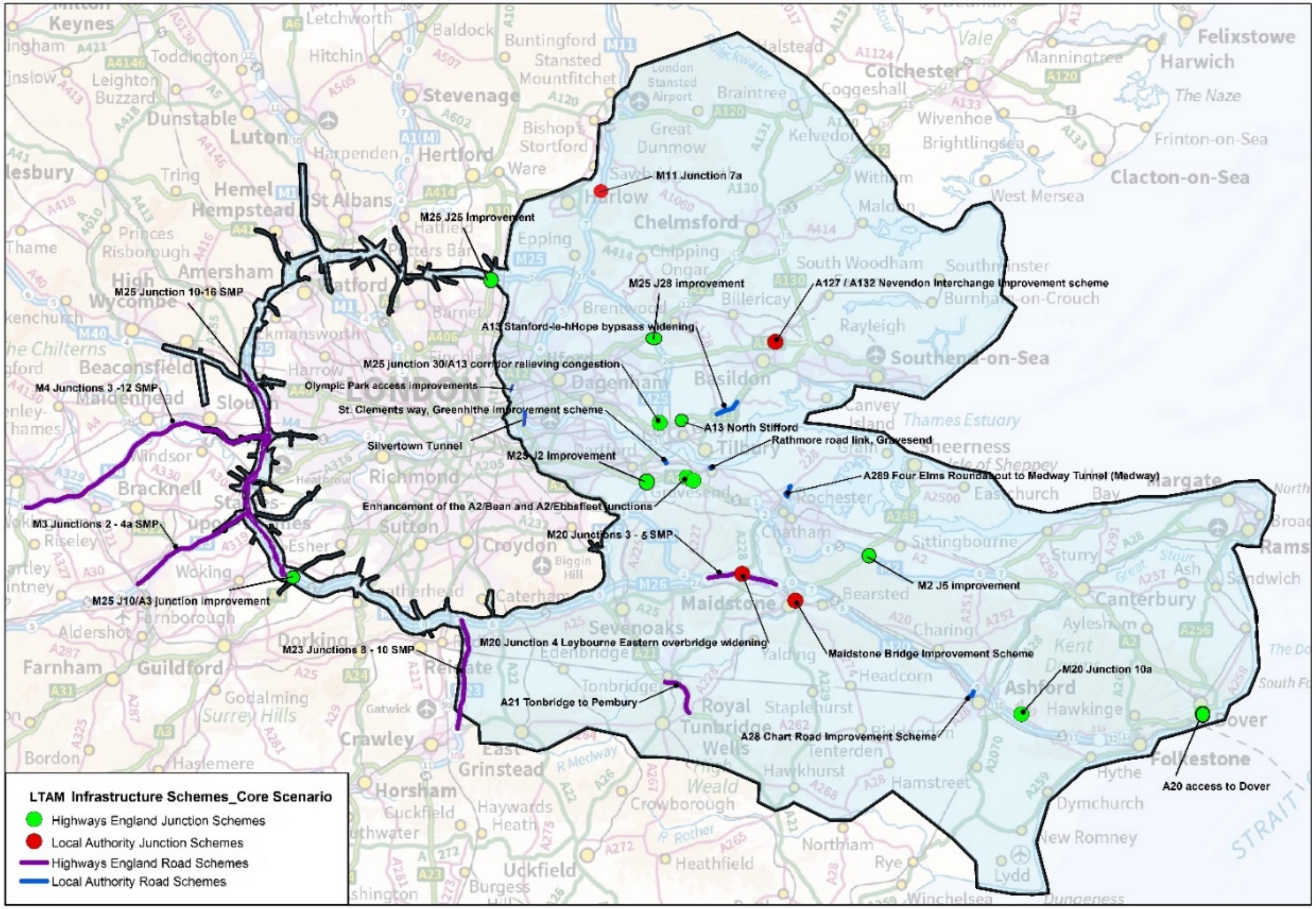


Figure 3.5 – Transport Schemes in Core Scenario



4 Forecast Year Demand

4.1 Overall Approach

Statement on Dependent Development

4.1.1 As defined in WebTAG Unit A2.2 a dependent development is a very particular case of induced investment. Its key features are:

1. There is a clear intention to develop a specific site; and
2. The existing transport network cannot reasonably accommodate the additional traffic associated with the development, hence the need for a transport investment.

4.1.2 WebTAG also states that “it is not appropriate to use the dependent development method outlined below for very large individual and programmatic schemes that aim to have significant structural impacts on multiple, geographically dispersed, unidentified sites. An assessment of induced investment impacts for these schemes would require supplementary economic modelling.” LTC certainly falls within the category of “very large individual schemes” and it would certainly have “significant structural impacts on multiple, geographically dispersed, unidentified sites”.

4.1.3 The requirement for LTC is substantial for existing levels of demand. The provision of LTC will enable growth in the surrounding area. However, none of this growth is considered to be dependent on the delivery of LTC. Therefore, it was agreed that no dependent development assessment was required for this stage of LTC. This is considered a conservative approach.

New Development Locations Allocated to LTAM Zones

4.1.4 When incorporating new development sites into the forecast model there are generally two options available to the modeller to represent the development spatially:

- Incorporate the development within an existing model zone; or
- Represent the new development as a new independent zone.

4.1.5 The first option essentially means that trips from the new development would be treated in the same way as the trips within the existing zone. This is usually appropriate for smaller developments where the land use mix is similar to that within the existing zone.

4.1.6 The primary benefit of representing a new development location as a separate zone is that it enables trips from the new development to be modelled differently from the existing locations. This could be for example the access and egress to/from the new development or the distribution pattern of trips. This approach is usually adopted for very large developments, or for developments where trip behaviour is considered to be substantially different from that in the existing land use.

4.1.7 During the development of the base year model a series of zones were set aside to enable specific new development locations to be incorporated into the forecasts. As stated above it is not necessary for all developments to be represented as an independent zone. The developments allocated to new independent zones are shown in Table 4.1 below.

Table 4.1 – New Development to LTAM Zone Correspondence

New Development Name	LTAM Zone Number
Tilbury London Distribution Park	8001
London Gateway Logistics Park	8002
Tilbury 2 Seaport	8003

4.2 Forecast Year Highway Demand Matrices

4.2.1 Chapter 3 and Appendix A provide details of the different new development locations incorporated within the LTAM forecast year highway demand matrices. This section describes how the forecast number of trips for each development were estimated and how overall growth levels were constrained to the values set out in the National Trip End Model (NTEM) V7.2 for car trips and Road Traffic Forecasts (RTF) 2015 for goods vehicle trips.

Trip Generation and Distribution Process

4.2.2 As shown in Appendix A, the data collected from the local authorities relating to proposed development locations includes the type and size of the development. The TRICS database was used to derive trip rates for the different types of development which were then applied in order to generate the numbers of trips to and from each of these locations.

4.2.3 Table 4.2 to Table 4.5 below provide the trip rates used for the employment locations for all vehicles combined and for the different vehicle types separately. Employment trip rates are presented as the hourly vehicle trip rate per 100 m^2 gross floor area. For some development types the trip rates were calculated based upon a combination of different land use types due to there being a low sample in the TRICS database.

4.2.4 Table 4.6 to Table 4.9 provide the trip rates used for the residential locations for all vehicles combined and for the different vehicle types separately. Residential trip rates are presented as the hourly vehicle trip rate per dwelling unit. TRICS Version 7.4.3 was used for these calculations.

Table 4.2 – TRICS Trip Rates Used in LTAM for Employment Locations (All Vehicles)

	All Vehicles					
	AM (07:00-08:00)		IP (Avg 09:00-15:00)		PM (17:00-18:00)	
TRICS_ Land Use Type	Origin	Dest	Origin	Dest	Origin	Dest
01-Retail A-Food Superstore_Sub	1.069	1.685	4.376	4.608	4.708	4.591
01-Retail I-Shopping Centre - Local Shops_Sub	3.561	3.981	5.851	6.061	6.197	5.552
01-Retail J-Retail Park - Including Food	2.315	2.833	5.113	5.334	5.453	5.072
02-Employment A-Office_TC	0.040	0.566	0.250	0.402	1.140	0.108
02-Employment A-Office_Sub	0.053	0.635	0.176	0.281	1.191	0.081
02-Employment B-Business Park_Sub	0.061	0.480	0.271	0.339	0.986	0.110
02-Employment D-Industrial Estate_Sub	0.140	0.383	0.341	0.359	0.414	0.123
02-Employment F-Warehouse(Commercial)_Sub	0.041	0.116	0.070	0.081	0.172	0.054
04-Education A-Primary_Sub	0.045	0.643	0.229	0.297	0.380	0.145
04-Education C-College/University_Sub	0.043	0.216	0.254	0.317	0.539	0.218
05-Health A-General Hospital - With Casualty_Sub	0.287	0.822	0.464	0.537	0.819	0.336
05-Health G-GP Surgeries_Sub	0.113	1.346	3.602	3.592	3.184	2.232
06-Hotel, Food and Drink A-Hotels_Sub	0.362	0.150	0.200	0.198	0.184	0.315
06-Hotel, Food&Drink C-Pub/Restaurant_Sub	0.118	0.471	0.953	1.205	1.582	2.150
07-Leisure C-Leisure Centre	0.386	0.455	0.559	0.594	1.215	1.322
07-Leisure Q-Community Centre_Sub	0.386	0.455	0.559	0.594	1.215	1.322
14-Car Show Rooms A-Car Show Rooms_Sub	0.056	0.337	0.545	0.572	0.486	0.296
15-Vehicle Services B-Motorist Centre (Fast Fit)_Sub	0.043	0.301	1.042	1.116	0.731	0.467
A1-Retail-Shopping Mall	0.000	0.048	0.193	0.239	0.235	0.106
Community centres	0.190	0.190	0.400	0.400	0.430	0.430

Table 4.3 – TRICS Trip Rates Used in LTAM for Employment Locations (Car and Taxi)

	Car and Taxi					
	AM (07:00-08:00)		IP (Avg 09:00-15:00)		PM (17:00-18:00)	
TRICS_ Land Use Type	Origin	Dest	Origin	Dest	Origin	Dest
01-Retail A-Food Superstore_Sub	0.994	1.564	4.204	4.437	4.587	4.432
01-Retail I-Shopping Centre - Local Shops_Sub	2.503	2.799	5.046	5.207	5.214	4.652
01-Retail J-Retail Park - Including Food	1.748	2.182	4.625	4.822	4.900	4.542
02-Employment A-Office_TC	0.032	0.532	0.220	0.368	1.140	0.108
02-Employment A-Office_Sub	0.049	0.627	0.158	0.259	1.188	0.079
02-Employment B-Business Park_Sub	0.028	0.428	0.186	0.251	0.930	0.086
02-Employment D-Industrial Estate_Sub	0.031	0.223	0.170	0.180	0.323	0.081
02-Employment F-Warehouse(Commercial)_Sub	0.011	0.091	0.032	0.038	0.147	0.035
04-Education A-Primary_Sub	0.036	0.623	0.210	0.280	0.372	0.135
04-Education C-College/University_Sub	0.035	0.201	0.233	0.296	0.529	0.209
05-Health A-General Hospital - With Casualty_Sub	0.259	0.779	0.411	0.483	0.781	0.305
05-Health G-GP Surgeries_Sub	0.113	1.243	3.227	3.220	3.116	2.173
06-Hotel, Food and Drink A-Hotels_Sub	0.325	0.136	0.177	0.175	0.167	0.285
06-Hotel, Food&Drink C-Pub/Restaurant_Sub	0.000	0.118	0.853	1.114	1.475	2.036
07-Leisure C-Leisure Centre	0.374	0.444	0.538	0.571	1.208	1.306
07-Leisure Q-Community Centre_Sub	0.374	0.444	0.538	0.571	1.208	1.306
14-Car Show Rooms A-Car Show Rooms_Sub	0.056	0.289	0.464	0.500	0.445	0.245
15-Vehicle Services B-Motorist Centre (Fast Fit)_Sub	0.043	0.258	0.886	0.974	0.670	0.386
A1-Retail-Shopping Mall	0.000	0.045	0.176	0.223	0.231	0.102
Community centres	0.184	0.185	0.384	0.384	0.427	0.425

Table 4.4 – TRICS Trip Rates Used in LTAM for Employment Locations (Light Goods Vehicles)

TRICS_ Land Use Type	Light Goods Vehicles					
	AM (07:00-08:00)		IP (Avg 09:00-15:00)		PM (17:00-18:00)	
	Origin	Dest	Origin	Dest	Origin	Dest
01-Retail A-Food Superstore_Sub	0.064	0.100	0.159	0.158	0.116	0.154
01-Retail I-Shopping Centre - Local Shops_Sub	1.006	1.130	0.712	0.770	0.951	0.840
01-Retail J-Retail Park - Including Food	0.535	0.615	0.435	0.464	0.534	0.497
02-Employment A-Office_TC	0.008	0.034	0.029	0.034	0.000	0.000
02-Employment A-Office_Sub	0.004	0.008	0.015	0.020	0.003	0.002
02-Employment B-Business Park_Sub	0.031	0.048	0.076	0.079	0.053	0.020
02-Employment D-Industrial Estate_Sub	0.097	0.147	0.148	0.152	0.085	0.034
02-Employment F-Warehouse(Commercial)_Sub	0.001	0.004	0.017	0.016	0.009	0.008
04-Education A-Primary_Sub	0.009	0.014	0.017	0.014	0.008	0.010
04-Education C-College/University_Sub	0.007	0.011	0.017	0.016	0.009	0.005
05-Health A-General Hospital - With Casualty_Sub	0.022	0.037	0.044	0.044	0.035	0.027
05-Health G-GP Surgeries_Sub	0.000	0.103	0.375	0.372	0.068	0.059
06-Hotel, Food and Drink A-Hotels_Sub	0.037	0.007	0.015	0.016	0.017	0.030
06-Hotel, Food&Drink C-Pub/Restaurant_Sub	0.000	0.118	0.075	0.068	0.107	0.114
07-Leisure C-Leisure Centre	0.012	0.011	0.021	0.023	0.007	0.016
07-Leisure Q-Community Centre_Sub	0.012	0.011	0.021	0.023	0.007	0.016
14-Car Show Rooms A-Car Show Rooms_Sub	0.000	0.048	0.078	0.069	0.041	0.051
15-Vehicle Services B-Motorist Centre (Fast Fit)_Sub	0.000	0.043	0.149	0.135	0.061	0.081
A1-Retail-Shopping Mall	0.000	0.002	0.012	0.012	0.004	0.003
Community centres	0.006	0.005	0.015	0.016	0.003	0.005

Table 4.5 – TRICS Trip Rates Used in LTAM for Employment Locations (Heavy Goods Vehicles)

TRICS_ Land Use Type	Heavy Goods Vehicles					
	AM (07:00-08:00)		IP (Avg 09:00-15:00)		PM (17:00-18:00)	
	Origin	Dest	Origin	Dest	Origin	Dest
01-Retail A-Food Superstore_Sub	0.011	0.021	0.013	0.013	0.005	0.005
01-Retail I-Shopping Centre - Local Shops_Sub	0.052	0.051	0.093	0.083	0.033	0.060
01-Retail J-Retail Park - Including Food	0.031	0.036	0.053	0.048	0.019	0.033
02-Employment A-Office_TC	0.000	0.000	0.000	0.000	0.000	0.000
02-Employment A-Office_Sub	0.000	0.000	0.002	0.002	0.000	0.000
02-Employment B-Business Park_Sub	0.003	0.005	0.009	0.009	0.003	0.003
02-Employment D-Industrial Estate_Sub	0.012	0.013	0.023	0.026	0.006	0.008
02-Employment F-Warehouse(Commercial)_Sub	0.028	0.021	0.020	0.028	0.016	0.011
04-Education A-Primary_Sub	0.000	0.007	0.002	0.003	0.000	0.000
04-Education C-College/University_Sub	0.001	0.004	0.005	0.005	0.001	0.004
05-Health A-General Hospital - With Casualty_Sub	0.006	0.006	0.009	0.009	0.003	0.004
05-Health G-GP Surgeries_Sub	0.000	0.000	0.000	0.000	0.000	0.000
06-Hotel, Food and Drink A-Hotels_Sub	0.000	0.007	0.009	0.007	0.000	0.000
06-Hotel, Food&Drink C-Pub/Restaurant_Sub	0.118	0.235	0.024	0.023	0.000	0.000
07-Leisure C-Leisure Centre	0.000	0.000	0.001	0.000	0.000	0.000
07-Leisure Q-Community Centre_Sub	0.000	0.000	0.001	0.000	0.000	0.000
14-Car Show Rooms A-Car Show Rooms_Sub	0.000	0.000	0.003	0.003	0.000	0.000
15-Vehicle Services B-Motorist Centre (Fast Fit)_Sub	0.000	0.000	0.007	0.007	0.000	0.000
A1-Retail-Shopping Mall	0.000	0.001	0.004	0.003	0.000	0.002
Community centres	0.000	0.000	0.000	0.000	0.000	0.000

Table 4.6 – TRICS Trip Rates Used in LTAM for Residential Locations (All Vehicles)

	All Vehicles					
	AM (07:00-08:00)		IP (Avg 09:00-15:00)		PM (17:00-18:00)	
TRICS_ Land Use Type	Origin	Dest	Origin	Dest	Origin	Dest
03-Residential M-Mixed Private/Affordable Housing_Sub K&E All vehicles	0.248	0.062	0.132	0.115	0.129	0.291
03-Residential M-Mixed Private/Affordable Housing_Sub GLA All Vehicles/Split	0.136	0.044	0.092	0.081	0.089	0.128
03-Residential C-Flats Privately Owned_TC K&E All vehicles	0.102	0.052	0.109	0.107	0.114	0.163
03-Residential C-Flats Privately Owned_TC GLA All vehicles	0.101	0.026	0.054	0.049	0.082	0.119

Table 4.7 – TRICS Trip Rates Used in LTAM for Residential Locations (Car and Taxi)

	Car and Taxi					
	AM (07:00-08:00)		IP (Avg 09:00-15:00)		PM (17:00-18:00)	
TRICS_ Land Use Type	Origin	Dest	Origin	Dest	Origin	Dest
03-Residential M-Mixed Private/Affordable Housing_Sub K&E All vehicles	0.225	0.051	0.114	0.097	0.116	0.269
03-Residential M-Mixed Private/Affordable Housing_Sub GLA All Vehicles/Split	0.120	0.036	0.076	0.065	0.080	0.118
03-Residential C-Flats Privately Owned_TC K&E All vehicles	0.094	0.048	0.082	0.079	0.109	0.159
03-Residential C-Flats Privately Owned_TC GLA All vehicles	0.097	0.023	0.041	0.034	0.063	0.101

Table 4.8 – TRICS Trip Rates Used in LTAM for Residential Locations (Light Goods Vehicles)

	Light Goods Vehicles					
	AM (07:00-08:00)		IP (Avg 09:00-15:00)		PM (17:00-18:00)	
TRICS_ Land Use Type	Origin	Dest	Origin	Dest	Origin	Dest
03-Residential M-Mixed Private/Affordable Housing_Sub K&E All vehicles	0.022	0.010	0.017	0.017	0.013	0.022
03-Residential M-Mixed Private/Affordable Housing_Sub GLA All Vehicles/Split	0.010	0.004	0.014	0.014	0.007	0.010
03-Residential C-Flats Privately Owned_TC K&E All vehicles	0.008	0.004	0.024	0.027	0.005	0.004
03-Residential C-Flats Privately Owned_TC GLA All vehicles	0.000	0.000	0.010	0.010	0.015	0.014

Table 4.9 – TRICS Trip Rates Used in LTAM for Residential Locations (Heavy Goods Vehicles)

TRICS_ Land Use Type	Heavy Goods Vehicles					
	AM (07:00-08:00)		IP (Avg 09:00-15:00)		PM (17:00-18:00)	
	Origin	Dest	Origin	Dest	Origin	Dest
03-Residential M-Mixed Private/Affordable Housing_Sub K&E All vehicles	0.001	0.001	0.001	0.001	0.000	0.000
03-Residential M-Mixed Private/Affordable Housing_Sub GLA All Vehicles/Split	0.002	0.002	0.001	0.001	0.000	0.000
03-Residential C-Flats Privately Owned_TC K&E All vehicles	0.000	0.000	0.002	0.002	0.000	0.000
03-Residential C-Flats Privately Owned_TC GLA All vehicles	0.004	0.003	0.003	0.004	0.004	0.004

4.2.5 Some port locations were treated differently. DP World and Tilbury 2 Port have published figures stating the number of trips forecast to be produced respectively. These values were manipulated to produce forecasts in the required format for use in the LTAM and then incorporated into the forecasts.

4.2.6 Table 4.10 provides the trips identified for DP World. Table 4.11 provides the trips identified for Tilbury 2 Port.

Table 4.10 – DP World Forecast Trips (Hourly PCU's)

Source: LG-DPW-ENV-LDO-C0000-RPT-ENV-0138 - Traffic Assessment Final.pdf

Time Period	Location	Car - Commute		Car - Other		Car - Business		LGV		HGV	
		Orig	Dest	Orig	Dest	Orig	Dest	Orig	Dest	Orig	Dest
AM Peak	London Gateway Seaport	14	39	3	31	64	139	0	0	240	238
	London Gateway Logistics Park	11	80	17	20	50	287	0	0	118	130
Inter Peak	London Gateway Seaport	40	34	7	52	40	32	0	0	363	323
	London Gateway Logistics Park	106	110	169	102	106	103	0	0	104	172
PM Peak	London Gateway Seaport	23	7	4	11	92	33	0	0	281	281
	London Gateway Logistics Park	85	16	58	11	335	82	0	0	119	95

Table 4.11 – Tilbury 2 Port Forecast Trips

Source: ES APPENDIX 13.A: TRANSPORT ASSESSMENT DOCUMENT REF: 6.2 13.A

	Car - Commute		Car - Other		Car - Business		LGV		HGV	
Time Period	Orig	Dest	Orig	Dest	Orig	Dest	Orig	Dest	Orig	Dest
AM Peak	1	30	2	15	0	5	1	12	267.5	150
Inter Peak	11	6	9	5	3	2	3	19	193	202.5
PM Peak	37	1	18	2	5	0	3	4	112.5	130

4.2.7 Table 4.12 below provides the overall assumptions used to apply growth for all major ports and distribution centres within the LTAM forecasts.

Table 4.12 – LTAM Forecast Port Traffic Growth Assumptions

		Car - Commute		Car - Other		Car - Business		LGV		HGV	
LTAM Zone	Location	Orig	Dest	Orig	Dest	Orig	Dest	Orig	Dest	Orig	Dest
5154	Tilbury Seaport	NTEM Growth						NRTF Growth			
8001	Tilbury Distribution Park	Uncertainty Log/TRICS Trip Rates									
8003	Tilbury 2	As Per Table 4.11 in 2026 Then Zero Additional Growth									
5158	Purfleet Seaport	NTEM Growth						NRTF Growth			
5159	London Gateway Seaport	As Per Table 4.10 in 2026 Then Zero Additional Growth									
8002	London Gateway Logistics Park	As Per Table 4.10 in 2026 Then Zero Additional Growth									
5160	Thurrock Seaport	NTEM Growth						NRTF Growth			
7319	Dover Seaport	NTEM Growth						NRTF Growth			
7321	Channel Tunnel	NTEM Growth						NRTF Growth			

4.2.8 Each new development location was allocated a “donor zone” from the base year model. These were generally either adjacent zones or zones which were considered to be “similar” to the new development. For most new developments this donor zone was used to provide the spatial distribution of trips and the journey purpose split for car trips. Some larger new developments used a gravity model approach to define the spatial distribution. Bespoke gravity models were calibrated for each of these zones.

4.2.9 The tripends defined in the tables above represent hourly OD travel. In order to input these trips into the demand model it was necessary to convert the home based non port trips into 24 hour Production Attraction format. This was achieved using the factors and transposition rules already applied in the base year LTAM.

4.2.10 It was also necessary to identify appropriate “fitting on factors”. For new development locations included within existing zones, the existing zone fitting on factors were applied. For new development locations allocated to new zones fitting on factors were derived in order to reproduce the OD values as defined above.

4.2.11 Growth in public transport trips was simply applied using factors derived from NTEM.

Constraining Demand Matrices to National Growth

4.2.12 As per current guidance it is necessary to constrain overall growth to nationally approved forecasts. For car trips this is NTEM. For goods vehicle trips this is RTF. For the LTAM forecasts the constraints were applied at regional level.

4.2.13 The Highways England Interactive DIADEM Interface (HEIDI) was used to apply these constraints and produce the final reference case matrices for use in the core LTAM growth forecasts. The matrix totals derived from these processes are presented in the next section.

4.3 Forecast Year Reference Matrix Totals

4.3.1 Reference matrices for the core growth scenario for each of the forecast years were developed in line with the above approach.

4.3.2 Due to the nature of how matrices are input to DIADEM it is necessary to report the matrix totals in two ways, firstly using the 17 demand segments used in DIADEM and secondly using the 9 demand segments used in the highway assignment model. The HAM matrices reported below are produced by DIADEM as part of the first loop of the VDM. They do not include any demand model responses and are just a function of applying fitting on factors, person to vehicle/PCU factors and peak hour conversion factors to the input 17 demand segment reference matrices.

4.3.3 Table 4.13 presents the input reference matrix totals in the DIADEM segmentation. Table 4.14 presents the input reference matrix totals in the SATURN segmentation.

4.3.4 Matrix totals output from the fully converged VDM runs are presented in Chapter 6.

Table 4.13 – LTAM Reference Matrix Totals in DIADEM Segmentation (Core Growth Scenario Highway Trips in PCU's)

Segment	Matrix Type	Time Period	Actual Base (2016)	Core Growth (2026)			Core Growth (2031)			Core Growth (2041)			Core Growth (2051)		
			Matrix Total	Matrix Total	Diff to Actual Base	Diff %	Matrix Total	Diff to Actual Base	Diff %	Matrix Total	Diff to Actual Base	Diff %	Matrix Total	Diff to Actual Base	Diff %
HBEB	24Hr PA	N/A	2,567,826	2,742,676	174,851	6.8%	2,868,171	300,346	11.7%	2,989,632	421,806	16.4%	3,246,668	678,843	26%
HBW L	24Hr PA	N/A	2,253,299	2,387,511	134,212	6.0%	2,478,103	224,804	10.0%	2,571,988	318,689	14.1%	2,754,329	501,029	22%
HBW M	24Hr PA	N/A	3,990,863	4,226,886	236,023	5.9%	4,384,869	394,006	9.9%	4,550,420	559,557	14.0%	4,869,516	878,653	22%
HBW H	24Hr PA	N/A	3,125,105	3,309,467	184,362	5.9%	3,433,623	308,518	9.9%	3,559,890	434,786	13.9%	3,810,317	685,212	22%
HBO L	24Hr PA	N/A	6,573,923	7,237,377	663,453	10.1%	7,701,292	1,127,369	17.1%	8,136,824	1,562,901	23.8%	8,883,920	2,309,997	35%
HBO M	24Hr PA	N/A	5,675,738	6,255,929	580,191	10.2%	6,660,955	985,216	17.4%	7,041,178	1,365,439	24.1%	7,687,692	2,011,954	35%
HBO H	24Hr PA	N/A	3,973,463	4,392,035	418,573	10.5%	4,686,625	713,162	17.9%	4,957,313	983,850	24.8%	5,416,495	1,443,033	36%
NHBEB	By Time Period OD	AM	87,884	94,732	6,848	7.8%	97,064	9,180	10.4%	102,432	14,548	16.6%	108,312	20,428	23%
		IP	113,362	122,118	8,756	7.7%	125,145	11,783	10.4%	132,065	18,704	16.5%	139,637	26,276	23%
		PM	126,282	136,005	9,723	7.7%	139,359	13,077	10.4%	147,075	20,793	16.5%	155,513	29,231	23%
		OP	32,481	34,976	2,495	7.7%	35,839	3,357	10.3%	37,825	5,344	16.5%	39,993	7,512	23%
NHBO L	By Time Period OD	AM	123,655	136,349	12,694	10.3%	141,189	17,534	14.2%	150,719	27,065	21.9%	160,413	36,758	30%
		IP	327,258	360,959	33,701	10.3%	373,849	46,590	14.2%	399,000	71,742	21.9%	424,388	97,130	30%
		PM	258,391	285,019	26,628	10.3%	295,208	36,817	14.2%	315,052	56,661	21.9%	335,032	76,641	30%
		OP	92,832	102,339	9,507	10.2%	105,959	13,127	14.1%	113,030	20,198	21.8%	120,136	27,304	29%
NHBO M	By Time Period OD	AM	131,456	145,048	13,592	10.3%	150,245	18,789	14.3%	160,423	28,967	22.0%	170,735	39,279	30%
		IP	261,436	288,620	27,184	10.4%	299,036	37,600	14.4%	319,257	57,821	22.1%	339,565	78,129	30%
		PM	259,577	286,480	26,903	10.4%	296,797	37,220	14.3%	316,833	57,256	22.1%	336,943	77,365	30%
		OP	74,155	81,807	7,652	10.3%	84,732	10,577	14.3%	90,414	16,259	21.9%	96,096	21,942	30%
NHBO H	By Time Period OD	AM	105,663	116,841	11,178	10.6%	121,124	15,461	14.6%	129,407	23,744	22.5%	137,680	32,017	30%
		IP	178,252	197,271	19,018	10.7%	204,586	26,334	14.8%	218,602	40,349	22.6%	232,460	54,207	30%
		PM	200,155	221,472	21,317	10.7%	229,665	29,510	14.7%	245,363	45,208	22.6%	260,868	60,713	30%
		OP	50,590	55,955	5,365	10.6%	58,010	7,420	14.7%	61,949	11,358	22.5%	65,823	15,232	30%
LGV	By Time Period OD	AM	728,254	950,818	222,564	30.6%	1,044,988	316,735	43.5%	1,217,634	489,380	67.2%	1,411,959	683,705	94%
		IP	627,316	820,243	192,927	30.8%	901,598	274,282	43.7%	1,050,371	423,054	67.4%	1,217,803	590,486	94%
		PM	524,914	685,879	160,966	30.7%	754,014	229,101	43.6%	878,550	353,636	67.4%	1,018,693	493,780	94%
		OP	252,979	329,431	76,452	30.2%	361,903	108,925	43.1%	421,851	168,872	66.8%	489,362	236,383	93%
HGV	By Time Period OD	AM	374,760	410,596	35,837	9.6%	426,603	51,844	13.8%	461,489	86,729	23.1%	499,458	124,698	33%
		IP	372,671	408,518	35,846	9.6%	424,378	51,707	13.9%	458,881	86,210	23.1%	496,412	123,741	33%
		PM	234,571	257,203	22,632	9.6%	267,136	32,565	13.9%	288,966	54,395	23.2%	312,731	78,160	33%
		OP	149,809	162,992	13,184	8.8%	169,277	19,469	13.0%	183,109	33,301	22.2%	198,163	48,354	32%
Port Trips EB	By Time Period OD	AM	4,670	5,151	481	10.3%	5,258	588	12.6%	5,455	784	16.8%	5,639	968	21%
		IP	3,334	3,613	279	8.4%	3,690	356	10.7%	3,831	497	14.9%	3,963	629	19%
		PM	4,110	4,485	375	9.1%	4,580	470	11.4%	4,752	643	15.6%	4,914	804	20%

Segment	Matrix Type	Time Period	Actual Base (2016)	Core Growth (2026)			Core Growth (2031)			Core Growth (2041)			Core Growth (2051)		
			Matrix Total	Matrix Total	Diff to Actual Base	Diff %	Matrix Total	Diff to Actual Base	Diff %	Matrix Total	Diff to Actual Base	Diff %	Matrix Total	Diff to Actual Base	Diff %
		OP	1,320	1,394	75	5.6%	1,423	104	7.9%	1,479	159	12.1%	1,531	211	16%
Port Trips O LI	By Time Period OD	AM	2,812	2,999	187	6.6%	3,066	254	9.0%	3,184	372	13.2%	3,294	482	17%
		IP	3,477	3,713	237	6.8%	3,792	315	9.1%	3,936	459	13.2%	4,071	594	17%
		PM	3,428	3,653	225	6.6%	3,734	305	8.9%	3,875	447	13.0%	4,008	580	17%
		OP	1,381	1,457	76	5.5%	1,487	106	7.7%	1,544	163	11.8%	1,597	217	16%
Port Trips O MI	By Time Period OD	AM	3,293	3,509	215	6.5%	3,586	292	8.9%	3,724	431	13.1%	3,853	560	17%
		IP	3,677	3,926	249	6.8%	4,009	333	9.0%	4,161	484	13.2%	4,303	627	17%
		PM	4,022	4,283	261	6.5%	4,377	355	8.8%	4,543	521	13.0%	4,699	677	17%
		OP	1,459	1,539	81	5.5%	1,571	112	7.7%	1,631	173	11.8%	1,688	229	16%
Port Trips O HI	By Time Period OD	AM	4,661	4,953	292	6.3%	5,060	399	8.6%	5,252	591	12.7%	5,431	770	17%
		IP	3,904	4,162	258	6.6%	4,250	346	8.9%	4,410	506	13.0%	4,560	656	17%
		PM	5,140	5,462	321	6.2%	5,579	438	8.5%	5,789	648	12.6%	5,985	845	16%
		OP	1,544	1,630	86	5.6%	1,663	119	7.7%	1,726	182	11.8%	1,785	242	16%

Table 4.14 – LTAM Reference Matrix Totals in SATURN Segmentation (Core Growth Scenario Hourly PCU’s)

Userclass	Time Period	Actual Base (2016)	Core Growth (2026)			Core Growth (2031)			Core Growth (2041)			Core Growth (2051)		
		Matrix Total	Matrix Total	Diff to Actual Base	Diff %	Matrix Total	Diff to Actual Base	Diff %	Matrix Total	Diff to Actual Base	Diff %	Matrix Total	Diff to Actual Base	Diff %
Car Employers Business	AM	446,694	478,228	31,533	7.1%	497,442	50,747	11.4%	519,597	72,902	16.3%	560,534	113,840	25.5%
	IP	388,554	416,139	27,585	7.1%	432,513	43,959	11.3%	452,498	63,944	16.5%	487,339	98,785	25.4%
	PM	534,331	572,176	37,845	7.1%	595,029	60,698	11.4%	622,391	88,060	16.5%	670,877	136,546	25.6%
	OP	156,563	167,426	10,863	6.9%	174,309	17,745	11.3%	182,202	25,638	16.4%	196,731	40,168	25.7%
Car Commute Low Income	AM	416,776	441,669	24,893	6.0%	458,294	41,518	10.0%	475,786	59,011	14.2%	509,314	92,538	22.2%
	IP	189,264	200,575	11,312	6.0%	208,291	19,027	10.1%	216,092	26,828	14.2%	231,517	42,253	22.3%
	PM	476,659	505,309	28,649	6.0%	524,344	47,685	10.0%	544,500	67,840	14.2%	582,769	106,110	22.3%
	OP	76,290	80,715	4,424	5.8%	83,772	7,482	9.8%	86,889	10,599	13.9%	93,106	16,816	22.0%
Car Commute Medium Income	AM	843,955	893,398	49,443	5.9%	926,496	82,541	9.8%	961,464	117,508	13.9%	1,028,496	184,541	21.9%
	IP	290,776	308,145	17,369	6.0%	319,869	29,093	10.0%	331,846	41,069	14.1%	355,342	64,566	22.2%
	PM	914,413	968,919	54,506	6.0%	1,005,004	90,592	9.9%	1,043,426	129,013	14.1%	1,116,206	201,794	22.1%
	OP	117,233	124,042	6,809	5.8%	128,647	11,414	9.7%	133,444	16,211	13.8%	142,856	25,623	21.9%
Car Commute High Income	AM	718,557	760,561	42,005	5.8%	788,926	70,369	9.8%	818,034	99,478	13.8%	875,312	156,755	21.8%
	IP	207,267	219,633	12,365	6.0%	227,967	20,700	10.0%	236,256	28,989	14.0%	253,021	45,754	22.1%

Userclass	Time Period	Actual Base (2016)	Core Growth (2026)			Core Growth (2031)			Core Growth (2041)			Core Growth (2051)		
		Matrix Total	Matrix Total	Diff to Actual Base	Diff %	Matrix Total	Diff to Actual Base	Diff %	Matrix Total	Diff to Actual Base	Diff %	Matrix Total	Diff to Actual Base	Diff %
	PM	740,132	784,000	43,869	5.9%	813,285	73,153	9.9%	843,476	103,344	14.0%	902,456	162,324	21.9%
	OP	83,498	88,345	4,847	5.8%	91,650	8,152	9.8%	94,975	11,476	13.7%	101,709	18,211	21.8%
Car Other Low Income	AM	650,678	716,838	66,161	10.2%	758,566	107,889	16.6%	803,240	152,563	23.4%	872,354	221,676	34.1%
	IP	1,155,317	1,272,277	116,960	10.1%	1,343,274	187,957	16.3%	1,423,108	267,791	23.2%	1,542,152	386,835	33.5%
	PM	1,126,453	1,241,095	114,641	10.2%	1,312,013	185,560	16.5%	1,389,615	263,162	23.4%	1,507,358	380,904	33.8%
	OP	465,750	512,597	46,847	10.1%	542,253	76,503	16.4%	573,948	108,198	23.2%	623,187	157,437	33.8%
Car Other Medium Income	AM	694,080	765,315	71,235	10.3%	810,183	116,103	16.7%	858,076	163,996	23.6%	931,859	237,779	34.3%
	IP	922,839	1,017,388	94,549	10.2%	1,074,694	151,855	16.5%	1,139,120	216,281	23.4%	1,234,323	311,485	33.8%
	PM	1,134,022	1,250,425	116,404	10.3%	1,322,426	188,405	16.6%	1,401,211	267,189	23.6%	1,519,912	385,891	34.0%
	OP	371,895	409,725	37,830	10.2%	433,654	61,759	16.6%	459,228	87,333	23.5%	498,608	126,714	34.1%
Car Other High Income	AM	555,396	613,673	58,277	10.5%	650,522	95,126	17.1%	689,197	133,801	24.1%	748,435	193,039	34.8%
	IP	619,518	684,773	65,255	10.5%	724,467	104,949	16.9%	768,437	148,920	24.0%	832,846	213,328	34.4%
	PM	858,565	949,289	90,724	10.6%	1,005,631	147,065	17.1%	1,066,227	207,662	24.2%	1,156,922	298,357	34.8%
	OP	249,550	275,668	26,119	10.5%	292,283	42,733	17.1%	309,746	60,197	24.1%	336,433	86,884	34.8%
Car Total	AM	4,326,135	4,669,682	343,546	7.9%	4,890,429	564,293	13.0%	5,125,394	799,258	18.5%	5,526,303	1,200,168	27.7%
	IP	3,773,535	4,118,929	345,395	9.2%	4,331,075	557,540	14.8%	4,567,355	793,821	21.0%	4,936,540	1,163,005	30.8%
	PM	5,784,575	6,271,213	486,638	8.4%	6,577,732	793,158	13.7%	6,910,843	1,126,269	19.5%	7,456,500	1,671,925	28.9%
	OP	1,520,780	1,658,518	137,738	9.1%	1,746,568	225,789	14.8%	1,840,432	319,652	21.0%	1,992,632	471,852	31.0%
LGV	AM	728,254	950,818	222,564	30.6%	1,044,988	316,735	43.5%	1,217,634	489,380	67.2%	1,411,959	683,705	93.9%
	IP	627,316	820,243	192,927	30.8%	901,598	274,282	43.7%	1,050,371	423,054	67.4%	1,217,803	590,486	94.1%
	PM	524,914	685,879	160,966	30.7%	754,014	229,101	43.6%	878,550	353,636	67.4%	1,018,693	493,780	94.1%
	OP	252,979	329,431	76,452	30.2%	361,903	108,925	43.1%	421,851	168,872	66.8%	489,362	236,383	93.4%
HGV	AM	374,760	410,596	35,837	9.6%	426,603	51,844	13.8%	461,489	86,729	23.1%	499,458	124,698	33.3%
	IP	372,671	408,518	35,846	9.6%	424,378	51,707	13.9%	458,881	86,210	23.1%	496,412	123,741	33.2%
	PM	234,571	257,203	22,632	9.6%	267,136	32,565	13.9%	288,966	54,395	23.2%	312,731	78,160	33.3%
	OP	149,809	162,992	13,184	8.8%	169,277	19,469	13.0%	183,109	33,301	22.2%	198,163	48,354	32.3%

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5 Forecast Year Supply

5.1 Do Minimum Networks

Schemes Included

5.1.1 Do Minimum networks are required to represent the highway network in the without LTC scenario. The methodology used to identify the different infrastructure schemes to be included within the without scheme (Do Minimum) scenario is provided in Chapter 3. The schemes included are provided in Appendix A and are shown graphically in Figure 3.5. No schemes are considered to be dependent on the delivery of LTC.

5.1.2 As shown in Appendix A all schemes are considered to fall within the core scenario and all of them will be delivered before the proposed LTC opening year of 2026. All of the schemes shown in the Uncertainty Log are therefore included in the 2026 core scenario networks. The 2031, 2041 and 2051 networks do not have any additional schemes. Low and high growth scenario networks are the same as the core scenario.

Other Forecast Year Network Changes

5.1.3 Forecast year model parameters such as the VoT and VOC are presented in Chapter 6.

5.1.4 Buffer link speeds have been modified in the forecast years to take account of speed reductions associated with increases in congestion in forecast years. The speeds have either been taken from the source models, which is primarily RXHAM in London or by using speed reduction factors as provided in the Road Traffic Forecasts.

5.1.5 The Traffic Management Cell (TMC) at Dartford is assumed to remain constant in all forecast years. The Base Plus values presented in Table 2.32 are therefore maintained in each forecast year.

Charges

5.1.6 The methodology used for the derivation of tolls and charges for use in the base year is summarised below. In the base year there are two charging regimes that need to be included in the LTAM. These are the existing Dartford Crossing and the London congestion charge. The final base year values are provided in Table 5.1.

Table 5.1 – LTAM Base Year Charges (2016 Values in 2010 Prices)

Location	Vehicle Type	Time Period			
		AM	IP	PM	OP
Congestion Charge	Car (All Purposes)	£1.35	£1.35	£1.35	£0.00
	LGV	£2.03	£2.03	£2.03	£0.00
	HGV	£2.14	£2.14	£2.14	£0.00
Dartford Crossing	Car (All Purposes)	£1.42	£1.42	£1.42	£0.78
	LGV	£2.19	£2.19	£2.19	£1.20
	HGV	£3.87	£3.87	£3.87	£2.13

5.1.7 The derivation of tolls and charges for use in the forecast year networks is summarised below.

Charge Locations

5.1.8 In the base year Blackwall Tunnel in London is free to use. However, as part of the consented TfL scheme for a new Silvertown River Crossing it is proposed to introduce new charges at Blackwall and for Blackwall and Silvertown to be equally charged. The proposed charging regime at Silvertown and Blackwall is to adopt directional charging based on the peak traffic flows.

5.1.9 Charges are included at the following locations in the forecast year LTAM:

- Central London Congestion Charge;
- Dartford Crossing; and
- Blackwall/Silvertown Tunnels.

Charging Regime Correspondence to LTAM Time Periods

5.1.10 How these different charging regimes at each location relate to the different time periods is provided in Table 5.2.

Table 5.2 – LTAM Model Time Periods and Forecast Year Charging Regime Correspondence

Hour	LTAM Time Periods	Dartford Charge	TfL Congestion Charge	TfL Silvertown and Blackwall SB	TfL Silvertown and Blackwall NB
00:00 - 01:00	OP	No Charge	No Charge	No Charge	No Charge
01:00 - 02:00	OP	No Charge	No Charge	No Charge	No Charge
02:00 - 03:00	OP	No Charge	No Charge	No Charge	No Charge
03:00 - 04:00	OP	No Charge	No Charge	No Charge	No Charge
04:00 - 05:00	OP	No Charge	No Charge	No Charge	No Charge
05:00 - 06:00	OP	No Charge	No Charge	No Charge	No Charge
06:00 - 07:00	AM	Charge	No Charge	Off Peak	Peak
07:00 - 08:00	AM	Charge	Charge	Off Peak	Peak
08:00 - 09:00	AM	Charge	Charge	Off Peak	Peak
09:00 - 10:00	IP	Charge	Charge	Off Peak	Peak
10:00 - 11:00	IP	Charge	Charge	Off Peak	Off Peak
11:00 - 12:00	IP	Charge	Charge	Off Peak	Off Peak
12:00 - 13:00	IP	Charge	Charge	Off Peak	Off Peak
13:00 - 14:00	IP	Charge	Charge	Off Peak	Off Peak
14:00 - 15:00	IP	Charge	Charge	Off Peak	Off Peak
15:00 - 16:00	PM	Charge	Charge	Off Peak	Off Peak
16:00 - 17:00	PM	Charge	Charge	Peak	Off Peak
17:00 - 18:00	PM	Charge	Charge	Peak	Off Peak
18:00 - 19:00	OP	Charge	No Charge	Peak	Off Peak
19:00 - 20:00	OP	Charge	No Charge	Off Peak	Off Peak
20:00 - 21:00	OP	Charge	No Charge	Off Peak	Off Peak
21:00 - 22:00	OP	Charge	No Charge	Off Peak	Off Peak
22:00 - 23:00	OP	No Charge	No Charge	No Charge	No Charge
23:00 - 00:00	OP	No Charge	No Charge	No Charge	No Charge

5.1.11 How the charges are derived is covered in the following sections.

Central London Congestion Charge

5.1.12 As with the base year values the congestion charge level applied in the forecast models is taken from the RXHAM model coding. The RXHAM model does not have 2026 or 2051 forecast years therefore the charges applied for these years were interpolated and extrapolated from the available model years. The values are shown in Table 5.3.

Table 5.3 – Forecast Year Central London Congestion Charges in LTAM

Year	Car Employers Business	Car Commute	Car Other	LGV	HGV
2026	£1.74	£1.74	£1.74	£2.61	£2.76
2031	£1.91	£1.91	£1.91	£2.86	£3.02
2041	£2.33	£1.91	£1.91	£3.50	£3.69
2051	£2.75	£1.91	£1.91	£4.14	£4.36

5.1.13 During the coding of the LTAM forecast networks an anomaly in the congestion charges in RXHAM was identified. As can be seen in Table 5.3 all car charges increase between 2026 and 2031 but then after 2031 Commute and Other car trip charges remain fixed and car Employers Business trip charges continue to rise.

5.1.14 This anomaly was reported to TfL and clarification sought as to the reason for this difference. As yet no clarification has been received. In order to maintain consistency between the RXHAM model, and therefore the Silvertown DCO, and LTAM it was decided to maintain the charges provided within RXHAM. The charges shown are applied in the AM, IP and PM peaks with no charge levied in the off peak as per the pattern depicted in Table 5.2.

Dartford Charge

5.1.15 Highways England advised that they currently have statutory powers to increase the charges at Dartford in line with the Retail Price Index (RPI). It was therefore decided to apply RPI based inflation to the charges for each of the forecast years. As with all monetary values in LTAM these are then converted back into 2010 prices using the GDP deflator.

5.1.16 The RPI and GDP deflator indices for each of the LTAM forecast years are provided in Table 5.4.

Table 5.4 – RPI and GDP Growth Values (December 2017 WebTAG Databook)

Year	RPI Growth	GDP Deflator
2010	1	100
2016	1.031	110.04
2026	1.379	131.96
2031	1.599	147.85
2041	2.149	185.6
2051	2.888	232.98

5.1.17 It is important to note that since this work was undertaken there has been an update to the WebTAG Databook in May 2018. The core scenario forecasts, as described under subsequent sections of this report, were produced in April 2018 and outputs provided to the environmental specialists to undertake their work. Analysis has been undertaken to compare the December 2017 and May 2018 values. The largest difference was a 3.2% increase in 2051 RPI growth. It was considered that this would make little material difference to the forecasts and therefore the results produced using the December 2017 values have been maintained.

5.1.18 Applying the factors presented in Table 5.4 to the base year charges presented in Table 5.1 leads to the charges presented in Table 5.5. The Off-Peak charge factor is kept constant at 0.55 for each of the forecast years.

Table 5.5 – Forecast Year Dartford Crossing Charges in LTAM

Year	Time Period	Car Employers Business	Car Commute	Car Other	LGV	HGV
2026	AM	£1.63	£1.63	£1.63	£2.52	£4.46
	IP	£1.63	£1.63	£1.63	£2.52	£4.46
	PM	£1.63	£1.63	£1.63	£2.52	£4.46
	OP	£0.90	£0.90	£0.90	£1.38	£2.45
2031	AM	£1.69	£1.69	£1.69	£2.60	£4.61
	IP	£1.69	£1.69	£1.69	£2.60	£4.61
	PM	£1.69	£1.69	£1.69	£2.60	£4.61
	OP	£0.93	£0.93	£0.93	£1.43	£2.54
2041	AM	£1.81	£1.81	£1.81	£2.79	£4.94
	IP	£1.81	£1.81	£1.81	£2.79	£4.94
	PM	£1.81	£1.81	£1.81	£2.79	£4.94
	OP	£1.00	£1.00	£1.00	£1.53	£2.72
2051	AM	£1.94	£1.94	£1.94	£2.98	£5.28
	IP	£1.94	£1.94	£1.94	£2.98	£5.28
	PM	£1.94	£1.94	£1.94	£2.98	£5.28
	OP	£1.07	£1.07	£1.07	£1.64	£2.91

Blackwall/Silvertown Tunnels Charge

5.1.19 The Silvertown Tunnel proposal underwent a Development Consent Order examination during 2017 with the Secretary of State delaying the decision until May 10th, 2018. The consent for Silvertown has recently been granted. However, the charges assessed (known as the Assessed Case) were determined and reported on in TR010021 Silvertown Tunnel 7.5 Charging Statement.

5.1.20 The primary source of the charges to apply at Blackwall and Silvertown for LTAM was the TfL RXHAM model. These charges had been adjusted from the advertised user charges for use in the model to represent exemptions, discounts, local residents etc. It is important to note that the proposed charging regime uses different charges in different directions in the peak hours.

5.1.21 The RXHAM model does not have 2026 or 2051 forecast years therefore the charges applied for these years were interpolated and extrapolated from the available model years. The resultant figures were then adjusted according to the charging time periods and LTAM modelled time periods based on the proportion of time a charge in place was in either a peak or off-peak period.

5.1.22 As an example, to illustrate this, the Inter Peak charge in the SB direction is made up of 6 hours of the off-peak charge so the average charge is £0.90. In the NB direction the Inter Peak charge is made up of five hours of the Off-Peak charge and one hour of the Peak charge, so the average charge is £1.20.

5.1.23 The resultant modelled charges are shown in Table 5.6.

Table 5.6 – Blackwall and Silvertown Modelled Charges in LTAM Time Periods

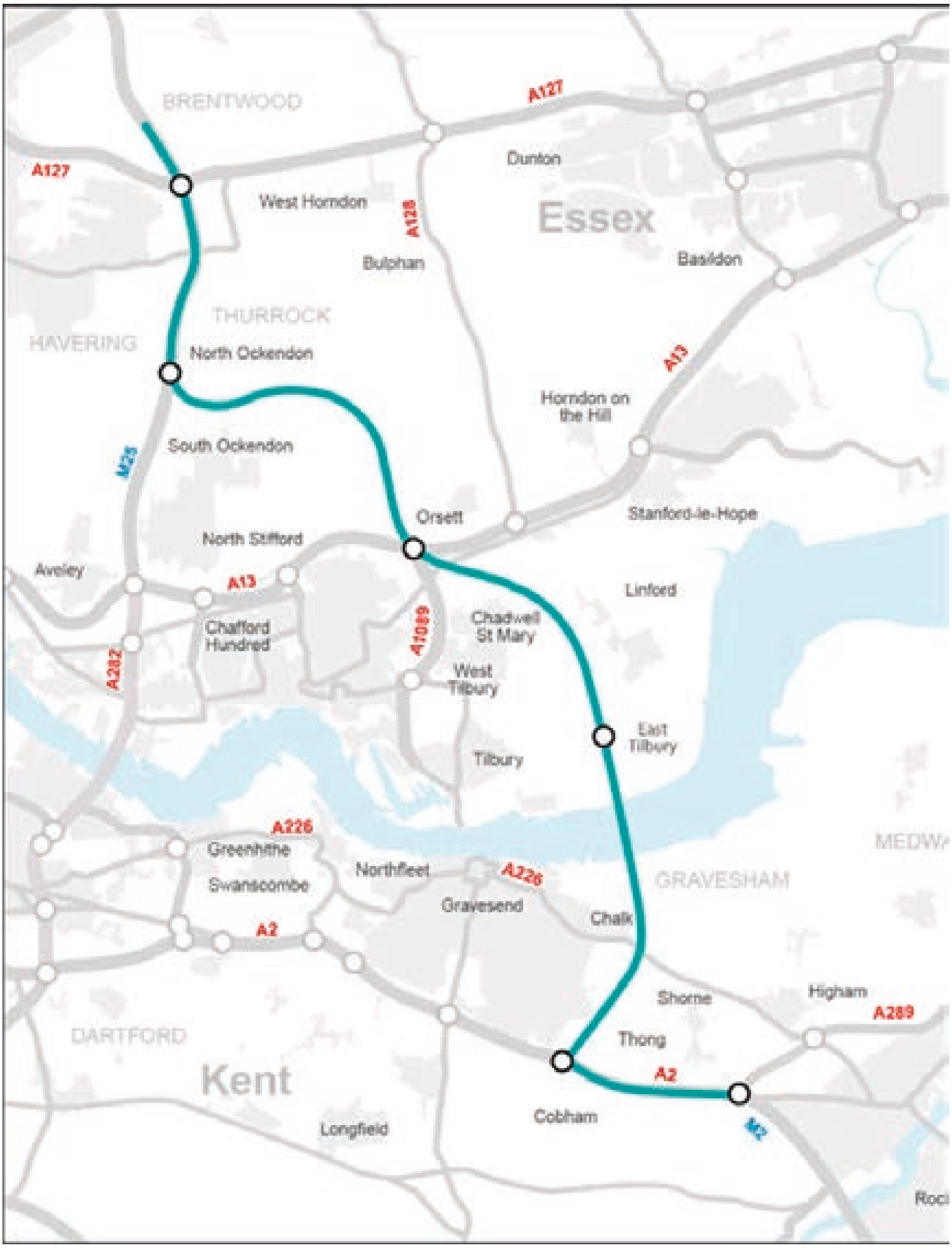
Direction	Year	Time Period	Car Employers Business	Car Commute	Car Other	LGV	HGV
SB	2026	AM	£0.90	£0.90	£0.90	£1.49	£3.60
		IP	£0.90	£0.90	£0.90	£1.49	£3.60
		PM	£2.70	£2.70	£2.70	£4.50	£6.76
		OP	£0.45	£0.45	£0.45	£0.75	£1.46
	2031	AM	£0.90	£0.90	£0.90	£1.49	£3.60
		IP	£0.90	£0.90	£0.90	£1.49	£3.60
		PM	£2.70	£2.70	£2.70	£4.50	£6.76
		OP	£0.45	£0.45	£0.45	£0.75	£1.46
	2041	AM	£0.90	£0.90	£0.90	£1.49	£3.60
		IP	£0.90	£0.90	£0.90	£1.49	£3.60
		PM	£2.70	£2.70	£2.70	£4.50	£6.76
		OP	£0.45	£0.45	£0.45	£0.75	£1.46
	2051	AM	£0.90	£0.90	£0.90	£1.49	£3.60
		IP	£0.90	£0.90	£0.90	£1.49	£3.60
		PM	£2.70	£2.70	£2.70	£4.50	£6.76
		OP	£0.45	£0.45	£0.45	£0.75	£1.46
NB	2026	AM	£2.70	£2.70	£2.70	£4.50	£6.76
		IP	£1.20	£1.20	£1.20	£1.99	£4.13
		PM	£0.90	£0.90	£0.90	£1.49	£3.60
		OP	£0.30	£0.30	£0.30	£0.50	£1.20
	2031	AM	£2.70	£2.70	£2.70	£4.50	£6.76
		IP	£1.20	£1.20	£1.20	£1.99	£4.13
		PM	£0.90	£0.90	£0.90	£1.49	£3.60
		OP	£0.30	£0.30	£0.30	£0.50	£1.20
	2041	AM	£2.70	£2.70	£2.70	£4.50	£6.76
		IP	£1.20	£1.20	£1.20	£1.99	£4.13
		PM	£0.90	£0.90	£0.90	£1.49	£3.60
		OP	£0.30	£0.30	£0.30	£0.50	£1.20
	2051	AM	£2.70	£2.70	£2.70	£4.50	£6.76
		IP	£1.20	£1.20	£1.20	£1.99	£4.13
		PM	£0.90	£0.90	£0.90	£1.49	£3.60
		OP	£0.30	£0.30	£0.30	£0.50	£1.20

5.2 Do Something Networks

Description of the Scheme

5.2.1 The LTC route connects the A2/M2 in Kent, east of Gravesend, crossing under the River Thames through two bored tunnels, before joining the M25 south of junction 29. The route alignment is presented in Figure 5.1.

Figure 5.1 – LTC Route Alignment



5.2.2 The route would be approximately 31km long with 4km in a twin-bored tunnel.

5.2.3 Junctions are proposed at the following locations:

- A new junction with the A2 to the east of Gravesend;
- A new junction east of Tilbury;
- A junction with the A13/ A1089 in Thurrock; and
- A new junction with north-facing slip roads on the M25 between junctions 29 and 30 including improvements to circulatory flow at M25 J29.

5.2.4 Figure 5.2 to Figure 5.5 present detailed drawings of these junctions. Figure 5.6 to Figure 5.8 present schematic representations of these junctions as they have been depicted in the LTAM.

Figure 5.2 – LTC A2 Junction

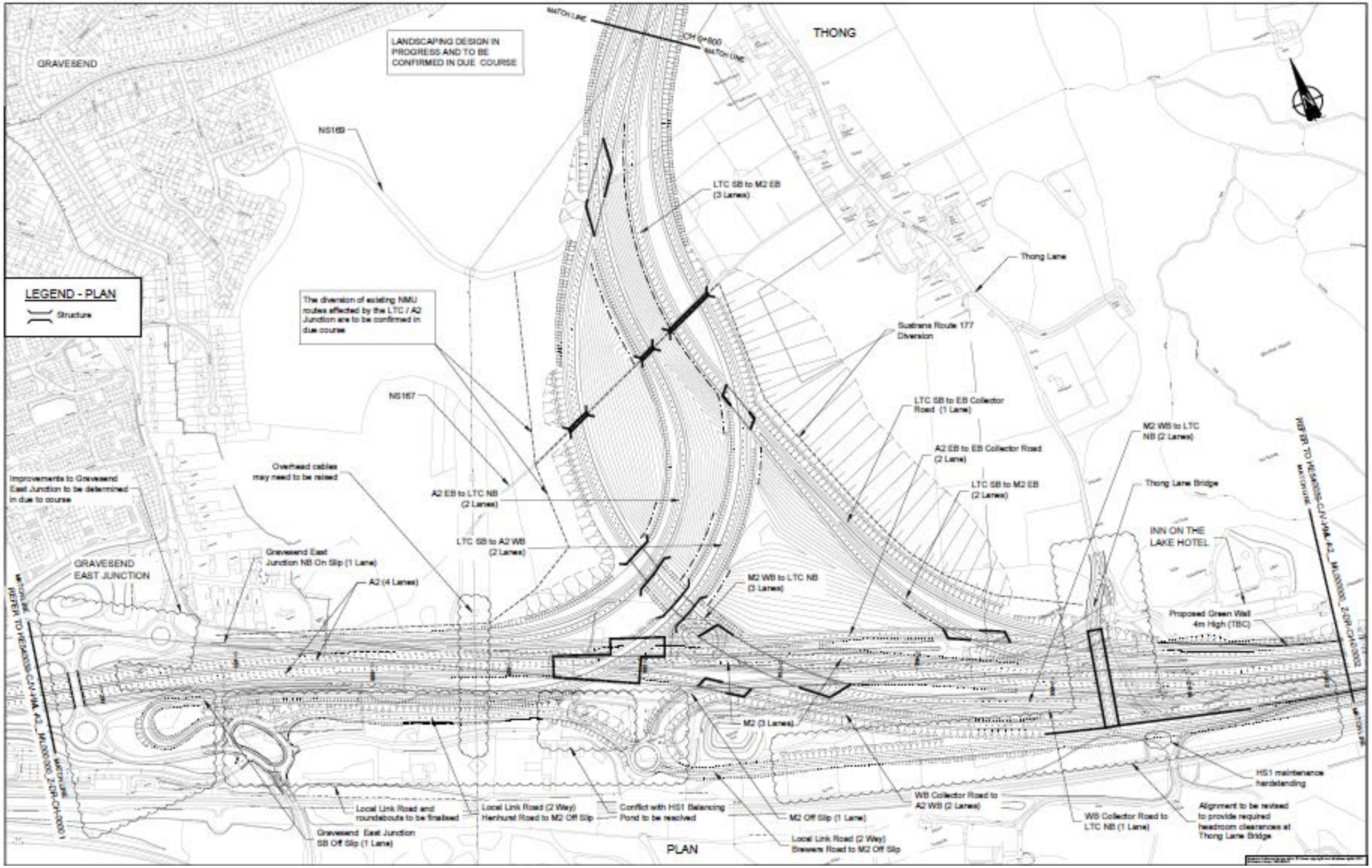


Figure 5.3 – LTC Tilbury Junction

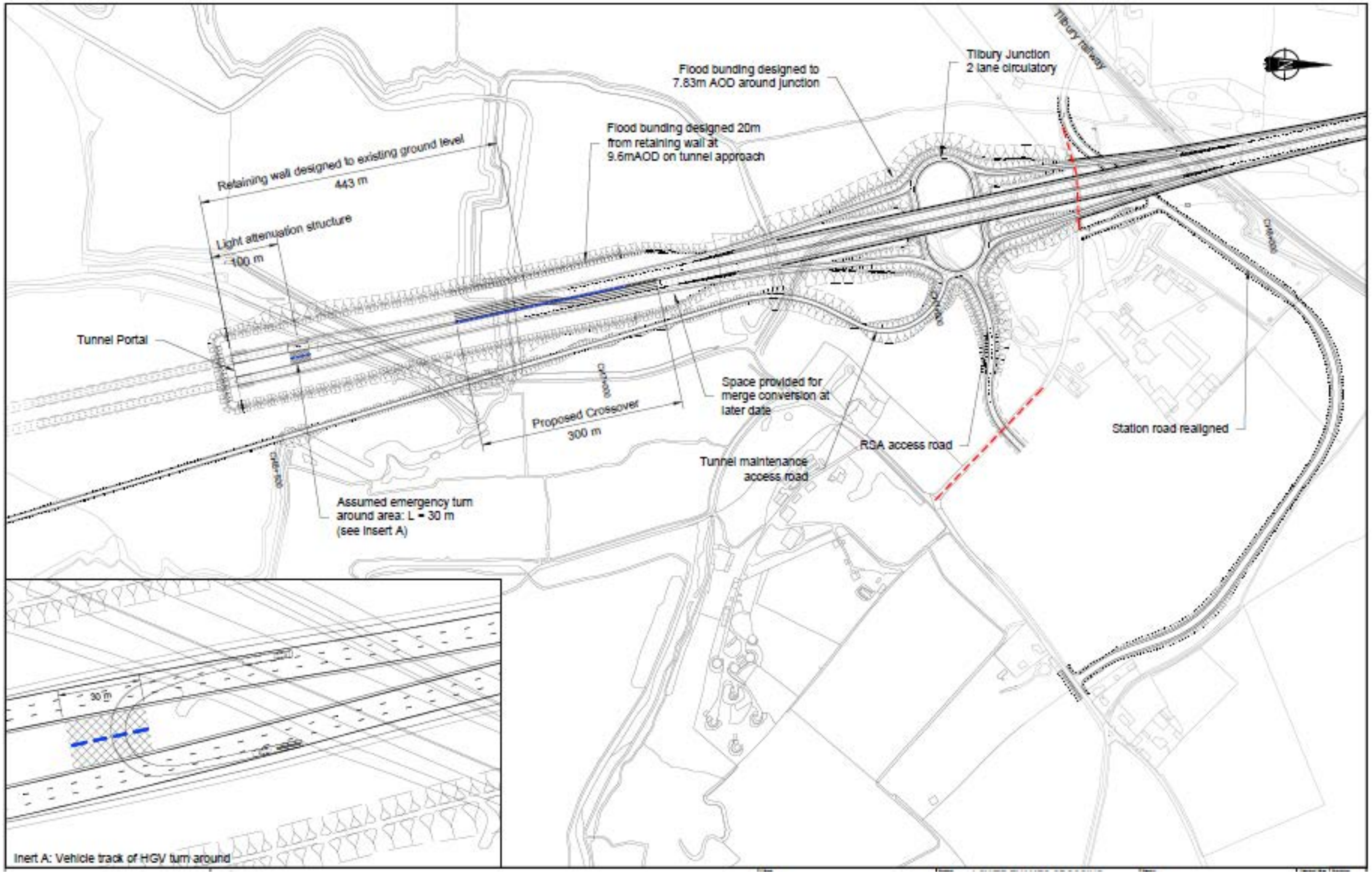


Figure 5.4 – LTC A13/A1089 Junction

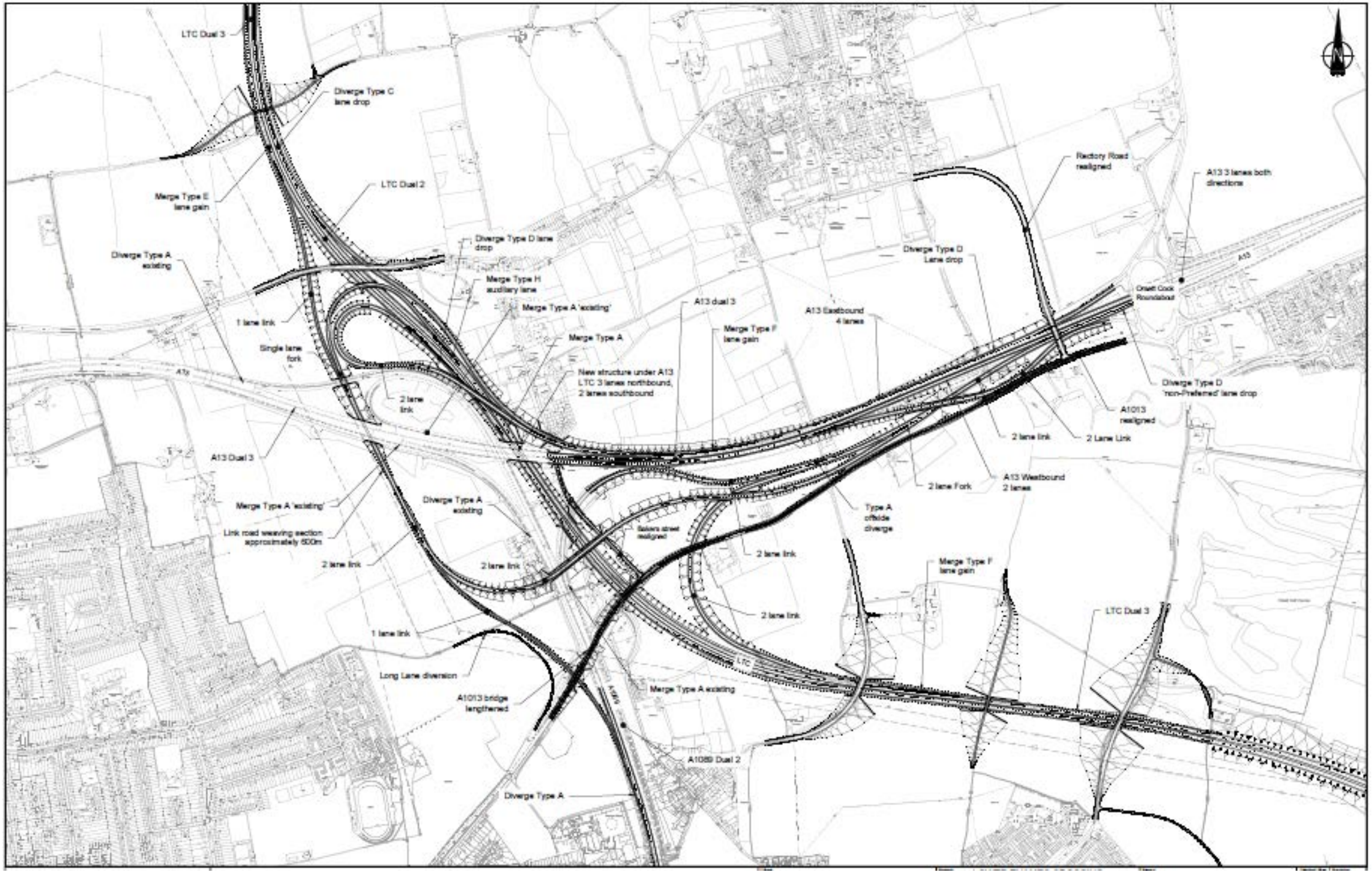


Figure 5.5 – LTC M25 Junction

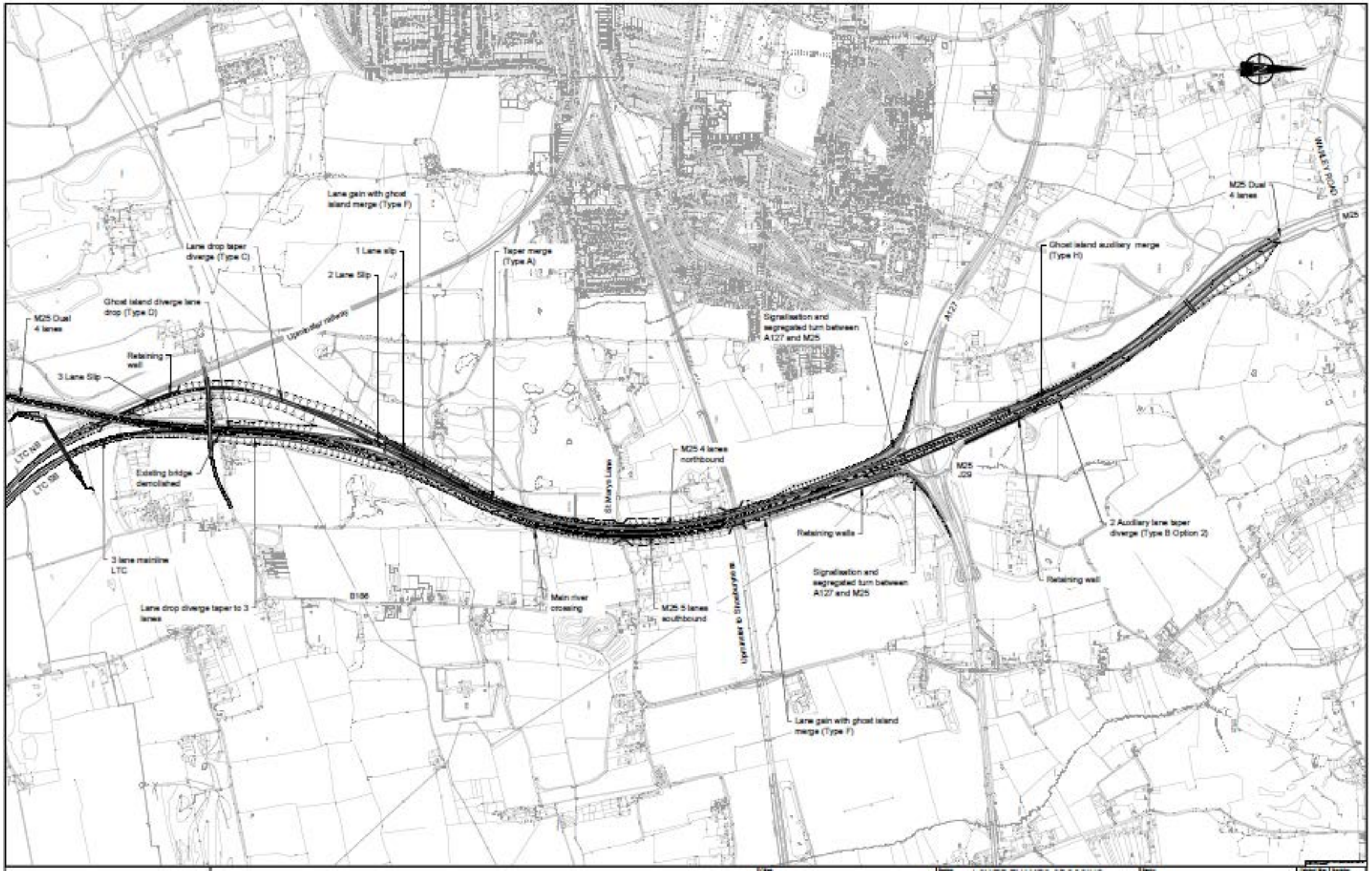


Figure 5.6 – LTC A2 Junction Representation in LTAM

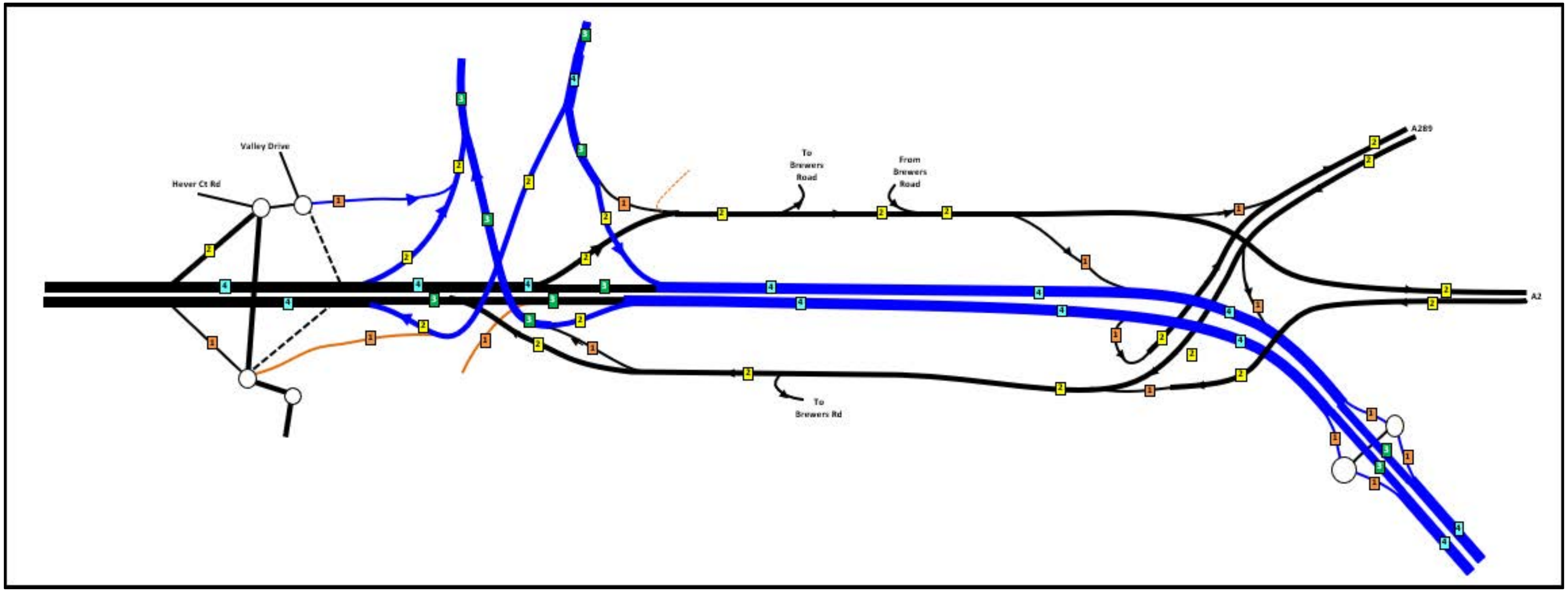


Figure 5.7 – LTC A13/A1089 Junction Representation in LTAM

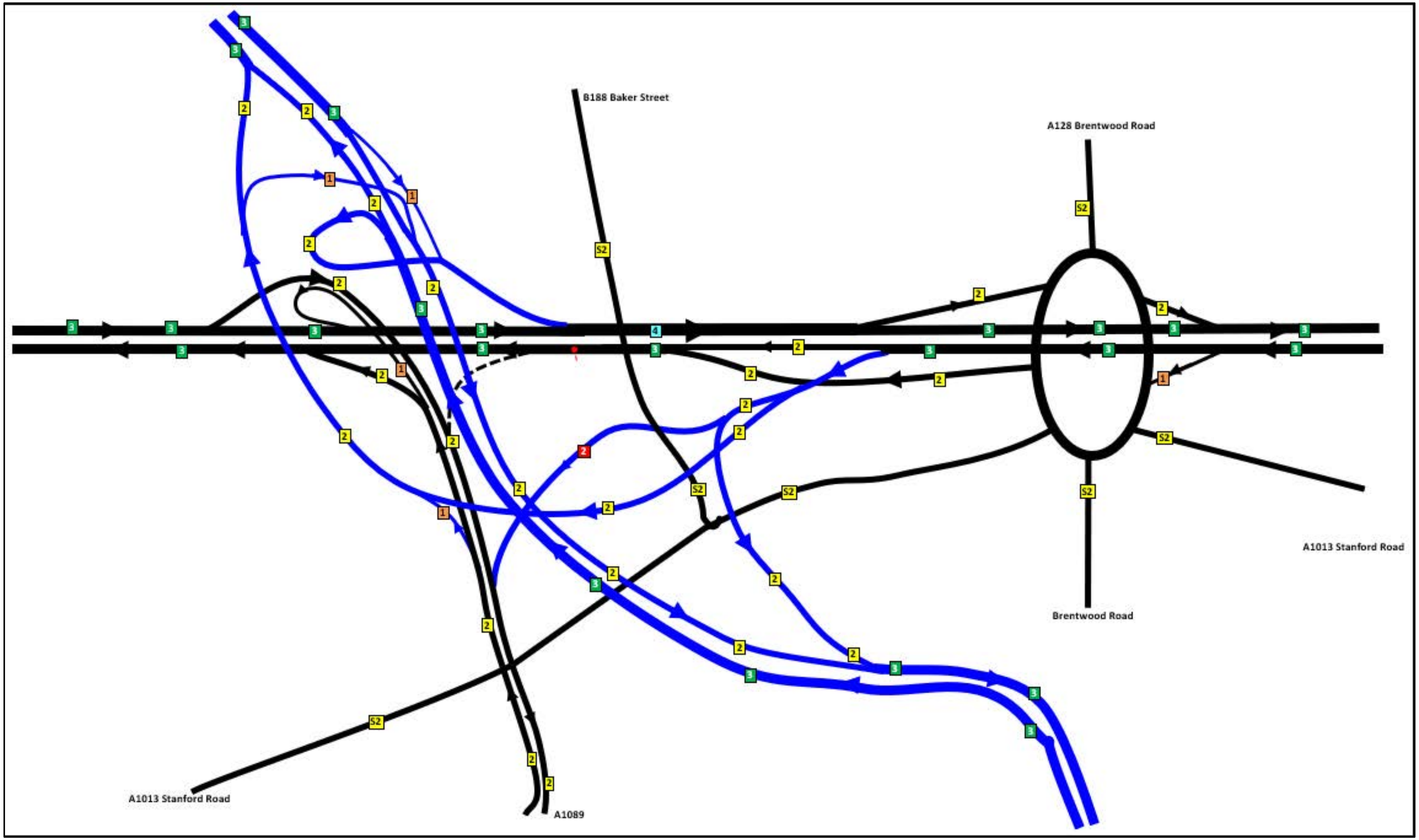
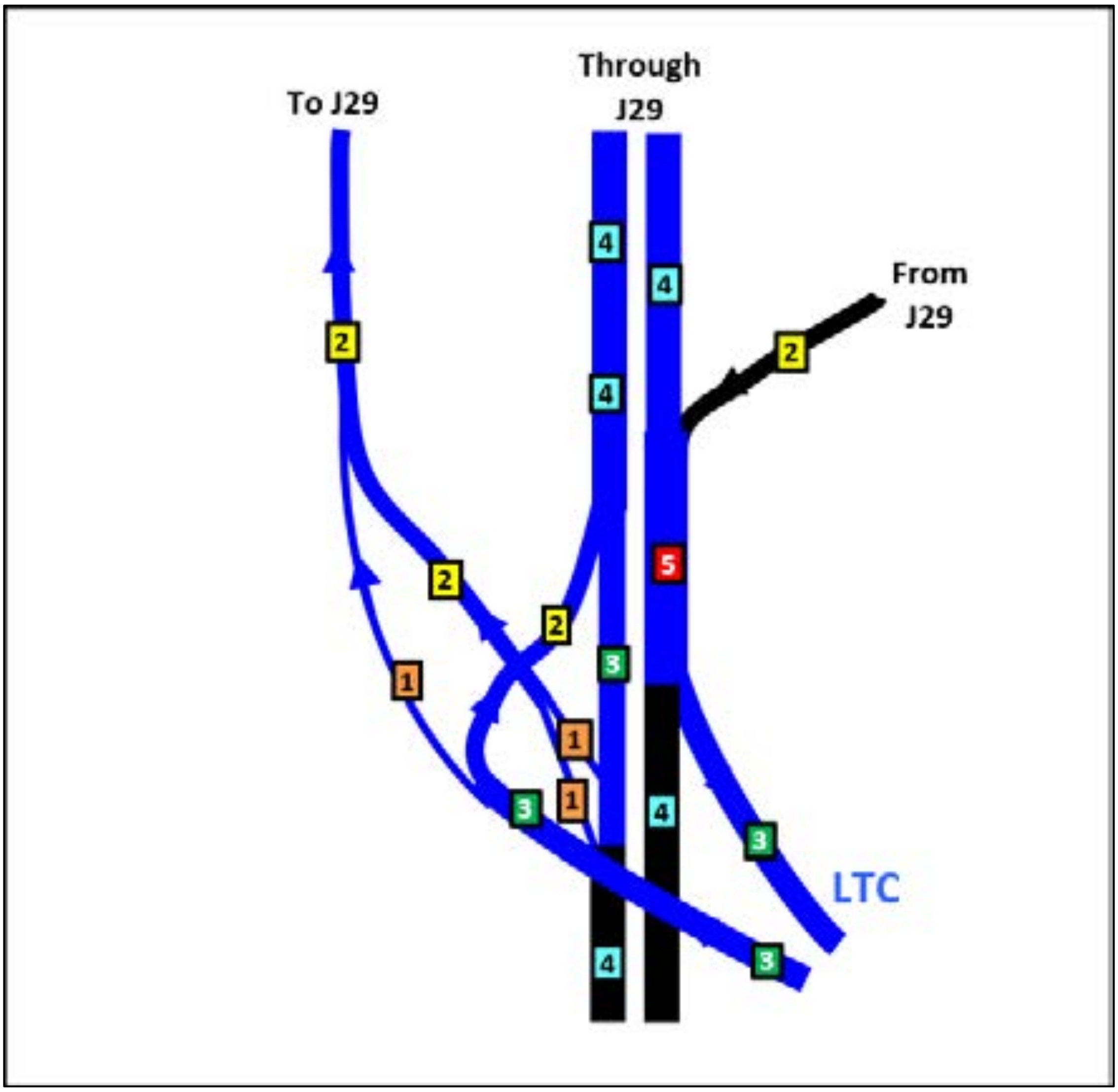


Figure 5.8 – LTC M25 Junction Representation in LTAM



Network Coding

5.2.5 The LTC mainline is coded as a 3-lane motorway. Merges and diverges are coded as per the SERTM Network Coding Manual so as to be consistent with the rest of the model.

5.2.6 The Traffic Management Cell (TMC) is assumed to be unchanged between the DM and DS.

5.2.7 Guidance received from Highways England stipulated that, for the purposes of modelling, the charges at LTC would be exactly the same as the charges at Dartford.

5.2.8 Table 5.7 provides the LTAM model charges for LTC for each year.

Table 5.7 – Forecast Year Lower Thames Crossing Charges in LTAM

Year	Time Period	Car Employers Business	Car Commute	Car Other	LGV	HGV
2026	AM	£1.63	£1.63	£1.63	£2.52	£4.46
	IP	£1.63	£1.63	£1.63	£2.52	£4.46
	PM	£1.63	£1.63	£1.63	£2.52	£4.46
	OP	£0.90	£0.90	£0.90	£1.38	£2.45
2031	AM	£1.69	£1.69	£1.69	£2.60	£4.61
	IP	£1.69	£1.69	£1.69	£2.60	£4.61
	PM	£1.69	£1.69	£1.69	£2.60	£4.61
	OP	£0.93	£0.93	£0.93	£1.43	£2.54
2041	AM	£1.81	£1.81	£1.81	£2.79	£4.94
	IP	£1.81	£1.81	£1.81	£2.79	£4.94
	PM	£1.81	£1.81	£1.81	£2.79	£4.94
	OP	£1.00	£1.00	£1.00	£1.53	£2.72
2051	AM	£1.94	£1.94	£1.94	£2.98	£5.28
	IP	£1.94	£1.94	£1.94	£2.98	£5.28
	PM	£1.94	£1.94	£1.94	£2.98	£5.28
	OP	£1.07	£1.07	£1.07	£1.64	£2.91

6 Equilibrium Demand Forecasts

6.1 Model Parameters

6.1.1 Table 6.1 to Table 6.18 provide the model values of time (VOT) and vehicle operating costs (VOC) for each of the forecast years for highway and public transport users. It is important to note that the actual base values were derived from the July 2017 WebTAG Databook. Values for the Base Plus and all forecast years were derived from the December 2017 WebTAG Databook. This inconsistency is due to the release of a new WebTAG Databook between the time when the base year model was calibrated and when the forecasts were derived. It was considered important to change the parameters from the actual base to the Base Plus as the Base Plus is used as the pivot point for the forecast matrices. All values presented are in 2010 prices.

6.1.2 It is also important to note that since the forecasts were developed there has been another update to the WebTAG Databook in May 2018. A comparison has been undertaken between the December 2017 values used in the LTAM forecasts and the May 2018 values. This analysis found that there were minimal differences between the values and that these differences were considered not to have a material impact and therefore it was agreed that using the December 2017 values was acceptable. The May 2018 values have been used in subsequent economic appraisal activities.

Table 6.1 – VOT Parameters Actual Base (Highway Users)

	AM	IP	PM	All Day
Business	30.10	30.84	30.53	1835.08
Commute Low	9.28	9.43	9.32	560.83
Commute Med	15.61	15.86	15.66	942.96
Commute High	27.21	27.65	27.30	1643.84
Other Low	7.59	8.09	7.95	476.38
Other Med	13.07	13.92	13.69	820.27
Other High	20.81	22.17	21.79	1306.15
LGV	21.27	21.27	21.27	
HGV	43.19	43.19	43.19	

Table 6.2 – VOT Parameters Actual Base (PT Users)

	All Day
Business	2634.42
Commute Low	491.87
Commute Med	827.03
Commute High	1441.73
Other Low	266.05
Other Med	458.11
Other High	729.47

Table 6.3 – VOC Parameters Actual Base (Highway Users)

	AM	IP	PM	All Day
Business	12.73	12.16	12.78	12.42
Commute Low	5.99	5.79	6.01	5.87
Commute Med	5.99	5.79	6.01	5.87
Commute High	5.99	5.79	6.01	5.87
Other Low	5.99	5.79	6.01	5.87
Other Med	5.99	5.79	6.01	5.87
Other High	5.99	5.79	6.01	5.87
LGV	13.37	13.31	13.39	13.31
HGV	47.71	44.96	47.96	46.22

Table 6.4 – VOT Parameters Base Plus (Highway Users)

	AM	IP	PM	OP	Weekend	All Day
Business	30.21	30.95	30.64	31.22	35.08	1841.88
Commute Low	9.32	9.47	9.35	9.49	9.93	562.91
Commute Med	15.67	15.92	15.72	15.95	16.70	946.46
Commute High	27.31	27.76	27.41	27.81	29.11	1649.93
Other Low	7.62	8.12	7.98	7.95	9.44	478.14
Other Med	13.12	13.97	13.74	13.69	16.25	823.31
Other High	20.89	22.25	21.87	21.80	25.87	1310.99
LGV	21.35	21.35	21.35	21.35	23.07	
HGV	43.35	43.35	43.35	43.35	43.35	

Table 6.5 – VOT Parameters Base Plus (PT Users)

	All Day
Business	2644.19
Commute Low	493.70
Commute Med	830.09
Commute High	1447.08
Other Low	267.03
Other Med	459.81
Other High	732.17

Table 6.6 – VOC Parameters Base Plus (Highway Users)

	AM	IP	PM	OP	Weekend	All Day
Business	12.60	12.03	12.65	11.71	11.65	12.15
Commute Low	5.87	5.67	5.89	5.59	5.58	5.71
Commute Med	5.87	5.67	5.89	5.59	5.58	5.71
Commute High	5.87	5.67	5.89	5.59	5.58	5.71
Other Low	5.87	5.67	5.89	5.59	5.58	5.71
Other Med	5.87	5.67	5.89	5.59	5.58	5.71
Other High	5.87	5.67	5.89	5.59	5.58	5.71
LGV	13.24	13.18	13.26	13.30	13.34	13.17
HGV	47.13	44.41	47.38	43.03	42.83	44.94

Table 6.7 – VOT Parameters 2026 (Highway Users)

	AM	IP	PM	OP	Weekend	All Day
Business	33.97	34.81	34.46	35.11	39.45	2071.25
Commute Low	10.48	10.65	10.51	10.67	11.17	633.01
Commute Med	17.62	17.90	17.68	17.94	18.78	1064.32
Commute High	30.71	31.21	30.82	31.27	32.74	1855.40
Other Low	8.57	9.13	8.97	8.94	10.61	537.69
Other Med	14.75	15.71	15.45	15.39	18.27	925.84
Other High	23.49	25.02	24.60	24.51	29.09	1474.25
LGV	24.01	24.01	24.01	24.01	25.95	
HGV	48.75	48.75	48.75	48.75	48.75	

Table 6.8 – VOT Parameters 2026 (PT Users)

	All Day
Business	2973.48
Commute Low	555.18
Commute Med	933.46
Commute High	1627.28
Other Low	300.29
Other Med	517.07
Other High	823.35

Table 6.9 – VOC Parameters 2026 (Highway Users)

	AM	IP	PM	OP	Weekend	All Day
Business	12.20	11.64	12.25	11.31	11.26	11.75
Commute Low	5.74	5.54	5.75	5.46	5.45	5.58
Commute Med	5.74	5.54	5.75	5.46	5.45	5.58
Commute High	5.74	5.54	5.75	5.46	5.45	5.58
Other Low	5.74	5.54	5.75	5.46	5.45	5.58
Other Med	5.74	5.54	5.75	5.46	5.45	5.58
Other High	5.74	5.54	5.75	5.46	5.45	5.58
LGV	13.81	13.76	13.83	13.90	13.94	13.75
HGV	53.51	50.44	53.78	48.93	48.71	51.04

Table 6.10 – VOT Parameters 2031 (Highway Users)

	AM	IP	PM	OP	Weekend	All Day
Business	37.18	38.10	37.72	38.44	43.19	2267.31
Commute Low	11.47	11.66	11.51	11.68	12.23	692.92
Commute Med	19.29	19.60	19.35	19.64	20.56	1165.06
Commute High	33.62	34.17	33.74	34.23	35.84	2031.03
Other Low	9.38	9.99	9.82	9.79	11.61	588.58
Other Med	16.15	17.20	16.91	16.85	20.00	1013.48
Other High	25.71	27.39	26.93	26.83	31.85	1613.80
LGV	26.28	26.28	26.28	26.28	28.40	
HGV	53.36	53.36	53.36	53.36	53.36	

Table 6.11 – VOT Parameters 2031 (PT Users)

	All Day
Business	3254.93
Commute Low	607.73
Commute Med	1021.82
Commute High	1781.31
Other Low	328.71
Other Med	566.01
Other High	901.28

Table 6.12 – VOC Parameters 2031 (Highway Users)

	AM	IP	PM	OP	Weekend	All Day
Business	11.78	11.22	11.83	10.90	10.84	11.34
Commute Low	5.62	5.44	5.64	5.36	5.35	5.47
Commute Med	5.62	5.44	5.64	5.36	5.35	5.47
Commute High	5.62	5.44	5.64	5.36	5.35	5.47
Other Low	5.62	5.44	5.64	5.36	5.35	5.47
Other Med	5.62	5.44	5.64	5.36	5.35	5.47
Other High	5.62	5.44	5.64	5.36	5.35	5.47
LGV	13.66	13.60	13.67	13.73	13.78	13.59
HGV	55.74	52.56	56.03	51.00	50.78	53.18

Table 6.13 – VOT Parameters 2041 (Highway Users)

	AM	IP	PM	OP	Weekend	All Day
Business	44.93	46.04	45.58	46.44	52.18	2739.49
Commute Low	13.86	14.08	13.91	14.11	14.77	837.23
Commute Med	23.30	23.68	23.38	23.72	24.84	1407.70
Commute High	40.62	41.28	40.76	41.36	43.30	2454.00
Other Low	11.33	12.07	11.87	11.82	14.03	711.16
Other Med	19.51	20.78	20.43	20.36	24.16	1224.54
Other High	31.07	33.09	32.53	32.42	38.48	1949.88
LGV	31.76	31.76	31.76	31.76	34.32	
HGV	64.48	64.48	64.48	64.48	64.48	

Table 6.14 – VOT Parameters 2041 (PT Users)

	All Day
Business	3932.79
Commute Low	734.29
Commute Med	1234.62
Commute High	2152.28
Other Low	397.17
Other Med	683.89
Other High	1088.98

Table 6.15 – VOC Parameters 2041 (Highway Users)

	AM	IP	PM	OP	Weekend	All Day
Business	11.51	10.95	11.56	10.63	10.58	11.07
Commute Low	5.61	5.43	5.63	5.35	5.34	5.46
Commute Med	5.61	5.43	5.63	5.35	5.34	5.46
Commute High	5.61	5.43	5.63	5.35	5.34	5.46
Other Low	5.61	5.43	5.63	5.35	5.34	5.46
Other Med	5.61	5.43	5.63	5.35	5.34	5.46
Other High	5.61	5.43	5.63	5.35	5.34	5.46
LGV	13.54	13.49	13.56	13.61	13.66	13.48
HGV	57.17	53.91	57.47	52.32	52.10	54.54

Table 6.16 – VOT Parameters 2051 (Highway Users)

	AM	IP	PM	OP	Weekend	All Day
Business	54.54	55.89	55.33	56.38	63.35	3325.71
Commute Low	16.82	17.10	16.88	17.13	17.94	1016.39
Commute Med	28.29	28.75	28.39	28.80	30.16	1708.93
Commute High	49.31	50.12	49.48	50.21	52.57	2979.13
Other Low	13.76	14.65	14.40	14.35	17.04	863.34
Other Med	23.69	25.23	24.80	24.71	29.34	1486.58
Other High	37.72	40.18	39.50	39.35	46.71	2367.14
LGV	38.55	38.55	38.55	38.55	41.66	
HGV	78.28	78.28	78.28	78.28	78.28	

Table 6.17 – VOT Parameters 2051 (PT Users)

	All Day
Business	4774.37
Commute Low	891.42
Commute Med	1498.82
Commute High	2612.85
Other Low	482.16
Other Med	830.23
Other High	1322.01

Table 6.18 – VOC Parameters 2051 (Highway Users)

	AM	IP	PM	OP	Weekend	All Day
Business	11.69	11.13	11.74	10.80	10.75	11.24
Commute Low	5.83	5.64	5.84	5.56	5.55	5.67
Commute Med	5.83	5.64	5.84	5.56	5.55	5.67
Commute High	5.83	5.64	5.84	5.56	5.55	5.67
Other Low	5.83	5.64	5.84	5.56	5.55	5.67
Other Med	5.83	5.64	5.84	5.56	5.55	5.67
Other High	5.83	5.64	5.84	5.56	5.55	5.67
LGV	13.79	13.74	13.81	13.88	13.92	13.73
HGV	58.70	55.35	59.00	53.73	53.51	56.00

6.2 LTAM Base Plus Model

6.2.1 The specification for the Base Plus model is described in Section 2.5. The tables below present the impact of the VDM on the Base Plus reference matrices and assignments.

VDM Convergence Statistics

6.2.2 LTAM model convergence statistics are provided in Table 6.19 below for the Base Plus VDM run.

Table 6.19 – Convergence and Stability Statistics (Base Plus 2016)

Iteration			Cost stability				Flow stability				Totals
Main	Full Model Rel	Subset Area Rel	RAAD	AAD	RMS	%<5%	RAAD	AAD	RMS	%<5%	Trips
1	0.08%	0.93%	0.000	0.000	0.000	0%	0.000	0.000	0.000	0%	71,452,634
2	0.04%	0.43%	0.001	0.048	0.174	99.96%	0.009	0.000	0.028	95.33%	71,452,995
3	0.02%	0.24%	0.000	0.017	0.071	99.99%	0.004	0.000	0.018	99.77%	71,453,065
4	0.02%	0.15%	0.000	0.012	0.065	99.99%	0.002	0.000	0.007	99.95%	71,453,071

Matrix Totals – Actual Base Vs Base Plus

6.2.3 As described in Section 4.3 it is necessary to report the matrix totals in two ways, firstly using the 17 demand segments used in DIADEM and secondly using the 9 demand segments used in the highway assignment model.

6.2.4 The matrices used in the LTAM include all trips in the country. A large majority of these trips are outside of the study area and will not impact on the assessment of LTC. It is therefore important, when looking at the impacts that the VDM has made, to isolate those movements that are considered relevant to the scheme appraisal.

6.2.5 During the development of the base model a series of origin to destination movements were defined as being relevant to the scheme appraisal. The identification of many of the irrelevant movements is relatively straight forward. For example, trips between Liverpool and Manchester can easily be considered as irrelevant. For some movements the identification is more difficult such as trips from the Midlands to the south coast. Some of these may use the M25 which would bring them within the region of influence of the scheme. Some will simply use the M5 or other routes and should therefore also be considered as irrelevant.

6.2.6 Initially all movements which started or finished within the Fully Modelled Area (as defined in Figure 2.3) were considered to be relevant. Also, all external to external movements which crossed the FMA boundary were also considered relevant. This pattern was developed using a select link procedure in SATURN. Intrazonal movements within the FMA have been considered as being relevant.

6.2.7 Table 6.20 explains the pattern adopted. Table 6.21 shows the number of OD pairs in each model area considered to be relevant, in comparison to all movements and Table 6.22 shows the percentage of relevant movements by modelled area. The relevant movement pattern has only been applied to the SATURN matrix analysis in the subsequent tables below.

Table 6.20 – Relevant Movement Pattern

Movement		All Movements	Relevant Movements Inc Internal Intrazonals
From	To		
Internal	Internal	Relevant	Relevant
Internal	External	Relevant	Relevant
External	Internal	Relevant	Relevant
External	External	Relevant	Only Trips Entering FMA

Table 6.21 – Number of Relevant Movements by Model Area

Movement		All Movements	Relevant Movements Inc Internal Intrazonals
From	To		
Internal	Internal	484,416	484,416
Internal	External	185,832	185,832
External	Internal	185,832	185,832
External	External	71,289	24,804
Total		927,369	880,884

Table 6.22 – Percentage of Relevant Movements by Model Area

Movement		All Movements	Relevant Movements Inc Internal Intrazonals
From	To		
Internal	Internal	100%	100%
Internal	External	100%	100%
External	Internal	100%	100%
External	External	100%	34.8%
Total		100%	95.0%

6.2.8 Table 6.23 presents a comparison of the actual base and Base Plus matrices for the DIADEM 17 demand segment pattern. Table 6.24 presents a comparison between the actual base and Base Plus matrices for the SATURN 9 userclass pattern. Only the SATURN matrices have the all movement and relevant movements analysis presented as this is more applicable to OD matrices used in the assignment model.

Table 6.23 – LTAM DIADEM Matrix Total Comparison – Actual Base Vs VDM Output Matrix (Base Plus Highway Trips in PCU's)

Segment	Matrix Type	Time Period	Actual Base (2016)	VDM Output Base Plus (2016)		
			Matrix Total	Matrix Total	Diff to Actual Base	Diff %
HBEB	24Hr PA	N/A	2,567,826	2,567,839	13	0.0%
HBW L	24Hr PA	N/A	2,253,299	2,253,318	19	0.0%
HBW M	24Hr PA	N/A	3,990,863	3,990,959	96	0.0%
HBW H	24Hr PA	N/A	3,125,105	3,125,202	97	0.0%
HBO L	24Hr PA	N/A	6,573,923	6,573,981	57	0.0%
HBO M	24Hr PA	N/A	5,675,738	5,675,788	50	0.0%
HBO H	24Hr PA	N/A	3,973,463	3,973,507	44	0.0%
NHBEB	By Time Period OD	AM	87,884	87,904	20	0.0%
		IP	113,362	113,376	15	0.0%
		PM	126,282	126,276	-6	0.0%
		OP	32,481	32,473	-8	0.0%
NHBO L	By Time Period OD	AM	123,655	123,671	17	0.0%
		IP	327,258	327,305	47	0.0%
		PM	258,391	258,372	-19	0.0%
		OP	92,832	92,814	-18	0.0%
NHBO M	By Time Period OD	AM	131,456	131,474	18	0.0%
		IP	261,436	261,486	51	0.0%
		PM	259,577	259,566	-12	0.0%
		OP	74,155	74,133	-22	0.0%
NHBO H	By Time Period OD	AM	105,663	105,680	17	0.0%
		IP	178,252	178,284	31	0.0%
		PM	200,155	200,149	-6	0.0%
		OP	50,590	50,576	-14	0.0%
LGV	By Time Period OD	AM	728,254	728,254	0	0.0%
		IP	627,316	627,316	0	0.0%
		PM	524,914	524,914	0	0.0%
		OP	252,979	252,979	0	0.0%
HGV	By Time Period OD	AM	374,760	374,760	0	0.0%
		IP	372,671	372,671	0	0.0%
		PM	234,571	234,571	0	0.0%
		OP	149,809	149,809	0	0.0%
Port Trips EB	By Time Period OD	AM	4,670	4,670	0	0.0%
		IP	3,334	3,334	0	0.0%
		PM	4,110	4,110	0	0.0%
		OP	1,320	1,320	0	0.0%
Port Trips O LI	By Time Period OD	AM	2,812	2,812	0	0.0%
		IP	3,477	3,477	0	0.0%
		PM	3,428	3,428	0	0.0%
		OP	1,381	1,381	0	0.0%
Port Trips O MI	By Time Period OD	AM	3,293	3,293	0	0.0%
		IP	3,677	3,677	0	0.0%
		PM	4,022	4,022	0	0.0%
		OP	1,459	1,459	0	0.0%
Port Trips O HI	By Time Period OD	AM	4,661	4,661	0	0.0%
		IP	3,904	3,904	0	0.0%
		PM	5,140	5,140	0	0.0%
		OP	1,544	1,544	0	0.0%

Table 6.24 – LTAM SATURN Matrix Total Comparison – Actual Base Vs VDM Output Matrix (Base Plus Hourly PCU's)

Userclass	Time Period	All Movements				Relevant Movements			
		Actual Base (2016)	VDM Output Base Plus (2016)			Actual Base (2016)	VDM Output Base Plus (2016)		
		Matrix Total	Matrix Total	Diff to Actual Base	Diff %	Matrix Total	Matrix Total	Diff to Actual Base	Diff %
Car Employers Business	AM	446,694	446,748	54	0.0%	36,939	36,991	51	0.1%
	IP	388,554	388,581	27	0.0%	25,308	25,337	29	0.1%
	PM	534,331	534,331	-0	0.0%	36,463	36,462	-1	0.0%
	OP	156,563	156,546	-18	0.0%	10,029	10,018	-10	-0.1%
Car Commute Low Income	AM	416,776	416,777	1	0.0%	29,884	29,886	2	0.0%
	IP	189,264	189,265	1	0.0%	16,532	16,533	1	0.0%
	PM	476,659	476,676	17	0.0%	31,296	31,314	18	0.1%
	OP	76,290	76,288	-2	0.0%	6,581	6,579	-2	0.0%
Car Commute Medium Income	AM	843,955	843,974	19	0.0%	64,573	64,594	20	0.0%
	IP	290,776	290,784	8	0.0%	25,159	25,168	9	0.0%
	PM	914,413	914,454	41	0.0%	62,467	62,509	42	0.1%
	OP	117,233	117,230	-3	0.0%	10,067	10,064	-3	0.0%
Car Commute High Income	AM	718,557	718,563	6	0.0%	61,601	61,610	8	0.0%
	IP	207,267	207,269	1	0.0%	21,463	21,465	2	0.0%
	PM	740,132	740,199	68	0.0%	60,852	60,923	71	0.1%
	OP	83,498	83,495	-3	0.0%	8,576	8,573	-3	0.0%
Car Other Low Income	AM	650,678	650,720	43	0.0%	65,525	65,566	42	0.1%
	IP	1,155,317	1,155,415	99	0.0%	90,465	90,575	110	0.1%
	PM	1,126,453	1,126,447	-6	0.0%	96,023	96,021	-2	0.0%
	OP	465,750	465,700	-50	0.0%	36,055	36,024	-31	-0.1%
Car Other Medium Income	AM	694,080	694,134	54	0.0%	72,383	72,418	35	0.0%
	IP	922,839	922,956	117	0.0%	84,216	84,327	111	0.1%
	PM	1,134,022	1,134,027	6	0.0%	107,044	107,042	-2	0.0%
	OP	371,895	371,831	-64	0.0%	33,540	33,514	-26	-0.1%
Car Other High Income	AM	555,396	555,439	44	0.0%	68,681	68,716	36	0.1%
	IP	619,518	619,585	68	0.0%	68,813	68,887	74	0.1%
	PM	858,565	858,586	21	0.0%	95,932	95,956	25	0.0%
	OP	249,550	249,509	-41	0.0%	27,475	27,458	-17	-0.1%
Car Total	AM	4,326,135	4,326,355	219	0.0%	399,586	399,781	195	0.0%

Userclass	Time Period	All Movements				Relevant Movements			
		Actual Base (2016)	VDM Output Base Plus (2016)			Actual Base (2016)	VDM Output Base Plus (2016)		
		Matrix Total	Matrix Total	Diff to Actual Base	Diff %	Matrix Total	Matrix Total	Diff to Actual Base	Diff %
	IP	3,773,535	3,773,855	321	0.0%	331,955	332,291	336	0.1%
	PM	5,784,575	5,784,720	146	0.0%	490,076	490,228	152	0.0%
	OP	1,520,780	1,520,600	-180	0.0%	132,323	132,230	-93	-0.1%
LGV	AM	728,254	728,254	0	0.0%	85,730	85,730	0	0.0%
	IP	627,316	627,316	0	0.0%	63,840	63,840	0	0.0%
	PM	524,914	524,914	0	0.0%	66,469	66,469	0	0.0%
	OP	252,979	252,979	0	0.0%	25,604	25,604	0	0.0%
HGV	AM	374,760	374,760	0	0.0%	54,636	54,636	0	0.0%
	IP	372,671	372,671	0	0.0%	56,055	56,055	0	0.0%
	PM	234,571	234,571	0	0.0%	33,936	33,936	0	0.0%
	OP	149,809	149,809	0	0.0%	22,172	22,172	0	0.0%

Assignments – Actual Base Vs VDM Output (Base Plus)

6.2.9 Figure 6.1 to Figure 6.3 provide a flow difference comparison between the actual base assignment and the VDM output assignment for the Base Plus for each time period. The plots are zoomed in to show the differences between the actual base and the Base Plus. Blue colours show reductions in traffic in the Base Plus, green colours show increases in traffic.

Figure 6.1 – Assigned Flow Differences – Actual Base Vs Base Plus (AM Peak All Vehicles (PCU's))

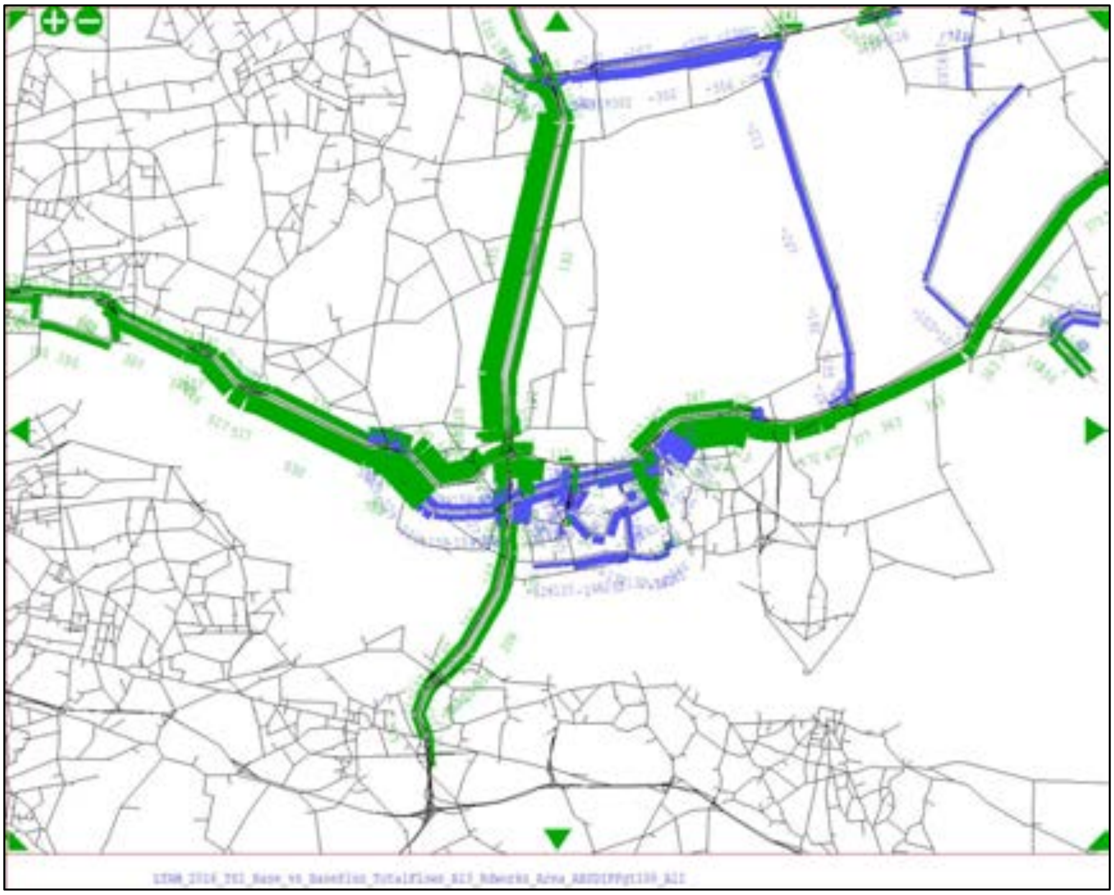


Figure 6.2 – Assigned Flow Differences – Actual Base Vs Base Plus (Inter Peak All Vehicles (PCU's))

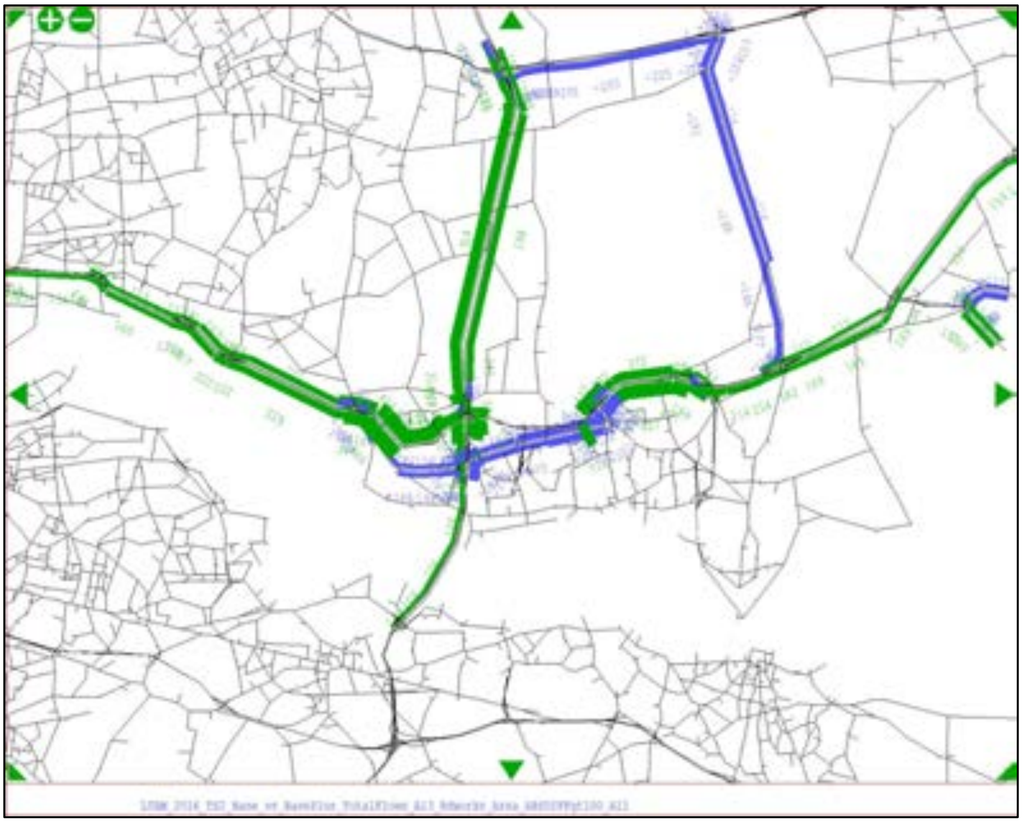
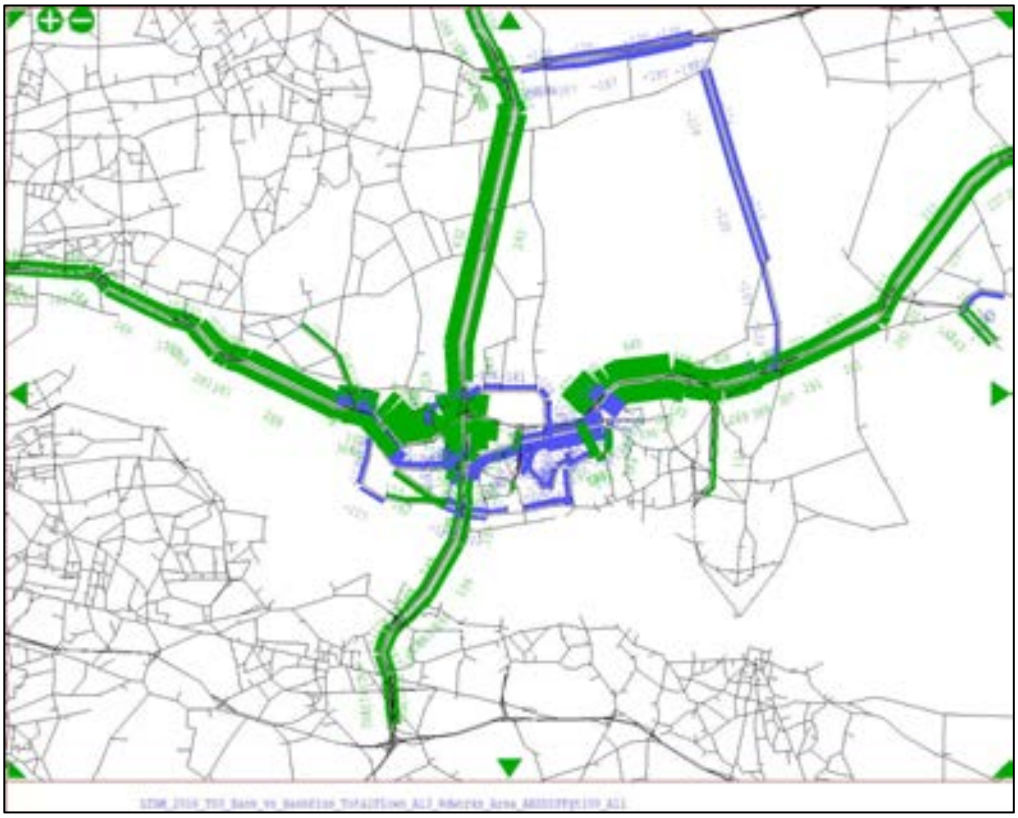


Figure 6.3 – Assigned Flow Differences – Actual Base Vs Base Plus (PM Peak All Vehicles (PCU's))



Key Statistics – Actual Base Vs Base Plus

6.2.10 Table 6.25 provides some key network statistics from the actual base and Base Plus.

Commentary on Results

6.2.11 Table 6.19 demonstrates that the Base Plus VDM has converged to the required level within 4 iterations.

6.2.12 The Base Plus model is used to represent the conditions of the network after the roadworks at M25 J30 have been removed and the associated flow metering at the Dartford Crossing TMC has been reduced. Generally, the matrix totals in the peaks have increased very slightly as would be expected with the increases in capacity associated with the network improvements. This is the case when looking at all movements and those movements considered relevant.

6.2.13 The impact of the Base Plus is contained to flows around the existing crossing. Flows along the M25 and the A13 increase with similar reductions along the alternative routes.

6.2.14 Without running the VDM the impact would be a reduction in total time and a very small increase in distance travelled, when compared with the actual base. As expected, when the VDM is used, the level of journey time saving is reduced and the increase in distance travelled increases. This is due to VDM shifting movements to take account of the increases in capacity leading to slightly longer journeys.

Table 6.25 – Key Network Statistics – Reference Matrix Vs VDM Output Matrix (Core 2026)

Metric	Time Period	Actual Base (2016)				VDM Output Matrix (Base Plus 2016)			
		Actual Base*	Base Plus**	Diff	Diff%	Actual Base***	Base Plus****	Diff	Diff%
Time (PCU Hours)	AM	1,876,990	1,875,777	-1,213	-0.06%	1,876,990	1,876,376	-614	-0.03%
	IP	1,613,658	1,612,905	-753	-0.05%	1,613,658	1,613,324	-334	-0.02%
	PM	2,139,491	2,138,778	-713	-0.03%	2,139,491	2,139,211	-280	-0.01%
	OP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Distance (PCU KM)	AM	116,840,816	116,842,792	1,976	0.00%	116,840,816	116,893,048	52,232	0.04%
	IP	102,531,120	102,532,288	1,168	0.00%	102,531,120	102,575,528	44,408	0.04%
	PM	132,837,680	132,840,792	3,112	0.00%	132,837,680	132,894,304	56,624	0.04%
	OP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Average Speed (KM/Hr)	AM	62.25	62.29	0.04	0.07%	62	62	0.05	0.08%
	IP	63.54	63.57	0.03	0.05%	64	64	0.04	0.06%
	PM	62.09	62.11	0.02	0.04%	62	62	0.03	0.06%
	OP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

* These statistics are generated by assigning the actual base matrix to the actual base network

** These statistics are generated by assigning the actual base matrix to the Base Plus network

*** The VDM is not run for the actual base. These values are the same as the reference matrix

**** These statistics are generated from the final VDM loop for the Base Plus

6.3 LTAM 2026 Core DM and DS Forecasts

6.3.1 Section 4.2 describes how the reference matrices have been developed. Section 5.1 describes how the Do Minimum (DM) networks have been developed. Section 5.2 describes how the Do Something (DS) networks have been developed. The analysis presented below describes the impact that the VDM has on the reference matrices, assigned networks and some key network statistics.

VDM Convergence Statistics

6.3.2 Convergence statistics for the core 2026 forecasts are provided in Table 6.26 below for the Do Minimum and in Table 6.27 for the Do Something.

Matrix Totals – Reference Matrix Vs VDM Output Matrix

6.3.3 As described in Section 4.3 it is necessary to report the matrix totals in two ways, firstly using the 17 demand segments used in DIADEM and secondly using the 9 demand segments used in the highway assignment model.

6.3.4 Table 6.28 presents a comparison of the core 2026 reference matrices and VDM output matrices to the DIADEM 17 demand segment pattern. Table 6.29 presents a comparison between the core 2026 reference matrices and VDM output matrices to the SATURN 9 userclass pattern.

Table 6.26 – Convergence and Stability Statistics (Core 2026 DM)

Iteration			Cost stability				Flow stability				Totals
Main	Full Model Rel	Subset Area Rel	RAAD	AAD	RMS	%<5%	RAAD	AAD	RMS	%<5%	Trips*
1	11.67%	17.54%	0.000	0.000	0.000	0%	0.000	0.000	0.000	0%	77,592,279
2	5.48%	7.42%	0.007	0.358	0.692	99.24%	0.068	0.011	1.323	55.17%	77,712,775
3	2.67%	3.53%	0.001	0.059	0.119	99.99%	0.025	0.005	0.660	88.71%	77,774,422
4	1.32%	1.74%	0.000	0.021	0.060	100.00%	0.012	0.003	0.329	97.61%	77,805,354
5	0.66%	0.89%	0.000	0.016	0.064	100.00%	0.006	0.001	0.165	99.19%	77,820,856
6	0.34%	0.50%	0.000	0.017	0.064	100.00%	0.003	0.001	0.085	99.67%	77,828,695
7	0.17%	0.30%	0.000	0.018	0.068	99.99%	0.002	0.000	0.047	99.85%	77,832,565
8	0.10%	0.21%	0.000	0.017	0.069	100.00%	0.001	0.000	0.028	99.92%	77,834,557
9	0.05%	0.15%	0.000	0.017	0.062	100.00%	0.001	0.000	0.039	99.96%	77,835,413

* the trips column numbers only refer to those trips in the VDM that are considered variable. These totals therefore are not expected to match matrix totals reported elsewhere in this report

Table 6.27 – Convergence and Stability Statistics (Core 2026 DS)

Iteration			Cost stability				Flow stability				Totals
Main	Full Model Rel	Subset Area Rel	RAAD	AAD	RMS	%<5%	RAAD	AAD	RMS	%<5%	Trips*
1	11.69%	17.82%	0.000	0.000	0.000	0%	0.000	0.000	0.000	0%	77,592,279
2	5.50%	7.67%	0.004	0.206	0.474	99.68%	0.083	0.012	1.323	56.29%	77,713,590
3	2.68%	3.63%	0.001	0.046	0.127	99.98%	0.031	0.006	0.661	84.58%	77,775,536
4	1.33%	1.84%	0.000	0.024	0.130	99.96%	0.014	0.003	0.329	95.24%	77,806,631
5	0.66%	0.95%	0.000	0.018	0.137	99.96%	0.007	0.001	0.165	99.17%	77,822,105
6	0.34%	0.55%	0.000	0.018	0.144	99.96%	0.004	0.001	0.084	99.63%	77,829,955
7	0.17%	0.31%	0.000	0.015	0.139	99.96%	0.002	0.000	0.044	99.82%	77,833,876
8	0.09%	0.20%	0.000	0.012	0.051	99.99%	0.001	0.000	0.026	99.89%	77,835,781

* the trips column numbers only refer to those trips in the VDM that are considered variable. These totals therefore are not expected to match matrix totals reported elsewhere in this report

Table 6.28 – LTAM DIADEM Matrix Total Comparison – Reference Matrix Vs VDM Output Matrices (Core 2026 Reference DM and DS Highway Trips in PCU's)

Segment	Matrix Type	Time Period	Reference Matrix (Core 2026)	VDM Output Matrix (Core 2026 DM)			VDM Output Matrix (Core 2026 DS)		
			Matrix Total	Matrix Total	Diff to Reference	Diff %	Matrix Total	Diff to Reference	Diff %
HBEB	24Hr PA	N/A	2,742,676	2,741,805	-871	0.0%	2,741,844	-832	0.0%
HBW L	24Hr PA	N/A	2,387,511	2,381,628	-5,883	-0.2%	2,381,676	-5,835	-0.2%
HBW M	24Hr PA	N/A	4,226,886	4,220,310	-6,576	-0.2%	4,220,421	-6,465	-0.2%
HBW H	24Hr PA	N/A	3,309,467	3,302,845	-6,622	-0.2%	3,302,980	-6,487	-0.2%
HBO L	24Hr PA	N/A	7,237,377	7,267,553	30,176	0.4%	7,267,602	30,225	0.4%
HBO M	24Hr PA	N/A	6,255,929	6,274,933	19,004	0.3%	6,275,022	19,093	0.3%
HBO H	24Hr PA	N/A	4,392,035	4,397,465	5,430	0.1%	4,397,594	5,559	0.1%
NHBEB	By Time Period OD	AM	94,732	94,436	-297	-0.3%	94,495	-237	-0.3%
		IP	122,118	121,920	-198	-0.2%	121,908	-210	-0.2%
		PM	136,005	135,439	-566	-0.4%	135,456	-549	-0.4%
		OP	34,976	35,076	100	0.3%	35,069	93	0.3%
NHBO L	By Time Period OD	AM	136,349	136,659	311	0.2%	136,765	416	0.3%
		IP	360,959	362,010	1,050	0.3%	361,986	1,027	0.3%
		PM	285,019	285,028	10	0.0%	285,051	32	0.0%
		OP	102,339	103,102	764	0.7%	103,090	752	0.7%
NHBO M	By Time Period OD	AM	145,048	145,019	-29	0.0%	145,099	51	0.0%
		IP	288,620	289,313	693	0.2%	289,312	692	0.2%
		PM	286,480	286,396	-84	0.0%	286,405	-75	0.0%
		OP	81,807	82,423	617	0.8%	82,411	605	0.7%
NHBO H	By Time Period OD	AM	116,841	116,446	-395	-0.3%	116,523	-318	-0.3%
		IP	197,271	197,389	118	0.1%	197,377	106	0.1%
		PM	221,472	220,875	-597	-0.3%	220,940	-533	-0.2%
		OP	55,955	56,387	432	0.8%	56,369	414	0.7%
LGV	By Time Period OD	AM	950,818	950,818	0	0.0%	950,818	0	0.0%
		IP	820,243	820,243	0	0.0%	820,243	0	0.0%
		PM	685,879	685,879	0	0.0%	685,879	0	0.0%
		OP	329,431	329,431	0	0.0%	329,431	0	0.0%
HGV	By Time Period OD	AM	410,596	410,596	0	0.0%	410,596	0	0.0%
		IP	408,518	408,518	0	0.0%	408,518	0	0.0%
		PM	257,203	257,203	0	0.0%	257,203	0	0.0%

Segment	Matrix Type	Time Period	Reference Matrix (Core 2026)	VDM Output Matrix (Core 2026 DM)			VDM Output Matrix (Core 2026 DS)		
			Matrix Total	Matrix Total	Diff to Reference	Diff %	Matrix Total	Diff to Reference	Diff %
		OP	162,992	162,992	0	0.0%	162,992	0	0.0%
Port Trips EB	By Time Period OD	AM	5,151	5,151	0	0.0%	5,151	0	0.0%
		IP	3,613	3,613	0	0.0%	3,613	0	0.0%
		PM	4,485	4,485	0	0.0%	4,485	0	0.0%
		OP	1,394	1,394	0	0.0%	1,394	0	0.0%
Port Trips O LI	By Time Period OD	AM	2,999	2,999	0	0.0%	2,999	0	0.0%
		IP	3,713	3,713	0	0.0%	3,713	0	0.0%
		PM	3,653	3,653	0	0.0%	3,653	0	0.0%
		OP	1,457	1,457	0	0.0%	1,457	0	0.0%
Port Trips O MI	By Time Period OD	AM	3,509	3,509	0	0.0%	3,509	0	0.0%
		IP	3,926	3,926	0	0.0%	3,926	0	0.0%
		PM	4,283	4,283	0	0.0%	4,283	0	0.0%
		OP	1,539	1,539	0	0.0%	1,539	0	0.0%
Port Trips O HI	By Time Period OD	AM	4,953	4,953	0	0.0%	4,953	0	0.0%
		IP	4,162	4,162	0	0.0%	4,162	0	0.0%
		PM	5,462	5,462	0	0.0%	5,462	0	0.0%
		OP	1,630	1,630	0	0.0%	1,630	0	0.0%

Table 6.29 – LTAM SATURN Matrix Total Comparison – Reference Matrix Vs VDM Output Matrices (Core 2026 Reference DM and DS Hourly PCU's)

Userclass	Time Period	All Movements							Relevant Movements						
		Reference Matrix (Core 2026)	VDM Output Matrix (Core 2026 DM)			VDM Output Matrix (Core 2026 DS)			Reference Matrix (Core 2026)	VDM Output Matrix (Core 2026 DM)			VDM Output Matrix (Core 2026 DS)		
		Matrix Total	Matrix Total	Diff to Reference	Diff %	Matrix Total	Diff to Reference	Diff %	Matrix Total	Matrix Total	Diff to Reference	Diff %	Matrix Total	Diff to Reference	Diff %
Car Employers Business	AM	478,228	477,510	-718	-0.2%	477,622	-606	-0.1%	40,013	39,443	-570	-1.4%	39,576	-437	-1.1%
	IP	416,139	415,775	-363	-0.1%	415,757	-382	-0.1%	27,563	27,509	-55	-0.2%	27,506	-57	-0.2%
	PM	572,176	571,010	-1,166	-0.2%	571,054	-1,122	-0.2%	39,703	39,337	-366	-0.9%	39,402	-301	-0.8%
	OP	167,426	167,610	184	0.1%	167,597	170	0.1%	10,724	10,914	190	1.8%	10,899	175	1.6%
Car Commute Low Income	AM	441,669	439,637	-2,032	-0.5%	439,630	-2,039	-0.5%	31,747	31,431	-316	-1.0%	31,419	-327	-1.0%
	IP	200,575	200,245	-331	-0.2%	200,257	-318	-0.2%	17,664	17,564	-100	-0.6%	17,577	-87	-0.5%
	PM	505,309	503,840	-1,468	-0.3%	503,862	-1,447	-0.3%	33,508	33,179	-329	-1.0%	33,198	-310	-0.9%
	OP	80,715	80,670	-45	-0.1%	80,670	-45	-0.1%	6,914	6,929	15	0.2%	6,929	15	0.2%
Car Commute Medium Income	AM	893,398	890,638	-2,760	-0.3%	890,736	-2,662	-0.3%	68,146	67,369	-777	-1.1%	67,464	-682	-1.0%
	IP	308,145	307,816	-328	-0.1%	307,809	-336	-0.1%	26,967	26,817	-150	-0.6%	26,810	-157	-0.6%
	PM	968,919	967,470	-1,449	-0.1%	967,524	-1,395	-0.1%	66,645	65,892	-753	-1.1%	65,950	-695	-1.0%
	OP	124,042	124,034	-9	0.0%	124,024	-19	0.0%	10,622	10,648	26	0.2%	10,638	16	0.1%
Car Commute High Income	AM	760,561	758,503	-2,058	-0.3%	758,449	-2,112	-0.3%	65,200	64,358	-842	-1.3%	64,304	-896	-1.4%
	IP	219,633	219,179	-454	-0.2%	219,193	-440	-0.2%	23,018	22,865	-153	-0.7%	22,882	-136	-0.6%
	PM	784,000	782,467	-1,534	-0.2%	782,612	-1,389	-0.2%	65,170	64,247	-923	-1.4%	64,397	-772	-1.2%
	OP	88,345	88,262	-83	-0.1%	88,259	-87	-0.1%	9,085	9,103	18	0.2%	9,099	15	0.2%
Car Other Low Income	AM	716,838	718,997	2,158	0.3%	719,224	2,385	0.3%	74,065	72,708	-1,358	-1.8%	73,004	-1,061	-1.4%
	IP	1,272,277	1,276,642	4,365	0.3%	1,276,572	4,295	0.3%	102,334	101,910	-424	-0.4%	101,935	-398	-0.4%
	PM	1,241,095	1,243,820	2,725	0.2%	1,243,856	2,761	0.2%	108,891	107,262	-1,629	-1.5%	107,378	-1,513	-1.4%
	OP	512,597	515,691	3,094	0.6%	515,663	3,066	0.6%	40,617	41,340	723	1.8%	41,296	679	1.7%
Car Other Medium Income	AM	765,315	766,049	734	0.1%	766,198	884	0.1%	81,887	80,261	-1,626	-2.0%	80,479	-1,408	-1.7%
	IP	1,017,388	1,019,927	2,539	0.2%	1,019,921	2,533	0.2%	95,342	94,994	-348	-0.4%	95,070	-272	-0.3%
	PM	1,250,425	1,252,031	1,606	0.1%	1,252,037	1,612	0.1%	121,440	119,718	-1,722	-1.4%	119,807	-1,633	-1.3%
	OP	409,725	411,986	2,262	0.6%	411,964	2,239	0.5%	37,812	38,534	721	1.9%	38,500	687	1.8%
Car Other High Income	AM	613,673	612,598	-1,075	-0.2%	612,760	-913	-0.1%	77,740	75,854	-1,886	-2.4%	76,071	-1,669	-2.1%
	IP	684,773	685,266	493	0.1%	685,236	463	0.1%	78,011	77,471	-540	-0.7%	77,501	-510	-0.7%
	PM	949,289	948,480	-809	-0.1%	948,648	-642	-0.1%	109,047	107,130	-1,917	-1.8%	107,373	-1,674	-1.5%
	OP	275,668	276,983	1,314	0.5%	276,939	1,271	0.5%	31,041	31,612	571	1.8%	31,569	528	1.7%
Car Total	AM	4,669,682	4,663,931	-5,751	-0.1%	4,664,619	-5,063	-0.1%	438,797	431,424	-7,373	-1.7%	432,317	-6,480	-1.5%

Userclass	Time Period	All Movements							Relevant Movements						
		Reference Matrix (Core 2026)	VDM Output Matrix (Core 2026 DM)			VDM Output Matrix (Core 2026 DS)			Reference Matrix (Core 2026)	VDM Output Matrix (Core 2026 DM)			VDM Output Matrix (Core 2026 DS)		
	IP	4,118,929	4,124,850	5,920	0.1%	4,124,744	5,815	0.1%	370,899	369,129	-1,770	-0.5%	369,282	-1,618	-0.4%
	PM	6,271,213	6,269,117	-2,096	0.0%	6,269,591	-1,622	0.0%	544,404	536,765	-7,640	-1.4%	537,505	-6,899	-1.3%
	OP	1,658,518	1,665,235	6,717	0.4%	1,665,115	6,597	0.4%	146,815	149,080	2,265	1.5%	148,930	2,115	1.4%
LGV	AM	950,818	950,818	0	0.0%	950,818	0	0.0%	113,770	113,770	0	0.0%	113,770	0	0.0%
	IP	820,243	820,243	0	0.0%	820,243	0	0.0%	86,087	86,087	0	0.0%	86,087	0	0.0%
	PM	685,879	685,879	0	0.0%	685,879	0	0.0%	88,562	88,562	0	0.0%	88,562	0	0.0%
	OP	329,431	329,431	0	0.0%	329,431	0	0.0%	33,240	33,240	0	0.0%	33,240	0	0.0%
HGV	AM	410,596	410,596	0	0.0%	410,596	0	0.0%	61,952	61,952	0	0.0%	61,952	0	0.0%
	IP	408,518	408,518	0	0.0%	408,518	0	0.0%	63,892	63,892	0	0.0%	63,892	0	0.0%
	PM	257,203	257,203	0	0.0%	257,203	0	0.0%	38,670	38,670	0	0.0%	38,670	0	0.0%
	OP	162,992	162,992	0	0.0%	162,992	0	0.0%	24,274	24,274	0	0.0%	24,274	0	0.0%

Assignments – Reference Matrix Vs VDM Output Matrix

6.3.5 Figure 6.4 to Figure 6.6 provide a flow difference comparison between the reference matrix assignment and the VDM output assignment for the DM scenario for each time period. Figure 6.7 to Figure 6.9 provide a flow difference comparison between the reference matrix assignment and the VDM output assignment for the DS scenario for each time period. Blue colours show reductions in traffic, green colours show increases in traffic.

Figure 6.4 – Assigned Flow Differences – Reference Matrix Vs VDM Output Matrix (Core 2026 Reference Vs 2026 DM AM Peak)

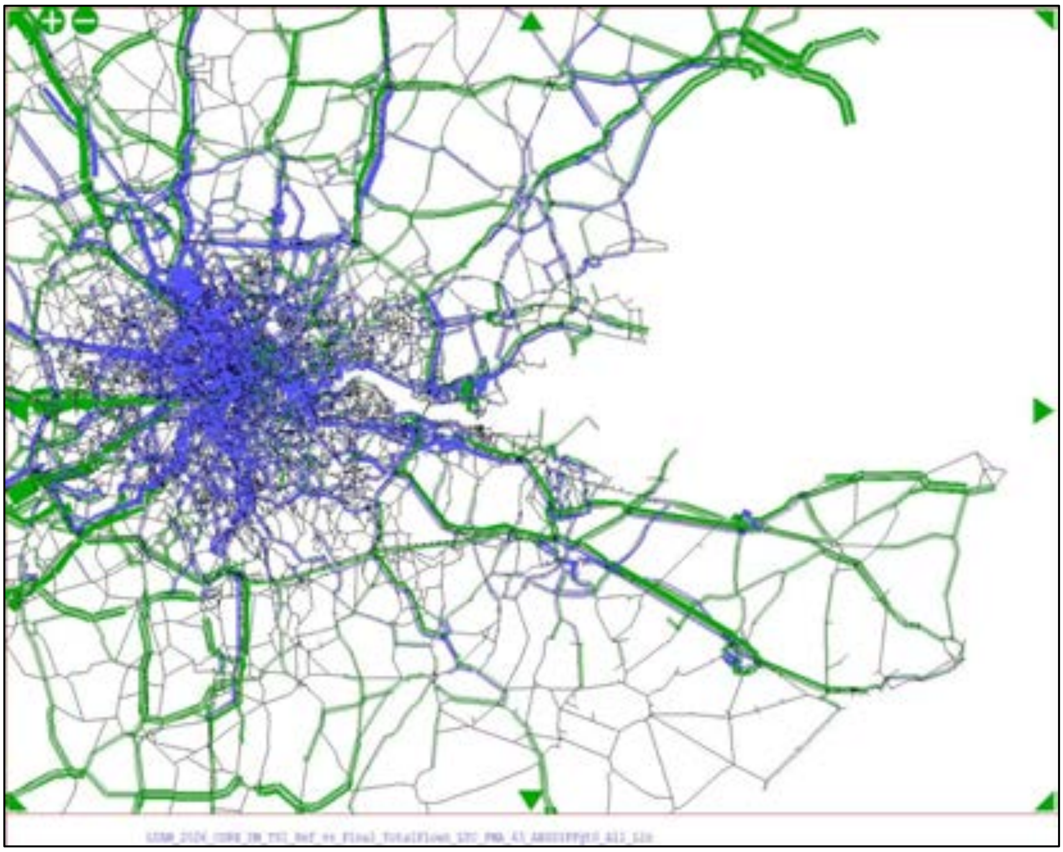


Figure 6.5 – Assigned Flow Differences – Reference Matrix Vs VDM Output Matrix (Core 2026 Reference Vs 2026 DM Inter Peak)

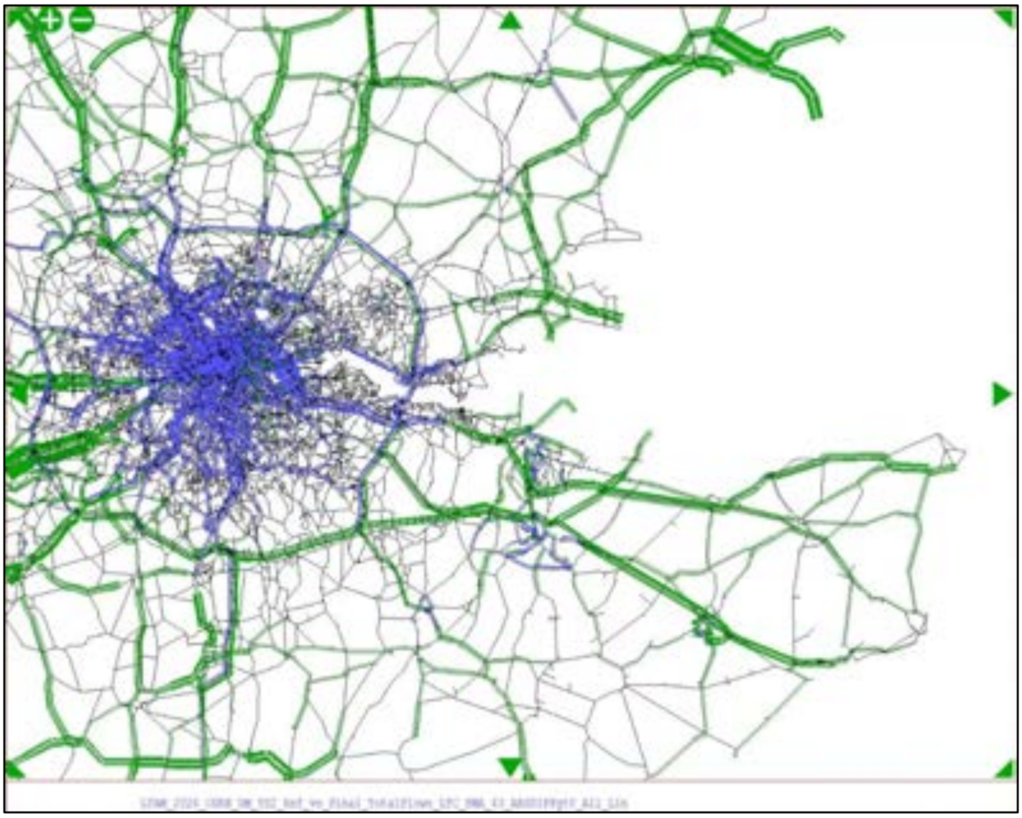


Figure 6.6 – Assigned Flow Differences – Reference Matrix Vs VDM Output Matrix (Core 2026 Reference Vs 2026 DM PM Peak)

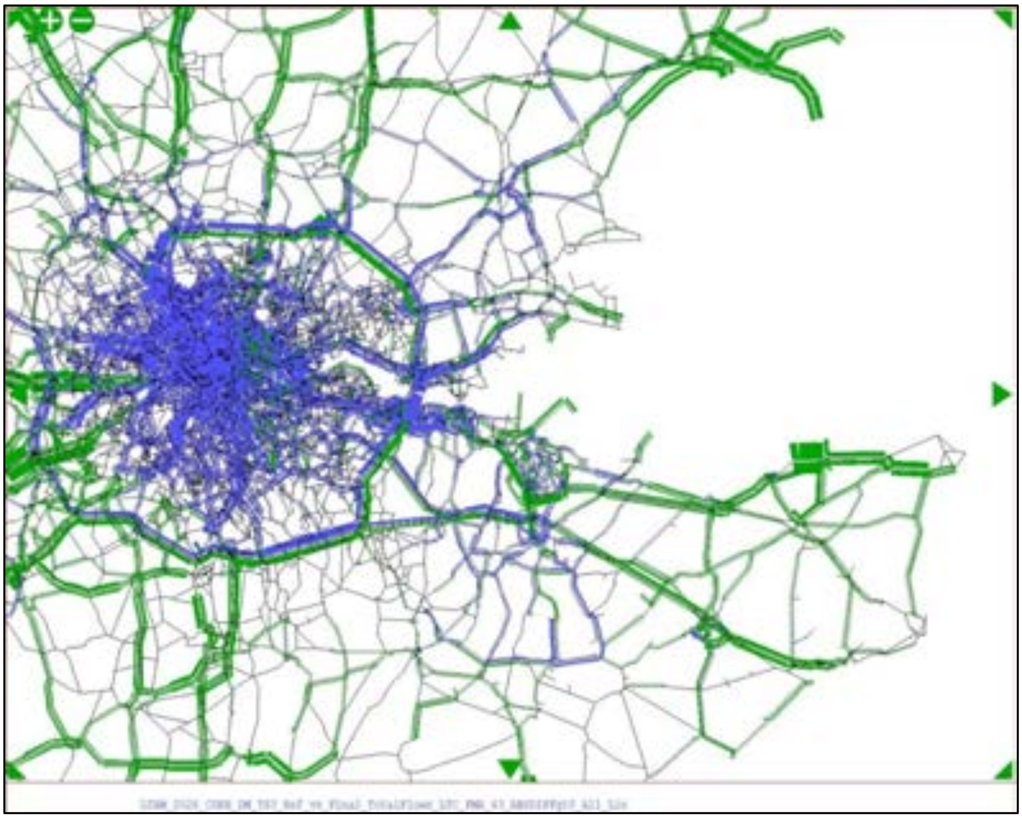


Figure 6.7 – Assigned Flow Differences – Reference Matrix Vs VDM Output Matrix (Core 2026 Reference Vs 2026 DS AM Peak)

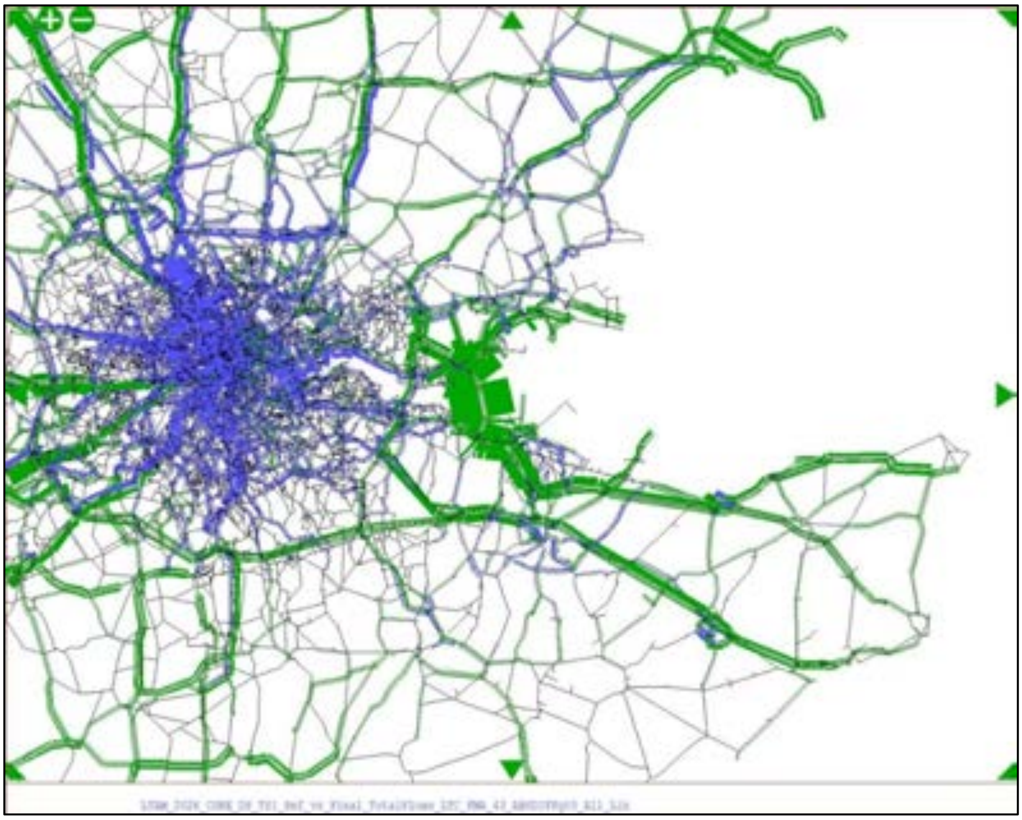


Figure 6.8 – Assigned Flow Differences – Reference Matrix Vs VDM Output Matrix (Core 2026 Reference Vs 2026 DS Inter Peak)

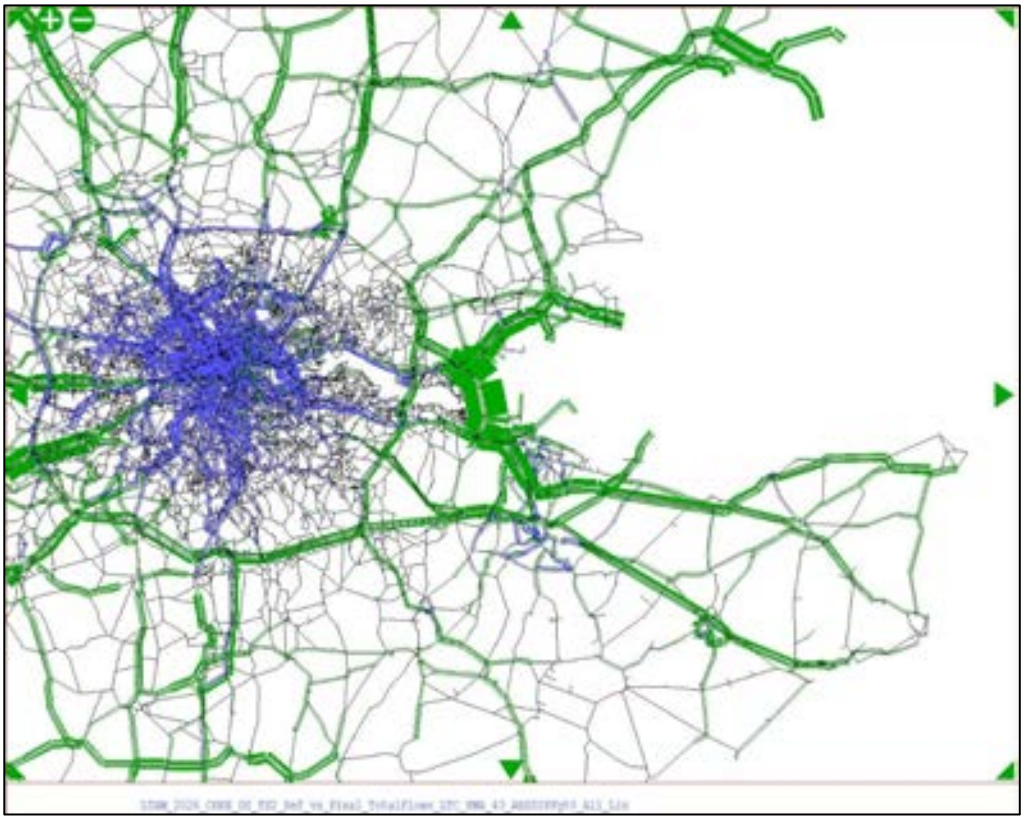
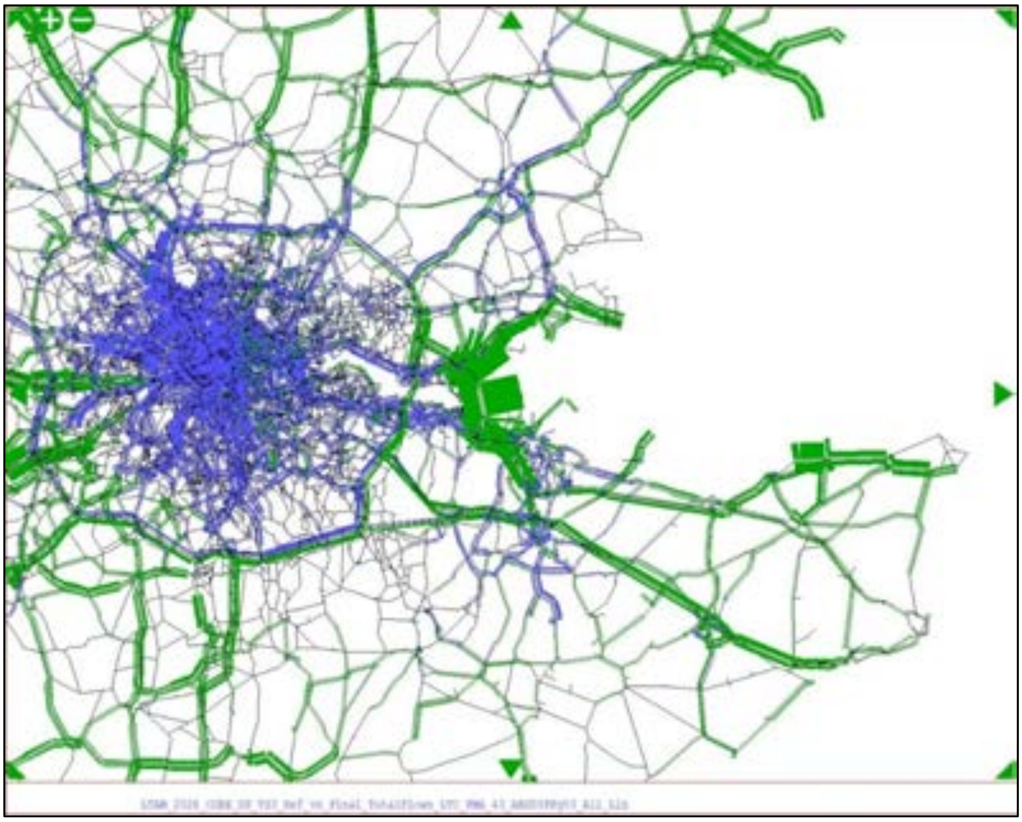


Figure 6.9 – Assigned Flow Differences – Reference Matrix Vs VDM Output Matrix (Core 2026 Reference Vs 2026 DS PM Peak)



Key Statistics – Reference Matrix Vs VDM Output Matrix

6.3.6 Table 6.30 provides some key network statistics from the reference matrix assignments and the VDM output matrix assignments.

Table 6.30 – Key Network Statistics – Reference Matrix Vs VDM Output Matrix (Core 2026)

Metric	Time Period	Reference Matrix (Core 2026)				VDM Output Matrix (Core 2026)			
		DM*	DS**	Diff	Diff%	DM***	DS****	Diff	Diff%
Time (PCU Hours)	AM	2,116,651	2,113,209	-3,442	-0.16%	2,184,488	2,184,324	-164	-0.01%
	IP	1,815,599	1,814,244	-1,355	-0.07%	1,899,059	1,898,513	-546	-0.03%
	PM	2,377,398	2,373,931	-3,466	-0.15%	2,479,437	2,479,131	-307	-0.01%
	OP	715,489	715,363	-127	-0.02%	753,511	753,358	-153	-0.02%
Distance (PCU KM)	AM	130,227,008	130,186,720	-40,288	-0.03%	135,750,736	135,850,688	99,952	0.07%
	IP	114,596,104	114,568,208	-27,896	-0.02%	120,629,976	120,663,968	33,992	0.03%
	PM	146,051,824	146,024,336	-27,488	-0.02%	153,878,448	153,970,048	91,600	0.06%
	OP	45,807,944	45,797,192	-10,752	-0.02%	48,470,536	48,464,384	-6,152	-0.01%
Average Speed (KM/Hr)	AM	61.53	61.61	0.08	0.13%	62.14	62.19	0.05	0.08%
	IP	63.12	63.15	0.03	0.05%	63.52	63.56	0.04	0.06%
	PM	61.43	61.51	0.08	0.13%	62.06	62.11	0.04	0.07%
	OP	64.02	64.02	-0.00	-0.01%	64.33	64.33	0.00	0.01%

* These statistics are generated by assigning the reference matrix to the DM network

** These statistics are generated by assigning the reference matrix to the DS network

*** These statistics are generated from the final VDM loop for the DM

**** These statistics are generated from the final VDM loop for the DS

Commentary on Results

6.3.7 Table 6.26 and Table 6.27 demonstrate that the VDM runs for the Do Minimum and Do Something scenarios have converged within 9 and 8 iterations respectively.

6.3.8 From an all movement perspective the VDM generally reduces the number of employers business and commuting trips and increases the number of other purpose trips, in both the Do Minimum and Do Something scenarios, as demonstrated in Table 6.28 and Table 6.29. When the irrelevant movements are removed from the analysis we actually see a general reduction in trips across all journey purposes. There is a switch away from the peak periods to the off peak.

6.3.9 These matrix sensitivities are as would be expected and are due to increases in the levels of congestion on the road network leading to reductions in the number of highway trips. As would also be expected, the reductions in trips are slightly higher in the Do Minimum than they are in the Do Something scenario. This is due to the increased capacity of the network in the Do Something, in particular, associated with Thames river crossings.

6.3.10 These changes in the matrices are supported by the flow difference analysis. As can be seen in the Do Minimum there is a general decrease in flow along the M25 in the Dartford Crossing corridor when compared to the reference matrix assignments. This is consistent across the time periods. In the Do Something there is generally an increase in flow along this corridor as a result of destination switching where more trips are able to cross the river in the Do Something due to the introduction of LTC.

6.3.11 The reference matrix assignments do not take account of this switching, leading to lower flow over Dartford (as the reference demand has the choice of using either Dartford or LTC), therefore in the with LTC scenario there is spare capacity to cross the river. The VDM will switch trips that currently do not cross the river to crossing the river in order to take advantage of this spare capacity. Much of this cross river demand is suppressed in the reference case due to the lack of available capacity. There is a general reduction in flow throughout London which is due to the lack of spare capacity in the highway network to accommodate the levels of growth.

6.3.12 The overall network statistics comparison shows that in the reference case assignments there is a relatively large reduction in both journey time and distance travelled in absolute terms between the Do Minimum and Do Something scenarios. It is a very small relative decrease. As would be expected, the post VDM statistics show a substantial reduction in the amount of travel time savings and a switch to an overall increase in distance travelled. Again, this is as expected due to the VDM shifting movements to take account of the increases in capacity, leading to less overall travel time savings and slightly longer distance journeys.

6.3.13 The average speed over the entire network is very slightly higher in the Do Something than in the Do Minimum in the AM, IP and PM peaks. There is essentially no difference in the off peak.

6.4 LTAM 2031 Core DM and DS Forecasts

6.4.1 Section 4.2 describes how the reference matrices have been developed. Section 5.1 describes how the Do Minimum (DM) networks have been developed. Section 5.2 describes how the Do Something (DS) networks have been developed. The analysis presented below describes the impact that the VDM has on the reference matrices, assigned networks and some key network statistics.

VDM Convergence Statistics

6.4.2 Convergence statistics for the core 2031 forecasts are provided in Table 6.31 below for the Do Minimum and in Table 6.32 for the Do Something.

Matrix Totals – Reference Matrix Vs VDM Output Matrix

6.4.3 As described in Section 4.3 it is necessary to report the matrix totals in two ways, firstly using the 17 demand segments used in DIADEM and secondly using the 9 demand segments used in the highway assignment model.

6.4.4 Table 6.33 presents a comparison of the core 2031 reference matrices and VDM output matrices to the DIADEM 17 demand segment pattern. Table 6.34 presents a comparison between the core 2031 reference matrices and VDM output matrices to the SATURN 9 userclass pattern.

Table 6.31 – Convergence and Stability Statistics (Core 2031 DM)

Iteration			Cost stability				Flow stability				Totals
Main	Full Model Rel	Subset Area Rel	RAAD	AAD	RMS	%<5%	RAAD	AAD	RMS	%<5%	Trips*
1	29.97%	46.24%	0.000	0.000	0.000	0%	0.000	0.000	0.000	0%	81,434,388
2	13.14%	18.52%	0.009	0.501	0.970	97.42%	0.162	0.021	2.444	40.77%	81,675,081
3	6.20%	8.49%	0.002	0.100	0.207	99.96%	0.037	0.010	1.219	77.58%	81,797,667
4	3.02%	4.10%	0.001	0.037	0.112	99.97%	0.018	0.005	0.610	95.36%	81,859,335
5	1.50%	2.12%	0.001	0.030	0.283	99.93%	0.010	0.002	0.305	98.54%	81,890,176
6	0.75%	1.14%	0.001	0.032	0.319	99.90%	0.006	0.001	0.153	99.07%	81,905,554
7	0.38%	0.62%	0.000	0.025	0.091	99.99%	0.004	0.001	0.077	99.35%	81,913,331
8	0.20%	0.39%	0.001	0.027	0.165	99.95%	0.002	0.000	0.046	99.55%	81,917,157
9	0.11%	0.26%	0.001	0.026	0.104	99.98%	0.002	0.000	0.022	99.73%	81,919,153
10	0.07%	0.22%	0.001	0.031	0.156	99.95%	0.001	0.000	0.013	99.81%	81,920,122
11	0.04%	0.19%	0.001	0.033	0.162	99.95%	0.002	0.000	0.030	99.81%	81,920,518

* the trips column numbers only refer to those trips in the VDM that are considered variable. These totals therefore are not expected to match matrix totals reported elsewhere in this report

Table 6.32 – Convergence and Stability Statistics (Core 2031 DS)

Iteration			Cost stability				Flow stability				Totals
Main	Full Model Rel	Subset Area Rel	RAAD	AAD	RMS	%<5%	RAAD	AAD	RMS	%<5%	Trips*
1	29.99%	46.54%	0.000	0.000	0.000	0%	0.000	0.000	0.000	0%	81,434,388
2	13.16%	18.71%	0.006	0.310	0.697	98.86%	0.179	0.021	2.442	41.36%	81,676,260
3	6.22%	8.65%	0.001	0.069	0.206	99.92%	0.042	0.010	1.220	74.08%	81,799,027
4	3.03%	4.17%	0.001	0.033	0.125	99.96%	0.020	0.005	0.610	92.70%	81,860,706
5	1.49%	2.07%	0.000	0.024	0.087	99.99%	0.011	0.003	0.306	98.49%	81,891,638
6	0.75%	1.06%	0.000	0.020	0.083	99.99%	0.006	0.001	0.152	99.17%	81,907,152
7	0.38%	0.57%	0.000	0.020	0.092	99.99%	0.003	0.001	0.076	99.45%	81,914,885
8	0.20%	0.32%	0.000	0.014	0.062	100.00%	0.002	0.000	0.039	99.61%	81,918,756
9	0.11%	0.23%	0.000	0.017	0.075	99.99%	0.001	0.000	0.073	99.80%	81,920,490
10	0.06%	0.18%	0.000	0.022	0.090	99.99%	0.001	0.000	0.046	99.84%	81,921,570

* the trips column numbers only refer to those trips in the VDM that are considered variable. These totals therefore are not expected to match matrix totals reported elsewhere in this report

Table 6.33 – LTAM DIADEM Matrix Total Comparison – Reference Matrix Vs VDM Output Matrices (Core 2031 Reference DM and DS Highway Trips in PCU's)

Segment	Matrix Type	Time Period	Reference Matrix (Core 2031)	VDM Output Matrix (Core 2031 DM)			VDM Output Matrix (Core 2031 DS)		
			Matrix Total	Matrix Total	Diff to Reference	Diff %	Matrix Total	Diff to Reference	Diff %
HBEB	24Hr PA	N/A	2,868,171	2,867,287	-885	0.0%	2,867,322	-849	0.0%
HBW L	24Hr PA	N/A	2,478,103	2,468,714	-9,389	-0.4%	2,468,742	-9,361	-0.4%
HBW M	24Hr PA	N/A	4,384,869	4,374,810	-10,059	-0.2%	4,374,900	-9,969	-0.2%
HBW H	24Hr PA	N/A	3,433,623	3,423,899	-9,724	-0.3%	3,424,012	-9,611	-0.3%
HBO L	24Hr PA	N/A	7,701,292	7,706,765	5,472	0.1%	7,706,964	5,672	0.1%
HBO M	24Hr PA	N/A	6,660,955	6,683,791	22,836	0.3%	6,683,957	23,002	0.3%
HBO H	24Hr PA	N/A	4,686,625	4,693,809	7,185	0.2%	4,693,977	7,352	0.2%
NHBEB	By Time Period OD	AM	97,064	96,796	-269	-0.3%	96,846	-219	-0.2%
		IP	125,145	124,881	-263	-0.2%	124,873	-272	-0.2%
		PM	139,359	138,513	-846	-0.6%	138,532	-827	-0.6%
		OP	35,839	35,999	161	0.4%	35,991	152	0.4%
NHBO L	By Time Period OD	AM	141,189	141,748	559	0.4%	141,857	668	0.5%
		IP	373,849	375,222	1,374	0.4%	375,218	1,369	0.4%
		PM	295,208	294,970	-238	-0.1%	295,007	-201	-0.1%
		OP	105,959	107,022	1,063	1.0%	107,002	1,043	1.0%
NHBO M	By Time Period OD	AM	150,245	150,236	-9	0.0%	150,309	64	0.0%
		IP	299,036	299,834	798	0.3%	299,853	817	0.3%
		PM	296,797	296,166	-631	-0.2%	296,185	-612	-0.2%
		OP	84,732	85,553	821	1.0%	85,534	803	0.9%
NHBO H	By Time Period OD	AM	121,124	120,636	-487	-0.4%	120,703	-421	-0.3%
		IP	204,586	204,681	95	0.0%	204,681	95	0.0%
		PM	229,665	228,536	-1,129	-0.5%	228,608	-1,057	-0.5%
		OP	58,010	58,596	586	1.0%	58,575	565	1.0%
LGV	By Time Period OD	AM	1,044,988	1,044,988	0	0.0%	1,044,988	0	0.0%
		IP	901,598	901,598	0	0.0%	901,598	0	0.0%
		PM	754,014	754,014	0	0.0%	754,014	0	0.0%
		OP	361,903	361,903	0	0.0%	361,903	0	0.0%
HGV	By Time Period OD	AM	426,603	426,603	0	0.0%	426,603	0	0.0%
		IP	424,378	424,378	0	0.0%	424,378	0	0.0%
		PM	267,136	267,136	0	0.0%	267,136	0	0.0%
		OP	169,277	169,277	0	0.0%	169,277	0	0.0%
Port Trips EB	By Time Period OD	AM	5,258	5,258	0	0.0%	5,258	0	0.0%
		IP	3,690	3,690	0	0.0%	3,690	0	0.0%
		PM	4,580	4,580	0	0.0%	4,580	0	0.0%

Segment	Matrix Type	Time Period	Reference Matrix (Core 2031)	VDM Output Matrix (Core 2031 DM)			VDM Output Matrix (Core 2031 DS)		
			Matrix Total	Matrix Total	Diff to Reference	Diff %	Matrix Total	Diff to Reference	Diff %
		OP	1,423	1,423	0	0.0%	1,423	0	0.0%
Port Trips O LI	By Time Period OD	AM	3,066	3,066	0	0.0%	3,066	0	0.0%
		IP	3,792	3,792	0	0.0%	3,792	0	0.0%
		PM	3,734	3,734	0	0.0%	3,734	0	0.0%
		OP	1,487	1,487	0	0.0%	1,487	0	0.0%
Port Trips O MI	By Time Period OD	AM	3,586	3,586	0	0.0%	3,586	0	0.0%
		IP	4,009	4,009	0	0.0%	4,009	0	0.0%
		PM	4,377	4,377	0	0.0%	4,377	0	0.0%
		OP	1,571	1,571	0	0.0%	1,571	0	0.0%
Port Trips O HI	By Time Period OD	AM	5,060	5,060	0	0.0%	5,060	0	0.0%
		IP	4,250	4,250	0	0.0%	4,250	0	0.0%
		PM	5,579	5,579	0	0.0%	5,579	0	0.0%
		OP	1,663	1,663	0	0.0%	1,663	0	0.0%

Table 6.34 – LTAM SATURN Matrix Total Comparison – Reference Matrix Vs VDM Output Matrices (Core 2031 Reference DM and DS)

Userclass	Time Period	All Movements							Relevant Movements						
		Reference Matrix (Core 2031)	VDM Output Matrix (Core 2031 DM)			VDM Output Matrix (Core 2031 DS)			Reference Matrix (Core 2031)	VDM Output Matrix (Core 2031 DM)			VDM Output Matrix (Core 2031 DS)		
		Matrix Total	Matrix Total	Diff to Reference	Diff %	Matrix Total	Diff to Reference	Diff %	Matrix Total	Matrix Total	Diff to Reference	Diff %	Matrix Total	Diff to Reference	Diff %
Car Employers Business	AM	497,442	496,876	-566	-0.1%	496,961	-480	-0.1%	41,534	40,951	-582	-1.4%	41,057	-476	-1.1%
	IP	432,513	431,994	-519	-0.1%	431,981	-532	-0.1%	28,659	28,608	-52	-0.2%	28,612	-47	-0.2%
	PM	595,029	593,204	-1,826	-0.3%	593,250	-1,779	-0.3%	41,283	40,675	-608	-1.5%	40,746	-538	-1.3%
	OP	174,309	174,601	293	0.2%	174,585	276	0.2%	11,151	11,484	333	3.0%	11,467	316	2.8%
Car Commute Low Income	AM	458,294	454,826	-3,468	-0.8%	454,807	-3,487	-0.8%	32,928	32,461	-467	-1.4%	32,439	-489	-1.5%
	IP	208,291	207,834	-457	-0.2%	207,849	-442	-0.2%	18,392	18,273	-119	-0.6%	18,289	-103	-0.6%
	PM	524,344	521,966	-2,378	-0.5%	521,985	-2,359	-0.4%	34,858	34,357	-501	-1.4%	34,379	-479	-1.4%
	OP	83,772	83,731	-41	0.0%	83,731	-41	0.0%	7,153	7,194	41	0.6%	7,194	41	0.6%
Car Commute Medium Income	AM	926,496	921,929	-4,567	-0.5%	922,028	-4,468	-0.5%	70,564	69,399	-1,165	-1.7%	69,497	-1,067	-1.5%
	IP	319,869	319,447	-422	-0.1%	319,439	-431	-0.1%	28,115	27,927	-188	-0.7%	27,919	-196	-0.7%
	PM	1,005,004	1,002,744	-2,260	-0.2%	1,002,798	-2,206	-0.2%	69,262	68,076	-1,186	-1.7%	68,135	-1,127	-1.6%
	OP	128,647	128,679	32	0.0%	128,666	19	0.0%	10,993	11,060	67	0.6%	11,047	54	0.5%
Car Commute High Income	AM	788,926	785,697	-3,229	-0.4%	785,615	-3,310	-0.4%	67,455	66,221	-1,234	-1.8%	66,143	-1,312	-1.9%
	IP	227,967	227,341	-626	-0.3%	227,357	-610	-0.3%	23,952	23,742	-210	-0.9%	23,760	-191	-0.8%
	PM	813,285	810,999	-2,286	-0.3%	811,160	-2,125	-0.3%	67,685	66,265	-1,419	-2.1%	66,436	-1,249	-1.8%
	OP	91,650	91,557	-94	-0.1%	91,551	-99	-0.1%	9,415	9,460	45	0.5%	9,454	39	0.4%
Car Other Low Income	AM	758,566	759,176	609	0.1%	759,409	843	0.1%	79,342	76,597	-2,745	-3.5%	76,883	-2,458	-3.1%
	IP	1,343,274	1,344,901	1,627	0.1%	1,344,886	1,612	0.1%	109,591	107,454	-2,136	-1.9%	107,509	-2,082	-1.9%
	PM	1,312,013	1,310,109	-1,904	-0.1%	1,310,199	-1,814	-0.1%	116,758	112,114	-4,644	-4.0%	112,273	-4,485	-3.8%
	OP	542,253	544,614	2,361	0.4%	544,565	2,312	0.4%	43,527	44,082	555	1.3%	44,023	496	1.1%
Car Other Medium Income	AM	810,183	811,109	926	0.1%	811,221	1,038	0.1%	87,704	85,238	-2,466	-2.8%	85,403	-2,301	-2.6%
	IP	1,074,694	1,077,630	2,936	0.3%	1,077,673	2,979	0.3%	102,046	101,197	-848	-0.8%	101,313	-733	-0.7%
	PM	1,322,426	1,323,071	645	0.0%	1,323,116	689	0.1%	130,170	126,553	-3,618	-2.8%	126,675	-3,495	-2.7%
	OP	433,654	436,662	3,009	0.7%	436,624	2,970	0.7%	40,503	41,625	1,123	2.8%	41,581	1,078	2.7%
Car Other High Income	AM	650,522	649,223	-1,299	-0.2%	649,344	-1,179	-0.2%	83,252	80,554	-2,698	-3.2%	80,731	-2,521	-3.0%
	IP	724,467	725,000	533	0.1%	724,994	527	0.1%	83,471	82,578	-892	-1.1%	82,630	-840	-1.0%
	PM	1,005,631	1,003,799	-1,831	-0.2%	1,003,995	-1,636	-0.2%	116,891	113,464	-3,428	-2.9%	113,750	-3,142	-2.7%
	OP	292,283	294,134	1,851	0.6%	294,082	1,799	0.6%	33,263	34,226	963	2.9%	34,174	911	2.7%
Car Total	AM	4,890,429	4,878,835	-11,594	-0.2%	4,879,385	-11,044	-0.2%	462,778	451,421	-11,357	-2.5%	452,154	-10,624	-2.3%
	IP	4,331,075	4,334,147	3,072	0.1%	4,334,179	3,104	0.1%	394,225	389,779	-4,446	-1.1%	390,033	-4,193	-1.1%

Userclass	Time Period	All Movements							Relevant Movements						
		Reference Matrix (Core 2031)	VDM Output Matrix (Core 2031 DM)			VDM Output Matrix (Core 2031 DS)			Reference Matrix (Core 2031)	VDM Output Matrix (Core 2031 DM)			VDM Output Matrix (Core 2031 DS)		
	PM	6,577,732	6,565,892	-11,841	-0.2%	6,566,503	-11,229	-0.2%	576,908	561,503	-15,405	-2.7%	562,393	-14,515	-2.5%
	OP	1,746,568	1,753,978	7,409	0.4%	1,753,804	7,236	0.4%	156,005	159,131	3,126	2.0%	158,939	2,934	1.9%
LGV	AM	1,044,988	1,044,988	0	0.0%	1,044,988	0	0.0%	125,357	125,357	0	0.0%	125,357	0	0.0%
	IP	901,598	901,598	0	0.0%	901,598	0	0.0%	95,018	95,018	0	0.0%	95,018	0	0.0%
	PM	754,014	754,014	0	0.0%	754,014	0	0.0%	97,752	97,752	0	0.0%	97,752	0	0.0%
	OP	361,903	361,903	0	0.0%	361,903	0	0.0%	36,489	36,489	0	0.0%	36,489	0	0.0%
HGV	AM	426,603	426,603	0	0.0%	426,603	0	0.0%	64,706	64,706	0	0.0%	64,706	0	0.0%
	IP	424,378	424,378	0	0.0%	424,378	0	0.0%	66,722	66,722	0	0.0%	66,722	0	0.0%
	PM	267,136	267,136	0	0.0%	267,136	0	0.0%	40,311	40,311	0	0.0%	40,311	0	0.0%
	OP	169,277	169,277	0	0.0%	169,277	0	0.0%	25,309	25,309	0	0.0%	25,309	0	0.0%

Assignments – Reference Matrix Vs VDM Output Matrix

6.4.5 Figure 6.10 to Figure 6.12 provide a flow difference comparison between the reference matrix assignment and the VDM output assignment for the DM scenario for each time period. Figure 6.13 to Figure 6.15 provide a flow difference comparison between the reference matrix assignment and the VDM output assignment for the DS scenario for each time period. Blue colours show reductions in traffic, green colours show increases in traffic.

Figure 6.10 – Assigned Flow Differences – Reference Matrix Vs VDM Output Matrix (Core 2031 Reference Vs 2031 DM AM Peak)

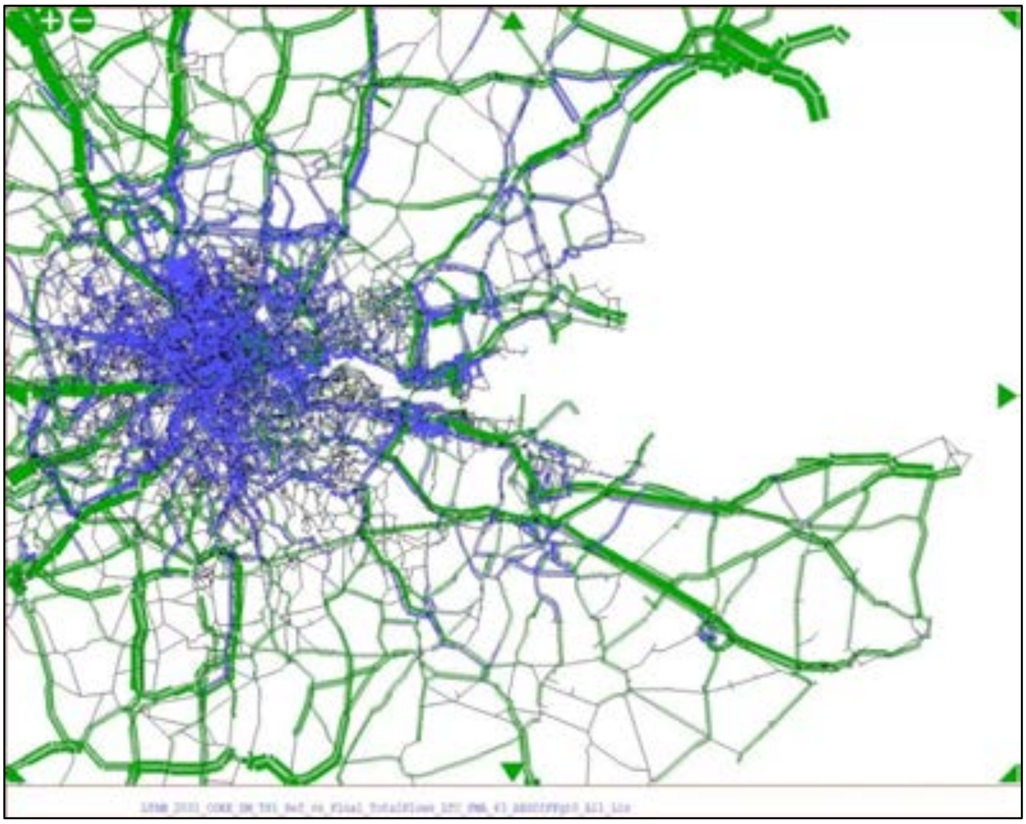


Figure 6.11 – Assigned Flow Differences – Reference Matrix Vs VDM Output Matrix (Core 2031 Reference Vs 2031 DM Inter Peak)

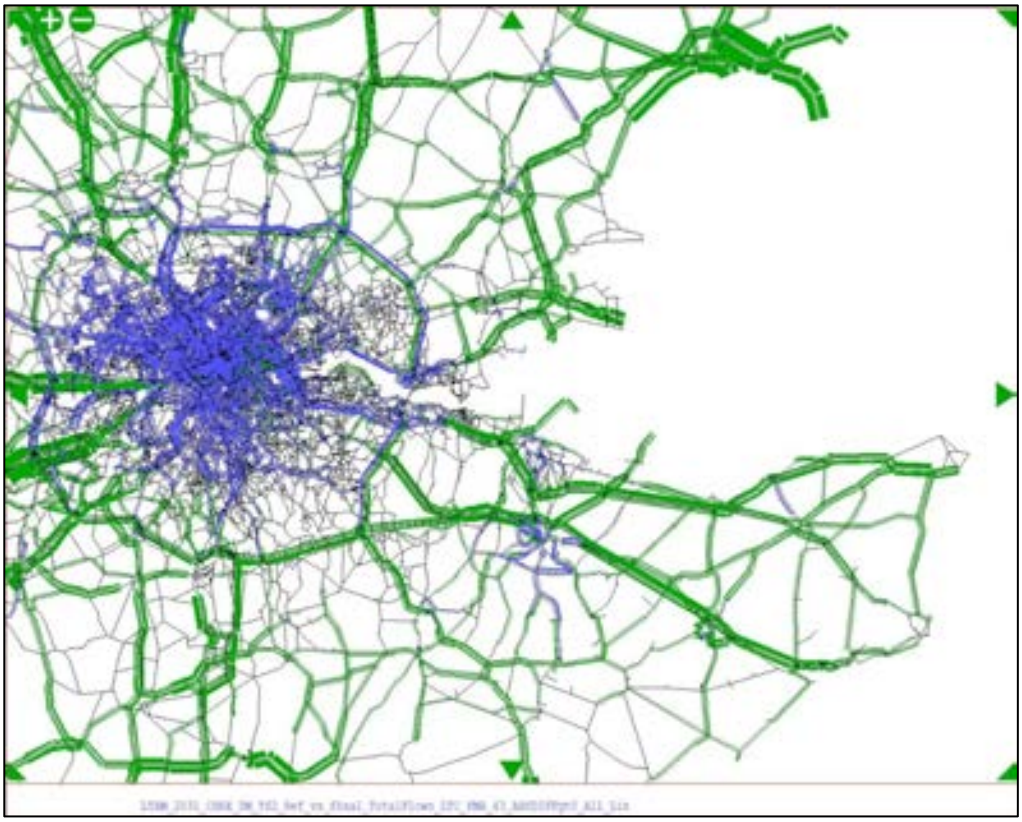


Figure 6.12 – Assigned Flow Differences – Reference Matrix Vs VDM Output Matrix (Core 2031 Reference Vs 2031 DM PM Peak)

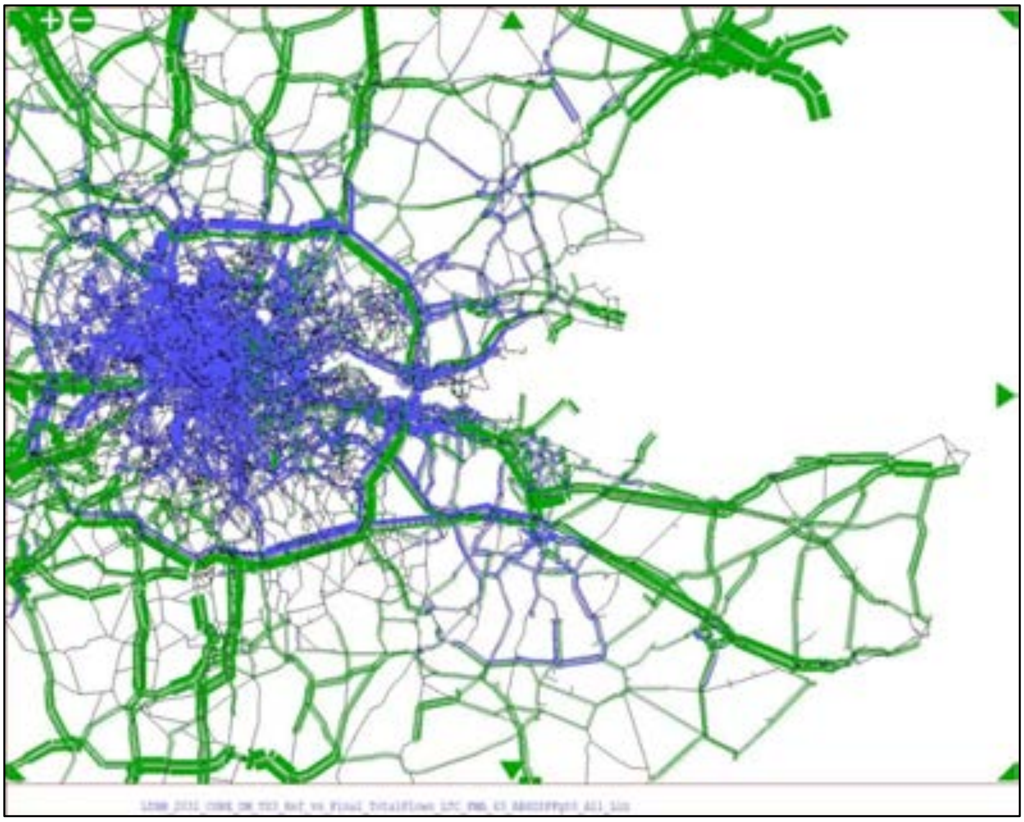


Figure 6.13 – Assigned Flow Differences – Reference Matrix Vs VDM Output Matrix (Core 2031 Reference Vs 2031 DS AM Peak)

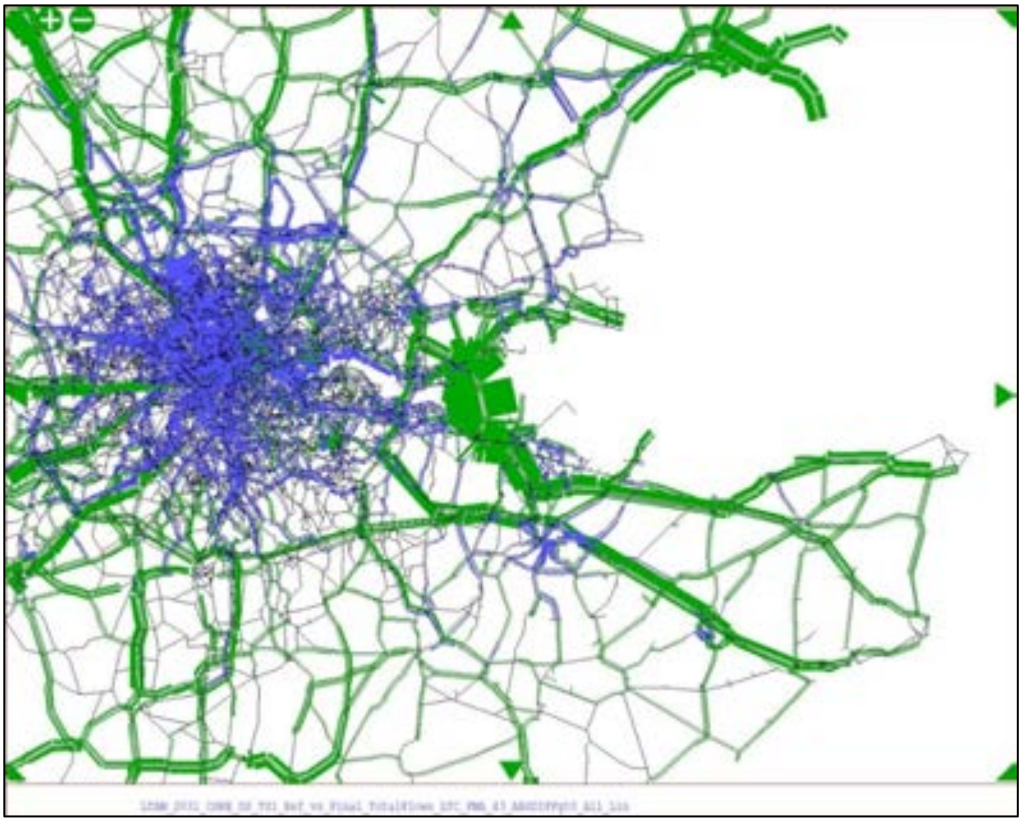


Figure 6.14 – Assigned Flow Differences – Reference Matrix Vs VDM Output Matrix (Core 2031 Reference Vs 2031 DS Inter Peak)

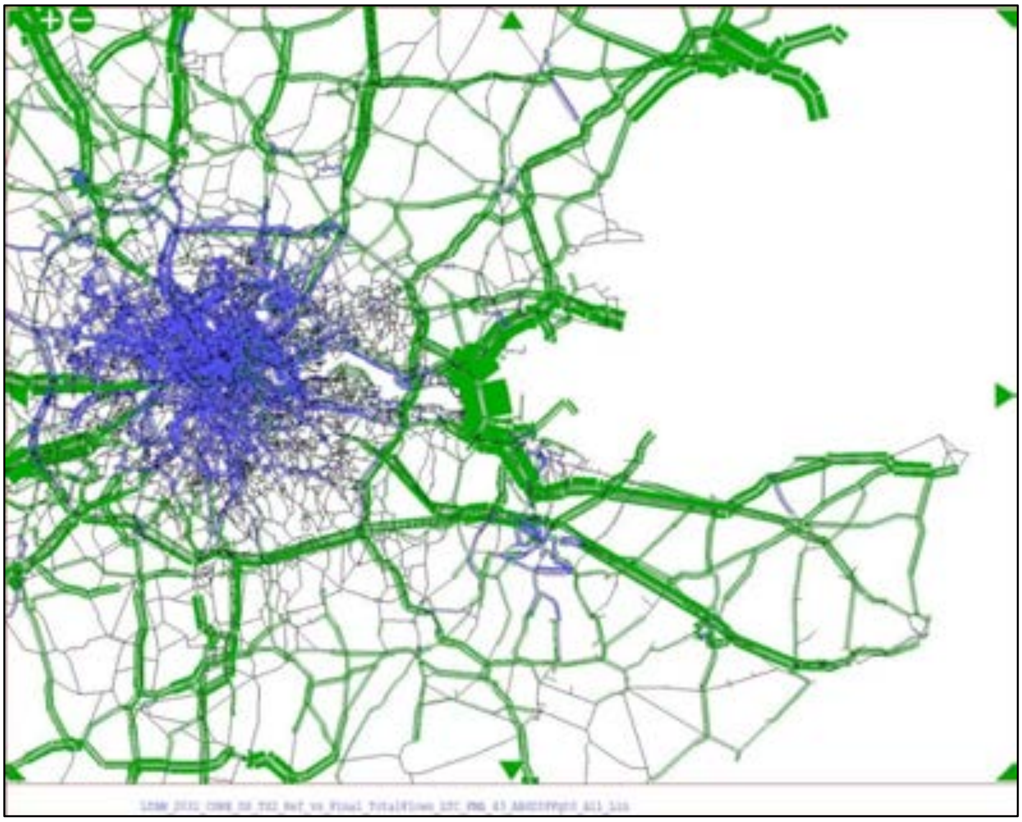
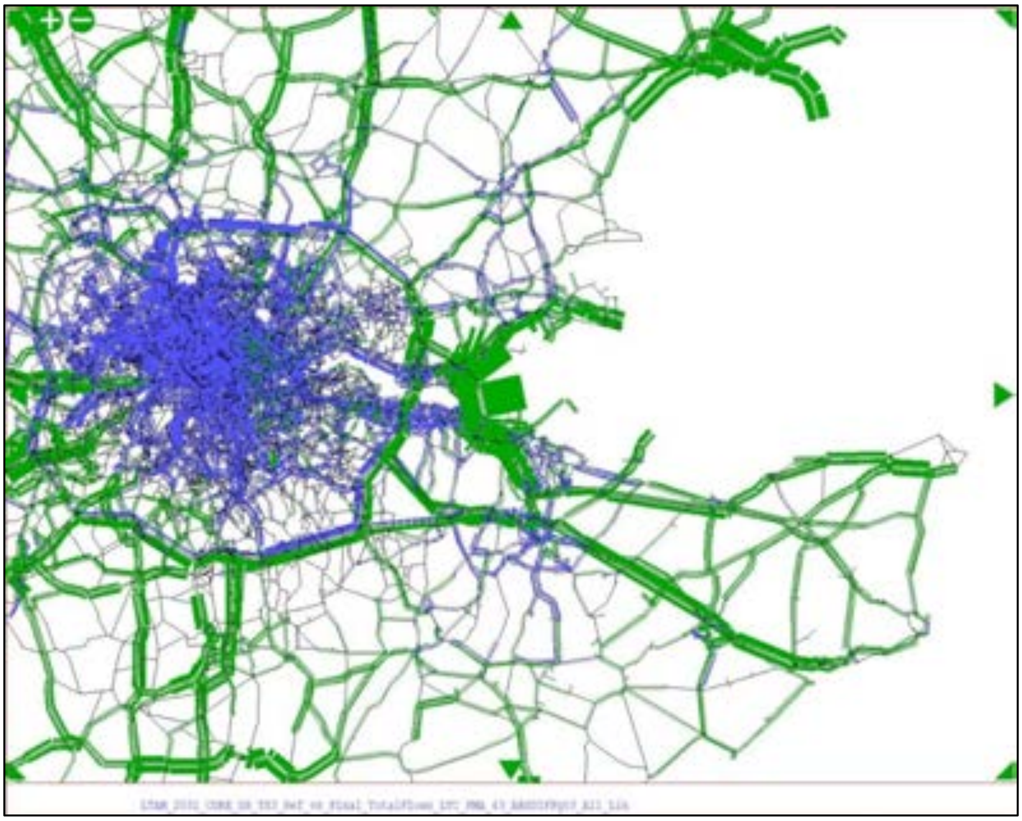


Figure 6.15 – Assigned Flow Differences – Reference Matrix Vs VDM Output Matrix (Core 2031 Reference Vs 2031 DS PM Peak)



Key Statistics – Reference Matrix Vs VDM Output Matrix

6.4.6 Table 6.35 provides some key network statistics from the reference matrix assignments and the VDM output matrix assignments.

Table 6.35 – Key Network Statistics – Reference Matrix Vs VDM Output Matrix (Core 2031)

Metric	Time Period	Reference Matrix (Core 2031)				VDM Output Matrix (Core 2031)			
		DM*	DS**	Diff	Diff%	DM***	DS****	Diff	Diff%
Time (PCU Hours)	AM	2,246,667	2,242,059	-4,608	-0.21%	2,369,718	2,369,415	-303	-0.01%
	IP	1,923,236	1,921,205	-2,031	-0.11%	2,071,323	2,070,813	-510	-0.02%
	PM	2,517,436	2,513,786	-3,650	-0.14%	2,696,840	2,697,122	283	0.01%
	OP	755,887	755,735	-153	-0.02%	822,666	822,621	-44	-0.01%
Distance (PCU KM)	AM	137,289,360	137,241,968	-47,392	-0.03%	146,941,680	147,059,776	118,096	0.08%
	IP	120,808,496	120,780,304	-28,192	-0.02%	131,350,680	131,412,936	62,256	0.05%
	PM	153,467,712	153,440,800	-26,912	-0.02%	167,090,256	167,217,744	127,488	0.08%
	OP	48,338,096	48,326,572	-11,524	-0.02%	52,969,956	52,972,292	2,336	0.00%
Average Speed (KM/Hr)	AM	61.11	61.21	0.10	0.17%	62.01	62.07	0.06	0.09%
	IP	62.82	62.87	0.05	0.08%	63.41	63.46	0.05	0.07%
	PM	60.96	61.04	0.08	0.13%	61.96	62.00	0.04	0.07%
	OP	63.95	63.95	-0.00	0.00%	64.39	64.39	0.01	0.01%

* These statistics are generated by assigning the reference matrix to the DM network

** These statistics are generated by assigning the reference matrix to the DS network

*** These statistics are generated from the final VDM loop for the DM

**** These statistics are generated from the final VDM loop for the DS

Commentary on Results

6.4.7 Table 6.31 and Table 6.32 demonstrate that the VDM runs for the Do Minimum and Do Something scenarios have converged within 11 and 10 iterations respectively.

6.4.8 From an all movement perspective the VDM generally reduces the number of employers business and commuting trips and increases the number of other purpose trips, in both the Do Minimum and Do Something scenarios, as demonstrated in Table 6.33 and Table 6.34. When the irrelevant movements are removed from the analysis we actually see a general reduction in trips across all journey purposes. There is a switch away from the peak periods to the off peak.

6.4.9 These matrix sensitivities are as would be expected and are due to increases in the levels of congestion on the road network leading to reductions in the number of highway trips. As would also be expected, the reductions in trips are slightly higher in the Do Minimum than they are in the Do Something scenario. This is due to the increased capacity of the network in the Do Something, in particular, associated with Thames river crossings.

6.4.10 These changes in the matrices are supported by the flow difference analysis. As can be seen in the Do Minimum there is a general decrease in flow along the M25 in the Dartford Crossing corridor when compared to the reference matrix assignments. This is consistent across the time periods. In the Do Something there is generally an increase in flow along this corridor as a result of destination switching where more trips are able to cross the river in the Do Something due to the introduction of LTC.

6.4.11 The reference matrix assignments do not take account of this switching, leading to lower flow over Dartford (as the reference demand has the choice of using either Dartford or LTC), therefore in the with LTC scenario there is spare capacity to cross the river. The VDM will switch trips that currently do not cross the river to crossing the river in order to take advantage of this spare capacity. Much of this cross river demand is suppressed in the reference case due to the lack of available capacity. There is a general reduction in flow throughout London which is due to the lack of spare capacity in the highway network to accommodate the levels of growth.

6.4.12 The overall network statistics comparison shows that in the reference case assignments there is a relatively large reduction in both journey time and distance travelled in absolute terms between the Do Minimum and Do Something scenarios. It is a very small relative decrease. As would be expected, the post VDM statistics show a substantial reduction in the amount of travel time savings and a switch to an overall increase in distance travelled. In the PM peak there is an overall increase in the total travel time on the network. Again, this is as expected due to the VDM shifting movements to take account of the increases in capacity, leading to less overall travel time savings, and in some instances increases, and slightly longer distance journeys.

6.4.13 The average speed over the entire network is very slightly higher in the Do Something than in the Do Minimum in the AM, IP and PM peaks. There is essentially no difference in the off peak.

6.5 LTAM 2041 Core DM and DS Forecasts

6.5.1 Section 4.2 describes how the reference matrices have been developed. Section 5.1 describes how the Do Minimum (DM) networks have been developed. Section 5.2 describes how the Do Something (DS) networks have been developed. The analysis presented below describes the impact that the VDM has on the reference matrices, assigned networks and some key network statistics.

VDM Convergence Statistics

6.5.2 Convergence statistics for the core 2041 forecasts are provided in Table 6.36 below for the Do Minimum and in Table 6.37 for the Do Something.

Matrix Totals – Reference Matrix Vs VDM Output Matrix

6.5.3 As described in Section 4.3 it is necessary to report the matrix totals in two ways, firstly using the 17 demand segments used in DIADEM and secondly using the 9 demand segments used in the highway assignment model.

6.5.4 Table 6.38 presents a comparison of the core 2041 reference matrices and VDM output matrices to the DIADEM 17 demand segment pattern. Table 6.39 presents a comparison between the core 2041 reference matrices and VDM output matrices to the SATURN 9 userclass pattern.

Table 6.36 – Convergence and Stability Statistics (Core 2041 DM)

Iteration			Cost stability				Flow stability				Totals
Main	Full Model Rel	Subset Area Rel	RAAD	AAD	RMS	%<5%	RAAD	AAD	RMS	%<5%	Trips*
1	76.87%	107.07%	0.000	0.000	0.000	0%	0.000	0.000	0.000	0%	85,624,725
2	28.39%	35.99%	0.013	0.680	1.265	94.73%	2.166	0.040	5.233	29.40%	86,195,540
3	12.56%	15.45%	0.002	0.127	0.250	99.93%	0.057	0.020	2.617	62.67%	86,484,274
4	5.94%	7.25%	0.001	0.056	0.174	99.93%	0.030	0.010	1.308	88.74%	86,629,330
5	2.90%	3.56%	0.001	0.047	0.180	99.91%	0.018	0.005	0.654	96.69%	86,702,079
6	1.44%	1.82%	0.001	0.046	0.180	99.94%	0.011	0.002	0.327	97.73%	86,738,425
7	0.72%	0.96%	0.001	0.049	0.197	99.92%	0.008	0.001	0.164	98.21%	86,756,634
8	0.37%	0.56%	0.001	0.036	0.202	99.87%	0.006	0.001	0.083	98.51%	86,765,752
9	0.19%	0.35%	0.001	0.040	0.212	99.88%	0.005	0.000	0.044	98.78%	86,770,322
10	0.10%	0.26%	0.001	0.036	0.217	99.87%	0.004	0.000	0.022	99.02%	86,772,615
11	0.06%	0.21%	0.001	0.043	0.222	99.88%	0.004	0.000	0.016	99.15%	86,773,809
12	0.04%	0.17%	0.001	0.045	0.187	99.91%	0.004	0.000	0.009	99.21%	86,774,436

* the trips column numbers only refer to those trips in the VDM that are considered variable. These totals therefore are not expected to match matrix totals reported elsewhere in this report

Table 6.37 – Convergence and Stability Statistics (Core 2041 DS)

Iteration			Cost stability				Flow stability				Totals
Main	Full Model Rel	Subset Area Rel	RAAD	AAD	RMS	%<5%	RAAD	AAD	RMS	%<5%	Trips*
1	76.91%	107.66%	0.000	0.000	0.000	0%	0.000	0.000	0.000	0%	85,624,725
2	28.41%	36.14%	0.009	0.458	0.951	97.22%	2.190	0.041	5.234	29.35%	86,196,999
3	12.56%	15.51%	0.002	0.112	0.266	99.86%	0.062	0.020	2.617	59.41%	86,486,031
4	5.94%	7.26%	0.001	0.042	0.121	99.97%	0.032	0.010	1.308	86.08%	86,631,232
5	2.90%	3.55%	0.001	0.039	0.188	99.92%	0.018	0.005	0.654	96.67%	86,703,974
6	1.43%	1.80%	0.001	0.028	0.148	99.94%	0.012	0.002	0.327	97.77%	86,740,425
7	0.72%	0.93%	0.001	0.031	0.161	99.92%	0.008	0.001	0.164	98.15%	86,758,618
8	0.36%	0.49%	0.000	0.024	0.098	99.98%	0.006	0.001	0.082	98.54%	86,767,741
9	0.19%	0.29%	0.001	0.026	0.112	99.97%	0.005	0.000	0.042	98.91%	86,772,268
10	0.10%	0.24%	0.001	0.027	0.174	99.90%	0.004	0.000	0.021	99.12%	86,774,573
11	0.06%	0.17%	0.001	0.028	0.182	99.90%	0.004	0.000	0.014	99.18%	86,775,649

* the trips column numbers only refer to those trips in the VDM that are considered variable. These totals therefore are not expected to match matrix totals reported elsewhere in this report

Table 6.38 – LTAM DIADEM Matrix Total Comparison – Reference Matrix Vs VDM Output Matrices (Core 2041 Reference DM and DS Highway Trips in PCU's)

Segment	Matrix Type	Time Period	Reference Matrix (Core 2041)	VDM Output Matrix (Core 2041 DM)			VDM Output Matrix (Core 2041 DS)		
			Matrix Total	Matrix Total	Diff to Reference	Diff %	Matrix Total	Diff to Reference	Diff %
HBEB	24Hr PA	N/A	2,989,632	2,987,090	-2,542	-0.1%	2,987,132	-2,500	-0.1%
HBW L	24Hr PA	N/A	2,571,988	2,556,612	-15,376	-0.6%	2,556,641	-15,347	-0.6%
HBW M	24Hr PA	N/A	4,550,420	4,533,724	-16,696	-0.4%	4,533,827	-16,593	-0.4%
HBW H	24Hr PA	N/A	3,559,890	3,544,039	-15,851	-0.4%	3,544,164	-15,726	-0.4%
HBO L	24Hr PA	N/A	8,136,824	7,997,727	-139,098	-1.7%	7,998,050	-138,775	-1.7%
HBO M	24Hr PA	N/A	7,041,178	7,019,604	-21,574	-0.3%	7,019,830	-21,348	-0.3%
HBO H	24Hr PA	N/A	4,957,313	4,947,148	-10,165	-0.2%	4,947,350	-9,963	-0.2%
NHBEB	By Time Period OD	AM	102,432	101,968	-465	-0.5%	102,033	-399	-0.4%
		IP	132,065	131,501	-564	-0.4%	131,495	-570	-0.4%
		PM	147,075	145,683	-1,391	-0.9%	145,698	-1,377	-0.9%
		OP	37,825	38,037	212	0.6%	38,025	200	0.5%
NHBO L	By Time Period OD	AM	150,719	149,689	-1,030	-0.7%	149,852	-868	-0.6%
		IP	399,000	395,159	-3,841	-1.0%	395,182	-3,818	-1.0%
		PM	315,052	310,124	-4,927	-1.6%	310,167	-4,884	-1.6%
		OP	113,030	112,773	-257	-0.2%	112,731	-299	-0.3%
NHBO M	By Time Period OD	AM	160,423	159,999	-424	-0.3%	160,111	-312	-0.2%
		IP	319,257	319,637	380	0.1%	319,682	425	0.1%
		PM	316,833	315,383	-1,449	-0.5%	315,386	-1,447	-0.5%
		OP	90,414	91,361	947	1.0%	91,327	913	1.0%
NHBO H	By Time Period OD	AM	129,407	128,380	-1,027	-0.8%	128,472	-935	-0.7%
		IP	218,602	218,022	-580	-0.3%	218,032	-570	-0.3%
		PM	245,363	243,107	-2,256	-0.9%	243,180	-2,182	-0.9%
		OP	61,949	62,556	607	1.0%	62,526	577	0.9%
LGV	By Time Period OD	AM	1,217,634	1,217,634	0	0.0%	1,217,634	0	0.0%
		IP	1,050,371	1,050,371	0	0.0%	1,050,371	0	0.0%
		PM	878,550	878,550	0	0.0%	878,550	0	0.0%
		OP	421,851	421,851	0	0.0%	421,851	0	0.0%
HGV	By Time Period OD	AM	461,489	461,489	0	0.0%	461,489	0	0.0%
		IP	458,881	458,881	0	0.0%	458,881	0	0.0%
		PM	288,966	288,966	0	0.0%	288,966	0	0.0%
		OP	183,109	183,109	0	0.0%	183,109	0	0.0%
		AM	5,455	5,455	0	0.0%	5,455	0	0.0%

Segment	Matrix Type	Time Period	Reference Matrix (Core 2041)	VDM Output Matrix (Core 2041 DM)			VDM Output Matrix (Core 2041 DS)		
			Matrix Total	Matrix Total	Diff to Reference	Diff %	Matrix Total	Diff to Reference	Diff %
Port Trips EB	By Time Period OD	IP	3,831	3,831	0	0.0%	3,831	0	0.0%
		PM	4,752	4,752	0	0.0%	4,752	0	0.0%
		OP	1,479	1,479	0	0.0%	1,479	0	0.0%
Port Trips O LI	By Time Period OD	AM	3,184	3,184	0	0.0%	3,184	0	0.0%
		IP	3,936	3,936	0	0.0%	3,936	0	0.0%
		PM	3,875	3,875	0	0.0%	3,875	0	0.0%
		OP	1,544	1,544	0	0.0%	1,544	0	0.0%
Port Trips O MI	By Time Period OD	AM	3,724	3,724	0	0.0%	3,724	0	0.0%
		IP	4,161	4,161	0	0.0%	4,161	0	0.0%
		PM	4,543	4,543	0	0.0%	4,543	0	0.0%
		OP	1,631	1,631	0	0.0%	1,631	0	0.0%
Port Trips O HI	By Time Period OD	AM	5,252	5,252	0	0.0%	5,252	0	0.0%
		IP	4,410	4,410	0	0.0%	4,410	0	0.0%
		PM	5,789	5,789	0	0.0%	5,789	0	0.0%
		OP	1,726	1,726	0	0.0%	1,726	0	0.0%

Table 6.39 – LTAM SATURN Matrix Total Comparison – Reference Matrix Vs VDM Output Matrices (Core 2041 Reference DM and DS)

Userclass	Time Period	All Movements							Relevant Movements						
		Reference Matrix (Core 2041)	VDM Output Matrix (Core 2041 DM)			VDM Output Matrix (Core 2041 DS)			Reference Matrix (Core 2041)	VDM Output Matrix (Core 2041 DM)			VDM Output Matrix (Core 2041 DS)		
		Matrix Total	Matrix Total	Diff to Reference	Diff %	Matrix Total	Diff to Reference	Diff %	Matrix Total	Matrix Total	Diff to Reference	Diff %	Matrix Total	Diff to Reference	Diff %
Car Employers Business	AM	519,597	518,622	-974	-0.2%	518,739	-858	-0.2%	43,119	42,239	-880	-2.0%	42,368	-752	-1.7%
	IP	452,498	451,372	-1,125	-0.2%	451,366	-1,132	-0.3%	29,851	29,699	-153	-0.5%	29,710	-142	-0.5%
	PM	622,391	619,281	-3,110	-0.5%	619,319	-3,071	-0.5%	42,917	42,071	-846	-2.0%	42,127	-790	-1.8%
	OP	182,202	182,544	342	0.2%	182,520	319	0.2%	11,598	12,128	530	4.6%	12,108	510	4.4%
Car Commute Low Income	AM	475,786	469,869	-5,918	-1.2%	469,848	-5,939	-1.2%	34,012	33,269	-743	-2.2%	33,244	-769	-2.3%
	IP	216,092	215,421	-671	-0.3%	215,439	-652	-0.3%	18,950	18,784	-166	-0.9%	18,803	-147	-0.8%
	PM	544,500	540,704	-3,796	-0.7%	540,722	-3,778	-0.7%	35,979	35,241	-738	-2.1%	35,258	-720	-2.0%
	OP	86,889	86,819	-70	-0.1%	86,818	-71	-0.1%	7,363	7,428	65	0.9%	7,427	65	0.9%
Car Commute Medium Income	AM	961,464	953,896	-7,567	-0.8%	954,020	-7,444	-0.8%	72,568	70,753	-1,815	-2.5%	70,870	-1,697	-2.3%
	IP	331,846	331,180	-666	-0.2%	331,171	-674	-0.2%	28,983	28,693	-290	-1.0%	28,685	-298	-1.0%
	PM	1,043,426	1,039,752	-3,674	-0.4%	1,039,798	-3,628	-0.3%	71,256	69,494	-1,762	-2.5%	69,539	-1,718	-2.4%
	OP	133,444	133,474	30	0.0%	133,459	16	0.0%	11,315	11,417	102	0.9%	11,403	88	0.8%
Car Commute High Income	AM	818,034	812,728	-5,307	-0.6%	812,641	-5,393	-0.7%	69,758	67,828	-1,930	-2.8%	67,735	-2,023	-2.9%
	IP	236,256	235,267	-989	-0.4%	235,285	-971	-0.4%	24,787	24,448	-339	-1.4%	24,469	-318	-1.3%
	PM	843,476	839,809	-3,667	-0.4%	839,980	-3,495	-0.4%	69,980	67,843	-2,137	-3.1%	68,016	-1,964	-2.8%
	OP	94,975	94,810	-165	-0.2%	94,804	-171	-0.2%	9,741	9,806	64	0.7%	9,800	59	0.6%
Car Other Low Income	AM	803,240	790,899	-12,341	-1.5%	791,311	-11,930	-1.5%	85,037	77,827	-7,210	-8.5%	78,251	-6,786	-8.0%
	IP	1,423,108	1,401,362	-21,746	-1.5%	1,401,422	-21,685	-1.5%	117,483	109,256	-8,226	-7.0%	109,342	-8,141	-6.9%
	PM	1,389,615	1,362,848	-26,767	-1.9%	1,362,976	-26,639	-1.9%	125,168	113,392	-11,776	-9.4%	113,541	-11,627	-9.3%
	OP	573,948	567,226	-6,722	-1.2%	567,112	-6,836	-1.2%	46,677	45,600	-1,077	-2.3%	45,517	-1,160	-2.5%
Car Other Medium Income	AM	858,076	853,752	-4,323	-0.5%	853,995	-4,081	-0.5%	93,909	88,455	-5,454	-5.8%	88,713	-5,196	-5.5%
	IP	1,139,120	1,136,476	-2,643	-0.2%	1,136,583	-2,537	-0.2%	109,287	105,983	-3,305	-3.0%	106,146	-3,141	-2.9%
	PM	1,401,211	1,393,300	-7,911	-0.6%	1,393,318	-7,893	-0.6%	139,376	131,752	-7,624	-5.5%	131,809	-7,567	-5.4%
	OP	459,228	460,515	1,287	0.3%	460,434	1,206	0.3%	43,384	44,322	938	2.2%	44,262	878	2.0%
Car Other High Income	AM	689,197	685,036	-4,161	-0.6%	685,239	-3,958	-0.6%	89,315	84,550	-4,766	-5.3%	84,780	-4,535	-5.1%
	IP	768,437	766,206	-2,231	-0.3%	766,224	-2,213	-0.3%	89,623	87,476	-2,147	-2.4%	87,553	-2,069	-2.3%
	PM	1,066,227	1,059,712	-6,515	-0.6%	1,059,918	-6,309	-0.6%	125,527	119,668	-5,859	-4.7%	119,930	-5,597	-4.5%
	OP	309,746	311,139	1,393	0.4%	311,061	1,314	0.4%	35,738	36,958	1,220	3.4%	36,892	1,155	3.2%
Car Total	AM	5,125,394	5,084,802	-40,591	-0.8%	5,085,792	-39,602	-0.8%	487,718	464,920	-22,798	-4.7%	465,961	-21,758	-4.5%
	IP	4,567,355	4,537,284	-30,071	-0.7%	4,537,491	-29,864	-0.7%	418,963	404,338	-14,626	-3.5%	404,708	-14,255	-3.4%
	PM	6,910,843	6,855,405	-55,439	-0.8%	6,856,030	-54,813	-0.8%	610,203	579,460	-30,743	-5.0%	580,219	-29,984	-4.9%

Userclass	Time Period	All Movements							Relevant Movements						
		Reference Matrix (Core 2041)	VDM Output Matrix (Core 2041 DM)			VDM Output Matrix (Core 2041 DS)			Reference Matrix (Core 2041)	VDM Output Matrix (Core 2041 DM)			VDM Output Matrix (Core 2041 DS)		
	OP	1,840,432	1,836,527	-3,905	-0.2%	1,836,209	-4,223	-0.2%	165,816	167,658	1,843	1.1%	167,410	1,594	1.0%
LGV	AM	1,217,634	1,217,634	0	0.0%	1,217,634	0	0.0%	145,490	145,490	0	0.0%	145,490	0	0.0%
	IP	1,050,371	1,050,371	0	0.0%	1,050,371	0	0.0%	110,049	110,049	0	0.0%	110,049	0	0.0%
	PM	878,550	878,550	0	0.0%	878,550	0	0.0%	113,424	113,424	0	0.0%	113,424	0	0.0%
	OP	421,851	421,851	0	0.0%	421,851	0	0.0%	42,472	42,472	0	0.0%	42,472	0	0.0%
HGV	AM	461,489	461,489	0	0.0%	461,489	0	0.0%	70,396	70,396	0	0.0%	70,396	0	0.0%
	IP	458,881	458,881	0	0.0%	458,881	0	0.0%	72,543	72,543	0	0.0%	72,543	0	0.0%
	PM	288,966	288,966	0	0.0%	288,966	0	0.0%	43,876	43,876	0	0.0%	43,876	0	0.0%
	OP	183,109	183,109	0	0.0%	183,109	0	0.0%	27,585	27,585	0	0.0%	27,585	0	0.0%

Assignments – Reference Matrix Vs VDM Output Matrix

6.5.5 Figure 6.16 to Figure 6.18 provide a flow difference comparison between the reference matrix assignment and the VDM output assignment for the DM scenario for each time period. Figure 6.19 to Figure 6.21 provide a flow difference comparison between the reference matrix assignment and the VDM output assignment for the DS scenario for each time period. Blue colours show reductions in traffic, green colours show increases in traffic.

Figure 6.16 – Assigned Flow Differences – Reference Matrix Vs VDM Output Matrix (Core 2041 Reference Vs 2041 DM AM Peak)

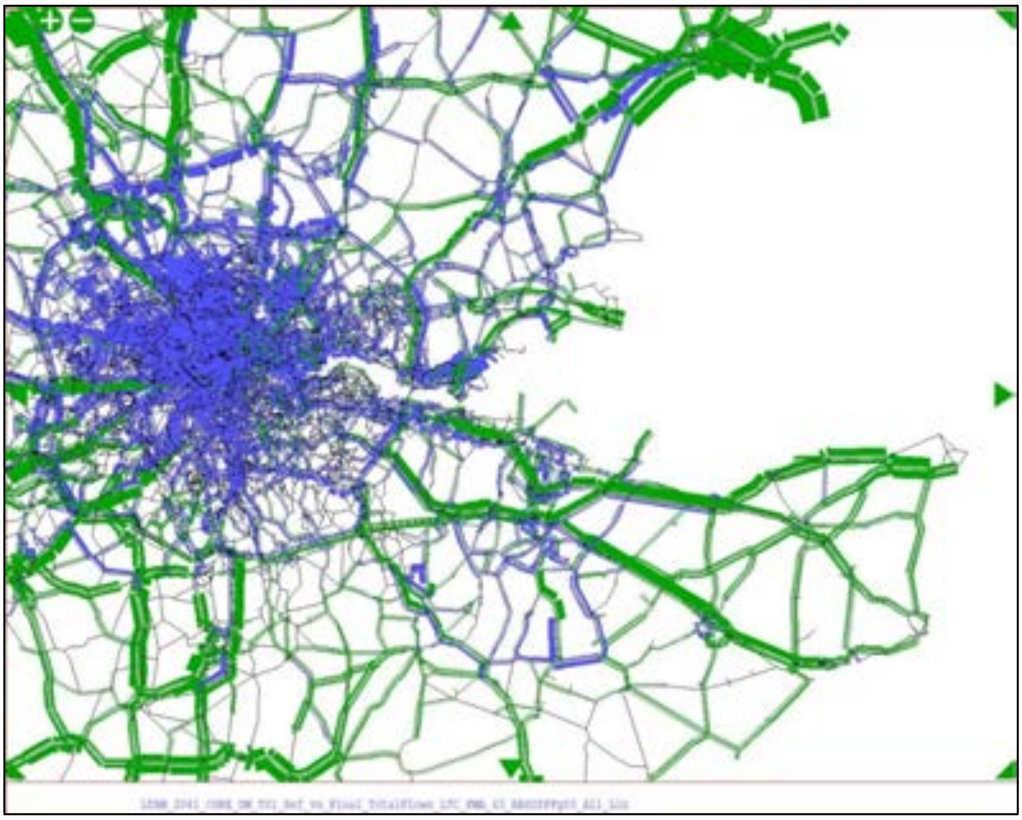


Figure 6.17 – Assigned Flow Differences – Reference Matrix Vs VDM Output Matrix (Core 2041 Reference Vs 2041 DM Inter Peak)

Figure 6.18 – Assigned Flow Differences – Reference Matrix Vs VDM Output Matrix (Core 2041 Reference Vs 2041 DM PM Peak)

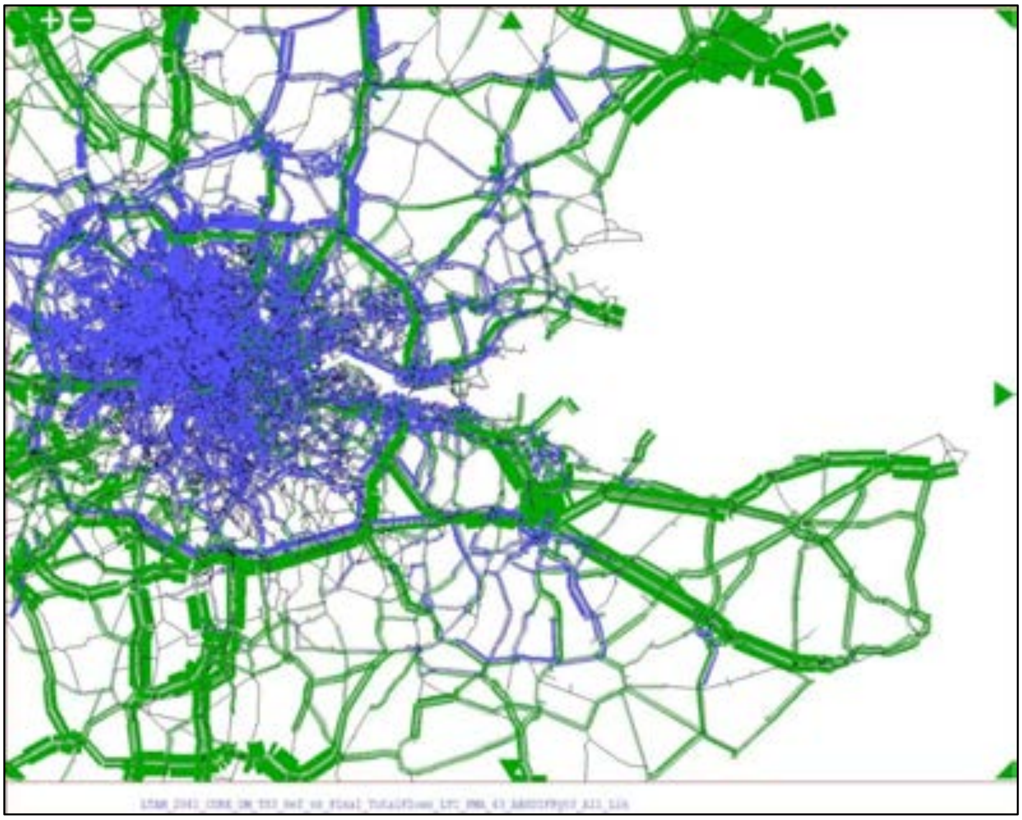


Figure 6.19 – Assigned Flow Differences – Reference Matrix Vs VDM Output Matrix (Core 2041 Reference Vs 2041 DS AM Peak)

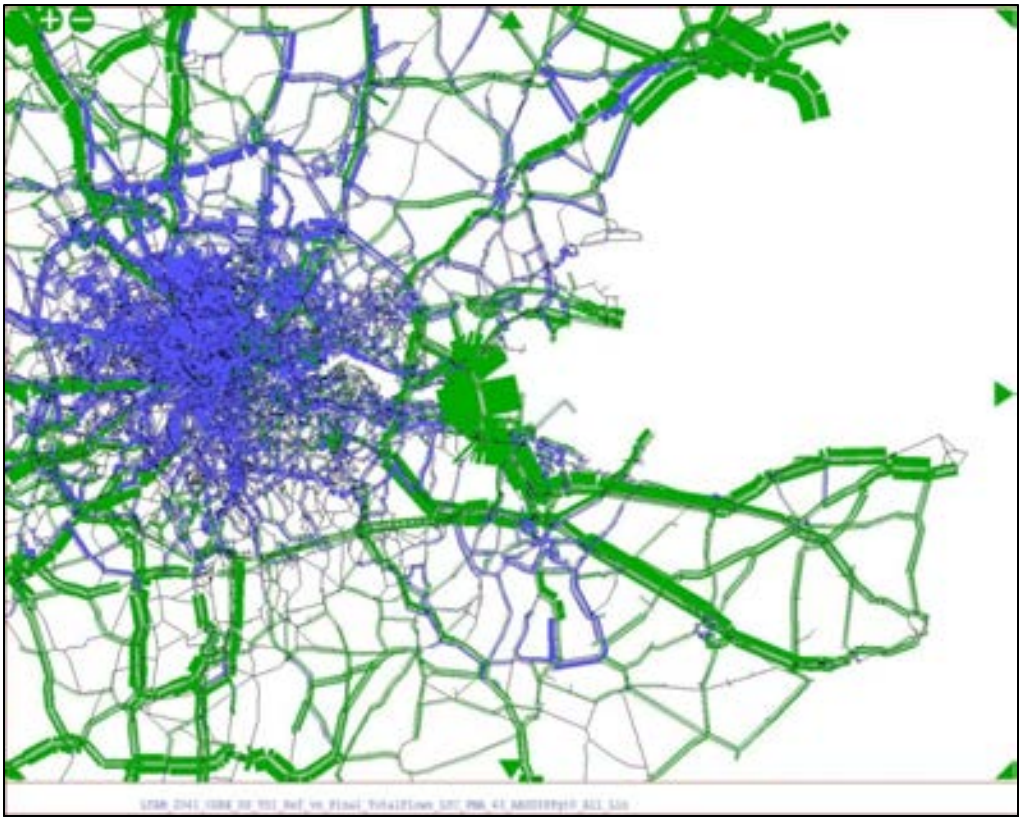
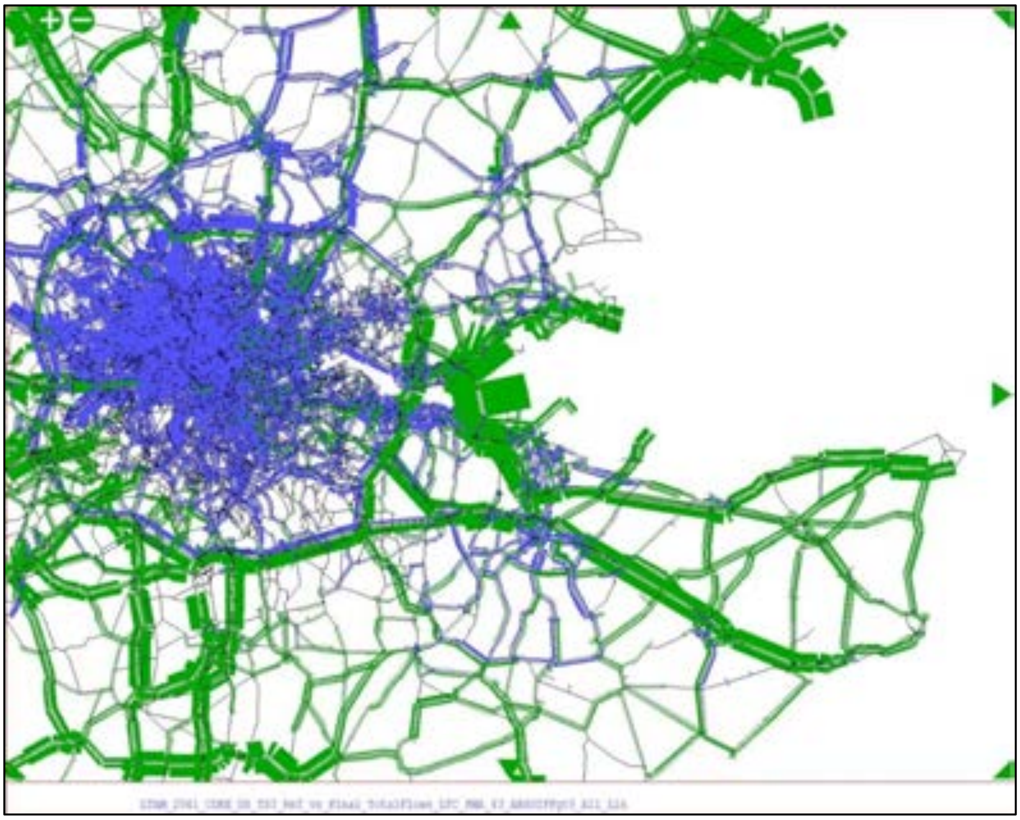


Figure 6.20 – Assigned Flow Differences – Reference Matrix Vs VDM Output Matrix (Core 2041 Reference Vs 2041 DS Inter Peak)

Figure 6.21 – Assigned Flow Differences – Reference Matrix Vs VDM Output Matrix (Core 2041 Reference Vs 2041 DS PM Peak)



Key Statistics – Reference Matrix Vs VDM Output Matrix

6.5.6 Table 6.40 provides some key network statistics from the reference matrix assignments and the VDM output matrix assignments.

Table 6.40 – Key Network Statistics – Reference Matrix Vs VDM Output Matrix (Core 2041)

Metric	Time Period	Reference Matrix (Core 2041)				VDM Output Matrix (Core 2041)			
		DM*	DS**	Diff	Diff%	DM***	DS****	Diff	Diff%
Time (PCU Hours)	AM	2,443,793	2,438,361	-5,432	-0.22%	2,644,152	2,644,085	-67	0.00%
	IP	2,088,713	2,085,778	-2,935	-0.14%	2,329,193	2,328,812	-381	-0.02%
	PM	2,709,564	2,704,495	-5,069	-0.19%	3,001,856	3,001,961	105	0.00%
	OP	815,596	815,444	-152	-0.02%	924,266	924,192	-74	-0.01%
Distance (PCU KM)	AM	147,539,024	147,484,064	-54,960	-0.04%	163,178,112	163,317,424	139,312	0.09%
	IP	130,045,864	130,011,712	-34,152	-0.03%	147,257,232	147,334,656	77,424	0.05%
	PM	163,276,064	163,245,712	-30,352	-0.02%	185,467,792	185,605,856	138,064	0.07%
	OP	52,024,420	52,012,496	-11,924	-0.02%	59,554,392	59,557,544	3,152	0.01%
Average Speed (KM/Hr)	AM	60.37	60.48	0.11	0.19%	61.71	61.77	0.05	0.09%
	IP	62.26	62.33	0.07	0.11%	63.22	63.27	0.04	0.07%
	PM	60.26	60.36	0.10	0.17%	61.78	61.83	0.04	0.07%
	OP	63.79	63.78	-0.00	0.00%	64.43	64.44	0.01	0.01%

* These statistics are generated by assigning the reference matrix to the DM network

** These statistics are generated by assigning the reference matrix to the DS network

*** These statistics are generated from the final VDM loop for the DM

**** These statistics are generated from the final VDM loop for the DS

Commentary on Results

6.5.7 Table 6.36 and Table 6.37 demonstrate that the VDM runs for the Do Minimum and Do Something scenarios have converged within 12 and 11 iterations respectively.

6.5.8 From an all movement perspective the VDM generally reduces the number of car trips across all purposes in both the Do Minimum and Do Something scenarios, as demonstrated in Table 6.38 and Table 6.39. When the irrelevant movements are removed from the analysis we also see a general reduction in car trips across all journey purposes. There is some switching away from the peaks to the off peak for some journey purposes.

6.5.9 These matrix sensitivities are as would be expected and are due to increases in the levels of congestion on the road network leading to reductions in the number of highway trips. As would also be expected, the reductions in trips are slightly higher in the Do Minimum than they are in the Do Something scenario. This is due to the increased capacity of the network in the Do Something, in particular, associated with Thames river crossings.

6.5.10 These changes in the matrices are supported by the flow difference analysis. As can be seen in the Do Minimum there is a general decrease in flow along the M25 in the Dartford Crossing corridor when compared to the reference matrix assignments. This is consistent across the time periods. In the Do Something there is generally an increase in flow along this corridor as a result of destination switching where more trips are able to cross the river in the Do Something due to the introduction of LTC.

6.5.11 The reference matrix assignments do not take account of this switching, leading to lower flow over Dartford (as the reference demand has the choice of using either Dartford or LTC), therefore in the with LTC scenario there is spare capacity to cross the river. The VDM will switch trips that currently do not cross the river to crossing the river in order to take advantage of this spare capacity. Much of this cross river demand is suppressed in the reference case due to the lack of available capacity. There is a general reduction in flow throughout London which is due to the lack of spare capacity in the highway network to accommodate the levels of growth.

6.5.12 The overall network statistics comparison shows that in the reference case assignments there is a relatively large reduction in both journey time and distance travelled in absolute terms between the Do Minimum and Do Something scenarios. It is a very small relative decrease. As would be expected, the post VDM statistics show a substantial reduction in the amount of travel time savings and a switch to an overall increase in distance travelled. In the PM peak there is an overall increase in the total travel time on the network. Again, this is as expected due to the VDM shifting movements to take account of the increases in capacity, leading to less overall travel time savings, and in some instances increases, and slightly longer distance journeys.

6.5.13 The average speed over the entire network is very slightly higher in the Do Something than in the Do Minimum in the AM, IP and PM peaks. There is essentially no difference in the off peak.

6.6 LTAM 2051 Core DM and DS Forecasts

6.6.1 Section 4.2 describes how the reference matrices have been developed. Section 5.1 describes how the Do Minimum (DM) networks have been developed. Section 5.2 describes how the Do Something (DS) networks have been developed. The analysis presented below describes the impact that the VDM has on the reference matrices, assigned networks and some key network statistics.

VDM Convergence Statistics

6.6.2 Convergence statistics for the core 2051 forecasts are provided in Table 6.41 below for the Do Minimum and in Table 6.42 for the Do Something.

Matrix Totals – Reference Matrix Vs VDM Output Matrix

6.6.3 As described in Section 4.3 it is necessary to report the matrix totals in two ways, firstly using the 17 demand segments used in DIADEM and secondly using the 9 demand segments used in the highway assignment model.

6.6.4 Table 6.43 presents a comparison of the core 2051 reference matrices and VDM output matrices to the DIADEM 17 demand segment pattern. Table 6.44 presents a comparison between the core 2051 reference matrices and VDM output matrices to the SATURN 9 userclass pattern.

Table 6.41 – Convergence and Stability Statistics (Core 2051 DM)

Iteration			Cost stability				Flow stability				Totals
Main	Full Model Rel	Subset Area Rel	RAAD	AAD	RMS	%<5%	RAAD	AAD	RMS	%<5%	Trips*
1	117.75%	158.56%	0.000	0.000	0.000	0%	0.000	0.000	0.000	0%	92,342,603
2	38.12%	46.42%	0.018	0.984	1.755	89.27%	17.178	0.062	8.983	22.44%	93,429,503
3	16.20%	19.16%	0.004	0.213	0.380	99.90%	0.074	0.030	4.491	52.60%	93,978,697
4	7.54%	8.83%	0.001	0.071	0.191	99.92%	0.040	0.015	2.245	81.52%	94,254,489
5	3.65%	4.29%	0.001	0.050	0.182	99.91%	0.025	0.008	1.122	94.46%	94,392,837
6	1.80%	2.16%	0.001	0.057	0.200	99.91%	0.017	0.004	0.561	96.25%	94,461,980
7	0.90%	1.11%	0.001	0.040	0.171	99.90%	0.013	0.002	0.281	96.95%	94,496,643
8	0.46%	0.66%	0.001	0.062	0.238	99.85%	0.010	0.001	0.141	97.51%	94,513,971
9	0.24%	0.40%	0.001	0.050	0.220	99.84%	0.009	0.001	0.073	97.76%	94,522,600
10	0.12%	0.24%	0.001	0.045	0.219	99.87%	0.008	0.000	0.039	98.02%	94,526,890
11	0.07%	0.20%	0.001	0.039	0.184	99.89%	0.007	0.000	0.021	98.27%	94,529,120
12	0.04%	0.16%	0.001	0.042	0.252	99.84%	0.006	0.000	0.014	98.49%	94,530,167

* the trips column numbers only refer to those trips in the VDM that are considered variable. These totals therefore are not expected to match matrix totals reported elsewhere in this report

Table 6.42 – Convergence and Stability Statistics (Core 2051 DS)

Iteration			Cost stability				Flow stability				Totals
Main	Full Model Rel	Subset Area Rel	RAAD	AAD	RMS	%<5%	RAAD	AAD	RMS	%<5%	Trips*
1	117.79%	159.37%	0.000	0.000	0.000	0%	0.00	0.00	0.00	0%	92,342,603
2	38.13%	46.53%	0.013	0.715	1.409	93.36%	17.20	0.06	8.98	22.66%	93,431,379
3	16.21%	19.20%	0.003	0.169	0.353	99.80%	0.08	0.03	4.49	50.32%	93,980,784
4	7.54%	8.85%	0.001	0.062	0.181	99.91%	0.04	0.02	2.25	79.24%	94,256,699
5	3.65%	4.30%	0.001	0.049	0.223	99.86%	0.03	0.01	1.12	94.40%	94,394,952
6	1.80%	2.14%	0.001	0.033	0.193	99.88%	0.02	0.00	0.56	96.27%	94,464,204
7	0.90%	1.12%	0.001	0.034	0.199	99.88%	0.01	0.00	0.28	96.97%	94,498,734
8	0.45%	0.61%	0.001	0.036	0.200	99.89%	0.01	0.00	0.14	97.49%	94,516,164
9	0.23%	0.37%	0.001	0.041	0.167	99.91%	0.01	0.00	0.07	97.82%	94,524,754
10	0.13%	0.29%	0.001	0.047	0.211	99.87%	0.01	0.00	0.04	98.03%	94,529,167
11	0.07%	0.19%	0.001	0.037	0.188	99.89%	0.01	0.00	0.03	98.25%	94,531,194

* the trips column numbers only refer to those trips in the VDM that are considered variable. These totals therefore are not expected to match matrix totals reported elsewhere in this report

Table 6.43 – LTAM DIADEM Matrix Total Comparison – Reference Matrix Vs VDM Output Matrices (Core 2051 Reference DM and DS Highway Trips in PCU's)

Segment	Matrix Type	Time Period	Reference Matrix (Core 2051)	VDM Output Matrix (Core 2051 DM)			VDM Output Matrix (Core 2051 DS)		
			Matrix Total	Matrix Total	Diff to Reference	Diff %	Matrix Total	Diff to Reference	Diff %
HBEB	24Hr PA	N/A	3,246,668	3,240,417	-6,251	-0.2%	3,240,467	-6,201	-0.2%
HBW L	24Hr PA	N/A	2,754,329	2,731,886	-22,443	-0.8%	2,731,924	-22,405	-0.8%
HBW M	24Hr PA	N/A	4,869,516	4,845,537	-23,979	-0.5%	4,845,664	-23,851	-0.5%
HBW H	24Hr PA	N/A	3,810,317	3,787,778	-22,539	-0.6%	3,787,928	-22,390	-0.6%
HBO L	24Hr PA	N/A	8,883,920	8,598,091	-285,829	-3.2%	8,598,572	-285,348	-3.2%
HBO M	24Hr PA	N/A	7,687,692	7,579,759	-107,933	-1.4%	7,580,072	-107,620	-1.4%
HBO H	24Hr PA	N/A	5,416,495	5,363,689	-52,806	-1.0%	5,363,939	-52,557	-1.0%
NHBEB	By Time Period OD	AM	108,312	107,406	-905	-0.8%	107,487	-824	-0.8%
		IP	139,637	138,638	-1,000	-0.7%	138,622	-1,016	-0.7%
		PM	155,513	153,378	-2,135	-1.4%	153,402	-2,111	-1.4%
		OP	39,993	40,251	257	0.6%	40,238	245	0.6%
NHBO L	By Time Period OD	AM	160,413	157,784	-2,629	-1.6%	157,979	-2,434	-1.5%
		IP	424,388	415,600	-8,788	-2.1%	415,598	-8,790	-2.1%
		PM	335,032	325,276	-9,755	-2.9%	325,354	-9,678	-2.9%
		OP	120,136	118,811	-1,324	-1.1%	118,771	-1,365	-1.1%
NHBO M	By Time Period OD	AM	170,735	168,974	-1,761	-1.0%	169,094	-1,641	-1.0%
		IP	339,565	337,889	-1,675	-0.5%	337,921	-1,644	-0.5%
		PM	336,943	332,866	-4,077	-1.2%	332,890	-4,052	-1.2%
		OP	96,096	96,813	716	0.7%	96,780	684	0.7%
NHBO H	By Time Period OD	AM	137,680	135,892	-1,788	-1.3%	135,990	-1,690	-1.2%
		IP	232,460	230,973	-1,487	-0.6%	230,967	-1,493	-0.6%
		PM	260,868	257,244	-3,623	-1.4%	257,346	-3,522	-1.4%
		OP	65,823	66,493	671	1.0%	66,464	641	1.0%
LGV	By Time Period OD	AM	1,411,959	1,411,959	0	0.0%	1,411,959	0	0.0%
		IP	1,217,803	1,217,803	0	0.0%	1,217,803	0	0.0%
		PM	1,018,693	1,018,693	0	0.0%	1,018,693	0	0.0%
		OP	489,362	489,362	0	0.0%	489,362	0	0.0%
HGV	By Time Period OD	AM	499,458	499,458	0	0.0%	499,458	0	0.0%
		IP	496,412	496,412	0	0.0%	496,412	0	0.0%
		PM	312,731	312,731	0	0.0%	312,731	0	0.0%
		OP	198,163	198,163	0	0.0%	198,163	0	0.0%
		AM	5,639	5,639	0	0.0%	5,639	0	0.0%

Segment	Matrix Type	Time Period	Reference Matrix (Core 2051)	VDM Output Matrix (Core 2051 DM)			VDM Output Matrix (Core 2051 DS)		
			Matrix Total	Matrix Total	Diff to Reference	Diff %	Matrix Total	Diff to Reference	Diff %
Port Trips EB	By Time Period OD	IP	3,963	3,963	0	0.0%	3,963	0	0.0%
		PM	4,914	4,914	0	0.0%	4,914	0	0.0%
		OP	1,531	1,531	0	0.0%	1,531	0	0.0%
Port Trips O LI	By Time Period OD	AM	3,294	3,294	0	0.0%	3,294	0	0.0%
		IP	4,071	4,071	0	0.0%	4,071	0	0.0%
		PM	4,008	4,008	0	0.0%	4,008	0	0.0%
		OP	1,597	1,597	0	0.0%	1,597	0	0.0%
Port Trips O MI	By Time Period OD	AM	3,853	3,853	0	0.0%	3,853	0	0.0%
		IP	4,303	4,303	0	0.0%	4,303	0	0.0%
		PM	4,699	4,699	0	0.0%	4,699	0	0.0%
		OP	1,688	1,688	0	0.0%	1,688	0	0.0%
Port Trips O HI	By Time Period OD	AM	5,431	5,431	0	0.0%	5,431	0	0.0%
		IP	4,560	4,560	0	0.0%	4,560	0	0.0%
		PM	5,985	5,985	0	0.0%	5,985	0	0.0%
		OP	1,785	1,785	0	0.0%	1,785	0	0.0%

Table 6.44 – LTAM SATURN Matrix Total Comparison – Reference Matrix Vs VDM Output Matrices (Core 2051 Reference DM and DS)

Userclass	Time Period	All Movements							Relevant Movements						
		Reference Matrix (Core 2051)	VDM Output Matrix (Core 2051 DM)			VDM Output Matrix (Core 2051 DS)			Reference Matrix (Core 2051)	VDM Output Matrix (Core 2051 DM)			VDM Output Matrix (Core 2051 DS)		
		Matrix Total	Matrix Total	Diff to Reference	Diff %	Matrix Total	Diff to Reference	Diff %	Matrix Total	Matrix Total	Diff to Reference	Diff %	Matrix Total	Diff to Reference	Diff %
Car Employers Business	AM	560,534	558,337	-2,197	-0.4%	558,483	-2,051	-0.4%	46,606	44,942	-1,664	-3.6%	45,104	-1,502	-3.2%
	IP	487,339	485,254	-2,084	-0.4%	485,232	-2,107	-0.4%	32,263	31,827	-436	-1.4%	31,819	-444	-1.4%
	PM	670,877	665,880	-4,997	-0.7%	665,939	-4,938	-0.7%	46,389	44,898	-1,491	-3.2%	44,981	-1,408	-3.0%
	OP	196,731	197,090	358	0.2%	197,065	334	0.2%	12,607	13,363	756	6.0%	13,342	735	5.8%
Car Commute Low Income	AM	509,314	500,863	-8,450	-1.7%	500,849	-8,465	-1.7%	36,503	35,316	-1,187	-3.3%	35,294	-1,209	-3.3%
	IP	231,517	230,498	-1,019	-0.4%	230,516	-1,001	-0.4%	20,371	20,096	-275	-1.3%	20,113	-257	-1.3%
	PM	582,769	577,250	-5,519	-0.9%	577,278	-5,491	-0.9%	38,594	37,383	-1,211	-3.1%	37,411	-1,183	-3.1%
	OP	93,106	92,975	-131	-0.1%	92,974	-132	-0.1%	7,924	8,016	92	1.2%	8,015	91	1.1%
Car Commute Medium Income	AM	1,028,496	1,017,946	-10,550	-1.0%	1,018,120	-10,376	-1.0%	77,843	75,128	-2,715	-3.5%	75,292	-2,551	-3.3%
	IP	355,342	354,347	-996	-0.3%	354,330	-1,013	-0.3%	31,187	30,730	-457	-1.5%	30,714	-474	-1.5%
	PM	1,116,206	1,110,766	-5,440	-0.5%	1,110,824	-5,383	-0.5%	76,440	73,737	-2,704	-3.5%	73,791	-2,650	-3.5%
	OP	142,856	142,884	27	0.0%	142,867	11	0.0%	12,185	12,335	151	1.2%	12,318	134	1.1%
Car Commute High Income	AM	875,312	867,922	-7,390	-0.8%	867,834	-7,478	-0.9%	74,489	71,669	-2,820	-3.8%	71,570	-2,919	-3.9%
	IP	253,021	251,618	-1,403	-0.6%	251,636	-1,385	-0.5%	26,590	26,064	-526	-2.0%	26,084	-506	-1.9%
	PM	902,456	897,064	-5,392	-0.6%	897,268	-5,188	-0.6%	74,841	71,651	-3,190	-4.3%	71,855	-2,986	-4.0%
	OP	101,709	101,483	-227	-0.2%	101,477	-233	-0.2%	10,467	10,559	92	0.9%	10,552	85	0.8%
Car Other Low Income	AM	872,354	846,183	-26,170	-3.0%	846,670	-25,684	-2.9%	92,587	80,320	-12,267	-13.2%	80,826	-11,761	-12.7%
	IP	1,542,152	1,496,915	-45,237	-2.9%	1,496,943	-45,208	-2.9%	127,769	113,311	-14,458	-11.3%	113,368	-14,401	-11.3%
	PM	1,507,358	1,454,935	-52,423	-3.5%	1,455,147	-52,211	-3.5%	136,147	116,607	-19,539	-14.4%	116,850	-19,296	-14.2%
	OP	623,187	607,808	-15,379	-2.5%	607,695	-15,492	-2.5%	50,882	48,419	-2,463	-4.8%	48,325	-2,557	-5.0%
Car Other Medium Income	AM	931,859	916,389	-15,470	-1.7%	916,620	-15,239	-1.6%	102,243	92,264	-9,979	-9.8%	92,527	-9,716	-9.5%
	IP	1,234,323	1,219,465	-14,858	-1.2%	1,219,564	-14,760	-1.2%	118,816	111,424	-7,392	-6.2%	111,571	-7,245	-6.1%
	PM	1,519,912	1,494,952	-24,960	-1.6%	1,495,021	-24,891	-1.6%	151,532	137,673	-13,858	-9.1%	137,807	-13,725	-9.1%
	OP	498,608	495,945	-2,663	-0.5%	495,869	-2,739	-0.5%	47,282	47,781	499	1.1%	47,720	438	0.9%
Car Other High Income	AM	748,435	738,322	-10,114	-1.4%	738,516	-9,919	-1.3%	97,003	89,084	-7,919	-8.2%	89,316	-7,687	-7.9%
	IP	832,846	824,752	-8,094	-1.0%	824,749	-8,097	-1.0%	97,164	92,724	-4,440	-4.6%	92,765	-4,399	-4.5%
	PM	1,156,922	1,141,057	-15,865	-1.4%	1,141,327	-15,596	-1.3%	136,156	126,184	-9,972	-7.3%	126,531	-9,625	-7.1%
	OP	336,433	336,365	-68	0.0%	336,286	-147	0.0%	38,836	40,129	1,293	3.3%	40,063	1,227	3.2%
Car Total	AM	5,526,303	5,445,962	-80,341	-1.5%	5,447,092	-79,211	-1.4%	527,273	488,722	-38,550	-7.3%	489,929	-37,344	-7.1%
	IP	4,936,540	4,862,849	-73,691	-1.5%	4,862,968	-73,572	-1.5%	454,160	426,175	-27,985	-6.2%	426,434	-27,726	-6.1%

Userclass	Time Period	All Movements							Relevant Movements						
		Reference Matrix (Core 2051)	VDM Output Matrix (Core 2051 DM)			VDM Output Matrix (Core 2051 DS)			Reference Matrix (Core 2051)	VDM Output Matrix (Core 2051 DM)			VDM Output Matrix (Core 2051 DS)		
	PM	7,456,500	7,341,904	-114,596	-1.5%	7,342,803	-113,696	-1.5%	660,099	608,134	-51,965	-7.9%	609,225	-50,874	-7.7%
	OP	1,992,632	1,974,549	-18,083	-0.9%	1,974,234	-18,398	-0.9%	180,182	180,602	420	0.2%	180,336	153	0.1%
LGV	AM	1,411,959	1,411,959	0	0.0%	1,411,959	0	0.0%	168,031	168,031	0	0.0%	168,031	0	0.0%
	IP	1,217,803	1,217,803	0	0.0%	1,217,803	0	0.0%	126,843	126,843	0	0.0%	126,843	0	0.0%
	PM	1,018,693	1,018,693	0	0.0%	1,018,693	0	0.0%	130,945	130,945	0	0.0%	130,945	0	0.0%
	OP	489,362	489,362	0	0.0%	489,362	0	0.0%	49,201	49,201	0	0.0%	49,201	0	0.0%
HGV	AM	499,458	499,458	0	0.0%	499,458	0	0.0%	76,632	76,632	0	0.0%	76,632	0	0.0%
	IP	496,412	496,412	0	0.0%	496,412	0	0.0%	78,912	78,912	0	0.0%	78,912	0	0.0%
	PM	312,731	312,731	0	0.0%	312,731	0	0.0%	47,791	47,791	0	0.0%	47,791	0	0.0%
	OP	198,163	198,163	0	0.0%	198,163	0	0.0%	30,084	30,084	0	0.0%	30,084	0	0.0%

Assignments – Reference Matrix Vs VDM Output Matrix

6.6.5 Figure 6.22 to Figure 6.24 provide a flow difference comparison between the reference matrix assignment and the VDM output assignment for the DM scenario for each time period. Figure 6.25 to Figure 6.27 provide a flow difference comparison between the reference matrix assignment and the VDM output assignment for the DS scenario for each time period. Blue colours show reductions in traffic, green colours show increases in traffic.

Figure 6.22 – Assigned Flow Differences – Reference Matrix Vs VDM Output Matrix (Core 2051 Reference Vs 2051 DM AM Peak)

Figure 6.23 – Assigned Flow Differences – Reference Matrix Vs VDM Output Matrix (Core 2051 Reference Vs 2051 DM Inter Peak)

Figure 6.24 – Assigned Flow Differences – Reference Matrix Vs VDM Output Matrix (Core 2051 Reference Vs 2051 DM PM Peak)

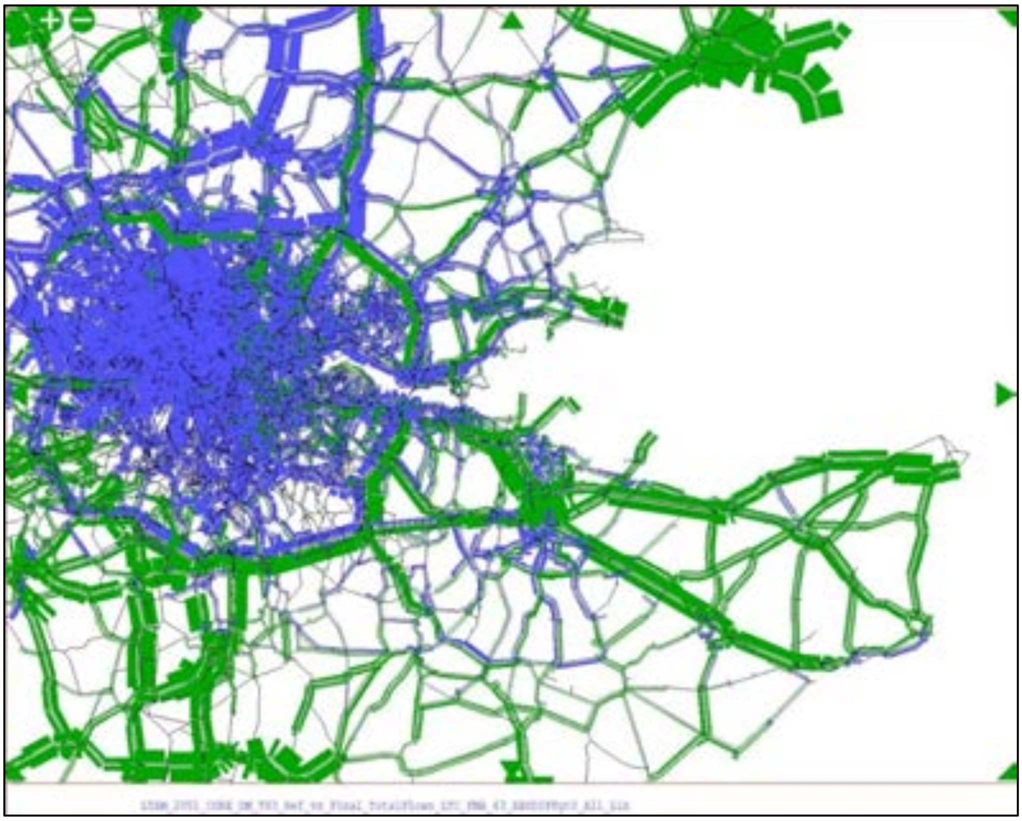


Figure 6.25 – Assigned Flow Differences – Reference Matrix Vs VDM Output Matrix (Core 2051 Reference Vs 2051 DS AM Peak)

Figure 6.26 – Assigned Flow Differences – Reference Matrix Vs VDM Output Matrix (Core 2051 Reference Vs 2051 DS Inter Peak)

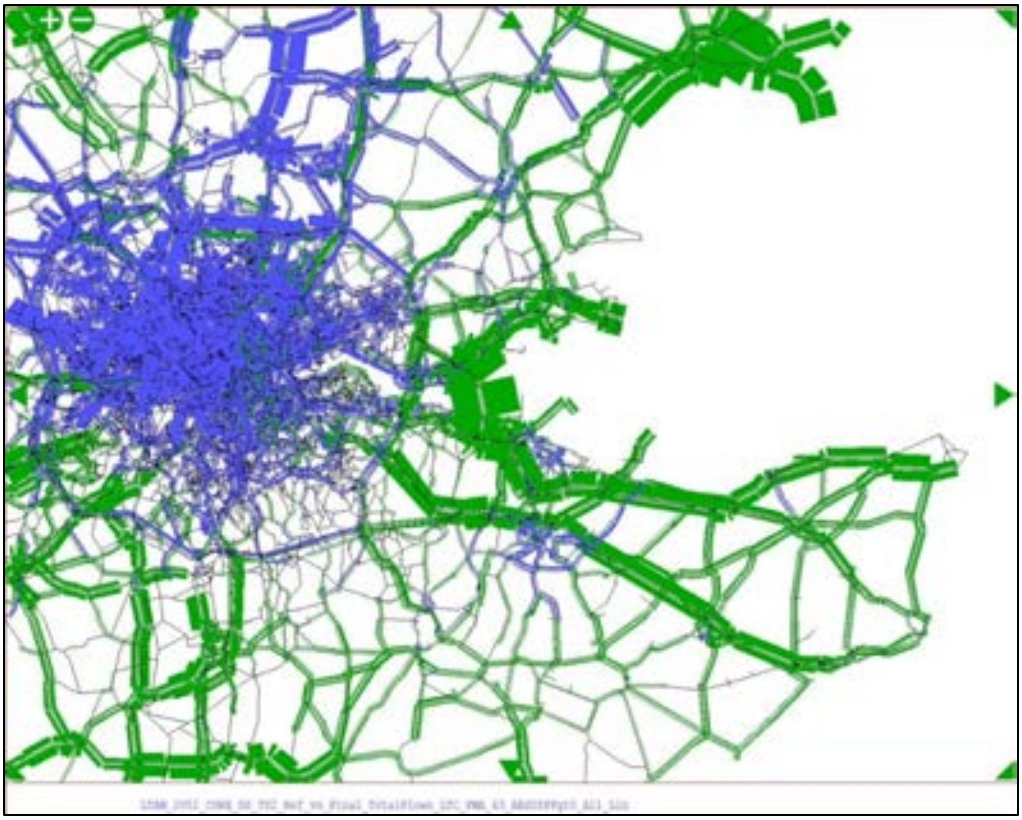
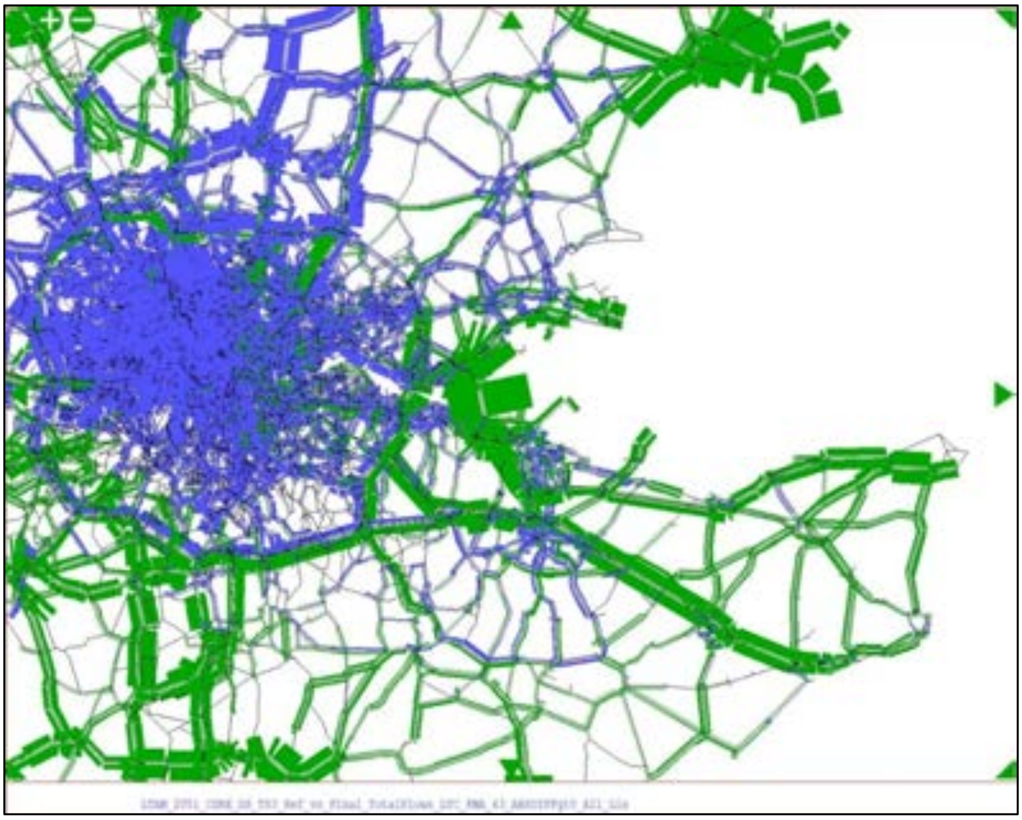


Figure 6.27 – Assigned Flow Differences – Reference Matrix Vs VDM Output Matrix (Core 2051 Reference Vs 2051 DS PM Peak)



Key Statistics – Reference Matrix Vs VDM Output Matrix

6.6.6 Table 6.45 provides some key network statistics from the reference matrix assignments and the VDM output matrix assignments.

Table 6.45 – Key Network Statistics – Reference Matrix Vs VDM Output Matrix (Core 2051)

Metric	Time Period	Reference Matrix (Core 2051)				VDM Output Matrix (Core 2051)			
		DM*	DS**	Diff	Diff%	DM***	DS****	Diff	Diff%
Time (PCU Hours)	AM	2,724,901	2,717,703	-7,198	-0.26%	2,972,186	2,972,386	201	0.01%
	IP	2,317,509	2,313,577	-3,933	-0.17%	2,626,175	2,625,465	-710	-0.03%
	PM	2,999,619	2,992,945	-6,674	-0.22%	3,367,028	3,367,448	421	0.01%
	OP	899,296	899,077	-218	-0.02%	1,042,761	1,042,664	-97	-0.01%
Distance (PCU KM)	AM	161,873,856	161,805,216	-68,640	-0.04%	182,021,424	182,174,128	152,704	0.08%
	IP	142,499,728	142,459,312	-40,416	-0.03%	164,963,104	165,038,256	75,152	0.05%
	PM	178,000,752	177,969,264	-31,488	-0.02%	206,868,032	207,025,504	157,472	0.08%
	OP	57,100,628	57,087,896	-12,732	-0.02%	67,004,488	67,009,128	4,640	0.01%
Average Speed (KM/Hr)	AM	59.41	59.54	0.13	0.22%	61.24	61.29	0.05	0.08%
	IP	61.49	61.58	0.09	0.14%	62.81	62.86	0.05	0.07%
	PM	59.34	59.46	0.12	0.21%	61.44	61.48	0.04	0.06%
	OP	63.49	63.50	0.00	0.00%	64.26	64.27	0.01	0.02%

* These statistics are generated by assigning the reference matrix to the DM network

** These statistics are generated by assigning the reference matrix to the DS network

*** These statistics are generated from the final VDM loop for the DM

**** These statistics are generated from the final VDM loop for the DS

Commentary on Results

6.6.7 Table 6.41 and Table 6.42 demonstrate that the VDM runs for the Do Minimum and Do Something scenarios have converged within 12 and 11 iterations respectively.

6.6.8 From an all movement perspective the VDM generally reduces the number of car trips across all purposes in both the Do Minimum and Do Something scenarios, as demonstrated in Table 6.43 and Table 6.44. When the irrelevant movements are removed from the analysis we also see a general reduction in car trips across all journey purposes. There is some switching away from the peaks to the off peak for some journey purposes.

6.6.9 These matrix sensitivities are as would be expected and are due to increases in the levels of congestion on the road network leading to reductions in the number of highway trips. As would also be expected, the reductions in trips are slightly higher in the Do Minimum than they are in the Do Something scenario. This is due to the increased capacity of the network in the Do Something, in particular, associated with Thames river crossings.

6.6.10 These changes in the matrices are supported by the flow difference analysis. As can be seen in the Do Minimum there is a general decrease in flow along the M25 in the Dartford Crossing corridor when compared to the reference matrix assignments. This is consistent across the time periods. In the Do Something there is generally an increase in flow along this corridor as a result of destination switching where more trips are able to cross the river in the Do Something due to the introduction of LTC.

6.6.11 The reference matrix assignments do not take account of this switching, leading to lower flow over Dartford (as the reference demand has the choice of using either Dartford or LTC), therefore in the with LTC scenario there is spare capacity to cross the river. The VDM will switch trips that currently do not cross the river to crossing the river in order to take advantage of this spare capacity. Much of this cross river demand is suppressed in the reference case due to the lack of available capacity. There is a general reduction in flow throughout London which is due to the lack of spare capacity in the highway network to accommodate the levels of growth.

6.6.12 The overall network statistics comparison shows that in the reference case assignments there is a relatively large reduction in both journey time and distance travelled in absolute terms between the Do Minimum and Do Something scenarios. It is a very small relative decrease. As would be expected, the post VDM statistics show a substantial reduction in the amount of travel time savings and a switch to an overall increase in distance travelled. In the AM and PM peaks there is an overall increase in the total travel time on the network. Again, this is as expected due to the VDM shifting movements to take account of the increases in capacity, leading to less overall travel time savings, and in some instances increases, and slightly longer distance journeys.

6.6.13 The average speed over the entire network is very slightly higher in the Do Something than in the Do Minimum in the AM, IP and PM peaks. There is essentially no difference in the off peak.

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7 Assignment Results for Economic Assessment

7.1 Introduction

7.1.1 Outputs from LTAM are used to support the economic appraisal of the scheme. This section of the report provides summary information on those forecasts provided. Current guidance requires that this is provided for all years, all time periods and all scenarios. The sections below provide the required analysis for the core scenario. More detailed analysis of cross river flows is presented in Appendix B. Detailed journey time analysis is provided in Appendix C. The low and high growth sensitivity test analysis is presented in Appendix D. Flow difference plots comparing the core scenario with the low and high growth sensitivity tests are presented in Appendix E.

7.2 LTAM 2026 Core – Outputs to Economic Assessment

7.2.1 The analysis presented below summarises the impact of the LTC scheme on forecast traffic flows and journey times for the 2026 core forecast. The statistics presented are from the final converged VDM loop as described under Chapter 6 above.

Highway Assignment Model (HAM) Convergence Statistics

7.2.2 Table 7.1 to Table 7.3 provide the final VDM loop highway assignment model convergence statistics for the 2026 core DM forecasts.

7.2.3 Table 7.4 to Table 7.6 provide the final VDM loop highway assignment model convergence statistics for the 2026 core DS forecasts.

Table 7.1 – HAM Convergence Statistics – 2026 Core DM AM Peak

Iteration	Delta (%)	%GAP	%Flows	%Delays
52	0.0055	0.0090	98.2	99.1
53	0.0063	0.0062	97.7	99.1
54	0.0060	0.0089	98.4	99.2
55	0.0067	0.0076	97.9	99.1

Table 7.2 – HAM Convergence Statistics – 2026 Core DM Inter Peak

Iteration	Delta (%)	%GAP	%Flows	%Delays
66	0.0052	0.012	98.4	99.3
67	0.0142	0.0063	97.8	99.1
68	0.0067	0.012	98.2	99.3
69	0.0171	0.0064	97.6	99.1

Table 7.3 – HAM Convergence Statistics – 2026 Core DM PM Peak

Iteration	Delta (%)	%GAP	%Flows	%Delays
59	0.0049	0.0083	97.7	98.9
60	0.0043	0.0087	98.3	99.1
61	0.0064	0.0077	97.9	98.9
62	0.0043	0.0080	98.4	99.2

Table 7.4 – HAM Convergence Statistics – 2026 Core DS AM Peak

Iteration	Delta (%)	%GAP	%Flows	%Delays
58	0.0061	0.0099	98.3	99.0
59	0.0086	0.0086	97.9	98.9
60	0.0063	0.0090	98.2	99.0
61	0.0070	0.0074	97.8	99.1

Table 7.5 – HAM Convergence Statistics – 2026 Core DS Inter Peak

Iteration	Delta (%)	%GAP	%Flows	%Delays
69	0.0048	0.011	98.1	99.2
70	0.0119	0.0061	97.8	99.1
71	0.0048	0.012	98.3	99.3
72	0.0114	0.0056	97.6	99.1

Table 7.6 – HAM Convergence Statistics – 2026 Core DS PM Peak

Iteration	Delta (%)	%GAP	%Flows	%Delays
69	0.0057	0.013	98.0	98.9
70	0.0134	0.0074	97.5	98.7
71	0.0058	0.013	98.2	99.0
72	0.0118	0.0077	97.6	98.7

7.2.4 These tables demonstrate that the LTAM has achieved the WebTAG convergence targets in all time periods for this scenario and year.

Movement Patterns Using the Crossings

7.2.5 Figure 7.1 to Figure 7.9 provide select link analysis of movements using the Dartford and Lower Thames Crossing for the Do Minimum and Do Something scenarios for each of the model time periods. These diagrams show the pattern of movements using each of the crossings in each of the time periods. Table 7.7 to Table 7.9 provide a summary of the main corridors using each of the crossings and a comparison between the DM and DS scenarios for each time period.

Figure 7.1 – Select Link Analysis – Dartford Crossing DM 2026 Core AM Peak

Figure 7.2 – Select Link Analysis – Dartford Crossing DS 2026 Core AM Peak

Figure 7.3 – Select Link Analysis – Lower Thames Crossing DS 2026 Core AM Peak

Table 7.7 – Select Link Analysis – Summary of Primary Corridors of Movement 2026 AM Peak Two-Way Flow

Movement	Corridor	DM		DS		DS-DM SLA Flow (PCU)	% change (DM to DS) in SLA Flow
		SLA Flow (PCU)	% of Selected Link Flow	SLA Flow (PCU)	% of Selected Link Flow		
South of River	London South	2,906	18%	3,201	26%	295	10%
	Local Traffic	1,444	9%	1,286	10%	-158	-11%
	M25 South (J2-3)	8,147	50%	7,053	57%	-1,094	-13%
	A2/M2 to/from Kent	3,685	23%	906	7%	-2,779	-75%
Select Link	Dartford	**16,202**	**100%**	**12,468**	**100%**	**-3,734**	**-23%**
North of River	London North	1,979	12%	2,193	18%	214	11%
	Local Traffic	1,879	12%	1,381	11%	-497	-26%
	M25 North (J30-29)	8,923	55%	6,188	50%	-2,735	-31%
	A13 to/from Essex	3,287	20%	2,705	22%	-582	-18%
South of River	Local Traffic	n/a	n/a	614	8%	n/a	n/a
	A2 West of LTC	n/a	n/a	482	6%	n/a	n/a
	A2/A2M East of LTC	n/a	n/a	6,595	86%	n/a	n/a
Select Link	LTC	**n/a**	**n/a**	**7,692**	**100%**	**n/a**	**n/a**
North of River	A1089	n/a	n/a	600	8%	n/a	n/a
	A13 West of LTC	n/a	n/a	40	1%	n/a	n/a
	A13 East of LTC	n/a	n/a	3,220	42%	n/a	n/a
	M25 North of LTC	n/a	n/a	3,832	50%	n/a	n/a
	M25 South of LTC	n/a	n/a	0	0%	n/a	n/a

Figure 7.4 – Select Link Analysis – Dartford Crossing DM 2026 Core Inter Peak

Figure 7.5 – Select Link Analysis – Dartford Crossing DS 2026 Core Inter Peak

Figure 7.6 – Select Link Analysis – Lower Thames Crossing DS 2026 Core Inter Peak

Table 7.8 – Select Link Analysis – Summary of Primary Corridors of Movement 2026 Inter Peak Two-Way Flow

Movement	Corridor	DM		DS		DS-DM SLA Flow (PCU)	% change (DM to DS) in SLA Flow
		SLA Flow (PCU)	% of Selected Link Flow	SLA Flow (PCU)	% of Selected Link Flow		
South of River	London South	2,323	17%	2,483	25%	160	7%
	Local Traffic	1,075	8%	1,027	10%	-48	-4%
	M25 South (J2-3)	6,668	48%	5,639	57%	-1,029	-15%
	A2/M2 to/from Kent	3,750	27%	722	7%	-3,028	-81%
Select Link	Dartford	**13,841**	**100%**	**9,911**	**100%**	**-3,930**	-28%
North of River	London North	1,229	9%	1,263	13%	34	3%
	Local Traffic	1,254	9%	1,106	11%	-148	-12%
	M25 North (J30-29)	8,133	59%	5,151	52%	-2,982	-37%
	A13 to/from Essex	3,216	23%	2,392	24%	-825	-26%
South of River	Local Traffic	n/a	n/a	519	9%	n/a	n/a
	A2 West of LTC	n/a	n/a	289	5%	n/a	n/a
	A2/A2M East of LTC	n/a	n/a	5,051	86%	n/a	n/a
Select Link	LTC	n/a	n/a	**5,859**	**100%**	n/a	n/a
North of River	A1089	n/a	n/a	230	4%	n/a	n/a
	A13 West of LTC	n/a	n/a	10	0%	n/a	n/a
	A13 East of LTC	n/a	n/a	2,411	41%	n/a	n/a
	M25 North of LTC	n/a	n/a	3,209	55%	n/a	n/a
	M25 South of LTC	n/a	n/a	0	0%	n/a	n/a

Figure 7.7 – Select Link Analysis – Dartford Crossing DM 2026 Core PM Peak

Figure 7.8 – Select Link Analysis – Dartford Crossing DS 2026 Core PM Peak

Figure 7.9 – Select Link Analysis – Lower Thames Crossing DS 2026 Core PM Peak

Table 7.9 – Select Link Analysis – Summary of Primary Corridors of Movement 2026 PM Peak Two-Way Flow

Movement	Corridor	DM		DS		DS-DM SLA Flow (PCU)	% change (DM to DS) in SLA Flow
		SLA Flow (PCU)	% of Selected Link Flow	SLA Flow (PCU)	% of Selected Link Flow		
South of River	London South	3,039	20%	3,329	28%	290	10%
	Local Traffic	1,758	11%	1,634	14%	-124	-7%
	M25 South (J2-3)	6,345	41%	5,495	47%	-850	-13%
	A2/M2 to/from Kent	4,097	27%	1,140	10%	-2,957	-72%
Select Link	Dartford	**15,359**	**100%**	**11,724**	**100%**	**-3,635**	**-24%**
North of River	London North	1,985	13%	2,070	18%	85	4%
	Local Traffic	1,490	10%	1,375	12%	-116	-8%
	M25 North (J30-29)	8,381	55%	5,913	50%	-2,468	-29%
	A13 to/from Essex	3,146	20%	2,197	19%	-949	-30%
South of River	Local Traffic	n/a	n/a	757	11%	n/a	n/a
	A2 West of LTC	n/a	n/a	572	8%	n/a	n/a
	A2/A2M East of LTC	n/a	n/a	5,731	81%	n/a	n/a
Select Link	LTC	n/a	n/a	**7,060**	**100%**	n/a	n/a
North of River	A1089	n/a	n/a	392	6%	n/a	n/a
	A13 West of LTC	n/a	n/a	12	0%	n/a	n/a
	A13 East of LTC	n/a	n/a	3,277	46%	n/a	n/a
	M25 North of LTC	n/a	n/a	3,379	48%	n/a	n/a
	M25 South of LTC	n/a	n/a	0	0%	n/a	n/a

DM Vs DS Flow Comparisons

7.2.6 The impacts of the LTC scheme on traffic flows are presented in a number of different ways. Figure 7.10 to Figure 7.12 provide a flow difference plot between the DM and DS scenarios. Blue colours equate to reductions in flow, green colours indicate increases in flow. Flow differences less than 100 PCU's per hour have been excluded from the colouring.

7.2.7 Table 7.10 provides a comparison of the cross-river traffic flows between the DM and DS scenarios. Graphs showing a comparison of the cross river flows across different years and growth assumptions are provided in Appendix B.

Figure 7.10 – Actual Flow Comparison Plot – 2026 Core DM Vs DS AM Peak

Figure 7.11 – Actual Flow Comparison Plot – 2026 Core DM Vs DS Inter Peak

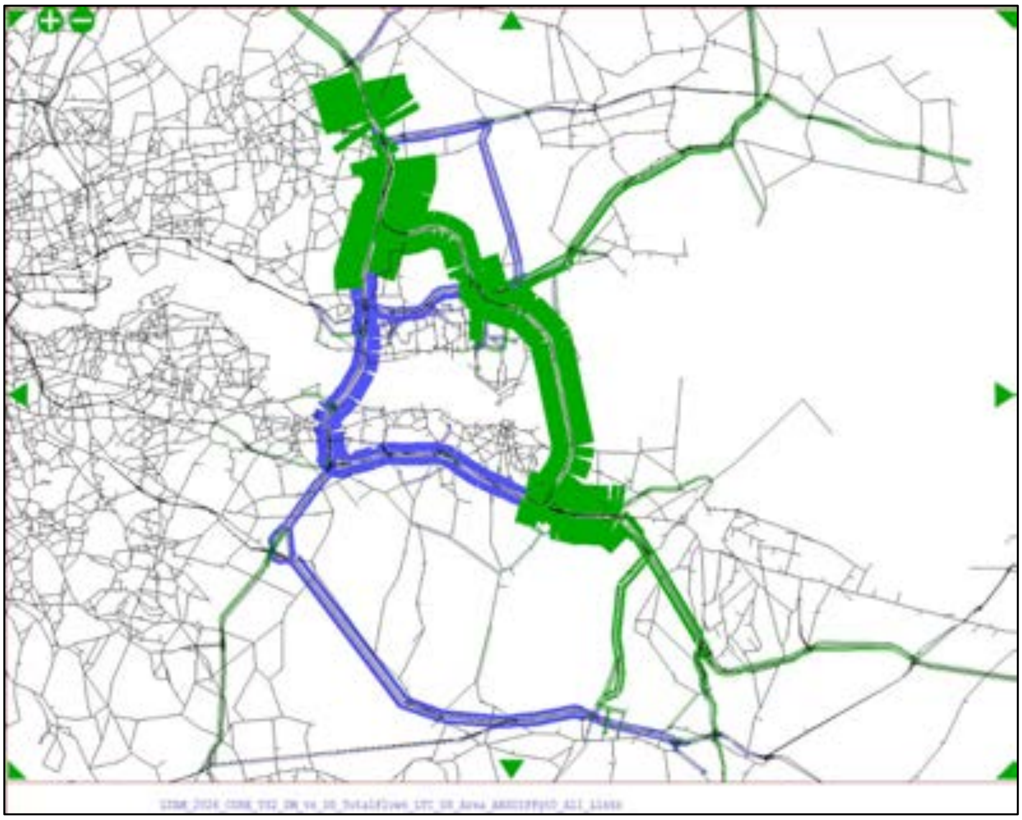

Figure 7.12 – Actual Flow Comparison Plot – 2026 Core DM Vs DS PM Peak

Table 7.10 – Cross River Traffic Flows – 2026 Core DM Vs DS (Hourly Flows in PCU's)

Direction	Crossing	Time Period	Cars				LGV				HGV				Total			
			DM	DS	Diff	Diff %	DM	DS	Diff	Diff %	DM	DS	Diff	Diff %	DM	DS	Diff	Diff %
SB	Dartford	AM	3,218	2,800	-418	-13%	1,876	1,671	-205	-11%	3,406	2,263	-1,143	-34%	8,500	6,734	-1,766	-21%
		IP	2,910	2,233	-677	-23%	865	664	-202	-23%	3,097	1,911	-1,186	-38%	6,872	4,808	-2,065	-30%
		PM	4,700	3,597	-1,103	-23%	1,201	886	-314	-26%	2,206	1,218	-988	-45%	8,107	5,701	-2,405	-30%
	LTC	AM	0	1,929			0	352			0	1,333			0	3,614		
		IP	0	1,575			0	219			0	1,262			0	3,056		
		PM	0	3,101			0	346			0	1,056			0	4,503		
	Total	AM	3,218	4,729	1,511	47%	1,876	2,023	147	8%	3,406	3,597	191	6%	8,500	10,349	1,849	22%
		IP	2,910	3,808	898	31%	865	883	17	2%	3,097	3,173	76	2%	6,872	7,863	991	14%
		PM	4,700	6,698	1,999	43%	1,201	1,233	32	3%	2,206	2,274	68	3%	8,107	10,205	2,098	26%
NB	Dartford	AM	3,696	3,046	-651	-18%	1,497	1,106	-391	-26%	2,229	1,297	-932	-42%	7,422	5,449	-1,974	-27%
		IP	2,872	2,421	-451	-16%	1,028	838	-190	-18%	2,977	1,750	-1,227	-41%	6,877	5,009	-1,868	-27%
		PM	3,831	3,539	-293	-8%	1,080	884	-195	-18%	2,109	1,328	-781	-37%	7,020	5,751	-1,269	-18%
	LTC	AM	0	2,468			0	479			0	1,056			0	4,002		
		IP	0	1,267			0	222			0	1,303			0	2,792		
		PM	0	1,449			0	225			0	789			0	2,463		
	Total	AM	3,696	5,513	1,817	49%	1,497	1,584	88	6%	2,229	2,353	123	6%	7,422	9,451	2,028	27%
		IP	2,872	3,689	816	28%	1,028	1,059	32	3%	2,977	3,053	76	3%	6,877	7,801	924	13%
		PM	3,831	4,987	1,156	30%	1,080	1,110	30	3%	2,109	2,117	8	0%	7,020	8,214	1,194	17%

7.2.8 The impact on flows has also been analysed at other locations in the wider network considered critical to understanding the impacts of the scheme. Figure 7.13 provides a graphical representation of these locations. Table 7.11 provides a comparison of the flows at these strategic locations between the DM and DS in each time period.

Figure 7.13 – Identification of Key Corridor Locations

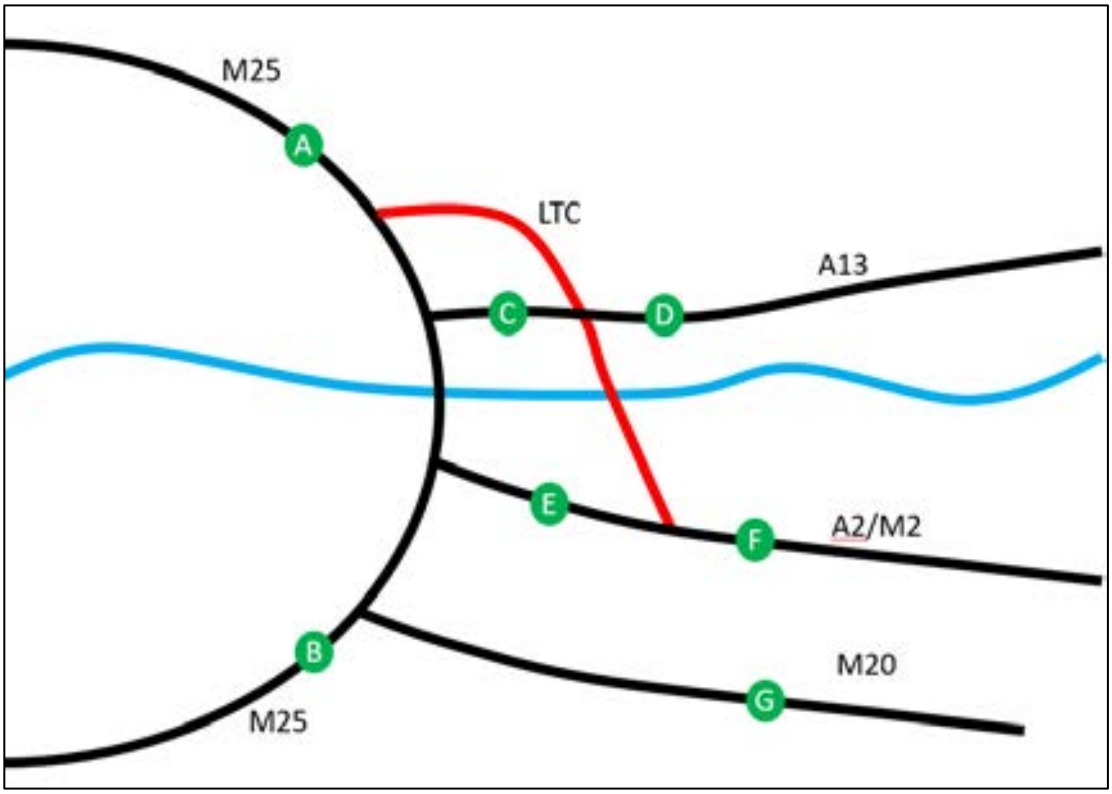

Table 7.11 – Key Corridor Traffic Flows – 2026 Core DM Vs DS (Hourly Flows in PCU's)

Location	Location Description	Time Period	DM			DS			Flow Differences	
			Flow	Effective Capacity	V/C	Flow	Effective Capacity	V/C	Diff	Diff %
A	M25 J29 to M25 J28 (NB)	AM	7,232	9,180	0.79	8,031	9,180	0.87	799	11%
		IP	6,918	9,180	0.75	7,145	9,180	0.78	227	3%
		PM	6,771	9,180	0.74	7,234	9,180	0.79	463	7%
	M25 J28 to M25 J29 (SB)	AM	7,402	9,115	0.81	7,542	9,180	0.82	140	2%
		IP	6,656	9,115	0.73	6,907	9,180	0.75	252	4%
		PM	7,302	9,115	0.80	7,574	9,180	0.83	271	4%
B	M25 J4 to M25 J3 (NB)	AM	5,323	6,850	0.78	5,529	6,850	0.81	205	4%
		IP	5,112	6,850	0.75	5,222	6,850	0.76	111	2%
		PM	5,714	6,850	0.83	5,847	6,850	0.85	133	2%
		AM	6,850	6,850	1.00	6,850	6,850	1.00	0	0%

Location	Location Description	Time Period	DM			DS			Flow Differences	
			Flow	Effective Capacity	V/C	Flow	Effective Capacity	V/C	Diff	Diff %
	M25 J3 to M25 J4 (SB)	IP	4,832	6,850	0.71	4,925	6,850	0.72	94	2%
		PM	5,084	6,850	0.74	5,282	6,850	0.77	198	4%
C	A13 A126 to A1012 (EB)	AM	4,611	6,303	0.73	3,759	6,285	0.60	-853	-18%
		IP	4,696	6,278	0.75	4,240	6,274	0.68	-455	-10%
		PM	5,629	6,277	0.90	5,626	6,251	0.90	-4	0%
	A13 A1012 to A126 (WB)	AM	6,112	6,360	0.96	5,577	6,360	0.88	-534	-9%
		IP	5,274	6,360	0.83	4,378	6,360	0.69	-896	-17%
		PM	5,138	6,360	0.81	4,002	6,360	0.63	-1,136	-22%
D	A13 Orsett Cock to Manor Way (EB)	AM	3,961	6,370	0.62	4,466	6,370	0.70	505	13%
		IP	3,693	6,370	0.58	4,104	6,370	0.64	411	11%
		PM	4,940	6,370	0.78	5,602	6,370	0.88	662	13%
	A13 Manor Way to Orsett Cock (WB)	AM	4,743	6,220	0.76	5,764	6,220	0.93	1,021	22%
		IP	3,896	6,220	0.63	4,802	6,220	0.77	907	23%
		PM	3,981	6,220	0.64	5,251	6,220	0.84	1,270	32%
E	A2 A227 to Gravesend East (EB)	AM	5,712	9,227	0.62	4,457	9,211	0.48	-1,255	-22%
		IP	5,788	9,188	0.63	4,616	9,167	0.50	-1,172	-20%
		PM	8,718	9,185	0.95	7,683	9,159	0.84	-1,036	-12%
	A2 Gravesend East to A227 (WB)	AM	6,772	7,779	0.87	5,951	7,621	0.78	-821	-12%
		IP	5,767	7,669	0.75	4,617	7,490	0.62	-1,150	-20%
		PM	6,106	7,475	0.82	5,599	7,309	0.77	-506	-8%
F	M2 J1 to M2 J2 (EB)	AM	4,823	8,421	0.57	5,643	8,438	0.67	820	17%
		IP	4,036	8,530	0.47	5,013	8,587	0.58	977	24%
		PM	6,299	8,537	0.74	7,574	8,565	0.88	1,275	20%
	M2 J2 to M2 J1 (WB)	AM	4,772	9,115	0.52	6,460	9,180	0.70	1,687	35%
		IP	3,672	9,115	0.40	4,609	9,180	0.50	937	26%
		PM	4,527	9,115	0.50	5,251	9,180	0.57	723	16%
G	M20 J3 to M20 J4 (EB)	AM	5,014	9,115	0.55	4,406	9,115	0.48	-608	-12%
		IP	4,938	9,115	0.54	4,304	9,115	0.47	-633	-13%
		PM	7,582	9,115	0.83	7,005	9,115	0.77	-577	-8%
	M20 J4 to M20 J3 (WB)	AM	8,000	9,115	0.88	7,026	9,115	0.77	-974	-12%
		IP	4,655	9,115	0.51	3,972	9,115	0.44	-683	-15%
		PM	4,251	9,115	0.47	3,637	9,115	0.40	-614	-14%

DM Vs DS Journey Time Comparisons

7.2.9 Another important metric used to measure the scheme impact is journey times. These can be monitored in two separate ways:

- **Link Based Impacts** – This is where LTC attracts traffic away from or on to specific corridors leading to either reduced or additional congestion which is reflected in the journey time along these corridors; and
- **Route Based Impacts** – This is where LTC provides an alternative route through the network for the same origin to destination movement.

7.2.10 Link based impacts have been assessed by comparing journey times along key strategic corridors. The corridors analysed are shown diagrammatically in Figure 7.14. The journey times are presented in Table 7.12 to Table 7.14 by time period. A more detailed analysis of link based journey times is provided in Appendix C.

Figure 7.14 – Link Based Journey Time Routes for Comparison

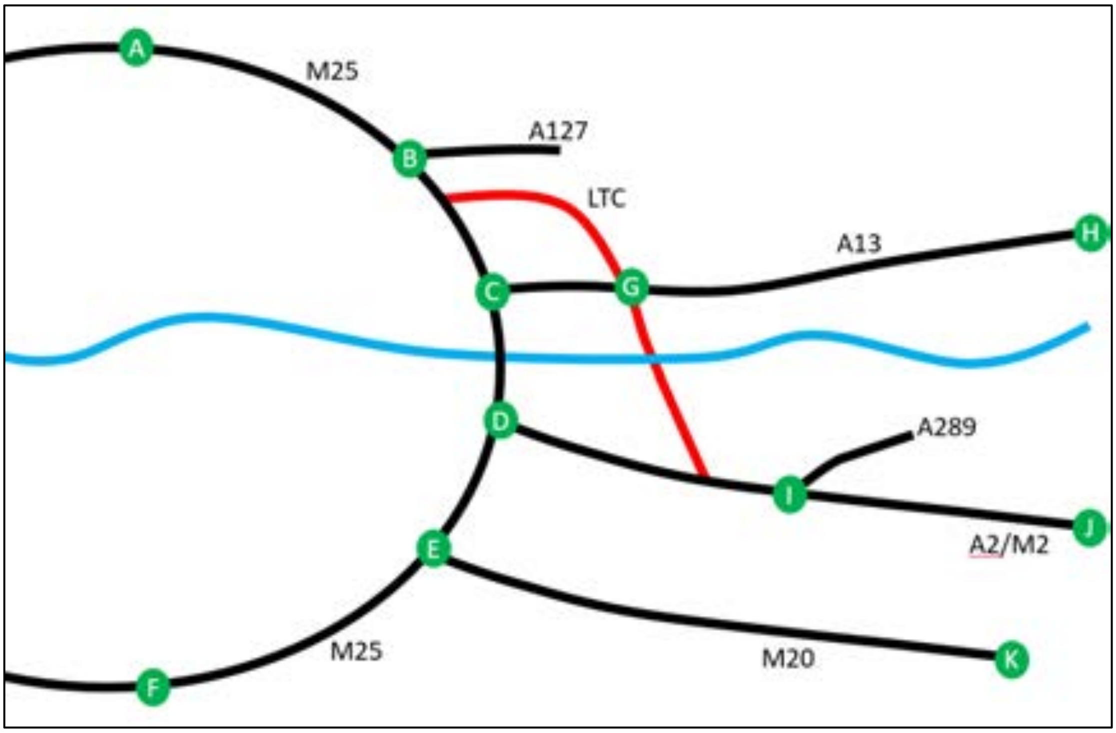

Table 7.12 – Link Based Journey Time Scenario Comparison (2026 Core DM Vs DS) AM Peak

Road	Movement	From	To	Do-Minimum			Do-Something			Difference			Difference (%)		
				Distance (km)	Time (mins)	Av Speed (kph)	Distance (km)	Time (mins)	Av Speed (kph)	Distance (km)	Time (mins)	Av Speed (kph)	Distance (km)	Time (mins)	Av Speed (kph)
M25 clockwise	A to B	M25 J26	M25 J29	23.5	18.0	78.2	23.5	17.2	82.1	-0.0	-0.9	3.8	-0.1%	-4.8%	+4.9%
	B to D	M25 J29	M25 J2	18.9	16.4	69.2	18.9	12.8	88.8	-0.0	-3.6	19.6	-0.1%	-22.1%	+28.3%
	D to F	M25 J2	M25 J7	37.4	28.2	79.5	37.4	30.1	74.7	0.0	1.8	-4.8	+0.0%	+6.4%	-6.0%
M25 Anti-clockwise	F to D	M25 J7	M25 J2	37.8	26.2	86.6	37.8	26.2	86.5	0.0	0.0	-0.1	+0.0%	+0.1%	-0.1%
	D to B	M25 J2	M25 J29	18.6	21.3	52.5	18.4	14.3	77.3	-0.2	-7.0	24.8	-1.1%	-32.8%	+47.2%
	B to A	M25 J29	M25 J26	23.4	18.3	76.5	23.3	18.8	74.5	-0.0	0.5	-2.0	-0.1%	+2.6%	-2.6%
A13 EB	C to G	M25 J30	A1089	5.0	4.3	70.7	5.2	4.1	75.9	0.2	-0.2	5.1	+3.1%	-3.9%	+7.3%
	G to H	A1089	A130	15.7	10.9	86.3	15.7	11.3	83.6	-0.0	0.4	-2.7	-0.0%	+3.2%	-3.1%
A13 WB	H to G	A130	A1089	15.6	12.4	75.4	15.6	14.9	62.7	0.0	2.5	-12.8	+0.1%	+20.5%	-16.9%
	G to C	A1089	M25 J30	5.3	7.4	42.8	5.6	6.2	53.6	0.3	-1.2	10.9	+5.9%	-15.6%	+25.4%
A2/M2 EB	D to I	M25 J2	M2 J1	14.2	8.5	100.2	14.6	8.3	105.3	0.4	-0.2	5.1	+3.0%	-2.0%	+5.1%
	I to J	M2 J1	M2 J4	14.9	8.4	106.4	14.4	8.3	104.3	-0.5	-0.1	-2.0	-3.3%	-1.4%	-1.9%
A2/M2 WB	J to I	M2 J4	M2 J1	15.0	8.8	102.2	15.0	9.3	97.6	0.0	0.4	-4.6	+0.0%	+4.7%	-4.5%
	I to D	M2 J1	M25 J2	14.7	16.6	53.1	14.8	12.6	70.6	0.1	-4.1	17.5	+0.4%	-24.5%	+32.9%
M20 EB	E to K	M25 J3	M20 J8	35.2	24.8	85.2	35.2	23.9	88.3	0.0	-0.9	3.1	+0.0%	-3.6%	+3.7%
M20 WB	K to E	M20 J8	M25 J3	35.4	23.2	91.7	35.4	21.7	98.1	0.0	-1.5	6.4	+0.0%	-6.5%	+6.9%

Table 7.13 – Link Based Journey Time Scenario Comparison (2026 Core DM Vs DS) Inter Peak

Road	Movement	From	To	Do-Minimum (CM6)			Do-Something (C8E)			Difference			Difference (%)		
				Distance (km)	Time (mins)	Av Speed (kph)	Distance (km)	Time (mins)	Av Speed (kph)	Distance (km)	Time (mins)	Av Speed (kph)	Distance (km)	Time (mins)	Av Speed (kph)
M25 clockwise	A to B	M25 J26	M25 J29	23.5	15.8	89.3	23.5	15.2	93.0	-0.0	-0.7	3.7	-0.1%	-4.1%	+4.1%
	B to D	M25 J29	M25 J2	18.9	12.9	87.7	18.9	12.0	94.3	-0.0	-0.9	6.6	-0.1%	-7.1%	+7.6%
	D to F	M25 J2	M25 J7	37.4	22.7	98.8	37.4	22.7	98.8	0.0	0.0	0.0	+0.0%	+0.0%	+0.0%
M25 Anti-clockwise	F to D	M25 J7	M25 J2	37.8	25.1	90.6	37.8	25.1	90.4	0.0	0.1	-0.2	+0.0%	+0.3%	-0.3%
	D to B	M25 J2	M25 J29	18.6	17.4	64.2	18.4	13.6	81.5	-0.2	-3.8	17.2	-1.1%	-22.0%	+26.8%
	B to A	M25 J29	M25 J26	23.4	15.8	88.8	23.3	15.6	90.1	-0.0	-0.2	1.3	-0.1%	-1.5%	+1.4%
A13 EB	C to G	M25 J30	A1089	5.0	4.4	68.6	5.2	4.3	72.9	0.2	-0.1	4.3	+3.1%	-3.0%	+6.3%
	G to H	A1089	A130	15.7	10.7	88.1	15.7	10.9	86.2	-0.0	0.2	-1.9	-0.0%	+2.2%	-2.2%
A13 WB	H to G	A130	A1089	15.6	10.6	88.2	15.6	11.4	81.8	0.0	0.8	-6.3	+0.1%	+7.9%	-7.2%
	G to C	A1089	M25 J30	5.3	5.1	61.5	5.6	4.9	67.8	0.3	-0.2	6.3	+5.9%	-3.9%	+10.2%
A2/M2 EB	D to I	M25 J2	M2 J1	14.2	8.5	100.4	14.6	8.3	105.1	0.4	-0.1	4.7	+3.0%	-1.6%	+4.6%
	I to J	M2 J1	M2 J4	14.9	8.3	108.1	14.4	8.1	106.7	-0.5	-0.2	-1.4	-3.3%	-2.0%	-1.3%
A2/M2 WB	J to I	M2 J4	M2 J1	15.0	8.3	108.3	15.0	8.4	107.1	0.0	0.1	-1.3	+0.0%	+1.2%	-1.2%
	I to D	M2 J1	M25 J2	14.7	9.7	90.7	14.8	8.7	102.3	0.1	-1.1	11.5	+0.4%	-11.0%	+12.7%
M20 EB	E to K	M25 J3	M20 J8	35.2	22.4	94.3	35.2	22.2	95.1	0.0	-0.2	0.8	+0.0%	-0.8%	+0.8%
M20 WB	K to E	M20 J8	M25 J3	35.4	19.9	106.9	35.4	19.7	107.9	0.0	-0.2	1.0	+0.0%	-0.9%	+0.9%

Table 7.14 – Link Based Journey Time Scenario Comparison (2026 Core DM Vs DS) PM Peak

Road	Movement	From	To	Do-Minimum (CM6)			Do-Something (C8E)			Difference			Difference (%)		
				Distance (km)	Time (mins)	Av Speed (kph)	Distance (km)	Time (mins)	Av Speed (kph)	Distance (km)	Time (mins)	Av Speed (kph)	Distance (km)	Time (mins)	Av Speed (kph)
M25 clockwise	A to B	M25 J26	M25 J29	23.5	17.5	80.7	23.5	17.4	81.1	-0.0	-0.1	0.4	-0.1%	-0.7%	+0.5%
	B to D	M25 J29	M25 J2	18.9	14.6	77.7	18.9	12.3	91.8	-0.0	-2.2	14.0	-0.1%	-15.3%	+18.0%
	D to F	M25 J2	M25 J7	37.4	22.5	99.9	37.4	22.6	99.4	0.0	0.1	-0.5	+0.0%	+0.5%	-0.5%
M25 Anti-clockwise	F to D	M25 J7	M25 J2	37.8	29.5	77.0	37.8	29.8	76.2	0.0	0.3	-0.8	+0.0%	+1.1%	-1.1%
	D to B	M25 J2	M25 J29	18.6	22.2	50.5	18.4	14.8	74.8	-0.2	-7.4	24.3	-1.1%	-33.2%	+48.2%
	B to A	M25 J29	M25 J26	23.4	15.3	91.6	23.3	15.1	92.9	-0.0	-0.2	1.4	-0.1%	-1.5%	+1.5%
A13 EB	C to G	M25 J30	A1089	5.0	7.0	43.3	5.2	5.5	56.9	0.2	-1.5	13.6	+3.1%	-21.5%	+31.3%
	G to H	A1089	A130	15.7	11.8	79.7	15.7	13.6	69.5	-0.0	1.7	-10.1	-0.0%	+14.5%	-12.7%
A13 WB	H to G	A130	A1089	15.6	10.7	87.6	15.6	12.0	77.9	0.0	1.3	-9.7	+0.1%	+12.5%	-11.0%
	G to C	A1089	M25 J30	5.3	5.1	62.3	5.6	4.8	70.4	0.3	-0.3	8.1	+5.9%	-6.3%	+12.9%
A2/M2 EB	D to I	M25 J2	M2 J1	14.2	13.8	61.7	14.6	9.9	88.5	0.4	-3.9	26.8	+3.0%	-28.2%	+43.4%
	I to J	M2 J1	M2 J4	14.9	9.3	96.3	14.4	10.9	79.1	-0.5	1.7	-17.2	-3.3%	+17.8%	-17.9%
A2/M2 WB	J to I	M2 J4	M2 J1	15.0	8.5	105.8	15.0	8.7	104.2	0.0	0.1	-1.6	+0.0%	+1.6%	-1.5%
	I to D	M2 J1	M25 J2	14.7	11.4	77.8	14.8	9.4	94.3	0.1	-2.0	16.5	+0.4%	-17.2%	+21.2%
M20 EB	E to K	M25 J3	M20 J8	35.2	29.1	72.5	35.2	29.3	72.0	0.0	0.2	-0.5	+0.0%	+0.7%	-0.7%
M20 WB	K to E	M20 J8	M25 J3	35.4	19.9	106.9	35.4	19.7	107.8	0.0	-0.2	0.9	+0.0%	-0.8%	+0.8%

7.2.11 Route based impacts have been analysed by selecting a series of cross river origin to destination movements, some of which are considered likely to have additional routing options, not related to increases or reductions in capacity on existing roads, with the introduction of LTC. Some of the movements do switch route to use LTC rather than Dartford, some do not. Both of these types of movement are important to present as it demonstrates the range and scale of impact of the scheme.

7.2.12 Table 7.15 to Table 7.20 provide the with and without scheme journey distances, times and average speeds for a selection of these movements for southbound and northbound movements. The locations are shown first in Figure 7.15.

7.2.13 It is important to note that the values presented in Table 7.15 to Table 7.20, and subsequent route based journey time analysis, are extracted from the LTAM forest skim matrices. This means that they are values that have been averaged over all assigned paths in the assignment model. This can lead to some very small differences in, for example, the distances of the average path.

Figure 7.15 – Route Based Journey Time Comparison

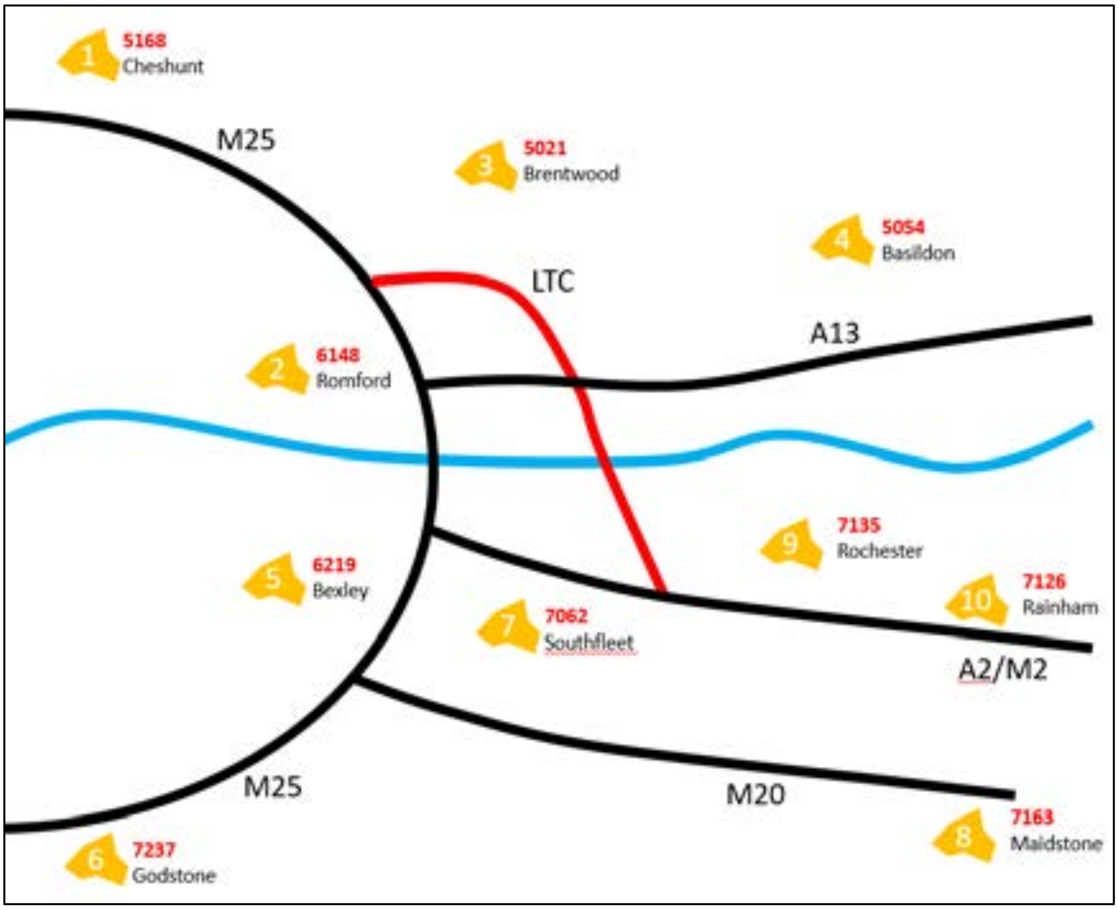

Table 7.15 – Route Based Journey Time Comparison North to South Movements (2026 Core DM Vs DS) AM Peak

Movement	From	To	DM			DS			Difference			Difference %age		
			Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)
1 to 5	Cheshunt	Bexley	61.7	62.0	59.7	61.8	60.5	61.3	0.1	-1.5	1.6	+0.2%	-2.4%	+2.7%
1 to 6	Cheshunt	Godstone	91.6	83.5	65.8	91.7	81.9	67.2	0.1	-1.5	1.3	+0.1%	-1.8%	+2.0%
1 to 7	Cheshunt	Southfleet	60.6	58.1	62.6	60.8	55.3	66.0	0.2	-2.8	3.4	+0.3%	-4.8%	+5.4%
1 to 8	Cheshunt	Maidstone	88.0	75.7	69.8	88.1	71.8	73.6	0.1	-3.9	3.9	+0.1%	-5.2%	+5.6%
1 to 9	Cheshunt	Rochester	76.6	77.4	59.4	70.9	70.9	59.9	-5.7	-6.5	0.6	-7.5%	-8.3%	+0.9%
1 to 10	Cheshunt	Rainham	92.3	80.0	69.2	87.8	72.5	72.6	-4.5	-7.5	3.4	-4.9%	-9.3%	+4.9%
2 to 5	Romford	Bexley	31.7	47.6	40.0	31.7	46.1	41.3	0.0	-1.5	1.3	+0.0%	-3.1%	+3.2%
2 to 6	Romford	Godstone	61.6	69.0	53.6	61.6	67.5	54.8	0.0	-1.5	1.2	+0.0%	-2.2%	+2.2%
2 to 7	Romford	Southfleet	30.7	43.7	42.1	30.8	40.9	45.1	0.1	-2.8	3.0	+0.3%	-6.3%	+7.1%
2 to 8	Romford	Maidstone	58.0	61.2	56.9	58.0	57.4	60.7	0.0	-3.9	3.9	+0.0%	-6.3%	+6.8%
2 to 9	Romford	Rochester	45.9	63.2	43.6	47.2	55.2	51.4	1.3	-8.0	7.8	+2.9%	-12.7%	+17.9%
2 to 10	Romford	Rainham	62.3	65.6	57.0	63.8	56.9	67.3	1.5	-8.7	10.3	+2.4%	-13.3%	+18.0%
3 to 5	Brentwood	Bexley	33.3	36.5	54.8	33.3	34.7	57.7	-0.0	-1.8	2.9	-0.0%	-5.0%	+5.2%
3 to 6	Brentwood	Godstone	63.2	57.9	65.5	63.2	56.1	67.6	-0.0	-1.9	2.2	-0.0%	-3.2%	+3.3%
3 to 7	Brentwood	Southfleet	34.0	35.9	56.8	32.3	29.5	65.8	-1.6	-6.4	9.0	-4.8%	-17.9%	+15.9%
3 to 8	Brentwood	Maidstone	59.6	50.2	71.3	59.6	45.9	77.9	-0.0	-4.2	6.5	-0.0%	-8.4%	+9.2%
3 to 9	Brentwood	Rochester	48.2	51.9	55.8	42.4	45.1	56.4	-5.8	-6.8	0.6	-12.1%	-13.1%	+1.1%
3 to 10	Brentwood	Rainham	63.9	54.5	70.4	59.3	46.7	76.1	-4.6	-7.8	5.8	-7.3%	-14.3%	+8.2%
4 to 5	Basildon	Bexley	36.6	46.3	47.4	36.6	42.4	51.8	0.0	-3.9	4.4	+0.1%	-8.3%	+9.2%
4 to 6	Basildon	Godstone	66.5	67.7	58.9	66.5	63.8	62.5	0.0	-3.9	3.6	+0.0%	-5.7%	+6.1%
4 to 7	Basildon	Southfleet	35.5	42.4	50.3	33.4	29.4	68.2	-2.1	-13.0	17.9	-5.9%	-30.6%	+35.6%
4 to 8	Basildon	Maidstone	62.9	60.0	62.9	47.6	49.6	57.6	-15.3	-10.3	-5.3	-24.3%	-17.2%	-8.5%
4 to 9	Basildon	Rochester	51.5	61.7	50.1	35.7	43.9	48.7	-15.8	-17.8	-1.3	-30.7%	-28.8%	-2.6%
4 to 10	Basildon	Rainham	67.2	64.3	62.7	52.6	45.5	69.3	-14.6	-18.8	6.6	-21.7%	-29.2%	+10.6%

Table 7.16 – Route Based Journey Time Comparison North to South Movements (2026 Core DM Vs DS) Inter Peak

Move ment	From	To	DM			DS			Difference			Difference %age		
			Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)
1 to 5	Cheshunt	Bexley	62.0	49.7	74.8	62.0	49.2	75.5	0.0	-0.5	0.7	+0.0%	-0.9%	+1.0%
1 to 6	Cheshunt	Godstone	91.4	65.8	83.4	91.4	65.1	84.2	0.0	-0.7	0.8	+0.0%	-1.0%	+1.0%
1 to 7	Cheshunt	Southfleet	60.8	48.1	75.9	60.8	47.3	77.2	0.0	-0.8	1.3	+0.0%	-1.6%	+1.7%
1 to 8	Cheshunt	Maidstone	88.1	63.3	83.5	82.5	62.1	79.7	-5.6	-1.2	-3.8	-6.3%	-1.8%	-4.6%
1 to 9	Cheshunt	Rochester	76.4	63.7	72.0	70.9	60.3	70.6	-5.5	-3.4	-1.4	-7.2%	-5.4%	-1.9%
1 to 10	Cheshunt	Rainham	91.5	68.3	80.4	86.9	63.2	82.5	-4.6	-5.1	2.1	-5.1%	-7.5%	+2.6%
2 to 5	Romford	Bexley	35.5	39.9	53.5	35.5	38.4	55.5	-0.0	-1.5	2.0	-0.0%	-3.7%	+3.8%
2 to 6	Romford	Godstone	64.9	55.9	69.7	64.9	54.3	71.8	-0.0	-1.7	2.1	-0.0%	-3.0%	+3.0%
2 to 7	Romford	Southfleet	34.4	38.2	53.9	34.3	36.4	56.6	-0.0	-1.8	2.6	-0.0%	-4.7%	+4.9%
2 to 8	Romford	Maidstone	61.6	53.4	69.2	56.0	51.3	65.6	-5.6	-2.1	-3.7	-9.1%	-4.0%	-5.3%
2 to 9	Romford	Rochester	50.0	53.8	55.7	44.4	49.4	53.9	-5.5	-4.4	-1.7	-11.1%	-8.2%	-3.1%
2 to 10	Romford	Rainham	65.0	58.4	66.8	60.4	52.3	69.3	-4.6	-6.1	2.4	-7.1%	-10.4%	+3.7%
3 to 5	Brentwood	Bexley	32.7	30.9	63.5	32.6	29.9	65.4	-0.0	-0.9	1.9	-0.1%	-3.0%	+3.0%
3 to 6	Brentwood	Godstone	62.0	46.9	79.4	62.0	45.8	81.2	-0.0	-1.1	1.9	-0.1%	-2.4%	+2.4%
3 to 7	Brentwood	Southfleet	31.5	29.2	64.7	31.5	28.0	67.5	-0.0	-1.2	2.8	-0.1%	-4.2%	+4.3%
3 to 8	Brentwood	Maidstone	58.8	44.4	79.4	53.2	42.8	74.5	-5.6	-1.6	-4.9	-9.6%	-3.6%	-6.2%
3 to 9	Brentwood	Rochester	46.1	45.2	61.1	42.0	40.8	61.8	-4.0	-4.4	0.7	-8.7%	-9.8%	+1.2%
3 to 10	Brentwood	Rainham	62.2	49.4	75.5	57.5	43.9	78.7	-4.7	-5.5	3.2	-7.5%	-11.2%	+4.2%
4 to 5	Basildon	Bexley	39.3	34.1	69.2	39.3	33.0	71.4	-0.0	-1.1	2.2	-0.1%	-3.1%	+3.1%
4 to 6	Basildon	Godstone	68.7	50.1	82.2	68.7	48.9	84.3	-0.0	-1.2	2.0	-0.1%	-2.5%	+2.5%
4 to 7	Basildon	Southfleet	38.2	32.5	70.5	33.4	25.7	77.9	-4.8	-6.7	7.4	-12.5%	-20.8%	+10.5%
4 to 8	Basildon	Maidstone	65.4	47.7	82.4	47.3	39.8	71.2	-18.1	-7.8	-11.1	-27.7%	-16.4%	-13.5%
4 to 9	Basildon	Rochester	53.8	48.1	67.1	35.7	38.0	56.4	-18.1	-10.1	-10.7	-33.6%	-21.0%	-16.0%
4 to 10	Basildon	Rainham	68.8	52.7	78.4	51.6	40.9	75.8	-17.2	-11.8	-2.7	-25.0%	-22.3%	-3.4%

Table 7.17 – Route Based Journey Time Comparison North to South Movements (2026 Core DM Vs DS) PM Peak

Movement	From	To	DM			DS			Difference			Difference %age		
			Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)
1 to 5	Cheshunt	Bexley	62.3	57.9	64.6	62.3	57.3	65.3	-0.0	-0.6	0.7	-0.0%	-1.1%	+1.1%
1 to 6	Cheshunt	Godstone	92.0	73.9	74.7	92.0	72.7	76.0	0.0	-1.2	1.2	+0.0%	-1.6%	+1.6%
1 to 7	Cheshunt	Southfleet	61.0	55.6	65.9	61.0	54.8	66.8	0.0	-0.8	0.9	+0.0%	-1.4%	+1.4%
1 to 8	Cheshunt	Maidstone	88.4	76.3	69.6	82.8	71.4	69.6	-5.6	-4.8	0.0	-6.3%	-6.3%	+0.0%
1 to 9	Cheshunt	Rochester	75.7	82.0	55.4	71.2	73.5	58.1	-4.6	-8.4	2.6	-6.1%	-10.3%	+4.7%
1 to 10	Cheshunt	Rainham	92.7	90.3	61.6	88.1	82.4	64.1	-4.6	-7.9	2.5	-5.0%	-8.7%	+4.1%
2 to 5	Romford	Bexley	38.1	45.3	50.4	35.6	44.2	48.3	-2.5	-1.1	-2.1	-6.5%	-2.4%	-4.2%
2 to 6	Romford	Godstone	67.7	61.3	66.3	65.3	59.6	65.7	-2.5	-1.7	-0.6	-3.7%	-2.7%	-1.0%
2 to 7	Romford	Southfleet	36.8	43.0	51.4	34.3	41.7	49.3	-2.5	-1.2	-2.0	-6.7%	-2.9%	-4.0%
2 to 8	Romford	Maidstone	64.2	63.7	60.5	56.1	58.4	57.7	-8.1	-5.3	-2.8	-12.6%	-8.3%	-4.6%
2 to 9	Romford	Rochester	51.5	69.4	44.5	44.4	60.4	44.1	-7.1	-8.9	-0.4	-13.7%	-12.9%	-1.0%
2 to 10	Romford	Rainham	68.4	77.6	52.9	61.3	69.3	53.0	-7.1	-8.3	0.2	-10.4%	-10.7%	+0.3%
3 to 5	Brentwood	Bexley	33.5	35.8	56.3	33.5	34.8	57.8	-0.0	-1.0	1.6	-0.0%	-2.8%	+2.8%
3 to 6	Brentwood	Godstone	63.2	51.7	73.3	63.2	50.2	75.6	-0.0	-1.6	2.3	-0.0%	-3.0%	+3.1%
3 to 7	Brentwood	Southfleet	32.3	33.5	57.8	32.2	32.3	59.9	-0.0	-1.1	2.0	-0.0%	-3.4%	+3.5%
3 to 8	Brentwood	Maidstone	59.6	54.1	66.1	54.0	48.9	66.2	-5.6	-5.2	0.2	-9.4%	-9.6%	+0.2%
3 to 9	Brentwood	Rochester	46.9	59.9	47.0	42.2	51.0	49.7	-4.7	-8.8	2.7	-9.9%	-14.7%	+5.6%
3 to 10	Brentwood	Rainham	63.9	68.1	56.3	59.2	59.9	59.3	-4.7	-8.2	3.0	-7.3%	-12.1%	+5.4%
4 to 5	Basildon	Bexley	36.8	39.5	55.9	36.8	36.9	59.8	-0.0	-2.6	3.9	-0.0%	-6.5%	+6.9%
4 to 6	Basildon	Godstone	66.5	55.5	71.9	66.5	52.3	76.2	0.0	-3.1	4.3	+0.0%	-5.7%	+6.0%
4 to 7	Basildon	Southfleet	35.5	37.2	57.3	33.4	27.1	73.9	-2.1	-10.1	16.6	-5.9%	-27.1%	+29.0%
4 to 8	Basildon	Maidstone	62.9	57.9	65.2	47.3	43.9	64.7	-15.6	-14.0	-0.5	-24.8%	-24.2%	-0.8%
4 to 9	Basildon	Rochester	50.2	63.6	47.4	35.6	46.0	46.5	-14.6	-17.6	-0.9	-29.1%	-27.7%	-1.9%
4 to 10	Basildon	Rainham	67.2	71.9	56.1	52.5	54.9	57.4	-14.6	-17.0	1.3	-21.8%	-23.6%	+2.4%

Table 7.18 – Route Based Journey Time Comparison South to North Movements (2026 Core DM Vs DS) AM Peak

Movement	From	To	DM			DS			Difference			Difference %age		
			Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)
5 to 1	Bexley	Cheshunt	61.6	55.5	66.6	61.6	53.2	69.4	-0.0	-2.3	2.8	-0.1%	-4.1%	+4.2%
5 to 2	Bexley	Romford	31.5	43.8	43.1	33.4	39.3	51.0	1.9	-4.6	7.9	+6.0%	-10.4%	+18.3%
5 to 3	Bexley	Brentwood	34.4	41.8	49.5	34.3	36.3	56.7	-0.2	-5.5	7.2	-0.5%	-13.2%	+14.6%
5 to 4	Bexley	Basildon	36.5	37.8	58.0	36.5	33.5	65.3	-0.0	-4.2	7.3	-0.0%	-11.2%	+12.5%
6 to 1	Godstone	Cheshunt	91.2	75.4	72.6	91.2	72.9	75.1	-0.0	-2.5	2.5	-0.1%	-3.3%	+3.4%
6 to 2	Godstone	Romford	63.0	63.0	60.0	63.0	59.0	64.1	0.0	-4.0	4.1	+0.0%	-6.4%	+6.9%
6 to 3	Godstone	Brentwood	64.0	61.7	62.3	63.9	55.9	68.5	-0.2	-5.7	6.2	-0.3%	-9.3%	+9.9%
6 to 4	Godstone	Basildon	66.1	57.7	68.8	66.1	53.2	74.5	-0.0	-4.4	5.7	-0.0%	-7.7%	+8.3%
7 to 1	Southfleet	Cheshunt	60.7	55.8	65.2	60.6	51.3	70.9	-0.1	-4.5	5.7	-0.1%	-8.1%	+8.7%
7 to 2	Southfleet	Romford	32.5	43.5	44.8	32.5	37.4	52.1	-0.0	-6.1	7.3	-0.0%	-13.9%	+16.2%
7 to 3	Southfleet	Brentwood	33.5	42.1	47.7	33.3	34.4	58.2	-0.2	-7.8	10.4	-0.6%	-18.4%	+21.9%
7 to 4	Southfleet	Basildon	35.6	38.1	56.0	35.5	26.7	79.8	-0.1	-11.4	23.8	-0.2%	-30.0%	+42.6%
8 to 1	Maidstone	Cheshunt	88.1	77.7	68.1	87.8	73.0	72.2	-0.3	-4.7	4.1	-0.4%	-6.0%	+6.0%
8 to 2	Maidstone	Romford	57.3	66.3	51.8	60.0	59.0	61.0	2.6	-7.4	9.2	+4.6%	-11.1%	+17.7%
8 to 3	Maidstone	Brentwood	61.0	64.0	57.2	55.1	57.2	57.8	-5.9	-6.8	0.6	-9.6%	-10.6%	+1.1%
8 to 4	Maidstone	Basildon	63.0	59.9	63.1	50.7	48.0	63.4	-12.4	-12.0	0.3	-19.6%	-20.0%	+0.4%
9 to 1	Rochester	Cheshunt	77.0	82.1	56.3	73.0	68.2	64.2	-4.0	-13.9	7.9	-5.2%	-17.0%	+14.1%
9 to 2	Rochester	Romford	48.5	69.9	41.6	46.7	54.8	51.2	-1.8	-15.1	9.5	-3.6%	-21.6%	+22.8%
9 to 3	Rochester	Brentwood	49.9	68.4	43.7	44.2	50.7	52.4	-5.6	-17.7	8.6	-11.3%	-25.9%	+19.8%
9 to 4	Rochester	Basildon	51.9	64.4	48.3	39.8	41.5	57.5	-12.1	-22.9	9.2	-23.4%	-35.6%	+19.0%
10 to 1	Rainham	Cheshunt	92.6	89.3	62.2	88.5	75.3	70.5	-4.0	-13.9	8.3	-4.3%	-15.6%	+13.4%
10 to 2	Rainham	Romford	64.4	76.9	50.2	61.6	62.2	59.4	-2.8	-14.7	9.1	-4.3%	-19.1%	+18.2%
10 to 3	Rainham	Brentwood	65.4	75.5	51.9	59.8	57.8	62.1	-5.6	-17.8	10.2	-8.6%	-23.5%	+19.5%
10 to 4	Rainham	Basildon	67.4	71.5	56.6	55.3	48.6	68.4	-12.1	-23.0	11.8	-17.9%	-32.1%	+20.8%

Table 7.19 – Route Based Journey Time Comparison South to North Movements (2026 Core DM Vs DS) Inter Peak

Movement	From	To	DM			DS			Difference			Difference %age		
			Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)
5 to 1	Bexley	Cheshunt	61.5	51.0	72.3	61.5	48.9	75.5	-0.0	-2.2	3.1	-0.1%	-4.2%	+4.3%
5 to 2	Bexley	Romford	35.7	37.3	57.3	35.5	34.8	61.2	-0.2	-2.5	3.8	-0.5%	-6.8%	+6.7%
5 to 3	Bexley	Brentwood	32.3	34.4	56.2	32.1	31.1	61.8	-0.2	-3.3	5.6	-0.6%	-9.6%	+9.9%
5 to 4	Bexley	Basildon	36.5	35.6	61.5	36.5	31.8	68.8	-0.0	-3.8	7.3	-0.0%	-10.6%	+11.9%
6 to 1	Godstone	Cheshunt	91.5	70.5	77.8	91.4	68.5	80.1	-0.0	-2.0	2.3	-0.0%	-2.9%	+2.9%
6 to 2	Godstone	Romford	65.6	56.9	69.2	65.4	54.5	72.0	-0.2	-2.4	2.9	-0.3%	-4.2%	+4.1%
6 to 3	Godstone	Brentwood	62.2	54.0	69.1	62.0	50.8	73.2	-0.2	-3.2	4.1	-0.3%	-5.9%	+5.9%
6 to 4	Godstone	Basildon	66.4	55.2	72.2	66.4	51.5	77.4	-0.0	-3.7	5.2	-0.0%	-6.7%	+7.1%
7 to 1	Southfleet	Cheshunt	60.7	50.1	72.6	60.6	47.8	76.1	-0.0	-2.3	3.5	-0.1%	-4.6%	+4.8%
7 to 2	Southfleet	Romford	34.7	36.5	57.1	34.6	33.8	61.4	-0.2	-2.7	4.3	-0.5%	-7.4%	+7.4%
7 to 3	Southfleet	Brentwood	31.3	33.6	56.0	31.1	30.1	62.1	-0.2	-3.5	6.1	-0.6%	-10.4%	+10.9%
7 to 4	Southfleet	Basildon	35.5	34.8	61.4	35.5	26.3	80.9	-0.1	-8.4	19.5	-0.2%	-24.3%	+31.9%
8 to 1	Maidstone	Cheshunt	88.1	71.6	73.8	83.8	68.8	73.1	-4.3	-2.7	-0.8	-4.8%	-3.8%	-1.1%
8 to 2	Maidstone	Romford	62.2	57.9	64.5	57.8	54.7	63.4	-4.4	-3.2	-1.1	-7.1%	-5.5%	-1.7%
8 to 3	Maidstone	Brentwood	58.8	55.0	64.2	55.0	49.1	67.2	-3.8	-5.9	3.0	-6.5%	-10.7%	+4.7%
8 to 4	Maidstone	Basildon	63.0	56.1	67.4	50.7	44.7	68.0	-12.4	-11.5	0.7	-19.6%	-20.4%	+1.0%
9 to 1	Rochester	Cheshunt	76.9	69.1	66.8	72.9	61.7	70.9	-4.0	-7.4	4.1	-5.2%	-10.7%	+6.2%
9 to 2	Rochester	Romford	51.1	55.4	55.3	46.9	47.5	59.2	-4.2	-7.9	3.9	-8.2%	-14.2%	+7.1%
9 to 3	Rochester	Brentwood	47.7	52.5	54.4	44.1	42.0	63.0	-3.6	-10.6	8.6	-7.5%	-20.1%	+15.7%
9 to 4	Rochester	Basildon	51.9	53.7	58.0	39.8	37.6	63.5	-12.1	-16.2	5.6	-23.3%	-30.1%	+9.7%
10 to 1	Rainham	Cheshunt	91.6	72.2	76.1	87.6	64.8	81.2	-4.0	-7.5	5.1	-4.4%	-10.3%	+6.6%
10 to 2	Rainham	Romford	65.8	58.5	67.4	61.6	50.6	73.0	-4.2	-7.9	5.6	-6.3%	-13.5%	+8.3%
10 to 3	Rainham	Brentwood	62.4	55.6	67.3	58.8	45.0	78.3	-3.6	-10.6	11.1	-5.7%	-19.0%	+16.4%
10 to 4	Rainham	Basildon	66.6	56.8	70.3	54.5	40.6	80.5	-12.1	-16.2	10.2	-18.2%	-28.5%	+14.4%

Table 7.20 – Route Based Journey Time Comparison South to North Movements (2026 Core DM Vs DS) PM Peak

Movement	From	To	DM			DS			Difference			Difference %age		
			Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)
5 to 1	Bexley	Cheshunt	61.5	54.8	67.4	61.4	53.1	69.4	-0.1	-1.7	2.1	-0.1%	-3.1%	+3.1%
5 to 2	Bexley	Romford	37.1	40.5	55.0	37.1	38.2	58.3	-0.0	-2.3	3.3	-0.1%	-5.8%	+6.0%
5 to 3	Bexley	Brentwood	32.5	42.3	46.0	34.3	35.9	57.2	1.8	-6.4	11.2	+5.6%	-15.2%	+24.4%
5 to 4	Bexley	Basildon	36.5	43.5	50.3	36.5	39.9	54.9	-0.0	-3.6	4.5	-0.0%	-8.3%	+9.0%
6 to 1	Godstone	Cheshunt	91.2	75.2	72.8	91.2	73.5	74.5	-0.0	-1.7	1.7	-0.0%	-2.3%	+2.3%
6 to 2	Godstone	Romford	66.7	61.0	65.6	66.7	58.6	68.3	-0.0	-2.4	2.6	-0.1%	-3.9%	+4.0%
6 to 3	Godstone	Brentwood	62.0	62.8	59.2	63.9	56.4	68.0	1.8	-6.5	8.8	+3.0%	-10.3%	+14.8%
6 to 4	Godstone	Basildon	66.1	64.0	62.0	66.1	60.3	65.7	-0.0	-3.6	3.7	-0.0%	-5.7%	+6.0%
7 to 1	Southfleet	Cheshunt	60.7	52.8	69.0	60.6	50.1	72.6	-0.0	-2.6	3.6	-0.1%	-5.0%	+5.2%
7 to 2	Southfleet	Romford	36.4	38.5	56.7	36.6	35.2	62.5	0.2	-3.3	5.8	+0.7%	-8.7%	+10.2%
7 to 3	Southfleet	Brentwood	31.5	40.4	46.8	33.3	33.0	60.6	1.8	-7.4	13.8	+5.8%	-18.3%	+29.5%
7 to 4	Southfleet	Basildon	35.5	41.5	51.4	35.5	31.0	68.7	-0.1	-10.5	17.3	-0.2%	-25.3%	+33.7%
8 to 1	Maidstone	Cheshunt	88.1	70.9	74.6	88.1	68.4	77.3	-0.0	-2.5	2.7	-0.1%	-3.6%	+3.7%
8 to 2	Maidstone	Romford	63.7	56.7	67.3	63.6	53.5	71.3	-0.0	-3.2	4.0	-0.1%	-5.6%	+5.9%
8 to 3	Maidstone	Brentwood	59.0	58.6	60.4	60.8	51.3	71.1	1.8	-7.3	10.7	+3.1%	-12.4%	+17.7%
8 to 4	Maidstone	Basildon	63.0	59.7	63.3	51.8	50.8	61.2	-11.3	-8.9	-2.2	-17.9%	-15.0%	-3.4%
9 to 1	Rochester	Cheshunt	75.3	81.3	55.6	71.3	72.2	59.3	-4.0	-9.2	3.7	-5.4%	-11.3%	+6.6%
9 to 2	Rochester	Romford	51.0	67.1	45.6	48.0	57.0	50.5	-2.9	-10.0	4.9	-5.8%	-14.9%	+10.8%
9 to 3	Rochester	Brentwood	46.3	68.9	40.3	42.6	53.1	48.2	-3.6	-15.8	7.9	-7.9%	-22.9%	+19.6%
9 to 4	Rochester	Basildon	50.3	70.0	43.1	38.2	50.0	45.8	-12.1	-20.0	2.7	-24.1%	-28.6%	+6.3%
10 to 1	Rainham	Cheshunt	92.6	78.0	71.2	88.5	68.5	77.6	-4.0	-9.6	6.4	-4.3%	-12.3%	+9.0%
10 to 2	Rainham	Romford	68.1	63.8	64.0	64.1	53.6	71.7	-4.0	-10.2	7.7	-5.9%	-16.0%	+12.0%
10 to 3	Rainham	Brentwood	63.4	65.7	57.9	59.8	49.5	72.5	-3.6	-16.2	14.6	-5.6%	-24.7%	+25.2%
10 to 4	Rainham	Basildon	67.4	66.8	60.6	55.3	46.4	71.5	-12.1	-20.4	11.0	-17.9%	-30.5%	+18.1%

Commentary on the Results

7.2.14 Table 7.1 to Table 7.6 demonstrate that the highway assignment models for each time period in the Do Minimum and Do Something scenarios have converged to well within the WebTAG recommended convergence limits. This does not necessarily mean that they have converged to a tight enough level for use in the economic assessment of the scheme. Additional analysis is recommended during the economic assessment of the scheme to identify whether there are any convergence issues associated with these models.

7.2.15 The select link analysis presented in Figure 7.1 to Figure 7.9 and associated Table 7.7 to Table 7.9 shows that the introduction of LTC has a significant impact on the patterns of movement using the Dartford Crossing. In particular there is a substantial reduction in traffic to/from east Kent using the Dartford Crossing. As would be expected, in the Do Something situation the majority of this traffic uses LTC. There is also a substantial reduction north of the river in trips to/from M25 north.

7.2.16 There is a slight increase in the number of trips using Dartford from within London both north and south of the River. This is likely due to some route switching of travellers using Silvertown/Blackwall in the Do Minimum to using Dartford in the Do Something due to the newly available capacity. This will also be caused by an increase in shorter distance trips switching destinations to cross the river in the Do Something scenario. These movements are suppressed in the Do Minimum scenario due to the lack of available capacity at Dartford.

7.2.17 Movements using LTC are predominantly from/to east Kent from/to M25 north and A13 east of the LTC junction. In the south there is some local traffic (approximately 600-750 pcu/hr in the peak hours) and relatively few trips to/from Kent west of the LTC junction using LTC (approximately 600 pcu/hr in the peak hours) and zero trips from M25 south of the A2 junction using LTC. These movements will continue to use Dartford Crossing as to use LTC is a considerable detour. In the north there is a small amount of traffic to/from A1089 using LTC (up to 600 pcu/hr in the peak hours). These results are consistent across all time periods and accord well with a priori expectations.

7.2.18 Comparing flows in the Do Minimum and Do Something scenarios presented in Figure 7.10 to Figure 7.12 and in Table 7.10 and Table 7.11 show a substantial reduction in flow at the Dartford Crossing. Flows across Dartford reduce by approximately 20-30% compared to the Do Minimum scenario. This is as expected and is one of the primary objectives of the LTC scheme. In particular there is a substantial reduction in HGV's using the Dartford Crossing in the Do Something compared to the Do Minimum. This is due to the alignment of LTC making it a very favourable route for HGV's accessing the ports in Kent and Essex.

7.2.19 There are associated reductions along the A2 and A13 west of their LTC junctions and also on the M20. These reductions in flow lead to reductions in congestion along these corridors. This is seen as being one of the major benefits of the LTC scheme and is where a significant proportion of the economic benefits of the scheme would be derived from.

7.2.20 There are also some increases in flow in the Do Something compared to the Do Minimum on the A2/M2 corridor east of LTC and A13 east of LTC and on M25 north of LTC. This is caused by LTC drawing more traffic to cross the river than in the constrained Do Minimum scenario. This increase in flow leads to additional congestion in these corridors and will likely lead to disbenefits of introducing the LTC scheme.

7.2.21 These benefits and disbenefits are further illustrated by the link based journey time analysis presented in Table 7.12 to Table 7.14. We can observe substantial increases in speed in the Dartford Crossing corridor between M25 J29 and M25 J2 in both directions (up to a 24 km/h increase in the peak periods in the northbound direction). There are also significant journey time savings on the A2 between the LTC junction and the M25 and on the A13 between the LTC junction and the M25. There are also some predicted reductions in speed on the A2 and A13 east of their LTC junctions and on the wider M25 both north and south of the river. This is in line with the increases in flows predicted in those corridors. This pattern is relatively consistent across all time periods.

7.2.22 There is additional detailed link based journey time analysis presented in Appendix C.

7.2.23 The route based journey times presented in Table 7.15 to Table 7.20 show cross river movements. As expected, all cross river movements experience improved journey times in the Do Something scenario when compared to the Do Minimum. Some cross river movements also benefit substantially from a reduced journey distance. Using LTC rather than Dartford provides a significant distance saving for movements to/from east Kent to/from east Essex.

7.2.24 It is for this reason that it is considered necessary to undertake a full 24 hour per day, 365 days per year economic assessment of LTC. Some movements will benefit significantly from the introduction of LTC even during the night when flow is predicted to be low. It is important that the associated benefits, and disbenefits, of this are captured in the economic analysis.

7.2.25 Most movements also experience an increase in average speed in the Do Something. Some movements don't however, primarily due to using different parts of the network with different speed limits and links with higher congestion in the Do Something as described above. Overall though the balance is generally very positive.

7.3 LTAM 2031 Core – Outputs to Economic Assessment

7.3.1 The analysis presented below summarises the impact of the LTC scheme on forecast traffic flows and journey times for the 2031 core forecast. The statistics presented are from the final converged VDM loop as described under Chapter 6 above.

Highway Assignment Model (HAM) Convergence Statistics

7.3.2 Table 7.21 to Table 7.23 provide the final VDM loop highway assignment model convergence statistics for the 2031 core DM forecasts.

7.3.3 Table 7.24 to Table 7.26 provide the final VDM loop highway assignment model convergence statistics for the 2031 core DS forecasts.

Table 7.21 – HAM Convergence Statistics – 2031 Core DM AM Peak

Iteration	Delta (%)	%GAP	%Flows	%Delays
72	0.0059	0.011	98.6	99.0
73	0.0089	0.0084	97.6	98.8
74	0.0066	0.019	98.4	99.0
75	0.0151	0.0072	97.5	98.8

Table 7.22 – HAM Convergence Statistics – 2031 Core DM Inter Peak

Iteration	Delta (%)	%GAP	%Flows	%Delays
65	0.0049	0.012	98.2	99.2
66	0.0119	0.0061	97.7	98.9
67	0.0051	0.012	98.4	99.2
68	0.0147	0.0064	97.6	99.0

Table 7.23 – HAM Convergence Statistics – 2031 Core DM PM Peak

Iteration	Delta (%)	%GAP	%Flows	%Delays
65	0.0055	0.0089	97.9	98.9
66	0.0047	0.0086	97.6	98.9
67	0.0066	0.0084	97.9	98.9
68	0.0054	0.0072	97.8	99.0

Table 7.24 – HAM Convergence Statistics – 2031 Core DS AM Peak

Iteration	Delta (%)	%GAP	%Flows	%Delays
53	0.0069	0.0092	98.1	99.1
54	0.0074	0.0091	97.9	99.0
55	0.0064	0.0087	98.1	98.9
56	0.0067	0.0100	98.1	98.9

Table 7.25 – HAM Convergence Statistics – 2031 Core DS Inter Peak

Iteration	Delta (%)	%GAP	%Flows	%Delays
112	0.0042	0.012	98.3	99.2
113	0.0144	0.0058	97.6	99.0
114	0.0050	0.011	98.3	99.2
115	0.0126	0.0060	97.6	98.9

Table 7.26 – HAM Convergence Statistics – 2031 Core DS PM Peak

Iteration	Delta (%)	%GAP	%Flows	%Delays
84	0.0053	0.013	98.0	98.9
85	0.0121	0.0086	97.7	98.8
86	0.0052	0.014	98.2	98.8
87	0.0137	0.0076	97.6	98.7

7.3.4 These tables demonstrate that the LTAM has achieved the WebTAG convergence targets in all time periods for this scenario and year.

Movement Patterns Using the Crossings

7.3.5 Figure 7.16 to Figure 7.24 provide select link analysis of movements using the Dartford and Lower Thames Crossing for the Do Minimum and Do Something scenarios for each of the model time periods. These diagrams show the pattern of movements using each of the crossings in each of the time periods. Table 7.27 to Table 7.29 provide a summary of the main corridors using each of the crossings and a comparison between the DM and DS scenarios for each time period.

Figure 7.16 – Select Link Analysis – Dartford Crossing DM 2031 Core AM Peak

Figure 7.17 – Select Link Analysis – Dartford Crossing DS 2031 Core AM Peak

Figure 7.18 – Select Link Analysis – Lower Thames Crossing DS 2031 Core AM Peak

Table 7.27 – Select Link Analysis – Summary of Primary Corridors of Movement 2031 AM Peak Two-Way Flow

Movement	Corridor	DM		DS		DS-DM SLA Flow (PCU)	% change (DM to DS) in SLA Flow
		SLA Flow (PCU)	% of Selected Link Flow	SLA Flow (PCU)	% of Selected Link Flow		
South of River	London South	2,890	18%	3,400	25%	510	18%
	Local Traffic	1,541	9%	1,408	11%	-133	-9%
	M25 South (J2-3)	8,309	51%	7,437	56%	-873	-11%
	A2/M2 to/from Kent	3,664	22%	1,049	8%	-2,615	-71%
Select Link	Dartford	**16,430**	**100%**	**13,336**	**100%**	**-3,094**	-19%
North of River	London North	2,011	12%	2,328	17%	317	16%
	Local Traffic	1,993	12%	1,552	12%	-441	-22%
	M25 North (J30-29)	9,113	55%	6,623	50%	-2,490	-27%
	A13 to/from Essex	3,313	20%	2,833	21%	-480	-14%
South of River	Local Traffic	n/a	n/a	683	8%	n/a	n/a
	A2 West of LTC	n/a	n/a	596	7%	n/a	n/a
	A2/A2M East of LTC	n/a	n/a	6,882	84%	n/a	n/a
Select Link	LTC	n/a	n/a	**8,160**	**100%**	n/a	n/a
North of River	A1089	n/a	n/a	689	8%	n/a	n/a
	A13 West of LTC	n/a	n/a	43	1%	n/a	n/a
	A13 East of LTC	n/a	n/a	3,456	42%	n/a	n/a
	M25 North of LTC	n/a	n/a	3,973	49%	n/a	n/a
	M25 South of LTC	n/a	n/a	0	0%	n/a	n/a

Figure 7.19 – Select Link Analysis – Dartford Crossing DM 2031 Core Inter Peak

Figure 7.20 – Select Link Analysis – Dartford Crossing DS 2031 Core Inter Peak

Figure 7.21 – Select Link Analysis – Lower Thames Crossing DS 2031 Core Inter Peak

Table 7.28 – Select Link Analysis – Summary of Primary Corridors of Movement 2031 Inter Peak Two-Way Flow

Movement	Corridor	DM		DS		DS-DM SLA Flow (PCU)	% change (DM to DS) in SLA Flow
		SLA Flow (PCU)	% of Selected Link Flow	SLA Flow (PCU)	% of Selected Link Flow		
South of River	London South	2,493	17%	2,676	25%	183	7%
	Local Traffic	1,182	8%	1,108	10%	-74	-6%
	M25 South (J2-3)	7,007	48%	6,079	57%	-928	-13%
	A2/M2 to/from Kent	3,892	27%	814	8%	-3,078	-79%
Select Link	Dartford	**14,601**	**100%**	**10,719**	**100%**	**-3,881**	-27%
North of River	London North	1,241	9%	1,349	13%	107	9%
	Local Traffic	1,338	9%	1,235	12%	-103	-8%
	M25 North (J30-29)	8,466	58%	5,590	52%	-2,876	-34%
	A13 to/from Essex	3,248	22%	2,546	24%	-702	-22%
South of River	Local Traffic	n/a	n/a	592	9%	n/a	n/a
	A2 West of LTC	n/a	n/a	361	6%	n/a	n/a
	A2/A2M East of LTC	n/a	n/a	5,384	85%	n/a	n/a
Select Link	LTC	n/a	n/a	**6,338**	**100%**	n/a	n/a
North of River	A1089	n/a	n/a	256	4%	n/a	n/a
	A13 West of LTC	n/a	n/a	12	0%	n/a	n/a
	A13 East of LTC	n/a	n/a	2,663	42%	n/a	n/a
	M25 North of LTC	n/a	n/a	3,408	54%	n/a	n/a
	M25 South of LTC	n/a	n/a	0	0%	n/a	n/a

Figure 7.22 – Select Link Analysis – Dartford Crossing DM 2031 Core PM Peak

Figure 7.23 – Select Link Analysis – Dartford Crossing DS 2031 Core PM Peak

Figure 7.24 – Select Link Analysis – Lower Thames Crossing DS 2031 Core PM Peak

Table 7.29 – Select Link Analysis – Summary of Primary Corridors of Movement 2031 PM Peak Two-Way Flow

Movement	Corridor	DM		DS		DS-DM SLA Flow (PCU)	% change (DM to DS) in SLA Flow
		SLA Flow (PCU)	% of Selected Link Flow	SLA Flow (PCU)	% of Selected Link Flow		
South of River	London South	3,080	20%	3,495	28%	415	13%
	Local Traffic	1,799	11%	1,647	13%	-152	-8%
	M25 South (J2-3)	6,513	41%	5,865	47%	-648	-10%
	A2/M2 to/from Kent	4,194	27%	1,313	11%	-2,881	-69%
Select Link	Dartford	**15,712**	**100%**	**12,453**	**100%**	**-3,259**	-21%
North of River	London North	1,999	13%	2,195	18%	196	10%
	Local Traffic	1,540	10%	1,457	12%	-84	-5%
	M25 North (J30-29)	8,566	55%	6,299	51%	-2,267	-26%
	A13 to/from Essex	3,139	20%	2,289	18%	-850	-27%
South of River	Local Traffic	n/a	n/a	864	12%	n/a	n/a
	A2 West of LTC	n/a	n/a	672	9%	n/a	n/a
	A2/A2M East of LTC	n/a	n/a	5,922	79%	n/a	n/a
Select Link	LTC	n/a	n/a	**7,459**	**100%**	n/a	n/a
North of River	A1089	n/a	n/a	417	6%	n/a	n/a
	A13 West of LTC	n/a	n/a	19	0%	n/a	n/a
	A13 East of LTC	n/a	n/a	3,528	47%	n/a	n/a
	M25 North of LTC	n/a	n/a	3,495	47%	n/a	n/a
	M25 South of LTC	n/a	n/a	0	0%	n/a	n/a

DM Vs DS Flow Comparisons

7.3.6 The impacts of the LTC scheme on traffic flows are presented in a number of different ways. Figure 7.25 to Figure 7.27 provide a flow difference plot between the DM and DS scenarios. Blue colours equate to reductions in flow, green colours indicate increases in flow. Flow differences less than 100 PCU's per hour have been excluded from the colouring.

7.3.7 Table 7.30 provides a comparison of the cross-river traffic flows between the DM and DS scenarios.

Figure 7.25 – Actual Flow Comparison Plot – 2031 Core DM Vs DS AM Peak

Figure 7.26 – Actual Flow Comparison Plot – 2031 Core DM Vs DS Inter Peak

Figure 7.27 – Actual Flow Comparison Plot – 2031 Core DM Vs DS PM Peak

Table 7.30 – Cross River Traffic Flows – 2031 Core DM Vs DS (Hourly Flows in PCU's)

Direction	Crossing	Time Period	Cars				LGV				HGV				Total			
			DM	DS	Diff	Diff %	DM	DS	Diff	Diff %	DM	DS	Diff	Diff %	DM	DS	Diff	Diff %
SB	Dartford	AM	3,192	3,017	-176	-6%	1,972	1,832	-140	-7%	3,336	2,359	-976	-29%	8,500	7,208	-1,292	-15%
		IP	3,099	2,455	-644	-21%	958	745	-212	-22%	3,238	2,011	-1,227	-38%	7,295	5,211	-2,083	-29%
		PM	4,701	3,792	-909	-19%	1,300	985	-315	-24%	2,258	1,281	-977	-43%	8,259	6,057	-2,201	-27%
	LTC	AM	0	2,109			0	382			0	1,341			0	3,833		
		IP	0	1,742			0	241			0	1,318			0	3,301		
		PM	0	3,221			0	368			0	1,062			0	4,652		
	Total	AM	3,192	5,126	1,934	61%	1,972	2,215	242	12%	3,336	3,700	365	11%	8,500	11,041	2,541	30%
		IP	3,099	4,196	1,098	35%	958	987	29	3%	3,238	3,329	91	3%	7,295	8,512	1,218	17%
		PM	4,701	7,013	2,312	49%	1,300	1,353	53	4%	2,258	2,343	85	4%	8,259	10,709	2,450	30%
NB	Dartford	AM	3,657	3,201	-456	-12%	1,604	1,216	-387	-24%	2,245	1,344	-901	-40%	7,505	5,762	-1,744	-23%
		IP	2,967	2,626	-341	-11%	1,128	930	-198	-18%	3,094	1,840	-1,254	-41%	7,189	5,396	-1,793	-25%
		PM	3,924	3,729	-195	-5%	1,180	976	-203	-17%	2,158	1,357	-801	-37%	7,262	6,062	-1,200	-17%
	LTC	AM	0	2,600			0	534			0	1,095			0	4,230		
		IP	0	1,413			0	250			0	1,364			0	3,027		
		PM	0	1,635			0	253			0	815			0	2,703		
	Total	AM	3,657	5,801	2,144	59%	1,604	1,751	147	9%	2,245	2,439	195	9%	7,505	9,991	2,486	33%
		IP	2,967	4,039	1,072	36%	1,128	1,180	52	5%	3,094	3,204	109	4%	7,189	8,423	1,233	17%
		PM	3,924	5,365	1,440	37%	1,180	1,229	49	4%	2,158	2,171	13	1%	7,262	8,765	1,503	21%

7.3.8 The movements considered critical to understanding the impacts of the scheme are the same as those described under Section 7.2 and previously illustrated in Figure 7.13. Table 7.31 provides a comparison of the flows at these strategic locations between the DM and DS in each time period.

Table 7.31 – Key Corridor Traffic Flows – 2031 Core DM Vs DS (Hourly Flows in PCU's)

Location	Location Description	Time Period	DM			DS			Flow Differences	
			Flow	Effective Capacity	V/C	Flow	Effective Capacity	V/C	Diff	Diff %
A	M25 J29 to M25 J28 (NB)	AM	7,471	9,180	0.81	8,486	9,180	0.92	1,016	14%
		IP	7,112	9,180	0.77	7,575	9,180	0.83	463	7%
		PM	6,880	9,180	0.75	7,548	9,180	0.82	667	10%
	M25 J28 to M25 J29 (SB)	AM	7,568	9,115	0.83	7,717	9,180	0.84	149	2%
		IP	7,046	9,115	0.77	7,305	9,180	0.80	259	4%
		PM	7,610	9,115	0.83	7,832	9,180	0.85	221	3%
B	M25 J4 to M25 J3 (NB)	AM	5,540	6,850	0.81	5,771	6,850	0.84	231	4%
		IP	5,401	6,850	0.79	5,559	6,850	0.81	158	3%
		PM	5,935	6,850	0.87	6,123	6,850	0.89	188	3%
	M25 J3 to M25 J4 (SB)	AM	6,850	6,850	1.00	6,850	6,850	1.00	0	0%
		IP	5,158	6,850	0.75	5,317	6,850	0.78	159	3%
		PM	5,207	6,850	0.76	5,443	6,850	0.79	236	5%
C	A13 A126 to A1012 (EB)	AM	4,827	6,304	0.77	4,011	6,287	0.64	-816	-17%
		IP	4,874	6,279	0.78	4,489	6,274	0.72	-385	-8%
		PM	5,590	6,279	0.89	5,634	6,251	0.90	44	1%
	A13 A1012 to A126 (WB)	AM	6,130	6,360	0.96	5,662	6,360	0.89	-469	-8%
		IP	5,500	6,360	0.86	4,593	6,360	0.72	-907	-16%
		PM	5,362	6,360	0.84	4,290	6,360	0.67	-1,072	-20%
D	A13 Orsett Cock to Manor Way (EB)	AM	4,319	6,370	0.68	4,838	6,370	0.76	519	12%
		IP	3,832	6,370	0.60	4,362	6,370	0.68	530	14%
		PM	5,119	6,370	0.80	5,766	6,370	0.91	647	13%
	A13 Manor Way to Orsett Cock (WB)	AM	4,875	6,220	0.78	5,947	6,220	0.96	1,072	22%
		IP	4,092	6,220	0.66	5,062	6,220	0.81	970	24%
		PM	4,303	6,220	0.69	5,587	6,220	0.90	1,284	30%
E	A2 A227 to Gravesend East (EB)	AM	6,238	9,213	0.68	5,067	9,195	0.55	-1,171	-19%
		IP	6,324	9,177	0.69	5,086	9,153	0.56	-1,238	-20%
		PM	8,564	9,177	0.93	7,692	9,155	0.84	-872	-10%
	A2 Gravesend East to A227 (WB)	AM	6,865	7,779	0.88	6,074	7,618	0.80	-791	-12%
		IP	6,020	7,660	0.79	5,005	7,468	0.67	-1,015	-17%
		PM	6,458	7,467	0.86	5,977	7,346	0.81	-481	-7%
F	M2 J1 to M2 J2 (EB)	AM	5,188	8,452	0.61	6,099	8,435	0.72	911	18%
		IP	4,379	8,531	0.51	5,334	8,556	0.62	955	22%

Location	Location Description	Time Period	DM			DS			Flow Differences	
			Flow	Effective Capacity	V/C	Flow	Effective Capacity	V/C	Diff	Diff %
		PM	6,306	8,545	0.74	7,631	8,545	0.89	1,326	21%
	M2 J2 to M2 J1 (WB)	AM	4,902	9,115	0.54	6,652	9,180	0.72	1,750	36%
		IP	3,874	9,115	0.42	4,946	9,180	0.54	1,073	28%
		PM	4,797	9,115	0.53	5,564	9,180	0.61	768	16%
G	M20 J3 to M20 J4 (EB)	AM	5,398	9,115	0.59	4,853	9,115	0.53	-545	-10%
		IP	5,314	9,115	0.58	4,674	9,115	0.51	-640	-12%
		PM	7,789	9,115	0.85	7,279	9,115	0.80	-510	-7%
	M20 J4 to M20 J3 (WB)	AM	8,120	9,115	0.89	7,117	9,115	0.78	-1,003	-12%
		IP	5,103	9,115	0.56	4,311	9,115	0.47	-792	-16%
		PM	4,575	9,115	0.50	3,999	9,115	0.44	-575	-13%

DM Vs DS Journey Time Comparisons

7.3.9 The same link based and route based journey time comparisons introduced under Section 7.2 are repeated for this year scenario combination.

7.3.10 The link based corridors analysed are as previously shown diagrammatically in Figure 7.14.

7.3.11 The link based journey time comparisons for this scenario are presented in Table 7.32 to Table 7.34.

7.3.12 The route based movements analysed are as previously shown diagrammatically in Figure 7.15.

7.3.13 Table 7.35 to Table 7.40 provide the with and without scheme journey distances, times and average speeds for a selection of these movements for southbound and northbound movements.

Table 7.32 – Link Based Journey Time Scenario Comparison (2031 Core DM Vs DS) AM Peak

Road	Movement	From	To	Do-Minimum (CM6) Distance (km)	Do-Minimum (CM6) Time (mins)	Do-Minimum (CM6) Av Speed (kph)	Do-Something (C8E) Distance (km)	Do-Something (C8E) Time (mins)	Do-Something (C8E) Av Speed (kph)	Difference Distance (km)	Difference Time (mins)	Difference Av Speed (kph)	Difference (%) Distance (km)	Difference (%) Time (mins)	Difference (%) Av Speed (kph)
M25 clockwise	A to B	M25 J26	M25 J29	23.5	18.9	74.8	23.5	18.0	78.1	-0.0	-0.8	3.3	-0.1%	-4.3%	+4.4%
	B to D	M25 J29	M25 J2	18.9	17.7	64.2	18.9	13.4	84.6	-0.0	-4.3	20.4	-0.1%	-24.2%	+31.8%
	D to F	M25 J2	M25 J7	37.4	29.6	75.9	37.4	32.3	69.4	0.0	2.8	-6.5	+0.0%	+9.4%	-8.6%
M25 Anti-clockwise	F to D	M25 J7	M25 J2	37.8	27.5	82.6	37.8	27.5	82.7	0.0	-0.0	0.1	+0.0%	-0.1%	+0.1%
	D to B	M25 J2	M25 J29	18.6	22.4	50.0	18.4	14.8	74.9	-0.2	-7.6	24.9	-1.1%	-34.0%	+49.8%
	B to A	M25 J29	M25 J26	23.4	19.0	73.6	23.3	19.8	70.7	-0.0	0.8	-2.9	-0.1%	+4.0%	-3.9%
A13 EB	C to G	M25 J30	A1089	5.0	4.4	68.9	5.2	4.2	74.4	0.2	-0.2	5.5	+3.1%	-4.6%	+8.0%
	G to H	A1089	A130	15.7	11.2	83.9	15.7	12.0	78.4	-0.0	0.8	-5.5	-0.0%	+7.0%	-6.5%
A13 WB	H to G	A130	A1089	15.6	12.9	72.5	15.6	16.0	58.3	0.0	3.2	-14.3	+0.1%	+24.6%	-19.7%
	G to C	A1089	M25 J30	5.3	7.7	40.9	5.6	6.7	50.3	0.3	-1.1	9.4	+5.9%	-13.8%	+22.9%
A2/M2 EB	D to I	M25 J2	M2 J1	14.2	8.7	97.4	14.6	8.5	103.1	0.4	-0.2	5.7	+3.0%	-2.7%	+5.8%
	I to J	M2 J1	M2 J4	14.9	8.5	104.9	14.4	8.5	102.1	-0.5	-0.1	-2.8	-3.3%	-0.6%	-2.7%
A2/M2 WB	J to I	M2 J4	M2 J1	15.0	8.9	101.6	15.0	9.4	96.4	0.0	0.5	-5.2	+0.0%	+5.4%	-5.2%
	I to D	M2 J1	M25 J2	14.7	18.6	47.4	14.8	13.5	65.8	0.1	-5.2	18.4	+0.4%	-27.7%	+38.9%
M20 EB	E to K	M25 J3	M20 J8	35.2	25.2	83.8	35.2	24.3	86.7	0.0	-0.9	2.9	+0.0%	-3.4%	+3.5%
M20 WB	K to E	M20 J8	M25 J3	35.4	23.6	89.9	35.4	21.9	96.8	0.0	-1.7	6.9	+0.0%	-7.1%	+7.7%

Table 7.33 – Link Based Journey Time Scenario Comparison (2031 Core DM Vs DS) Inter Peak

Road	Movement	From	To	Do-Minimum (CM6)			Do-Something (C8E)			Difference			Difference (%)		
				Distance (km)	Time (mins)	Av Speed (kph)	Distance (km)	Time (mins)	Av Speed (kph)	Distance (km)	Time (mins)	Av Speed (kph)	Distance (km)	Time (mins)	Av Speed (kph)
M25 clockwise	A to B	M25 J26	M25 J29	23.5	16.5	85.7	23.5	15.9	88.5	-0.0	-0.5	2.8	-0.1%	-3.3%	+3.3%
	B to D	M25 J29	M25 J2	18.9	13.5	84.0	18.9	12.2	93.0	-0.0	-1.3	9.0	-0.1%	-9.8%	+10.8%
	D to F	M25 J2	M25 J7	37.4	23.4	95.9	37.4	23.6	95.3	0.0	0.2	-0.7	+0.0%	+0.7%	-0.7%
M25 Anti-clockwise	F to D	M25 J7	M25 J2	37.8	26.4	86.2	37.8	26.5	85.6	0.0	0.2	-0.5	+0.0%	+0.6%	-0.6%
	D to B	M25 J2	M25 J29	18.6	19.5	57.4	18.4	14.0	79.2	-0.2	-5.5	21.8	-1.1%	-28.3%	+38.0%
	B to A	M25 J29	M25 J26	23.4	16.3	85.8	23.3	16.5	85.0	-0.0	0.2	-0.8	-0.1%	+0.9%	-1.0%
A13 EB	C to G	M25 J30	A1089	5.0	4.6	65.6	5.2	4.4	70.2	0.2	-0.2	4.6	+3.1%	-3.6%	+6.9%
	G to H	A1089	A130	15.7	10.8	87.0	15.7	11.2	84.1	-0.0	0.4	-2.9	-0.0%	+3.4%	-3.3%
A13 WB	H to G	A130	A1089	15.6	10.7	86.9	15.6	11.8	78.9	0.0	1.1	-8.0	+0.1%	+10.2%	-9.2%
	G to C	A1089	M25 J30	5.3	5.5	57.6	5.6	5.1	65.3	0.3	-0.4	7.8	+5.9%	-6.7%	+13.5%
A2/M2 EB	D to I	M25 J2	M2 J1	14.2	8.8	97.2	14.6	8.5	103.5	0.4	-0.3	6.3	+3.0%	-3.2%	+6.4%
	I to J	M2 J1	M2 J4	14.9	8.4	107.0	14.4	8.2	105.6	-0.5	-0.2	-1.4	-3.3%	-2.0%	-1.3%
A2/M2 WB	J to I	M2 J4	M2 J1	15.0	8.4	107.7	15.0	8.5	106.0	0.0	0.1	-1.7	+0.0%	+1.6%	-1.6%
	I to D	M2 J1	M25 J2	14.7	10.8	82.0	14.8	8.9	99.6	0.1	-1.9	17.6	+0.4%	-17.3%	+21.4%
M20 EB	E to K	M25 J3	M20 J8	35.2	22.9	92.2	35.2	22.5	93.7	0.0	-0.4	1.5	+0.0%	-1.6%	+1.6%
M20 WB	K to E	M20 J8	M25 J3	35.4	20.1	105.8	35.4	19.8	107.0	0.0	-0.2	1.2	+0.0%	-1.2%	+1.2%

Table 7.34 – Link Based Journey Time Scenario Comparison (2031 Core DM Vs DS) PM Peak

Road	Movement	From	To	Do-Minimum (CM6)			Do-Something (C8E)			Difference			Difference (%)		
				Distance (km)	Time (mins)	Av Speed (kph)	Distance (km)	Time (mins)	Av Speed (kph)	Distance (km)	Time (mins)	Av Speed (kph)	Distance (km)	Time (mins)	Av Speed (kph)
M25 clockwise	A to B	M25 J26	M25 J29	23.5	18.5	76.3	23.5	18.7	75.5	-0.0	0.2	-0.8	-0.1%	+0.9%	-1.0%
	B to D	M25 J29	M25 J2	18.9	15.6	72.4	18.9	12.5	90.4	-0.0	-3.1	18.0	-0.1%	-19.9%	+24.8%
	D to F	M25 J2	M25 J7	37.4	22.7	98.7	37.4	23.0	97.5	0.0	0.3	-1.1	+0.0%	+1.2%	-1.2%
M25 Anti-clockwise	F to D	M25 J7	M25 J2	37.8	30.9	73.4	37.8	31.5	72.2	0.0	0.5	-1.2	+0.0%	+1.7%	-1.7%
	D to B	M25 J2	M25 J29	18.6	24.0	46.7	18.4	15.3	72.6	-0.2	-8.7	25.9	-1.1%	-36.4%	+55.5%
	B to A	M25 J29	M25 J26	23.4	15.5	90.3	23.3	15.7	89.1	-0.0	0.2	-1.2	-0.1%	+1.3%	-1.3%
A13 EB	C to G	M25 J30	A1089	5.0	7.6	39.6	5.2	5.8	53.3	0.2	-1.8	13.7	+3.1%	-23.4%	+34.6%
	G to H	A1089	A130	15.7	12.0	78.5	15.7	14.1	67.0	-0.0	2.1	-11.6	-0.0%	+17.2%	-14.7%
A13 WB	H to G	A130	A1089	15.6	10.9	85.3	15.6	13.1	71.4	0.0	2.2	-13.9	+0.1%	+19.7%	-16.3%
	G to C	A1089	M25 J30	5.3	5.5	57.4	5.6	4.9	68.2	0.3	-0.6	10.8	+5.9%	-10.9%	+18.8%
A2/M2 EB	D to I	M25 J2	M2 J1	14.2	14.5	58.8	14.6	10.2	86.3	0.4	-4.3	27.5	+3.0%	-29.8%	+46.8%
	I to J	M2 J1	M2 J4	14.9	9.3	95.9	14.4	11.4	75.6	-0.5	2.1	-20.3	-3.3%	+22.7%	-21.2%
A2/M2 WB	J to I	M2 J4	M2 J1	15.0	8.6	104.6	15.0	8.8	102.6	0.0	0.2	-2.0	+0.0%	+1.9%	-1.9%
	I to D	M2 J1	M25 J2	14.7	12.7	69.7	14.8	10.3	86.5	0.1	-2.4	16.8	+0.4%	-19.1%	+24.0%
M20 EB	E to K	M25 J3	M20 J8	35.2	30.8	68.6	35.2	31.2	67.6	0.0	0.5	-1.0	+0.0%	+1.5%	-1.5%
M20 WB	K to E	M20 J8	M25 J3	35.4	20.0	106.1	35.4	19.9	107.0	0.0	-0.2	0.9	+0.0%	-0.8%	+0.8%

Table 7.35 – Route Based Journey Time Comparison North to South Movements (2031 Core DM Vs DS) AM Peak

Movement	From	To	DM			DS			Difference			Difference %age		
			Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)
1 to 5	Cheshunt	Bexley	61.9	64.5	57.6	61.9	62.7	59.3	0.0	-1.9	1.7	+0.1%	-2.9%	+3.0%
1 to 6	Cheshunt	Godstone	91.8	87.0	63.3	91.7	85.9	64.1	-0.0	-1.1	0.8	-0.0%	-1.2%	+1.2%
1 to 7	Cheshunt	Southfleet	60.8	60.2	60.6	60.9	56.9	64.2	0.1	-3.3	3.6	+0.1%	-5.5%	+5.9%
1 to 8	Cheshunt	Maidstone	88.2	78.3	67.6	88.2	74.1	71.4	-0.0	-4.2	3.8	-0.0%	-5.3%	+5.6%
1 to 9	Cheshunt	Rochester	76.5	80.7	56.9	70.9	73.2	58.1	-5.6	-7.5	1.3	-7.3%	-9.3%	+2.2%
1 to 10	Cheshunt	Rainham	92.5	83.1	66.8	87.8	74.6	70.6	-4.7	-8.5	3.9	-5.0%	-10.2%	+5.8%
2 to 5	Romford	Bexley	31.8	50.0	38.1	31.8	47.9	39.9	0.1	-2.2	1.8	+0.2%	-4.3%	+4.7%
2 to 6	Romford	Godstone	61.6	72.5	51.0	61.6	71.1	52.0	0.0	-1.4	1.0	+0.0%	-1.9%	+1.9%
2 to 7	Romford	Southfleet	30.7	45.7	40.3	30.8	42.1	43.9	0.1	-3.6	3.6	+0.3%	-7.9%	+8.9%
2 to 8	Romford	Maidstone	58.1	63.8	54.6	58.1	59.3	58.8	0.0	-4.5	4.1	+0.0%	-7.0%	+7.6%
2 to 9	Romford	Rochester	46.1	66.3	41.7	47.1	57.5	49.2	1.0	-8.8	7.4	+2.2%	-13.3%	+17.8%
2 to 10	Romford	Rainham	62.3	68.6	54.5	63.8	58.9	64.9	1.5	-9.7	10.4	+2.3%	-14.1%	+19.1%
3 to 5	Brentwood	Bexley	33.3	38.4	52.1	33.4	36.0	55.7	0.0	-2.5	3.6	+0.1%	-6.4%	+7.0%
3 to 6	Brentwood	Godstone	63.2	60.8	62.3	63.2	59.2	64.0	-0.0	-1.6	1.7	-0.0%	-2.7%	+2.8%
3 to 7	Brentwood	Southfleet	32.3	34.1	56.8	32.3	30.2	64.3	0.1	-3.9	7.5	+0.2%	-11.5%	+13.2%
3 to 8	Brentwood	Maidstone	59.6	52.1	68.6	59.6	47.4	75.5	-0.0	-4.8	6.9	-0.0%	-9.1%	+10.0%
3 to 9	Brentwood	Rochester	48.0	54.6	52.7	42.4	46.5	54.7	-5.6	-8.1	2.0	-11.7%	-14.9%	+3.8%
3 to 10	Brentwood	Rainham	63.9	57.0	67.3	59.3	47.9	74.2	-4.6	-9.1	7.0	-7.3%	-16.0%	+10.3%
4 to 5	Basildon	Bexley	39.0	48.8	48.0	39.2	44.0	53.4	0.1	-4.7	5.4	+0.4%	-9.7%	+11.2%
4 to 6	Basildon	Godstone	68.9	71.2	58.0	69.0	67.3	61.5	0.1	-3.9	3.5	+0.1%	-5.5%	+6.0%
4 to 7	Basildon	Southfleet	37.9	44.4	51.2	34.2	30.6	67.1	-3.7	-13.8	15.9	-9.8%	-31.1%	+31.0%
4 to 8	Basildon	Maidstone	65.3	62.5	62.7	48.5	51.7	56.3	-16.8	-10.8	-6.4	-25.8%	-17.3%	-10.2%
4 to 9	Basildon	Rochester	53.6	65.0	49.5	36.5	45.9	47.7	-17.2	-19.1	-1.9	-32.0%	-29.4%	-3.8%
4 to 10	Basildon	Rainham	69.6	67.3	62.0	53.3	47.3	67.7	-16.2	-20.0	5.7	-23.3%	-29.8%	+9.2%

Table 7.36 – Route Based Journey Time Comparison North to South Movements (2031 Core DM Vs DS) Inter Peak

Movement	From	To	DM			DS			Difference			Difference %age		
			Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)
1 to 5	Cheshunt	Bexley	61.8	51.2	72.5	61.8	50.7	73.2	0.0	-0.5	0.7	+0.0%	-1.0%	+1.0%
1 to 6	Cheshunt	Godstone	91.4	67.8	80.9	91.4	67.1	81.7	0.0	-0.6	0.8	+0.0%	-1.0%	+1.0%
1 to 7	Cheshunt	Southfleet	60.7	49.7	73.3	60.8	48.8	74.7	0.1	-0.9	1.4	+0.2%	-1.8%	+2.0%
1 to 8	Cheshunt	Maidstone	88.1	65.0	81.4	82.5	64.1	77.3	-5.6	-0.9	-4.1	-6.3%	-1.4%	-5.0%
1 to 9	Cheshunt	Rochester	78.0	66.3	70.6	75.7	60.4	75.2	-2.3	-5.9	4.6	-2.9%	-8.8%	+6.5%
1 to 10	Cheshunt	Rainham	91.5	70.4	78.0	86.9	64.9	80.4	-4.6	-5.6	2.4	-5.1%	-7.9%	+3.1%
2 to 5	Romford	Bexley	35.4	41.4	51.2	35.3	39.6	53.6	-0.0	-1.8	2.4	-0.0%	-4.4%	+4.6%
2 to 6	Romford	Godstone	64.9	58.0	67.1	64.9	56.0	69.5	-0.0	-2.0	2.4	-0.0%	-3.5%	+3.6%
2 to 7	Romford	Southfleet	34.3	40.0	51.5	34.4	37.7	54.6	0.1	-2.2	3.2	+0.2%	-5.6%	+6.2%
2 to 8	Romford	Maidstone	61.6	55.2	67.0	56.0	53.0	63.5	-5.6	-2.2	-3.5	-9.1%	-4.1%	-5.2%
2 to 9	Romford	Rochester	51.5	56.5	54.7	49.2	49.3	59.9	-2.3	-7.2	5.2	-4.4%	-12.7%	+9.5%
2 to 10	Romford	Rainham	65.0	60.6	64.4	60.4	53.7	67.4	-4.6	-6.9	3.1	-7.1%	-11.4%	+4.8%
3 to 5	Brentwood	Bexley	32.5	31.6	61.7	32.5	30.4	64.0	-0.0	-1.2	2.4	-0.1%	-3.8%	+3.8%
3 to 6	Brentwood	Godstone	62.1	48.2	77.2	62.0	46.9	79.4	-0.0	-1.4	2.2	-0.1%	-2.8%	+2.8%
3 to 7	Brentwood	Southfleet	31.4	30.2	62.5	31.5	28.6	66.1	0.1	-1.6	3.6	+0.2%	-5.3%	+5.7%
3 to 8	Brentwood	Maidstone	58.8	45.4	77.7	53.2	43.8	72.8	-5.6	-1.6	-4.9	-9.6%	-3.5%	-6.3%
3 to 9	Brentwood	Rochester	47.7	47.0	60.8	47.1	40.0	70.7	-0.6	-7.1	9.8	-1.3%	-15.0%	+16.1%
3 to 10	Brentwood	Rainham	62.2	50.9	73.4	57.5	44.6	77.4	-4.7	-6.3	4.0	-7.5%	-12.3%	+5.5%
4 to 5	Basildon	Bexley	39.1	35.2	66.7	39.1	33.9	69.3	-0.0	-1.4	2.6	-0.1%	-3.9%	+4.0%
4 to 6	Basildon	Godstone	68.7	51.8	79.5	68.7	50.3	81.9	-0.0	-1.5	2.4	-0.1%	-3.0%	+3.0%
4 to 7	Basildon	Southfleet	38.1	33.8	67.6	33.4	26.4	76.0	-4.7	-7.4	8.4	-12.3%	-21.9%	+12.4%
4 to 8	Basildon	Maidstone	65.4	49.0	80.1	47.3	41.2	68.8	-18.1	-7.8	-11.3	-27.7%	-15.9%	-14.1%
4 to 9	Basildon	Rochester	55.3	50.3	65.9	40.5	37.6	64.6	-14.8	-12.7	-1.3	-26.8%	-25.3%	-2.0%
4 to 10	Basildon	Rainham	68.8	54.5	75.8	51.7	42.0	73.7	-17.2	-12.4	-2.1	-25.0%	-22.8%	-2.7%

Table 7.37 – Route Based Journey Time Comparison North to South Movements (2031 Core DM Vs DS) PM Peak

Movement	From	To	DM			DS			Difference			Difference %age		
			Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)
1 to 5	Cheshunt	Bexley	62.3	60.7	61.6	62.4	59.9	62.4	0.0	-0.7	0.8	+0.0%	-1.2%	+1.3%
1 to 6	Cheshunt	Godstone	92.0	76.9	71.8	92.1	75.3	73.4	0.0	-1.6	1.6	+0.0%	-2.1%	+2.2%
1 to 7	Cheshunt	Southfleet	61.1	59.0	62.1	61.1	57.2	64.1	0.0	-1.8	2.0	+0.0%	-3.0%	+3.1%
1 to 8	Cheshunt	Maidstone	88.5	79.6	66.6	82.9	74.6	66.7	-5.6	-5.1	0.1	-6.3%	-6.4%	+0.1%
1 to 9	Cheshunt	Rochester	75.9	86.0	53.0	71.3	76.7	55.8	-4.7	-9.3	2.8	-6.1%	-10.8%	+5.2%
1 to 10	Cheshunt	Rainham	92.7	94.6	58.8	88.1	85.6	61.8	-4.6	-9.0	2.9	-5.0%	-9.5%	+5.0%
2 to 5	Romford	Bexley	38.1	47.2	48.3	35.6	45.7	46.7	-2.4	-1.5	-1.6	-6.4%	-3.2%	-3.3%
2 to 6	Romford	Godstone	67.7	63.5	64.1	65.3	61.1	64.1	-2.4	-2.4	0.1	-3.6%	-3.8%	+0.2%
2 to 7	Romford	Southfleet	36.8	45.6	48.4	34.3	43.0	47.9	-2.4	-2.6	-0.5	-6.7%	-5.6%	-1.1%
2 to 8	Romford	Maidstone	64.2	66.2	58.2	56.1	60.3	55.8	-8.0	-5.9	-2.3	-12.5%	-8.9%	-4.0%
2 to 9	Romford	Rochester	51.6	72.5	42.7	44.5	62.4	42.8	-7.1	-10.1	0.0	-13.8%	-13.9%	+0.1%
2 to 10	Romford	Rainham	68.4	81.2	50.6	61.3	71.4	51.5	-7.1	-9.8	1.0	-10.4%	-12.0%	+1.9%
3 to 5	Brentwood	Bexley	33.5	37.9	53.0	33.5	36.9	54.5	-0.0	-1.1	1.5	-0.0%	-2.8%	+2.8%
3 to 6	Brentwood	Godstone	63.2	54.1	70.0	63.2	52.2	72.6	-0.0	-1.9	2.6	-0.0%	-3.5%	+3.7%
3 to 7	Brentwood	Southfleet	32.3	36.3	53.4	32.2	34.2	56.6	-0.0	-2.1	3.2	-0.0%	-5.8%	+6.1%
3 to 8	Brentwood	Maidstone	59.6	56.9	62.9	54.0	51.5	63.0	-5.6	-5.4	0.1	-9.4%	-9.5%	+0.1%
3 to 9	Brentwood	Rochester	46.9	63.3	44.5	42.4	53.6	47.4	-4.6	-9.6	2.9	-9.7%	-15.3%	+6.5%
3 to 10	Brentwood	Rainham	63.9	71.9	53.3	59.2	62.6	56.8	-4.6	-9.3	3.5	-7.3%	-12.9%	+6.5%
4 to 5	Basildon	Bexley	36.8	42.2	52.3	36.8	38.7	57.0	-0.0	-3.5	4.7	-0.0%	-8.3%	+9.0%
4 to 6	Basildon	Godstone	66.5	58.4	68.2	66.5	54.1	73.8	0.0	-4.4	5.5	+0.0%	-7.5%	+8.1%
4 to 7	Basildon	Southfleet	35.5	40.5	52.6	33.4	28.4	70.4	-2.1	-12.1	17.9	-5.9%	-29.8%	+34.0%
4 to 8	Basildon	Maidstone	62.9	61.2	61.7	47.3	46.0	61.7	-15.6	-15.2	0.0	-24.8%	-24.9%	+0.1%
4 to 9	Basildon	Rochester	50.4	67.5	44.8	35.7	48.1	44.5	-14.7	-19.4	-0.3	-29.2%	-28.8%	-0.6%
4 to 10	Basildon	Rainham	67.1	76.1	52.9	52.5	57.0	55.2	-14.6	-19.1	2.3	-21.8%	-25.1%	+4.4%

Table 7.38 – Route Based Journey Time Comparison South to North Movements (2031 Core DM Vs DS) AM Peak

Movement	From	To	DM			DS			Difference			Difference %age		
			Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)
5 to 1	Bexley	Cheshunt	61.6	58.6	63.1	61.6	55.6	66.4	-0.0	-3.0	3.3	-0.1%	-5.0%	+5.2%
5 to 2	Bexley	Romford	33.4	44.7	44.8	33.4	40.3	49.8	0.0	-4.4	4.9	+0.0%	-9.9%	+11.0%
5 to 3	Bexley	Brentwood	34.4	43.6	47.4	34.3	37.9	54.3	-0.2	-5.7	6.9	-0.5%	-13.1%	+14.5%
5 to 4	Bexley	Basildon	36.5	39.9	54.8	36.5	35.1	62.4	-0.0	-4.9	7.6	-0.0%	-12.2%	+13.9%
6 to 1	Godstone	Cheshunt	91.2	78.7	69.5	91.2	75.6	72.3	-0.0	-3.1	2.8	-0.0%	-4.0%	+4.1%
6 to 2	Godstone	Romford	63.0	64.9	58.3	63.0	60.3	62.7	0.0	-4.6	4.5	+0.0%	-7.1%	+7.6%
6 to 3	Godstone	Brentwood	64.0	63.7	60.3	63.9	57.8	66.2	-0.2	-5.9	6.0	-0.3%	-9.2%	+9.9%
6 to 4	Godstone	Basildon	66.1	60.1	66.0	66.1	55.0	72.0	-0.0	-5.0	6.0	-0.0%	-8.4%	+9.2%
7 to 1	Southfleet	Cheshunt	60.7	59.7	61.0	60.6	53.7	67.8	-0.1	-6.1	6.8	-0.2%	-10.2%	+11.1%
7 to 2	Southfleet	Romford	32.5	45.9	42.6	32.5	38.3	50.9	-0.1	-7.6	8.3	-0.2%	-16.5%	+19.5%
7 to 3	Southfleet	Brentwood	33.6	44.7	45.0	33.3	35.9	55.7	-0.2	-8.8	10.7	-0.7%	-19.8%	+23.7%
7 to 4	Southfleet	Basildon	35.6	41.1	52.0	35.5	27.6	77.1	-0.1	-13.5	25.1	-0.4%	-32.8%	+48.3%
8 to 1	Maidstone	Cheshunt	88.1	81.9	64.6	88.0	76.3	69.2	-0.1	-5.6	4.6	-0.2%	-6.8%	+7.2%
8 to 2	Maidstone	Romford	59.9	68.0	52.9	60.0	60.9	59.1	0.0	-7.1	6.2	+0.0%	-10.5%	+11.7%
8 to 3	Maidstone	Brentwood	61.0	66.8	54.7	55.1	60.0	55.2	-5.9	-6.9	0.4	-9.6%	-10.3%	+0.8%
8 to 4	Maidstone	Basildon	63.0	63.2	59.8	50.7	50.2	60.6	-12.3	-13.0	0.7	-19.6%	-20.6%	+1.2%
9 to 1	Rochester	Cheshunt	77.0	87.2	53.0	73.0	70.9	61.7	-4.0	-16.2	8.7	-5.3%	-18.6%	+16.4%
9 to 2	Rochester	Romford	48.8	73.3	40.0	46.1	56.7	48.8	-2.8	-16.6	8.8	-5.6%	-22.6%	+22.0%
9 to 3	Rochester	Brentwood	49.9	72.2	41.5	44.2	52.9	50.2	-5.6	-19.3	8.7	-11.3%	-26.7%	+21.1%
9 to 4	Rochester	Basildon	51.9	68.5	45.5	39.8	43.1	55.4	-12.1	-25.4	9.9	-23.4%	-37.1%	+21.8%
10 to 1	Rainham	Cheshunt	92.6	94.5	58.8	88.5	78.3	67.9	-4.0	-16.2	9.1	-4.4%	-17.1%	+15.4%
10 to 2	Rainham	Romford	64.4	80.6	47.9	61.5	64.1	57.6	-2.8	-16.5	9.7	-4.4%	-20.4%	+20.2%
10 to 3	Rainham	Brentwood	65.4	79.5	49.4	59.8	60.2	59.6	-5.6	-19.2	10.2	-8.6%	-24.2%	+20.6%
10 to 4	Rainham	Basildon	67.4	75.8	53.4	55.3	50.5	65.8	-12.1	-25.4	12.4	-18.0%	-33.4%	+23.3%

Table 7.39 – Route Based Journey Time Comparison South to North Movements (2031 Core DM Vs DS) Inter Peak

Movement	From	To	DM			DS			Difference			Difference %age		
			Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)
5 to 1	Bexley	Cheshunt	61.5	54.1	68.3	61.5	51.0	72.3	-0.0	-3.1	4.0	-0.1%	-5.6%	+5.9%
5 to 2	Bexley	Romford	35.7	39.7	54.0	35.3	36.1	58.7	-0.3	-3.6	4.8	-1.0%	-9.0%	+8.9%
5 to 3	Bexley	Brentwood	32.3	36.8	52.7	32.1	32.5	59.2	-0.2	-4.2	6.5	-0.6%	-11.5%	+12.3%
5 to 4	Bexley	Basildon	36.5	38.4	57.1	36.5	33.2	66.0	-0.0	-5.2	8.9	-0.0%	-13.5%	+15.6%
6 to 1	Godstone	Cheshunt	91.5	73.9	74.2	91.4	71.1	77.1	-0.0	-2.8	2.9	-0.0%	-3.8%	+3.9%
6 to 2	Godstone	Romford	65.6	59.6	66.0	65.2	56.3	69.6	-0.3	-3.3	3.5	-0.5%	-5.6%	+5.4%
6 to 3	Godstone	Brentwood	62.2	56.7	65.8	62.0	52.7	70.5	-0.2	-4.0	4.7	-0.3%	-7.0%	+7.2%
6 to 4	Godstone	Basildon	66.4	58.3	68.3	66.4	53.4	74.6	-0.0	-4.9	6.3	-0.0%	-8.5%	+9.2%
7 to 1	Southfleet	Cheshunt	60.7	53.0	68.6	60.6	49.6	73.3	-0.0	-3.4	4.7	-0.1%	-6.5%	+6.8%
7 to 2	Southfleet	Romford	34.7	38.7	53.9	34.4	34.7	59.5	-0.3	-4.0	5.6	-1.0%	-10.3%	+10.4%
7 to 3	Southfleet	Brentwood	31.3	35.8	52.6	31.1	31.2	60.0	-0.2	-4.6	7.4	-0.6%	-12.9%	+14.1%
7 to 4	Southfleet	Basildon	35.5	37.4	57.1	35.5	26.9	79.2	-0.1	-10.5	22.1	-0.2%	-28.1%	+38.8%
8 to 1	Maidstone	Cheshunt	88.1	75.8	69.7	83.8	72.1	69.7	-4.3	-3.6	-0.0	-4.8%	-4.8%	-0.1%
8 to 2	Maidstone	Romford	62.2	61.4	60.8	57.6	57.1	60.6	-4.6	-4.3	-0.3	-7.4%	-7.0%	-0.4%
8 to 3	Maidstone	Brentwood	58.8	58.5	60.4	55.0	51.4	64.2	-3.8	-7.1	3.8	-6.5%	-12.1%	+6.3%
8 to 4	Maidstone	Basildon	63.0	60.1	63.0	50.7	47.0	64.7	-12.4	-13.1	1.8	-19.6%	-21.8%	+2.8%
9 to 1	Rochester	Cheshunt	76.9	73.5	62.8	72.9	64.0	68.3	-4.0	-9.5	5.5	-5.2%	-12.9%	+8.8%
9 to 2	Rochester	Romford	51.1	59.1	51.9	46.7	49.0	57.2	-4.3	-10.1	5.4	-8.5%	-17.1%	+10.4%
9 to 3	Rochester	Brentwood	47.7	56.2	50.9	44.1	43.3	61.1	-3.6	-12.9	10.2	-7.5%	-23.0%	+20.1%
9 to 4	Rochester	Basildon	51.9	57.8	53.9	39.8	38.9	61.4	-12.1	-18.9	7.6	-23.3%	-32.7%	+14.0%
10 to 1	Rainham	Cheshunt	91.6	76.2	72.2	87.6	66.6	78.9	-4.0	-9.6	6.8	-4.4%	-12.6%	+9.4%
10 to 2	Rainham	Romford	65.8	61.8	63.9	61.4	51.6	71.5	-4.3	-10.2	7.6	-6.6%	-16.5%	+11.9%
10 to 3	Rainham	Brentwood	62.4	58.9	63.6	58.8	45.9	76.9	-3.6	-13.0	13.3	-5.7%	-22.1%	+21.0%
10 to 4	Rainham	Basildon	66.6	60.5	66.0	54.5	41.4	78.9	-12.1	-19.0	12.8	-18.2%	-31.5%	+19.4%

Table 7.40 – Route Based Journey Time Comparison South to North Movements (2031 Core DM Vs DS) PM Peak

Movement	From	To	DM			DS			Difference			Difference %age		
			Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)
5 to 1	Bexley	Cheshunt	63.7	61.2	62.4	61.4	55.2	66.8	-2.2	-6.0	4.4	-3.5%	-9.9%	+7.1%
5 to 2	Bexley	Romford	39.3	47.3	49.9	32.6	41.7	46.9	-6.7	-5.6	-3.0	-17.1%	-11.8%	-6.1%
5 to 3	Bexley	Brentwood	34.6	49.0	42.4	34.3	37.6	54.7	-0.4	-11.5	12.3	-1.1%	-23.4%	+29.1%
5 to 4	Bexley	Basildon	38.7	51.0	45.5	36.5	42.7	51.3	-2.2	-8.3	5.8	-5.6%	-16.3%	+12.8%
6 to 1	Godstone	Cheshunt	91.2	77.9	70.2	91.2	75.9	72.1	-0.0	-2.1	1.9	-0.0%	-2.7%	+2.7%
6 to 2	Godstone	Romford	66.7	64.1	62.5	63.5	62.2	61.3	-3.2	-1.9	-1.1	-4.8%	-3.0%	-1.8%
6 to 3	Godstone	Brentwood	62.0	65.9	56.5	63.9	58.3	65.7	1.8	-7.5	9.2	+3.0%	-11.4%	+16.2%
6 to 4	Godstone	Basildon	66.1	67.8	58.5	66.1	63.4	62.5	-0.0	-4.4	4.0	-0.0%	-6.5%	+6.9%
7 to 1	Southfleet	Cheshunt	60.7	54.9	66.4	60.6	51.5	70.6	-0.0	-3.3	4.2	-0.1%	-6.0%	+6.3%
7 to 2	Southfleet	Romford	36.4	41.0	53.2	35.4	37.0	57.4	-1.0	-4.0	4.1	-2.7%	-9.7%	+7.8%
7 to 3	Southfleet	Brentwood	31.5	42.8	44.2	33.3	34.0	58.8	1.8	-8.8	14.6	+5.7%	-20.5%	+32.9%
7 to 4	Southfleet	Basildon	35.5	44.7	47.7	36.0	32.1	67.2	0.5	-12.6	19.6	+1.4%	-28.1%	+41.0%
8 to 1	Maidstone	Cheshunt	88.1	73.9	71.6	88.1	70.7	74.7	-0.0	-3.2	3.2	-0.1%	-4.3%	+4.4%
8 to 2	Maidstone	Romford	63.7	60.0	63.6	59.1	57.3	61.9	-4.6	-2.7	-1.8	-7.2%	-4.5%	-2.8%
8 to 3	Maidstone	Brentwood	59.0	61.8	57.3	60.8	53.2	68.6	1.8	-8.6	11.3	+3.0%	-13.9%	+19.7%
8 to 4	Maidstone	Basildon	63.0	63.8	59.3	51.8	53.7	57.8	-11.3	-10.0	-1.5	-17.9%	-15.7%	-2.6%
9 to 1	Rochester	Cheshunt	75.3	85.3	53.0	71.3	74.1	57.7	-4.0	-11.2	4.7	-5.4%	-13.1%	+8.9%
9 to 2	Rochester	Romford	51.0	71.3	42.9	48.0	59.0	48.8	-2.9	-12.3	6.0	-5.8%	-17.3%	+13.9%
9 to 3	Rochester	Brentwood	46.3	73.1	38.0	42.7	54.9	46.6	-3.6	-18.2	8.6	-7.9%	-24.9%	+22.7%
9 to 4	Rochester	Basildon	50.3	75.1	40.2	38.2	52.3	43.8	-12.1	-22.7	3.6	-24.1%	-30.3%	+8.9%
10 to 1	Rainham	Cheshunt	92.6	81.4	68.2	88.5	69.8	76.1	-4.0	-11.6	7.9	-4.3%	-14.2%	+11.5%
10 to 2	Rainham	Romford	68.1	67.6	60.5	64.1	55.0	69.9	-4.0	-12.5	9.4	-5.9%	-18.5%	+15.5%
10 to 3	Rainham	Brentwood	63.4	69.3	54.9	59.8	50.7	70.8	-3.6	-18.6	15.9	-5.6%	-26.9%	+29.0%
10 to 4	Rainham	Basildon	67.4	71.3	56.8	55.3	48.1	69.0	-12.1	-23.2	12.2	-17.9%	-32.5%	+21.6%

Commentary on the Results

7.3.14 Table 7.21 to Table 7.26 demonstrate that the highway assignment models for each time period in the Do Minimum and Do Something scenarios have converged to well within the WebTAG recommended convergence limits. This does not necessarily mean that they have converged to a tight enough level for use in the economic assessment of the scheme. Additional analysis is recommended during the economic assessment of the scheme to identify whether there are any convergence issues associated with these models.

7.3.15 The select link analysis presented in Figure 7.16 to Figure 7.24 and associated Table 7.27 to Table 7.29 shows that the introduction of LTC has a significant impact on the patterns of movement using the Dartford Crossing. In particular there is a substantial reduction in traffic to/from east Kent using the Dartford Crossing. As would be expected, in the Do Something situation the majority of this traffic uses LTC. There is also a substantial reduction north of the river in trips to/from M25 north.

7.3.16 There is a slight increase in the number of trips using Dartford from within London both north and south of the River. This is likely due to some route switching of travellers using Silvertown/Blackwall in the Do Minimum to using Dartford in the Do Something due to the newly available capacity. This will also be caused by an increase in shorter distance trips switching destinations to cross the river in the Do Something scenario. These movements are suppressed in the Do Minimum scenario due to the lack of available capacity at Dartford.

7.3.17 Movements using LTC are predominantly from/to east Kent from/to M25 north and A13 east of the LTC junction. In the south there is some local traffic (approximately 700-850 pcu/hr in the peak hours) and relatively few trips to/from Kent west of the LTC junction using LTC (approximately 700 pcu/hr in the peak hours) and zero trips from M25 south of the A2 junction using LTC. These movements will continue to use Dartford Crossing as to use LTC is a considerable detour. In the north there is a small amount of traffic to/from A1089 using LTC (up to 700 pcu/hr in the peak hours). These results are consistent across all time periods and accord well with a priori expectations.

7.3.18 Comparing flows in the Do Minimum and Do Something scenarios presented in Figure 7.25 to Figure 7.27 and in Table 7.30 and Table 7.31 show a substantial reduction in flow at the Dartford Crossing. Flows across Dartford reduce by approximately 20-30% compared to the Do Minimum scenario. This is as expected and is one of the primary objectives of the LTC scheme. In particular there is a substantial reduction in HGV's using the Dartford Crossing in the Do Something compared to the Do Minimum. This is due to the alignment of LTC making it a very favourable route for HGV's accessing the ports in Kent and Essex.

7.3.19 There are associated reductions along the A2 and A13 west of their LTC junctions and also on the M20. These reductions in flow lead to reductions in congestion along these corridors. This is seen as being one of the major benefits of the LTC scheme and is where a significant proportion of the economic benefits of the scheme would be derived from.

7.3.20 There are also some increases in flow in the Do Something compared to the Do Minimum on the A2/M2 corridor east of LTC and A13 east of LTC and on M25 north of LTC. This is caused by LTC drawing more traffic to cross the river than in the constrained Do Minimum scenario. This increase in flow leads to additional congestion in these corridors and will likely lead to disbenefits of introducing the LTC scheme. Some of these increases in flow are beginning to cause a critical level of congestion in these corridors. In particular M25 J28-29 and A13 Orsett Cock to Manor Way are significantly worse in the Do Something scenario when compared with the Do Minimum scenario.

7.3.21 These benefits and disbenefits are further illustrated by the link based journey time analysis presented in Table 7.32 to Table 7.34. We can observe substantial increases in speed in the Dartford Crossing corridor between M25 J29 and M25 J2 in both directions (up to a 26 km/h increase in the peak periods in the northbound direction). There are also significant journey time savings on the A2 between the LTC junction and the M25 and on the A13 between the LTC junction and the M25. There are also some predicted reductions in speed on the A2 and A13 east of their LTC junctions and on the wider M25 both north and south of the river. This is in line with the increases in flows predicted in those corridors. This pattern is relatively consistent across all time periods.

7.3.22 There is additional detailed link based journey time analysis presented in Appendix C.

7.3.23 The route based journey times presented in Table 7.35 to Table 7.40 show cross river movements. As expected, all cross river movements experience improved journey times in the Do Something scenario when compared to the Do Minimum. Some cross river movements also benefit substantially from a reduced journey distance. Using LTC rather than Dartford provides a significant distance saving for movements to/from east Kent to/from east Essex.

7.3.24 It is for this reason that it is considered necessary to undertake a full 24 hour per day, 365 days per year economic assessment of LTC. Some movements will benefit significantly from the introduction of LTC even during the night when flow is predicted to be low. It is important that the associated benefits, and disbenefits, of this are captured in the economic analysis.

7.3.25 Most movements also experience an increase in average speed in the Do Something. Some movements don’t however, primarily due to using different parts of the network with different speed limits and links with higher congestion in the Do Something as described above. Overall though the balance is generally very positive.

7.4 LTAM 2041 Core – Outputs to Economic Assessment

7.4.1 The analysis presented below summarises the impact of the LTC scheme on forecast traffic flows and journey times for the 2041 core forecast. The statistics presented are from the final converged VDM loop as described under Chapter 6 above.

Highway Assignment Model (HAM) Convergence Statistics

7.4.2 Table 7.41 to Table 7.43 provide the final VDM loop highway assignment model convergence statistics for the 2041 core DM forecasts.

7.4.3 Table 7.44 to Table 7.46 provide the final VDM loop highway assignment model convergence statistics for the 2041 core DS forecasts.

Table 7.41 – HAM Convergence Statistics – 2041 Core DM AM Peak

Iteration	Delta (%)	%GAP	%Flows	%Delays
72	0.0095	0.013	98.2	98.8
73	0.0075	0.011	97.6	98.6
74	0.0076	0.0099	98.1	98.9
75	0.0091	0.0095	98.0	98.9

Table 7.42 – HAM Convergence Statistics – 2041 Core DM Inter Peak

Iteration	Delta (%)	%GAP	%Flows	%Delays
67	0.0072	0.013	97.8	99.1
68	0.0153	0.0077	97.5	99.0
69	0.0068	0.013	98.0	99.1
70	0.0155	0.0076	97.6	99.0

Table 7.43 – HAM Convergence Statistics – 2041 Core DM PM Peak

Iteration	Delta (%)	%GAP	%Flows	%Delays
94	0.0071	0.014	98.1	98.8
95	0.0146	0.012	97.6	98.4
96	0.0072	0.014	97.5	98.6
97	0.0126	0.010	97.8	98.5

Table 7.44 – HAM Convergence Statistics – 2041 Core DS AM Peak

Iteration	Delta (%)	%GAP	%Flows	%Delays
59	0.0083	0.012	97.9	98.7
60	0.0084	0.010	97.6	98.7
61	0.0099	0.011	98.0	98.7
62	0.0083	0.0082	97.6	98.8

Table 7.45 – HAM Convergence Statistics – 2041 Core DS Inter Peak

Iteration	Delta (%)	%GAP	%Flows	%Delays
89	0.0061	0.012	98.1	99.1
90	0.0183	0.0068	97.6	98.9
91	0.0066	0.012	98.0	99.1
92	0.0125	0.0068	97.6	98.8

Table 7.46 – HAM Convergence Statistics – 2041 Core DS PM Peak

Iteration	Delta (%)	%GAP	%Flows	%Delays
80	0.0062	0.013	98.0	98.7
81	0.0139	0.0089	97.7	98.7
82	0.0070	0.012	98.0	98.8
83	0.0144	0.0084	97.7	98.4

7.4.4 These tables demonstrate that the LTAM has achieved the WebTAG convergence targets in all time periods for this scenario and year.

Movement Patterns Using the Crossings

7.4.5 Figure 7.28 to Figure 7.36 provide select link analysis of movements using the Dartford and Lower Thames Crossing for the Do Minimum and Do Something scenarios for each of the model time periods. These diagrams show the pattern of movements using each of the crossings in each of the time periods. Table 7.47 to Table 7.49 provide a summary of the main corridors using each of the crossings and a comparison between the DM and DS scenarios for each time period.

Figure 7.28 – Select Link Analysis – Dartford Crossing DM 2041 Core AM Peak

Figure 7.29 – Select Link Analysis – Dartford Crossing DS 2041 Core AM Peak

Figure 7.30 – Select Link Analysis – Lower Thames Crossing DS 2041 Core AM Peak

Table 7.47 – Select Link Analysis – Summary of Primary Corridors of Movement 2041 AM Peak Two-Way Flow

Movement	Corridor	DM		DS		DS-DM SLA Flow (PCU)	% change (DM to DS) in SLA Flow
		SLA Flow (PCU)	% of Selected Link Flow	SLA Flow (PCU)	% of Selected Link Flow		
South of River	London South	2,971	17%	3,671	25%	700	24%
	Local Traffic	1,633	10%	1,534	11%	-100	-6%
	M25 South (J2-3)	8,900	52%	8,093	56%	-807	-9%
	A2/M2 to/from Kent	3,577	21%	1,110	8%	-2,467	-69%
Select Link	Dartford	**17,106**	**100%**	**14,471**	**100%**	**-2,635**	-15%
North of River	London North	2,122	12%	2,583	18%	462	22%
	Local Traffic	2,057	12%	1,744	12%	-313	-15%
	M25 North (J30-29)	9,480	55%	7,165	50%	-2,314	-24%
	A13 to/from Essex	3,351	20%	2,978	21%	-373	-11%
South of River	Local Traffic	n/a	n/a	789	9%	n/a	n/a
	A2 West of LTC	n/a	n/a	723	8%	n/a	n/a
	A2/A2M East of LTC	n/a	n/a	7,316	83%	n/a	n/a
Select Link	LTC	n/a	n/a	**8,829**	**100%**	n/a	n/a
North of River	A1089	n/a	n/a	781	9%	n/a	n/a
	A13 West of LTC	n/a	n/a	58	1%	n/a	n/a
	A13 East of LTC	n/a	n/a	3,751	42%	n/a	n/a
	M25 North of LTC	n/a	n/a	4,239	48%	n/a	n/a
	M25 South of LTC	n/a	n/a	0	0%	n/a	n/a

Figure 7.31 – Select Link Analysis – Dartford Crossing DM 2041 Core Inter Peak

Figure 7.32 – Select Link Analysis – Dartford Crossing DS 2041 Core Inter Peak

Figure 7.33 – Select Link Analysis – Lower Thames Crossing DS 2041 Core Inter Peak

Table 7.48 – Select Link Analysis – Summary of Primary Corridors of Movement 2041 Inter Peak Two-Way Flow

Movement	Corridor	DM		DS		DS-DM SLA Flow (PCU)	% change (DM to DS) in SLA Flow
		SLA Flow (PCU)	% of Selected Link Flow	SLA Flow (PCU)	% of Selected Link Flow		
South of River	London South	2,646	17%	2,967	25%	321	12%
	Local Traffic	1,362	9%	1,229	10%	-132	-10%
	M25 South (J2-3)	7,561	48%	6,721	57%	-841	-11%
	A2/M2 to/from Kent	4,094	26%	878	7%	-3,216	-79%
Select Link	Dartford	**15,693**	**100%**	**11,836**	**100%**	**-3,857**	-25%
North of River	London North	1,282	8%	1,479	12%	197	15%
	Local Traffic	1,444	9%	1,439	12%	-5	-0%
	M25 North (J30-29)	8,889	57%	6,231	53%	-2,658	-30%
	A13 to/from Essex	3,309	21%	2,687	23%	-622	-19%
South of River	Local Traffic	n/a	n/a	686	10%	n/a	n/a
	A2 West of LTC	n/a	n/a	441	6%	n/a	n/a
	A2/A2M East of LTC	n/a	n/a	5,940	84%	n/a	n/a
Select Link	LTC	n/a	n/a	**7,067**	**100%**	n/a	n/a
North of River	A1089	n/a	n/a	293	4%	n/a	n/a
	A13 West of LTC	n/a	n/a	27	0%	n/a	n/a
	A13 East of LTC	n/a	n/a	3,039	43%	n/a	n/a
	M25 North of LTC	n/a	n/a	3,707	52%	n/a	n/a
	M25 South of LTC	n/a	n/a	0	0%	n/a	n/a

Figure 7.34 – Select Link Analysis – Dartford Crossing DM 2041 Core PM Peak

Figure 7.35 – Select Link Analysis – Dartford Crossing DS 2041 Core PM Peak

Figure 7.36 – Select Link Analysis – Lower Thames Crossing DS 2041 Core PM Peak

Table 7.49 – Select Link Analysis – Summary of Primary Corridors of Movement 2041 PM Peak Two-Way Flow

Movement	Corridor	DM		DS		DS-DM SLA Flow (PCU)	% change (DM to DS) in SLA Flow
		SLA Flow (PCU)	% of Selected Link Flow	SLA Flow (PCU)	% of Selected Link Flow		
South of River	London South	3,148	19%	3,791	28%	643	20%
	Local Traffic	1,831	11%	1,671	12%	-159	-9%
	M25 South (J2-3)	6,765	42%	6,405	48%	-360	-5%
	A2/M2 to/from Kent	4,299	27%	1,415	11%	-2,884	-67%
Select Link	Dartford	**16,178**	**100%**	**13,428**	**100%**	**-2,750**	-17%
North of River	London North	2,073	13%	2,392	18%	319	15%
	Local Traffic	1,598	10%	1,594	12%	-4	-0%
	M25 North (J30-29)	8,806	54%	6,828	51%	-1,978	-22%
	A13 to/from Essex	3,197	20%	2,375	18%	-822	-26%
South of River	Local Traffic	n/a	n/a	999	12%	n/a	n/a
	A2 West of LTC	n/a	n/a	775	10%	n/a	n/a
	A2/A2M East of LTC	n/a	n/a	6,289	78%	n/a	n/a
Select Link	LTC	n/a	n/a	**8,064**	**100%**	n/a	n/a
North of River	A1089	n/a	n/a	476	6%	n/a	n/a
	A13 West of LTC	n/a	n/a	26	0%	n/a	n/a
	A13 East of LTC	n/a	n/a	3,881	48%	n/a	n/a
	M25 North of LTC	n/a	n/a	3,681	46%	n/a	n/a
	M25 South of LTC	n/a	n/a	0	0%	n/a	n/a

DM Vs DS Flow Comparisons

7.4.6 The impacts of the LTC scheme on traffic flows are presented in a number of different ways. Figure 7.37 to Figure 7.39 provide a flow difference plot between the DM and DS scenarios. Blue colours equate to reductions in flow, green colours indicate increases in flow. Flow differences less than 100 PCU's per hour have been excluded from the colouring.

7.4.7 Table 7.50 provides a comparison of the cross-river traffic flows between the DM and DS scenarios.

Figure 7.37 – Actual Flow Comparison Plot – 2041 Core DM Vs DS AM Peak

Figure 7.38 – Actual Flow Comparison Plot – 2041 Core DM Vs DS Inter Peak

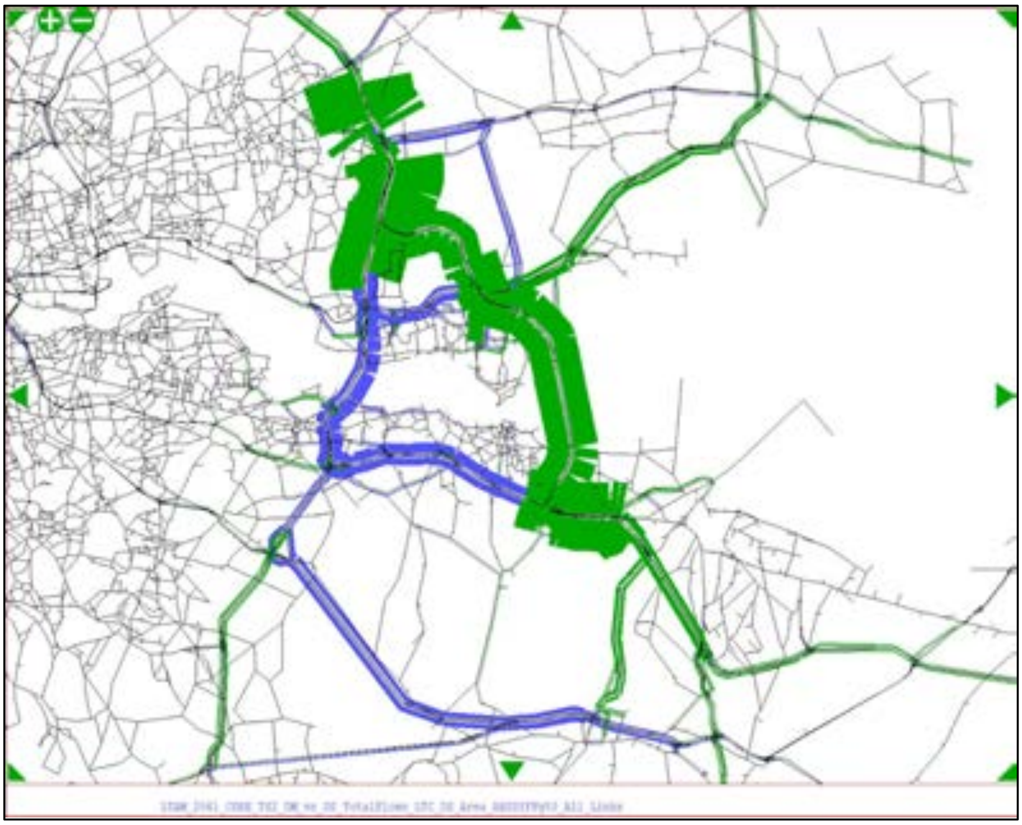

Figure 7.39 – Actual Flow Comparison Plot – 2041 Core DM Vs DS PM Peak

Table 7.50 – Cross River Traffic Flows – 2041 Core DM Vs DS (Hourly Flows in PCU's)

Direction	Crossing	Time Period	Cars				LGV				HGV				Total			
			DM	DS	Diff	Diff %	DM	DS	Diff	Diff %	DM	DS	Diff	Diff %	DM	DS	Diff	Diff %
SB	Dartford	AM	3,021	3,115	94	3%	2,134	2,068	-66	-3%	3,344	2,531	-814	-24%	8,500	7,714	-786	-9%
		IP	3,272	2,710	-562	-17%	1,098	868	-230	-21%	3,520	2,212	-1,308	-37%	7,890	5,789	-2,101	-27%
		PM	4,690	4,070	-620	-13%	1,438	1,122	-316	-22%	2,372	1,390	-982	-41%	8,500	6,582	-1,918	-23%
	LTC	AM	0	2,216			0	432			0	1,377			0	4,024		
		IP	0	1,931			0	280			0	1,431			0	3,642		
		PM	0	3,422			0	406			0	1,108			0	4,937		
	Total	AM	3,021	5,331	2,310	76%	2,134	2,500	365	17%	3,344	3,907	563	17%	8,500	11,738	3,238	38%
		IP	3,272	4,641	1,369	42%	1,098	1,148	50	5%	3,520	3,642	123	3%	7,890	9,432	1,542	20%
		PM	4,690	7,492	2,802	60%	1,438	1,529	91	6%	2,372	2,498	126	5%	8,500	11,519	3,019	36%
NB	Dartford	AM	3,625	3,417	-208	-6%	1,763	1,364	-399	-23%	2,330	1,465	-865	-37%	7,719	6,247	-1,472	-19%
		IP	2,994	2,848	-146	-5%	1,249	1,062	-187	-15%	3,270	1,996	-1,274	-39%	7,513	5,906	-1,607	-21%
		PM	3,909	3,833	-75	-2%	1,313	1,095	-218	-17%	2,294	1,461	-833	-36%	7,516	6,389	-1,127	-15%
	LTC	AM	0	2,871			0	625			0	1,186			0	4,682		
		IP	0	1,631			0	297			0	1,487			0	3,416		
		PM	0	1,825			0	293			0	865			0	2,983		
	Total	AM	3,625	6,288	2,663	73%	1,763	1,989	226	13%	2,330	2,651	321	14%	7,719	10,929	3,210	42%
		IP	2,994	4,480	1,486	50%	1,249	1,359	110	9%	3,270	3,483	214	7%	7,513	9,322	1,809	24%
		PM	3,909	5,658	1,750	45%	1,313	1,389	75	6%	2,294	2,326	32	1%	7,516	9,373	1,857	25%

7.4.8 The movements considered critical to understanding the impacts of the scheme are the same as those described under Section 7.2 and previously illustrated in Figure 7.13. Table 7.51 provides a comparison of the flows at these strategic locations between the DM and DS in each time period.

Table 7.51 – Key Corridor Traffic Flows – 2041 Core DM Vs DS

(Hourly Flows in PCU's)

Location	Location Description	Time Period	DM			DS			Flow Differences	
			Flow	Effective Capacity	V/C	Flow	Effective Capacity	V/C	Diff	Diff %
A	M25 J29 to M25 J28 (NB)	AM	7,769	9,180	0.85	8,988	9,180	0.98	1,219	16%
		IP	7,383	9,180	0.80	8,249	9,180	0.90	866	12%
		PM	7,152	9,180	0.78	7,987	9,180	0.87	836	12%
	M25 J28 to M25 J29 (SB)	AM	7,783	9,115	0.85	7,918	9,180	0.86	135	2%
		IP	7,581	9,115	0.83	7,770	9,180	0.85	189	2%
		PM	7,903	9,115	0.87	8,054	9,180	0.88	151	2%
B	M25 J4 to M25 J3 (NB)	AM	5,827	6,850	0.85	6,066	6,850	0.89	239	4%
		IP	5,736	6,850	0.84	5,953	6,850	0.87	218	4%
		PM	6,155	6,850	0.90	6,347	6,850	0.93	192	3%
	M25 J3 to M25 J4 (SB)	AM	6,850	6,850	1.00	6,850	6,850	1.00	0	0%
		IP	5,587	6,850	0.82	5,816	6,850	0.85	229	4%
		PM	5,371	6,850	0.78	5,738	6,850	0.84	366	7%
C	A13 A126 to A1012 (EB)	AM	5,120	6,307	0.81	4,342	6,289	0.69	-778	-15%
		IP	5,111	6,286	0.81	4,682	6,276	0.75	-428	-8%
		PM	5,587	6,278	0.89	5,601	6,251	0.90	13	0%
	A13 A1012 to A126 (WB)	AM	6,159	6,360	0.97	5,722	6,360	0.90	-437	-7%
		IP	5,795	6,360	0.91	4,875	6,360	0.77	-920	-16%
		PM	5,674	6,360	0.89	4,621	6,360	0.73	-1,053	-19%
D	A13 Orsett Cock to Manor Way (EB)	AM	4,656	6,370	0.73	5,208	6,370	0.82	552	12%
		IP	4,015	6,370	0.63	4,667	6,370	0.73	653	16%
		PM	5,216	6,370	0.82	5,811	6,365	0.91	595	11%
	A13 Manor Way to Orsett Cock (WB)	AM	4,931	6,220	0.79	6,009	6,220	0.97	1,078	22%
		IP	4,362	6,220	0.70	5,423	6,220	0.87	1,061	24%
		PM	4,737	6,220	0.76	5,902	6,220	0.95	1,165	25%
E	A2 A227 to Gravesend East (EB)	AM	6,465	9,208	0.70	5,501	9,194	0.60	-964	-15%
		IP	6,770	9,174	0.74	5,489	9,151	0.60	-1,282	-19%
		PM	8,624	9,174	0.94	7,790	9,153	0.85	-834	-10%
	A2 Gravesend East to A227 (WB)	AM	7,088	7,768	0.91	6,268	7,601	0.82	-820	-12%
		IP	6,347	7,676	0.83	5,388	7,445	0.72	-960	-15%
		PM	6,718	7,456	0.90	6,219	7,337	0.85	-499	-7%
F	M2 J1 to M2 J2 (EB)	AM	5,491	8,497	0.65	6,499	8,416	0.77	1,009	18%
		IP	4,831	8,547	0.57	5,840	8,535	0.68	1,009	21%

Location	Location Description	Time Period	DM			DS			Flow Differences	
			Flow	Effective Capacity	V/C	Flow	Effective Capacity	V/C	Diff	Diff %
		PM	6,530	8,569	0.76	7,804	8,527	0.92	1,274	20%
	M2 J2 to M2 J1 (WB)	AM	5,309	9,115	0.58	7,091	9,180	0.77	1,782	34%
		IP	4,360	9,115	0.48	5,616	9,180	0.61	1,256	29%
		PM	5,078	9,115	0.56	5,874	9,180	0.64	796	16%
G	M20 J3 to M20 J4 (EB)	AM	5,942	9,115	0.65	5,362	9,115	0.59	-580	-10%
		IP	5,920	9,115	0.65	5,258	9,115	0.58	-662	-11%
		PM	8,121	9,115	0.89	7,694	9,115	0.84	-427	-5%
	M20 J4 to M20 J3 (WB)	AM	8,563	9,115	0.94	7,574	9,115	0.83	-989	-12%
		IP	5,680	9,115	0.62	4,810	9,115	0.53	-871	-15%
		PM	5,063	9,115	0.56	4,414	9,115	0.48	-650	-13%

DM Vs DS Journey Time Comparisons

7.4.9 The same link based and route based journey time comparisons introduced under Section 7.2 are repeated for this year scenario combination.

7.4.10 The link based corridors analysed are as previously shown diagrammatically in Figure 7.14.

7.4.11 The link based journey time comparisons for this scenario are presented in Table 7.52 to Table 7.54.

7.4.12 The route based movements analysed are as previously shown diagrammatically in Figure 7.15.

7.4.13 Table 7.55 to Table 7.60 provide the with and without scheme journey distances, times and average speeds for a selection of these movements for southbound and northbound movements.

Table 7.52 – Link Based Journey Time Scenario Comparison (2041 Core DM Vs DS) AM Peak

Road	Movement	From	To	Do-Minimum (CM6)			Do-Something (C8E)			Difference			Difference (%)		
				Distance (km)	Time (mins)	Av Speed (kph)	Distance (km)	Time (mins)	Av Speed (kph)	Distance (km)	Time (mins)	Av Speed (kph)	Distance (km)	Time (mins)	Av Speed (kph)
M25 clockwise	A to B	M25 J26	M25 J29	23.5	20.1	70.3	23.5	19.5	72.2	-0.0	-0.6	1.9	-0.1%	-2.8%	+2.8%
	B to D	M25 J29	M25 J2	18.9	18.7	60.6	18.9	13.9	81.2	-0.0	-4.8	20.6	-0.1%	-25.4%	+34.0%
	D to F	M25 J2	M25 J7	37.4	32.3	69.6	37.4	35.2	63.7	0.0	3.0	-5.8	+0.0%	+9.1%	-8.4%
M25 Anti-clockwise	F to D	M25 J7	M25 J2	37.8	29.4	77.2	37.8	29.6	76.7	0.0	0.2	-0.5	+0.0%	+0.6%	-0.6%
	D to B	M25 J2	M25 J29	18.6	25.3	44.3	18.4	15.7	70.5	-0.2	-9.6	26.2	-1.1%	-37.9%	+59.3%
	B to A	M25 J29	M25 J26	23.4	20.4	68.7	23.3	21.9	63.9	-0.0	1.5	-4.8	-0.1%	+7.4%	-7.0%
A13 EB	C to G	M25 J30	A1089	5.0	4.7	64.0	5.2	4.3	72.1	0.2	-0.4	8.1	+3.1%	-8.5%	+12.6%
	G to H	A1089	A130	15.7	11.7	80.3	15.7	13.3	71.0	-0.0	1.5	-9.3	-0.0%	+13.1%	-11.6%
A13 WB	H to G	A130	A1089	15.6	13.7	68.1	15.6	17.6	53.0	0.0	3.9	-15.1	+0.1%	+28.7%	-22.2%
	G to C	A1089	M25 J30	5.3	8.3	38.3	5.6	7.0	47.6	0.3	-1.2	9.4	+5.9%	-14.9%	+24.5%
A2/M2 EB	D to I	M25 J2	M2 J1	14.2	8.9	95.9	14.6	8.6	101.7	0.4	-0.3	5.7	+3.0%	-2.8%	+6.0%
	I to J	M2 J1	M2 J4	14.9	8.7	103.1	14.4	8.7	99.2	-0.5	0.1	-4.0	-3.3%	+0.6%	-3.8%
A2/M2 WB	J to I	M2 J4	M2 J1	15.0	9.1	99.4	15.0	9.8	92.0	0.0	0.7	-7.4	+0.0%	+8.1%	-7.5%
	I to D	M2 J1	M25 J2	14.7	20.9	42.3	14.8	14.5	61.3	0.1	-6.4	19.0	+0.4%	-30.7%	+44.9%
M20 EB	E to K	M25 J3	M20 J8	35.2	25.6	82.6	35.2	25.0	84.4	0.0	-0.6	1.9	+0.0%	-2.2%	+2.3%
M20 WB	K to E	M20 J8	M25 J3	35.4	25.3	84.1	35.4	23.3	91.1	0.0	-1.9	7.0	+0.0%	-7.7%	+8.3%

Table 7.53 – Link Based Journey Time Scenario Comparison (2041 Core DM Vs DS) Inter Peak

Road	Movement	From	To	Do-Minimum (CM6)			Do-Something (C8E)			Difference			Difference (%)		
				Distance (km)	Time (mins)	Av Speed (kph)	Distance (km)	Time (mins)	Av Speed (kph)	Distance (km)	Time (mins)	Av Speed (kph)	Distance (km)	Time (mins)	Av Speed (kph)
M25 clockwise	A to B	M25 J26	M25 J29	23.5	17.8	79.2	23.5	17.5	80.7	-0.0	-0.4	1.5	-0.1%	-2.0%	+1.9%
	B to D	M25 J29	M25 J2	18.9	14.5	77.9	18.9	12.4	91.0	-0.0	-2.1	13.1	-0.1%	-14.4%	+16.8%
	D to F	M25 J2	M25 J7	37.4	25.3	88.7	37.4	25.6	87.6	0.0	0.3	-1.1	+0.0%	+1.3%	-1.2%
M25 Anti-clockwise	F to D	M25 J7	M25 J2	37.8	28.8	78.8	37.8	29.3	77.6	0.0	0.4	-1.2	+0.0%	+1.5%	-1.5%
	D to B	M25 J2	M25 J29	18.6	22.4	50.0	18.4	14.8	74.6	-0.2	-7.6	24.6	-1.1%	-33.7%	+49.3%
	B to A	M25 J29	M25 J26	23.4	17.1	81.8	23.3	18.2	77.2	-0.0	1.0	-4.6	-0.1%	+5.9%	-5.7%
A13 EB	C to G	M25 J30	A1089	5.0	4.9	61.6	5.2	4.7	66.4	0.2	-0.2	4.8	+3.1%	-4.4%	+7.8%
	G to H	A1089	A130	15.7	11.0	85.6	15.7	11.7	80.5	-0.0	0.7	-5.0	-0.0%	+6.2%	-5.9%
A13 WB	H to G	A130	A1089	15.6	11.0	84.8	15.6	12.5	74.6	0.0	1.5	-10.2	+0.1%	+13.8%	-12.0%
	G to C	A1089	M25 J30	5.3	6.1	51.8	5.6	5.5	60.6	0.3	-0.6	8.8	+5.9%	-9.6%	+17.1%
A2/M2 EB	D to I	M25 J2	M2 J1	14.2	9.1	93.5	14.6	8.6	102.1	0.4	-0.5	8.6	+3.0%	-5.7%	+9.2%
	I to J	M2 J1	M2 J4	14.9	8.5	105.3	14.4	8.4	103.3	-0.5	-0.1	-2.0	-3.3%	-1.4%	-1.9%
A2/M2 WB	J to I	M2 J4	M2 J1	15.0	8.5	106.0	15.0	8.7	103.8	0.0	0.2	-2.2	+0.0%	+2.2%	-2.1%
	I to D	M2 J1	M25 J2	14.7	11.8	75.0	14.8	9.2	96.2	0.1	-2.6	21.1	+0.4%	-21.7%	+28.1%
M20 EB	E to K	M25 J3	M20 J8	35.2	24.4	86.7	35.2	23.4	90.4	0.0	-1.0	3.7	+0.0%	-4.1%	+4.3%
M20 WB	K to E	M20 J8	M25 J3	35.4	20.4	104.2	35.4	20.1	105.7	0.0	-0.3	1.6	+0.0%	-1.5%	+1.5%

Table 7.54 – Link Based Journey Time Scenario Comparison (2041 Core DM Vs DS) PM Peak

Road	Movement	From	To	Do-Minimum (CM6)			Do-Something (C8E)			Difference			Difference (%)		
				Distance (km)	Time (mins)	Av Speed (kph)	Distance (km)	Time (mins)	Av Speed (kph)	Distance (km)	Time (mins)	Av Speed (kph)	Distance (km)	Time (mins)	Av Speed (kph)
M25 clockwise	A to B	M25 J26	M25 J29	23.5	20.2	69.7	23.5	20.7	68.2	-0.0	0.4	-1.6	-0.1%	+2.1%	-2.2%
	B to D	M25 J29	M25 J2	18.9	17.3	65.3	18.9	12.8	88.2	-0.0	-4.5	22.9	-0.1%	-26.0%	+35.0%
	D to F	M25 J2	M25 J7	37.4	23.3	96.3	37.4	24.0	93.6	0.0	0.7	-2.7	+0.0%	+2.9%	-2.8%
M25 Anti-clockwise	F to D	M25 J7	M25 J2	37.8	31.8	71.3	37.8	32.4	70.2	0.0	0.5	-1.1	+0.0%	+1.6%	-1.6%
	D to B	M25 J2	M25 J29	18.6	26.6	42.1	18.4	15.9	69.7	-0.2	-10.7	27.6	-1.1%	-40.2%	+65.4%
	B to A	M25 J29	M25 J26	23.4	16.3	86.2	23.3	16.7	83.9	-0.0	0.4	-2.4	-0.1%	+2.8%	-2.7%
A13 EB	C to G	M25 J30	A1089	5.0	7.9	38.3	5.2	6.1	51.4	0.2	-1.8	13.1	+3.1%	-23.3%	+34.3%
	G to H	A1089	A130	15.7	12.2	77.5	15.7	14.5	65.0	-0.0	2.3	-12.5	-0.0%	+19.2%	-16.1%
A13 WB	H to G	A130	A1089	15.6	11.5	80.9	15.6	14.5	64.5	0.0	3.0	-16.4	+0.1%	+25.6%	-20.3%
	G to C	A1089	M25 J30	5.3	6.1	51.8	5.6	5.2	64.3	0.3	-0.9	12.5	+5.9%	-14.8%	+24.2%
A2/M2 EB	D to I	M25 J2	M2 J1	14.2	14.7	57.9	14.6	10.2	85.6	0.4	-4.5	27.7	+3.0%	-30.3%	+47.8%
	I to J	M2 J1	M2 J4	14.9	9.6	92.9	14.4	13.0	66.7	-0.5	3.4	-26.3	-3.3%	+34.8%	-28.3%
A2/M2 WB	J to I	M2 J4	M2 J1	15.0	8.8	102.6	15.0	9.0	100.7	0.0	0.2	-1.9	+0.0%	+1.9%	-1.9%
	I to D	M2 J1	M25 J2	14.7	13.8	64.0	14.8	10.8	82.1	0.1	-3.0	18.1	+0.4%	-21.7%	+28.2%
M20 EB	E to K	M25 J3	M20 J8	35.2	33.7	62.6	35.2	33.9	62.2	0.0	0.2	-0.3	+0.0%	+0.5%	-0.5%
M20 WB	K to E	M20 J8	M25 J3	35.4	20.3	104.7	35.4	20.0	106.0	0.0	-0.3	1.3	+0.0%	-1.2%	+1.2%

Table 7.55 – Route Based Journey Time Comparison North to South Movements (2041 Core DM Vs DS) AM Peak

Movement	From	To	DM			DS			Difference			Difference %age		
			Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)
1 to 5	Cheshunt	Bexley	61.9	68.4	54.3	62.0	66.6	55.9	0.1	-1.8	1.6	+0.2%	-2.6%	+2.9%
1 to 6	Cheshunt	Godstone	91.8	92.9	59.3	91.8	91.6	60.1	0.0	-1.3	0.8	+0.0%	-1.4%	+1.4%
1 to 7	Cheshunt	Southfleet	60.8	63.4	57.5	60.9	59.7	61.2	0.1	-3.7	3.7	+0.2%	-5.8%	+6.4%
1 to 8	Cheshunt	Maidstone	88.2	81.9	64.6	88.2	77.4	68.4	0.0	-4.5	3.7	+0.0%	-5.5%	+5.8%
1 to 9	Cheshunt	Rochester	76.9	84.9	54.3	71.0	76.6	55.6	-5.9	-8.3	1.3	-7.7%	-9.8%	+2.3%
1 to 10	Cheshunt	Rainham	92.5	87.3	63.6	87.9	78.0	67.6	-4.6	-9.3	4.0	-5.0%	-10.6%	+6.3%
2 to 5	Romford	Bexley	31.8	52.8	36.2	31.9	50.2	38.1	0.1	-2.5	2.0	+0.3%	-4.8%	+5.4%
2 to 6	Romford	Godstone	61.7	77.3	47.9	61.7	75.2	49.2	-0.0	-2.1	1.3	-0.0%	-2.7%	+2.7%
2 to 7	Romford	Southfleet	30.7	47.8	38.5	30.8	43.3	42.6	0.1	-4.5	4.1	+0.3%	-9.3%	+10.6%
2 to 8	Romford	Maidstone	58.1	66.2	52.6	58.1	61.0	57.1	-0.0	-5.3	4.5	-0.0%	-7.9%	+8.6%
2 to 9	Romford	Rochester	47.0	69.2	40.7	47.3	60.3	47.1	0.3	-8.9	6.3	+0.6%	-12.9%	+15.5%
2 to 10	Romford	Rainham	62.4	71.7	52.2	63.8	61.7	62.0	1.4	-9.9	9.8	+2.3%	-13.9%	+18.8%
3 to 5	Brentwood	Bexley	33.3	40.8	49.1	33.4	38.3	52.4	0.1	-2.5	3.3	+0.3%	-6.0%	+6.7%
3 to 6	Brentwood	Godstone	63.2	65.3	58.1	63.2	63.3	59.9	-0.0	-2.0	1.8	-0.0%	-3.0%	+3.1%
3 to 7	Brentwood	Southfleet	32.3	35.8	54.1	32.3	31.4	61.7	0.1	-4.4	7.7	+0.3%	-12.2%	+14.2%
3 to 8	Brentwood	Maidstone	59.6	54.2	66.0	59.6	49.1	72.9	-0.0	-5.2	6.9	-0.0%	-9.5%	+10.5%
3 to 9	Brentwood	Rochester	48.3	57.3	50.6	42.4	48.3	52.6	-5.9	-9.0	2.0	-12.3%	-15.7%	+4.0%
3 to 10	Brentwood	Rainham	63.9	59.6	64.3	59.3	49.7	71.6	-4.6	-10.0	7.3	-7.3%	-16.7%	+11.4%
4 to 5	Basildon	Bexley	39.1	51.5	45.6	39.2	46.8	50.3	0.1	-4.7	4.7	+0.2%	-9.1%	+10.3%
4 to 6	Basildon	Godstone	69.0	76.0	54.5	69.0	71.8	57.6	-0.0	-4.2	3.2	-0.0%	-5.5%	+5.8%
4 to 7	Basildon	Southfleet	38.1	46.5	49.1	34.2	31.6	65.1	-3.8	-15.0	16.0	-10.0%	-32.1%	+32.6%
4 to 8	Basildon	Maidstone	65.4	65.0	60.4	48.6	53.5	54.5	-16.8	-11.4	-6.0	-25.7%	-17.6%	-9.9%
4 to 9	Basildon	Rochester	54.1	68.0	47.7	36.5	47.6	46.0	-17.6	-20.4	-1.7	-32.6%	-30.0%	-3.6%
4 to 10	Basildon	Rainham	69.7	70.4	59.4	53.4	49.0	65.4	-16.3	-21.4	6.0	-23.4%	-30.4%	+10.1%

Table 7.56 – Route Based Journey Time Comparison North to South Movements (2041 Core DM Vs DS) Inter Peak

Movement	From	To	DM			DS			Difference			Difference %age		
			Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)
1 to 5	Cheshunt	Bexley	61.9	53.8	69.0	61.8	52.8	70.2	-0.1	-1.0	1.2	-0.1%	-1.9%	+1.8%
1 to 6	Cheshunt	Godstone	91.4	72.2	75.9	91.3	71.1	77.1	-0.1	-1.2	1.2	-0.1%	-1.6%	+1.5%
1 to 7	Cheshunt	Southfleet	60.8	52.2	69.9	60.8	50.8	71.8	0.0	-1.4	1.9	+0.0%	-2.7%	+2.8%
1 to 8	Cheshunt	Maidstone	88.1	68.4	77.4	82.5	66.7	74.2	-5.7	-1.7	-3.1	-6.4%	-2.5%	-4.0%
1 to 9	Cheshunt	Rochester	80.7	68.7	70.5	76.2	62.6	73.1	-4.5	-6.1	2.5	-5.6%	-8.8%	+3.6%
1 to 10	Cheshunt	Rainham	91.5	74.1	74.1	86.8	67.6	77.1	-4.7	-6.6	3.0	-5.1%	-8.8%	+4.1%
2 to 5	Romford	Bexley	37.8	42.7	53.1	35.4	40.6	52.3	-2.4	-2.1	-0.9	-6.5%	-4.9%	-1.6%
2 to 6	Romford	Godstone	67.4	61.2	66.1	65.0	58.9	66.1	-2.4	-2.3	0.1	-3.6%	-3.7%	+0.1%
2 to 7	Romford	Southfleet	36.8	41.2	53.6	34.4	38.7	53.4	-2.4	-2.5	-0.2	-6.4%	-6.1%	-0.3%
2 to 8	Romford	Maidstone	64.1	57.3	67.1	56.1	54.5	61.7	-8.0	-2.8	-5.4	-12.5%	-4.9%	-8.0%
2 to 9	Romford	Rochester	56.8	57.7	59.1	49.9	50.5	59.3	-6.9	-7.2	0.2	-12.1%	-12.5%	+0.4%
2 to 10	Romford	Rainham	67.5	63.1	64.2	60.5	55.5	65.4	-7.1	-7.7	1.2	-10.5%	-12.1%	+1.9%
3 to 5	Brentwood	Bexley	33.2	32.9	60.6	32.5	31.0	62.8	-0.7	-1.8	2.2	-2.2%	-5.6%	+3.6%
3 to 6	Brentwood	Godstone	62.7	51.3	73.4	62.0	49.3	75.5	-0.7	-2.0	2.1	-1.2%	-3.9%	+2.8%
3 to 7	Brentwood	Southfleet	32.1	31.3	61.6	31.5	29.0	65.0	-0.6	-2.2	3.4	-2.0%	-7.1%	+5.6%
3 to 8	Brentwood	Maidstone	59.5	47.4	75.2	53.2	44.9	71.0	-6.3	-2.5	-4.2	-10.6%	-5.4%	-5.6%
3 to 9	Brentwood	Rochester	52.3	47.7	65.8	47.1	40.8	69.1	-5.3	-6.9	3.3	-10.1%	-14.4%	+5.1%
3 to 10	Brentwood	Rainham	62.9	53.2	70.9	57.5	45.8	75.3	-5.4	-7.4	4.4	-8.5%	-13.9%	+6.2%
4 to 5	Basildon	Bexley	39.1	37.0	63.6	39.1	34.7	67.7	-0.0	-2.3	4.1	-0.1%	-6.2%	+6.5%
4 to 6	Basildon	Godstone	68.7	55.4	74.4	68.7	53.0	77.8	-0.0	-2.4	3.4	-0.1%	-4.4%	+4.6%
4 to 7	Basildon	Southfleet	38.1	35.4	64.6	33.4	27.1	73.8	-4.7	-8.2	9.3	-12.3%	-23.3%	+14.4%
4 to 8	Basildon	Maidstone	65.4	51.5	76.2	47.3	42.7	66.5	-18.1	-8.8	-9.7	-27.7%	-17.2%	-12.8%
4 to 9	Basildon	Rochester	58.1	51.9	67.2	41.1	38.7	63.7	-17.0	-13.2	-3.4	-29.3%	-25.5%	-5.1%
4 to 10	Basildon	Rainham	68.8	57.3	72.0	51.7	43.6	71.0	-17.2	-13.7	-1.0	-25.0%	-23.9%	-1.4%

Table 7.57 – Route Based Journey Time Comparison North to South Movements (2041 Core DM Vs DS) PM Peak

Movement	From	To	DM			DS			Difference			Difference %age		
			Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)
1 to 5	Cheshunt	Bexley	62.4	64.8	57.7	62.3	63.3	59.0	-0.1	-1.5	1.3	-0.2%	-2.3%	+2.2%
1 to 6	Cheshunt	Godstone	92.1	81.5	67.8	92.1	79.4	69.6	-0.1	-2.2	1.8	-0.1%	-2.7%	+2.7%
1 to 7	Cheshunt	Southfleet	61.2	62.5	58.7	61.1	59.8	61.3	-0.1	-2.7	2.6	-0.1%	-4.3%	+4.4%
1 to 8	Cheshunt	Maidstone	88.6	84.0	63.3	82.9	78.8	63.1	-5.6	-5.1	-0.2	-6.4%	-6.1%	-0.3%
1 to 9	Cheshunt	Rochester	77.4	90.2	51.5	71.5	80.5	53.3	-6.0	-9.7	1.8	-7.7%	-10.7%	+3.4%
1 to 10	Cheshunt	Rainham	92.8	100.0	55.7	88.1	90.3	58.6	-4.7	-9.7	2.9	-5.0%	-9.7%	+5.1%
2 to 5	Romford	Bexley	38.0	50.6	45.1	35.4	47.9	44.3	-2.6	-2.6	-0.8	-6.9%	-5.2%	-1.7%
2 to 6	Romford	Godstone	67.7	67.3	60.4	65.3	64.0	61.2	-2.4	-3.3	0.9	-3.6%	-5.0%	+1.5%
2 to 7	Romford	Southfleet	36.8	48.3	45.7	34.3	44.4	46.4	-2.4	-3.9	0.7	-6.6%	-8.0%	+1.5%
2 to 8	Romford	Maidstone	64.1	69.7	55.2	56.1	63.4	53.1	-8.0	-6.3	-2.1	-12.5%	-9.0%	-3.8%
2 to 9	Romford	Rochester	53.0	76.0	41.9	44.7	65.1	41.2	-8.3	-10.8	-0.7	-15.7%	-14.3%	-1.7%
2 to 10	Romford	Rainham	68.4	86.1	47.6	61.3	75.1	49.0	-7.0	-11.0	1.4	-10.3%	-12.8%	+2.9%
3 to 5	Brentwood	Bexley	33.5	42.1	47.7	33.3	39.5	50.6	-0.2	-2.6	2.9	-0.6%	-6.3%	+6.1%
3 to 6	Brentwood	Godstone	63.2	58.8	64.4	63.2	55.5	68.3	-0.0	-3.3	3.9	-0.0%	-5.7%	+6.0%
3 to 7	Brentwood	Southfleet	32.3	39.8	48.6	32.2	36.0	53.8	-0.0	-3.9	5.2	-0.0%	-9.7%	+10.7%
3 to 8	Brentwood	Maidstone	59.6	61.3	58.4	54.0	55.0	59.0	-5.6	-6.3	0.6	-9.4%	-10.3%	+1.0%
3 to 9	Brentwood	Rochester	46.9	67.9	41.5	42.4	56.7	44.8	-4.6	-11.2	3.4	-9.7%	-16.5%	+8.1%
3 to 10	Brentwood	Rainham	63.8	77.6	49.3	59.2	66.6	53.3	-4.6	-11.0	4.0	-7.2%	-14.2%	+8.1%
4 to 5	Basildon	Bexley	36.7	46.7	47.2	36.7	42.8	51.4	-0.0	-3.9	4.2	-0.1%	-8.3%	+8.9%
4 to 6	Basildon	Godstone	66.5	63.4	62.9	66.5	58.9	67.7	0.0	-4.5	4.9	+0.0%	-7.2%	+7.7%
4 to 7	Basildon	Southfleet	35.5	44.4	48.0	33.4	31.6	63.5	-2.1	-12.8	15.5	-5.9%	-28.9%	+32.3%
4 to 8	Basildon	Maidstone	62.9	65.8	57.3	47.3	50.6	56.0	-15.6	-15.2	-1.3	-24.8%	-23.1%	-2.2%
4 to 9	Basildon	Rochester	51.7	72.1	43.1	35.9	52.3	41.1	-15.9	-19.8	-2.0	-30.7%	-27.4%	-4.5%
4 to 10	Basildon	Rainham	67.1	82.2	49.0	52.5	62.3	50.6	-14.6	-19.9	1.6	-21.8%	-24.2%	+3.2%

Table 7.58 – Route Based Journey Time Comparison South to North Movements (2041 Core DM Vs DS) AM Peak

Movement	From	To	DM			DS			Difference			Difference %age		
			Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)
5 to 1	Bexley	Cheshunt	61.6	62.6	59.0	61.6	59.2	62.4	-0.0	-3.5	3.4	-0.0%	-5.5%	+5.8%
5 to 2	Bexley	Romford	33.4	47.2	42.4	33.4	41.1	48.8	0.0	-6.1	6.4	+0.1%	-13.0%	+15.1%
5 to 3	Bexley	Brentwood	34.4	46.5	44.4	34.3	39.5	52.0	-0.1	-7.0	7.7	-0.4%	-15.1%	+17.3%
5 to 4	Bexley	Basildon	36.4	43.5	50.2	36.5	36.7	59.7	0.0	-6.9	9.5	+0.1%	-15.8%	+18.9%
6 to 1	Godstone	Cheshunt	91.2	84.3	64.9	91.2	81.1	67.5	-0.0	-3.2	2.5	-0.0%	-3.8%	+3.9%
6 to 2	Godstone	Romford	63.0	68.8	54.9	63.0	63.0	60.0	0.0	-5.9	5.1	+0.0%	-8.5%	+9.3%
6 to 3	Godstone	Brentwood	64.0	68.2	56.4	63.9	61.4	62.4	-0.2	-6.7	6.0	-0.3%	-9.9%	+10.7%
6 to 4	Godstone	Basildon	66.1	65.2	60.8	66.1	58.6	67.7	0.0	-6.6	6.9	+0.0%	-10.1%	+11.3%
7 to 1	Southfleet	Cheshunt	61.1	64.8	56.6	60.6	57.6	63.2	-0.5	-7.3	6.6	-0.8%	-11.2%	+11.7%
7 to 2	Southfleet	Romford	32.9	49.4	40.0	32.5	39.4	49.4	-0.4	-9.9	9.4	-1.3%	-20.1%	+23.5%
7 to 3	Southfleet	Brentwood	33.9	48.7	41.8	33.3	37.9	52.7	-0.6	-10.8	10.9	-1.8%	-22.2%	+26.1%
7 to 4	Southfleet	Basildon	36.0	45.7	47.2	35.5	29.0	73.5	-0.5	-16.8	26.3	-1.4%	-36.7%	+55.7%
8 to 1	Maidstone	Cheshunt	88.1	88.8	59.6	88.1	82.9	63.7	-0.1	-5.9	4.2	-0.1%	-6.6%	+7.0%
8 to 2	Maidstone	Romford	59.9	73.3	49.0	60.0	64.8	55.5	0.0	-8.6	6.5	+0.0%	-11.7%	+13.2%
8 to 3	Maidstone	Brentwood	61.0	72.7	50.4	55.1	64.6	51.2	-5.9	-8.1	0.9	-9.6%	-11.1%	+1.7%
8 to 4	Maidstone	Basildon	63.0	69.7	54.3	50.7	54.6	55.7	-12.3	-15.1	1.4	-19.6%	-21.6%	+2.6%
9 to 1	Rochester	Cheshunt	77.0	94.1	49.1	71.4	76.1	56.3	-5.6	-18.0	7.2	-7.3%	-19.2%	+14.7%
9 to 2	Rochester	Romford	48.8	78.7	37.2	44.3	59.7	44.6	-4.5	-19.0	7.3	-9.3%	-24.2%	+19.7%
9 to 3	Rochester	Brentwood	49.9	78.0	38.4	42.7	56.0	45.7	-7.2	-22.0	7.4	-14.4%	-28.2%	+19.2%
9 to 4	Rochester	Basildon	51.9	75.0	41.5	38.2	46.1	49.8	-13.7	-29.0	8.3	-26.4%	-38.6%	+20.0%
10 to 1	Rainham	Cheshunt	92.6	102.4	54.3	88.5	84.1	63.2	-4.0	-18.3	8.9	-4.4%	-17.8%	+16.4%
10 to 2	Rainham	Romford	64.4	86.9	44.4	61.4	67.7	54.4	-3.0	-19.2	10.0	-4.6%	-22.1%	+22.5%
10 to 3	Rainham	Brentwood	65.4	86.3	45.5	59.8	64.0	56.0	-5.6	-22.2	10.5	-8.6%	-25.8%	+23.2%
10 to 4	Rainham	Basildon	67.5	83.3	48.6	55.3	54.1	61.4	-12.1	-29.2	12.8	-18.0%	-35.1%	+26.4%

Table 7.59 – Route Based Journey Time Comparison South to North Movements (2041 Core DM Vs DS) Inter Peak

Movement	From	To	DM			DS			Difference			Difference %age		
			Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)
5 to 1	Bexley	Cheshunt	61.6	58.2	63.5	61.5	54.2	68.1	-0.0	-4.0	4.6	-0.1%	-6.8%	+7.2%
5 to 2	Bexley	Romford	35.7	43.4	49.3	35.2	38.0	55.6	-0.5	-5.4	6.3	-1.3%	-12.4%	+12.7%
5 to 3	Bexley	Brentwood	32.3	40.4	47.9	32.1	34.3	56.1	-0.2	-6.1	8.1	-0.6%	-15.0%	+17.0%
5 to 4	Bexley	Basildon	36.5	42.1	51.9	36.5	35.3	61.9	-0.0	-6.8	10.0	-0.0%	-16.1%	+19.2%
6 to 1	Godstone	Cheshunt	91.5	79.0	69.5	91.4	75.5	72.6	-0.0	-3.4	3.1	-0.0%	-4.3%	+4.5%
6 to 2	Godstone	Romford	65.6	64.2	61.3	65.1	59.4	65.8	-0.5	-4.8	4.5	-0.7%	-7.5%	+7.4%
6 to 3	Godstone	Brentwood	62.2	61.2	60.9	62.0	55.7	66.8	-0.2	-5.5	5.8	-0.3%	-9.0%	+9.6%
6 to 4	Godstone	Basildon	66.4	63.0	63.3	66.4	56.7	70.2	-0.0	-6.2	7.0	-0.0%	-9.9%	+11.0%
7 to 1	Southfleet	Cheshunt	60.7	56.7	64.1	60.6	52.2	69.7	-0.0	-4.5	5.5	-0.1%	-8.0%	+8.6%
7 to 2	Southfleet	Romford	34.7	42.0	49.6	34.3	36.0	57.1	-0.4	-6.0	7.5	-1.3%	-14.2%	+15.0%
7 to 3	Southfleet	Brentwood	31.3	39.0	48.2	31.1	32.3	57.8	-0.2	-6.6	9.5	-0.6%	-17.1%	+19.8%
7 to 4	Southfleet	Basildon	35.5	40.7	52.3	35.5	27.5	77.3	-0.1	-13.2	24.9	-0.2%	-32.4%	+47.6%
8 to 1	Maidstone	Cheshunt	88.1	81.4	64.9	83.8	76.2	66.0	-4.2	-5.2	1.1	-4.8%	-6.4%	+1.7%
8 to 2	Maidstone	Romford	62.2	66.6	56.0	57.5	59.9	57.7	-4.7	-6.8	1.6	-7.5%	-10.1%	+2.9%
8 to 3	Maidstone	Brentwood	58.8	63.6	55.4	55.0	54.1	60.9	-3.8	-9.5	5.5	-6.5%	-14.9%	+9.9%
8 to 4	Maidstone	Basildon	63.0	65.4	57.8	50.7	49.5	61.4	-12.3	-15.9	3.6	-19.6%	-24.3%	+6.3%
9 to 1	Rochester	Cheshunt	77.0	78.8	58.6	72.9	67.2	65.1	-4.0	-11.6	6.5	-5.2%	-14.7%	+11.1%
9 to 2	Rochester	Romford	51.1	64.0	47.9	46.6	50.9	55.0	-4.5	-13.1	7.1	-8.7%	-20.5%	+14.8%
9 to 3	Rochester	Brentwood	47.7	61.0	46.9	44.1	45.1	58.6	-3.6	-15.9	11.7	-7.5%	-26.0%	+25.0%
9 to 4	Rochester	Basildon	51.9	62.8	49.6	39.8	40.5	58.9	-12.1	-22.3	9.3	-23.3%	-35.5%	+18.8%
10 to 1	Rainham	Cheshunt	91.6	81.2	67.7	87.6	69.4	75.7	-4.0	-11.8	8.0	-4.4%	-14.5%	+11.8%
10 to 2	Rainham	Romford	65.8	66.4	59.4	61.3	53.1	69.3	-4.4	-13.3	9.9	-6.8%	-20.1%	+16.7%
10 to 3	Rainham	Brentwood	62.4	63.4	59.0	58.8	47.3	74.5	-3.6	-16.1	15.5	-5.7%	-25.4%	+26.3%
10 to 4	Rainham	Basildon	66.6	65.2	61.3	54.5	42.7	76.6	-12.1	-22.5	15.3	-18.2%	-34.5%	+24.9%

Table 7.60 – Route Based Journey Time Comparison South to North Movements (2041 Core DM Vs DS) PM Peak

Movement	From	To	DM			DS			Difference			Difference %age		
			Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)
5 to 1	Bexley	Cheshunt	61.5	60.6	60.9	61.4	57.7	63.9	-0.0	-3.0	3.1	-0.1%	-4.9%	+5.1%
5 to 2	Bexley	Romford	37.1	46.8	47.6	31.8	43.6	43.8	-5.3	-3.2	-3.8	-14.3%	-6.8%	-8.0%
5 to 3	Bexley	Brentwood	32.4	48.6	40.0	34.3	39.4	52.2	1.8	-9.2	12.1	+5.6%	-18.9%	+30.3%
5 to 4	Bexley	Basildon	36.5	50.0	43.8	36.5	44.4	49.3	-0.0	-5.6	5.5	-0.0%	-11.1%	+12.5%
6 to 1	Godstone	Cheshunt	91.2	81.8	66.9	91.2	79.4	68.9	-0.0	-2.4	2.0	-0.0%	-3.0%	+3.0%
6 to 2	Godstone	Romford	66.7	68.0	58.9	61.4	65.3	56.4	-5.3	-2.7	-2.5	-7.9%	-3.9%	-4.2%
6 to 3	Godstone	Brentwood	62.0	69.8	53.3	63.9	61.2	62.7	1.8	-8.7	9.4	+3.0%	-12.4%	+17.6%
6 to 4	Godstone	Basildon	66.1	71.2	55.7	66.1	66.2	59.9	-0.0	-5.0	4.2	-0.0%	-7.1%	+7.6%
7 to 1	Southfleet	Cheshunt	60.7	57.5	63.3	60.6	53.5	67.9	-0.0	-3.9	4.6	-0.1%	-6.8%	+7.3%
7 to 2	Southfleet	Romford	36.2	43.7	49.7	30.9	39.5	46.9	-5.3	-4.2	-2.8	-14.6%	-9.6%	-5.5%
7 to 3	Southfleet	Brentwood	31.5	45.5	41.5	33.3	35.3	56.6	1.8	-10.2	15.1	+5.8%	-22.4%	+36.3%
7 to 4	Southfleet	Basildon	35.5	46.9	45.5	36.0	32.7	66.1	0.5	-14.2	20.7	+1.4%	-30.3%	+45.5%
8 to 1	Maidstone	Cheshunt	88.1	77.6	68.2	88.1	74.0	71.4	-0.0	-3.6	3.3	-0.1%	-4.7%	+4.8%
8 to 2	Maidstone	Romford	63.7	63.8	59.9	58.4	59.9	58.4	-5.3	-3.9	-1.4	-8.3%	-6.1%	-2.4%
8 to 3	Maidstone	Brentwood	59.0	65.6	53.9	60.8	55.8	65.4	1.8	-9.9	11.5	+3.1%	-15.0%	+21.4%
8 to 4	Maidstone	Basildon	63.0	67.0	56.4	51.8	56.6	55.0	-11.2	-10.5	-1.4	-17.8%	-15.6%	-2.6%
9 to 1	Rochester	Cheshunt	75.3	89.8	50.3	71.3	76.6	55.8	-4.0	-13.2	5.5	-5.3%	-14.7%	+10.9%
9 to 2	Rochester	Romford	50.9	75.9	40.2	48.0	61.2	47.1	-2.9	-14.7	6.8	-5.7%	-19.4%	+16.9%
9 to 3	Rochester	Brentwood	46.2	77.8	35.7	42.7	56.6	45.3	-3.6	-21.2	9.6	-7.8%	-27.3%	+26.8%
9 to 4	Rochester	Basildon	50.3	79.2	38.1	38.2	53.9	42.5	-12.1	-25.3	4.4	-24.1%	-31.9%	+11.6%
10 to 1	Rainham	Cheshunt	92.6	85.6	64.9	88.5	72.1	73.7	-4.0	-13.5	8.8	-4.3%	-15.8%	+13.6%
10 to 2	Rainham	Romford	68.1	71.8	56.9	61.6	58.3	63.4	-6.5	-13.5	6.5	-9.5%	-18.8%	+11.5%
10 to 3	Rainham	Brentwood	63.4	73.6	51.7	59.8	52.1	68.9	-3.6	-21.5	17.2	-5.6%	-29.2%	+33.3%
10 to 4	Rainham	Basildon	67.4	75.0	53.9	55.3	49.4	67.2	-12.1	-25.6	13.3	-17.9%	-34.1%	+24.6%

Commentary on the Results

7.4.14 Table 7.41 to Table 7.46 demonstrate that the highway assignment models for each time period in the Do Minimum and Do Something scenarios have converged to well within the WebTAG recommended convergence limits. This does not necessarily mean that they have converged to a tight enough level for use in the economic assessment of the scheme. Additional analysis is recommended during the economic assessment of the scheme to identify whether there are any convergence issues associated with these models.

7.4.15 The select link analysis presented in Figure 7.28 to Figure 7.36 and associated Table 7.47 to Table 7.49 shows that the introduction of LTC has a significant impact on the patterns of movement using the Dartford Crossing. In particular there is a substantial reduction in traffic to/from east Kent using the Dartford Crossing. As would be expected, in the Do Something situation the majority of this traffic uses LTC. There is also a substantial reduction north of the river in trips to/from M25 north.

7.4.16 There is a slight increase in the number of trips using Dartford from within London both north and south of the River. This is likely due to some route switching of travellers using Silvertown/Blackwall in the Do Minimum to using Dartford in the Do Something due to the newly available capacity. This will also be caused by an increase in shorter distance trips switching destinations to cross the river in the Do Something scenario. These movements are suppressed in the Do Minimum scenario due to the lack of available capacity at Dartford.

7.4.17 Movements using LTC are predominantly from/to east Kent from/to M25 north and A13 east of the LTC junction. In the south there is some local traffic (approximately 800-1000 pcu/hr in the peak hours) and relatively few trips to/from Kent west of the LTC junction using LTC (approximately 800 pcu/hr in the peak hours) and zero trips from M25 south of the A2 junction using LTC. These movements will continue to use Dartford Crossing as to use LTC is a considerable detour. In the north there is a small amount of traffic to/from A1089 using LTC (up to 800 pcu/hr in the peak hours). These results are consistent across all time periods and accord well with a priori expectations.

7.4.18 Comparing flows in the Do Minimum and Do Something scenarios presented in Figure 7.37 to Figure 7.39 and in Table 7.50 and Table 7.51 show a substantial reduction in flow at the Dartford Crossing. Flows across Dartford reduce by approximately 10-25% compared to the Do Minimum scenario. This is as expected and is one of the primary objectives of the LTC scheme. In particular there is a substantial reduction in HGV's using the Dartford Crossing in the Do Something compared to the Do Minimum. This is due to the alignment of LTC making it a very favourable route for HGV's accessing the ports in Kent and Essex.

7.4.19 There are associated reductions along the A2 and A13 west of their LTC junctions and also on the M20. These reductions in flow lead to reductions in congestion along these corridors. This is seen as being one of the major benefits of the LTC scheme and is where a significant proportion of the economic benefits of the scheme would be derived from.

7.4.20 There are also some increases in flow in the Do Something compared to the Do Minimum on the A2/M2 corridor east of LTC and A13 east of LTC and on M25 north of LTC. This is caused by LTC drawing more traffic to cross the river than in the constrained Do Minimum scenario. This increase in flow leads to additional congestion in these corridors and will likely lead to disbenefits of introducing the LTC scheme. Some of these increases in flow cause a critical level of congestion in these corridors. In particular M25 J28-29 and A13 Orsett Cock to Manor Way are significantly worse in the Do Something scenario when compared with the Do Minimum scenario.

7.4.21 These benefits and disbenefits are further illustrated by the link based journey time analysis presented in Table 7.52 to Table 7.54. We can observe substantial increases in speed in the Dartford Crossing corridor between M25 J29 and M25 J2 in both directions (up to a 28 km/h increase in the peak periods in the northbound direction). There are also significant journey time savings on the A2 between the LTC junction and the M25 and on the A13 between the LTC junction and the M25. There are also some predicted reductions in speed on the A2 and A13 east of their LTC junctions and on the wider M25 both north and south of the river. This is in line with the increases in flows predicted in those corridors. This pattern is relatively consistent across all time periods.

7.4.22 There is additional detailed link based journey time analysis presented in Appendix C.

7.4.23 The route based journey times presented in Table 7.55 to Table 7.60 show cross river movements. As expected, all cross river movements experience improved journey times in the Do Something scenario when compared to the Do Minimum. Some cross river movements also benefit substantially from a reduced journey distance. Using LTC rather than Dartford provides a significant distance saving for movements to/from east Kent to/from east Essex.

7.4.24 It is for this reason that it is considered necessary to undertake a full 24 hour per day, 365 days per year economic assessment of LTC. Some movements will benefit significantly from the introduction of LTC even during the night when flow is predicted to be low. It is important that the associated benefits, and disbenefits, of this are captured in the economic analysis.

7.4.25 Most movements also experience an increase in average speed in the Do Something. Some movements don’t however, primarily due to using different parts of the network with different speed limits and links with higher congestion in the Do Something as described above. Overall though the balance is generally very positive.

7.5 LTAM 2051 Core – Outputs to Economic Assessment

7.5.1 The analysis presented below summarises the impact of the LTC scheme on forecast traffic flows and journey times for the 2051 core forecast. The statistics presented are from the final converged VDM loop as described under Chapter 6 above.

Highway Assignment Model (HAM) Convergence Statistics

7.5.2 Table 7.61 to Table 7.63 provide the final VDM loop highway assignment model convergence statistics for the 2051 core DM forecasts.

7.5.3 Table 7.64 to Table 7.66 provide the final VDM loop highway assignment model convergence statistics for the 2051 core DS forecasts.

Table 7.61 – HAM Convergence Statistics – 2051 Core DM AM Peak

Iteration	Delta (%)	%GAP	%Flows	%Delays
73	0.0084	0.0091	97.6	98.7
74	0.0064	0.011	98.4	98.8
75	0.0080	0.010	97.9	98.7
76	0.0060	0.011	97.9	98.7

Table 7.62 – HAM Convergence Statistics – 2051 Core DM Inter Peak

Iteration	Delta (%)	%GAP	%Flows	%Delays
81	0.0064	0.013	97.9	98.9
82	0.0129	0.0081	97.7	98.9
83	0.0071	0.012	98.1	99.1
84	0.0135	0.0074	97.7	98.9

Table 7.63 – HAM Convergence Statistics – 2051 Core DM PM Peak

Iteration	Delta (%)	%GAP	%Flows	%Delays
81	0.0060	0.0089	98.1	98.8
82	0.0052	0.010	97.7	98.8
83	0.0065	0.0078	97.7	98.6
84	0.0047	0.010	98.2	98.9

Table 7.64 – HAM Convergence Statistics – 2051 Core DS AM Peak

Iteration	Delta (%)	%GAP	%Flows	%Delays
84	0.0067	0.010	98.5	99.0
85	0.0089	0.0083	97.9	98.7
86	0.0077	0.0099	98.2	99.0
87	0.0079	0.0087	97.9	98.7

Table 7.65 – HAM Convergence Statistics – 2051 Core DS Inter Peak

Iteration	Delta (%)	%GAP	%Flows	%Delays
98	0.0069	0.013	98.0	98.9
99	0.0159	0.0081	97.6	98.7
100	0.0062	0.012	98.0	98.9
101	0.0118	0.0082	97.6	98.7

Table 7.66 – HAM Convergence Statistics – 2051 Core DS PM Peak

Iteration	Delta (%)	%GAP	%Flows	%Delays
73	0.0076	0.010	97.6	98.5
74	0.0064	0.010	97.9	98.6
75	0.0053	0.0079	97.6	98.7
76	0.0060	0.011	98.2	98.6

7.5.4 These tables demonstrate that the LTAM has achieved the WebTAG convergence targets in all time periods for this scenario and year.

Movement Patterns Using the Crossings

7.5.5 Figure 7.40 to Figure 7.48 provide select link analysis of movements using the Dartford and Lower Thames Crossing for the Do Minimum and Do Something scenarios for each of the model time periods. These diagrams show the pattern of movements using each of the crossings in each of the time periods. Table 7.67 to Table 7.69 provide a summary of the main corridors using each of the crossings and a comparison between the DM and DS scenarios for each time period.

Figure 7.40 – Select Link Analysis – Dartford Crossing DM 2051 Core AM Peak

Figure 7.41 – Select Link Analysis – Dartford Crossing DS 2051 Core AM Peak

Figure 7.42 – Select Link Analysis – Lower Thames Crossing DS 2051 Core AM Peak

Table 7.67 – Select Link Analysis – Summary of Primary Corridors of Movement 2051 AM Peak Two-Way Flow

Movement	Corridor	DM		DS		DS-DM SLA Flow (PCU)	% change (DM to DS) in SLA Flow
		SLA Flow (PCU)	% of Selected Link Flow	SLA Flow (PCU)	% of Selected Link Flow		
South of River	London South	3,030	18%	3,946	26%	916	30%
	Local Traffic	1,730	10%	1,754	11%	24	1%
	M25 South (J2-3)	8,907	52%	8,455	55%	-452	-5%
	A2/M2 to/from Kent	3,473	20%	1,086	7%	-2,387	-69%
Select Link	Dartford	**17,168**	**100%**	**15,442**	**100%**	**-1,725**	-10%
North of River	London North	2,211	13%	2,737	18%	526	24%
	Local Traffic	2,080	12%	1,985	13%	-96	-5%
	M25 North (J30-29)	9,546	56%	7,715	50%	-1,831	-19%
	A13 to/from Essex	3,317	19%	3,006	19%	-311	-9%
South of River	Local Traffic	n/a	n/a	915	10%	n/a	n/a
	A2 West of LTC	n/a	n/a	840	9%	n/a	n/a
	A2/A2M East of LTC	n/a	n/a	7,605	81%	n/a	n/a
Select Link	LTC	n/a	n/a	**9,360**	**100%**	n/a	n/a
North of River	A1089	n/a	n/a	932	10%	n/a	n/a
	A13 West of LTC	n/a	n/a	71	1%	n/a	n/a
	A13 East of LTC	n/a	n/a	3,955	42%	n/a	n/a
	M25 North of LTC	n/a	n/a	4,402	47%	n/a	n/a
	M25 South of LTC	n/a	n/a	0	0%	n/a	n/a

Figure 7.43 – Select Link Analysis – Dartford Crossing DM 2051 Core Inter Peak

Figure 7.44 – Select Link Analysis – Dartford Crossing DS 2051 Core Inter Peak

Figure 7.45 – Select Link Analysis – Lower Thames Crossing DS 2051 Core Inter Peak

Table 7.68 – Select Link Analysis – Summary of Primary Corridors of Movement 2051 Inter Peak Two-Way Flow

Movement	Corridor	DM		DS		DS-DM SLA Flow (PCU)	% change (DM to DS) in SLA Flow
		SLA Flow (PCU)	% of Selected Link Flow	SLA Flow (PCU)	% of Selected Link Flow		
South of River	London South	2,907	18%	3,256	25%	349	12%
	Local Traffic	1,483	9%	1,313	10%	-170	-11%
	M25 South (J2-3)	8,110	49%	7,237	56%	-873	-11%
	A2/M2 to/from Kent	4,021	24%	969	8%	-3,052	-76%
Select Link	Dartford	**16,555**	**100%**	**12,812**	**100%**	**-3,743**	-23%
North of River	London North	1,365	8%	1,645	13%	279	20%
	Local Traffic	1,580	10%	1,631	13%	51	3%
	M25 North (J30-29)	9,173	55%	6,807	53%	-2,366	-26%
	A13 to/from Essex	3,337	20%	2,729	21%	-608	-18%
South of River	Local Traffic	n/a	n/a	806	10%	n/a	n/a
	A2 West of LTC	n/a	n/a	547	7%	n/a	n/a
	A2/A2M East of LTC	n/a	n/a	6,393	83%	n/a	n/a
Select Link	LTC	n/a	n/a	**7,745**	**100%**	n/a	n/a
North of River	A1089	n/a	n/a	347	4%	n/a	n/a
	A13 West of LTC	n/a	n/a	44	1%	n/a	n/a
	A13 East of LTC	n/a	n/a	3,420	44%	n/a	n/a
	M25 North of LTC	n/a	n/a	3,933	51%	n/a	n/a
	M25 South of LTC	n/a	n/a	0	0%	n/a	n/a

Figure 7.46 – Select Link Analysis – Dartford Crossing DM 2051 Core PM Peak

Figure 7.47 – Select Link Analysis – Dartford Crossing DS 2051 Core PM Peak

Figure 7.48 – Select Link Analysis – Lower Thames Crossing DS 2051 Core PM Peak

Table 7.69 – Select Link Analysis – Summary of Primary Corridors of Movement 2051 PM Peak Two-Way Flow

Movement	Corridor	DM SLA Flow (PCU)	DM % of Selected Link Flow	DS SLA Flow (PCU)	DS % of Selected Link Flow	DS-DM SLA Flow (PCU)	% change (DM to DS) in SLA Flow
South of River	London South	3,225	19%	3,945	28%	720	22%
	Local Traffic	1,891	11%	1,723	12%	-167	-9%
	M25 South (J2-3)	7,067	43%	6,919	49%	-148	-2%
	A2/M2 to/from Kent	4,230	26%	1,477	10%	-2,752	-65%
Select Link	Dartford	**16,561**	**100%**	**14,227**	**100%**	**-2,334**	-14%
North of River	London North	2,124	13%	2,587	18%	463	22%
	Local Traffic	1,658	10%	1,712	12%	54	3%
	M25 North (J30-29)	8,941	54%	7,246	51%	-1,695	-19%
	A13 to/from Essex	3,193	19%	2,398	17%	-795	-25%
South of River	Local Traffic	n/a	n/a	1,161	14%	n/a	n/a
	A2 West of LTC	n/a	n/a	918	11%	n/a	n/a
	A2/A2M East of LTC	n/a	n/a	6,519	76%	n/a	n/a
Select Link	LTC	n/a	n/a	**8,598**	**100%**	n/a	n/a
North of River	A1089	n/a	n/a	540	6%	n/a	n/a
	A13 West of LTC	n/a	n/a	46	1%	n/a	n/a
	A13 East of LTC	n/a	n/a	4,203	49%	n/a	n/a
	M25 North of LTC	n/a	n/a	3,806	44%	n/a	n/a
	M25 South of LTC	n/a	n/a	0	0%	n/a	n/a

DM Vs DS Flow Comparisons

7.5.6 The impacts of the LTC scheme on traffic flows are presented in a number of different ways. Figure 7.49 to Figure 7.51 provide a flow difference plot between the DM and DS scenarios. Blue colours equate to reductions in flow, green colours indicate increases in flow. Flow differences less than 100 PCU's per hour have been excluded from the colouring.

7.5.7 Table 7.70 provides a comparison of the cross-river traffic flows between the DM and DS scenarios.

Figure 7.49 – Actual Flow Comparison Plot – 2051 Core DM Vs DS AM Peak

Figure 7.50 – Actual Flow Comparison Plot – 2051 Core DM Vs DS Inter Peak

Figure 7.51 – Actual Flow Comparison Plot – 2051 Core DM Vs DS PM Peak

Table 7.70 – Cross River Traffic Flows – 2051 Core DM Vs DS (Hourly Flows in PCU's)

Direction	Crossing	Time Period	Cars				LGV				HGV				Total			
			DM	DS	Diff	Diff %	DM	DS	Diff	Diff %	DM	DS	Diff	Diff %	DM	DS	Diff	Diff %
SB	Dartford	AM	2,889	3,209	320	11%	2,264	2,291	27	1%	3,347	2,710	-637	-19%	8,500	8,210	-290	-3%
		IP	3,328	2,883	-445	-13%	1,233	1,009	-225	-18%	3,772	2,422	-1,350	-36%	8,333	6,314	-2,020	-24%
		PM	4,508	4,239	-270	-6%	1,555	1,243	-312	-20%	2,437	1,488	-948	-39%	8,500	6,970	-1,530	-18%
	LTC	AM	0	2,447			0	486			0	1,360			0	4,293		
		IP	0	2,100			0	310			0	1,537			0	3,946		
		PM	0	3,436			0	462			0	1,181			0	5,079		
	Total	AM	2,889	5,656	2,767	96%	2,264	2,777	513	23%	3,347	4,069	723	22%	8,500	12,503	4,003	47%
		IP	3,328	4,983	1,655	50%	1,233	1,318	85	7%	3,772	3,959	187	5%	8,333	10,260	1,926	23%
		PM	4,508	7,675	3,166	70%	1,555	1,705	150	10%	2,437	2,670	233	10%	8,500	12,049	3,549	42%
NB	Dartford	AM	3,451	3,493	42	1%	1,916	1,547	-369	-19%	2,433	1,565	-868	-36%	7,801	6,605	-1,195	-15%
		IP	2,914	2,968	54	2%	1,342	1,193	-149	-11%	3,367	2,134	-1,234	-37%	7,623	6,294	-1,329	-17%
		PM	3,895	3,946	52	1%	1,431	1,216	-214	-15%	2,383	1,550	-833	-35%	7,709	6,712	-996	-13%
	LTC	AM	0	2,925			0	701			0	1,254			0	4,880		
		IP	0	1,837			0	343			0	1,614			0	3,793		
		PM	0	2,103			0	340			0	908			0	3,351		
	Total	AM	3,451	6,418	2,966	86%	1,916	2,249	332	17%	2,433	2,819	386	16%	7,801	11,485	3,685	47%
		IP	2,914	4,804	1,890	65%	1,342	1,536	194	14%	3,367	3,748	380	11%	7,623	10,088	2,465	32%
		PM	3,895	6,050	2,155	55%	1,431	1,556	125	9%	2,383	2,458	74	3%	7,709	10,063	2,354	31%

7.5.8 The movements considered critical to understanding the impacts of the scheme are the same as those described under Section 7.2 and previously illustrated in Figure 7.13. Table 7.71 provides a comparison of the flows at these strategic locations between the DM and DS in each time period.

Table 7.71 – Key Corridor Traffic Flows – 2051 Core DM Vs DS (Hourly Flows in PCU's)

Location	Location Description	Time Period	DM			DS			Flow Differences	
			Flow	Effective Capacity	V/C	Flow	Effective Capacity	V/C	Diff	Diff %
A	M25 J29 to M25 J28 (NB)	AM	8,127	9,180	0.89	9,174	9,180	1.00	1,047	13%
		IP	7,586	9,180	0.83	8,743	9,180	0.95	1,157	15%
		PM	7,298	9,180	0.80	8,291	9,180	0.90	993	14%
	M25 J28 to M25 J29 (SB)	AM	8,012	9,115	0.88	8,015	9,180	0.87	2	0%
		IP	7,888	9,115	0.87	8,023	9,180	0.87	135	2%
		PM	8,177	9,115	0.90	8,314	9,180	0.91	137	2%
B	M25 J4 to M25 J3 (NB)	AM	5,995	6,850	0.88	6,244	6,850	0.91	249	4%
		IP	5,999	6,850	0.88	6,238	6,850	0.91	239	4%
		PM	6,383	6,850	0.93	6,531	6,850	0.95	149	2%
	M25 J3 to M25 J4 (SB)	AM	6,850	6,850	1.00	6,850	6,850	1.00	0	0%
		IP	5,869	6,850	0.86	6,188	6,850	0.90	319	5%
		PM	5,470	6,850	0.80	5,947	6,850	0.87	478	9%
C	A13 A126 to A1012 (EB)	AM	5,204	6,312	0.82	4,500	6,293	0.72	-704	-14%
		IP	5,300	6,289	0.84	4,845	6,275	0.77	-454	-9%
		PM	5,575	6,280	0.89	5,573	6,249	0.89	-2	0%
	A13 A1012 to A126 (WB)	AM	6,182	6,360	0.97	5,762	6,360	0.91	-420	-7%
		IP	6,017	6,360	0.95	5,127	6,360	0.81	-890	-15%
		PM	5,865	6,360	0.92	4,823	6,360	0.76	-1,042	-18%
D	A13 Orsett Cock to Manor Way (EB)	AM	4,892	6,370	0.77	5,439	6,370	0.85	546	11%
		IP	4,214	6,370	0.66	4,950	6,370	0.78	736	17%
		PM	5,315	6,370	0.83	5,866	6,341	0.93	552	10%
	A13 Manor Way to Orsett Cock (WB)	AM	5,272	6,220	0.85	6,072	6,220	0.98	799	15%
		IP	4,618	6,220	0.74	5,696	6,220	0.92	1,078	23%
		PM	5,022	6,220	0.81	6,001	6,220	0.96	980	20%
E	A2 A227 to Gravesend East (EB)	AM	6,836	9,208	0.74	5,831	9,194	0.63	-1,005	-15%
		IP	7,141	9,170	0.78	5,857	9,146	0.64	-1,284	-18%
		PM	8,648	9,170	0.94	7,972	9,153	0.87	-677	-8%
	A2 Gravesend East to A227 (WB)	AM	7,280	7,756	0.94	6,434	7,556	0.85	-845	-12%
		IP	6,521	7,648	0.85	5,692	7,411	0.77	-829	-13%
		PM	6,924	7,460	0.93	6,447	7,303	0.88	-477	-7%
F	M2 J1 to M2 J2 (EB)	AM	5,900	8,549	0.69	6,908	8,423	0.82	1,008	17%
		IP	5,303	8,551	0.62	6,312	8,500	0.74	1,009	19%

Location	Location Description	Time Period	DM			DS			Flow Differences	
			Flow	Effective Capacity	V/C	Flow	Effective Capacity	V/C	Diff	Diff %
		PM	6,641	8,574	0.77	7,919	8,493	0.93	1,278	19%
	M2 J2 to M2 J1 (WB)	AM	5,571	9,115	0.61	7,252	9,180	0.79	1,681	30%
		IP	4,723	9,115	0.52	6,183	9,180	0.67	1,460	31%
		PM	5,303	9,115	0.58	6,161	9,180	0.67	858	16%
G	M20 J3 to M20 J4 (EB)	AM	6,466	9,115	0.71	6,016	9,115	0.66	-449	-7%
		IP	6,434	9,115	0.71	5,788	9,115	0.64	-646	-10%
		PM	8,276	9,115	0.91	7,880	9,115	0.86	-397	-5%
	M20 J4 to M20 J3 (WB)	AM	8,704	9,115	0.95	7,804	9,115	0.86	-900	-10%
		IP	6,240	9,115	0.68	5,124	9,115	0.56	-1,117	-18%
		PM	5,576	9,115	0.61	4,879	9,115	0.54	-697	-12%

DM Vs DS Journey Time Comparisons

7.5.9 The same link based and route based journey time comparisons introduced under Section 7.2 are repeated for this year scenario combination.

7.5.10 The link based corridors analysed are as previously shown diagrammatically in Figure 7.14.

7.5.11 The link based journey time comparisons for this scenario are presented in Table 7.72 to Table 7.74.

7.5.12 The route based movements analysed are as previously shown diagrammatically in Figure 7.15.

7.5.13 Table 7.75 to Table 7.80 provide the with and without scheme journey distances, times and average speeds for a selection of these movements for southbound and northbound movements.

Table 7.72 – Link Based Journey Time Scenario Comparison (2051 Core DM Vs DS) AM Peak

Road	Movement	From	To	Do-Minimum (CM6)			Do-Something (C8E)			Difference			Difference (%)		
				Distance (km)	Time (mins)	Av Speed (kph)	Distance (km)	Time (mins)	Av Speed (kph)	Distance (km)	Time (mins)	Av Speed (kph)	Distance (km)	Time (mins)	Av Speed (kph)
M25 clockwise	A to B	M25 J26	M25 J29	23.5	21.8	64.8	23.5	20.8	67.7	-0.0	-0.9	2.9	-0.1%	-4.4%	+4.4%
	B to D	M25 J29	M25 J2	18.9	20.2	56.0	18.9	15.2	74.3	-0.0	-5.0	18.3	-0.1%	-24.7%	+32.7%
	D to F	M25 J2	M25 J7	37.4	34.6	64.8	37.4	37.8	59.3	0.0	3.2	-5.5	+0.0%	+9.2%	-8.4%
M25 Anti-clockwise	F to D	M25 J7	M25 J2	37.8	30.7	73.9	37.8	30.9	73.4	0.0	0.2	-0.5	+0.0%	+0.7%	-0.7%
	D to B	M25 J2	M25 J29	18.6	27.6	40.5	18.4	21.5	51.5	-0.2	-6.1	11.0	-1.1%	-22.1%	+27.1%
	B to A	M25 J29	M25 J26	23.4	21.4	65.4	23.3	22.9	61.3	-0.0	1.4	-4.1	-0.1%	+6.6%	-6.3%
A13 EB	C to G	M25 J30	A1089	5.0	4.9	61.8	5.2	4.5	69.4	0.2	-0.4	7.6	+3.1%	-8.2%	+12.3%
	G to H	A1089	A130	15.7	12.6	74.6	15.7	14.2	66.5	-0.0	1.5	-8.1	-0.0%	+12.1%	-10.9%
A13 WB	H to G	A130	A1089	15.6	15.8	59.1	15.6	21.0	44.4	0.0	5.2	-14.6	+0.1%	+33.1%	-24.8%
	G to C	A1089	M25 J30	5.3	8.6	36.9	5.6	7.5	44.7	0.3	-1.1	7.7	+5.9%	-12.5%	+21.0%
A2/M2 EB	D to I	M25 J2	M2 J1	14.2	9.1	93.1	14.6	8.7	100.3	0.4	-0.4	7.2	+3.0%	-4.4%	+7.7%
	I to J	M2 J1	M2 J4	14.9	8.9	101.0	14.4	9.1	94.6	-0.5	0.3	-6.3	-3.3%	+3.2%	-6.3%
A2/M2 WB	J to I	M2 J4	M2 J1	15.0	9.3	96.9	15.0	10.1	89.4	0.0	0.8	-7.5	+0.0%	+8.4%	-7.8%
	I to D	M2 J1	M25 J2	14.7	22.4	39.4	14.8	15.2	58.4	0.1	-7.3	19.1	+0.4%	-32.4%	+48.5%
M20 EB	E to K	M25 J3	M20 J8	35.2	26.2	80.5	35.2	25.8	81.9	0.0	-0.5	1.5	+0.0%	-1.8%	+1.8%
M20 WB	K to E	M20 J8	M25 J3	35.4	26.3	80.9	35.4	24.2	87.7	0.0	-2.0	6.8	+0.0%	-7.7%	+8.4%

Table 7.73 – Link Based Journey Time Scenario Comparison (2051 Core DM Vs DS) Inter Peak

Road	Movement	From	To	Do-Minimum (CM6)			Do-Something (C8E)			Difference			Difference (%)		
				Distance (km)	Time (mins)	Av Speed (kph)	Distance (km)	Time (mins)	Av Speed (kph)	Distance (km)	Time (mins)	Av Speed (kph)	Distance (km)	Time (mins)	Av Speed (kph)
M25 clockwise	A to B	M25 J26	M25 J29	23.5	19.3	73.0	23.5	19.5	72.3	-0.0	0.2	-0.7	-0.1%	+0.9%	-1.0%
	B to D	M25 J29	M25 J2	18.9	15.7	72.0	18.9	12.7	89.2	-0.0	-3.0	17.2	-0.1%	-19.3%	+23.8%
	D to F	M25 J2	M25 J7	37.4	27.5	81.7	37.4	28.2	79.5	0.0	0.8	-2.2	+0.0%	+2.8%	-2.7%
M25 Anti-clockwise	F to D	M25 J7	M25 J2	37.8	31.2	72.8	37.8	32.0	71.0	0.0	0.8	-1.8	+0.0%	+2.6%	-2.5%
	D to B	M25 J2	M25 J29	18.6	25.2	44.4	18.4	15.9	69.8	-0.2	-9.3	25.4	-1.1%	-37.0%	+57.1%
	B to A	M25 J29	M25 J26	23.4	17.9	78.3	23.3	19.7	71.0	-0.0	1.8	-7.3	-0.1%	+10.1%	-9.3%
A13 EB	C to G	M25 J30	A1089	5.0	5.3	57.3	5.2	4.9	63.3	0.2	-0.4	6.0	+3.1%	-6.6%	+10.4%
	G to H	A1089	A130	15.7	11.3	83.8	15.7	12.4	76.1	-0.0	1.1	-7.7	-0.0%	+10.1%	-9.2%
A13 WB	H to G	A130	A1089	15.6	11.5	81.5	15.6	13.4	69.6	0.0	2.0	-11.9	+0.1%	+17.2%	-14.6%
	G to C	A1089	M25 J30	5.3	7.0	45.2	5.6	6.0	55.6	0.3	-1.0	10.3	+5.9%	-13.8%	+22.9%
A2/M2 EB	D to I	M25 J2	M2 J1	14.2	9.4	90.8	14.6	8.7	100.7	0.4	-0.7	9.9	+3.0%	-7.1%	+10.9%
	I to J	M2 J1	M2 J4	14.9	8.6	103.5	14.4	8.6	100.9	-0.5	-0.1	-2.6	-3.3%	-0.8%	-2.5%
A2/M2 WB	J to I	M2 J4	M2 J1	15.0	8.7	104.4	15.0	8.9	101.3	0.0	0.3	-3.1	+0.0%	+3.1%	-3.0%
	I to D	M2 J1	M25 J2	14.7	12.4	71.0	14.8	9.6	92.5	0.1	-2.9	21.5	+0.4%	-22.9%	+30.2%
M20 EB	E to K	M25 J3	M20 J8	35.2	25.5	82.7	35.2	24.7	85.4	0.0	-0.8	2.7	+0.0%	-3.2%	+3.3%
M20 WB	K to E	M20 J8	M25 J3	35.4	20.8	102.2	35.4	20.3	104.6	0.0	-0.5	2.4	+0.0%	-2.3%	+2.4%

Table 7.74 – Link Based Journey Time Scenario Comparison (2051 Core DM Vs DS) PM Peak

Road	Movement	From	To	Do-Minimum (CM6)			Do-Something (C8E)			Difference			Difference (%)		
				Distance (km)	Time (mins)	Av Speed (kph)	Distance (km)	Time (mins)	Av Speed (kph)	Distance (km)	Time (mins)	Av Speed (kph)	Distance (km)	Time (mins)	Av Speed (kph)
M25 clockwise	A to B	M25 J26	M25 J29	23.5	22.1	63.8	23.5	21.9	64.3	-0.0	-0.2	0.4	-0.1%	-0.8%	+0.7%
	B to D	M25 J29	M25 J2	18.9	18.4	61.5	18.9	13.2	85.5	-0.0	-5.2	24.0	-0.1%	-28.1%	+39.0%
	D to F	M25 J2	M25 J7	37.4	23.8	94.2	37.4	24.9	90.0	0.0	1.1	-4.2	+0.0%	+4.7%	-4.5%
M25 Anti-clockwise	F to D	M25 J7	M25 J2	37.8	32.6	69.6	37.8	33.4	68.1	0.0	0.7	-1.5	+0.0%	+2.2%	-2.2%
	D to B	M25 J2	M25 J29	18.6	29.0	38.6	18.4	16.8	66.1	-0.2	-12.2	27.5	-1.1%	-42.2%	+71.1%
	B to A	M25 J29	M25 J26	23.4	16.7	84.1	23.3	17.4	80.3	-0.0	0.8	-3.7	-0.1%	+4.6%	-4.5%
A13 EB	C to G	M25 J30	A1089	5.0	8.5	35.4	5.2	6.6	47.4	0.2	-2.0	12.0	+3.1%	-23.0%	+33.9%
	G to H	A1089	A130	15.7	12.3	76.6	15.7	15.1	62.5	-0.0	2.8	-14.2	-0.0%	+22.6%	-18.5%
A13 WB	H to G	A130	A1089	15.6	12.7	73.6	15.6	16.9	55.3	0.0	4.2	-18.2	+0.1%	+33.1%	-24.8%
	G to C	A1089	M25 J30	5.3	6.7	47.4	5.6	5.6	59.3	0.3	-1.0	12.0	+5.9%	-15.5%	+25.3%
A2/M2 EB	D to I	M25 J2	M2 J1	14.2	14.4	59.2	14.6	10.4	84.6	0.4	-4.0	25.4	+3.0%	-28.0%	+43.0%
	I to J	M2 J1	M2 J4	14.9	9.8	91.3	14.4	13.9	62.3	-0.5	4.1	-29.0	-3.3%	+41.7%	-31.8%
A2/M2 WB	J to I	M2 J4	M2 J1	15.0	8.9	101.3	15.0	9.2	98.5	0.0	0.3	-2.8	+0.0%	+2.8%	-2.7%
	I to D	M2 J1	M25 J2	14.7	15.1	58.7	14.8	11.3	78.3	0.1	-3.7	19.6	+0.4%	-24.8%	+33.5%
M20 EB	E to K	M25 J3	M20 J8	35.2	35.1	60.1	35.2	35.6	59.2	0.0	0.5	-0.8	+0.0%	+1.4%	-1.4%
M20 WB	K to E	M20 J8	M25 J3	35.4	20.7	102.8	35.4	20.3	104.6	0.0	-0.3	1.8	+0.0%	-1.7%	+1.7%

Table 7.75 – Route Based Journey Time Comparison North to South Movements (2051 Core DM Vs DS) AM Peak

Movement	From	To	DM			DS			Difference			Difference %age		
			Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)
1 to 5	Cheshunt	Bexley	62.3	72.1	51.8	62.4	70.2	53.3	0.1	-1.9	1.5	+0.2%	-2.7%	+2.9%
1 to 6	Cheshunt	Godstone	92.1	98.5	56.1	92.1	97.0	56.9	-0.0	-1.5	0.8	-0.0%	-1.5%	+1.5%
1 to 7	Cheshunt	Southfleet	61.2	66.9	54.9	61.2	62.8	58.4	-0.0	-4.0	3.5	-0.0%	-6.0%	+6.4%
1 to 8	Cheshunt	Maidstone	88.5	85.8	61.9	88.5	81.2	65.4	-0.0	-4.6	3.5	-0.0%	-5.4%	+5.7%
1 to 9	Cheshunt	Rochester	77.0	90.5	51.0	71.3	80.5	53.1	-5.7	-10.0	2.1	-7.4%	-11.0%	+4.1%
1 to 10	Cheshunt	Rainham	92.8	92.4	60.3	88.2	82.0	64.5	-4.7	-10.4	4.3	-5.0%	-11.3%	+7.1%
2 to 5	Romford	Bexley	32.1	55.7	34.6	32.0	53.2	36.2	-0.1	-2.6	1.6	-0.3%	-4.6%	+4.5%
2 to 6	Romford	Godstone	62.0	82.1	45.3	61.7	80.0	46.3	-0.2	-2.1	1.0	-0.4%	-2.6%	+2.3%
2 to 7	Romford	Southfleet	31.0	50.5	36.9	30.8	45.8	40.4	-0.2	-4.7	3.5	-0.8%	-9.3%	+9.4%
2 to 8	Romford	Maidstone	58.4	69.4	50.5	58.2	64.1	54.4	-0.2	-5.3	3.9	-0.4%	-7.6%	+7.8%
2 to 9	Romford	Rochester	45.9	74.3	37.0	46.9	64.2	43.8	1.0	-10.1	6.8	+2.2%	-13.6%	+18.3%
2 to 10	Romford	Rainham	62.7	76.0	49.5	63.8	65.6	58.3	1.1	-10.3	8.8	+1.7%	-13.6%	+17.8%
3 to 5	Brentwood	Bexley	33.4	44.7	44.8	33.5	43.3	46.4	0.1	-1.4	1.6	+0.4%	-3.1%	+3.6%
3 to 6	Brentwood	Godstone	63.2	71.1	53.4	63.2	70.1	54.1	-0.0	-0.9	0.7	-0.0%	-1.3%	+1.3%
3 to 7	Brentwood	Southfleet	32.3	39.4	49.1	32.2	35.9	53.8	-0.0	-3.5	4.7	-0.0%	-8.8%	+9.7%
3 to 8	Brentwood	Maidstone	59.6	58.4	61.3	59.6	54.3	65.9	0.0	-4.1	4.6	+0.0%	-7.0%	+7.5%
3 to 9	Brentwood	Rochester	48.1	63.1	45.7	42.4	53.6	47.4	-5.7	-9.5	1.7	-11.8%	-15.0%	+3.7%
3 to 10	Brentwood	Rainham	63.9	65.0	59.0	59.3	55.1	64.5	-4.6	-9.9	5.5	-7.3%	-15.2%	+9.4%
4 to 5	Basildon	Bexley	39.2	54.9	42.8	39.3	50.0	47.2	0.1	-5.0	4.4	+0.3%	-9.0%	+10.3%
4 to 6	Basildon	Godstone	69.0	81.3	50.9	69.0	76.8	53.9	-0.0	-4.5	3.0	-0.0%	-5.6%	+5.9%
4 to 7	Basildon	Southfleet	38.1	49.7	46.0	34.2	34.2	60.1	-3.8	-15.5	14.2	-10.0%	-31.2%	+30.8%
4 to 8	Basildon	Maidstone	65.4	68.6	57.2	48.6	57.5	50.7	-16.9	-11.1	-6.5	-25.8%	-16.2%	-11.4%
4 to 9	Basildon	Rochester	53.9	73.3	44.1	36.5	52.0	42.1	-17.4	-21.3	-2.0	-32.3%	-29.1%	-4.5%
4 to 10	Basildon	Rainham	69.7	75.2	55.6	53.4	53.4	59.9	-16.3	-21.8	4.3	-23.4%	-28.9%	+7.7%

Table 7.76 – Route Based Journey Time Comparison North to South Movements (2051 Core DM Vs DS) Inter Peak

Movement	From	To	DM			DS			Difference			Difference %age		
			Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)
1 to 5	Cheshunt	Bexley	61.8	56.9	65.2	61.8	55.6	66.6	-0.1	-1.2	1.4	-0.1%	-2.2%	+2.2%
1 to 6	Cheshunt	Godstone	91.4	77.6	70.6	91.3	76.6	71.5	-0.1	-1.0	0.9	-0.1%	-1.3%	+1.3%
1 to 7	Cheshunt	Southfleet	60.7	55.1	66.1	60.8	53.6	68.0	0.0	-1.5	1.9	+0.1%	-2.7%	+2.8%
1 to 8	Cheshunt	Maidstone	88.1	71.8	73.6	82.6	70.1	70.7	-5.5	-1.8	-2.9	-6.2%	-2.5%	-3.9%
1 to 9	Cheshunt	Rochester	80.9	72.6	66.9	76.3	66.0	69.4	-4.6	-6.5	2.4	-5.7%	-9.0%	+3.7%
1 to 10	Cheshunt	Rainham	91.5	78.4	70.0	86.8	71.3	73.0	-4.7	-7.1	3.0	-5.1%	-9.1%	+4.4%
2 to 5	Romford	Bexley	37.9	44.7	50.8	35.4	41.9	50.7	-2.4	-2.8	-0.1	-6.5%	-6.4%	-0.1%
2 to 6	Romford	Godstone	67.4	65.5	61.7	65.0	62.9	62.0	-2.4	-2.6	0.2	-3.6%	-4.0%	+0.4%
2 to 7	Romford	Southfleet	36.8	43.0	51.3	34.4	39.9	51.8	-2.4	-3.1	0.4	-6.4%	-7.2%	+0.8%
2 to 8	Romford	Maidstone	64.1	59.7	64.5	56.1	56.4	59.7	-8.0	-3.3	-4.7	-12.5%	-5.6%	-7.3%
2 to 9	Romford	Rochester	57.0	60.4	56.6	50.0	52.3	57.4	-7.0	-8.1	0.8	-12.3%	-13.5%	+1.4%
2 to 10	Romford	Rainham	67.5	66.3	61.1	60.5	57.6	63.0	-7.1	-8.7	1.9	-10.5%	-13.1%	+3.1%
3 to 5	Brentwood	Bexley	33.2	34.5	57.7	32.5	31.9	61.1	-0.7	-2.6	3.4	-2.2%	-7.6%	+5.8%
3 to 6	Brentwood	Godstone	62.7	55.3	68.1	62.0	52.9	70.4	-0.7	-2.4	2.3	-1.2%	-4.3%	+3.3%
3 to 7	Brentwood	Southfleet	32.1	32.7	58.9	31.5	29.9	63.2	-0.6	-2.9	4.4	-2.0%	-8.7%	+7.4%
3 to 8	Brentwood	Maidstone	59.5	49.4	72.2	53.2	46.3	68.8	-6.3	-3.1	-3.3	-10.6%	-6.3%	-4.6%
3 to 9	Brentwood	Rochester	52.3	50.2	62.6	47.1	42.3	66.8	-5.3	-7.9	4.2	-10.1%	-15.8%	+6.7%
3 to 10	Brentwood	Rainham	62.9	56.0	67.3	57.5	47.6	72.6	-5.4	-8.5	5.3	-8.5%	-15.1%	+7.8%
4 to 5	Basildon	Bexley	39.6	39.6	60.0	39.6	35.8	66.4	-0.0	-3.9	6.4	-0.1%	-9.7%	+10.7%
4 to 6	Basildon	Godstone	69.2	60.4	68.7	69.1	56.8	73.1	-0.0	-3.6	4.4	-0.0%	-6.0%	+6.4%
4 to 7	Basildon	Southfleet	38.5	37.9	61.0	33.4	28.1	71.3	-5.1	-9.8	10.2	-13.3%	-25.8%	+16.8%
4 to 8	Basildon	Maidstone	65.9	54.6	72.4	47.3	44.4	63.9	-18.6	-10.2	-8.6	-28.2%	-18.6%	-11.8%
4 to 9	Basildon	Rochester	58.8	55.3	63.7	41.2	40.4	61.2	-17.6	-15.0	-2.5	-29.9%	-27.1%	-3.9%
4 to 10	Basildon	Rainham	69.3	61.2	68.0	51.7	45.6	67.9	-17.6	-15.6	-0.0	-25.5%	-25.4%	-0.1%

Table 7.77 – Route Based Journey Time Comparison North to South Movements (2051 Core DM Vs DS) PM Peak

Movement	From	To	DM			DS			Difference			Difference %age		
			Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)
1 to 5	Cheshunt	Bexley	62.1	69.1	53.9	62.3	66.5	56.2	0.1	-2.7	2.3	+0.2%	-3.9%	+4.3%
1 to 6	Cheshunt	Godstone	91.9	86.1	64.1	92.1	83.3	66.3	0.2	-2.8	2.3	+0.2%	-3.2%	+3.6%
1 to 7	Cheshunt	Southfleet	61.0	66.0	55.4	61.1	62.3	58.9	0.2	-3.7	3.5	+0.3%	-5.6%	+6.3%
1 to 8	Cheshunt	Maidstone	88.3	88.1	60.2	82.9	82.5	60.3	-5.4	-5.6	0.1	-6.1%	-6.3%	+0.2%
1 to 9	Cheshunt	Rochester	77.2	94.3	49.1	71.5	84.1	51.0	-5.6	-10.2	2.0	-7.3%	-10.8%	+4.0%
1 to 10	Cheshunt	Rainham	92.6	104.8	53.0	88.2	94.8	55.8	-4.4	-9.9	2.7	-4.8%	-9.5%	+5.2%
2 to 5	Romford	Bexley	38.0	53.7	42.4	35.6	50.1	42.6	-2.4	-3.6	0.2	-6.3%	-6.7%	+0.5%
2 to 6	Romford	Godstone	67.7	70.7	57.5	65.4	67.2	58.4	-2.3	-3.5	0.9	-3.4%	-4.9%	+1.6%
2 to 7	Romford	Southfleet	36.8	50.6	43.6	34.5	46.2	44.7	-2.3	-4.4	1.2	-6.3%	-8.7%	+2.7%
2 to 8	Romford	Maidstone	64.1	72.7	52.9	56.2	66.4	50.8	-7.9	-6.3	-2.1	-12.3%	-8.6%	-4.0%
2 to 9	Romford	Rochester	53.0	78.9	40.3	44.9	68.0	39.6	-8.1	-10.9	-0.7	-15.3%	-13.8%	-1.7%
2 to 10	Romford	Rainham	68.3	89.8	45.7	61.5	78.8	46.8	-6.9	-11.0	1.1	-10.1%	-12.2%	+2.5%
3 to 5	Brentwood	Bexley	33.5	46.5	43.2	33.4	42.6	47.0	-0.1	-3.9	3.9	-0.2%	-8.4%	+8.9%
3 to 6	Brentwood	Godstone	63.2	63.5	59.7	63.2	59.7	63.5	-0.0	-3.8	3.8	-0.0%	-5.9%	+6.3%
3 to 7	Brentwood	Southfleet	32.3	43.5	44.5	32.2	38.8	49.9	-0.0	-4.7	5.4	-0.0%	-10.8%	+12.0%
3 to 8	Brentwood	Maidstone	59.6	65.5	54.6	54.0	59.0	55.0	-5.6	-6.5	0.4	-9.4%	-10.0%	+0.7%
3 to 9	Brentwood	Rochester	52.5	70.8	44.5	42.2	60.6	41.8	-10.2	-10.3	-2.6	-19.5%	-14.5%	-5.9%
3 to 10	Brentwood	Rainham	63.8	82.6	46.4	59.2	71.4	49.8	-4.6	-11.2	3.4	-7.2%	-13.6%	+7.4%
4 to 5	Basildon	Bexley	36.7	51.3	42.9	36.6	47.5	46.2	-0.0	-3.8	3.3	-0.1%	-7.4%	+7.8%
4 to 6	Basildon	Godstone	66.5	68.2	58.4	66.5	64.3	62.0	0.0	-3.9	3.5	+0.0%	-5.7%	+6.1%
4 to 7	Basildon	Southfleet	35.5	48.2	44.2	33.4	35.1	57.0	-2.1	-13.1	12.8	-5.9%	-27.1%	+29.0%
4 to 8	Basildon	Maidstone	62.9	70.3	53.7	47.3	55.4	51.2	-15.6	-14.9	-2.5	-24.8%	-21.2%	-4.6%
4 to 9	Basildon	Rochester	51.7	76.5	40.6	35.9	57.0	37.8	-15.8	-19.5	-2.7	-30.6%	-25.5%	-6.8%
4 to 10	Basildon	Rainham	67.1	87.3	46.1	52.5	67.9	46.4	-14.6	-19.5	0.3	-21.7%	-22.3%	+0.7%

Table 7.78 – Route Based Journey Time Comparison South to North Movements (2051 Core DM Vs DS) AM Peak

Movement	From	To	DM			DS			Difference			Difference %age		
			Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)
5 to 1	Bexley	Cheshunt	61.5	65.9	56.0	61.6	62.2	59.4	0.0	-3.7	3.4	+0.0%	-5.7%	+6.0%
5 to 2	Bexley	Romford	33.3	49.0	40.8	33.4	42.2	47.5	0.1	-6.8	6.7	+0.2%	-13.9%	+16.3%
5 to 3	Bexley	Brentwood	34.4	49.3	41.9	34.3	41.7	49.3	-0.1	-7.6	7.4	-0.3%	-15.4%	+17.7%
5 to 4	Bexley	Basildon	36.4	47.5	46.0	36.5	39.4	55.5	0.1	-8.1	9.5	+0.2%	-17.0%	+20.7%
6 to 1	Godstone	Cheshunt	91.2	89.0	61.5	91.2	85.9	63.7	-0.1	-3.1	2.2	-0.1%	-3.5%	+3.6%
6 to 2	Godstone	Romford	63.0	72.1	52.4	63.0	65.9	57.4	-0.0	-6.2	4.9	-0.0%	-8.6%	+9.4%
6 to 3	Godstone	Brentwood	64.1	72.3	53.1	63.9	65.4	58.6	-0.2	-7.0	5.5	-0.3%	-9.6%	+10.3%
6 to 4	Godstone	Basildon	66.1	70.6	56.2	66.1	63.1	62.8	-0.0	-7.5	6.7	-0.0%	-10.6%	+11.8%
7 to 1	Southfleet	Cheshunt	61.1	68.1	53.8	60.6	60.5	60.1	-0.5	-7.7	6.3	-0.8%	-11.2%	+11.8%
7 to 2	Southfleet	Romford	32.9	51.2	38.5	32.5	40.5	48.1	-0.4	-10.7	9.5	-1.3%	-20.9%	+24.8%
7 to 3	Southfleet	Brentwood	33.9	51.5	39.6	33.3	40.0	50.0	-0.6	-11.5	10.4	-1.8%	-22.3%	+26.3%
7 to 4	Southfleet	Basildon	36.0	49.7	43.4	35.5	30.8	69.2	-0.5	-19.0	25.8	-1.4%	-38.1%	+59.3%
8 to 1	Maidstone	Cheshunt	88.1	94.0	56.3	88.1	87.5	60.4	-0.1	-6.4	4.1	-0.1%	-6.8%	+7.3%
8 to 2	Maidstone	Romford	59.9	77.1	46.7	59.9	67.6	53.2	0.0	-9.5	6.6	+0.0%	-12.3%	+14.0%
8 to 3	Maidstone	Brentwood	61.0	77.3	47.3	56.9	68.8	49.7	-4.0	-8.5	2.3	-6.6%	-11.0%	+5.0%
8 to 4	Maidstone	Basildon	63.0	75.6	50.0	50.7	58.9	51.6	-12.3	-16.7	1.6	-19.6%	-22.0%	+3.1%
9 to 1	Rochester	Cheshunt	76.8	100.3	45.9	71.4	80.6	53.2	-5.4	-19.7	7.2	-7.0%	-19.7%	+15.7%
9 to 2	Rochester	Romford	48.6	83.4	35.0	44.3	62.3	42.7	-4.3	-21.1	7.7	-8.9%	-25.3%	+22.0%
9 to 3	Rochester	Brentwood	49.6	83.6	35.6	42.7	59.9	42.7	-7.0	-23.7	7.1	-14.0%	-28.3%	+19.9%
9 to 4	Rochester	Basildon	51.7	81.9	37.8	38.2	49.7	46.1	-13.5	-32.2	8.3	-26.1%	-39.3%	+21.9%
10 to 1	Rainham	Cheshunt	92.6	109.1	50.9	88.5	88.8	59.8	-4.0	-20.2	8.9	-4.4%	-18.5%	+17.4%
10 to 2	Rainham	Romford	64.4	92.2	41.9	61.4	70.5	52.2	-3.0	-21.6	10.3	-4.6%	-23.5%	+24.6%
10 to 3	Rainham	Brentwood	65.4	92.4	42.5	59.9	68.2	52.7	-5.5	-24.2	10.2	-8.5%	-26.2%	+24.0%
10 to 4	Rainham	Basildon	67.5	90.7	44.6	55.3	57.9	57.3	-12.1	-32.7	12.7	-18.0%	-36.1%	+28.4%

Table 7.79 – Route Based Journey Time Comparison South to North Movements (2051 Core DM Vs DS) Inter Peak

Movement	From	To	DM			DS			Difference			Difference %age		
			Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)
5 to 1	Bexley	Cheshunt	61.5	61.2	60.3	61.5	57.8	63.9	0.0	-3.4	3.5	+0.0%	-5.5%	+5.9%
5 to 2	Bexley	Romford	35.6	45.9	46.6	34.8	40.2	52.0	-0.8	-5.7	5.4	-2.3%	-12.5%	+11.6%
5 to 3	Bexley	Brentwood	34.2	42.5	48.3	34.1	35.8	57.1	-0.1	-6.7	8.8	-0.3%	-15.7%	+18.3%
5 to 4	Bexley	Basildon	36.4	45.1	48.4	36.5	38.2	57.3	0.1	-6.9	8.9	+0.2%	-15.3%	+18.3%
6 to 1	Godstone	Cheshunt	91.5	84.4	65.1	91.3	83.1	65.9	-0.2	-1.3	0.9	-0.2%	-1.5%	+1.3%
6 to 2	Godstone	Romford	65.6	69.1	56.9	64.7	63.2	61.4	-0.9	-5.9	4.5	-1.3%	-8.6%	+7.9%
6 to 3	Godstone	Brentwood	64.2	65.7	58.6	64.0	58.8	65.2	-0.2	-6.9	6.7	-0.3%	-10.5%	+11.4%
6 to 4	Godstone	Basildon	66.4	68.3	58.3	66.4	61.2	65.0	-0.0	-7.1	6.8	-0.0%	-10.4%	+11.7%
7 to 1	Southfleet	Cheshunt	60.7	60.2	60.4	60.5	57.2	63.5	-0.2	-3.1	3.0	-0.3%	-5.1%	+5.0%
7 to 2	Southfleet	Romford	34.7	45.0	46.3	33.9	37.3	54.5	-0.9	-7.7	8.2	-2.5%	-17.2%	+17.6%
7 to 3	Southfleet	Brentwood	33.3	41.6	48.1	33.2	32.9	60.4	-0.2	-8.7	12.3	-0.5%	-20.8%	+25.6%
7 to 4	Southfleet	Basildon	35.5	44.2	48.2	35.5	28.6	74.4	-0.1	-15.6	26.2	-0.2%	-35.3%	+54.4%
8 to 1	Maidstone	Cheshunt	88.1	87.2	60.6	83.9	80.4	62.6	-4.2	-6.7	2.0	-4.7%	-7.7%	+3.3%
8 to 2	Maidstone	Romford	62.2	71.9	51.9	57.2	62.6	54.8	-5.0	-9.3	2.9	-8.1%	-12.9%	+5.5%
8 to 3	Maidstone	Brentwood	60.8	68.5	53.2	55.1	57.0	58.0	-5.7	-11.6	4.8	-9.4%	-16.9%	+9.0%
8 to 4	Maidstone	Basildon	63.0	71.1	53.2	50.8	52.3	58.3	-12.3	-18.8	5.1	-19.4%	-26.5%	+9.6%
9 to 1	Rochester	Cheshunt	77.0	84.2	54.9	72.9	71.1	61.6	-4.0	-13.1	6.7	-5.2%	-15.6%	+12.3%
9 to 2	Rochester	Romford	51.1	68.9	44.5	46.2	53.3	52.1	-4.9	-15.6	7.6	-9.5%	-22.7%	+17.0%
9 to 3	Rochester	Brentwood	49.7	65.5	45.5	44.1	47.6	55.6	-5.6	-17.9	10.1	-11.3%	-27.4%	+22.2%
9 to 4	Rochester	Basildon	51.9	68.1	45.7	39.8	42.9	55.6	-12.1	-25.2	9.9	-23.3%	-37.0%	+21.7%
10 to 1	Rainham	Cheshunt	91.6	86.6	63.5	87.6	73.1	71.9	-4.0	-13.5	8.4	-4.4%	-15.6%	+13.3%
10 to 2	Rainham	Romford	65.8	71.3	55.3	60.9	55.3	66.1	-4.9	-16.0	10.7	-7.4%	-22.4%	+19.4%
10 to 3	Rainham	Brentwood	64.4	67.9	56.9	58.8	49.6	71.1	-5.6	-18.3	14.2	-8.7%	-26.9%	+25.0%
10 to 4	Rainham	Basildon	66.6	70.5	56.6	54.5	45.0	72.7	-12.1	-25.6	16.1	-18.2%	-36.3%	+28.4%

Table 7.80 – Route Based Journey Time Comparison South to North Movements (2051 Core DM Vs DS) PM Peak

Movement	From	To	DM			DS			Difference			Difference %age		
			Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)	Distance (km)	Journey Time (mins)	Average Speed (km/h)
5 to 1	Bexley	Cheshunt	61.5	63.1	58.4	61.5	59.9	61.5	-0.0	-3.2	3.1	-0.1%	-5.0%	+5.2%
5 to 2	Bexley	Romford	31.9	50.7	37.7	31.8	45.3	42.2	-0.1	-5.5	4.5	-0.2%	-10.8%	+11.9%
5 to 3	Bexley	Brentwood	32.4	51.4	37.9	34.3	41.6	49.4	1.8	-9.8	11.5	+5.6%	-19.0%	+30.5%
5 to 4	Bexley	Basildon	36.5	53.9	40.6	36.5	47.2	46.3	-0.0	-6.6	5.7	-0.0%	-12.3%	+14.0%
6 to 1	Godstone	Cheshunt	91.2	85.9	63.7	91.2	83.2	65.7	-0.0	-2.7	2.0	-0.1%	-3.1%	+3.1%
6 to 2	Godstone	Romford	62.8	73.2	51.4	61.4	68.6	53.8	-1.3	-4.7	2.3	-2.1%	-6.4%	+4.5%
6 to 3	Godstone	Brentwood	62.0	74.2	50.2	63.9	64.9	59.0	1.8	-9.2	8.8	+2.9%	-12.5%	+17.6%
6 to 4	Godstone	Basildon	66.1	76.6	51.7	66.1	70.5	56.2	-0.0	-6.1	4.5	-0.0%	-8.0%	+8.6%
7 to 1	Southfleet	Cheshunt	60.7	59.9	60.8	60.6	55.5	65.5	-0.0	-4.3	4.7	-0.1%	-7.3%	+7.8%
7 to 2	Southfleet	Romford	31.0	47.5	39.1	30.9	40.9	45.4	-0.1	-6.6	6.3	-0.2%	-14.0%	+16.0%
7 to 3	Southfleet	Brentwood	31.5	48.2	39.3	33.3	37.2	53.7	1.8	-10.9	14.5	+5.8%	-22.7%	+36.9%
7 to 4	Southfleet	Basildon	35.5	50.6	42.1	36.0	34.0	63.7	0.5	-16.7	21.5	+1.4%	-32.9%	+51.1%
8 to 1	Maidstone	Cheshunt	88.1	82.0	64.5	88.1	77.7	68.0	-0.0	-4.3	3.5	-0.1%	-5.2%	+5.5%
8 to 2	Maidstone	Romford	58.5	69.6	50.4	58.4	63.1	55.5	-0.1	-6.6	5.2	-0.2%	-9.4%	+10.2%
8 to 3	Maidstone	Brentwood	59.0	70.3	50.3	60.8	59.4	61.4	1.8	-10.9	11.1	+3.1%	-15.5%	+22.0%
8 to 4	Maidstone	Basildon	63.0	72.8	52.0	51.9	60.7	51.3	-11.1	-12.0	-0.7	-17.6%	-16.6%	-1.3%
9 to 1	Rochester	Cheshunt	75.4	95.5	47.4	71.3	79.8	53.6	-4.1	-15.7	6.2	-5.4%	-16.4%	+13.2%
9 to 2	Rochester	Romford	45.8	83.1	33.1	45.6	65.2	42.0	-0.2	-17.9	8.9	-0.4%	-21.6%	+27.0%
9 to 3	Rochester	Brentwood	46.3	83.7	33.2	42.7	59.5	43.0	-3.6	-24.2	9.8	-7.9%	-28.9%	+29.7%
9 to 4	Rochester	Basildon	50.4	86.2	35.0	38.2	57.0	40.2	-12.1	-29.2	5.2	-24.1%	-33.9%	+14.8%
10 to 1	Rainham	Cheshunt	92.6	90.4	61.4	88.5	75.0	70.8	-4.0	-15.4	9.4	-4.3%	-17.0%	+15.2%
10 to 2	Rainham	Romford	64.1	77.8	49.4	62.2	60.5	61.7	-1.9	-17.3	12.3	-2.9%	-22.2%	+24.8%
10 to 3	Rainham	Brentwood	63.4	78.7	48.3	59.8	54.8	65.5	-3.6	-23.9	17.2	-5.6%	-30.4%	+35.6%
10 to 4	Rainham	Basildon	67.4	81.2	49.9	55.3	52.3	63.5	-12.1	-28.9	13.7	-17.9%	-35.6%	+27.4%

Commentary on the Results

7.5.14 Table 7.61 to Table 7.66 demonstrate that the highway assignment models for each time period in the Do Minimum and Do Something scenarios have converged to well within the WebTAG recommended convergence limits. This does not necessarily mean that they have converged to a tight enough level for use in the economic assessment of the scheme. Additional analysis is recommended during the economic assessment of the scheme to identify whether there are any convergence issues associated with these models.

7.5.15 The select link analysis presented in Figure 7.40 to Figure 7.48 and associated Table 7.67 to Table 7.69 shows that the introduction of LTC has a significant impact on the patterns of movement using the Dartford Crossing. In particular there is a substantial reduction in traffic to/from east Kent using the Dartford Crossing. As would be expected, in the Do Something situation the majority of this traffic uses LTC. There is also a substantial reduction north of the river in trips to/from M25 north.

7.5.16 There is a slight increase in the number of trips using Dartford from within London both north and south of the River. This is likely due to some route switching of travellers using Silvertown/Blackwall in the Do Minimum to using Dartford in the Do Something due to the newly available capacity. This will also be caused by an increase in shorter distance trips switching destinations to cross the river in the Do Something scenario. These movements are suppressed in the Do Minimum scenario due to the lack of available capacity at Dartford.

7.5.17 Movements using LTC are predominantly from/to east Kent from/to M25 north and A13 east of the LTC junction. In the south there is some local traffic (approximately 900-1150 pcu/hr in the peak hours) and relatively few trips to/from Kent west of the LTC junction using LTC (approximately 900 pcu/hr in the peak hours) and zero trips from M25 south of the A2 junction using LTC. These movements will continue to use Dartford Crossing as to use LTC is a considerable detour. In the north there is a small amount of traffic to/from A1089 using LTC (up to 900 pcu/hr in the peak hours). These results are consistent across all time periods and accord well with a priori expectations.

7.5.18 Comparing flows in the Do Minimum and Do Something scenarios presented in Figure 7.49 to Figure 7.51 and in Table 7.70 and Table 7.71 show a substantial reduction in flow at the Dartford Crossing in some peak hours. Flows across Dartford reduce in all time periods, but this reduction is quite low in the AM southbound (3%). In other time periods the flows reduce by between 13-25%). This is as expected and is one of the primary objectives of the LTC scheme. In particular there is a substantial reduction in HGV's using the Dartford Crossing in the Do Something compared to the Do Minimum. This is due to the alignment of LTC making it a very favourable route for HGV's accessing the ports in Kent and Essex.

7.5.19 There are associated reductions along the A2 and A13 west of their LTC junctions and also on the M20. These reductions in flow lead to reductions in congestion along these corridors. This is seen as being one of the major benefits of the LTC scheme and is where a significant proportion of the economic benefits of the scheme would be derived from.

7.5.20 There are also some increases in flow in the Do Something compared to the Do Minimum on the A2/M2 corridor east of LTC and A13 east of LTC and on M25 north of LTC. This is caused by LTC drawing more traffic to cross the river than in the constrained Do Minimum scenario. This increase in flow leads to additional congestion in these corridors and will likely lead to disbenefits of introducing the LTC scheme. Some of these increases in flow cause a critical level of congestion in these corridors. In particular M25 J28-29 and A13 Orsett Cock to Manor Way are significantly worse in the Do Something scenario when compared with the Do Minimum scenario.

7.5.21 These benefits and disbenefits are further illustrated by the link based journey time analysis presented in Table 7.72 to Table 7.74. We can observe substantial increases in speed in the Dartford Crossing corridor between M25 J29 and M25 J2 in both directions (up to a 28 km/h increase in the PM peak in the northbound direction). There are also significant journey time savings on the A2 between the LTC junction and the M25 and on the A13 between the LTC junction and the M25. There are also some predicted reductions in speed on the A2 and A13 east of their LTC junctions and on the wider M25 both north and south of the river. This is in line with the increases in flows predicted in those corridors. This pattern is relatively consistent across all time periods.

7.5.22 There is additional detailed link based journey time analysis presented in Appendix C.

7.5.23 The route based journey times presented in Table 7.75 to Table 7.80 show cross river movements. As expected, all cross river movements experience improved journey times in the Do Something scenario when compared to the Do Minimum. Some cross river movements also benefit substantially from a reduced journey distance. Using LTC rather than Dartford provides a significant distance saving for movements to/from east Kent to/from east Essex.

7.5.24 It is for this reason that it is considered necessary to undertake a full 24 hour per day, 365 days per year economic assessment of LTC. Some movements will benefit significantly from the introduction of LTC even during the night when flow is predicted to be low. It is important that the associated benefits, and disbenefits, of this are captured in the economic analysis.

7.5.25 Most movements also experience an increase in average speed in the Do Something. Some movements don’t however, primarily due to using different parts of the network with different speed limits and links with higher congestion in the Do Something as described above. Overall though the balance is generally very positive.

7.6 LTAM Low and High Growth Scenarios

7.6.1 The WebTAG high and low growth increment is defined according to WebTAG guidance (Unit M4 Section 4.2). This involves adding/subtracting a proportion of the base year traffic to/from the demand from the core scenario. An important distinction is that the core scenario demand is taken from a fully converged VDM run of the core scenario. It is not the reference demand. This is as per current WebTAG guidance.

7.6.2 For highway trips the formula applied is as follows:

$$2.5\% \times \sqrt{(Forecast\ Year - Base\ Year)}$$

7.6.3 For rail trips the formula applied is as follows:

$$2.0\% \times \sqrt{(Forecast\ Year - Base\ Year)}$$

7.6.4 After these increments have been applied for both low and high the resultant matrices are then reassigned to the respective networks and the outputs extracted to inform the economic and operational assessments. The low and high growth outputs for economic assessment are provided in Appendix D. Comparisons of forecast flows between the core, low and high growth scenarios are presented in Appendix E.

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8 Assignment Results for Environmental Assessment

8.1 Introduction

8.1.1 Outputs from LTAM are used to support the environmental assessment of the scheme. This section of the report provides summary information on those forecasts provided. Current guidance requires that this is provided for the core scenario only, for all forecast years.

8.1.2 Data provided to the environmental teams covers the model periods but is also aggregated to form Annual Average Daily Traffic (AADT) and Annual Average Weekday Traffic (AAWT). It is therefore necessary to initially present the methodologies used in undertaking these aggregations.

8.2 AADT and AAWT Calculation Methodology

8.2.1 The LTAM models represent neutral weekday conditions within three distinct peak hours as defined below:

- AM Peak = 07.00 to 08.00;
- Inter Peak = 09.00 to 15.00 (Average Hour); and
- PM Peak = 17.00 to 18.00.

8.2.2 In order to support environmental assessment activities data from these model time periods needs to be factored to represent broader time periods. These requirements were discussed and agreed with the environmental consultants at a collaborative planning workshop at an early stage of the work. It was agreed that some of the standard environmental time periods would be shifted so as to better match the LTAM model hours and periods as defined under Chapter 2 above. The time periods required in order to support environmental assessment activities are provided in Table 8.1.

Table 8.1 – Environmental Assessment Time Period Definitions

Time Period Name	Description	Hours Included
AADT24	24hr Annual Average All Days	00.00 – 24.00
AADTAM	AM Peak Annual Average All Days	06.00 – 09.00
AADTIP	Inter Peak Annual Average All Days	09.00 – 15.00
AADTPM	PM Peak Annual Average All Days	15.00 – 18.00
AADTOP	Off Peak Annual Average All Days	18.00 – 06.00
AAWT24	24hr Annual Average Weekdays	00.00 – 24.00
AAWTAM	AM Peak Annual Average Weekdays	06.00 – 09.00
AAWTIP	Inter Peak Annual Average Weekdays	09.00 – 15.00
AAWTPM	PM Peak Annual Average Weekdays	15.00 – 18.00
AAWTOP	Off Peak Annual Average Weekdays	18.00 – 06.00
AAWT18	18hr Annual Average Weekdays	06.00 – 24.00
AAWTNighttime	Nighttime Annual Average Weekdays	23.00 – 07.00

8.2.3 In order to derive the factors to enable the transposition, a series of annual traffic counts were required. As discussed under Chapter 2, previous work had been undertaken to identify LTC's potential area of impact. This led to the development of the Fully Modelled Area as shown in Figure 2.3.

8.2.4 A range of traffic count data sources were reviewed. Highways England traffic flow data presented in the TRIS database was identified as the primary data source for generating the factors as this is a continuous dataset where data is collected 365 days of the year. Additional data sources were not included because they did not provide 24 hour counts for a full year.

8.2.5 TRIS data within the LTAM Fully Modelled Area (FMA) was processed to ensure that the count sites used provided high quality data. Two layers of data processing were performed:

- Data quality index score – a quality index (QI) score is provided with TRIS data. A score of 15 indicates that 15 valid one-minute counting records were used to generate a 15 minute interval flow. Only sites where over 95% of data records for the year have a QI score of 15 were used, and sites with less than 70% of data records with QI scores of 15 in any particular month were excluded; and
- Spatial and Road Type analysis – the data sites used were mapped in GIS software to show their spatial dispersion. Trip flow data and the spatial analysis were reviewed in conjunction to ensure that the resultant annualisation factors are not influenced by site clustering. This analysis suggested that spatial disaggregation of factors or calculating factors by different road types did not significantly impact the factors and that single factors across the area and across road types were appropriate.

8.2.6 Applying these criteria results in 440 TRIS count sites being used for annualisation factor calculation. A map showing the spatial locations of these sites is provided in Figure 8.1.

Figure 8.1 – TRIS Sites Used in Environmental Factor Calculations

8.2.7 The equations used to generate the time period flow values are presented in Table 8.2. The factors derived from analysis of this data are provided in Table 8.3. These have been disaggregated by vehicle type.

Table 8.2 – Environmental Assessment Time Period Equations

Time Period	Equation
AADT24	((LTAM AM x AADTAMFac) + (LTAM IP x AADTIPFac) + (LTAM PM x AADTPMFac)) x AADT24Fac
AADTAM	LTAM AM x AADTAMFac
AADTIP	LTAM IP x AADTIPFac
AADTPM	LTAM PM x AADTPMFac
AADTOP	((LTAM AM x AADTAMFac) + (LTAM IP x AADTIPFac) + (LTAM PM x AADTPMFac)) x AADTOPFac
AAWT24	((LTAM AM x AAWTAMFac) + (LTAM IP x AAWTIPFac) + (LTAM PM x AAWTPMFac)) x AAWT24Fac
AAWTAM	LTAM AM x AAWTAMFac
AAWTIP	LTAM IP x AAWTIPFac
AAWTPM	LTAM PM x AAWTPMFac
AAWTOP	((LTAM AM x AAWTAMFac) + (LTAM IP x AAWTIPFac) + (LTAM PM x AAWTPMFac)) x AAWTOPFac
AAWT18	((LTAM AM x AAWTAMFac) + (LTAM IP x AAWTIPFac) + (LTAM PM x AAWTPMFac)) x AAWT18Fac
AAWTNighttime	((LTAM AM x AAWTAMFac) + (LTAM IP x AAWTIPFac) + (LTAM PM x AAWTPMFac)) x AAWTNighttimeFac

Table 8.3 – Environmental Assessment Time Period Factors

Factor Name	**All vehicles factor**	**Car / LGV factor**	**HGV factor**
AADT24Fac	1.367	1.354	1.368
AADTAMFac	2.338	2.298	2.307
AADTIPFac	6.022	6.216	4.843
AADTPMFac	2.715	2.687	2.928
AADTOPFac	0.367	0.354	0.368
AAWT24Fac	1.348	1.342	1.340
AAWTAMFac	2.762	2.740	2.853
AAWTIPFac	6.000	6.000	6.000
AAWTPMFac	2.898	2.831	3.646
AAWTOPFac	0.348	0.342	0.340
AAWT18Fac	1.264	1.272	1.186
AAWTNightimeFac	0.179	0.159	0.264

8.2.8 In order to support the environmental assessment, it is also necessary to provide average speeds for each of the above time periods. The procedure adopted essentially provides a flow weighted average speed using the relative weights associated with each of the time periods as described above.

8.3 LTAM 2026 Core – Outputs to Environmental Assessment

8.3.1 Figure 8.2 to Figure 8.4 present the flow difference plots comparing the DM and DS for the 2026 core scenario. Plots are provided for AADT All Vehicles, AADT Non-HGV and AADT HGV. Blue colours show reductions in traffic, green colours show increases in traffic.

8.3.2 As can be seen these figures accord well with results presented in other sections of this report and with a priori expectations. Generally, flows reduce across Dartford, on the A13 and A2 west of their LTC junctions. Flows increase obviously on LTC, which doesn't exist in the Do Minimum scenario, and also on the M25 north of the LTC junction and south of the M20 junction and on the A2/M2 and A13 east of their LTC junctions and on the M20.

8.3.3 This pattern is consistent across the different vehicle type categories but, as mentioned in previous sections, there is a considerably higher relative reduction in HGV flow at Dartford in the Do Something scenario than for other vehicle categories. This is due to the alignment of LTC which makes it a particularly favourable route for HGV trips to/from the ports in Kent and Essex.

Figure 8.2 – AADT All Vehicles Flow Difference Plot – 2026 Core DM Vs DS

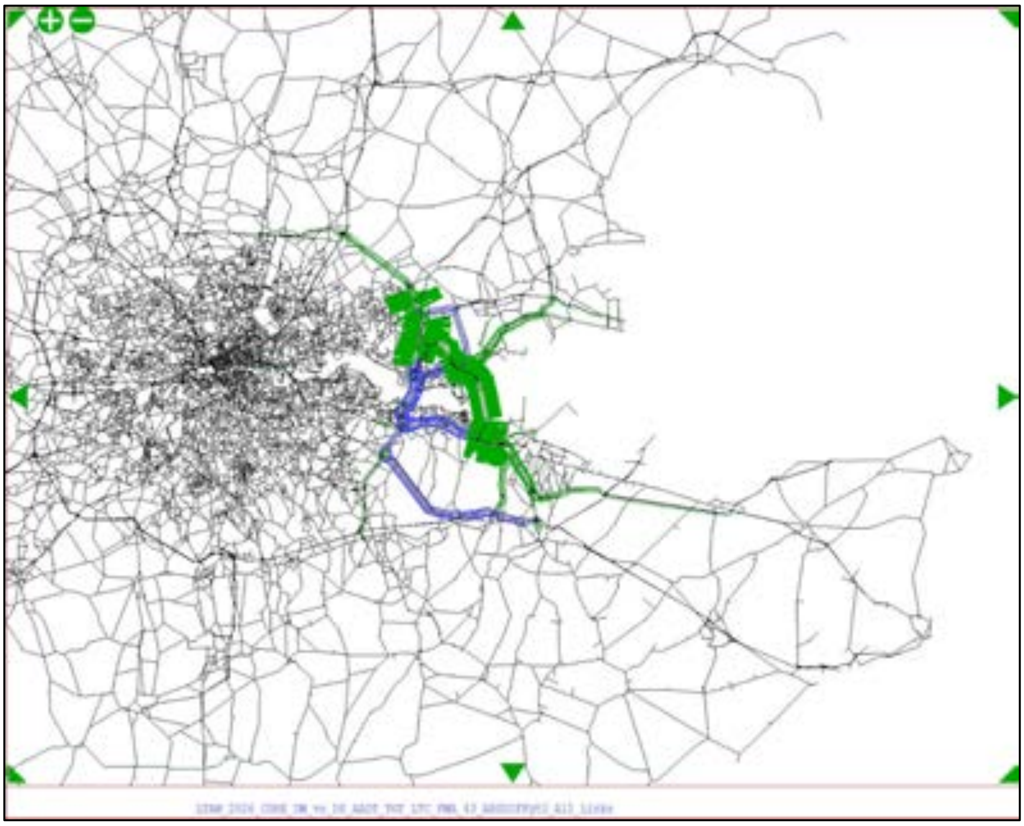


Figure 8.3 – AADT Non-HGV Vehicles Flow Difference Plot – 2026 Core DM Vs DS

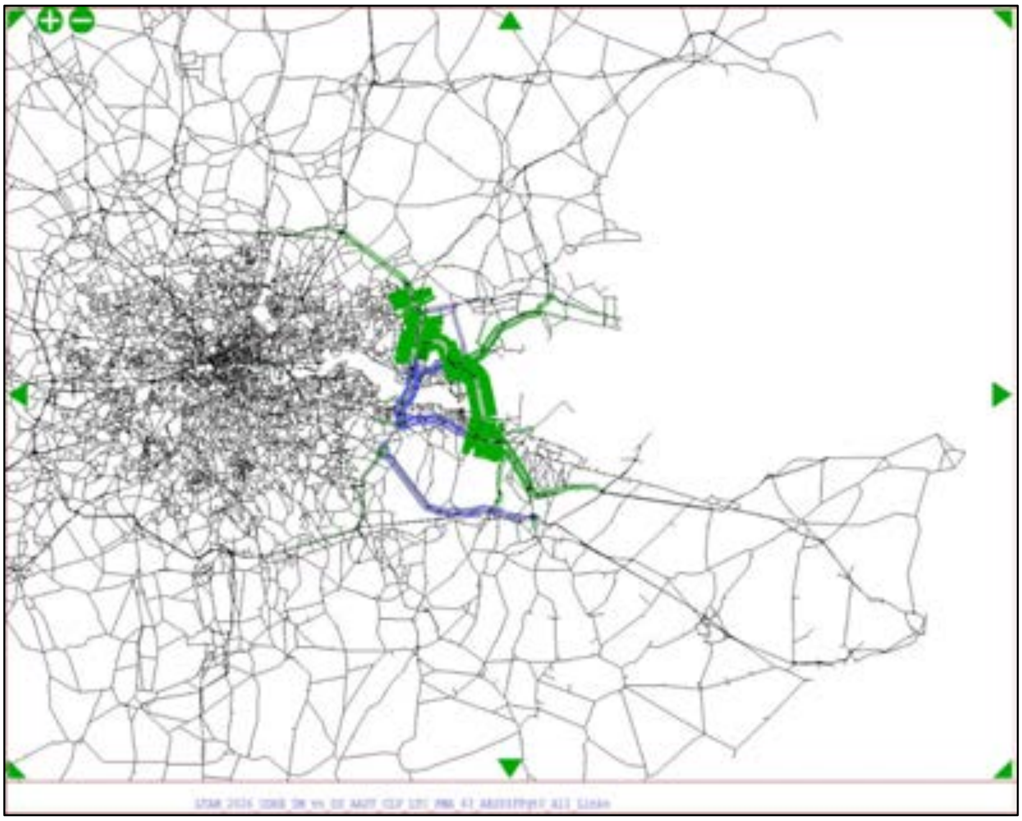
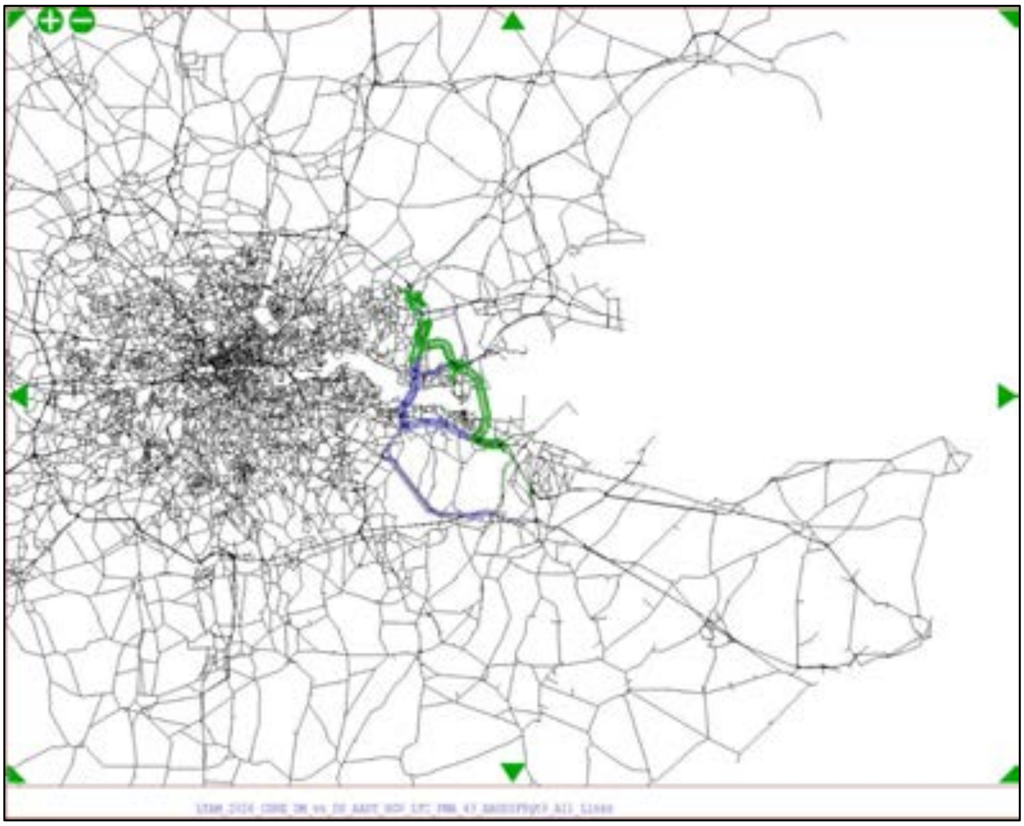


Figure 8.4 – AADT HGV Vehicles Flow Difference Plot – 2026 Core DM Vs DS



8.4 LTAM 2031 Core – Outputs to Environmental Assessment

8.4.1 Figure 8.5 to Figure 8.7 present the flow difference plots comparing the DM and DS for the 2031 core scenario. Plots are provided for AADT All Vehicles, AADT Non-HGV and AADT HGV. Blue colours show reductions in traffic, green colours show increases in traffic.

8.4.2 As can be seen these figures accord well with results presented in other sections of this report and with a priori expectations. Generally, flows reduce across Dartford, on the A13 and A2 west of their LTC junctions. Flows increase obviously on LTC, which doesn't exist in the Do Minimum scenario, and also on the M25 north of the LTC junction and south of the M20 junction and on the A2/M2 and A13 east of their LTC junctions and on the M20.

8.4.3 This pattern is consistent across the different vehicle type categories but, as mentioned in previous sections, there is a considerably higher relative reduction in HGV flow at Dartford in the Do Something scenario than for other vehicle categories. This is due to the alignment of LTC which makes it a particularly favourable route for HGV trips to/from the ports in Kent and Essex.

Figure 8.5 – AADT All Vehicles Flow Difference Plot – 2031 Core DM Vs DS

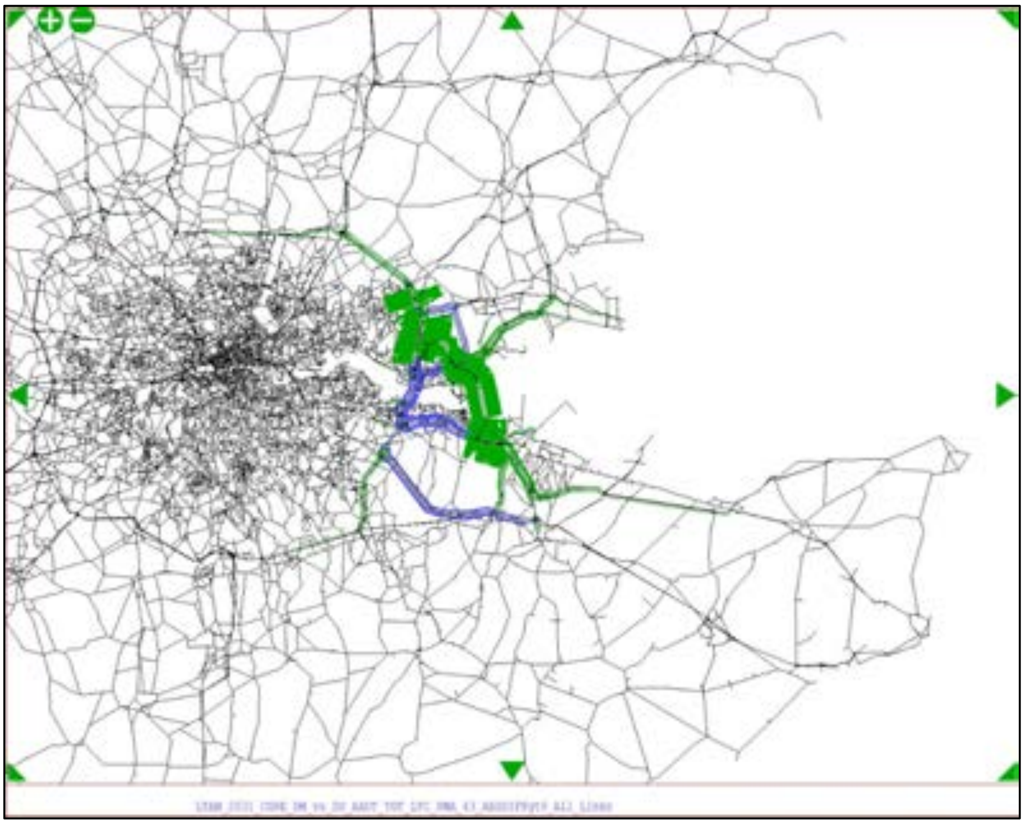


Figure 8.6 – AADT Non-HGV Vehicles Flow Difference Plot – 2031 Core DM Vs DS

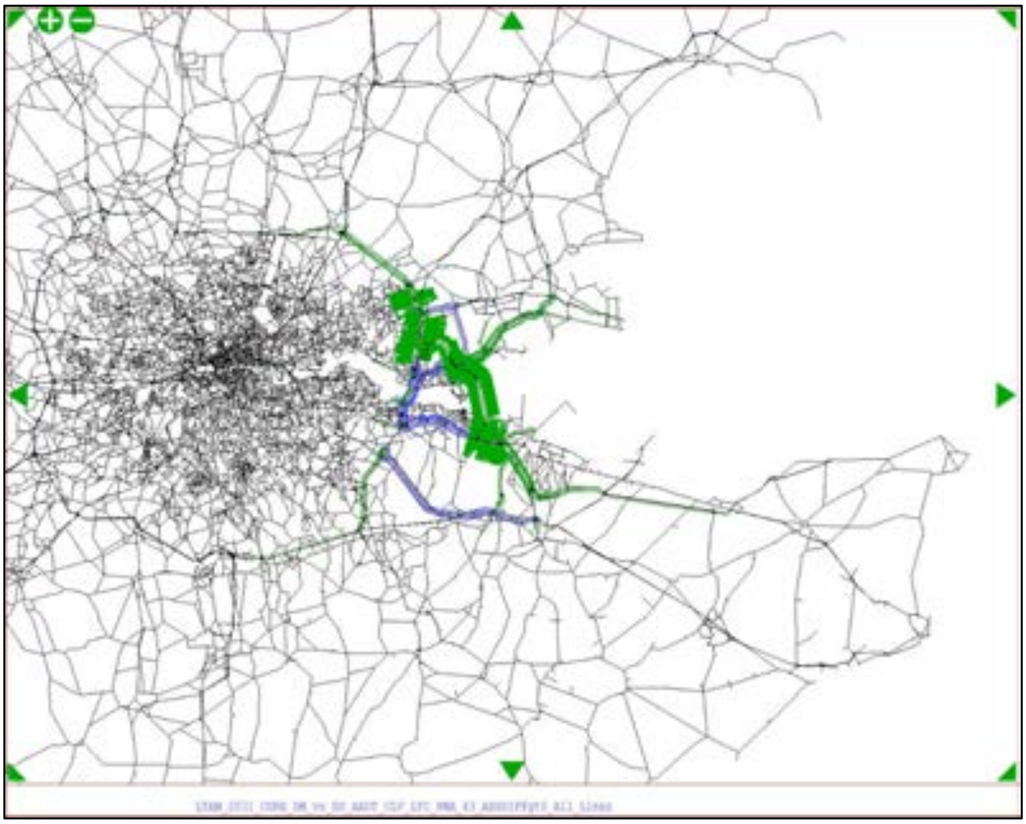
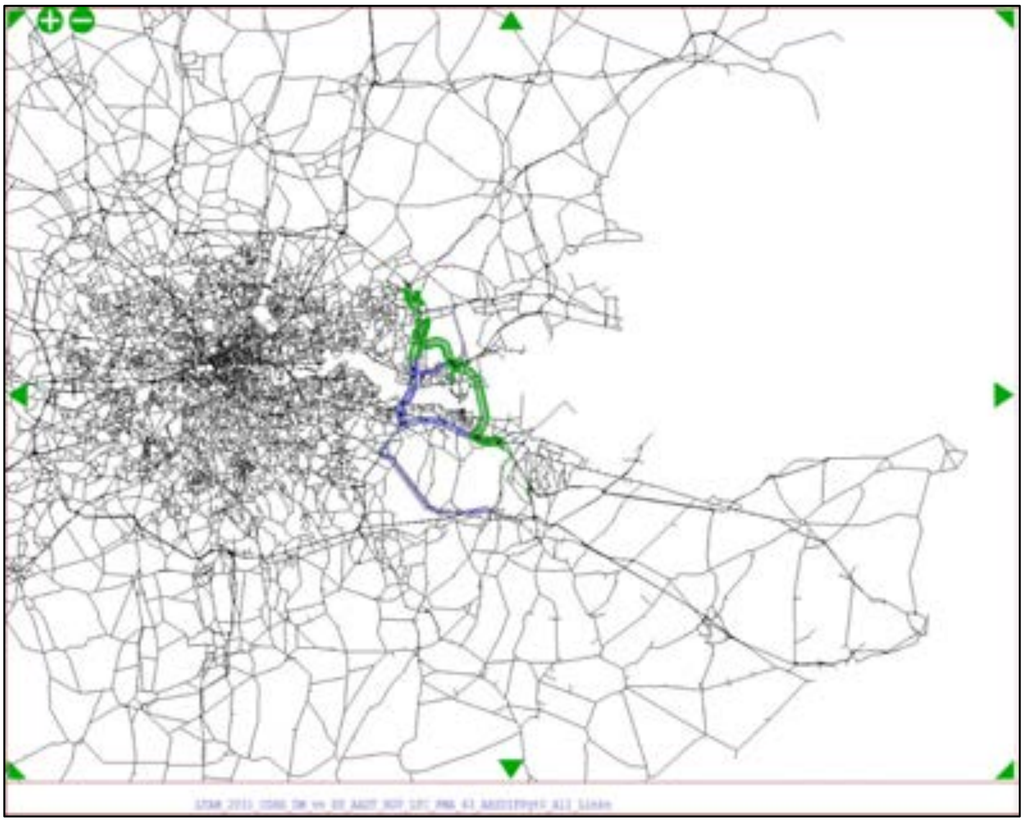


Figure 8.7 – AADT HGV Vehicles Flow Difference Plot – 2031 Core DM Vs DS



8.5 LTAM 2041 Core – Outputs to Environmental Assessment

8.5.1 Figure 8.8 to Figure 8.10 present the flow difference plots comparing the DM and DS for the 2041 core scenario. Plots are provided for AADT All Vehicles, AADT Non-HGV and AADT HGV. Blue colours show reductions in traffic, green colours show increases in traffic.

8.5.2 As can be seen these figures accord well with results presented in other sections of this report and with a priori expectations. Generally, flows reduce across Dartford, on the A13 and A2 west of their LTC junctions. Flows increase obviously on LTC, which doesn't exist in the Do Minimum scenario, and also on the M25 north of the LTC junction and south of the M20 junction and on the A2/M2 and A13 east of their LTC junctions and on the M20.

8.5.3 This pattern is consistent across the different vehicle type categories but, as mentioned in previous sections, there is a considerably higher relative reduction in HGV flow at Dartford in the Do Something scenario than for other vehicle categories. This is due to the alignment of LTC which makes it a particularly favourable route for HGV trips to/from the ports in Kent and Essex.

Figure 8.8 – AADT All Vehicles Flow Difference Plot – 2041 Core DM Vs DS

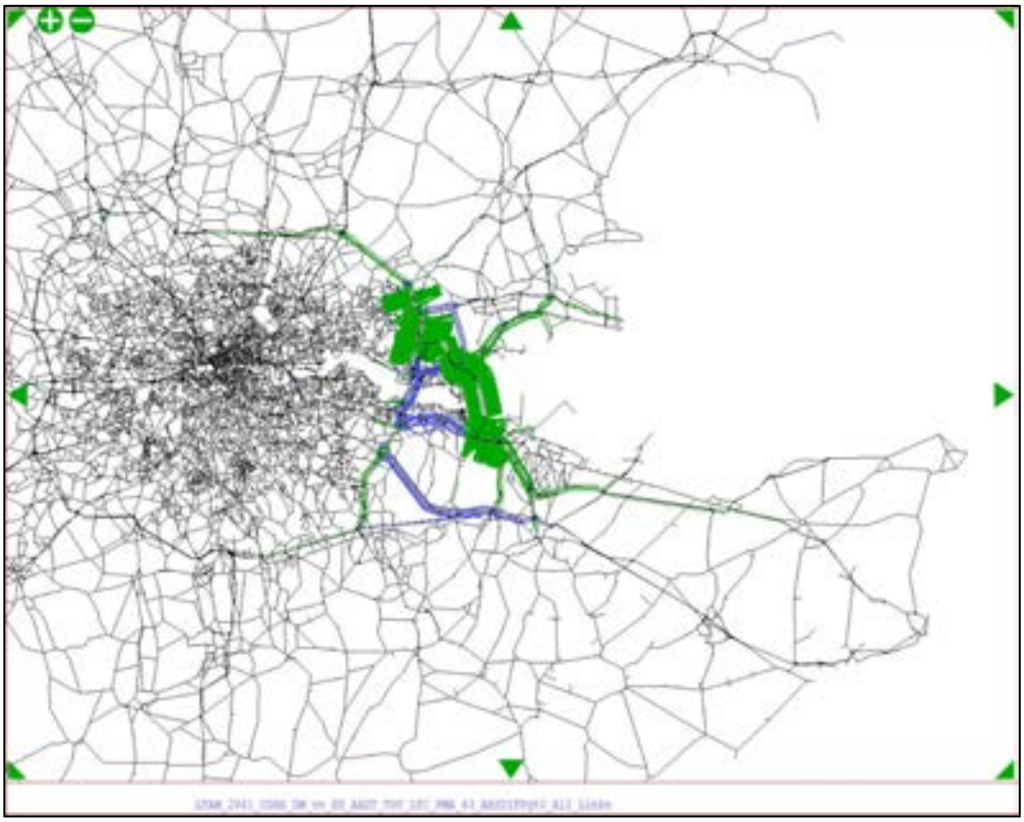


Figure 8.9 – AADT Non-HGV Vehicles Flow Difference Plot – 2041 Core DM Vs DS

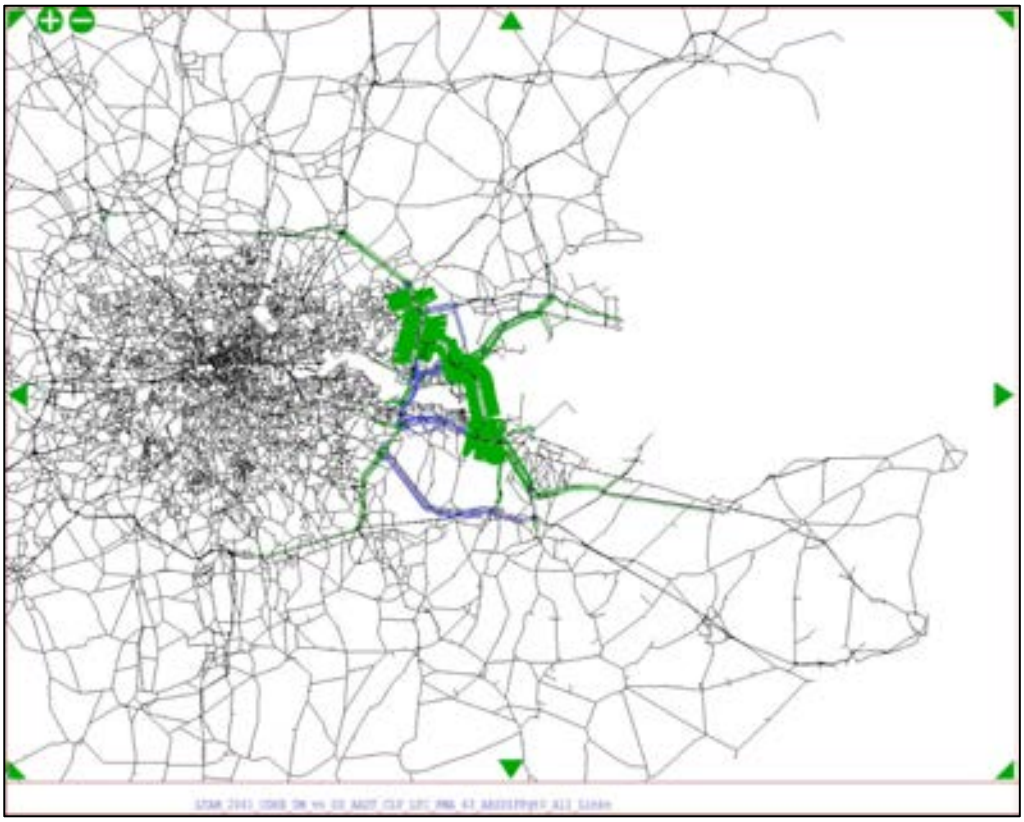
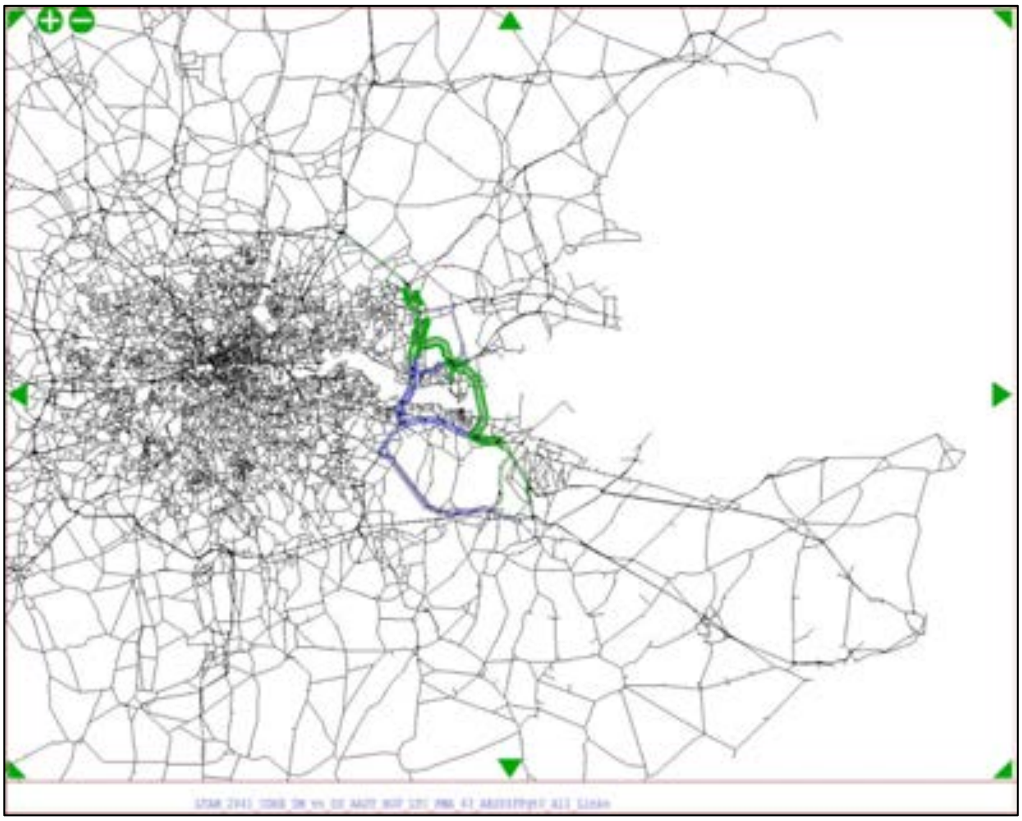


Figure 8.10 – AADT HGV Vehicles Flow Difference Plot – 2041 Core DM Vs DS



8.6 LTAM 2051 Core – Outputs to Environmental Assessment

8.6.1 Figure 8.11 to Figure 8.13 present the flow difference plots comparing the DM and DS for the 2051 core scenario. Plots are provided for AADT All Vehicles, AADT Non-HGV and AADT HGV. Blue colours show reductions in traffic, green colours show increases in traffic.

8.6.2 As can be seen these figures accord well with results presented in other sections of this report and with a priori expectations. Generally, flows reduce across Dartford, on the A13 and A2 west of their LTC junctions. Flows increase obviously on LTC, which doesn't exist in the Do Minimum scenario, and also on the M25 north of the LTC junction and south of the M20 junction and on the A2/M2 and A13 east of their LTC junctions and on the M20.

8.6.3 This pattern is consistent across the different vehicle type categories but, as mentioned in previous sections, there is a considerably higher relative reduction in HGV flow at Dartford in the Do Something scenario than for other vehicle categories. This is due to the alignment of LTC which makes it a particularly favourable route for HGV trips to/from the ports in Kent and Essex.

Figure 8.11 – AADT All Vehicles Flow Difference Plot – 2051 Core DM Vs DS

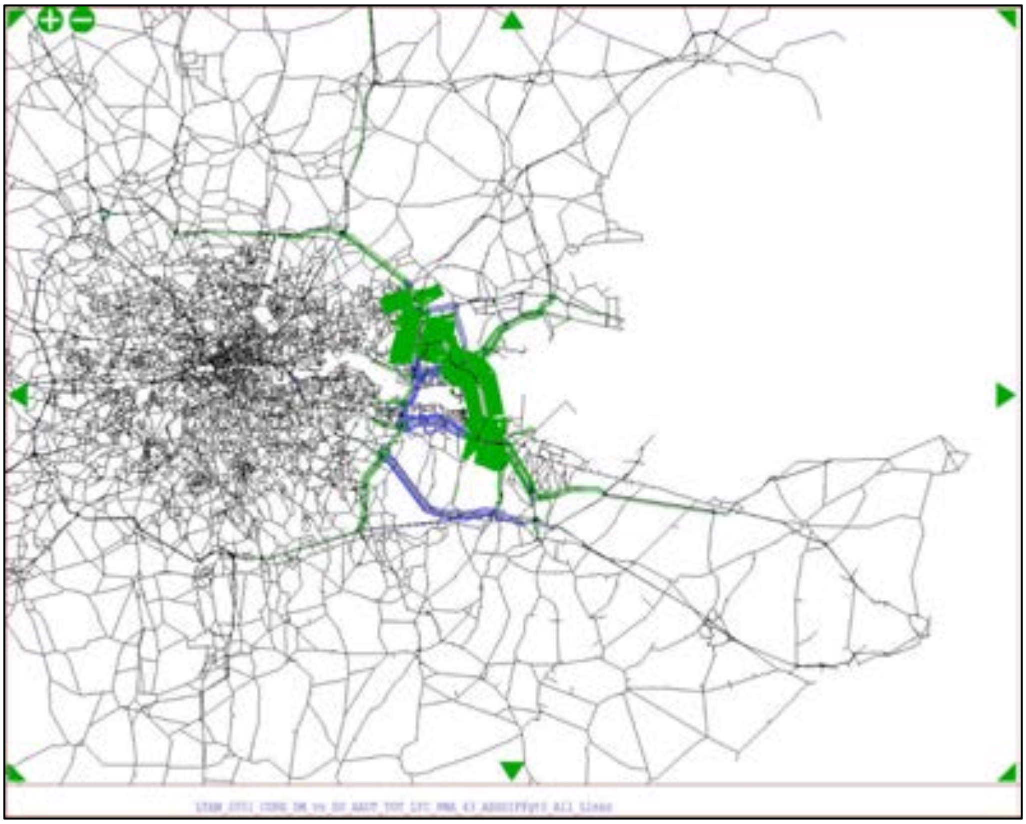


Figure 8.12 – AADT Non-HGV Vehicles Flow Difference Plot – 2051 Core DM Vs DS

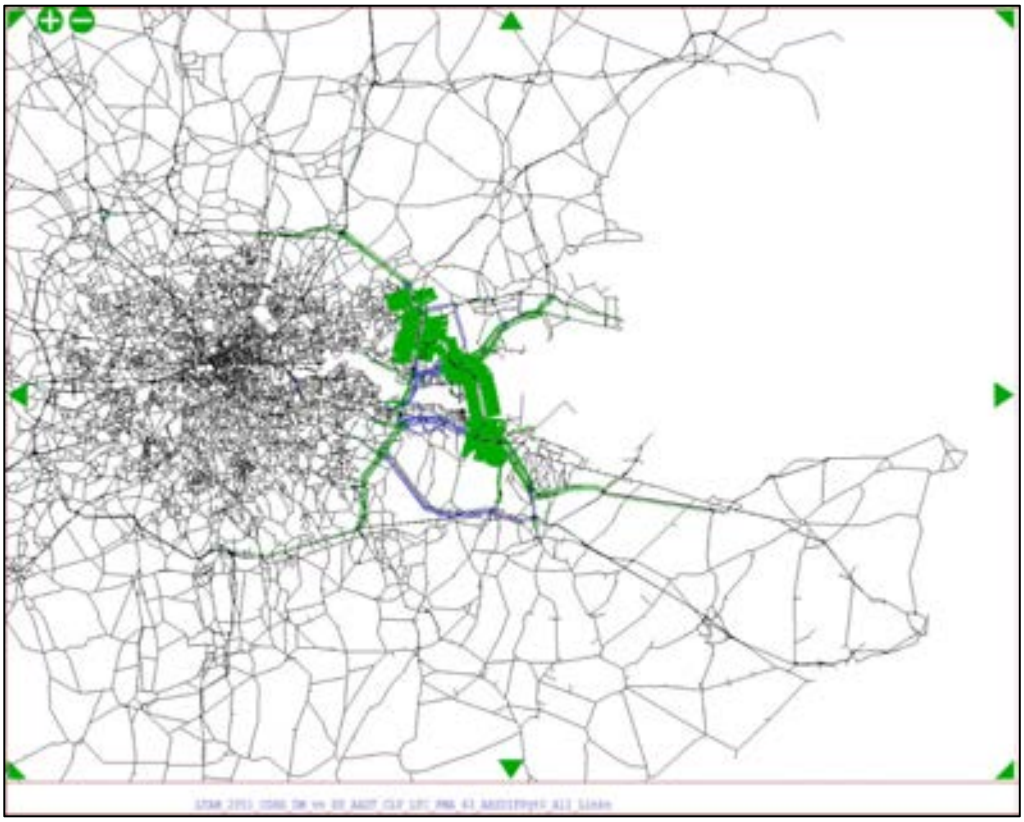
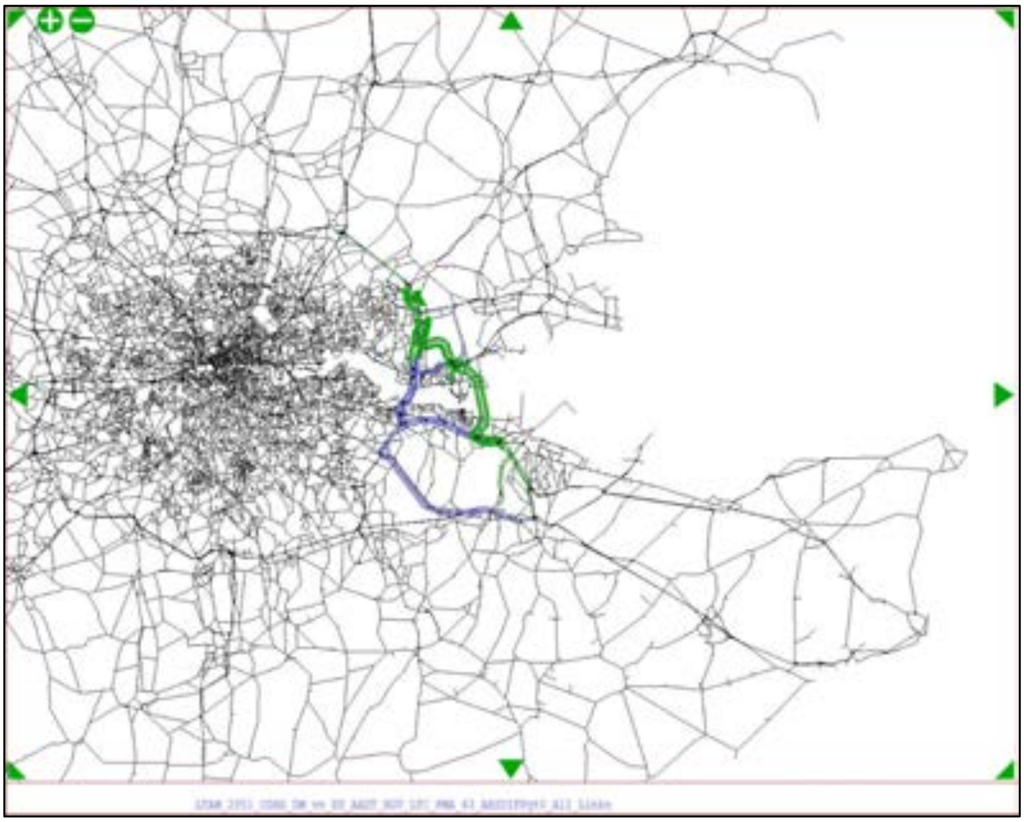


Figure 8.13 – AADT HGV Vehicles Flow Difference Plot – 2051 Core DM Vs DS



8.7 IAN185/15 Speed Banding Exercise

8.7.1 Interim Advice Note 185/5 titled Updated traffic, air quality and noise advice on the assessment of link speeds and generation of vehicle data into 'speed-bands' for users of DMRB Volume 11, Section 3, Part 1 'Air Quality' and Volume 11, Section 3, Part 7 'Noise' provides guidance on how speeds extracted from a traffic model should be processed in order for them to be used for detailed environmental modelling processes.

8.7.2 Strategic traffic models such as LTAM are calibrated and validated so as to reproduce observed speeds along strategic routes. They are not calibrated to speeds at the individual link level. This means that at the individual link level speeds predicted by the model can vary significantly from real world speeds.

8.7.3 IAN 185/15 attempts to alleviate some of the risks associated with this. The methodology involves three key steps:

- Calculating a speed pivot factor;
- Applying the speed pivot factor to model forecast speeds; and
- Allocation of links into speed bands.

Calculating a Speed Pivot Factor

8.7.4 Quoting from the IAN the objective is to "develop a cost effective method to better represent modelled speeds on individual links from the traffic model, by comparing them to observed traffic data."

8.7.5 The methodology operates by "using observed vehicle speeds from the base year. This allows for a comparison with the modelled base year speeds and provides an indication of the performance of the speeds from the traffic model. This information can then be used to adjust the individual base year link speeds output from the traffic model, where required. As it is not possible to measure forecast traffic speeds, the adjustments applied to the base year model are applied to the opening and design year forecasts in the same way."

8.7.6 During the development of the LTAM a correspondence was generated between the LTAM highway network node and link structure in the FMA and the Integrated Transport Network GIS file network structure. Trafficmaster journey time data provides observed speeds across all links in the ITN where there is a sample of records. It is therefore possible to generate an observed speed from the Trafficmaster dataset for every link in the LTAM FMA. Where there was no direct correspondence between the ITN network and the SATURN node and link structure a distance weighted average process was taken to derive the observed speed.

8.7.7 The pivot factor is therefore a simple ratio of:

$$Speed\ Pivot\ Factor = \frac{Observed\ Speed}{Modelled\ Speed}$$

Applying the Speed Pivot Factor to Model Forecast Speeds

8.7.8 Once the speed pivot factor has been calculated it can then be applied to forecast year model speeds. This is done in exactly the same way between the DM and DS scenarios as follows:

$$Do\ Minimum\ Speed = Do\ Minimum\ Model\ Speed\ \times Speed\ Pivot\ Factor$$

$$Do\ Something\ Speed = Do\ Something\ Model\ Speed\ \times Speed\ Pivot\ Factor$$

8.7.9 In certain locations there may not have been a Trafficmaster speed sample on a particular link, or it was a very small sample. In these locations an average speed has been derived from links with similar characteristics within the local area. This is as per the IAN.

Allocation of Links into Speed Bands

8.7.10 Once the speed pivot factors have been applied it is then necessary to allocate each link into a speed band category. Table 8.4 and Table 8.5 provide the speed band categories to be used for Motorway and Urban / Rural (Non-Motorway) Roads respectively. The primary criteria used to distinguish which speed band each link is in is the pivoted speed.

Table 8.4 – Motorway Speed Band Descriptors (Source: IAN 185/15)

Category	Speed Range	General Description	Examples of Possible Characteristics
Heavy Congestion	<30kph	Traffic with a high degree of congestion and stop:start driving behaviour	• Junction merges and diverges during morning and evening rush hours • Slip roads with queuing traffic • High variation in traffic speeds
Light Congestion	30 – 80kph	Traffic with some degree of flow breakdown	• Normally experience during the morning or evening peak periods • Typical volume/capacity would be >80% • Normal operating regime for slip roads • Medium variation in traffic speeds
High Speed	>80kph	Motorway with free flow driving conditions with no flow breakdown	• V/C <80% • Low variation in traffic speeds

Table 8.5 – Urban / Rural (Non-Motorway) Roads Speed-Band Descriptors

Category	Speed Range	General Description	Examples of Possible Characteristics
Heavy Congestion	<20kph	Traffic with a high degree of congestion. Within a 100m radius of road junction with a high degree of congestion.	• Typically, 10 stops per km
Light Congestion	20 – 45kph	Typical Urban traffic with a reasonable degree of congestion. Within a 100m radius of a road junction.	• On average 1.5 to 2 stops per km • Travelling to and from work during the morning and evening rush hours
Free Flow	45 – 80kph	Typical Urban traffic with limited or no congestion.	• Possibly experiencing 1 stop per km
High Speed Urban Road	>80kph	High speed urban single or dual carriageway	• Low likelihood of any stops per km

8.7.11 Once each link within the LTAM FMA has been allocated to a particular speed band based upon its pivoted speed, more detailed analysis is then undertaken on links that are close to the boundary of one of the speed ranges, in particular, if the link is predicted to change speed band between base year and forecast year DM and DS scenarios.

8.7.12 The speed banding exercise has focussed on the AADT 24, AADTAM, AADTIP, AADTPM and AADTOP. In accordance with the requirements of the environmental assessment team, this has only been undertaken for the scheme opening year of 2026. The analysis presented in Figure 8.14 to Figure 8.23 show links where speed bands have changed between the actual base Vs DM and the DM Vs DS.

8.7.13 As can be seen in the actual base vs DM analysis there are a number of links across the network that have changed speed band. This is as a result of a combination of changes in demand in these locations and the introduction of new transport infrastructure schemes in the DM. The comparisons between the DM and DS show only links associated with or clustered around the proposed LTC scheme have changed speed band. This accords well with analysis shown in other sections of this report and with a priori expectations.

Figure 8.14 – Link Speed Band Changes Actual Base Vs 2026 Core DM AADT24

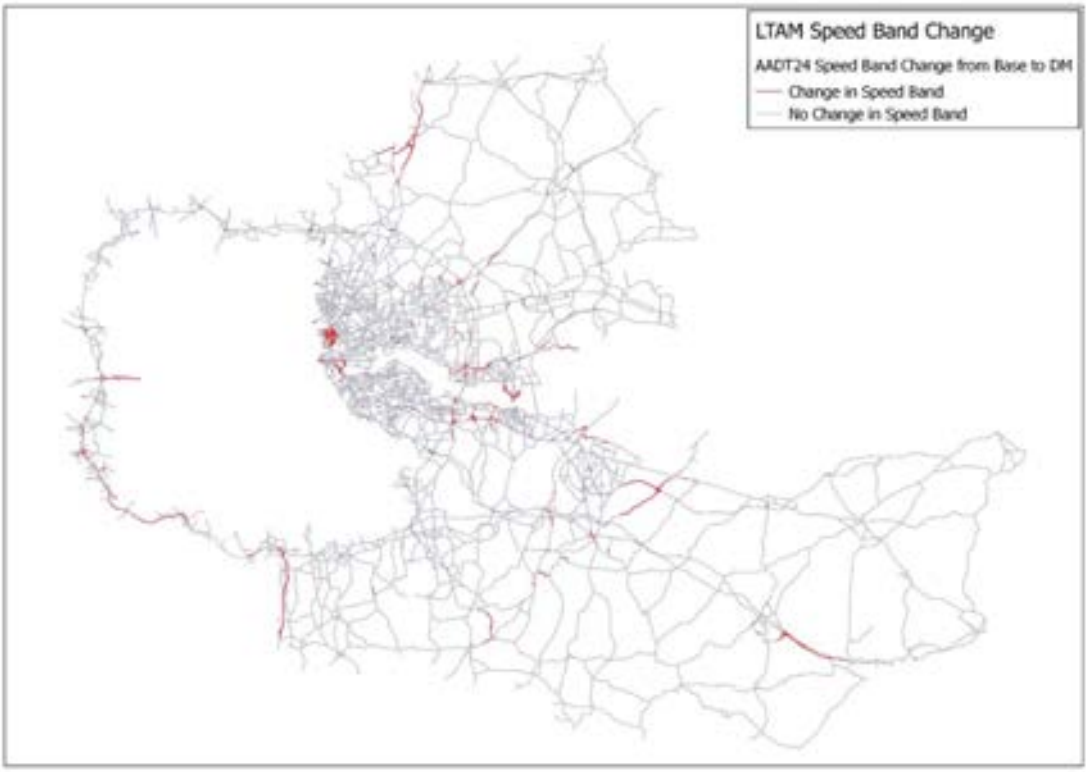


Figure 8.15 – Link Speed Band Changes Actual Base Vs 2026 Core DM AM Peak

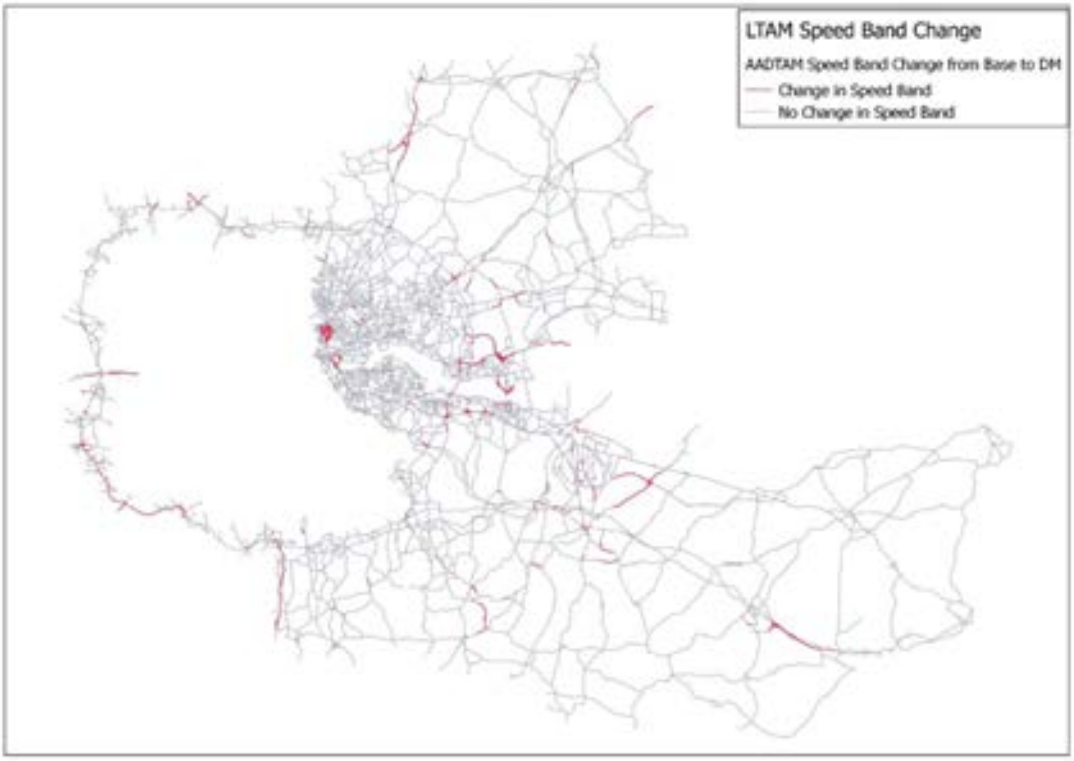


Figure 8.16 – Link Speed Band Changes Actual Base Vs 2026 Core DM Inter Peak

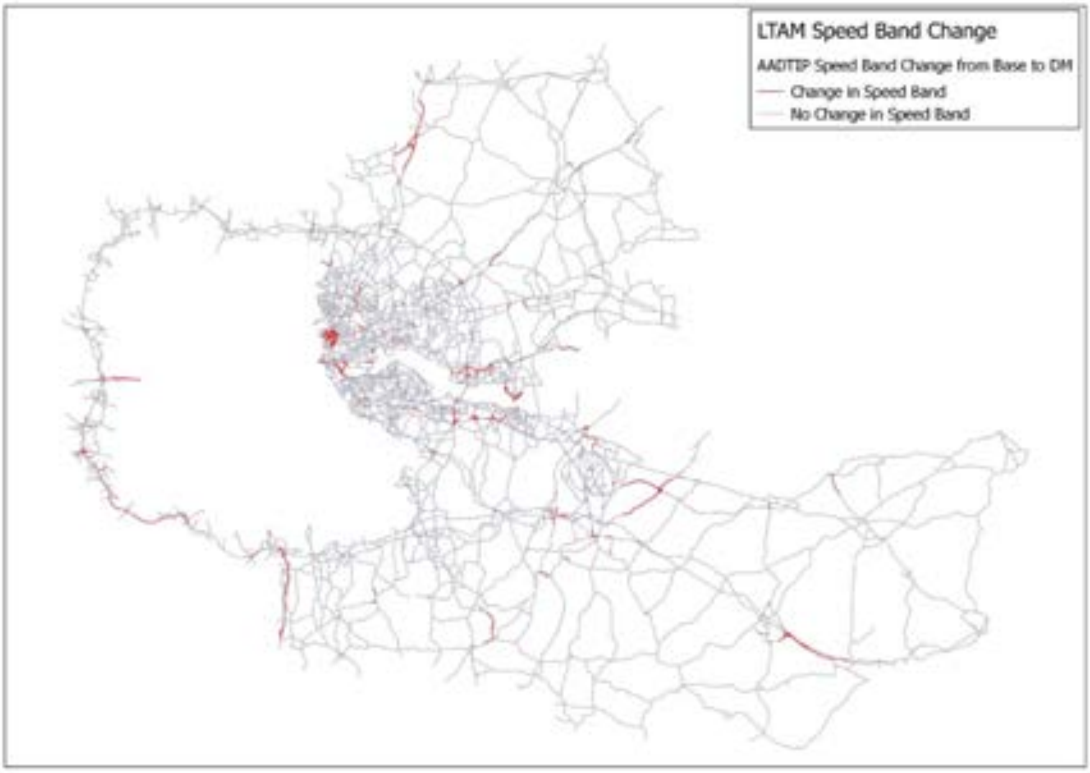


Figure 8.17 – Link Speed Band Changes Actual Base Vs 2026 Core DM PM Peak

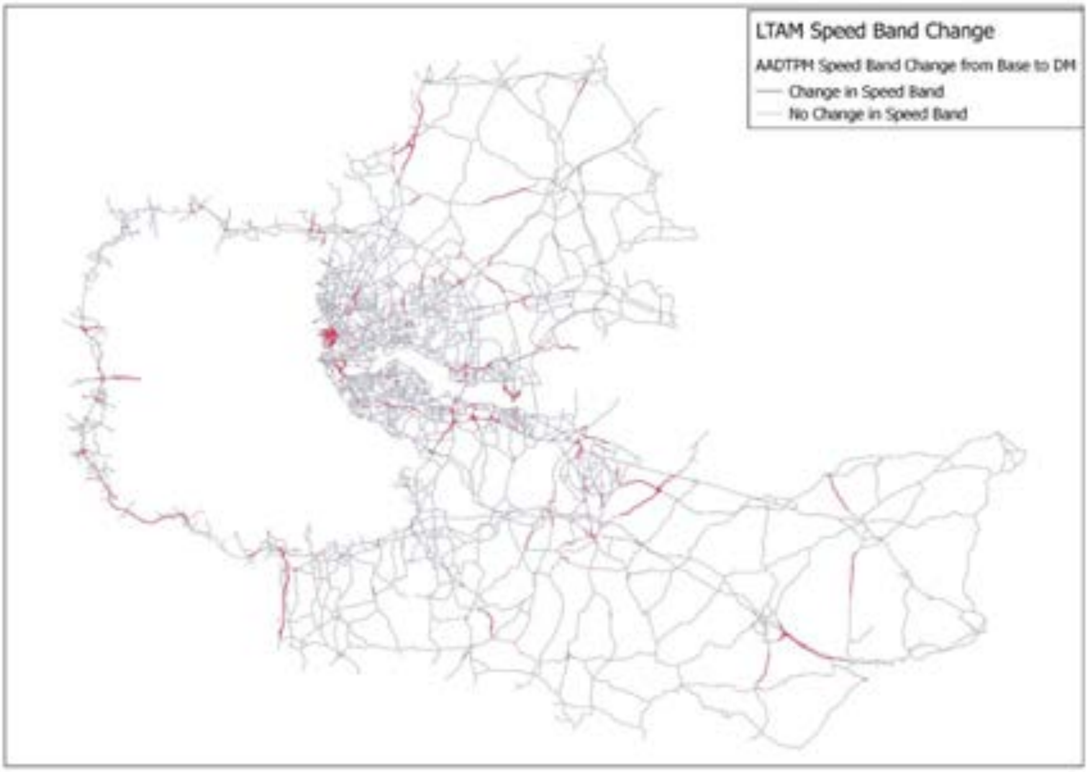


Figure 8.18 – Link Speed Band Changes Actual Base Vs 2026 Core DM Off Peak

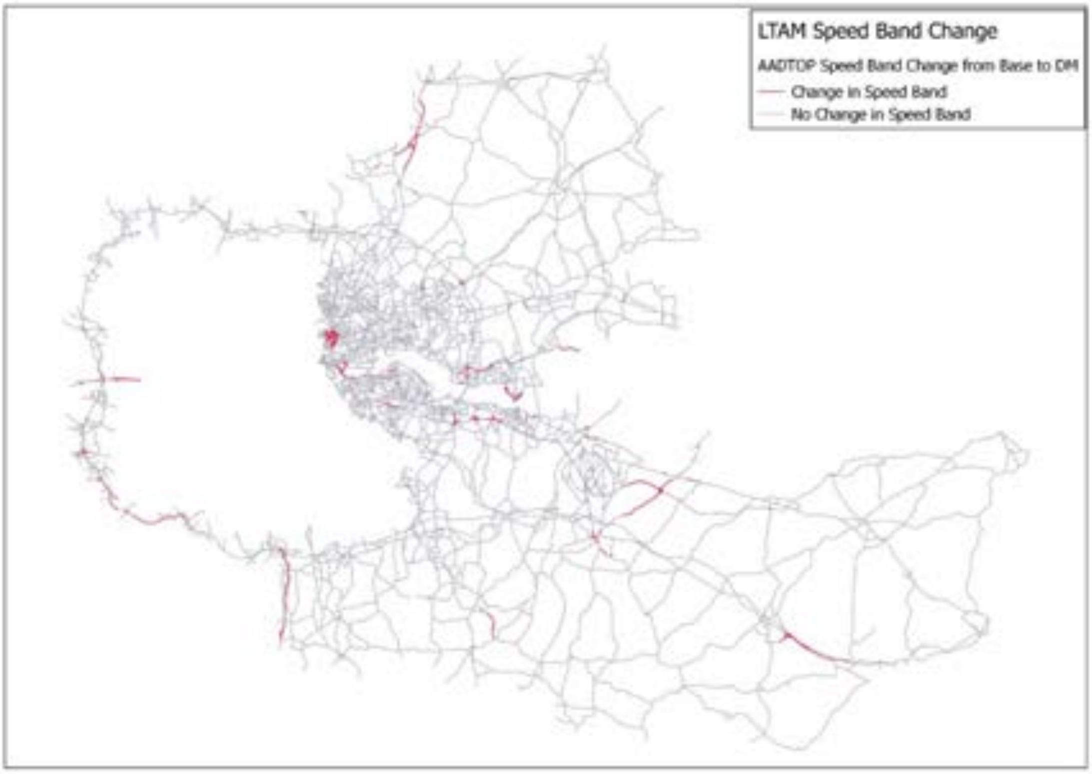


Figure 8.19 – Link Speed Band Changes 2026 Core DM Vs 2026 Core DS AADT24

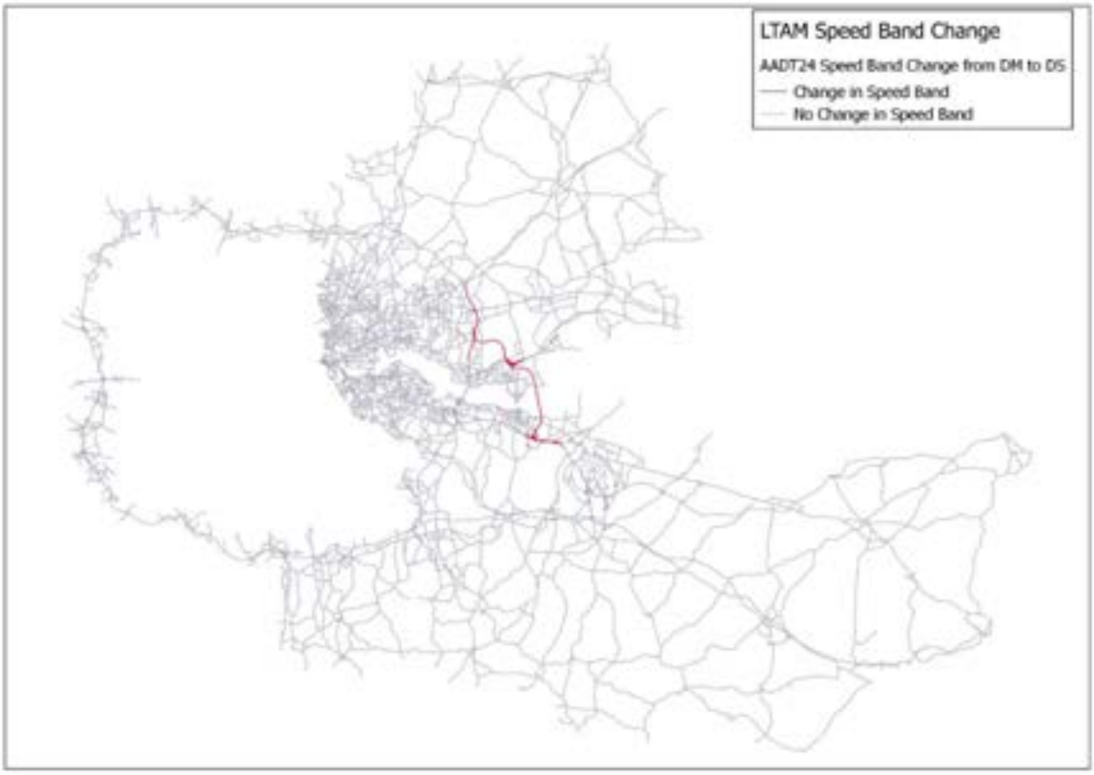


Figure 8.20 – Link Speed Band Changes 2026 Core DM Vs 2026 Core DS AM Peak

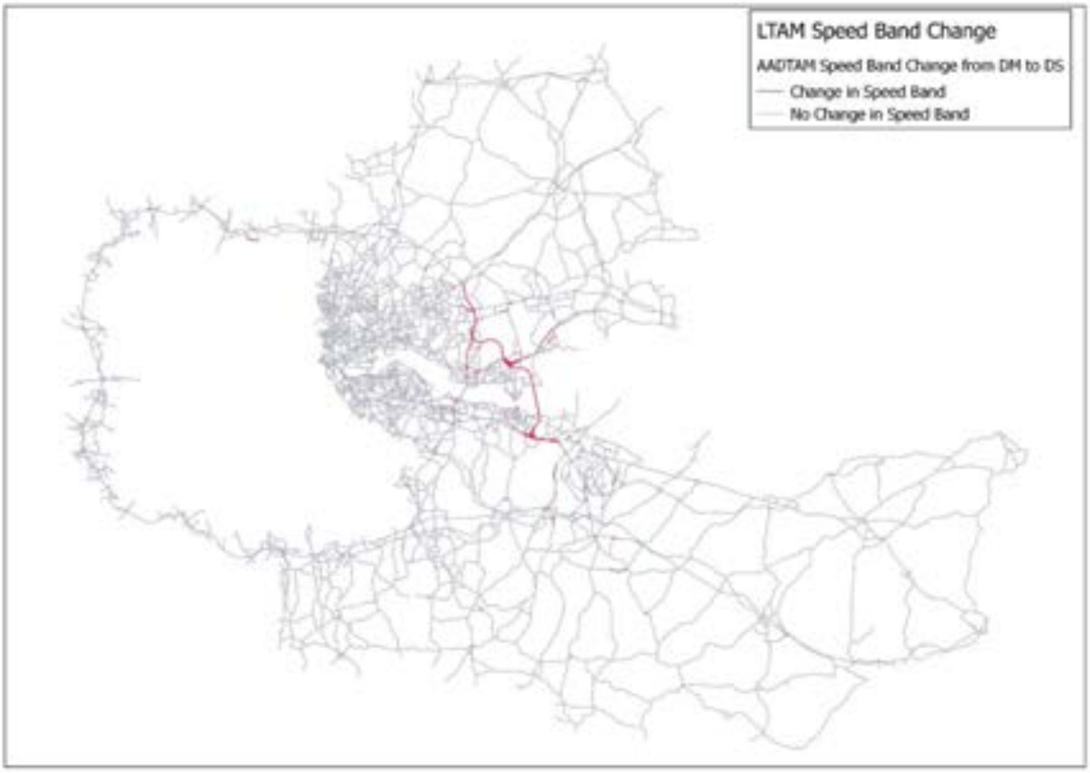


Figure 8.21 – Link Speed Band Changes 2026 Core DM Vs 2026 Core DS Inter Peak

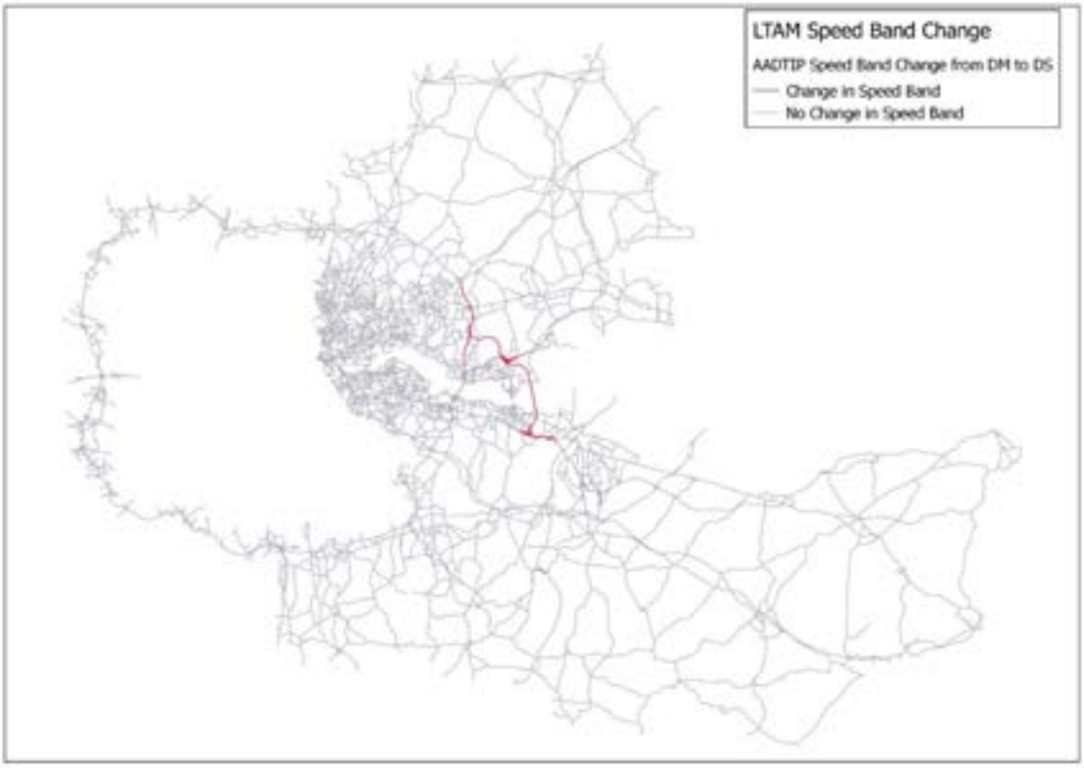


Figure 8.22 – Link Speed Band Changes 2026 Core DM Vs 2026 Core DS PM Peak

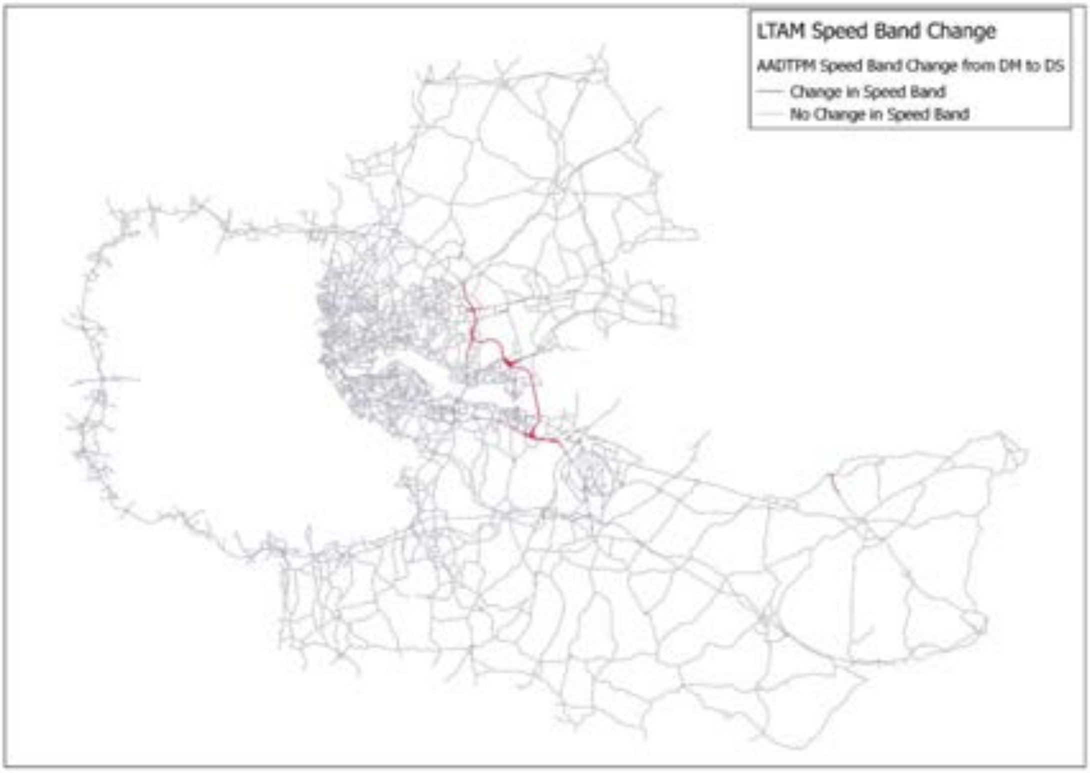
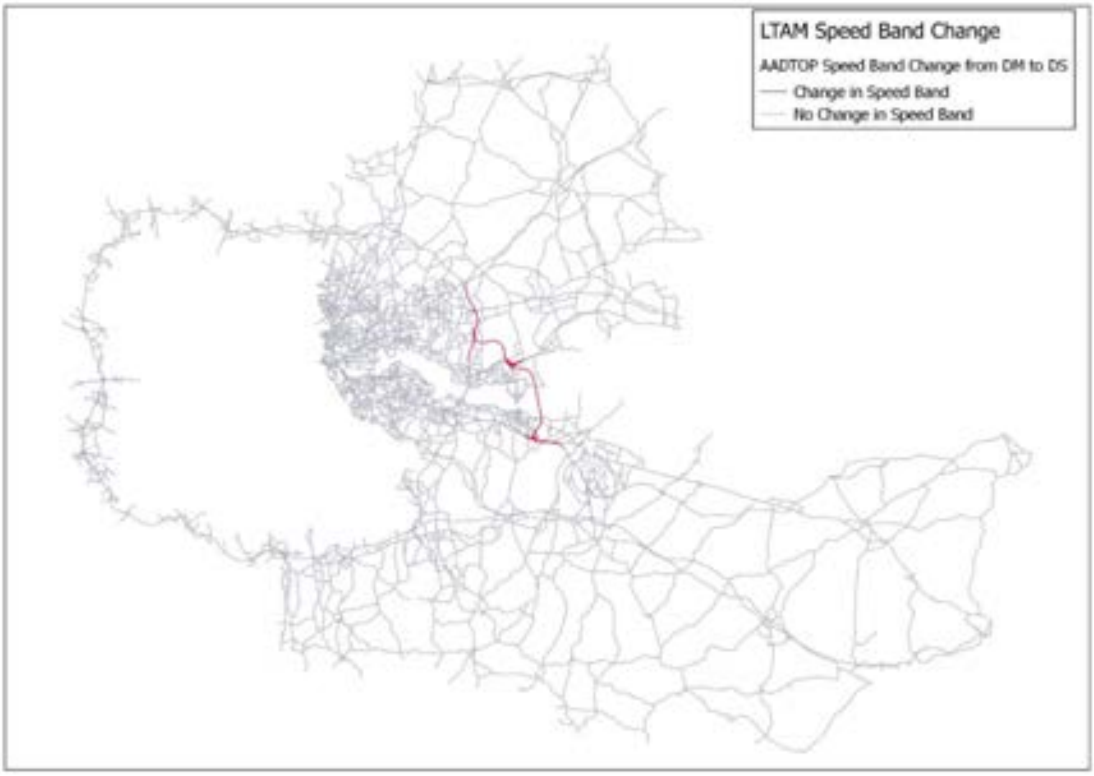


Figure 8.23 – Link Speed Band Changes 2026 Core DM Vs 2026 Core DS Off Peak



9 Assignment Results for Operational Performance Assessment

9.1 Introduction

9.1.1 A significant amount of work has been undertaken during this phase of the project to refine the scheme and improve its operational performance. LTAM model forecasts have been produced in order to predict traffic flows and speeds along the proposed scheme, which have then been fed to the design team in order to test the operation of the different elements of the design.

9.1.2 The analysis below is presented for the morning and evening peaks, for all model years for the core scenario for the Do Something only. The low and high growth scenario results are presented in Appendix F.

9.2 LTAM 2026 Core – Outputs to Operational Assessment

9.2.1 Figure 9.1 to Figure 9.12 provide traffic flow information at the three LTC junctions for All Vehicles and HGV for the morning and evening peak for the 2026 core scenario. The figures show a simplified representation of the junction layouts.

9.2.2 Figure 9.1 shows the total vehicle flows for the 2026 core scenario in the AM peak at the proposed LTC/A2 junction and highlights the low proportion of west-to-north and north-to-west traffic on LTC (attributed to the significant relief provided by LTC to the existing A2/A282/Dartford Crossing route). The traffic on LTC northbound consists of:

- 86% (3452 of 4002 PCU's) comes from the east;
- 8% (312 PCU's) accesses from Gravesend East; and
- 6% (232 PCU's) comes from the A2 to the west.

9.2.3 Similar proportions can be seen for southbound traffic on LTC:

- 86% (3102 of 3614 PCU's) travels east;
- 8% (281 PCU's) exits at Gravesend East; and
- 6% (232 PCU's) continues on the A2 to the west.

9.2.4 Figure 9.1 also shows the high 'weaving' flows that necessitated the design of separate carriageways at the LTC/A2 junction. These are the movements that would have been in conflict (i.e. weaving flows) in a single carriageway configuration. For westbound traffic these flows are:

- 2782 PCU's (i.e. well over 1 lane worth) from the M2 to LTC northbound; and
- 2082 PCU's (approx. 1 lane worth) from A2/A289 to A2 westbound.

9.2.5 For eastbound traffic the 'weaving' flows are:

- 2386 PCU's from LTC to M2 eastbound; and
- 1552 PCU's from A2 westbound to A2/A289 in the east.

9.2.6 Figure 9.2 shows the HGV (PCU's) flows for the 2026 core scenario in the AM peak at the proposed LTC/A2 junction and shows the very high proportions of east-to-north and north-to-east HGV traffic using LTC. Very few HGVs west of the Gravesend East junction will use LTC because HGVs have a much higher cost per km than other vehicles so will favour the shorter, LTC-relieved, existing route. This is shown by the following HGV flows using LTC northbound:

- 96% (1009 of 1056 PCU's) of HGVs on LTC northbound come from the east;
- 3% (34 PCU's) accesses LTC from Gravesend East; and
- 1% (8 PCU's) comes from the A2 to the west.

9.2.7 Similar proportions can be seen for southbound traffic on LTC:

- 93% (1236 of 1333 PCU's) travels east;
- 6% (82 PCU's) exits at Gravesend East; and
- 1% (15 PCU's) continues on the A2 to the west.

9.2.8 Figure 9.3 and Figure 9.4 show the total vehicle and HGV flows respectively for the 2026 core scenario in the AM peak at the proposed LTC/A13/A1089 junction. As with the LTC/A2 junction the scheme is designed to minimise the impact of weaving, in this case the westbound on-slip from Orsett Cock has been extended so that it joins the A13 after the A13 westbound to LTC southbound link road. In addition, the A13 westbound off-slip to the A1089 has now been incorporated into the same A13 to LTC southbound link road to also minimise weaving on the A13.

9.2.9 The key junction movements are as follows:

- The traffic travelling north across the Thames on LTC consists of:
  - 58% (2331 PCU's) of total traffic and 82% (865 PCU's) of HGV's continuing north towards the M25; and
  - 42% (1672 PCU's) of total traffic and 18% (191 PCU's) of HGV's turning east on to the A13.
- The traffic travelling south across the Thames on LTC consists of:
  - 41% (1473 PCU's) of total traffic and 64% (835 PCU's) of HGV's from the M25;
  - 43% (1551 PCU's) of total traffic and 24% (313 PCU's) of HGV's from A13 westbound; and
  - 16% (591 PCU's) of total traffic and 12% (163 PCU's) of HGV's from the A1089 northbound.

9.2.10 The scheme design does not provide for all possible movements at the LTC/A13 junction either due to lack of demand (e.g. A13 eastbound to LTC northbound) or because the scheme has provided significant relief to an existing route (e.g. LTC northbound to A13 westbound).

9.2.11 Another key feature of this junction is the retention of all key existing connections between the A13 and A1089 (which will include Tilbury Port traffic), and the addition of the following new connections:

- A1089 northbound to LTC southbound (total flow of 591 PCU's); and
- A1089 northbound to LTC northbound (total flow of 1120 PCU's).

9.2.12 These two connections provide a significant benefit to 64% (1711 of 2663 PCU's) of the traffic on the A1089 which otherwise would have been forced to access their eventual destinations via M25 junction 30 (or via a lengthy u-turn at the Manor Way junction on the A13 to access LTC to the south).

9.2.13 Figure 9.5 and Figure 9.6 show the total vehicle and HGV flows respectively for the 2026 core scenario in the AM peak at the proposed LTC/M25 junction. As with the LTC/A2 and LTC/A13 junctions, the scheme is designed to minimise the impact of weaving. In this case the M25 northbound off-slip to junction 29 has been greatly extended so that it is now located south of the LTC/M25 northbound merge. This results in the following total flow movements not having to weave through each other:

- 3033 PCU's from LTC northbound to M25 northbound; and
- 1659 PCU's from M25 northbound to junction 29.

9.2.14 Weaving was considered much less of an issue southbound as the distance between the merge (end of the on-slip from junction 29) and the diverge (start of LTC) is much longer than it would have been northbound. As such, it was considered that widening from the existing 4 lanes to 5 lanes would be sufficient to accommodate the additional demand generated by LTC as well as any weaving.

9.2.15 The key junction movements are as follows:

- The traffic travelling north on LTC consists of:
  - 81% (3033 PCU's) of total traffic and 97% (1605 PCU's) of HGV's continuing north towards the M25; and
  - 19% (693 PCU's) of total traffic and 3% (46 PCU's) of HGV's taking the slip/link road to M25 junction 29.
- The traffic travelling north on M25 consists of:
  - 79% (6358 PCU's) of total traffic and 95% (2728 PCU's) of HGV's continuing north on M25; and
  - 21% (1659 PCU's) of total traffic and 5% (142 PCU's) of HGV's taking the slip/link road to M25 junction 29.
- The traffic travelling south on M25 consists of:
  - 71% (5359 PCU's) of total traffic and 65% (2000 PCU's) of HGV's continuing south on M25; and

   - 29% (2180 PCU’s) of total traffic and 35% (1075 PCU’s) of HGV’s take LTC towards A13.

9.2.16 Figure 9.7 shows the total vehicle flows for the 2026 core scenario in the PM peak at the proposed LTC/A2 junction and highlights similar flow composition to the AM. The traffic on LTC northbound consists of:

- 78% (1910 of 2463 PCU’s) comes from the east;
- 10% (247 PCU’s) accesses from Gravesend East; and
- 12% (307 PCU’s) comes from the A2 to the west.

9.2.17 Similar proportions can be seen for southbound traffic on LTC:

- 83% (3751 of 4503 PCU’s) travels east;
- 11% (498 PCU’s) exits at Gravesend East; and
- 6% (255 PCU’s) continues on the A2 to the west.

9.2.18 Figure 9.7 also shows the high ‘weaving’ flows that necessitated the design of separate carriageways. These are the movements that would have been in conflict (i.e. weaving flows) in a single carriageway configuration. For westbound traffic these flows are:

- 1478 PCU’s from the M2 to LTC northbound; and
- 1850 PCU’s (approx. 1 lane worth) from A2/A289 to A2 westbound.

9.2.19 For eastbound traffic the ‘weaving’ flows are:

- 2980 PCU’s from LTC to M2 eastbound; and
- 2432 PCU’s from A2 westbound to A2/A289 in the east.

9.2.20 Figure 9.8 shows the HGV (PCU’s) flows for the 2026 core scenario in the PM peak at the proposed LTC/A2 junction and shows the very high proportions of east-to-north and north-to-east HGV traffic using LTC. Very few HGVs west of the Gravesend East junction will use LTC because HGVs have a much higher cost per km than other vehicles so will favour the shorter, LTC-relieved, existing route. This is shown by the following HGV flows using LTC northbound:

- 97% (752 PCU’s) of HGVs on LTC northbound comes from the east;
- 3% (26 PCU’s) accesses LTC from Gravesend East; and
- 0% (1 PCU) comes from the A2 to the west.

9.2.21 Similar proportions can be seen for southbound traffic on LTC:

- 95% (1006 of 1056 PCU’s) travels east;
- 4% (44 PCU’s) exits at Gravesend East; and
- 1% (6 PCU’s) continues on the A2 to the west.

9.2.22 Figure 9.9 and Figure 9.10 show the total vehicle and HGV flows respectively for the 2026 core scenario in the PM peak at the proposed LTC/A13/A1089 junction.

9.2.23 The key junction movements are as follows:

- The traffic travelling north across the Thames on LTC consists of:
  - 47% (1158 PCU's) of total traffic and 79% (625 PCU's) of HGV's continuing north towards the M25; and
  - 53% (1305 PCU's) of total traffic and 21% (164 PCU's) of HGV's turning east on to the A13.
- The traffic travelling south across the Thames on LTC consists of:
  - 49% (2192 PCU's) of total traffic and 88% (915 PCU's) of HGV's from the M25;
  - 43% (1923 PCU's) of total traffic and 8% (84 PCU's) of HGV's from A13 westbound; and
  - 9% (389 PCU's) of total traffic and 4% (39 PCU's) of HGV's from the A1089 northbound.

9.2.24 As noted for the AM, the scheme design does not provide for all possible movements at the LTC/A13 junction either due to lack of demand (e.g. A13 eastbound to LTC northbound) or because the scheme has provided significant relief to an existing route (e.g. LTC northbound to A13 westbound).

9.2.25 Another key feature of this junction is the retention of all key existing connections between the A13 and A1089 (which will include Tilbury Port traffic), and the addition of the following new connections:

- A1089 northbound to LTC southbound (total flow of 389 PCU's); and
- A1089 northbound to LTC northbound (total flow of 802 PCU's).

9.2.26 These two connections provide a significant benefit to 53% (1191 of 2234 PCU's) of the traffic on the A1089 which otherwise would have been forced to access their eventual destinations via M25 junction 30 (or via a lengthy u-turn at the Manor Way junction on the A13 to access LTC to the south).

9.2.27 Figure 9.11 and Figure 9.12 show the total vehicle and HGV flows respectively for the 2026 core scenario in the PM peak at the proposed LTC/M25 junction. As with the LTC/A2 and LTC/A13 junctions, the scheme is designed to minimise the impact of weaving. In this case the M25 northbound off-slip to junction 29 has been greatly extended so that it is now located south of the LTC/M25 northbound merge. This results in the following total flow movements not having to weave through each other:

- 2035 PCU's from LTC northbound to M25 northbound; and
- 1647 PCU's from M25 northbound to junction 29.

9.2.28 Other key junction movements are as follows:

- The traffic travelling north on LTC consists of:

  - 87% (2035 PCU’s) of total traffic and 95% (1085 PCU’s) of HGV’s continuing north towards the M25; and
  - 13% (306 PCU’s) of total traffic and 5% (60 PCU’s) of HGV’s taking the slip/link road to M25 junction 29.
- The traffic travelling north on M25 consists of:
  - 77% (5375 PCU’s) of total traffic and 87% (1876 PCU’s) of HGV’s continuing north on M25; and
  - 23% (1647 PCU’s) of total traffic and 13% (291 PCU’s) of HGV’s taking the slip/link road to M25 junction 29.
- The traffic travelling south on M25 consists of:
  - 63% (5030 PCU’s) of total traffic and 59% (1661 PCU’s) of HGV’s continuing south on M25; and
  - 37% (2956 PCU’s) of total traffic and 41% (1134 PCU’s) of HGV’s take LTC towards A13.

Figure 9.1 – LTC Junction with A2/M2 – LTAM Predicted Traffic Flows 2026 Core AM Peak All Vehicles (PCU's)

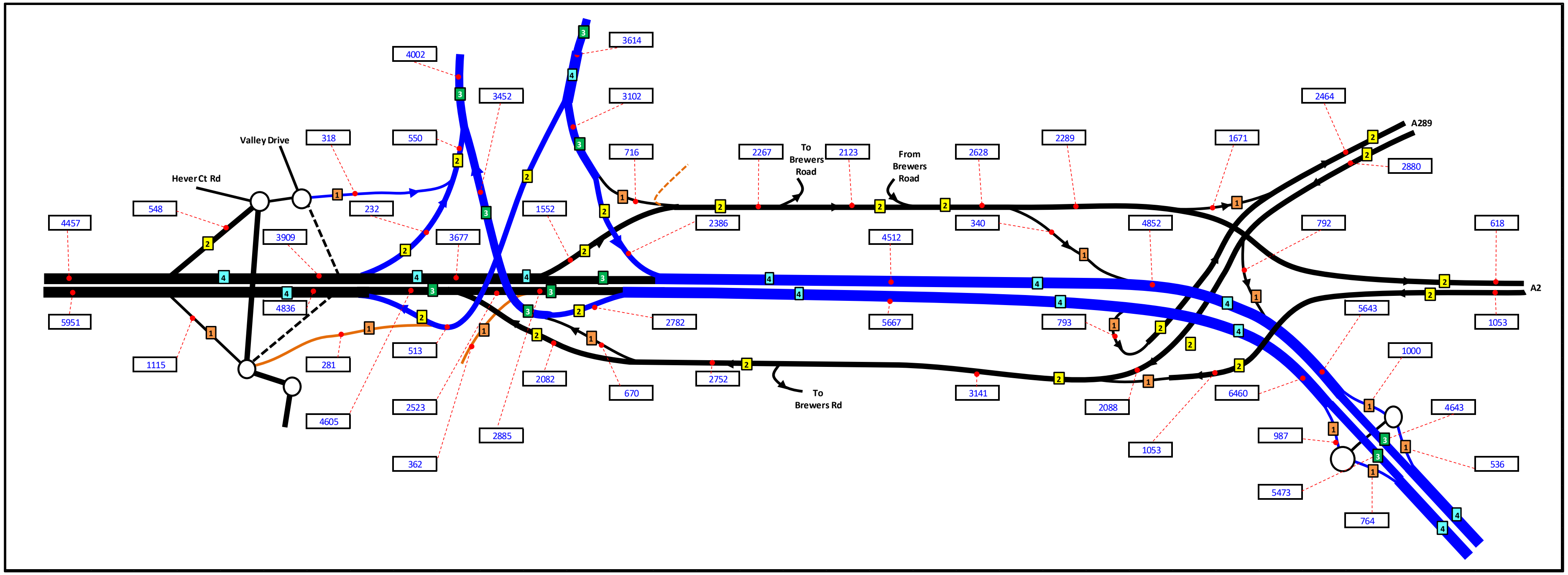


Figure 9.2 – LTC Junction with A2/M2 – LTAM Predicted Traffic Flows 2026 Core AM Peak HGV (PCU's)

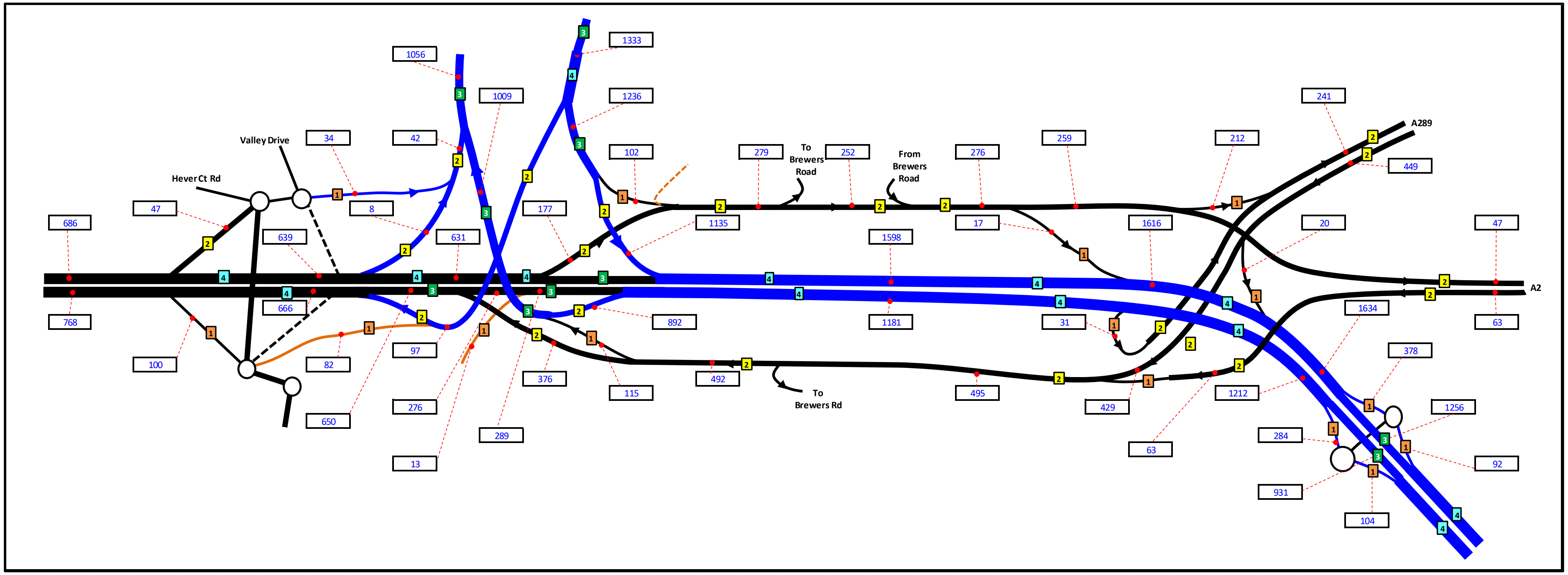


Figure 9.3 – LTC Junction with A13 – LTAM Predicted Traffic Flows 2026 Core AM Peak All Vehicles (PCU's)

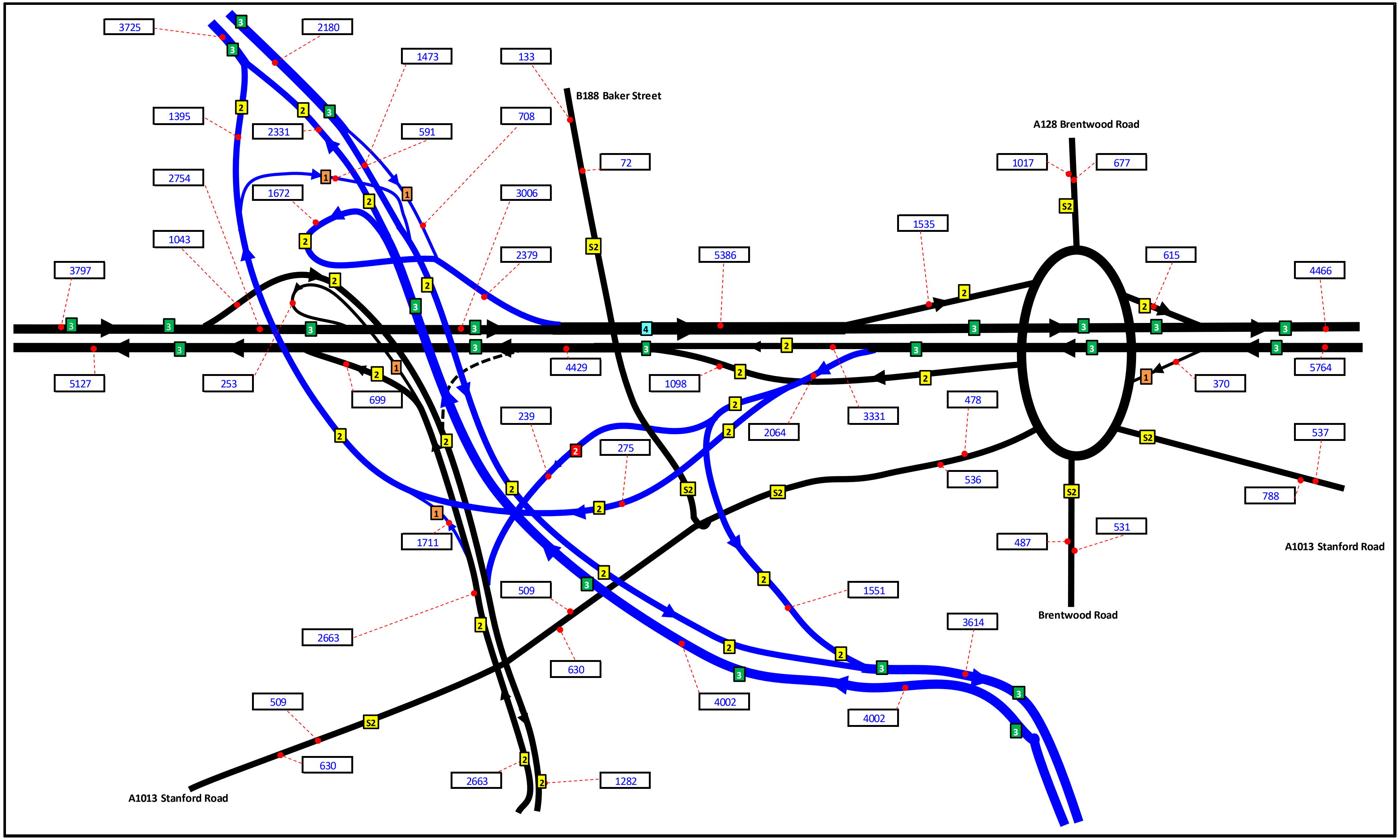


Figure 9.4 – LTC Junction with A13 – LTAM Predicted Traffic Flows 2026 Core AM Peak HGV (PCU's)

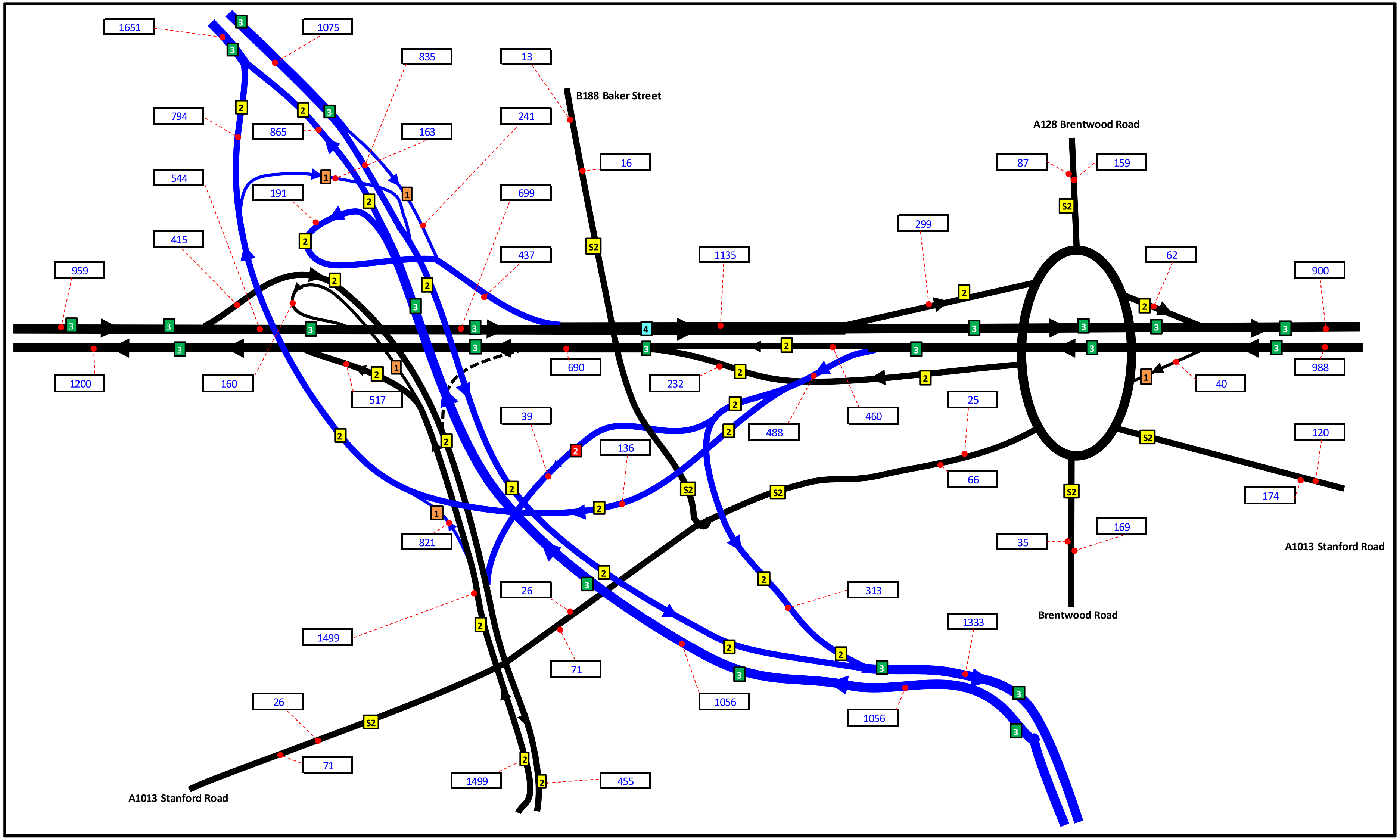


Figure 9.5 – LTC Junction with M25 – LTAM Predicted Traffic Flows 2026 Core AM Peak All Vehicles (PCU's)

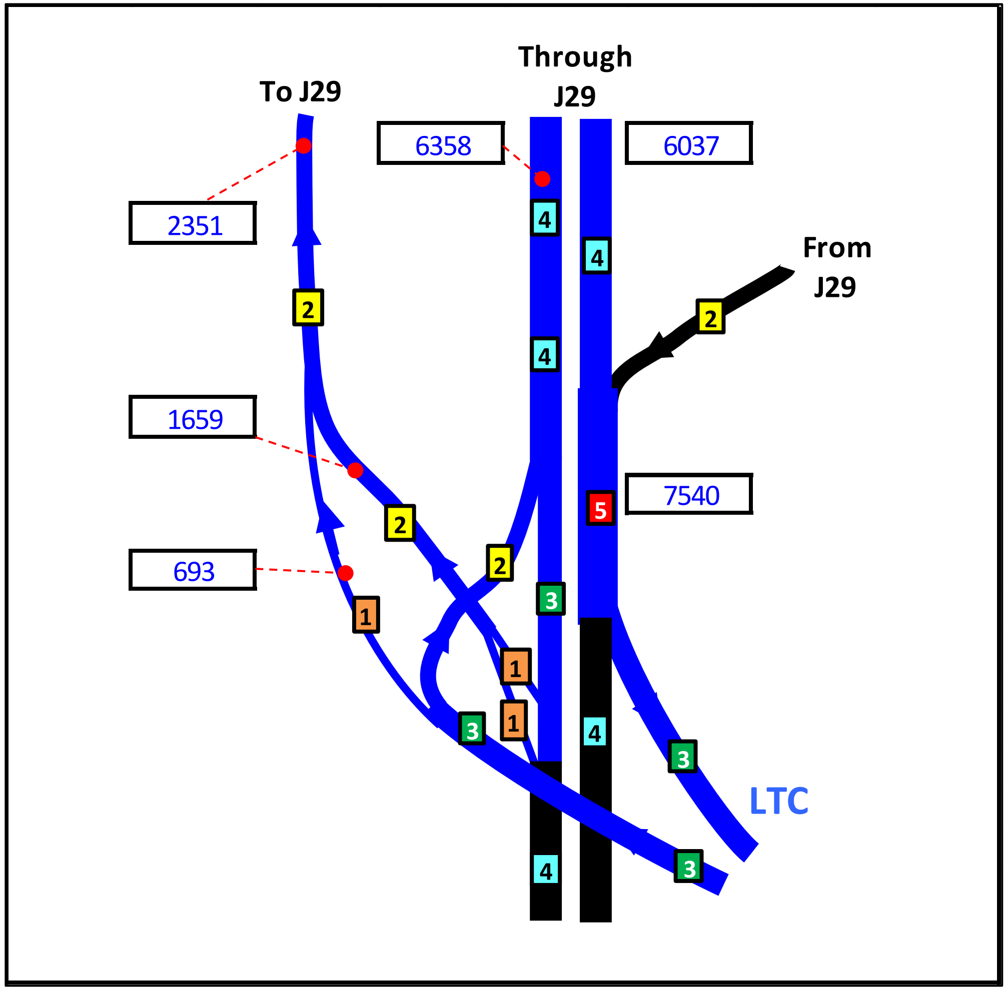


Figure 9.6 – LTC Junction with M25 – LTAM Predicted Traffic Flows 2026 Core AM Peak HGV (PCU's)

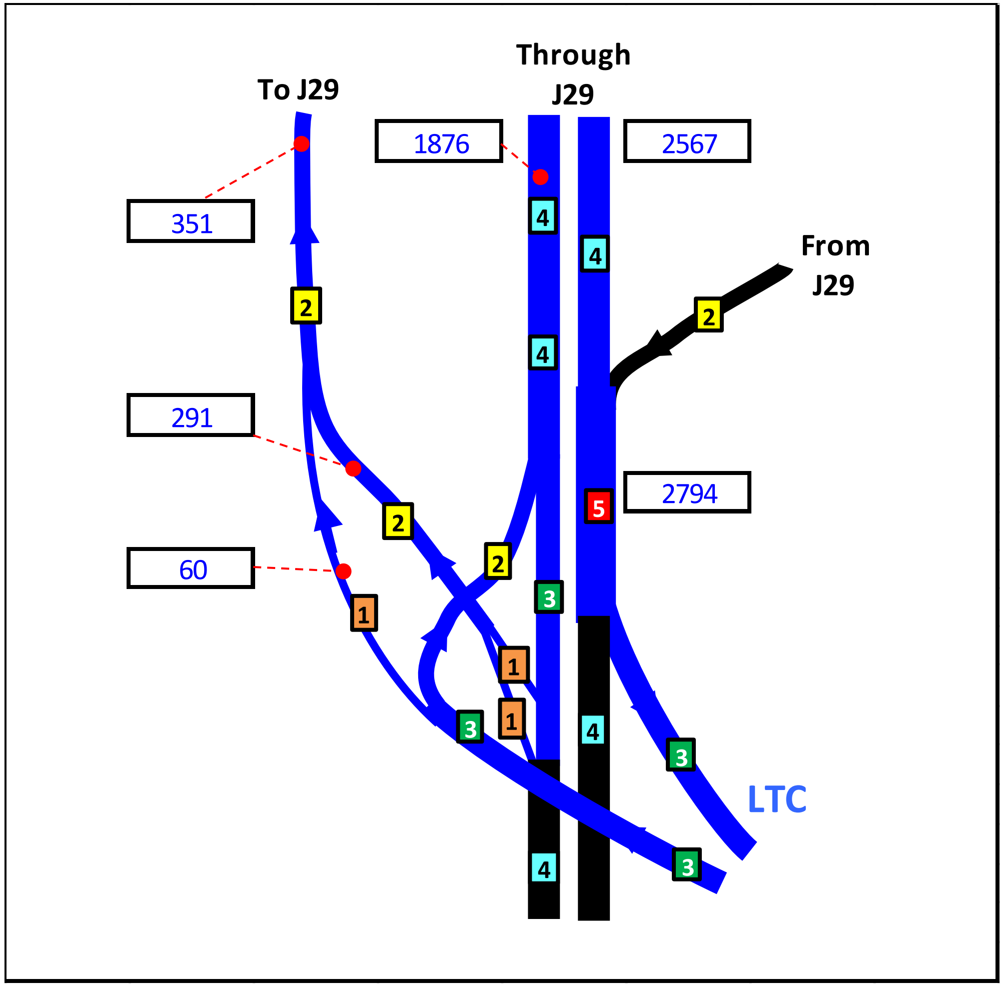


Figure 9.7 – LTC Junction with A2/M2 – LTAM Predicted Traffic Flows 2026 Core PM Peak All Vehicles (PCU's)

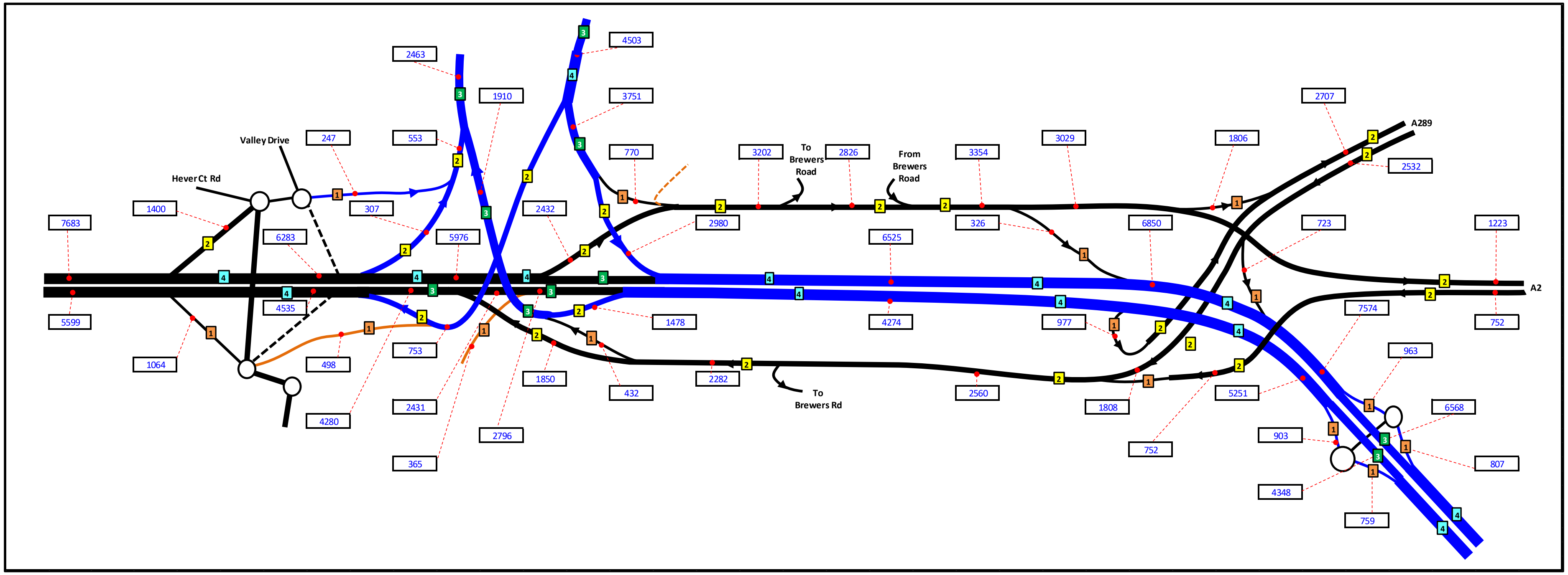


Figure 9.8 – LTC Junction with A2/M2 – LTAM Predicted Traffic Flows 2026 Core PM Peak HGV (PCU's)

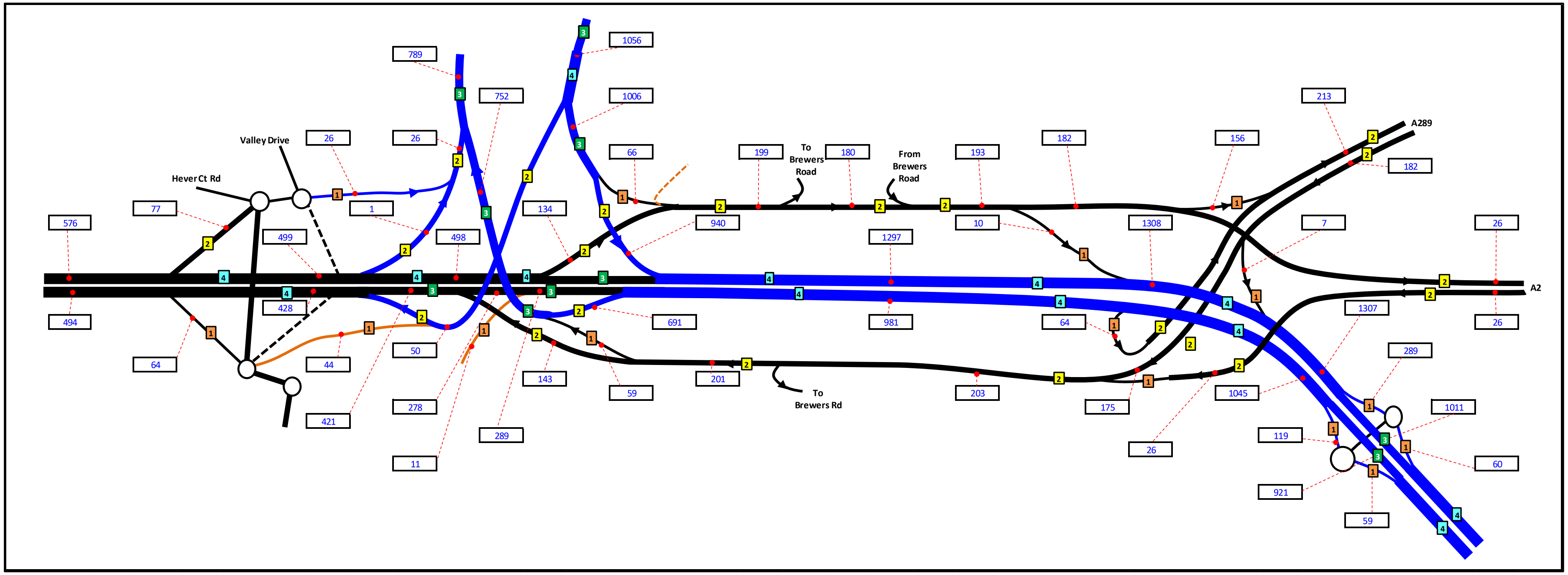


Figure 9.9 – LTC Junction with A13 – LTAM Predicted Traffic Flows 2026 Core PM Peak All Vehicles (PCU's)

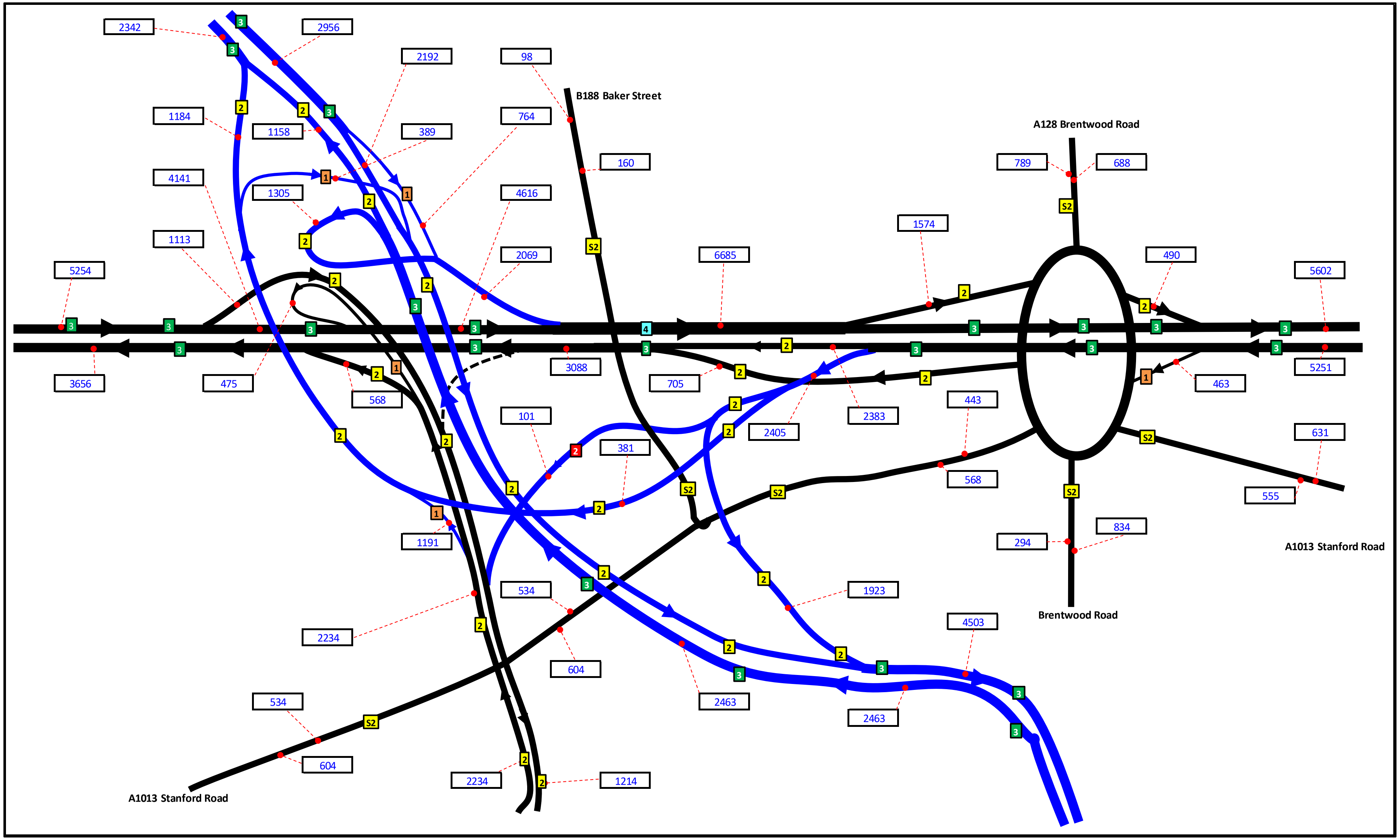


Figure 9.10 – LTC Junction with A13 – LTAM Predicted Traffic Flows 2026 Core PM Peak HGV (PCU's)

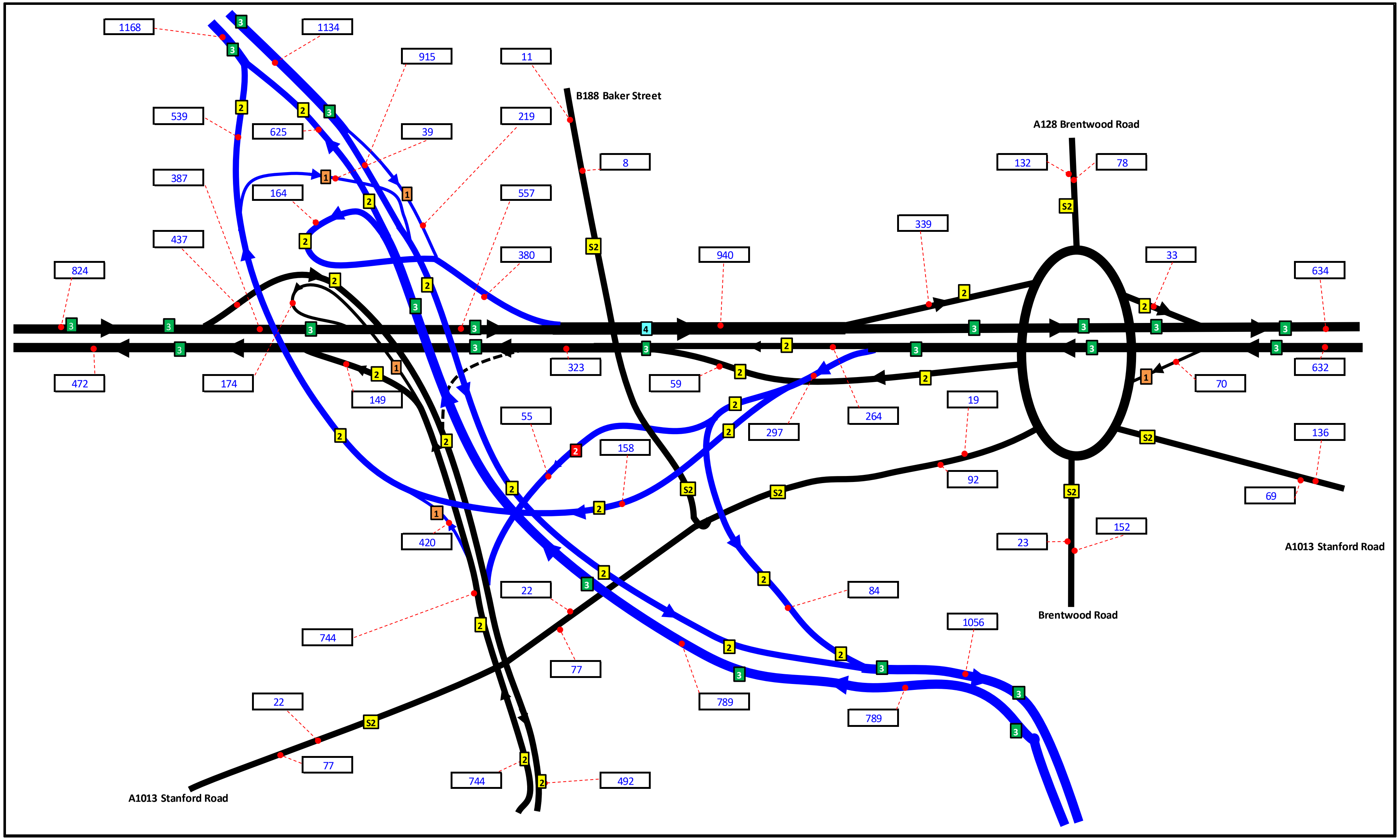


Figure 9.11 – LTC Junction with M25 – LTAM Predicted Traffic Flows 2026 Core PM Peak All Vehicles (PCU's)

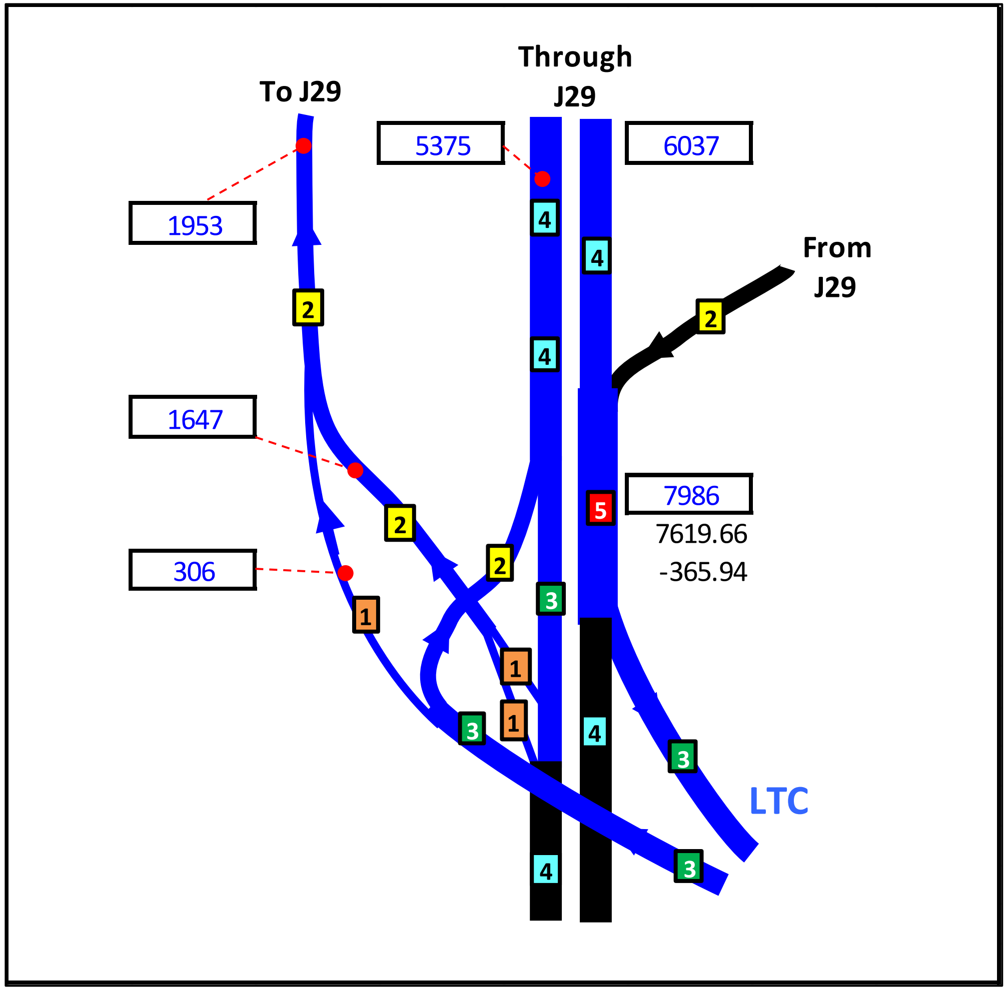
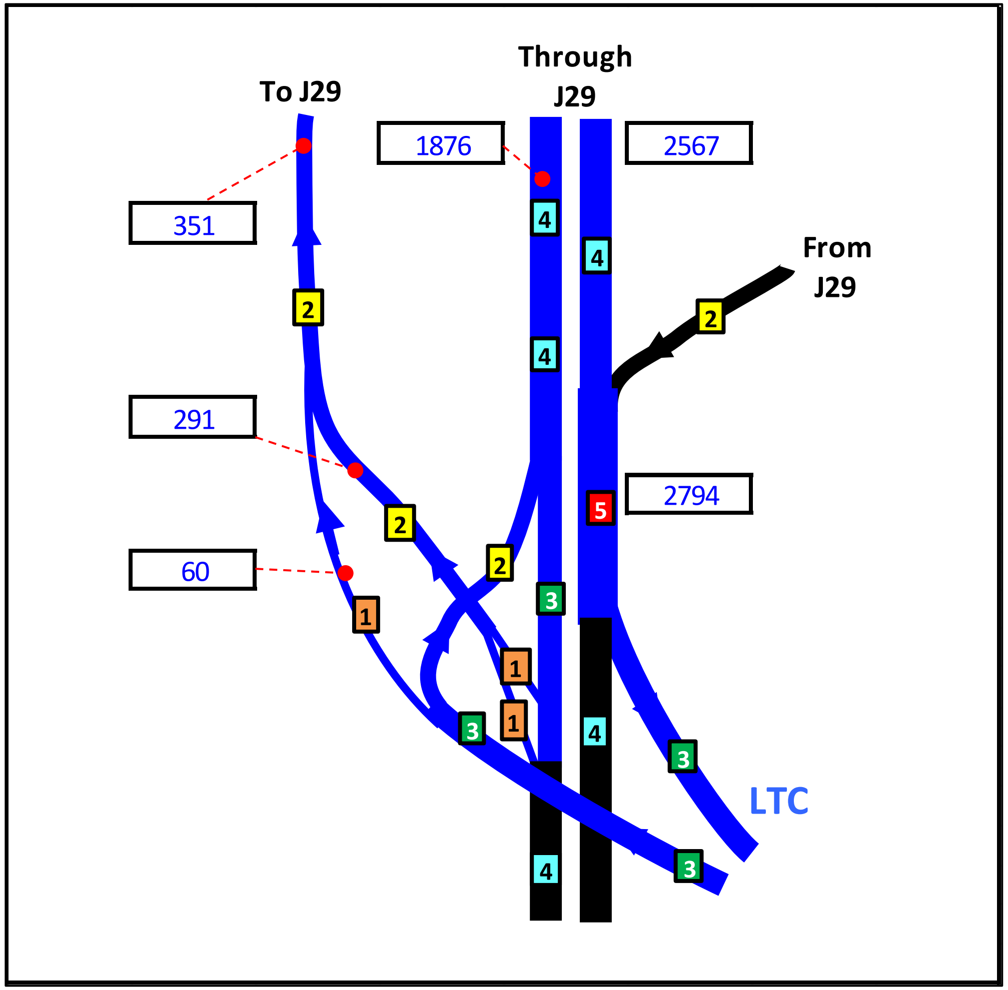


Figure 9.12 – LTC Junction with M25 – LTAM Predicted Traffic Flows 2026 Core PM Peak HGV (PCU's)



9.3 LTAM 2031 Core – Outputs to Operational Assessment

9.3.1 Figure 9.13 to Figure 9.24 provide traffic flow information at the three LTC junctions for All Vehicles and HGV for the morning and evening peak for the 2031 core scenario. The figures show a simplified representation of the junction layouts.

9.3.2 Figure 9.13 shows the total vehicle flows for the 2031 core scenario in the AM peak at the proposed LTC/A2 junction and highlights the low proportion of west-to-north and north-to-west traffic on LTC (attributed to the significant relief provided by LTC to the existing A2/A282/Dartford Crossing route). The traffic on LTC northbound consists of:

- 85% (3600 of 4230 PCU's) comes from the east;
- 8% (349 PCU's) accesses from Gravesend East; and
- 7% (280 PCU's) comes from the A2 to the west.

9.3.3 Similar proportions can be seen for southbound traffic on LTC:

- 84% (3228 of 3833 PCU's) travels east;
- 8% (315 PCU's) exits at Gravesend East; and
- 8% (289 PCU's) continues on the A2 to the west.

9.3.4 Figure 9.13 also shows the high 'weaving' flows that necessitated the design of separate carriageways at the LTC/A2 junction. These are the movements that would have been in conflict (i.e. weaving flows) in a single carriageway configuration. For westbound traffic these flows are:

- 2901 PCU's (i.e. well over 1 lane worth) from the M2 to LTC northbound; and
- 2056 PCU's (approx. 1 lane worth) from A2/A289 to A2 westbound.

9.3.5 For eastbound traffic the 'weaving' flows are:

- 2460 PCU's from LTC to M2 eastbound; and
- 1685 PCU's from A2 westbound to A2/A289 in the east.

9.3.6 Figure 9.14 shows the HGV (PCU's) flows for the 2031 core scenario in the AM peak at the proposed LTC/A2 junction and shows the very high proportions of east-to-north and north-to-east HGV traffic using LTC. Very few HGVs west of the Gravesend East junction will use LTC because HGVs have a much higher cost per km than other vehicles so will favour the shorter, LTC-relieved, existing route. This is shown by the following HGV flows using LTC northbound:

- 96% (1043 PCU's) of HGVs on LTC northbound comes from the east;
- 3% (38 PCU's) accesses LTC from Gravesend East; and
- 1% (8 PCU's) comes from the A2 to the west.

9.3.7 Similar proportions can be seen for southbound traffic on LTC:

- 92% (1236 of 1341 PCU's) travels east;
- 6% (86 PCU's) exits at Gravesend East; and
- 1% (20 PCU's) continues on the A2 to the west.

9.3.8 Figure 9.15 and Figure 9.16 show the total vehicle and HGV flows respectively for the 2031 core scenario in the AM peak at the proposed LTC/A13/A1089 junction. As with the LTC/A2 junction the scheme is designed to minimise the impact of weaving, in this case the westbound on-slip from Orsett Cock has been extended so that it joins the A13 after the A13 westbound to LTC southbound link road. In addition, the A13 westbound off-slip to the A1089 has now been incorporated into the same A13 to LTC southbound link road to also minimise weaving on the A13.

9.3.9 The key junction movements are as follows:

- The traffic travelling north across the Thames on LTC consists of:
  - 58% (2468 PCU's) of total traffic and 82% (901 PCU's) of HGV's continuing north towards the M25; and
  - 42% (1762 PCU's) of total traffic and 18% (194 PCU's) of HGV's turning east on to the A13.
- The traffic travelling south across the Thames on LTC consists of:
  - 39% (1478 PCU's) of total traffic and 62% (820 PCU's) of HGV's from the M25;
  - 44% (1685 PCU's) of total traffic and 25% (324 PCU's) of HGV's from the A13 westbound; and
  - 17% (669 PCU's) of total traffic and 13% (170 PCU's) of HGV's from the A1089 northbound.

9.3.10 The scheme design does not provide for all possible movements at the LTC/A13 junction either due to lack of demand (e.g. A13 eastbound to LTC northbound) or because the scheme has provided significant relief to an existing route (e.g. LTC northbound to A13 westbound).

9.3.11 Another key feature of this junction is the retention of all key existing connections between the A13 and A1089 (which will include Tilbury Port traffic), and the addition of the following new connections:

- A1089 northbound to LTC southbound (total flow of 669 PCU's); and
- A1089 northbound to LTC northbound (total flow of 1165 PCU's).

9.3.12 These two connections provide a significant benefit to 66% (1834 of 2792 PCU's) of the traffic on the A1089 which otherwise would have been forced to access their eventual destinations via M25 junction 30 (or via a lengthy u-turn at the Manor Way junction on the A13 to access LTC to the south).

9.3.13 Figure 9.17 and Figure 9.18 show the total vehicle and HGV flows respectively for the 2031 core scenario in the AM peak at the proposed LTC/M25 junction. As with the LTC/A2 and LTC/A13 junctions, the scheme is designed to minimise the impact of weaving. In this case the M25 northbound off-slip to junction 29 has been greatly extended so that it is now located south of the LTC/M25 northbound merge. This results in the following total flow movements not having to weave through each other:

- 3231 PCU's from LTC northbound to M25 northbound; and
- 1740 PCU's from M25 northbound to junction 29.

9.3.14 Weaving was considered much less of an issue southbound as the distance between the merge (end of the on-slip from junction 29) to the diverge (start of LTC) is much longer than it would have been northbound. As such, it was considered that widening from the existing 4 lanes to 5 lanes would be sufficient to accommodate the additional demand generated by LTC as well as any weaving.

9.3.15 The key junction movements are as follows:

- The traffic travelling north on LTC consists of:
  - 82% (3231 PCU's) of total traffic and 97% (1647 PCU's) of HGV's continuing north towards the M25; and
  - 18% (726 PCU's) of total traffic and 3% (45 PCU's) of HGV's taking the slip/link road to M25 junction 29.
- The traffic travelling north on M25 consists of:
  - 67% (3553 PCU's) of total traffic and 89% (1174 PCU's) of HGV's continuing north on M25; and
  - 33% (1740 PCU's) of total traffic and 11% (147 PCU's) of HGV's taking the slip/link road to M25 junction 29.
- The traffic travelling south on M25 consists of:
  - 71% (5665 PCU's) of total traffic and 66% (2084 PCU's) of HGV's continuing south on M25; and
  - 29% (2267 PCU's) of total traffic and 34% (1060 PCU's) of HGV's take LTC towards A13.

9.3.16 Figure 9.19 shows the total vehicle flows for the 2031 core scenario in the PM peak at the proposed LTC/A2 junction and highlights similar flow composition to the AM. The traffic on LTC northbound consists of:

- 75% (2026 of 2703 PCU's) comes from the east;
- 11% (290 PCU's) accesses from Gravesend East; and
- 14% (387 PCU's) comes from the A2 to the west.

9.3.17 Similar proportions can be seen for southbound traffic on LTC:

- 82% (3818 of 4652 PCU's) travels east;
- 12% (554 PCU's) exits at Gravesend East; and

- 6% (279 PCU's) continues on the A2 to the west.

9.3.18 Figure 9.19 also shows the high 'weaving' flows that necessitated the design of separate carriageways. These are the movements that would have been in conflict (i.e. weaving flows) in a single carriageway configuration. For westbound traffic these flows are:

- 1551 PCU's from the M2 to LTC northbound; and
- 1956 PCU's (approx. 1 lane worth) from A2/A289 to A2 westbound.

9.3.19 For eastbound traffic the 'weaving' flows are:

- 3019 PCU's from LTC to M2 eastbound; and
- 2398 PCU's from A2 westbound to A2/A289 in the east.

9.3.20 Figure 9.20 shows the HGV (PCU's) flows for the 2031 core scenario in the PM peak at the proposed LTC/A2 junction and shows the very high proportions of east-to-north and north-to-east HGV traffic using LTC. Very few HGVs west of the Gravesend East junction will use LTC because HGVs have a much higher cost per km than other vehicles so will favour the shorter, LTC-relieved, existing route. This is shown by the following HGV flows using LTC northbound:

- 96% (776 PCU's) of HGVs on LTC northbound comes from the east;
- 4% (28 PCU's) accesses LTC from Gravesend East; and
- 0% (2 PCU) comes from the A2 to the west.

9.3.21 Similar proportions can be seen for southbound traffic on LTC:

- 95% (1009 of 1056 PCU's) travels east;
- 5% (48 PCU's) exits at Gravesend East; and
- 0% (5 PCU's) continues on the A2 to the west.

9.3.22 Figure 9.21 and Figure 9.22 show the total vehicle and HGV flows respectively for the 2031 core scenario in the PM peak at the proposed LTC/A13/A1089 junction.

9.3.23 The key junction movements are as follows:

- The traffic travelling north across the Thames on LTC consists of:
  - 46% (1235 PCU's) of total traffic and 79% (646 PCU's) of HGV's continuing north towards the M25; and
  - 54% (1468 PCU's) of total traffic and 21% (169 PCU's) of HGV's turning east on to the A13.
- The traffic travelling south across the Thames on LTC consists of:
  - 48% (2226 PCU's) of total traffic and 88% (914 PCU's) of HGV's from the M25;
  - 43% (2013 PCU's) of total traffic and 8% (82 PCU's) of HGV's from A13 westbound; and

  - 9% (412 PCU's) of total traffic and 4% (40 PCU's) of HGV's from the A1089 northbound.

9.3.24 As noted for the AM, the scheme design does not provide for all possible movements at the LTC/A13 junction either due to lack of demand (e.g. A13 eastbound to LTC northbound) or because the scheme has provided significant relief to an existing route (e.g. LTC northbound to A13 westbound).

9.3.25 Another key feature of this junction is the retention of all key existing connections between the A13 and A1089 (which will include Tilbury Port traffic), and the addition of the following new connections:

- A1089 northbound to LTC southbound (total flow of 412 PCU's); and
- A1089 northbound to LTC northbound (total flow of 855 PCU's)

9.3.26 These two connections provide a significant benefit to 54% (1267 of 2347 PCU's) of the traffic on the A1089 which otherwise would have been forced to access their eventual destinations via M25 junction 30 (or via a lengthy u-turn at the Manor Way junction on the A13 to access LTC to the south).

9.3.27 Figure 9.23 and Figure 9.24 show the total vehicle and HGV flows respectively for the 2031 core scenario in the PM peak at the proposed LTC/M25 junction. As with the LTC/A2 and LTC/A13 junctions, the scheme is designed to minimise the impact of weaving. In this case the M25 northbound off-slip to junction 29 has been greatly extended so that it is now located south of the LTC/M25 northbound merge. This results in the following total flow movements not having to weave through each other:

- 2131 PCU's from LTC northbound to M25 northbound; and
- 1761 PCU's from M25 northbound to junction 29.

9.3.28 Other key junction movements are as follows:

- The traffic travelling north on LTC consists of:
  - 86% (2131 PCU's) of total traffic and 95% (1145 PCU's) of HGV's continuing north towards the M25; and
  - 14% (359 PCU's) of total traffic and 5% (63 PCU's) of HGV's taking the slip/link road to M25 junction 29.
- The traffic travelling north on M25 consists of:
  - 67% (3520 PCU's) of total traffic and 73% (792 PCU's) of HGV's continuing north on M25; and
  - 33% (1761 PCU's) of total traffic and 27% (299 PCU's) of HGV's taking the slip/link road to M25 junction 29.
- The traffic travelling south on M25 consists of:
  - 63% (5354 PCU's) of total traffic and 60% (1730 PCU's) of HGV's continuing south on M25; and
  - 37% (3092 PCU's) of total traffic and 40% (1140 PCU's) of HGV's take LTC towards A13.

Figure 9.13 – LTC Junction with A2/M2 – LTAM Predicted Traffic Flows 2031 Core AM Peak All Vehicles (PCU's)

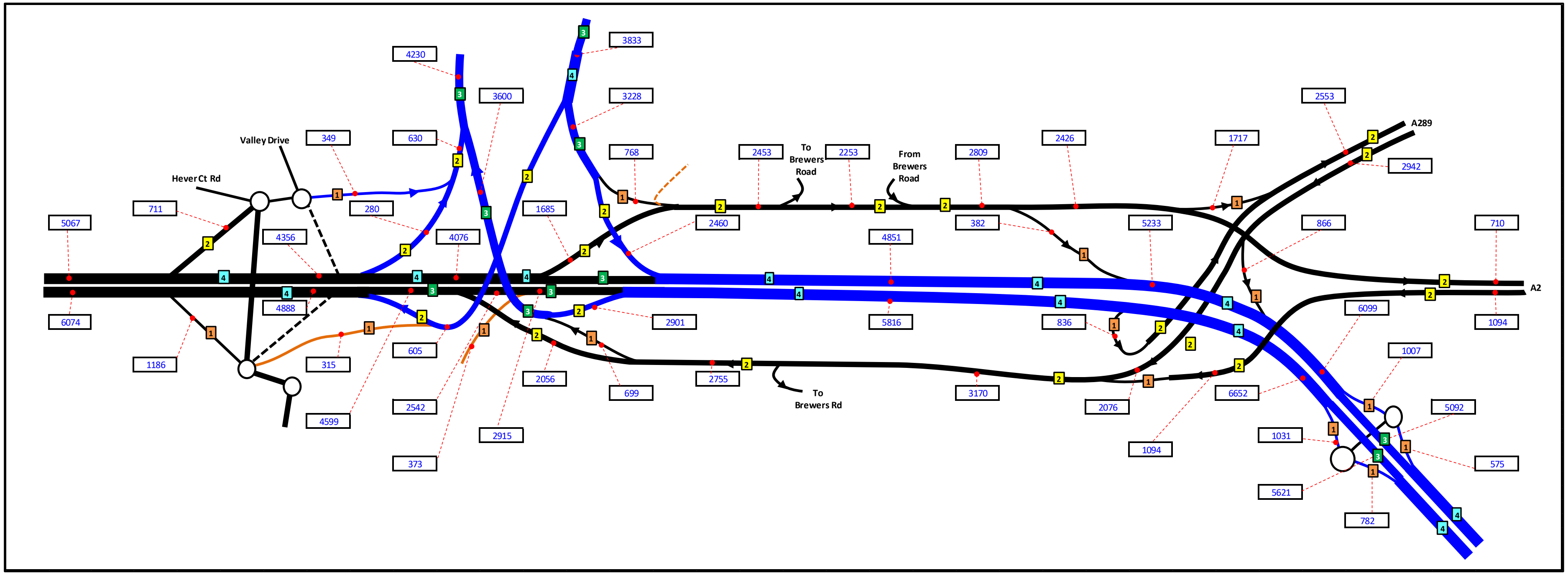


Figure 9.14 – LTC Junction with A2/M2 – LTAM Predicted Traffic Flows 2031 Core AM Peak HGV (PCU's)

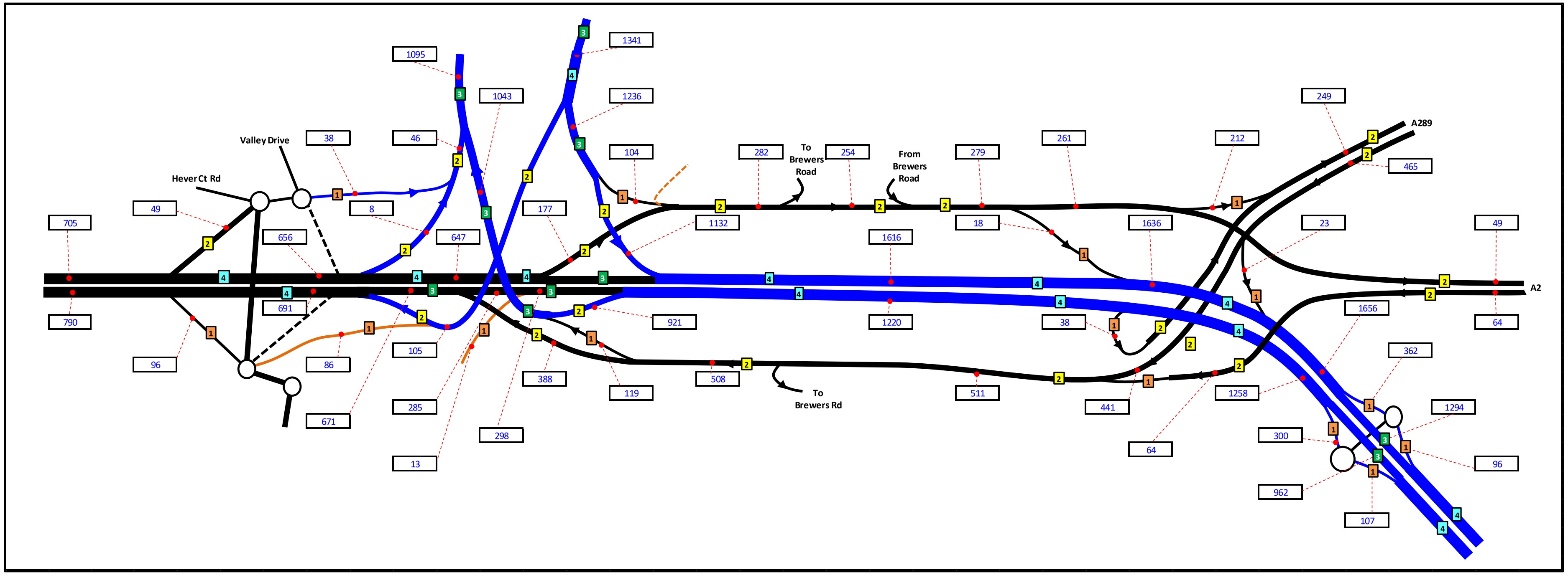


Figure 9.15 – LTC Junction with A13 – LTAM Predicted Traffic Flows 2031 Core AM Peak All Vehicles (PCU's)

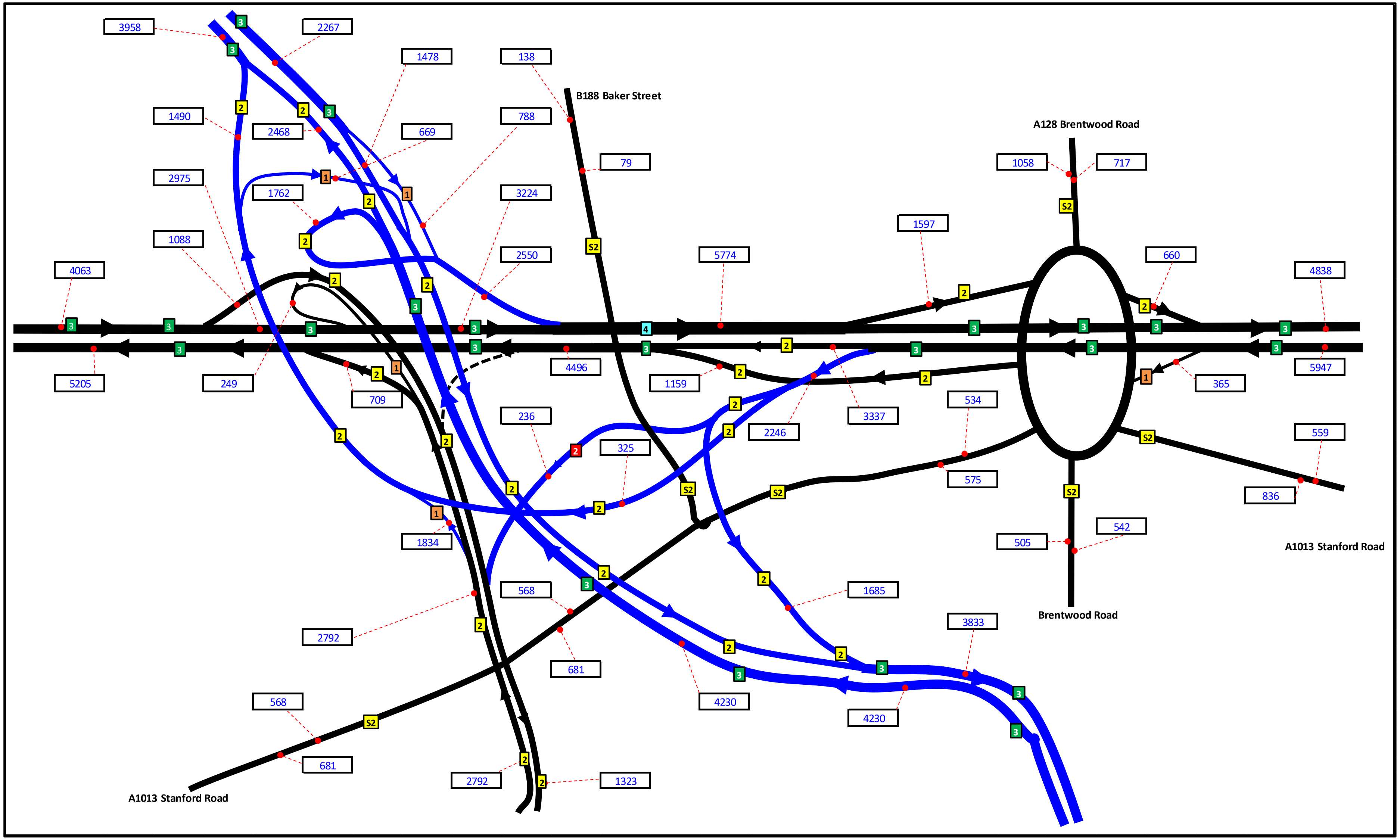


Figure 9.16 – LTC Junction with A13 – LTAM Predicted Traffic Flows 2031 Core AM Peak HGV (PCU's)

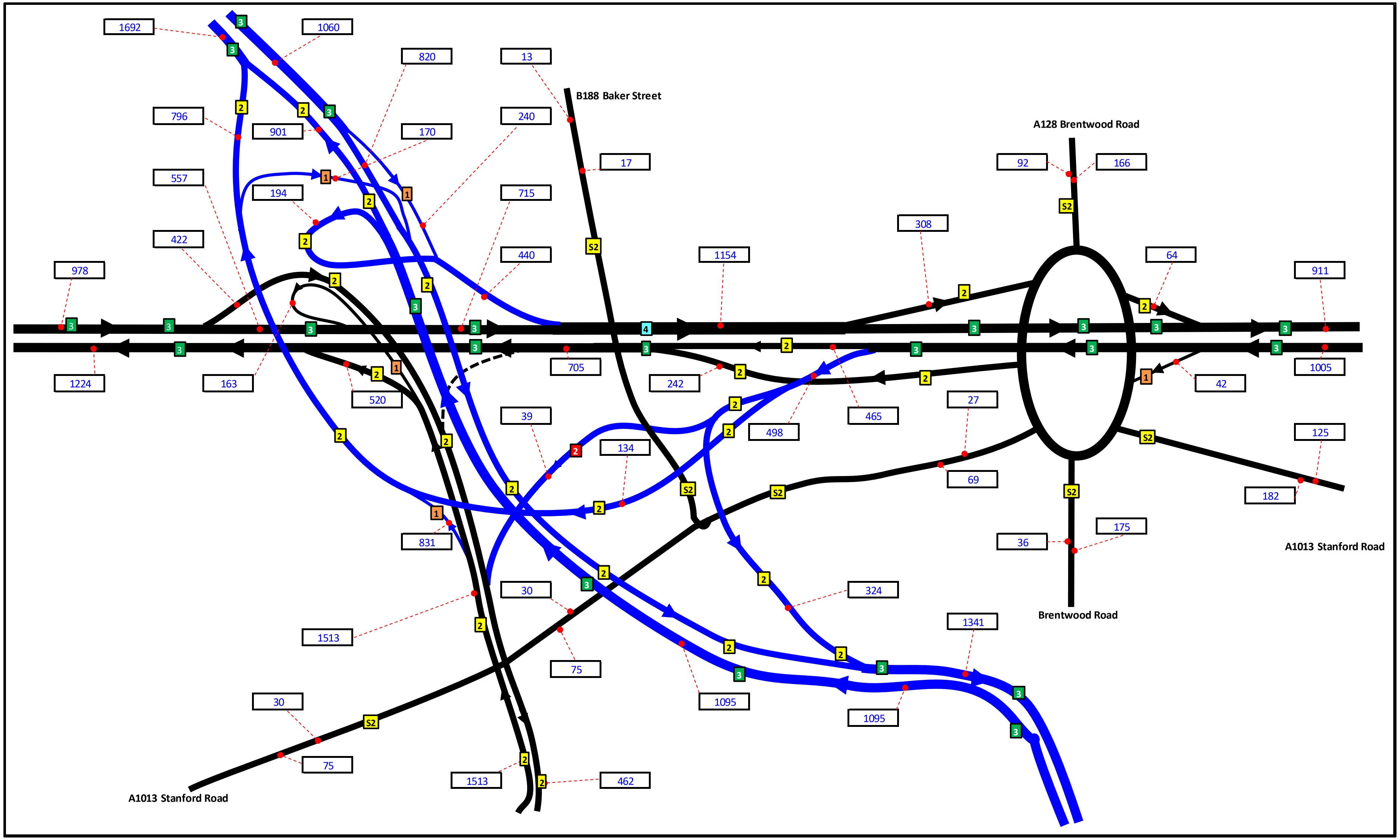


Figure 9.17 – LTC Junction with M25 – LTAM Predicted Traffic Flows 2031 Core AM Peak All Vehicles (PCU's)

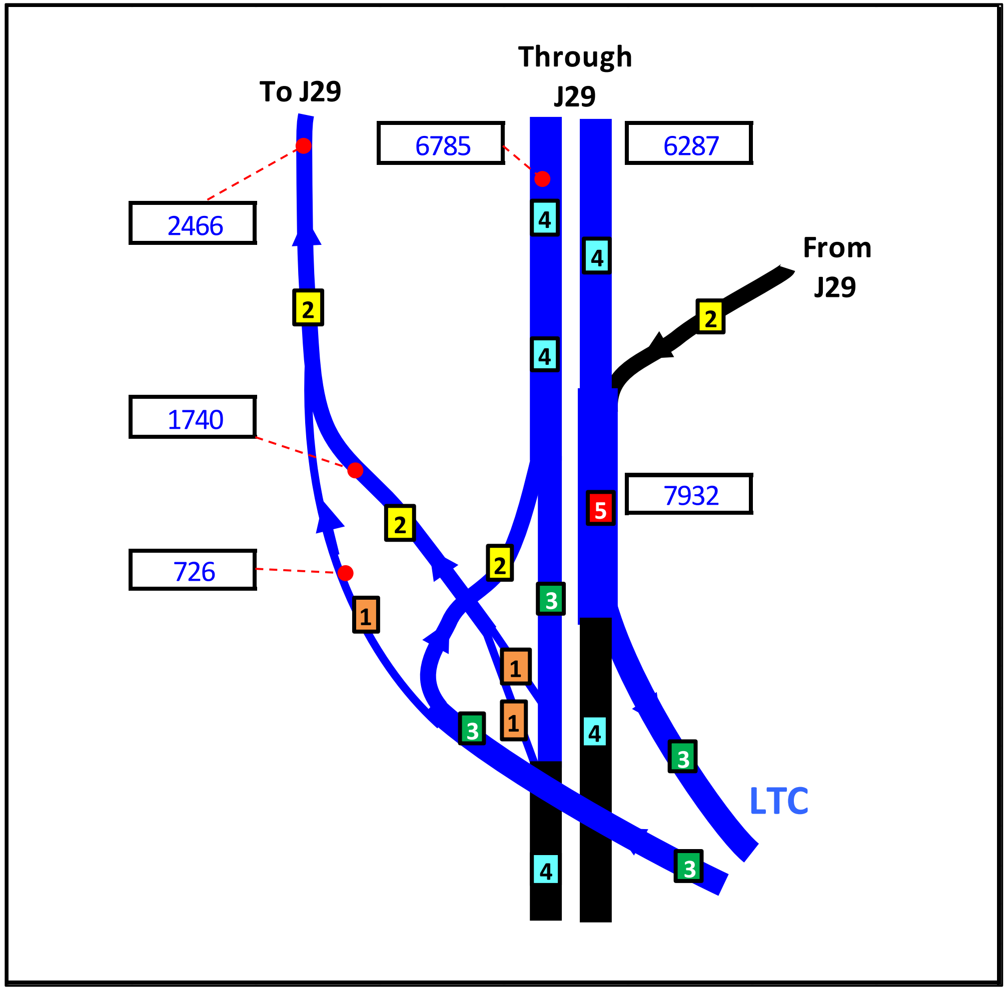


Figure 9.18 – LTC Junction with M25 – LTAM Predicted Traffic Flows 2031 Core AM Peak HGV (PCU's)

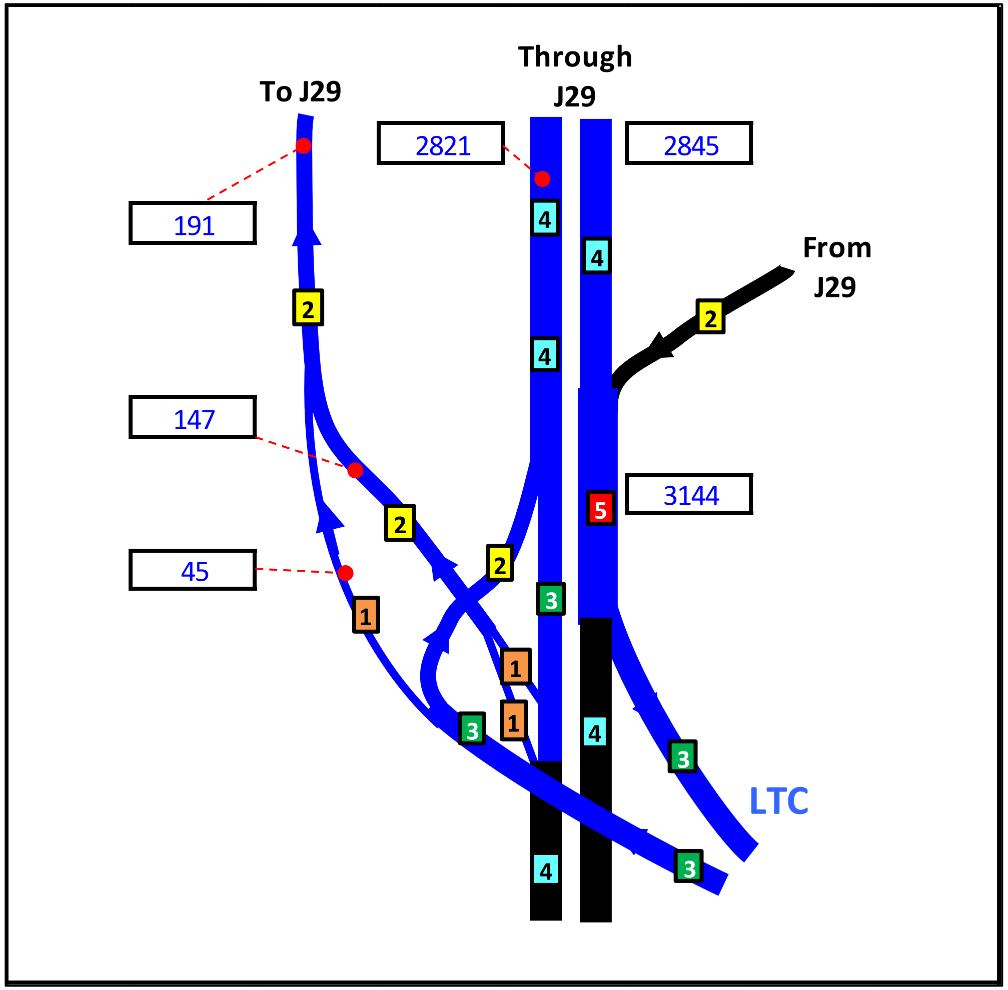


Figure 9.19 – LTC Junction with A2/M2 – LTAM Predicted Traffic Flows 2031 Core PM Peak All Vehicles (PCU's)

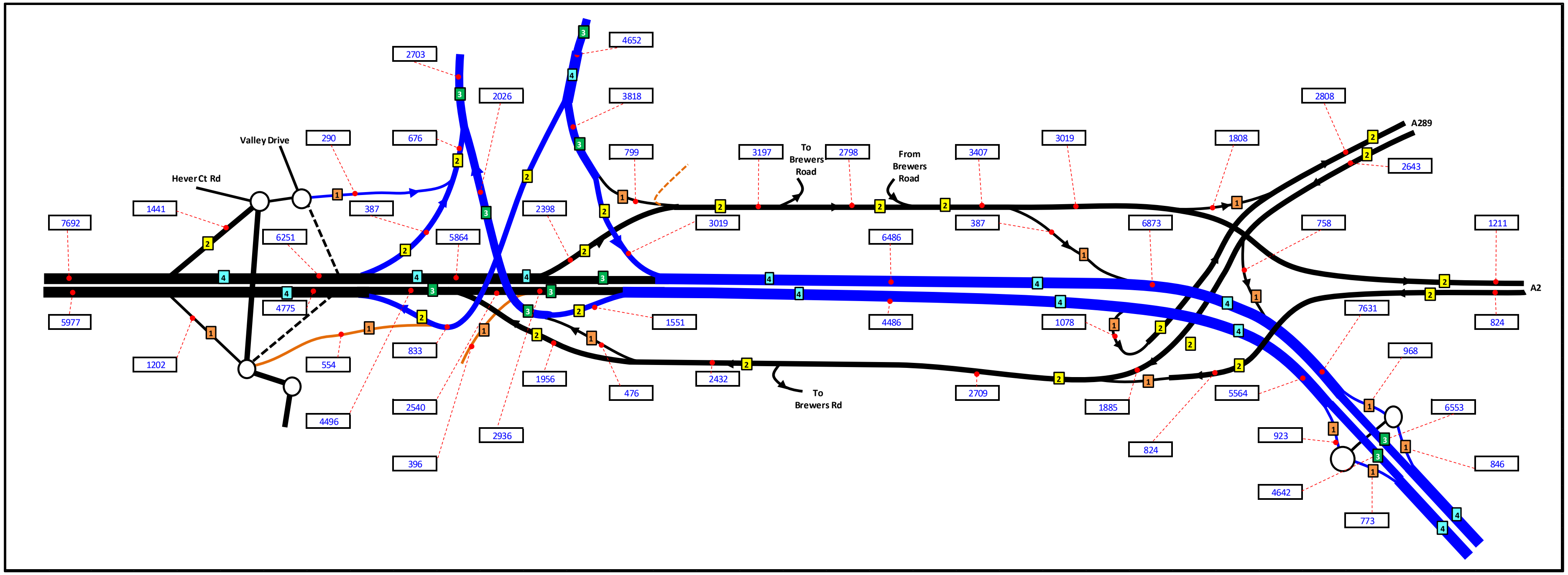


Figure 9.20 – LTC Junction with A2/M2 – LTAM Predicted Traffic Flows 2031 Core PM Peak HGV (PCU's)

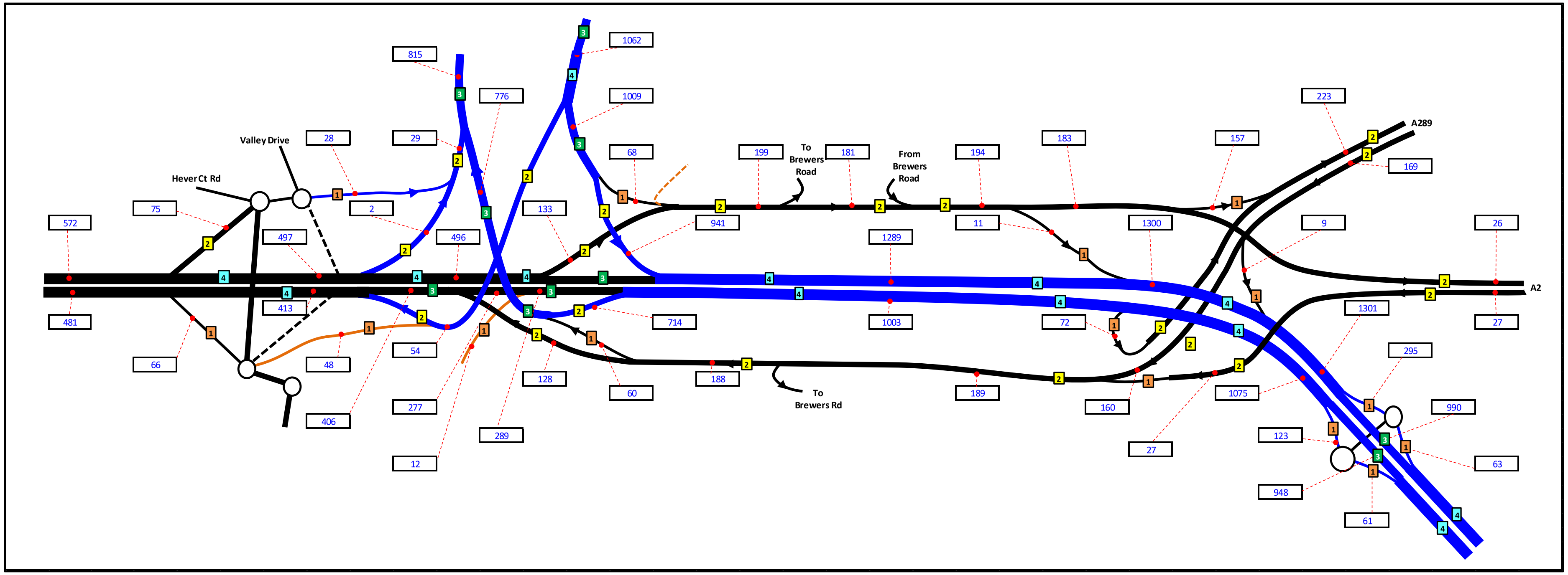


Figure 9.21 – LTC Junction with A13 – LTAM Predicted Traffic Flows 2031 Core PM Peak All Vehicles (PCU's)

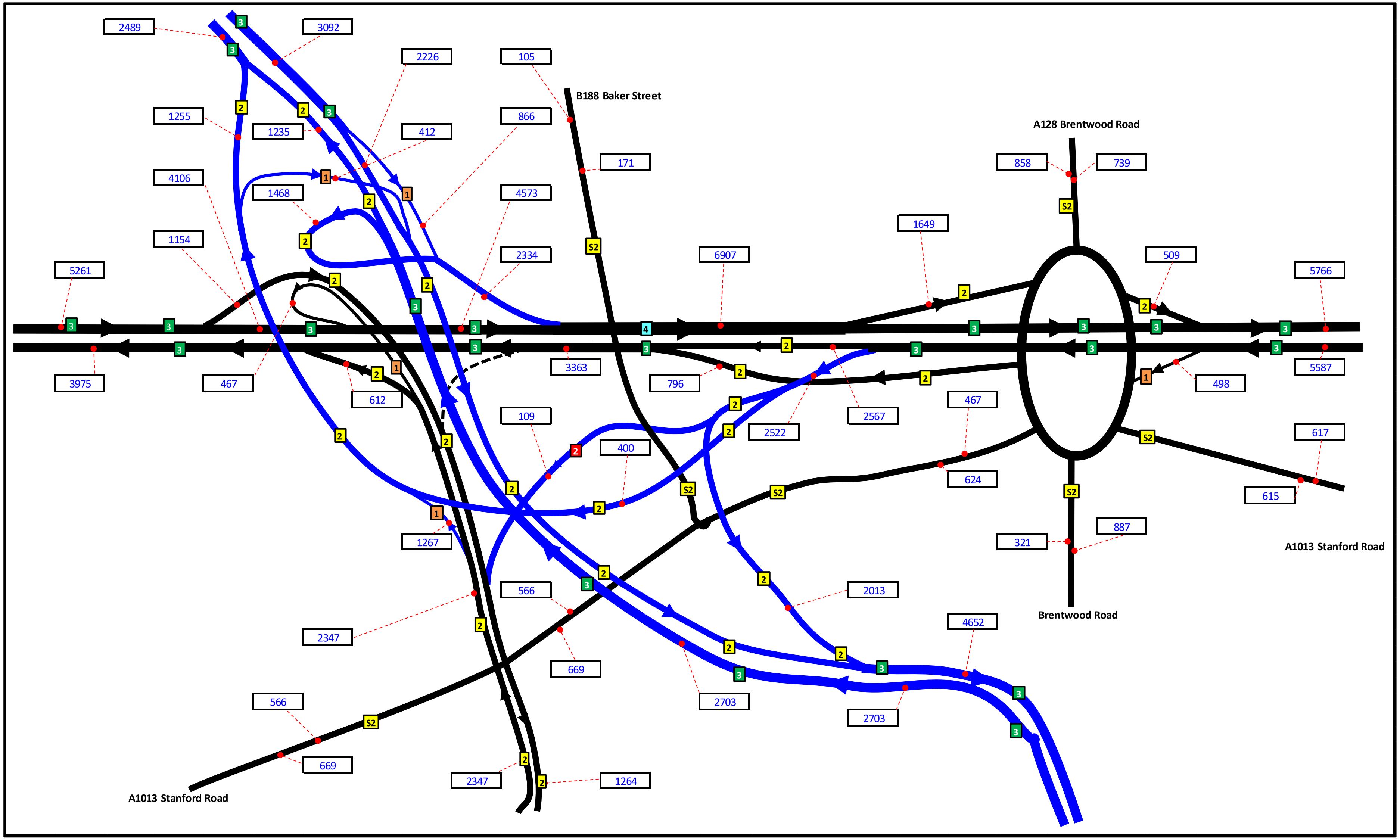


Figure 9.22 – LTC Junction with A13 – LTAM Predicted Traffic Flows 2031 Core PM Peak HGV (PCU's)

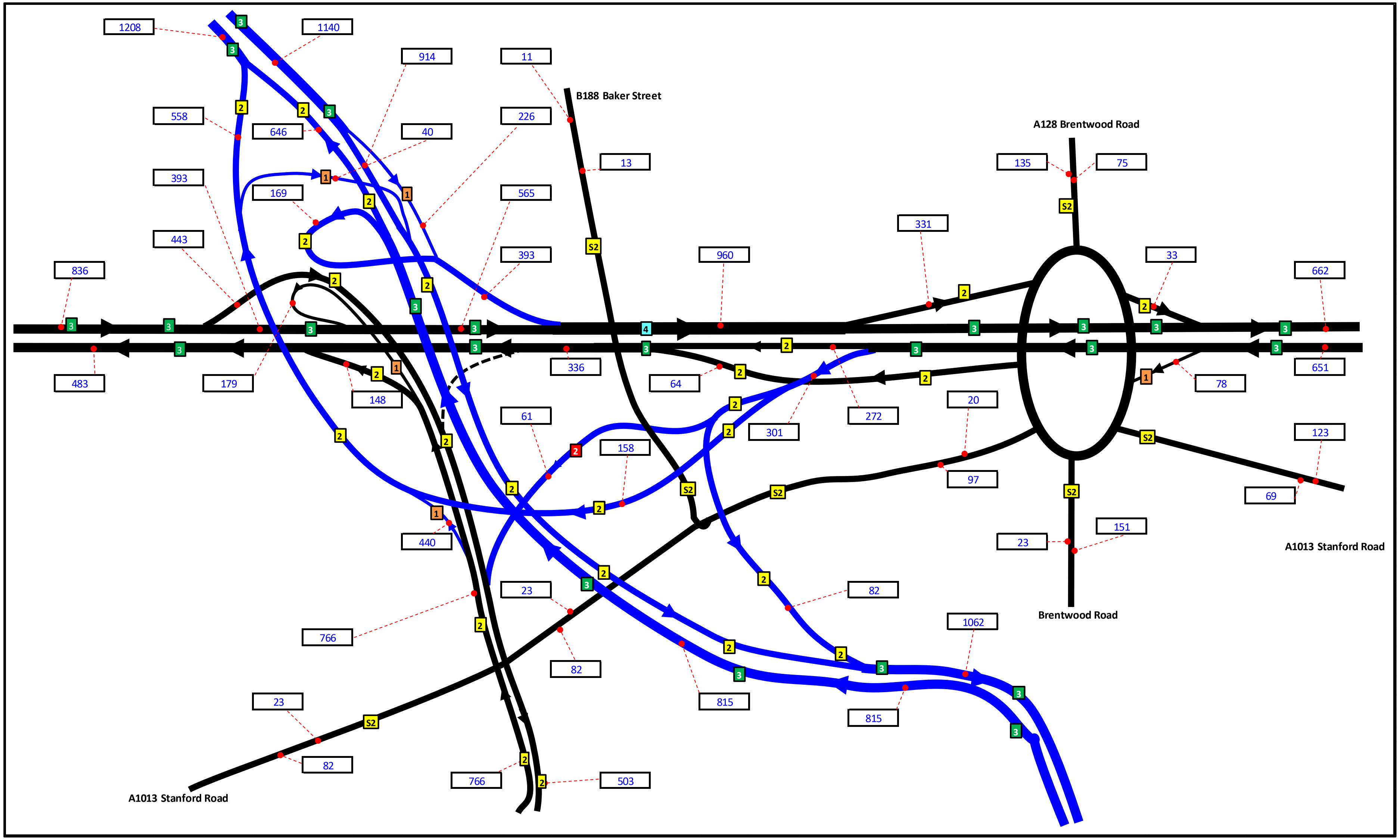


Figure 9.23 – LTC Junction with M25 – LTAM Predicted Traffic Flows 2031 Core PM Peak All Vehicles (PCU's)

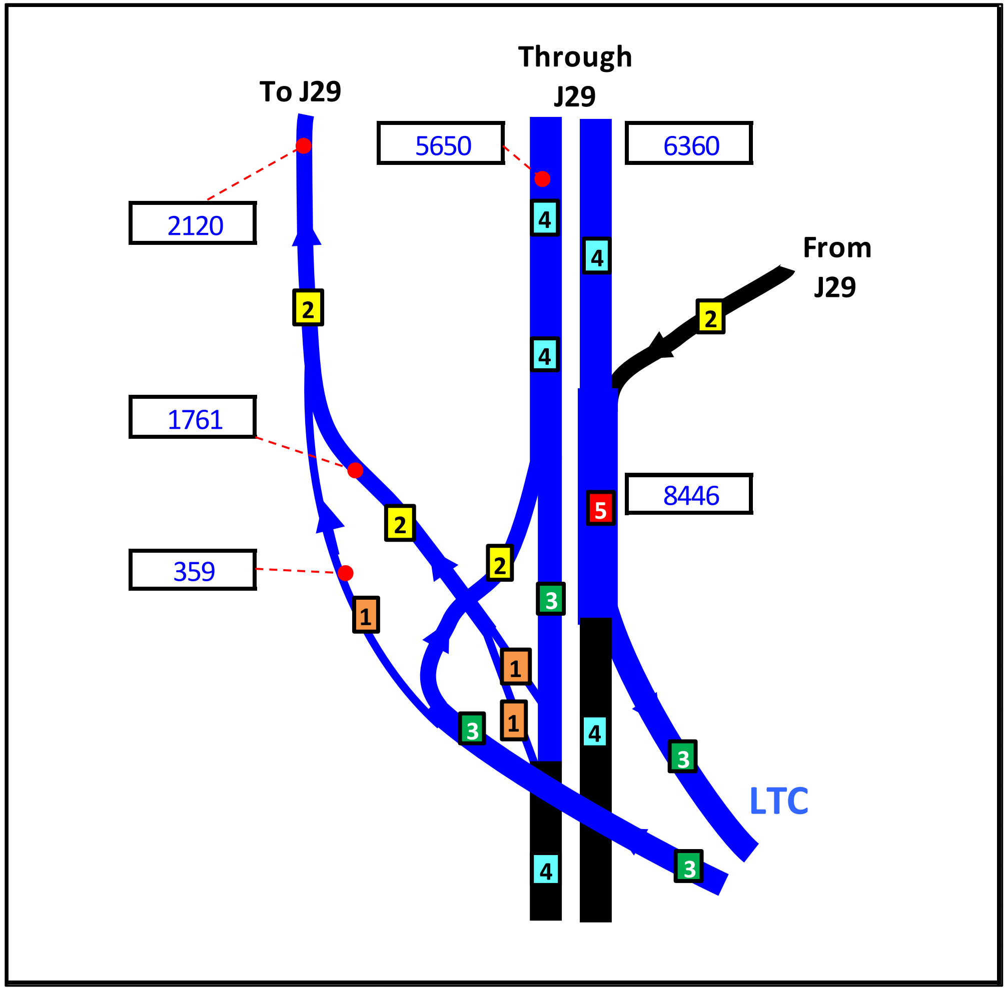
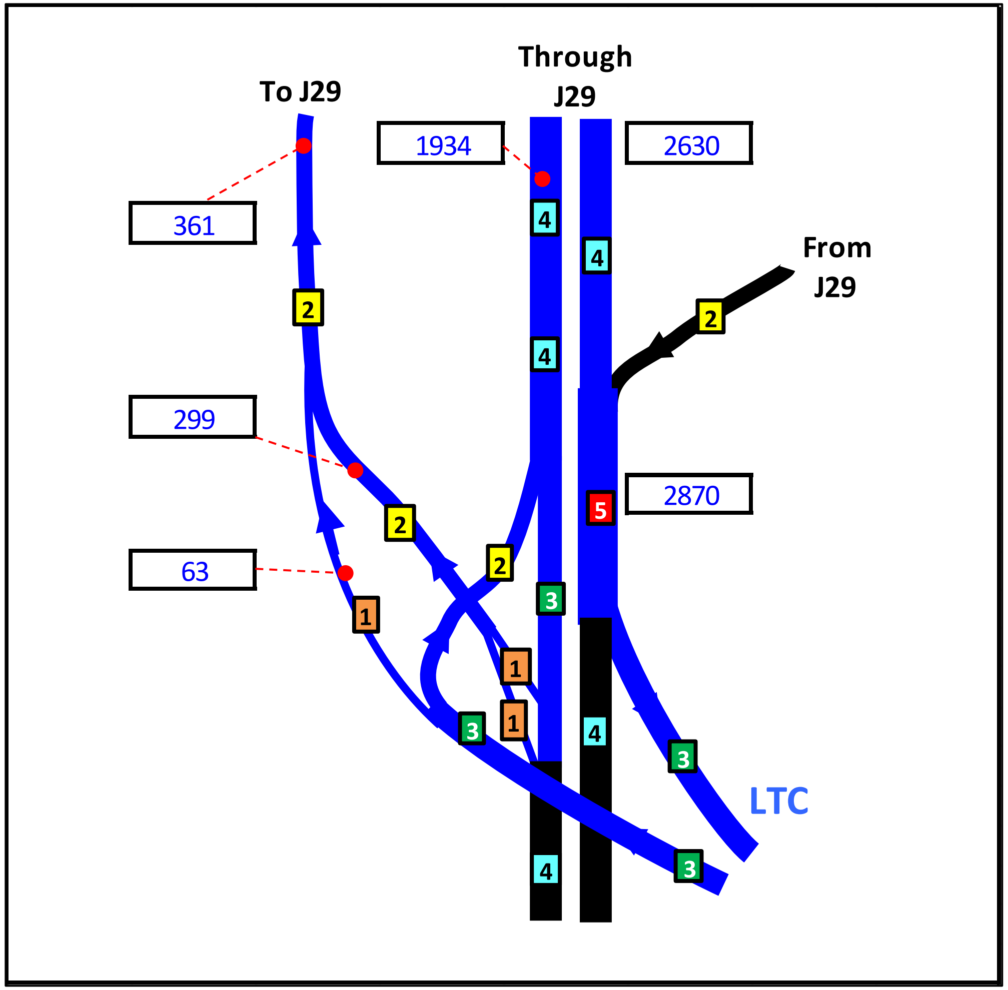


Figure 9.24 – LTC Junction with M25 – LTAM Predicted Traffic Flows 2031 Core PM Peak HGV (PCU's)



9.4 LTAM 2041 Core – Outputs to Operational Assessment

9.4.1 Figure 9.25 to Figure 9.36 provide traffic flow information at the three LTC junctions for All Vehicles and HGV for the morning and evening peak for the 2041 core scenario. The figures show a simplified representation of the junction layouts.

9.4.2 Figure 9.25 shows the total vehicle flows for the 2041 core scenario in the AM peak at the proposed LTC/A2 junction and highlights the low proportion of west-to-north and north-to-west traffic on LTC (attributed to the significant relief provided by LTC to the existing A2/A282/Dartford Crossing route). The traffic on LTC northbound consists of:

- 83% (3901 of 4679 PCU's) comes from the east;
- 9% (412 PCU's) accesses from Gravesend East; and
- 8% (366 PCU's) comes from the A2 to the west.

9.4.3 Similar proportions can be seen for southbound traffic on LTC:

- 83% (3351 of 4024 PCU's) travels east;
- 9% (354 PCU's) exits at Gravesend East; and
- 8% (319 PCU's) continues on the A2 to the west.

9.4.4 Figure 9.25 also shows the high 'weaving' flows that necessitated the design of separate carriageways at the LTC/A2 junction. These are the movements that would have been in conflict (i.e. weaving flows) in a single carriageway configuration. For westbound traffic these flows are:

- 3125 PCU's (i.e. well over 1 lane worth) from the M2 to LTC northbound; and
- 2098 PCU's (approx. 1 lane worth) from A2/A289 to A2 westbound.

9.4.5 For eastbound traffic the 'weaving' flows are:

- 2527 PCU's from LTC to M2 eastbound; and
- 1743 PCU's from A2 westbound to A2/A289 in the east.

9.4.6 Figure 9.26 shows the HGV (PCU's) flows for the 2041 core scenario in the AM peak at the proposed LTC/A2 junction and shows the very high proportions of east-to-north and north-to-east HGV traffic using LTC. Very few HGVs west of the Gravesend East junction will use LTC because HGVs have a much higher cost per km than other vehicles so will favour the shorter, LTC-relieved, existing route. This is shown by the following HGV flows using LTC northbound:

- 96% (1126 PCU's) of HGVs on LTC northbound comes from the east;
- 3% (41 PCU's) accesses LTC from Gravesend East; and
- 1% (9 PCU's) comes from the A2 to the west.

9.4.7 Similar proportions can be seen for southbound traffic on LTC:

- 91% (1258 of 1333 PCU's) travels east;
- 7% (99 PCU's) exits at Gravesend East; and
- 1% (20 PCU's) continues on the A2 to the west.

9.4.8 Figure 9.27 and Figure 9.28 show the total vehicle and HGV flows respectively for the 2041 core scenario in the AM peak at the proposed LTC/A13/A1089 junction. As with the LTC/A2 junction the scheme is designed to minimise the impact of weaving, in this case the westbound on-slip from Orsett Cock has been extended so that it joins the A13 after the A13 westbound to LTC southbound link road. In addition, the A13 westbound off-slip to the A1089 has now been incorporated into the same A13 to LTC southbound link road to also minimise weaving on the A13.

9.4.9 The key junction movements are as follows:

- The traffic travelling north across the Thames on LTC consists of:
  - 58% (2723 PCU's) of total traffic and 82% (972 PCU's) of HGV's continuing north towards the M25; and
  - 42% (1959 PCU's) of total traffic and 18% (214 PCU's) of HGV's turning east on to the A13.
- The traffic travelling south across the Thames on LTC consists of:
  - 37% (1495 PCU's) of total traffic and 61% (823 PCU's) of HGV's from the M25;
  - 44% (1784 PCU's) of total traffic and 26% (344 PCU's) of HGV's from A13 westbound; and
  - 18% (744 PCU's) of total traffic and 13% (179 PCU's) of HGV's from the A1089 northbound.

9.4.10 The scheme design does not provide for all possible movements at the LTC/A13 junction either due to lack of demand (e.g. A13 eastbound to LTC northbound) or because the scheme has provided significant relief to an existing route (e.g. LTC northbound to A13 westbound).

9.4.11 Another key feature of this junction is the retention of all key existing connections between the A13 and A1089 (which will include Tilbury Port traffic), and the addition of the following new connections:

- A1089 northbound to LTC southbound (total flow of 744 PCU's); and
- A1089 northbound to LTC northbound (total flow of 1186 PCU's).

9.4.12 These two connections provide a significant benefit to 67% (1930 of 2910 PCU's) of the traffic on the A1089 which otherwise would have been forced to access their eventual destinations via M25 junction 30 (or via a lengthy u-turn at the Manor Way junction on the A13 to access LTC to the south).

9.4.13 Figure 9.29 and Figure 9.30 show the total vehicle and HGV flows respectively for the 2041 core scenario in the AM peak at the proposed LTC/M25 junction. As with the LTC/A2 and LTC/A13 junctions, the scheme is designed to minimise the impact of weaving. In this case the M25 northbound off-slip to junction 29 has been greatly extended so that it is now located south of the LTC/M25 northbound merge. This results in the following total flow movements not having to weave through each other:

- 3475 PCU's from LTC northbound to M25 northbound; and
- 1822 PCU's from M25 northbound to junction 29.

9.4.14 Weaving was considered much less of an issue southbound as the distance between the merge (end of on-slip from junction 29) and the diverge (start of LTC) is much longer than it would have been northbound. As such it was considered that widening from the existing 4 lanes to 5 lanes would be sufficient to accommodate the additional demand generated by LTC as well as any weaving.

9.4.15 The key junction movements are as follows:

- The traffic travelling north on LTC consists of:
  - 82% (3475 PCU's) of total traffic and 97% (1747 PCU's) of HGV's continuing north towards the M25; and
  - 18% (774 PCU's) of total traffic and 3% (47 PCU's) of HGV's taking the slip/link road to M25 junction 29.
- The traffic travelling north on M25 consists of:
  - 68% (3788 PCU's) of total traffic and 89% (1266 PCU's) of HGV's continuing north on M25; and
  - 32% (1822 PCU's) of total traffic and 11% (155 PCU's) of HGV's taking the slip/link road to M25 junction 29.
- The traffic travelling south on M25 consists of:
  - 73% (6063 PCU's) of total traffic and 68% (2292 PCU's) of HGV's continuing south on M25; and
  - 27% (2259 PCU's) of total traffic and 32% (1073 PCU's) of HGV's take LTC towards A13.

9.4.16 Figure 9.31 shows the total vehicle flows for the 2041 core scenario in the PM peak at the proposed LTC/A2 junction and highlights similar flow composition to the AM. The traffic on LTC northbound consists of:

- 73% (2183 of 2983 PCU's) comes from the east;
- 11% (336 PCU's) accesses from Gravesend East; and
- 16% (465 PCU's) comes from the A2 to the west.

9.4.17 Similar proportions can be seen for southbound traffic on LTC:

- 81% (4010 of 4503 PCU's) travels east;
- 13% (632 PCU's) exits at Gravesend East; and

- 6% (295 PCU's) continues on the A2 to the west.

9.4.18 Figure 9.31 also shows the high 'weaving' flows that necessitated the design of separate carriageways. These are the movements that would have been in conflict (i.e. weaving flows) in a single carriageway configuration. For westbound traffic these flows are:

- 1635 PCU's from the M2 to LTC northbound; and
- 2057 PCU's (approx. 1 lane worth) from A2/A289 to A2 westbound.

9.4.19 For eastbound traffic the 'weaving' flows are:

- 3142 PCU's from LTC to M2 eastbound; and
- 2387 PCU's from A2 westbound to A2/A289 in the east.

9.4.20 Figure 9.32 shows the HGV (PCU's) flows for the 2041 core scenario in the PM peak at the proposed LTC/A2 junction and shows the very high proportions of east-to-north and north-to-east HGV traffic using LTC. Very few HGVs west of the Gravesend East junction will use LTC because HGVs have a much higher cost per km than other vehicles so will favour the shorter, LTC-relieved, existing route. This is shown by the following HGV flows using LTC northbound:

- 96% (823 PCU's) of HGVs on LTC northbound comes from the east;
- 4% (30 PCU's) accesses LTC from Gravesend East; and
- 0% (3 PCU) comes from the A2 to the west

9.4.21 Similar proportions can be seen for southbound traffic on LTC:

- 94% (1047 of 1056 PCU's) travels east;
- 5% (55 PCU's) exits at Gravesend East; and
- 1% (6 PCU's) continues on the A2 to the west.

9.4.22 Figure 9.33 and Figure 9.34 show the total vehicle and HGV flows respectively for the 2041 core scenario in the PM peak at the proposed LTC/A13/A1089 junction.

9.4.23 The key junction movements are as follows:

- The traffic travelling north across the Thames on LTC consists of:
  - 45% (1351 PCU's) of total traffic and 79% (685 PCU's) of HGV's continuing north towards the M25; and
  - 55% (1632 PCU's) of total traffic and 21% (180 PCU's) of HGV's turning east on to the A13.
- The traffic travelling south across the Thames on LTC consists of:
  - 46% (2284 PCU's) of total traffic and 88% (943 PCU's) of HGV's from the M25;
  - 44% (2184 PCU's) of total traffic and 8% (86 PCU's) of HGV's from A13 westbound; and

    - 9% (469 PCU's) of total traffic and 4% (41 PCU's) of HGV's from the A1089 northbound.

9.4.24 As noted for the AM, the scheme design does not provide for all possible movements at the LTC/A13 junction either due to lack of demand (e.g. A13 eastbound to LTC northbound) or because the scheme has provided significant relief to an existing route (e.g. LTC northbound to A13 westbound).

9.4.25 Another key feature of this junction is the retention of all key existing connections between the A13 and A1089 (which will include Tilbury Port traffic), and the addition of the following new connections:

- A1089 northbound to LTC southbound (total flow of 469 PCU's); and
- A1089 northbound to LTC northbound (total flow of 941 PCU's)

9.4.26 These two connections provide a significant benefit to 56% (1410 of 2521 PCU's) of the traffic on the A1089 which otherwise would have been forced to access their eventual destinations via M25 junction 30 (or via a lengthy u-turn at the Manor Way junction on the A13 to access LTC to the south).

9.4.27 Figure 9.35 and Figure 9.36 show the total vehicle and HGV flows respectively for the 2041 core scenario in the PM peak at the proposed LTC/M25 junction. As with the LTC/A2 and LTC/A13 junctions, the scheme is designed to minimise the impact of weaving. In this case the M25 northbound off-slip to junction 29 has been greatly extended so that it is now located south of the LTC/M25 northbound merge. This results in the following total flow movements not having to weave through each other:

- 2293 PCU's from LTC northbound to M25 northbound; and
- 1881 PCU's from M25 northbound to junction 29.

9.4.28 Other key junction movements are as follows:

- The traffic travelling north on LTC consists of:
    - 85% (2293 PCU's) of total traffic and 95% (1216 PCU's) of HGV's continuing north towards the M25; and
    - 15% (411 PCU's) of total traffic and 5% (66 PCU's) of HGV's taking the slip/link road to M25 junction 29.
- The traffic travelling north on M25 consists of:
    - 67% (3797 PCU's) of total traffic and 73% (865 PCU's) of HGV's continuing north on M25; and
    - 33% (1881 PCU's) of total traffic and 27% (320 PCU's) of HGV's taking the slip/link road to M25 junction 29.
- The traffic travelling south on M25 consists of:
    - 64% (5677 PCU's) of total traffic and 61% (1854 PCU's) of HGV's continuing south on M25; and
    - 36% (3175 PCU's) of total traffic and 39% (1171 PCU's) of HGV's take LTC towards A13.

Figure 9.25 – LTC Junction with A2/M2 – LTAM Predicted Traffic Flows 2041 Core AM Peak All Vehicles (PCU's)

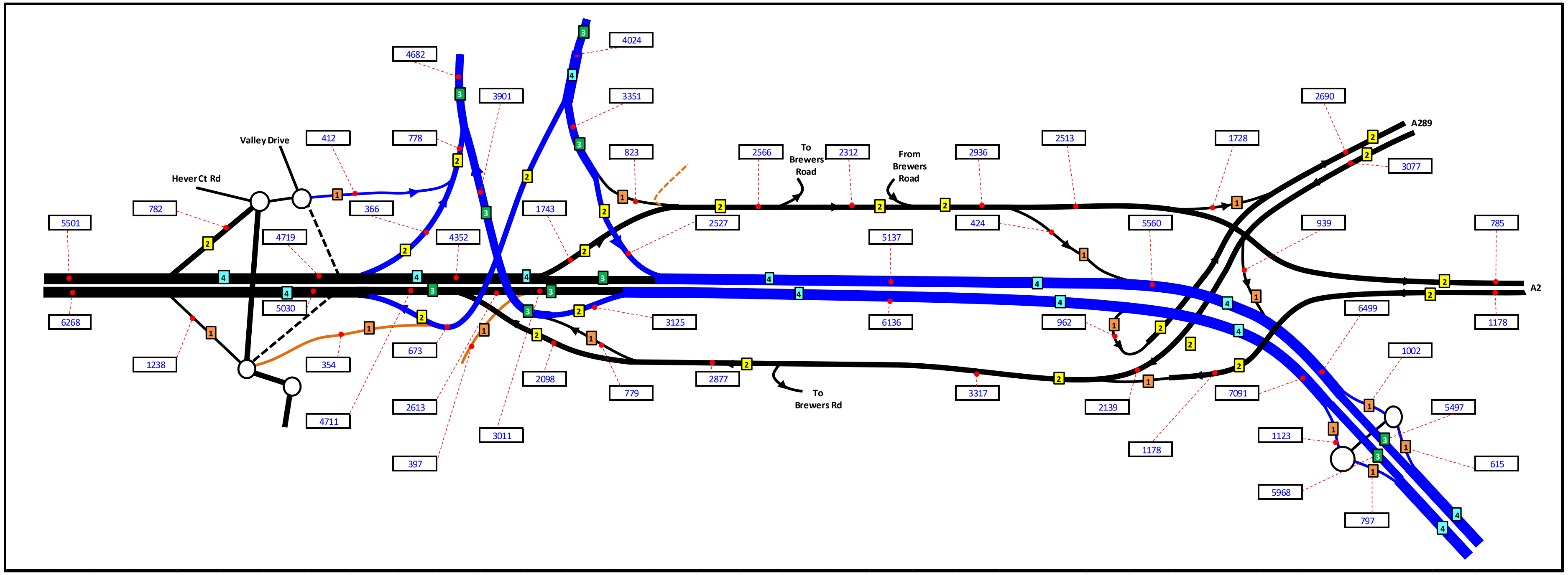


Figure 9.26 – LTC Junction with A2/M2 – LTAM Predicted Traffic Flows 2041 Core AM Peak HGV (PCU's)

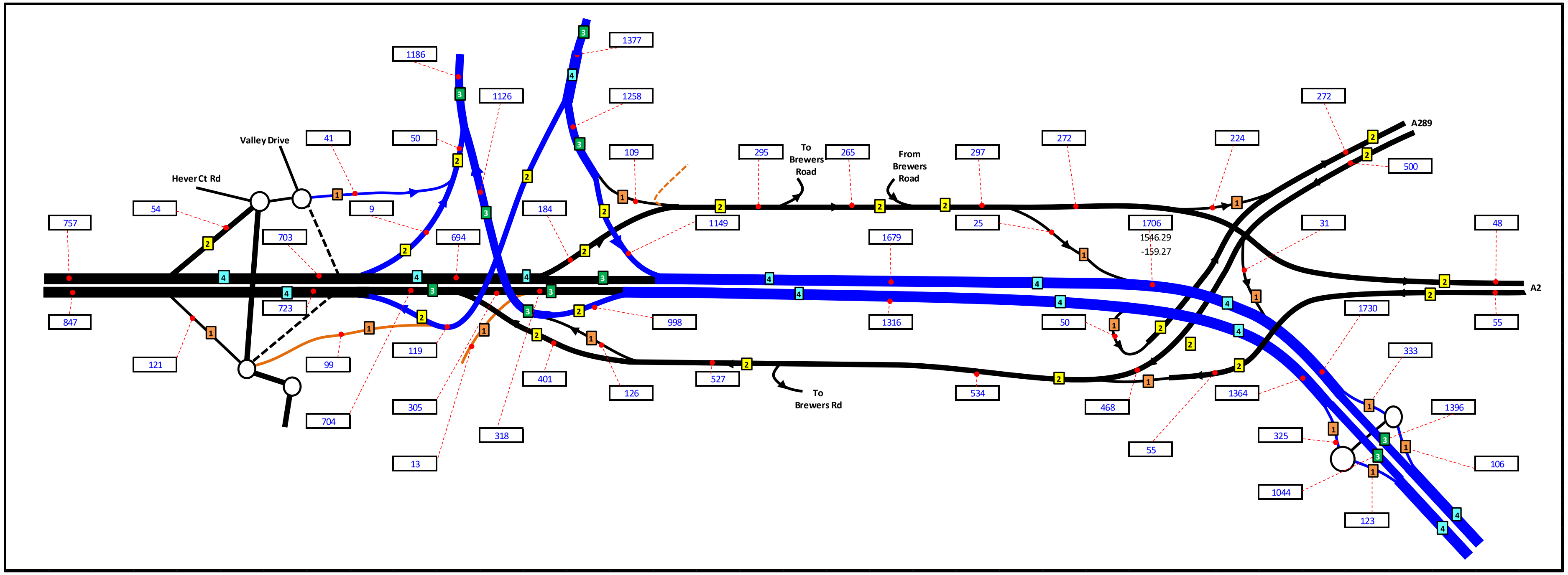


Figure 9.27 – LTC Junction with A13 – LTAM Predicted Traffic Flows 2041 Core AM Peak All Vehicles (PCU's)

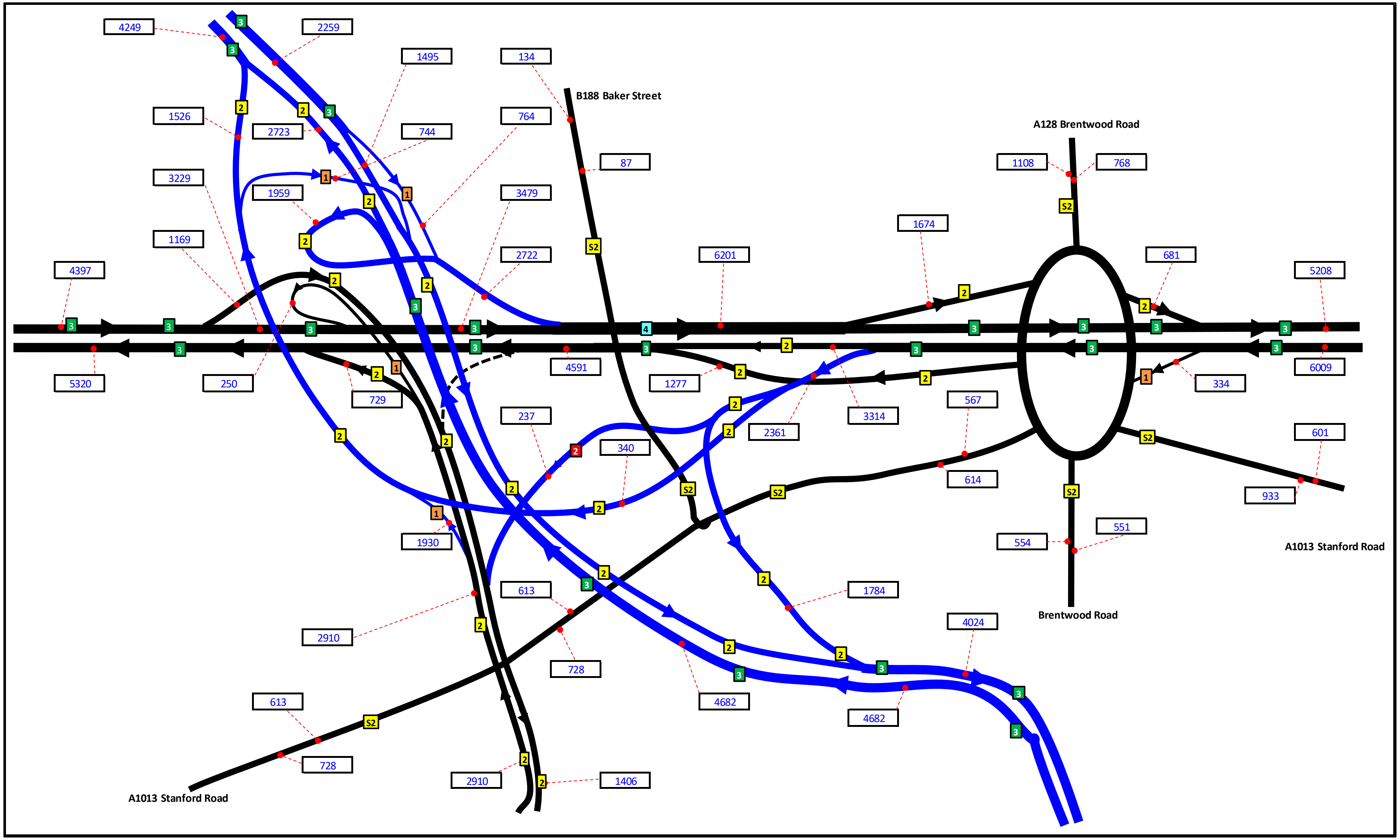


Figure 9.28 – LTC Junction with A13 – LTAM Predicted Traffic Flows 2041 Core AM Peak HGV (PCU's)

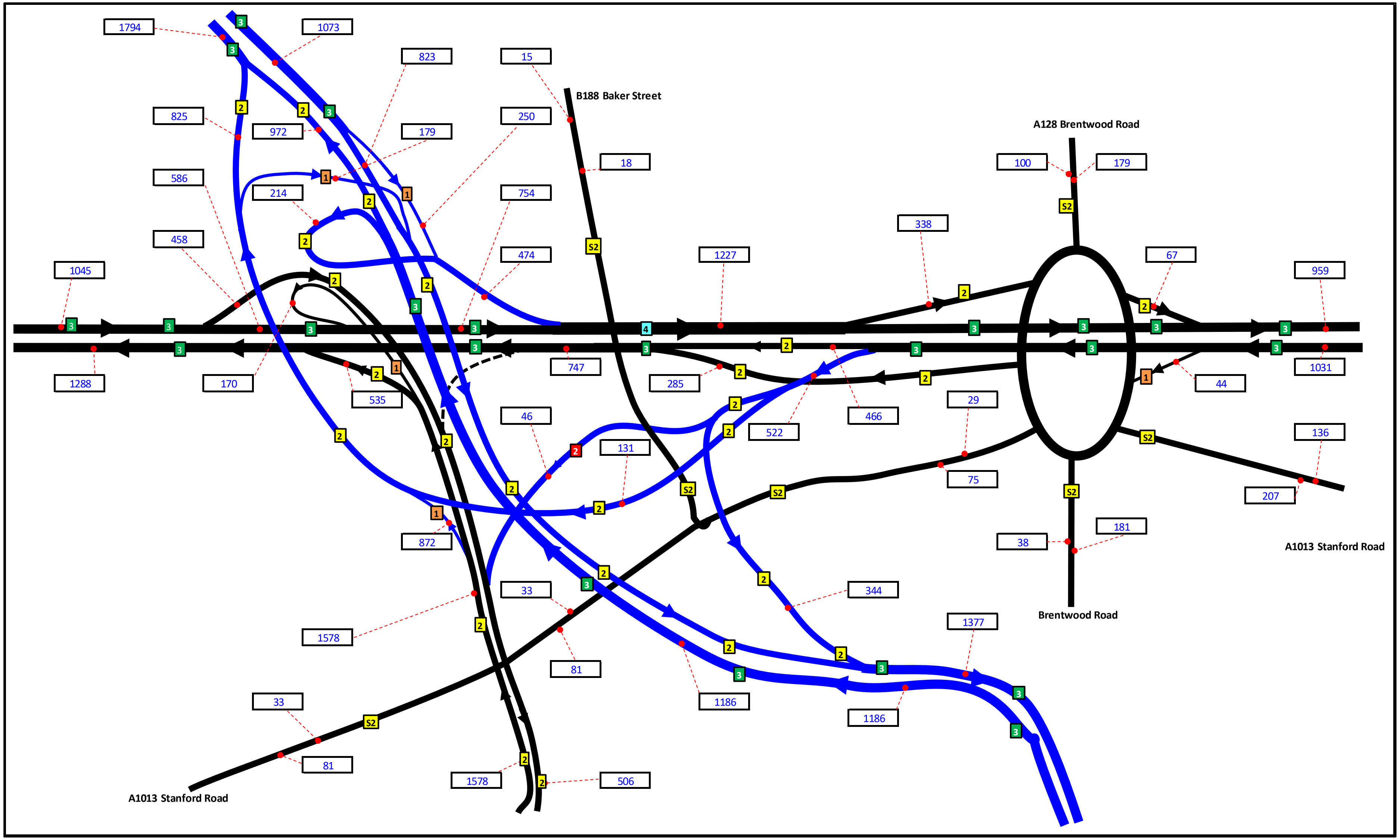


Figure 9.29 – LTC Junction with M25 – LTAM Predicted Traffic Flows 2041 Core AM Peak All Vehicles (PCU's)

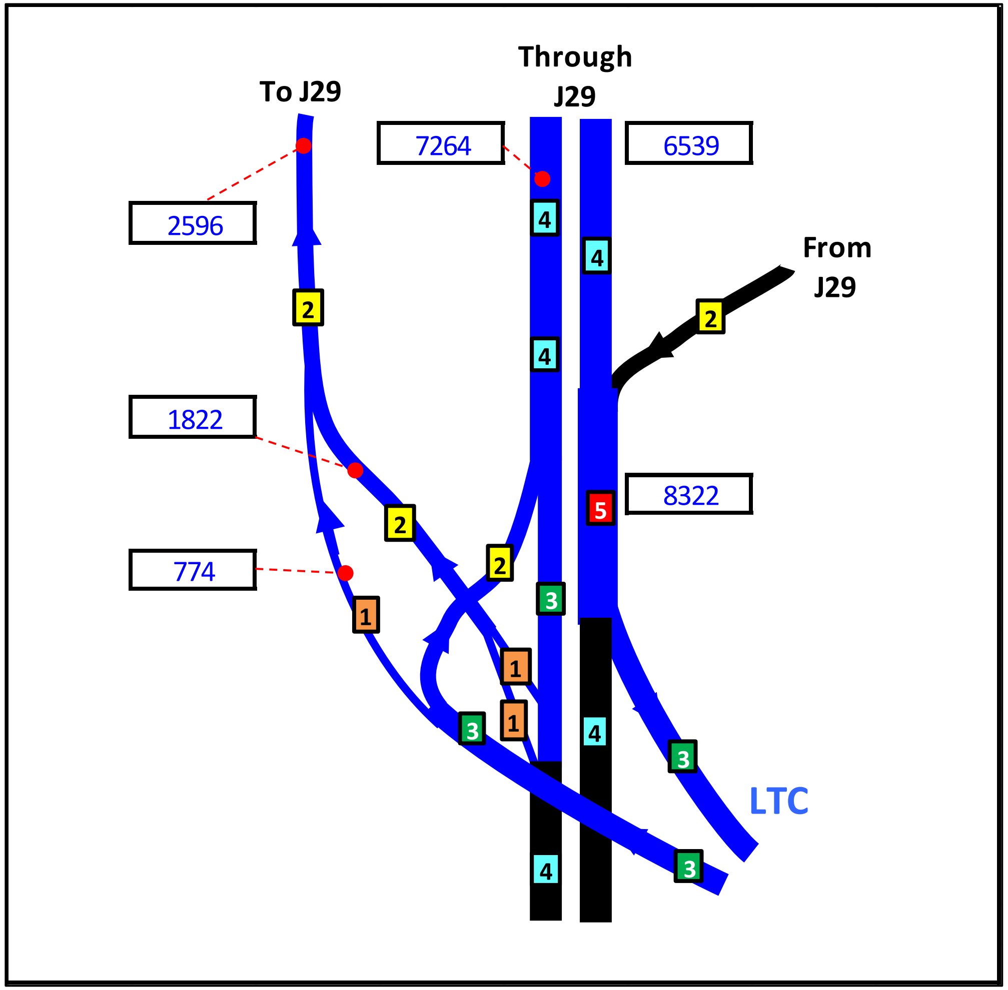


Figure 9.30 – LTC Junction with M25 – LTAM Predicted Traffic Flows 2041 Core AM Peak HGV (PCU's)

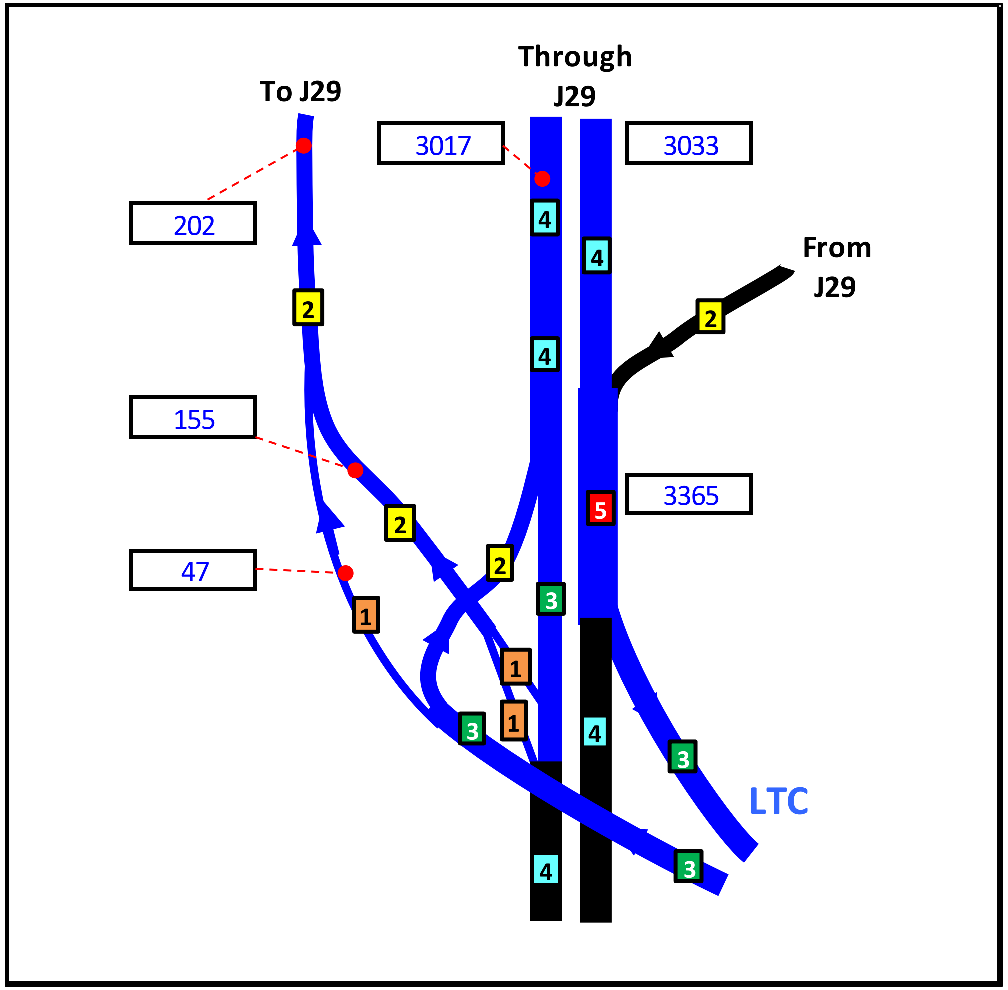


Figure 9.31 – LTC Junction with A2/M2 – LTAM Predicted Traffic Flows 2041 Core PM Peak All Vehicles (PCU's)

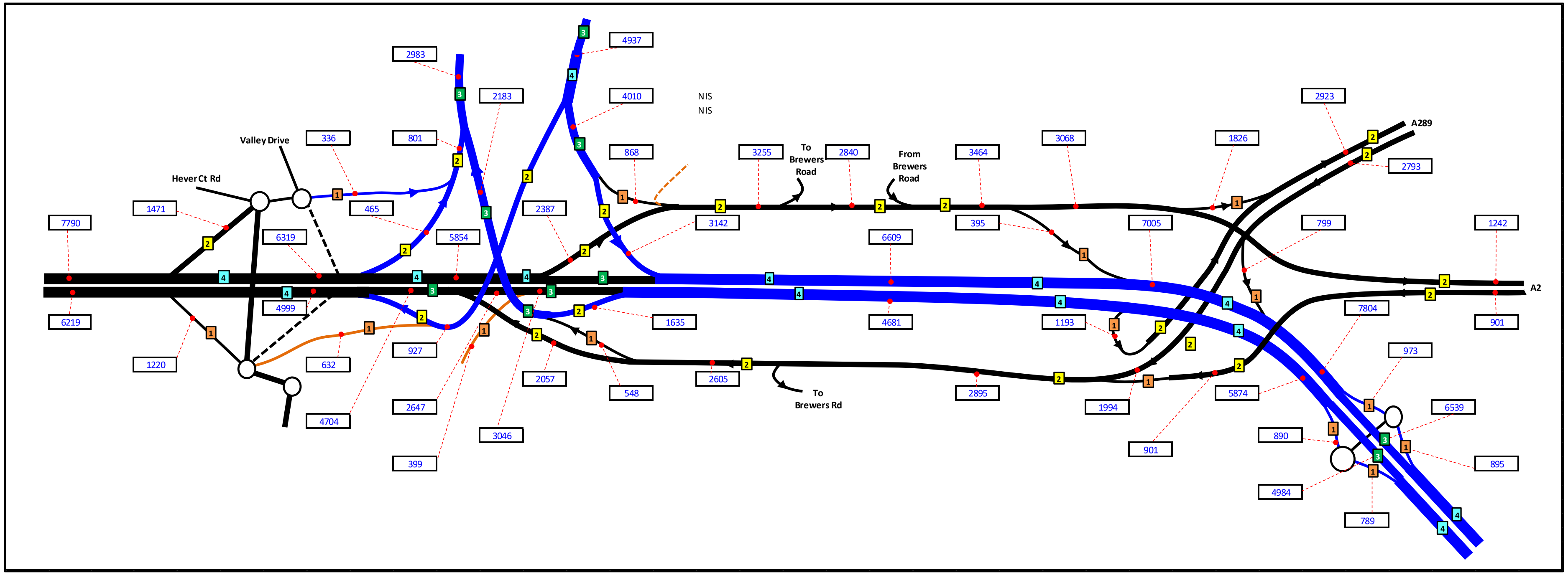


Figure 9.32 – LTC Junction with A2/M2 – LTAM Predicted Traffic Flows 2041 Core PM Peak HGV (PCU's)

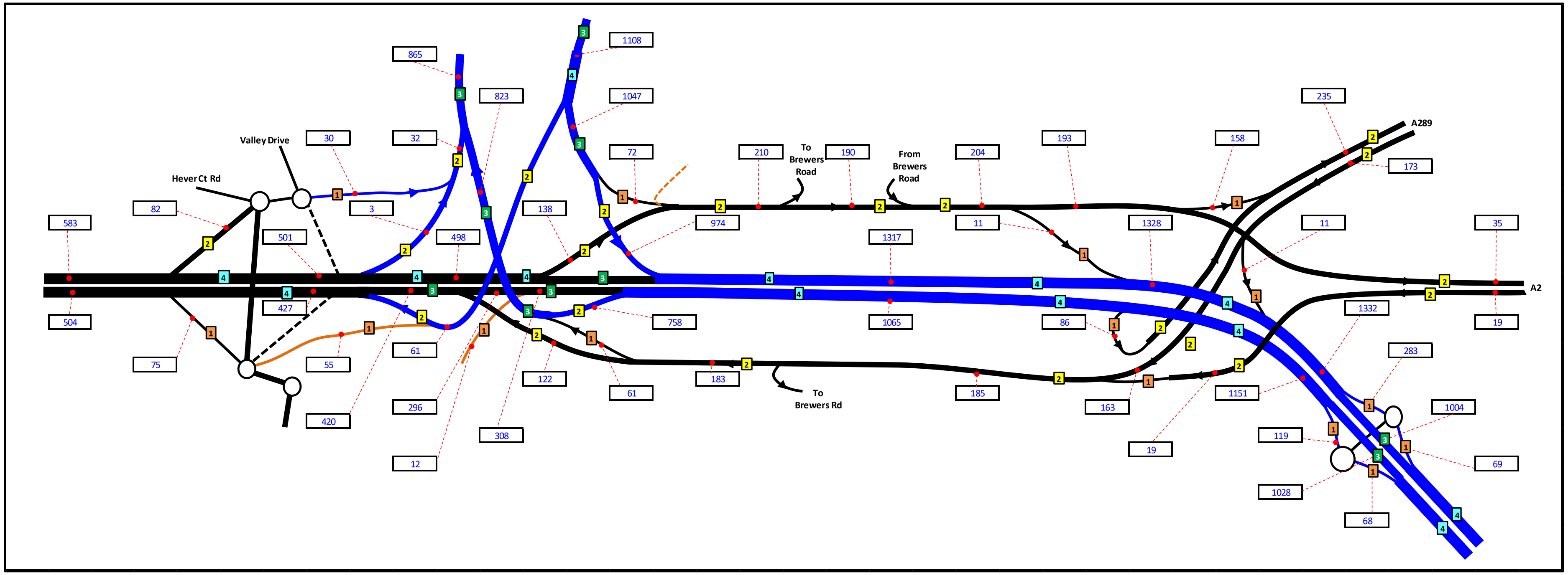


Figure 9.33 – LTC Junction with A13 – LTAM Predicted Traffic Flows 2041 Core PM Peak All Vehicles (PCU's)

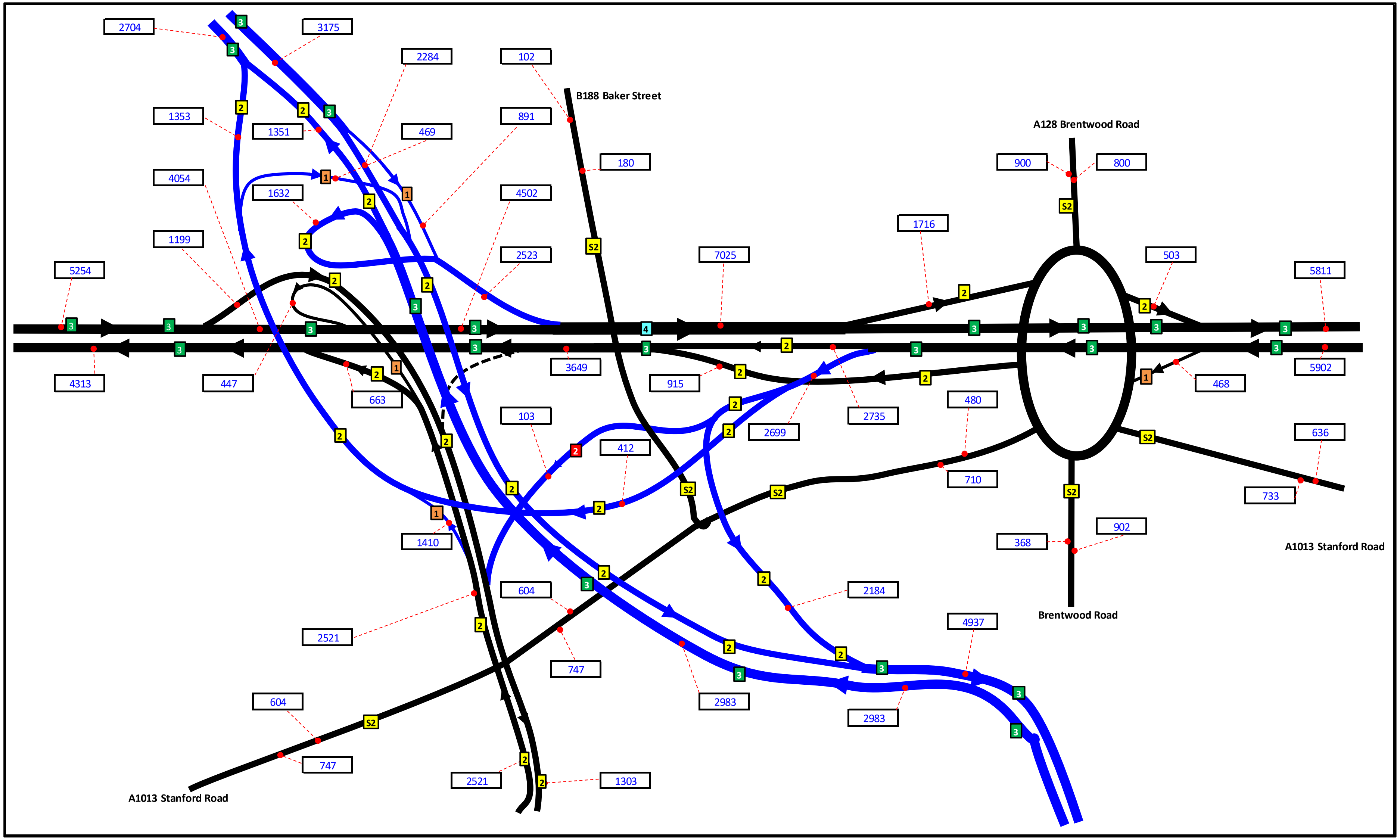


Figure 9.34 – LTC Junction with A13 – LTAM Predicted Traffic Flows 2041 Core PM Peak HGV (PCU's)

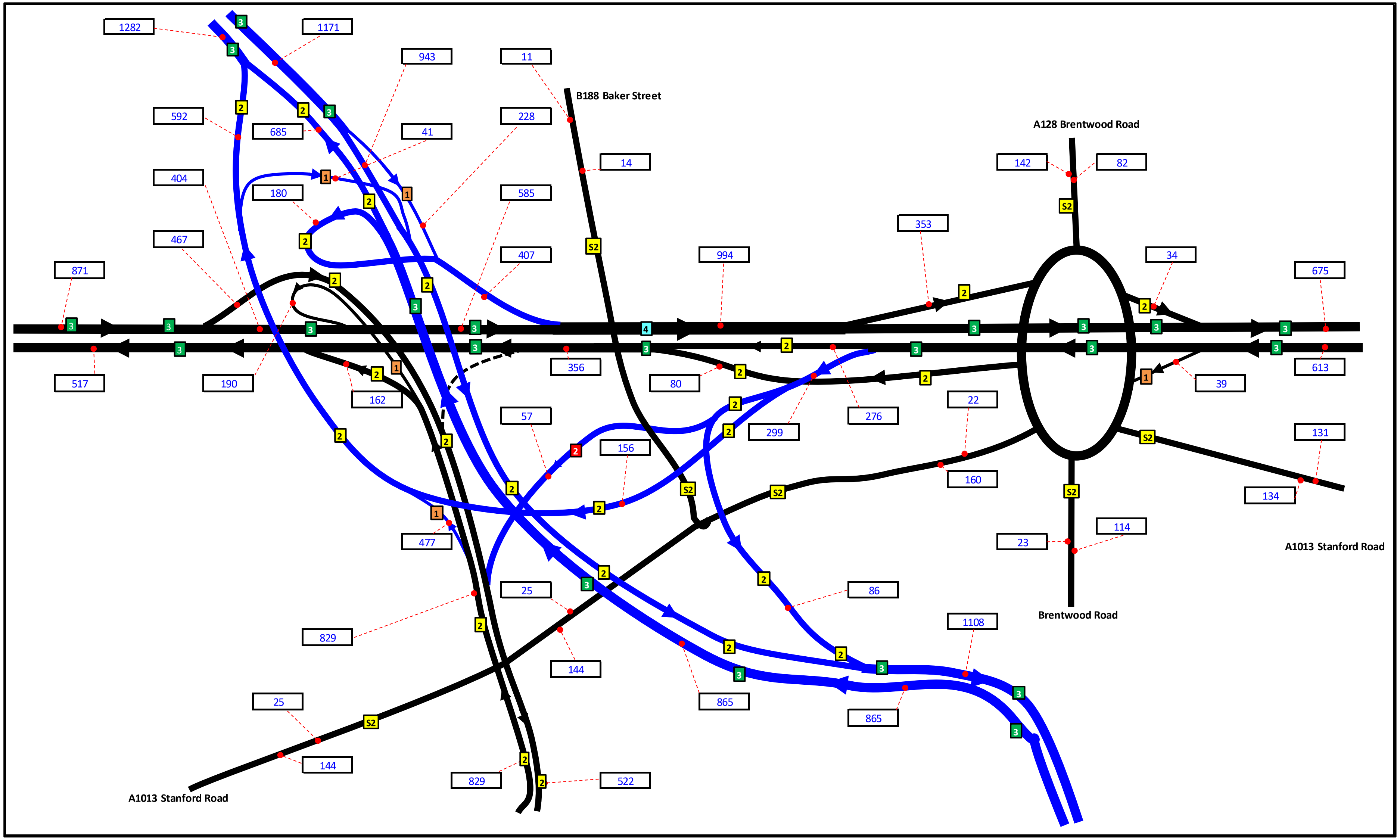


Figure 9.35 – LTC Junction with M25 – LTAM Predicted Traffic Flows 2041 Core PM Peak All Vehicles (PCU's)

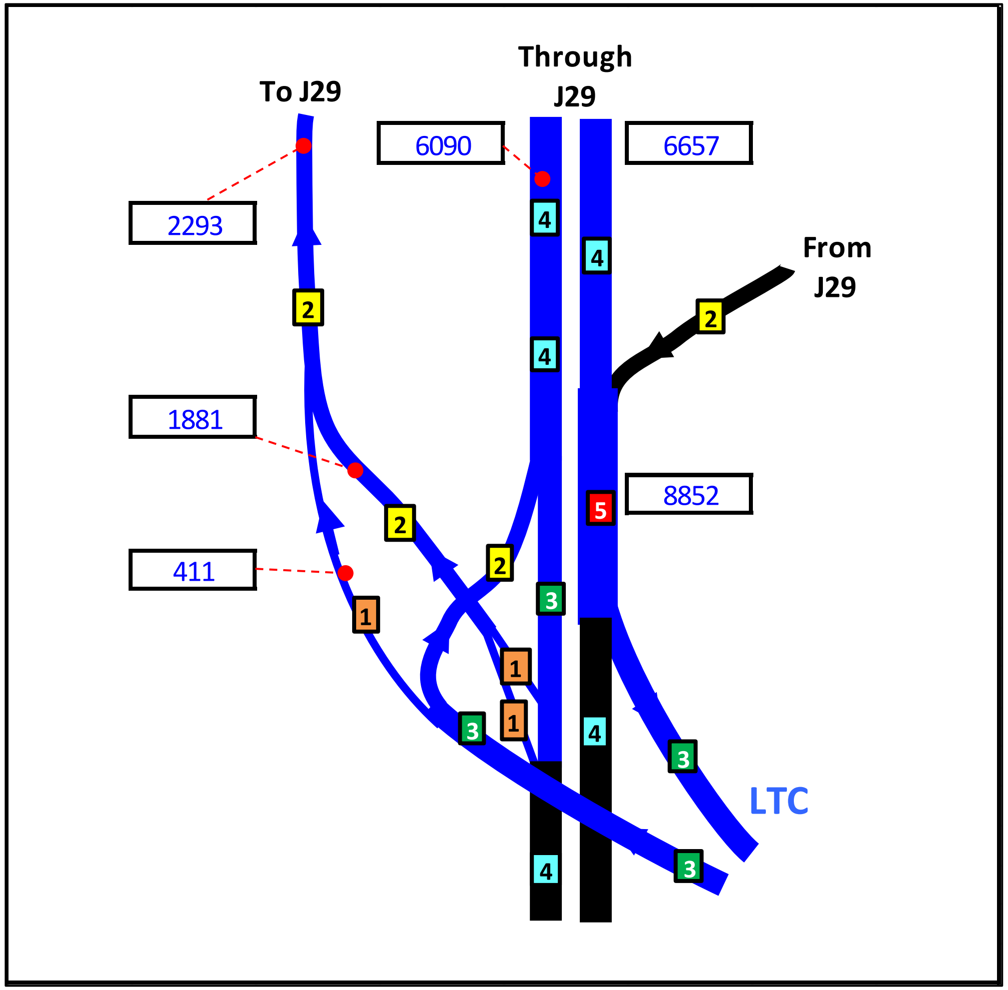
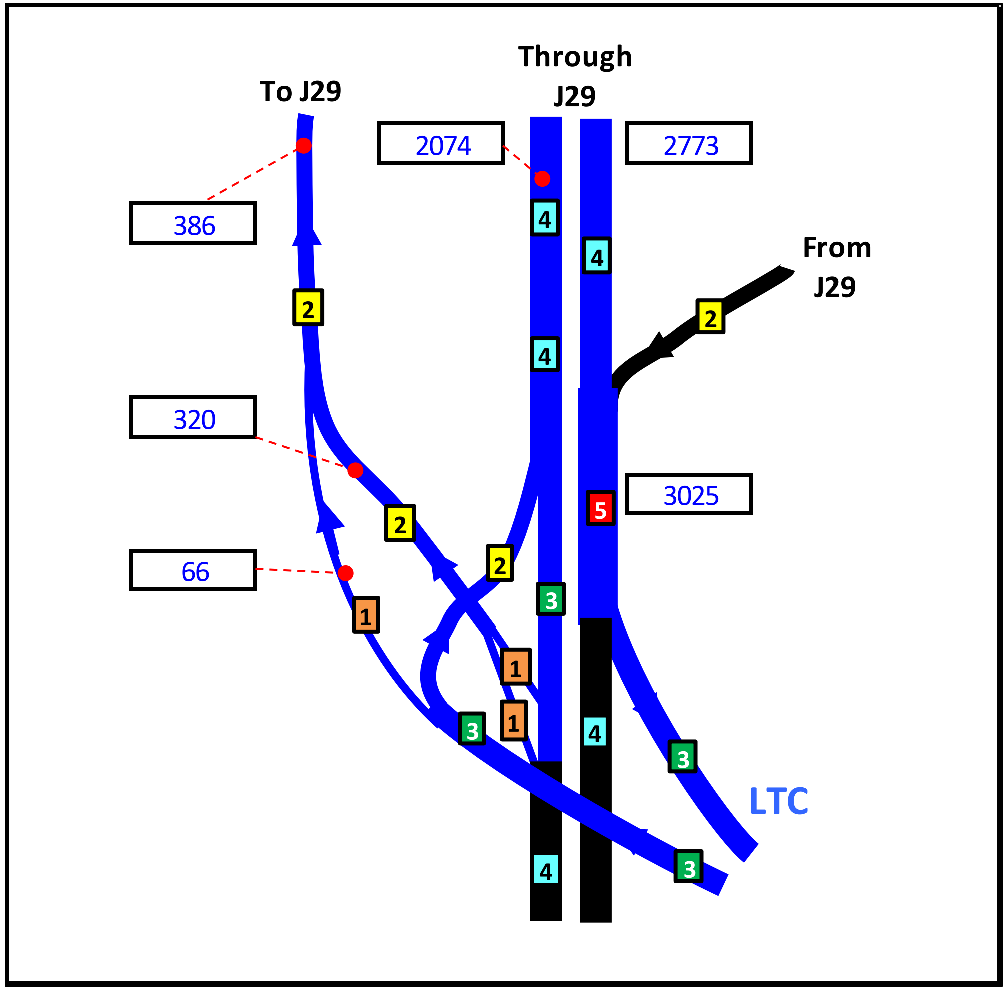


Figure 9.36 – LTC Junction with M25 – LTAM Predicted Traffic Flows 2041 Core PM Peak HGV (PCU's)



9.5 LTAM 2051 Core – Outputs to Operational Assessment

9.5.1 Figure 9.37 to Figure 9.48 provide traffic flow information at the three LTC junctions for All Vehicles and HGV for the morning and evening peak for the 2051 core scenario. The figures show a simplified representation of the junction layouts.

9.5.2 Figure 9.37 shows the total vehicle flows for the 2051 core scenario in the AM peak at the proposed LTC/A2 junction and highlights the low proportion of west-to-north and north-to-west traffic on LTC (attributed to the significant relief provided by LTC to the existing A2/A282/Dartford Crossing route). The traffic on LTC northbound consists of:

- 82% (3988 of 4880 PCU's) comes from the east;
- 10% (481 PCU's) accesses from Gravesend East; and
- 8% (411 PCU's) comes from the A2 to the west.

9.5.3 Similar proportions can be seen for southbound traffic on LTC:

- 82% (3512 of 4293 PCU's) travels east;
- 9% (401 PCU's) exits at Gravesend East; and
- 9% (380 PCU's) continues on the A2 to the west.

9.5.4 Figure 9.37 also shows the high 'weaving' flows that necessitated the design of separate carriageways at the LTC/A2 junction. These are the movements that would have been in conflict (i.e. weaving flows) in a single carriageway configuration. For westbound traffic these flows are:

- 3160 PCU's (i.e. well over 1 lane worth) from the M2 to LTC northbound; and
- 2139 PCU's (approx. 1 lane worth) from A2/A289 to A2 westbound.

9.5.5 For eastbound traffic the 'weaving' flows are:

- 2602 PCU's from LTC to M2 eastbound; and
- 1797 PCU's from A2 westbound to A2/A289 in the east.

9.5.6 Figure 9.38 shows the HGV (PCU's) flows for the 2051 core scenario in the AM peak at the proposed LTC/A2 junction and shows the very high proportions of east-to-north and north-to-east HGV traffic using LTC. Very few HGVs west of the Gravesend East junction will use LTC because HGVs have a much higher cost per km than other vehicles so will favour the shorter, LTC-relieved, existing route. This is shown by the following HGV flows using LTC northbound:

- 95% (1184 PCU's) of HGVs on LTC northbound comes from the east;
- 4% (45 PCU's) accesses LTC from Gravesend East; and
- 1% (11 PCU's) comes from the A2 to the west

9.5.7 Similar proportions can be seen for southbound traffic on LTC:

- 90% (1227 of 1333 PCU's) travels east;
- 8% (109 PCU's) exits at Gravesend East; and
- 2% (24 PCU's) continues on the A2 to the west.

9.5.8 Figure 9.39 and Figure 9.40 show the total vehicle and HGV flows respectively for the 2051 core scenario in the AM peak at the proposed LTC/A13/A1089 junction. As with the LTC/A2 junction the scheme is designed to minimise the impact of weaving, in this case the westbound on-slip from Orsett Cock has been extended so that it joins the A13 after the A13 westbound to LTC southbound link road. In addition, the A13 westbound off-slip to the A1089 has now been incorporated into the same A13 to LTC southbound link road to also minimise weaving on the A13.

9.5.9 The key junction movements are as follows:

- The traffic travelling north across the Thames on LTC consists of:
  - 59% (2868 PCU's) of total traffic and 82% (1026 PCU's) of HGV's continuing north towards the M25; and
  - 41% (2012 PCU's) of total traffic and 18% (228 PCU's) of HGV's turning east on to the A13.
- The traffic travelling south across the Thames on LTC consists of:
  - 35% (1507 PCU's) of total traffic and 59% (786 PCU's) of HGV's from the M25;
  - 45% (1920 PCU's) of total traffic and 27% (354 PCU's) of HGV's from A13 westbound; and
  - 20% (866 PCU's) of total traffic and 14% (190 PCU's) of HGV's from the A1089 northbound.

9.5.10 The scheme design does not provide for all possible movements at the LTC/A13 junction either due to lack of demand (e.g. A13 eastbound to LTC northbound) or because the scheme has provided significant relief to an existing route (e.g. LTC northbound to A13 westbound).

9.5.11 Another key feature of this junction is the retention of all key existing connections between the A13 and A1089 (which will include Tilbury Port traffic), and the addition of the following new connections:

- A1089 northbound to LTC southbound (total flow of 866 PCU's); and
- A1089 northbound to LTC northbound (total flow of 1252 PCU's).

9.5.12 These two connections provide a significant benefit to 67% (2118 of 3153 PCU's) of the traffic on the A1089 which otherwise would have been forced to access their eventual destinations via M25 junction 30 (or via a lengthy u-turn at the Manor Way junction on the A13 to access LTC to the south).

9.5.13 Figure 9.41 and Figure 9.42 show the total vehicle and HGV flows respectively for the 2051 core scenario in the AM peak at the proposed LTC/M25 junction. As with the LTC/A2 and LTC/A13 junctions, the scheme is designed to minimise the impact of weaving. In this case the M25 northbound off-slip to junction 29 has been greatly extended so that it is now located south of the LTC/M25 northbound merge. This results in the following total flow movements not having to weave through each other:

- 3897 PCU's from LTC northbound to M25 northbound; and
- 1891 PCU's from M25 northbound to junction 29.

9.5.14 Weaving was considered much less of an issue southbound as the distance between the merge (end of on-slip from junction 29) and the diverge (start of LTC) is much longer than it would have been northbound. As such it was considered that widening from the existing 4 lanes to 5 lanes would be sufficient to accommodate the additional demand generated by LTC as well as any weaving.

9.5.15 The key junction movements are as follows:

- The traffic travelling north on LTC consists of:
  - 83% (3897 PCU's) of total traffic and 97% (1857 PCU's) of HGV's continuing north towards the M25; and
  - 17% (771 PCU's) of total traffic and 3% (50 PCU's) of HGV's taking the slip/link road to M25 junction 29.
- The traffic travelling north on M25 consists of:
  - 69% (4162 PCU's) of total traffic and 89% (1358 PCU's) of HGV's continuing north on M25; and
  - 31% (1891 PCU's) of total traffic and 11% (166 PCU's) of HGV's taking the slip/link road to M25 junction 29.
- The traffic travelling south on M25 consists of:
  - 74% (6439 PCU's) of total traffic and 70% (2465 PCU's) of HGV's continuing south on M25; and
  - 26% (2234 PCU's) of total traffic and 30% (1042 PCU's) of HGV's take LTC towards A13.

9.5.16 Figure 9.43 shows the total vehicle flows for the 2051 core scenario in the PM peak at the proposed LTC/A2 junction and highlights similar flow composition to the AM. The traffic on LTC northbound consists of:

- 71% (2364 of 3351 PCU's) comes from the east;
- 12% (411 PCU's) accesses from Gravesend East; and
- 17% (576 PCU's) comes from the A2 to the west.

9.5.17 Similar proportions can be seen for southbound traffic on LTC:

- 80% (4056 of 5079 PCU's) travels east;
- 14% (707 PCU's) exits at Gravesend East; and

- 6% (317 PCU's) continues on the A2 to the west.

9.5.18 Figure 9.43 also shows the high 'weaving' flows that necessitated the design of separate carriageways. These are the movements that would have been in conflict (i.e. weaving flows) in a single carriageway configuration. For westbound traffic these flows are:

- 1751 PCU's from the M2 to LTC northbound; and
- 2176 PCU's (approx. 1 lane worth) from A2/A289 to A2 westbound.

9.5.19 For eastbound traffic the 'weaving' flows are:

- 3150 PCU's from LTC to M2 eastbound; and
- 2363 PCU's from A2 westbound to A2/A289 in the east.

9.5.20 Figure 9.44 shows the HGV (PCU's) flows for the 2051 core scenario in the PM peak at the proposed LTC/A2 junction and shows the very high proportions of east-to-north and north-to-east HGV traffic using LTC. Very few HGVs west of the Gravesend East junction will use LTC because HGVs have a much higher cost per km than other vehicles so will favour the shorter, LTC-relieved, existing route. This is shown by the following HGV flows using LTC northbound:

- 96% (857 PCU's) of HGVs on LTC northbound comes from the east;
- 4% (34 PCU's) accesses LTC from Gravesend East; and
- 0% (4 PCU) comes from the A2 to the west

9.5.21 Similar proportions can be seen for southbound traffic on LTC:

- 94% (1113 of 1181 PCU's) travels east;
- 5% (62 PCU's) exits at Gravesend East; and
- 1% (6 PCU's) continues on the A2 to the west.

9.5.22 Figure 9.45 and Figure 9.46 show the total vehicle and HGV flows respectively for the 2051 core scenario in the PM peak at the proposed LTC/A13/A1089 junction.

9.5.23 The key junction movements are as follows:

- The traffic travelling north across the Thames on LTC consists of:
  - 44% (1468 PCU's) of total traffic and 78% (707 PCU's) of HGV's continuing north towards the M25; and
  - 56% (1882 PCU's) of total traffic and 22% (201 PCU's) of HGV's turning east on to the A13.
- The traffic travelling south across the Thames on LTC consists of:
  - 45% (2303 PCU's) of total traffic and 89% (1014 PCU's) of HGV's from the M25;
  - 44% (2249 PCU's) of total traffic and 7% (77 PCU's) of HGV's from A13 westbound; and

  - 10% (527 PCU’s) of total traffic and 4% (42 PCU’s) of HGV’s from the A1089 northbound.

9.5.24 As noted for the AM, the scheme design does not provide for all possible movements at the LTC/A13 junction either due to lack of demand (e.g. A13 eastbound to LTC northbound) or because the scheme has provided significant relief to an existing route (e.g. LTC northbound to A13 westbound).

9.5.25 Another key feature of this junction is the retention of all key existing connections between the A13 and A1089 (which will include Tilbury Port traffic), and the addition of the following new connections:

- A1089 northbound to LTC southbound (total flow of 527 PCU’s); and
- A1089 northbound to LTC northbound (total flow of 1016 PCU’s)

9.5.26 These two connections provide a significant benefit to 53% (1543 of 2622 PCU’s) of the traffic on the A1089 which otherwise would have been forced to access their eventual destinations via M25 junction 30 (or via a lengthy u-turn at the Manor Way junction on the A13 to access LTC to the south).

9.5.27 Figure 9.47 and Figure 9.48 show the total vehicle and HGV flows respectively for the 2051 core scenario in the PM peak at the proposed LTC/M25 junction. As with the LTC/A2 and LTC/A13 junctions, the scheme is designed to minimise the impact of weaving. In this case the M25 northbound off-slip to junction 29 has been greatly extended so that it is now located south of the LTC/M25 northbound merge. This results in the following total flow movements not having to weave through each other:

- 2454 PCU’s from LTC northbound to M25 northbound; and
- 1950 PCU’s from M25 northbound to junction 29.

9.5.28 Other key junction movements are as follows:

- The traffic travelling north on LTC consists of:
  - 85% (2454 PCU’s) of total traffic and 95% (1263 PCU’s) of HGV’s continuing north towards the M25; and
  - 15% (440 PCU’s) of total traffic and 5% (71 PCU’s) of HGV’s taking the slip/link road to M25 junction 29.
- The traffic travelling north on M25 consists of:
  - 67% (3975 PCU’s) of total traffic and 74% (933 PCU’s) of HGV’s continuing north on M25; and
  - 33% (1950 PCU’s) of total traffic and 26% (336 PCU’s) of HGV’s taking the slip/link road to M25 junction 29.
- The traffic travelling south on M25 consists of:
  - 65% (5992 PCU’s) of total traffic and 61% (1953 PCU’s) of HGV’s continuing south on M25; and
  - 35% (3223 PCU’s) of total traffic and 39% (1236 PCU’s) of HGV’s take LTC towards A13.

Figure 9.37 – LTC Junction with A2/M2 – LTAM Predicted Traffic Flows 2051 Core AM Peak All Vehicles (PCU's)

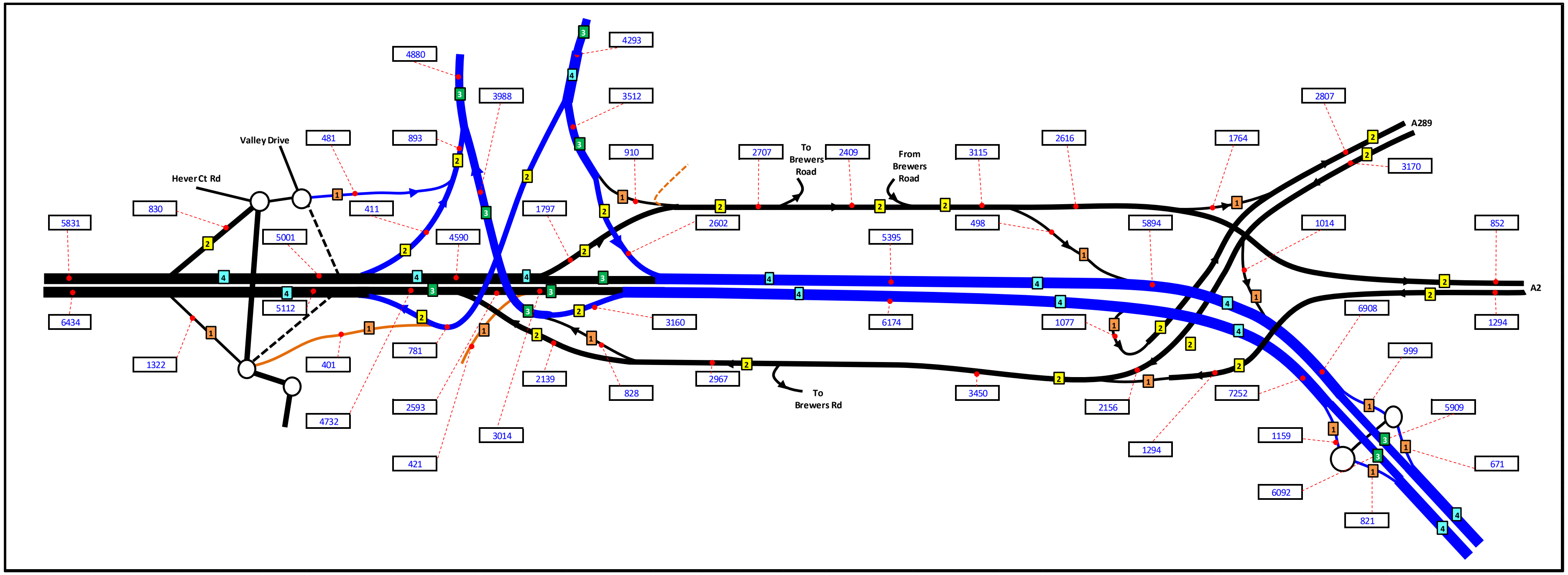


Figure 9.38 – LTC Junction with A2/M2 – LTAM Predicted Traffic Flows 2051 Core AM Peak HGV (PCU's)

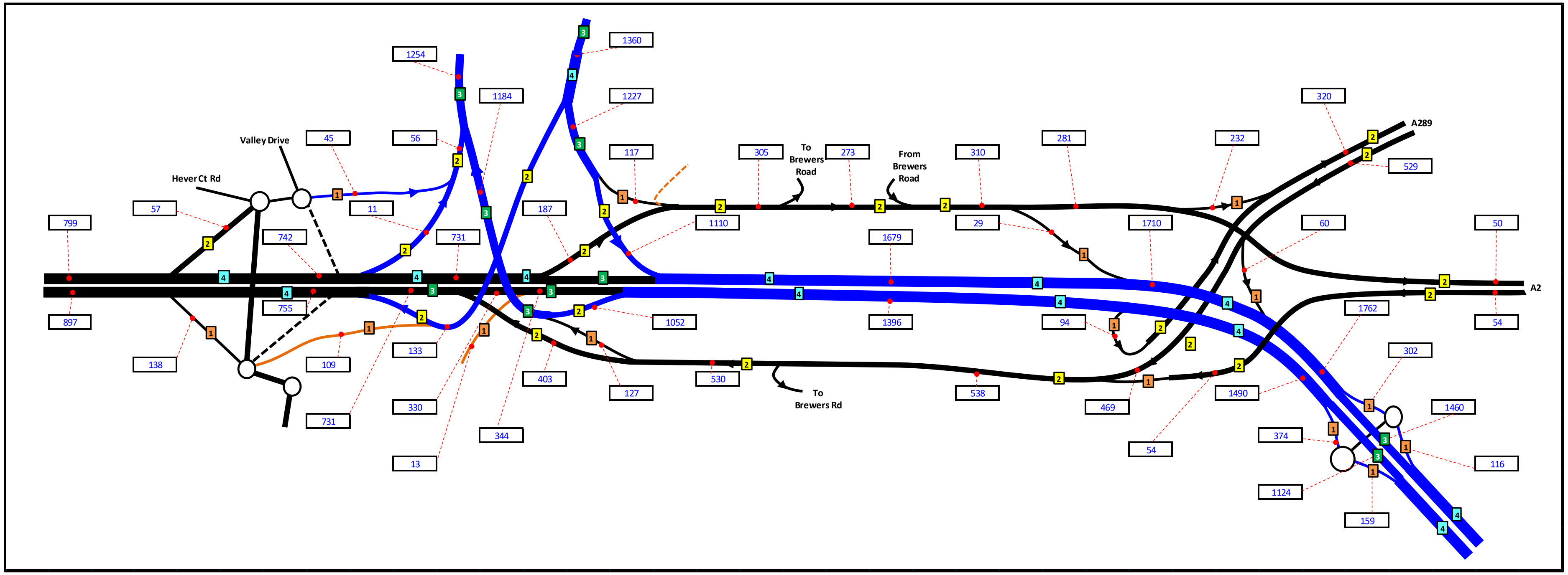


Figure 9.39 – LTC Junction with A13 – LTAM Predicted Traffic Flows 2051 Core AM Peak All Vehicles (PCU's)

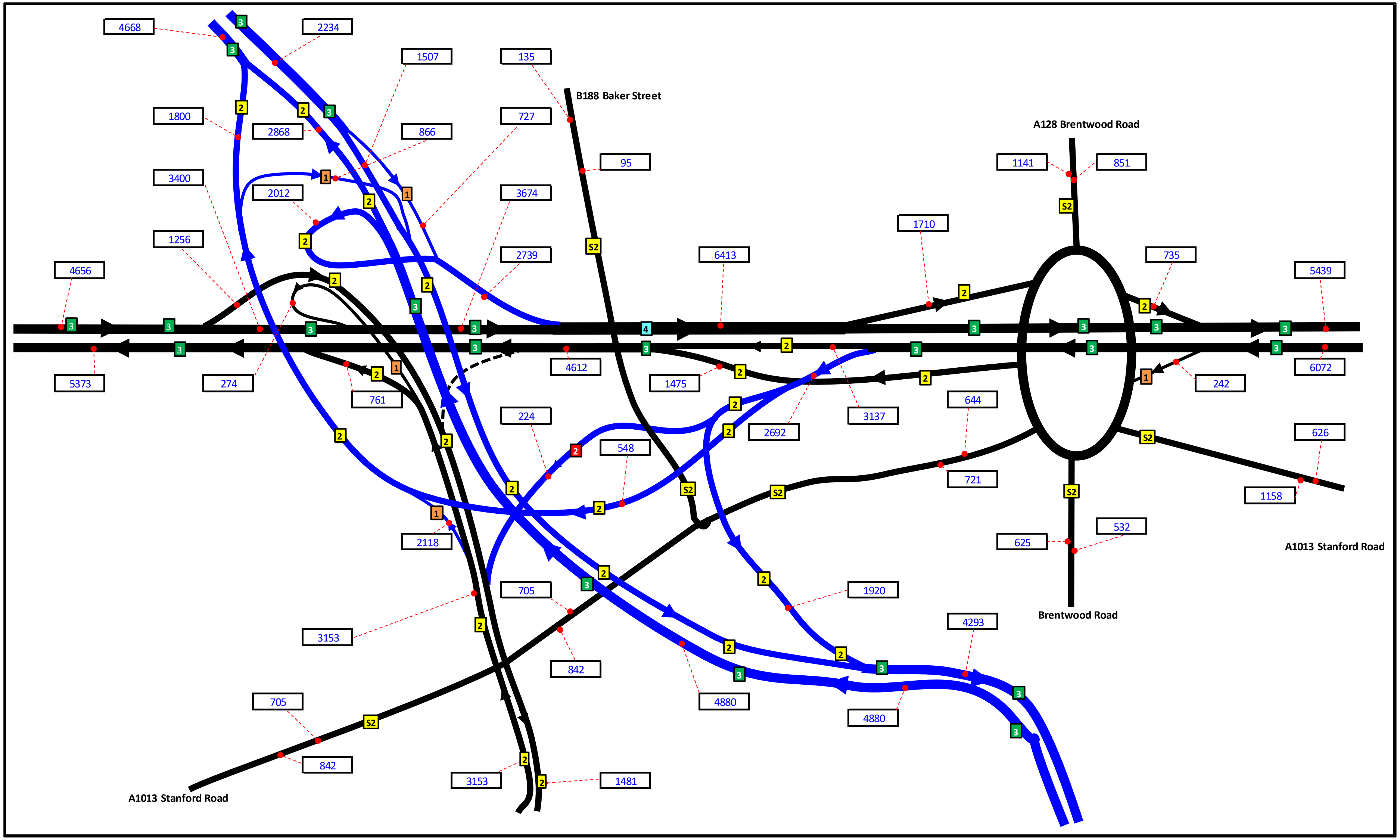


Figure 9.40 – LTC Junction with A13 – LTAM Predicted Traffic Flows 2051 Core AM Peak HGV (PCU's)

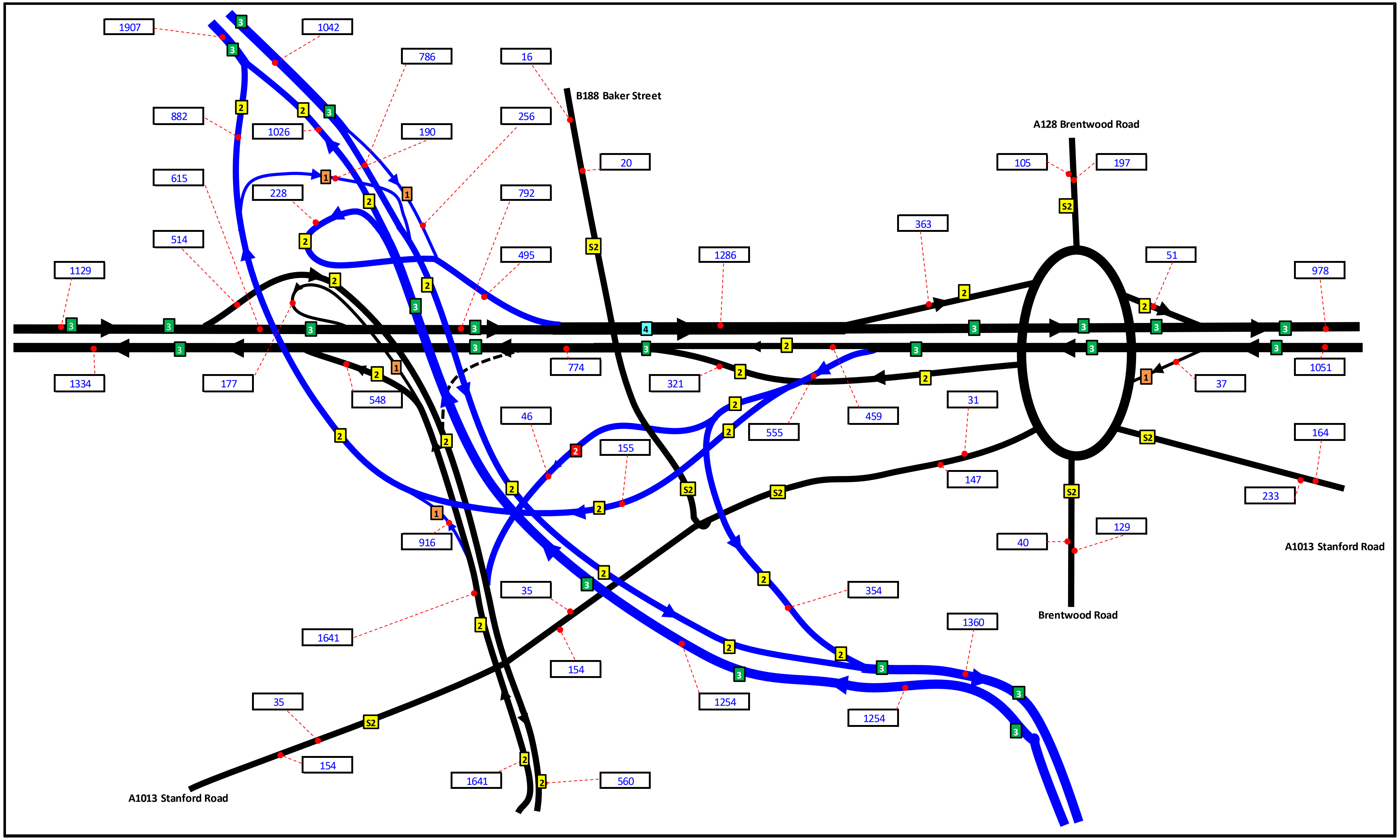


Figure 9.41 – LTC Junction with M25 – LTAM Predicted Traffic Flows 2051 Core AM Peak All Vehicles (PCU's)

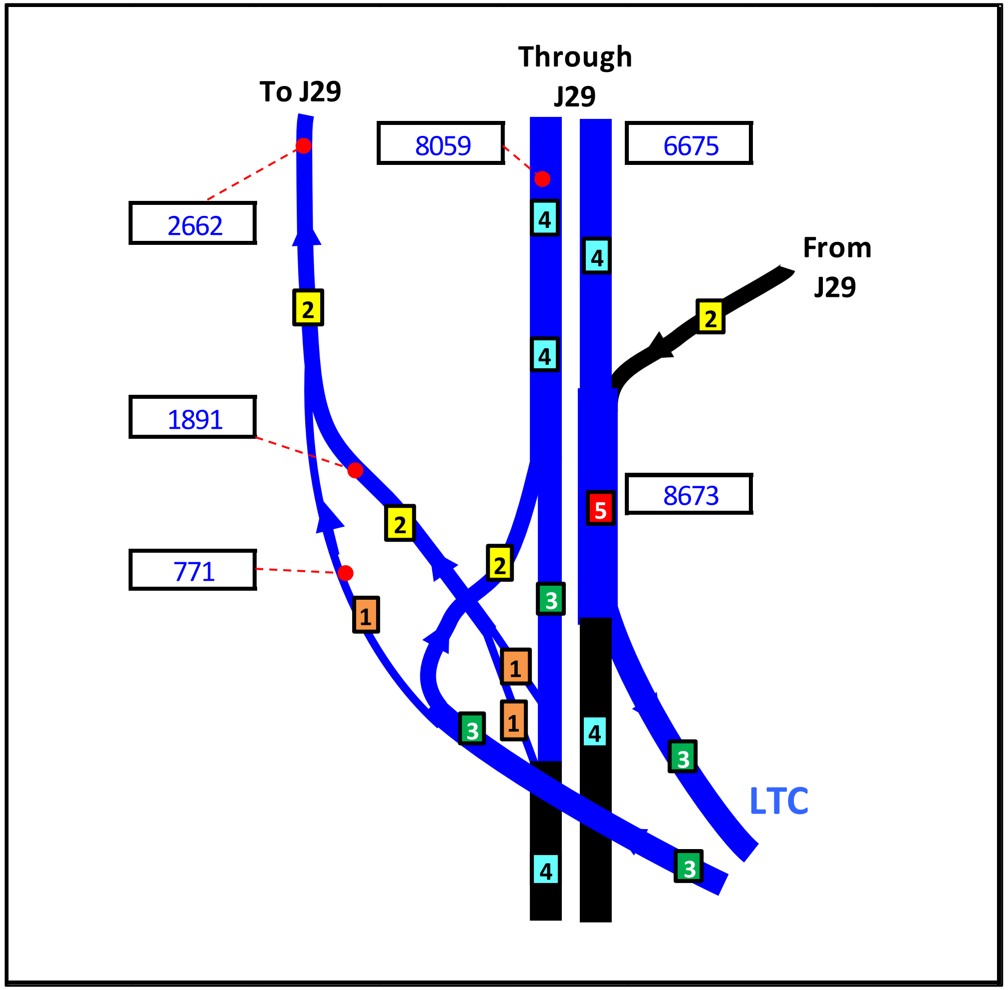


Figure 9.42 – LTC Junction with M25 – LTAM Predicted Traffic Flows 2051 Core AM Peak HGV (PCU's)

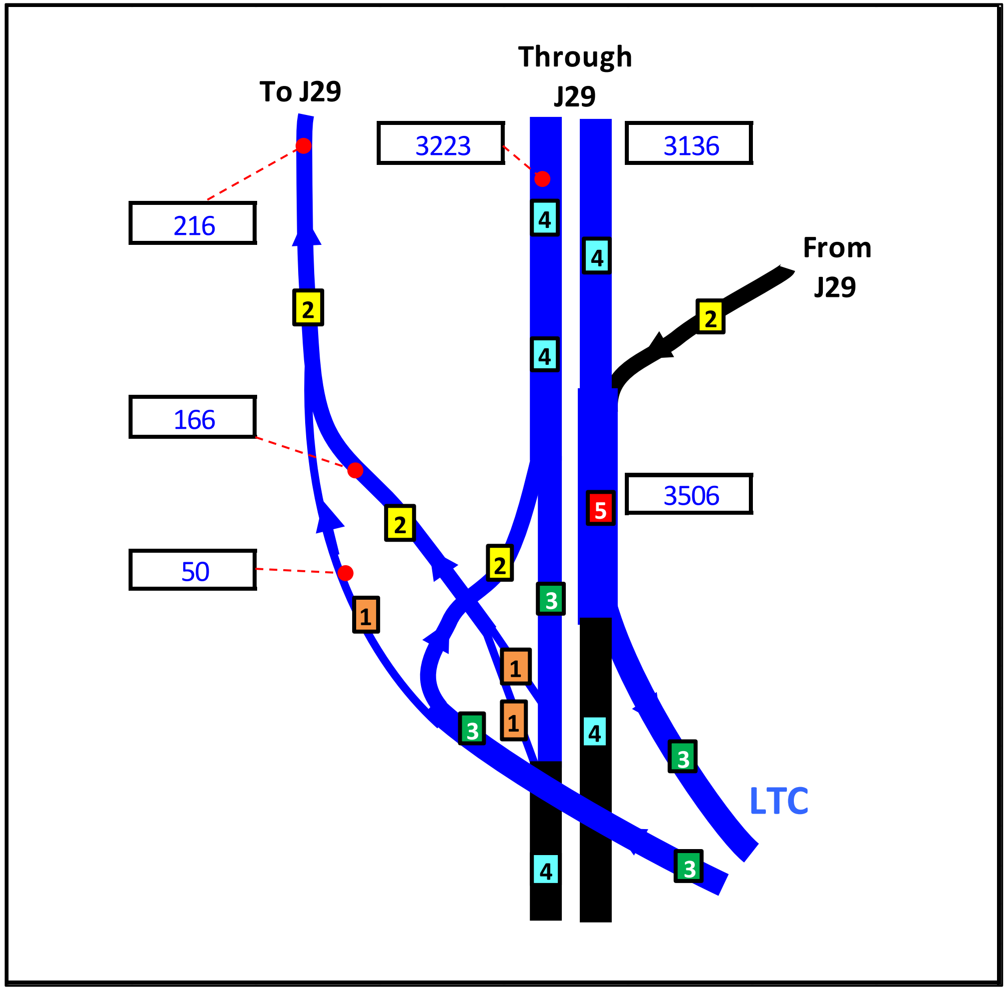


Figure 9.43 – LTC Junction with A2/M2 – LTAM Predicted Traffic Flows 2051 Core PM Peak All Vehicles (PCU's)

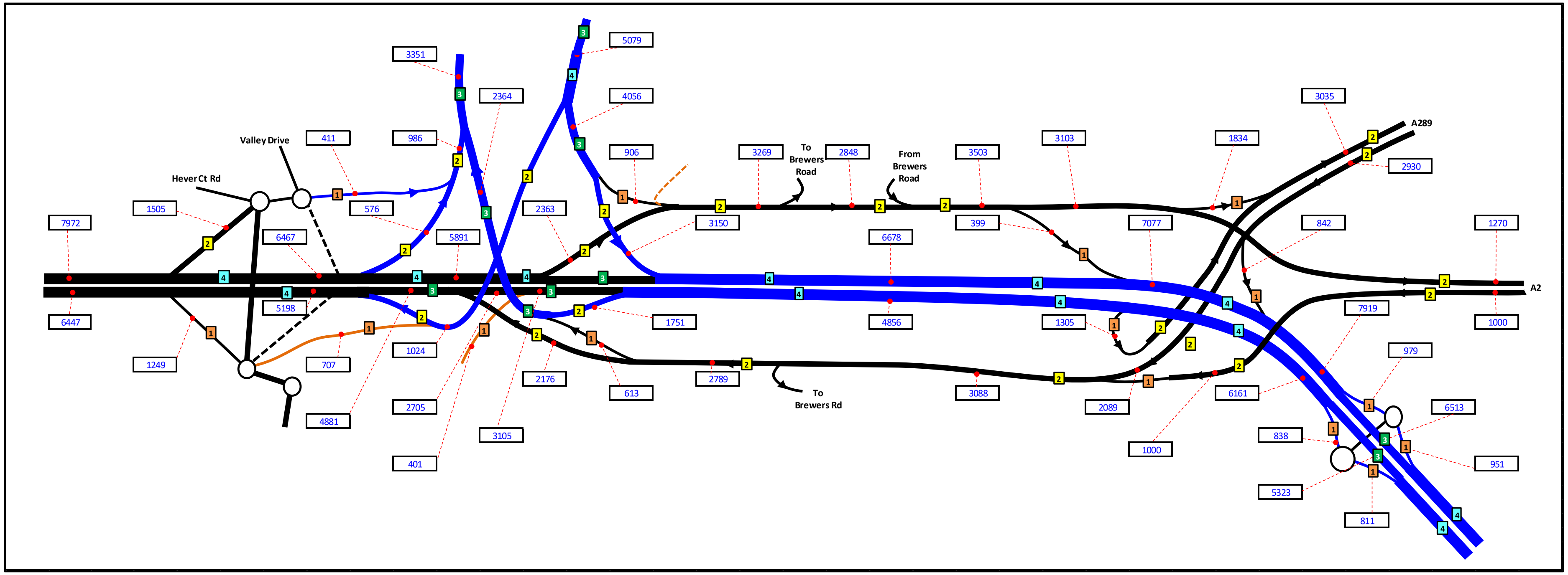


Figure 9.44 – LTC Junction with A2/M2 – LTAM Predicted Traffic Flows 2051 Core PM Peak HGV (PCU's)

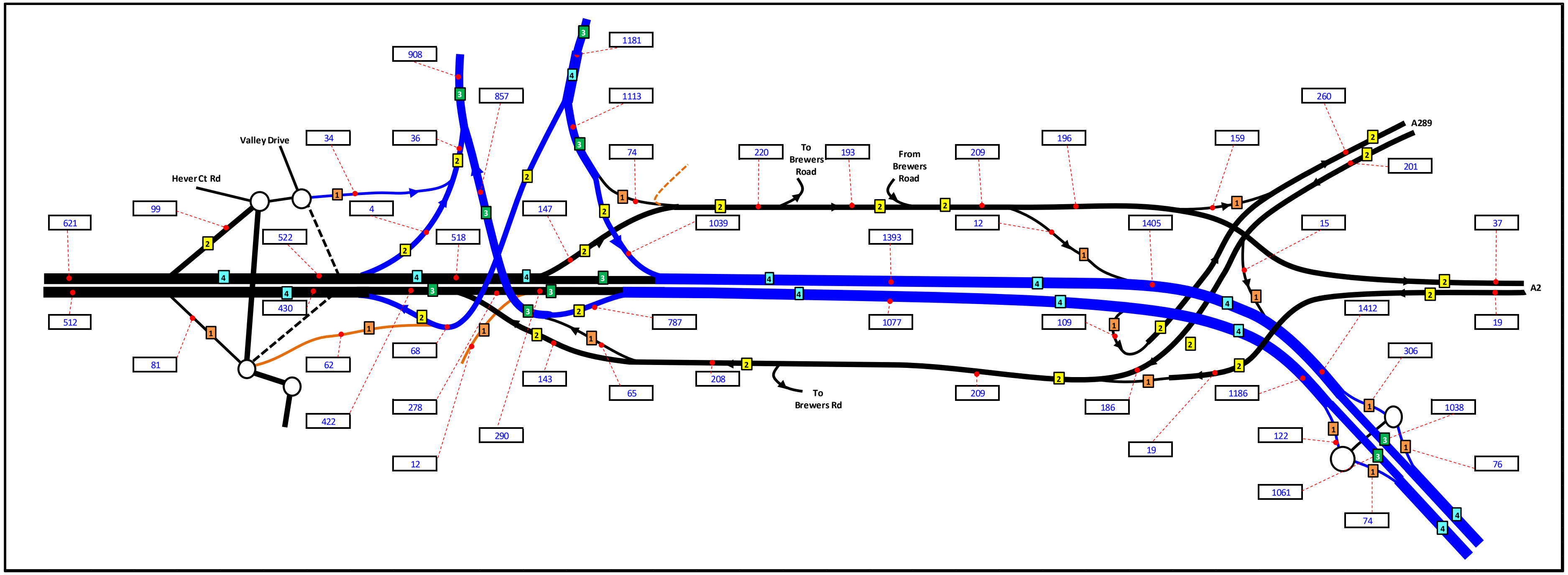


Figure 9.45 – LTC Junction with A13 – LTAM Predicted Traffic Flows 2051 Core PM Peak All Vehicles (PCU's)

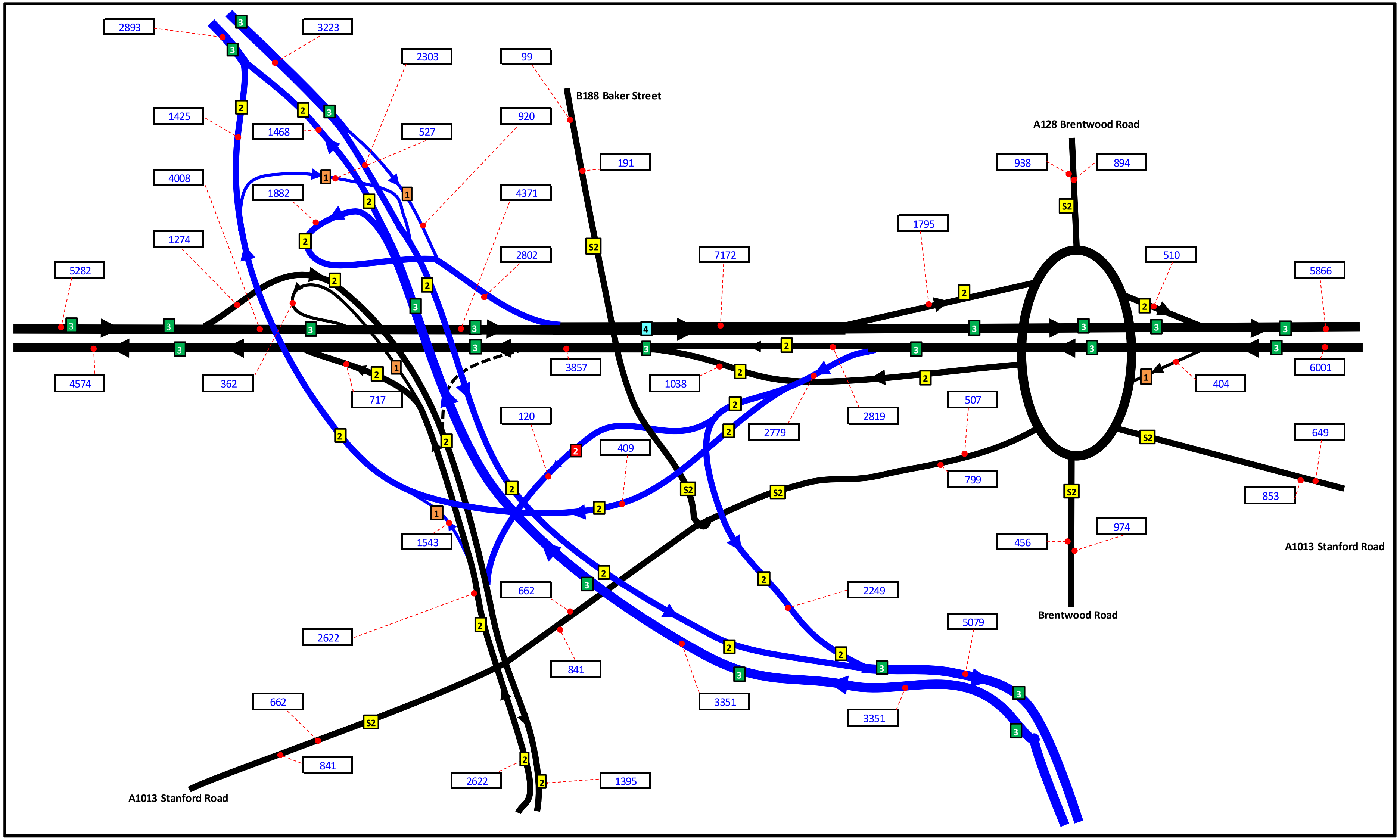


Figure 9.46 – LTC Junction with A13 – LTAM Predicted Traffic Flows 2051 Core PM Peak HGV (PCU's)

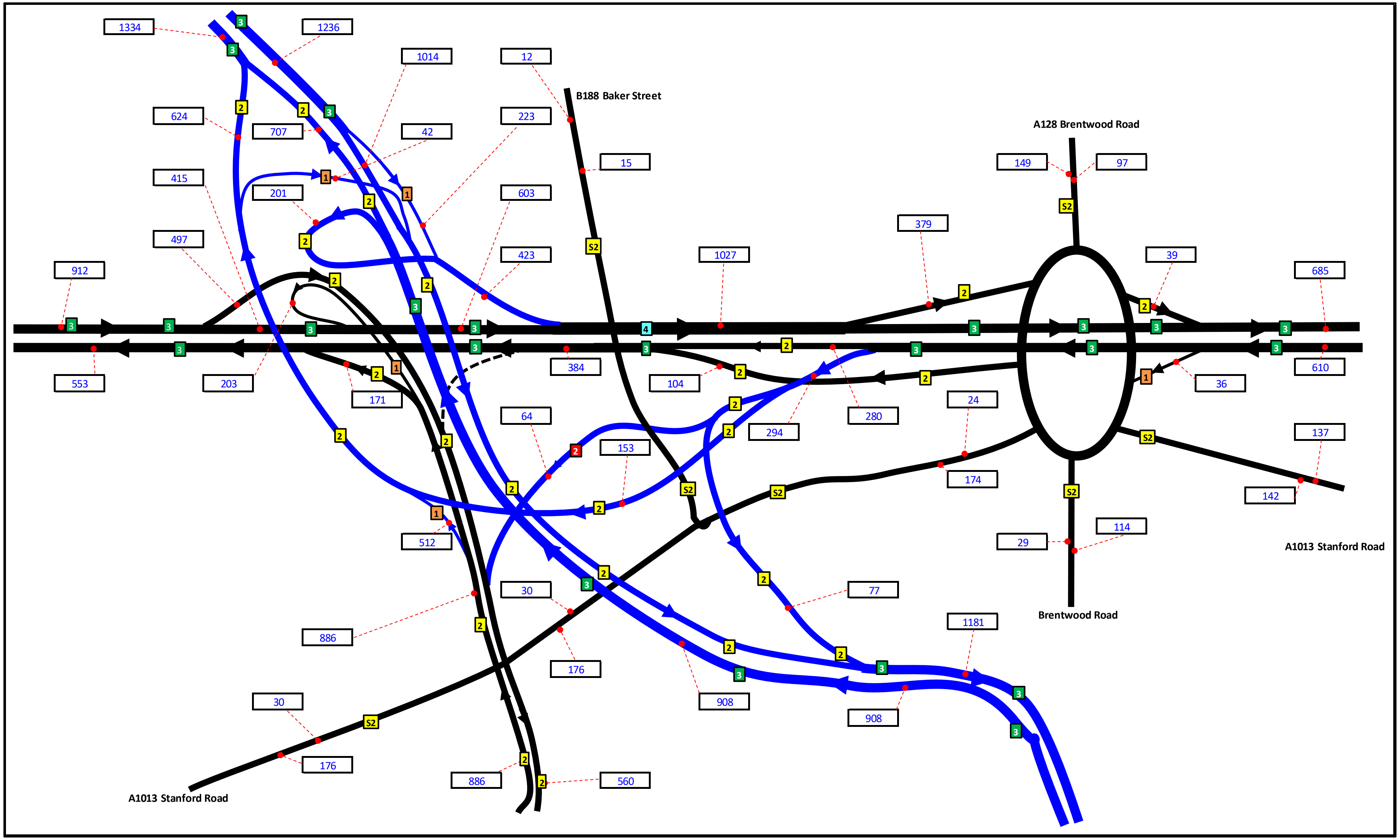


Figure 9.47 – LTC Junction with M25 – LTAM Predicted Traffic Flows 2051 Core PM Peak All Vehicles (PCU's)

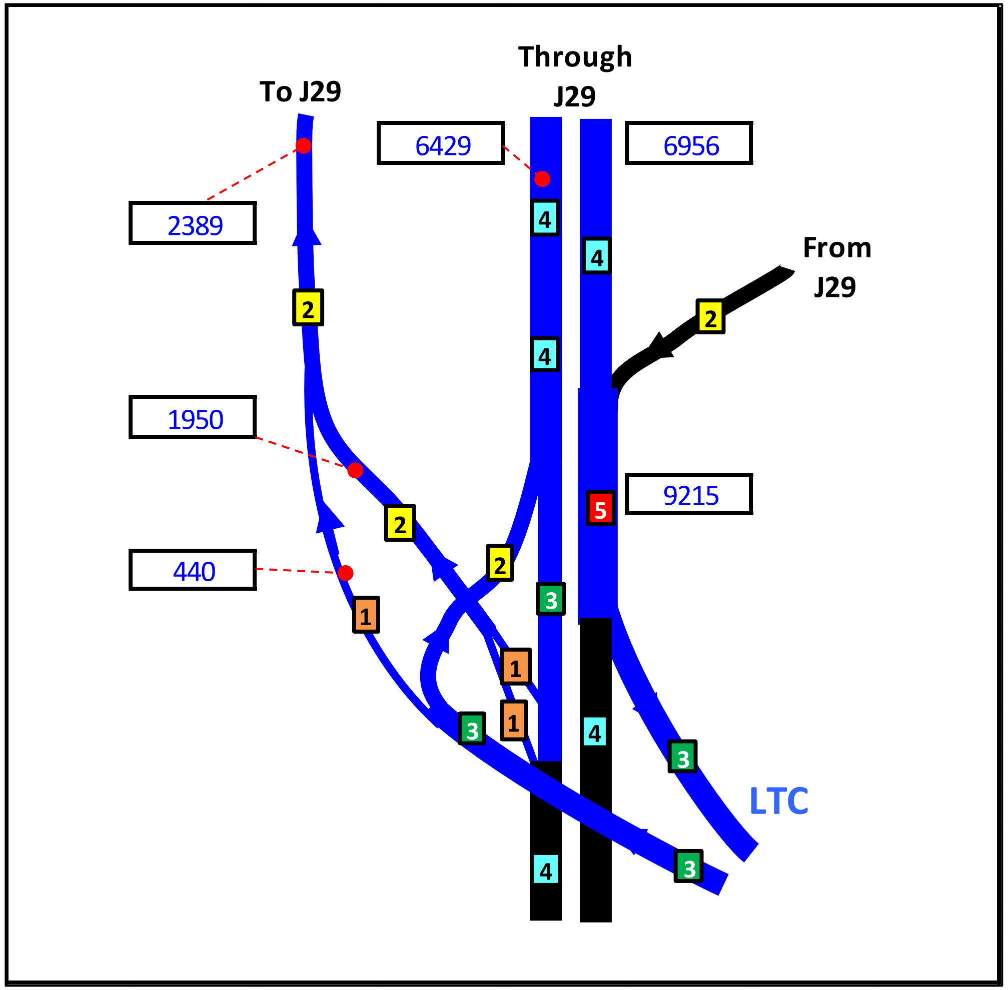
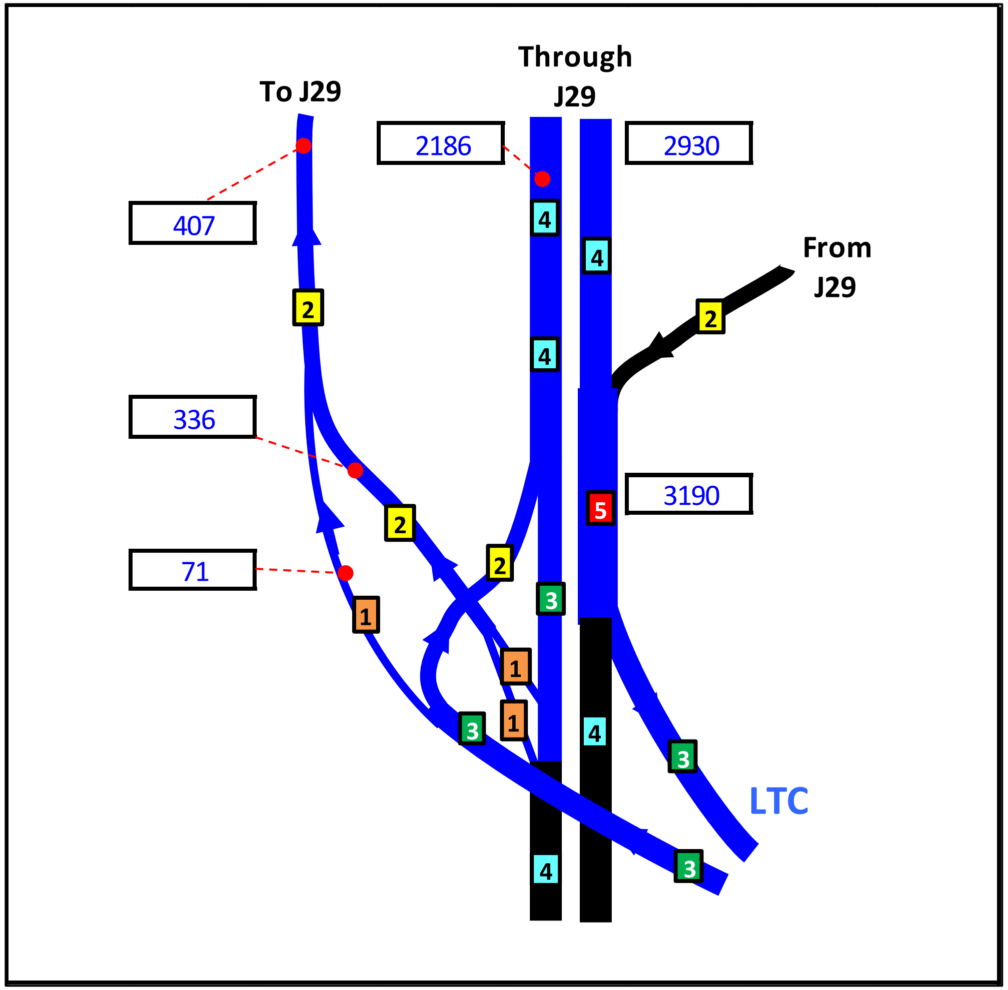


Figure 9.48 – LTC Junction with M25 – LTAM Predicted Traffic Flows 2051 Core PM Peak HGV (PCU's)



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10 Overall Conclusion

10.1.1 This Traffic Forecasting Report provides a comprehensive description of the methodologies used and the forecasts provided by the Lower Thames Area Model (LTAM) in order to support appraisal activities associated with Lower Thames Crossing. The report demonstrates that the methodologies used are in line with current best practice as set out in WebTAG.

10.1.2 This report initially provides some background information on the proposed LTC project. It then summarises the work undertaken to calibrate and validate the LTAM base year models. Further details of this are provided in the Local Model Validation Report, which can be viewed at www.lowerthamescrossing.co.uk/publications.

10.1.3 Planned land use developments and highway schemes were identified through contacting relevant local authorities. These developments were presented in an Uncertainty Log which sets out the relative scale of each development and the current level of certainty as to whether it will happen. Those developments considered near certain, or more than likely were incorporated within the core growth scenario for these forecasts.

10.1.4 Having agreed the Uncertainty Log, trip rates were identified from the TRICS database and these were used to determine the number of trips likely to be produced from each of the new developments in each of the model forecast years. The forecast years are 2026, 2031, 2041 and 2051. Some special locations were treated differently. This includes the DP World, Tilbury and Tilbury 2 ports where predicted demand was taken from reports associated with those specific developments.

10.1.5 Overall car growth is then constrained to that contained within the National Tripend Model. Growth in goods vehicle traffic is constrained to that contained within the Road Traffic Forecasts 2015. The Highways England Interactive DIADEM Interface (HEIDI) is then used to develop reference matrices for each of the forecast years for each of the different segments included within the model. Low and high growth demand matrices were also derived using a proportionate method to represent the uncertainty associated with national growth figures.

10.1.6 Forecast networks were defined for each of the forecast years by adding proposed highway schemes considered near certain or more than likely to the base year LTAM networks. These are called the Do Minimum networks. The LTC scheme is then added to the Do Minimum networks to produce the Do Something networks. Behavioural parameters such as values of time and vehicle operating costs were also derived for each of the forecast years using data provided in the WebTAG Databook.

10.1.7 The LTAM is a variable demand model. For each model year the model is used to forecast how travellers will change their behaviour as a result of changes in the levels of congestion, the cost of fuel, the fuel efficiency of the fleet and change in incomes. The modelled behavioural responses included in LTAM include changes to the frequency with which people make the same trip, the possibility of switching to/from rail, changes in the time of day they travel, changing where they travel to/from and the routes they use to make the journey. The model is run for both the Do Minimum and Do Something scenarios.

10.1.8 A series of outputs are then extracted from the Do Minimum and Do Something forecasts and the comparison between them is used to determine the level of impact that the proposed LTC scheme is predicted to have. These outputs are used to inform economic, environmental and operational appraisal activities and this report presents key findings for each of these areas.

10.1.9 The forecasts show that LTC is predicted to significantly reduce traffic along the A282 and across the Dartford Crossing, along the A2 between the proposed LTC junction and the M25, and on the A13 between its proposed LTC junction and the M25. These reductions in traffic lead to speed improvements on these sections of road. These locations are predicted to be heavily congested in the Do Minimum scenario therefore these reductions in congestion will lead to substantial economic benefits for the scheme.

10.1.10 Other locations on the network are predicted to experience increased congestion as a result of introducing LTC. This is due to the increased capacity to cross the Thames drawing more traffic into the corridor. These locations, such as on the M25 between junction 29 and 28, on the A13 east of its proposed junction with LTC and on the A2/M2 east of its proposed junction with LTC suffer speed reductions which will lead to economic disbenefits of the scheme. Information on the locations considered to be adversely affected by LTC has been passed back to Highways England who will investigate measures to ameliorate these impacts.

10.1.11 A detailed “speed banding” exercise was undertaken in line with Highways England's' Interim Advice Note 185/15. Data from this process has been passed to the environmental assessment teams for them to undertake a full environmental assessment of the scheme. The analysis showed that from an environmental perspective, the impact of the scheme is largely contained within the local area of influence of LTC.

10.1.12 During this phase of the project a considerable amount of work has been undertaken to further refine the design of the proposed scheme. Outputs from the forecasts have been used to determine the levels of demand for various different movements and these have been used to inform the design decision making process. Outputs from the model have also been used to inform microsimulation models used to further refine the design.

10.1.13 The proposed LTC scheme is a transformational project. It is predicted to have a wide ranging overall beneficial impact on large areas of the heavily congested road network in the south east. Its main impact is, as expected, at the Dartford Crossing and on the A2 and A13. There are also some locations which are predicted to be worse in the future with LTC but overall the balance of these benefits outweigh the disbenefits.

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WebTAG Unit M1.2 – Data Sources and Surveys

WebTAG Unit M2 – Variable Demand Modelling

WebTAG Unit M3.1 – Highway Assignment Modelling

WebTAG Databook (July 2017 Issue)

WebTAG Databook (December 2017 Issue)

WebTAG Databook (May 2018 Issue)

Abbreviations

Abbreviation	Description
AADT	Annual Average Daily Traffic
AAWT	Annual Average Weekday Traffic
AADF	Annual Average Daily Flow
ADT	Average Daily Traffic
ANPR	Automatic Number Plate Recognition
AQ	Air Quality
ASR	Appraisal Specification Report
ATC	Automatic Traffic Count
ATOC	Association of Train Operating Companies
BYFM	Base Year Freight Matrices
CASCADE	Jacobs/Arcadis/COWI Joint Venture
CLC	Classified Link Count
COBA	COst Benefit Analysis
DARTCharge	Dartford Crossing Payment System
DBCD	Distance Based Cost Damping
DCO	Development Consent Order
DfT	UK Department for Transport
DGV	Dangerous Goods Vehicle
DIADEM	Dynamic Integrated Assignment and DEmand Model
DMRB	Design Manual for Roads and Bridges
DVLA	Driver and Vehicle Licensing Agency
EA	External Area
ESL	Eastern Southern Link
FH	From Home
FMA	Fully Modelled Area
GDP	Gross Domestic Product
GIS	Geographical Information System
GPS	Global Positioning System
GTFS	General Transit Feed Specification
HAM	Highway Assignment Model

HBEB	Home Based Employers Business
HBO	Home Based Other
HBW	Home Based Work (Commute)
HDV	Heavy Duty Vehicle
HGV	Heavy Goods Vehicle
HHJV	Halcrow Hyder Joint Venture
ITN	Integrated Transport Network
IVD	In Vehicle Distance
LGV	Light Goods Vehicle
LMVR	Local Model Validation Report
LoHAM	TfL's London Highway Assignment Model
LSOA	Lower Layer Super Output Area
LTAM	Lower Thames Area Model
LTC	Lower Thames Crossing
MSOA	Middle Layer Super Output Area
MPND	Mobile Phone Network Data
NAPALM	DfT's National Air Passenger Allocation Model
NaPTAN	National Public Transport Access Nodes
NB	Northbound
NHBEB	Non-Home Based Employers Business
NHBO	Non-Home Based Other
NRTS	National Rail Travel Surveys
NTEM	DfT's National Trip-End Model
NTS	National Travel Survey
OD	Origin Destination
OS	Ordnance Survey
PA	Production Attraction
PBA	Peter Brett Associates
PCF	Project Control Framework
PCN	Penalty Charge Notice
PCU	Passenger Car Unit
PJT	Perceived Journey Time
PortPaxEB	Port Trips Employers Business

PortPaxO	Port Trips Other
PPK	Pence Per Kilometre
PPM	Pence Per Minute
PRA	Preferred Route Announcement
PT	Public Transport
QEII	Queen Elizabeth II Bridge
RH	Return Home
RSI	RoadSide Interview
RTM	Highways England Regional Traffic Model
SATURN	Simulation and Assignment of Traffic in Urban Road Networks
RXHAM	TfL's River Crossings Highway Assignment Model
SB	Southbound
SERTM	Highways England South East Regional Traffic Model
SRN	Strategic Road Network
SUE	Stochastic User Equilibrium
TCG	Highways England's Technical Consistency Group
TDCR	Traffic Data Collection Report
TfL	Transport for London
TIS	Highways England's Trip Information System
TMC	Traffic Management Cell
TPG	Highways England's Transport Planning Group
TRIS	Highways England's Traffic Count Database
UE	User Equilibrium
VDM	Variable Demand Model
VOC	Vehicle Operating Cost
VoT	Value of Time
VPD	Vehicles Per Day
WebTAG	WEB based Transport Analysis Guidance
WSL	Western Southern Link