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Forecasting Report

Maidstone VISUM Transport Model

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Contents

1 Introduction

Amey have been commissioned by Kent County Council (KCC) and Maidstone Borough Council (MBC) to provide transport modelling support to assess the traffic impact of Local Plan options for Maidstone District.

The commission involves the use of the existing Maidstone VISUM model which was developed by Jacobs on behalf of KCC and MBC. The model is to be used to assess the impact of the forecast demand for travel by car, commercial vehicle, bus and rail with alternative development and transport infrastructure options.

Forecast models were specified for a 2031 Do Minimum model, to provide a benchmark, and alternative 2031 Do something scenarios to assist in the Local Plan decision making process. The 2031 forecast scenarios modelled have arisen around differing aspirations and different approaches to tackling existing and forecast transport issues.

2 Background

2.1 Existing VISUM Model

The Maidstone VISUM model was developed to assist in the development of the Local Development Framework (LDF) and to assess the transport impacts of future developments in Maidstone District. The original Maidstone model was developed as a multi modal, variable demand model validated against AM and PM 2007 base year conditions and was further developed to produce 2026 forecast year models for a range of different scenarios.

The detailed modelled area encompasses the urban area of Maidstone District and includes the M20 corridor to the north of the town. The wider network, modelled in less detail, extends to include all the major approaches to the town.

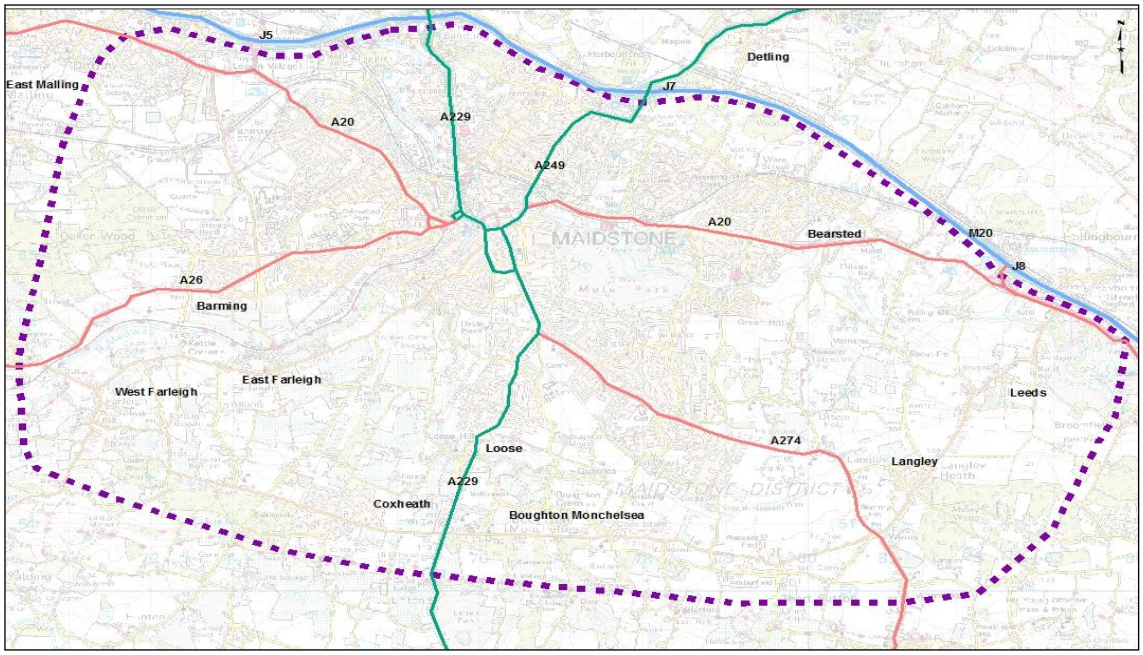


Figure 2.1: Detailed Model Area Plan

2.2 Modelling Approach

A review of the Maidstone model files that were provided was carried out to establish the content of the model and data available. Based on this review a modelling approach was proposed for the development of forecast models to represent 2031.

Amey have undertaken similar local plan testing for other Kent districts using existing models. Each of the models differs in content and application to some degree, but the approach taken has been essentially the same.

The model process involves the generation of reference matrices from an existing start point, which in this case is the 2007 Base model. The forecast matrices are developed using planning data, trips rates derived from TRICS which were used in previous models and local growth factors from TEMPRO.

Base matrices are furnessed to forecast trip totals, with relevant adjustments to account for empty zones or sparse distributions, to produce new reference matrices.

The new reference matrices are assigned to the network which includes any changes proposed to the highway or public transport provision. The new assignment allows for skims to be generated for travel costs which are used for the main incremental mode choice for car, bus and rail trips.

Park and ride cars are determined from a sub-mode choice of home based car trips to estimate the 'car all the way' and 'car with park and ride' element. For the PM peak model the AM peak park and ride car trips are transposed and adjusted to reflect the PM movement

It should be noted that with this approach the forecast trip distribution is not based on a variable demand response but is built upon the base model trip distribution. The AM and PM models are not linked and there is no time of day choice modelling adjustment.

3 2014 Model

3.1 Model Development

Due to the age of the existing base model the first step was to develop a version to represent a 2014 baseline and to carry out a sense check against available data to establish whether the model continued to provide a reasonable reflection of the travel pattern in and through the town.

The 2014 model has been developed to include all known information about development and transport infrastructure changes from 2007 to 2014 which has been incorporated into the base model. A high level sense check of the model performance was then carried out using available count and journey time data.

3.2 2014 travel demand

The 2014 Maidstone model incorporates identified land use changes between the base year 2007 and 2014. This is based on data was provided by MBC for planning approvals, consents and completions up to 2014. The net development quanta incorporated into the 2014 model is summarised in Table 3-1 below. The development identified is reasonably well distributed across the district and is unlikely to have a significant impact on the pattern of distribution of traffic.

Table 3-1: 2014 Development

Development	Net increase
Houses	4166 units
Employment	14693 m^2
Retail	19693 m^2

Trip generation for the new development was based on established TRICS data used in the previous forecast models. External traffic movements with no trip end in Maidstone (which include some of the M20 traffic) were updated to 2014 based on average growth for the south east established from TEMPRO.

3.3 2014 Transport Infrastructure

All known changes to transport infrastructure and other modelled elements from 2007 were included in the 2014 model. The network changes incorporated are comparatively limited in their impact on traffic movement around the town. The changes made for the 2014 model include:

- New signals at the junction of Cripple Street with A229 Loose Road;
- Access to Sittingbourne Road Park & Ride site including traffic signals;
- Access to new hospital site adjacent to Newnham Court on Bearsted Road;
- Updated bus services; and
- 2007 Bus fares and car parking charges adjusted to reflect current costs.

3.4 2014 Model Output

A review of the 2014 model was carried out as a sense check of the model performance and not as a full validation exercise. The review is based on the traffic flow and travel time data that was readily available from a number of sources.

For the journey time output the standard DMRB criteria for the validation of journey times has been used as an indicator of the network performance. The model traffic flows have been compared with observed data at 58 locations across the town, using the standard DMRB criteria for link flow assessment. In addition model flows were compared with observed data at 25 locations on the M20 corridor.

Of the 58 link flows within Maidstone, 78% and 72% of the AM and PM peak modelled flows respectively met the normal acceptable criteria.

Inbound and outbound journey times on the radial routes met the normal acceptable criteria in all but 2 cases in the AM peak. All the PM journey times met the criteria.

A summary of the link flow and journey time data and model performance is contained within **Appendix A.**

The 2014 AM and PM models were considered to provide a reasonable representation of the current travel conditions within Maidstone.

4 Outline of Forecast Model Scenarios

4.1 Overview

All of the 2031 forecast model scenarios tested to date include the same development assumptions based on forecast housing, employment and retail data provided by Maidstone Borough Council. As the planning input data has remained constant, the key difference between the options tested is the packages of transport interventions which have been proposed to mitigate the planned growth within the district.

The sections below provide an overview of the modelled forecast scenarios:

4.2 2031 Do Minimum Model (2031 DM)

The 2031 Do Minimum (2031 DM) model was developed from the validated 2007 base model and includes the same infrastructure changes identified for the 2014 model and the same assumptions for car park and bus fare costs.

The travel demand was developed from the base year model, based on known development from 2007 to 2014 and forecast development assumptions to 2031, as provided by Maidstone Borough Council.

The only significant change to the highway network for 2031 Do Minimum was the proposed Bridges Gyratory Scheme. Progress is being made on this scheme design which is expected to be in place before 2031 and it is therefore included in all the forecast models as a committed scheme.

4.3 2031 Do Something Model 1 (2031 DS1)

The 2031 Do Something 1 (2031 DS1) model is essentially based around highway infrastructure changes. A number of the changes to the highway infrastructure, such as junction improvements, are anticipated to occur as a consequence of specific developments.

The 2031 DS1 Model also includes a major highway change with the inclusion of a Leeds / Langley bypass route option. The route included in the model is indicative only and is based on broad assumptions about the route standard, junction arrangements and other highway based changes.

The forecast development scenario and the travel demand generated for the 2031 DS1 model is the same as for the 2031 DM model.

4.4 2031 Do Something Model 2 (2031 DS2)

The 2031 Do Something (2031 DS22031 DS2) model is developed around measures set out in the MBC Integrated Transport Strategy, contained in **Appendix B**, although it was not possible to model all of the measures listed. The model includes highway infrastructure changes, public transport changes and measures to reflect policy changes (e.g. public parking charges).

The forecast development remains the same as that for the 2031 DM and 2031 DS1 models. However the 2031 DS2 model also includes assumptions around the proportion of walking and cycling trip and the level of car sharing. This has an impact on the net travel demand modelled, which is lower than that for the 2031 DM and 2031 DS1 models.

5 Model Outputs Assessed

The Maidstone model is a strategic level model providing an overview of how traffic responds to changes in demand, highway and public transport provision and policy changes across the modelled network. Output from the model has been extracted to provide a measure of the level of demand for different scenarios and the subsequent impact on the overall network performance and efficiency.

5.1 Travel Demand

Total Travel Demand

Travel demand within the model refers to trips made by car, light goods vehicles (LGV), heavy goods vehicles (HGV), bus or rail. Walking and cycling modes of travel are not modelled specifically. However assumptions about the expected level of walk and cycle trips can be allowed for in the estimate of trip generation. Forecast travel demand is determined by the 2031 development allocation and on assumptions around factors such as car occupancy and sustainable modes of travel.

Mode Choice

Mode choice is estimated for home based trips on the assumption that these trips are most likely to have the opportunity for modal shift. Trips for employers business and non-home based purposes are considered to be less likely to change mode.

The choice of mode of travel, by car, rail or bus, is calculated within the model based on the generalised cost of travel for each mode. Travel costs are derived from car parking costs, vehicle operating costs, travel time, bus and rail fares. The attraction of bus and rail is also dependant on the origin and destination of trips, the accessibility of public transport at each end of the journey, service provision and the level of delay experienced by drivers. The model does not take into account issues around bus or rail capacity.

The proportion of trips made by car, bus or rail provides an indication of the net impact of changes to public transport, travel costs and highway infrastructure.

Park and Ride

The park and ride model is secondary to the main mode choice for public transport. The cars that might be expected to switch to park and ride are estimated based on the AM peak highway assignment and a simple mode choice model.

The PM peak park and ride car journeys are assumed to mirror the AM peak trips which are transposed and adjusted to reflect the PM peak rate of returns.

The number of cars that might be expected to use park and ride facilities is estimated based on travel time and travel costs by bus and by car. The travel time by bus is affected by the location of bus stopping points in relation to the final destination and the frequency of bus service provided. The car travel time is influenced by the location and accessibility of the park and ride sites.

There is an element of geographic restriction incorporated within the model to avoid trips originating in the town centre driving out to the park and ride site and returning to the town by bus.

The model does not specifically account for the capacity of park and ride sites. The Park and Ride trips are based on the highway assignment and are recorded in the vehicle trips. The bus leg of the journey is not included in the bus trips.

5.2 Network Performance

The network performance within the forecast scenario tests has been assessed using the following key indicators:

- Total vehicle distance travelled (vehicle kilometres)
- Total travel time (vehicle hours)
- Average network speed (kph)

The total vehicle kilometres travelled and total vehicle hours recorded on the network, in relation to the number of trips made, provide an indication of the level of efficiency of the network. Higher vehicle kilometres indicate that people have to travel further or take longer routes to reach their destination. Higher vehicle hours indicate that people are taking longer to travel to their destinations suggesting a more congested network. The average network speed is based on the total travel time and travel distance metrics set out above.

5.3 Link Flows

Representative link flows on key routes have been selected to provide an indication of the level of impact on different parts of the network. The locations of the links used are shown in Figure 5.1 below and are listed in Table 5-1.

Link flows are the net result of the different infrastructure or policy changes applied. The impact of the changes may complement each other or they may negate any impact.

Figure 5.1: Link Flow Locations Plan

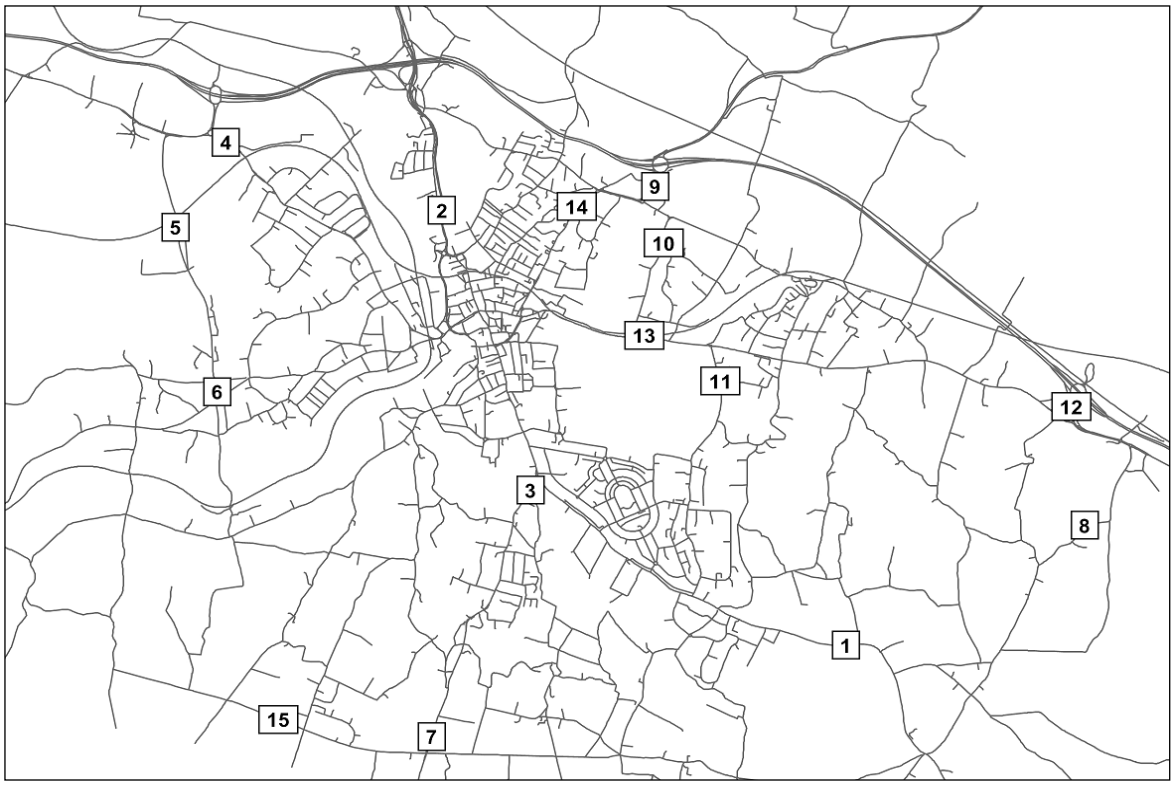


Table 5-1: Link Locations

Site	Location
1	A274 (W) Sutton Road
2	A229 (N) Royal Engineers Way
3	A229 Loose Rd
4	A20 London Road
5	Hermitage Lane
6	A26 Tonbridge Rd
7	A229 Linton Rd
8	B2163 Lower St
9	A249 (M20 J7)

Site	Location
10	New Cut Rd
11	Willington St
12	M20 J8 Spur Road
13	A20 Ashford Rd
14	A249 Sittingbourne Rd
15	B2163 Heath Road

5.4 Journey Times

Journey times have been extracted from selected routes to provide some insight into the impact of different scenarios on specific areas of the network. The journey time routes used are shown in Figure 5.2 below and are listed in Table 5-2.

Figure 5.2: Journey Time Route Locations Plan

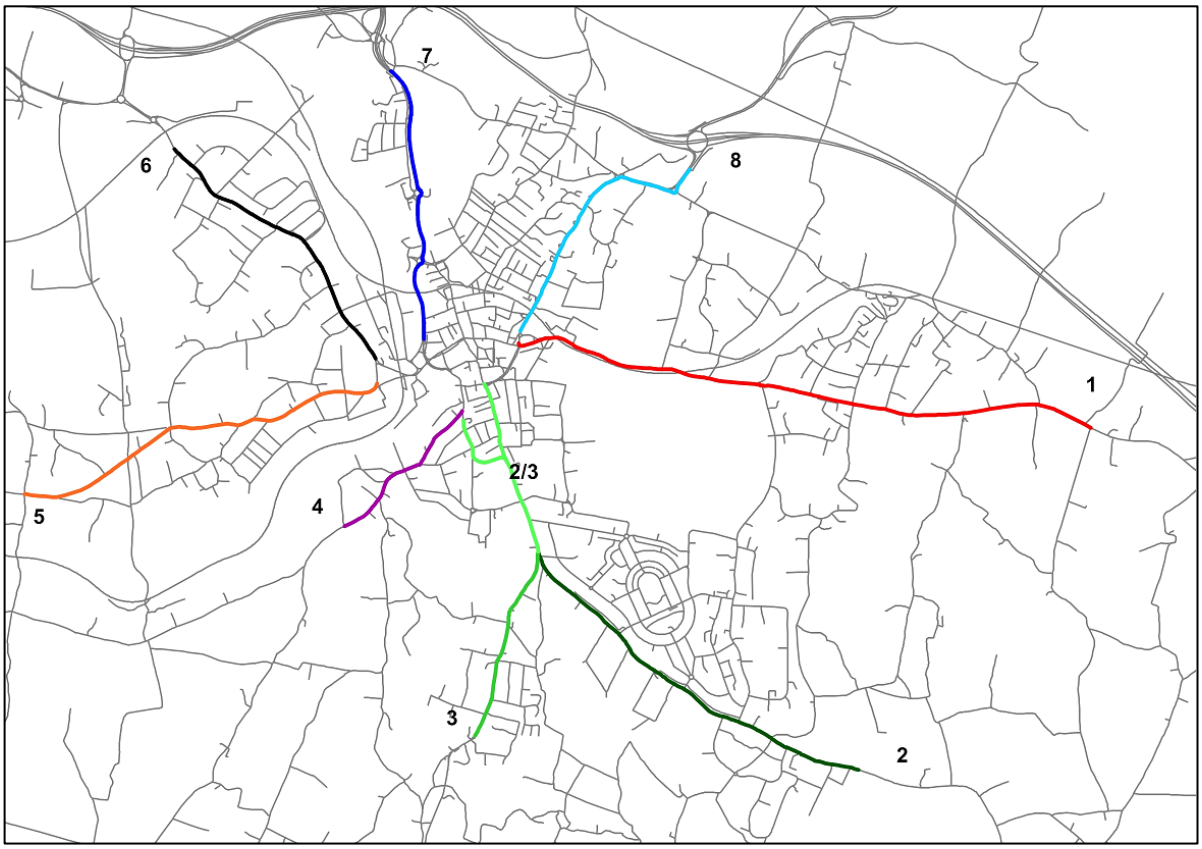


Table 5-2: Travel Time Routes

Route	
1	A20 Ashford Road
2	A274 Sutton Road
3	A229 Loose Road
4	B2010 Farleigh Hill
5	A26 Tonbridge Road
6	A20 London Road
7	A229 Royal Engineers Way
8	A249 Sittingbourne Road

6 2031 Development Allocation (as provided by MBC)

The forecast quantum of development for the Borough has been kept constant between the 2031 DM, 2031 DS1 and 2031 DS2 model scenarios. The forecast housing and retail and employment allocation for 2031 have been provided by MBC.

The 2031 employment and retail allocation includes Local Plan allocations for employment and mixed use sites. Table 6-1 summarises the housing (units), commercial and retail development (m^2) incorporated into the 2031 forecast models. Details of the developments included within the forecast models is provided in **Appendix C.**

Table 6-1 – Forecast Development Quantum

Development Type	Forecast Development for 2031
Houses	17,381 units
Employment land	151,000 m^2
Retail use	12,100 m^2

6.1 Housing

The housing allocation includes completions to 2014, approved sites, extant permissions, Local Plan allocations, sites expected to come forward and an allowance for windfall sites.

6.2 Retail

The forecast retail allocation included in the model to 2031 is comparatively small, based on information provided from the Local Plan. The key retail locations are Newham Court, Maidstone East station, Maidstone Sorting Office, King Street car park and the former AMF Bowling site.

6.3 Employment

The employment allocation identified in the Local Plan includes development at sites outside or on the fringe of the urban area e.g. Marden, Headcorn, Yalding, Coxheath. The largest employment allocation within the town is the medical facility at Newnham Park.

7 2031 Do Minimum Model Review

7.1 Summary Description

The 2031 Do Minimum model represents a 'worst case' scenario where forecast development for 2031 is complete but only committed transport interventions are included. This scenario is not expected to occur but is used as a benchmark against which to view the alternative Do Something scenarios.

7.2 2031 Do Minimum Model Assumptions

For the 2031 Do Minimum model the only additional change to the highway network, over and above those introduced for the 2014 model, is the inclusion of the Bridges Gyratory improvement. This scheme diverts northbound traffic from the A229 Bishops Way via a new link directly to the A229 northbound exit of the Bridges gyratory. Traffic on this link avoids circulating around the gyratory via the two river bridges.

This scheme is also included in the 2031 DS1 and 2031 DS2 models.

7.3 Travel Demand

The 2031 DM total travel demand, in person trips, arising from the forecast development represents an increase of 17-18% over the 2014 baseline. There is a similar proportional increase in the vehicle demand on the network. The total person and vehicular demand on the network is summarised in Table 7-1 below.

Table 7-1: Total Travel Demand

	AM Peak		PM Peak	
	2014	**2031 DM**	**2014**	**2031 DM**
All person trips	50300	58600	44900	52800
% diff from 2014		17%		18%
All vehicles	35500	41500	32,000	38000
% diff from 2014		17%		19%

Cars currently account for 80-83% of the peak vehicle traffic modelled, including park and ride cars which account for less than 1%. Heavy goods vehicles (HGVs) account for 6-7% of traffic and light goods vehicles (LGVs) 12-13%. This composition of vehicle traffic remains similar for the 2031 forecast demand.

The composition of trips made in the AM and PM peaks differs by journey purpose and by mode of travel. The proportion of trips by car, bus rail for the 2031 DM model are similar to the 2014 model. Person trips made by car in the AM peak account for around 81% with 11% travelling by bus and 8% by rail. There is a slightly higher proportion of people travelling by car in the PM peak. The mode share for the 2031 Do Minimum model remains unchanged for the AM peak and with minor changes in the PM peak. The peak hour modal split is summarised is Table 7-2 below.

Table 7-2: Modal Split

Person Trips	AM Peak		PM Peak	
	2014	2031 DM	2014	2031 DM
Car (all purposes)	80%	81%	83%	84%
Bus trips	11%	11%	8 %	8%
Rail trips	9%	8%	9%	8%

7.4 Network Performance

The increased demand on the network in the 2031 Do minimum model that arises from forecast development is reflected by an increase in the total vehicle kilometres travelled across the detailed modelled are. The total vehicle kilometres increase from 2014 by 18% in the AM peak and 21% in the PM peak.

The increase in total travel time for the 2031 DM is significantly more than that for travel distance, suggesting an increase in the level of congestion on the network.

The net result is a decrease in the network wide average vehicular speed in both peaks.

Table 7-3: Network Performance Summary

	AM Peak			PM Peak		
	2014	**2031 DM**	**% diff**	**2014**	**2031 DM**	**% diff**
Total Travel Distance (veh km)	122000	144500	18%	113400	137500	21%
Total Travel Time (veh hrs)	8300	11400	38%	7000	10000	42%
Average Vehicle Speed (kph)	15	13		16	14	

7.5 Link Flows

The locations of the link flows provided have been selected to provide a reasonable snapshot of traffic demand across the network. In some locations there may be a number of factors affecting local traffic movements, the net result being a minimal change in flows.

The majority of the links show an increase in traffic flow for the 2031 Do minimum compared to the 2014 model, reflecting the increase in travel demand due to forecast development (Figure 7.1 and Figure 7.2).

Figure 7.1: 2014 & 2031 DM - AM Peak Two-way Flows

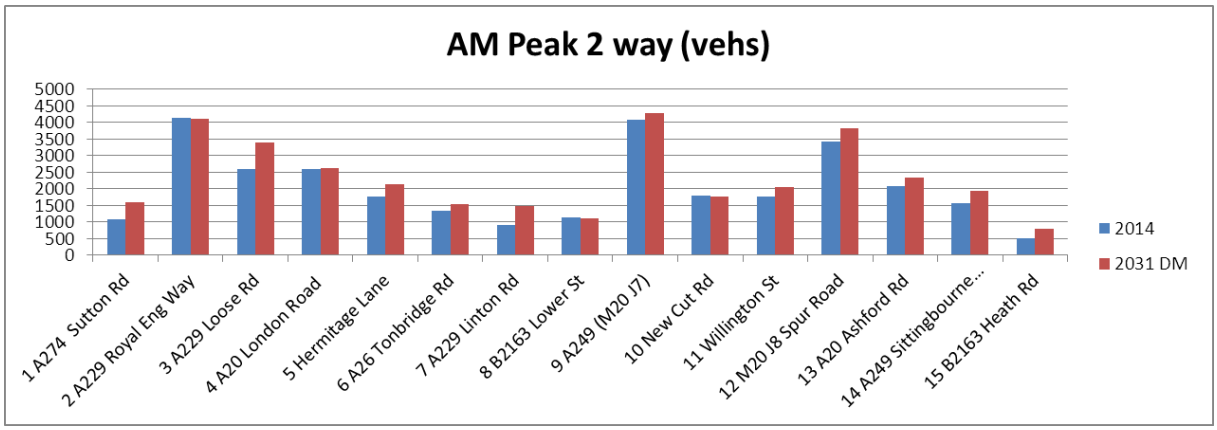


Figure 7.2: 2014 & 2031 DM - PM Peak Two-way Flows

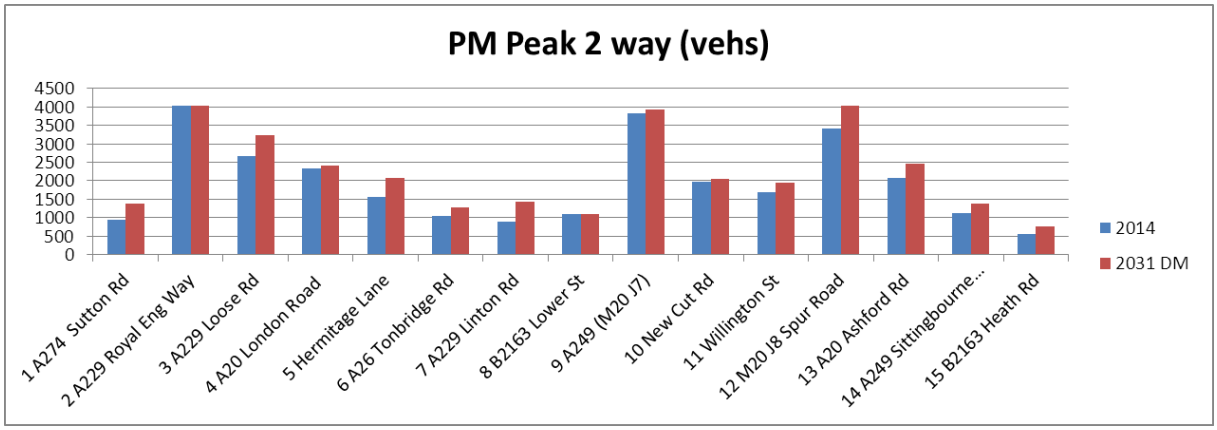
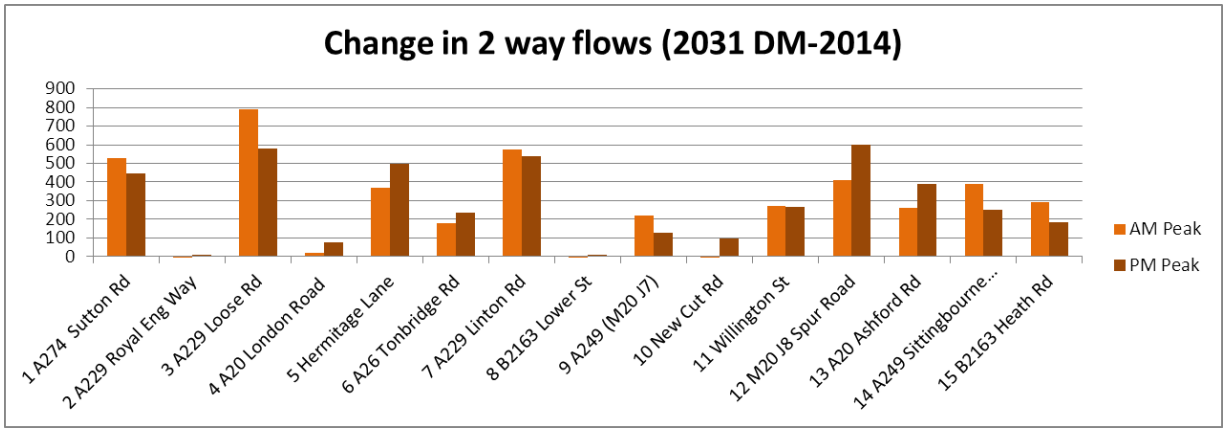


Figure 7.3 shows the change in the volume of traffic compared with the 2014 baseline. Some of the most significant increases in the volume of traffic are shown to be on the A274 Sutton Road, A229 Loose Road and A229 Linton Road (Figure 7.3).

Figure 7.3: 2031 DM - Change in Two-way Flows from 2014 (vehs)



7.6 Travel Times

The additional demand on the 2031 DM network results in a general increase in journey times on the radial routes compared with the 2014 model. The impact is greater in the AM peak than the PM peak with the largest increase being greater than 3.5 minutes on the A229 Loose Road (inbound). The increase in travel time on the A274 Sutton Road and A229 Loose Road reflects the increase in traffic demand on these routes.

Figure 7.4: AM Peak - 2014 and 2031 DM Inbound Travel Times

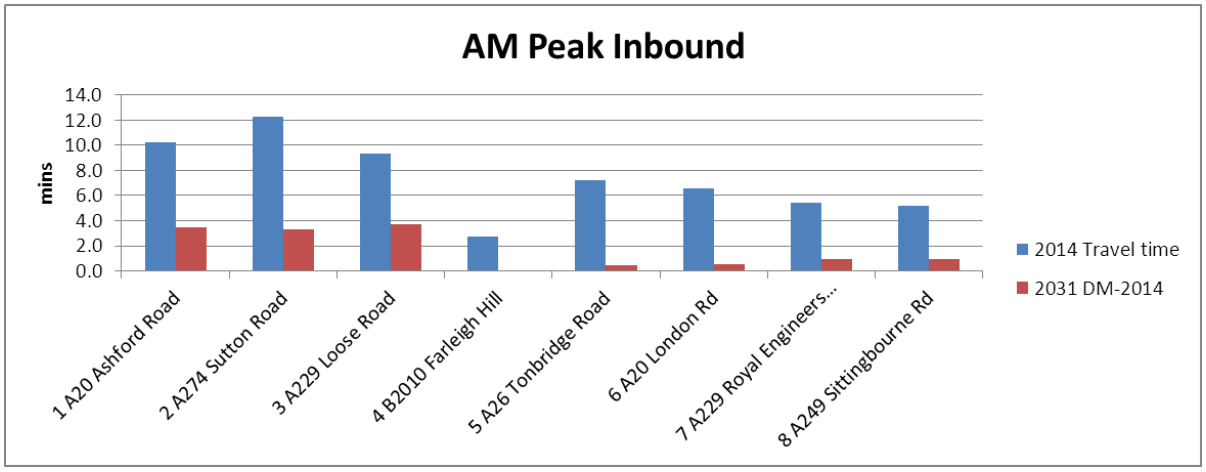


Figure 7.5: AM Peak - 2014 and 2031 DM Outbound Travel Times

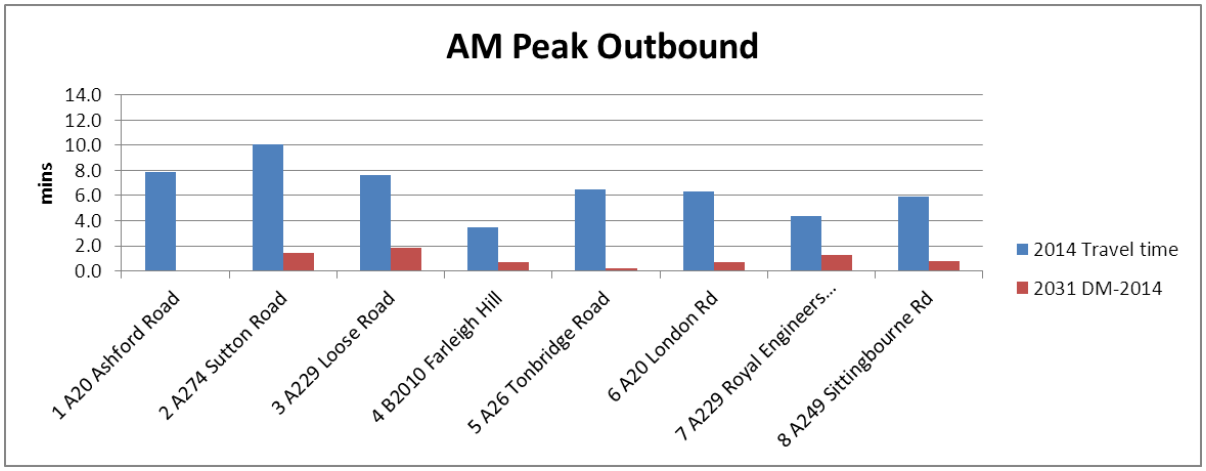


Figure 7.6: PM Peak - 2014 and 2031 DM Inbound Travel Times

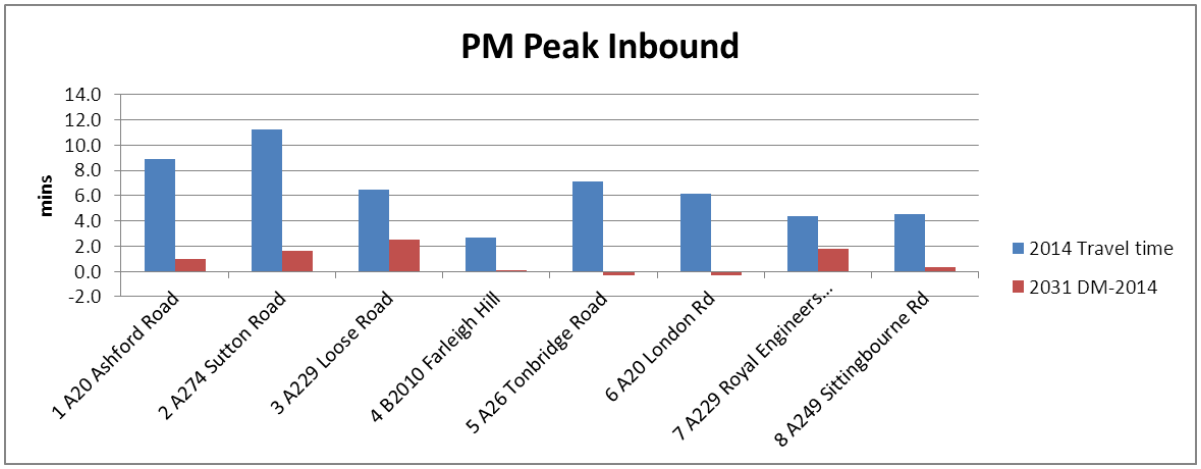
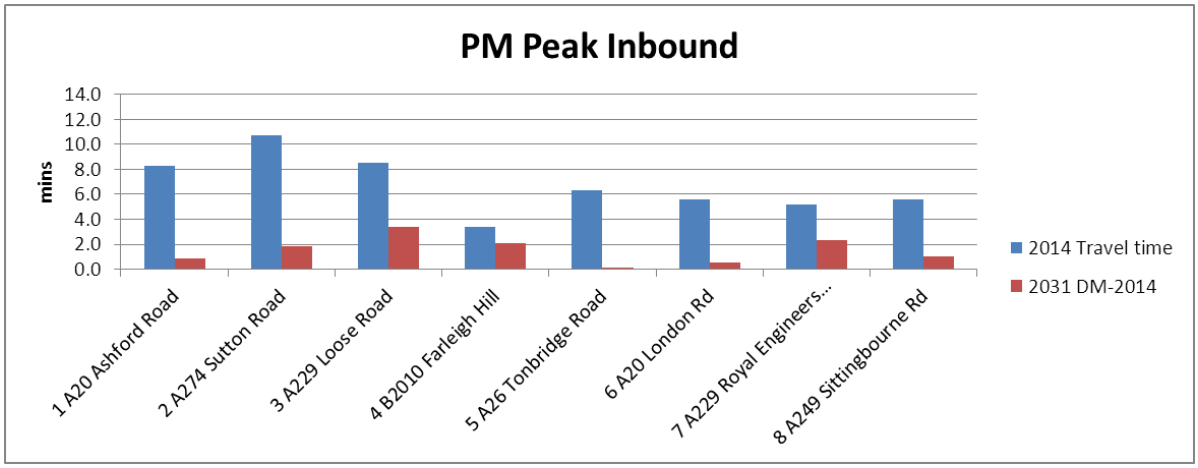


Figure 7.7: PM Peak - 2014 and 2031 DM Inbound Travel Times



7.7 Summary of Model Performance

The increase in travel demand from 2014 to the 2031 DM model is reflected in increases to link flows and travel times on most of the radial routes. The 2031 DM model includes the improvements brought about by the Bridges Gyratory scheme which will have an impact on movements around the town centre. However the additional demand arising from the forecast development will have a significant impact across the town.

With no demand management or other transport infrastructure improvements there would clearly be excessive demand on the A229, A274 to the south and east, A249, A20 to north and east and to Hermitage Lane to the west during the AM and PM peaks.

There is minimal change in the mode choice as there is no significant change to public transport or car travel costs.

8 2031 Do something 1 Model

8.1 Summary Description

The 2031 Do something 1 (2031 DS1) model is essentially based on highway infrastructure changes, including the Bridges Gyratory link, junction improvements at various locations and also the Leeds/Langley Bypass to the east of the town. The travel demand within the model is the same as for the 2031 DM model.

The model has been assessed using the 2031 DM model as a benchmark.

8.2 2031 Do Something 1 Model Assumptions

Bridges Gyratory

The transport improvements included in the 2031 DS1 model include the Bridges Gyratory scheme as modelled in the 20131 DM and 2031 DS2 models.

Junction Improvements

The 2031 DS1 model includes junction improvements at A20/Coldharbour Lane, A249/Bearsted Rd, Bearsted Rd/New Cut, A20/Willington St, A229/ A274 Wheatsheaf, A274/Willington St, A274/Wallis Ave and A26/Fountain Lane.

The improvements to junction configuration and to signal arrangements are based on drawings and details provided, where available.

Leeds/Langley Bypass

A major feature of the network changes for the 2031 DS1 model is the inclusion of the Leeds / Langley bypass. This new route between the A20 and A274 provides an alternative route to the east of the town. The modelled scheme is based on limited information available regarding assumptions around the junction arrangements and associated improvements to the A274. The transport interventions are listed in Table 8-1 below.

Table 8-1: 2031 DS1 Transport Interventions Summary

Transport Improvement	Description
Bridges Gyratory	New northbound link to bypass the gyratory
A20 / Coldharbour Lane Junction	Junction Capacity and signals – no change to M20 J5
A249 / Bearsted Rd roundabout	Junction improvements
Bearsted Rd / New Cut junction	Junction improvements
Dual carriageway between A249 and New Cut junctions	Increased capacity and junction arrangement
A20 Ashford Road / Willington Street	Junction capacity and signals arrangement
A229 / A274 Wheatsheaf Junction	Close exit to Cranbourne Avenue
A274 / Willington Street Junctions	Junction capacity improvements
A274 / Wallis Avenue Junction	Junction capacity improvements
A26 Fountain Lane Junction	Changes to accommodate right turn vehicles within the junction
Leeds Langley Relief Road	New route linking the A274 and the A20 and including improvements to the A274. Single carriageway with roundabouts at each end and replacing the 5 Wents junction. Existing B2163 closed south of Horseshoes Lane

8.3 Travel Demand

The forecast development quantum is the same for 2031 DM and the 2031 DS1 model. The 2031 DS1 model includes no change to the assumptions around sustainable modes of transport or to car occupancy which could influence the level of travel demand modelled.

The 2031 DS1 model highway interventions have an impact on vehicle travel distance and time. The reduced travel time on the highway network attracts a small increase of <1% in car trips (Table 8-2) compared with the 2031 DM. There is a corresponding small shift in the mode share in the AM peak (Table 8-3).

There is a small increase in the number of the AM peak hour park and ride cars to 286 vehicles, which account for <1% of all car movements.

Table 8-2: 2031 DS1 Travel Demand (Vehicle Trips)

	AM Peak			PM Peak		
	2014	**2031 DM**	**2031 DS1**	**2014**	**2031 DM**	**2031 DS1**
All vehicles	35500	41500	41600	32,000	38000	38100
% diff from 2014		17%	17%		19%	19%
% diff from 2031 DM			0.2%			0.2%

Table 8-3: 2031 DS1 Modal Split

Person Trips	**AM Peak**		**PM Peak**	
	2031 DM	**2031 DS1**	**2031 DM**	**2031 DS1**
Car (all purposes)	81%	82%	84%	84%
Bus trips	11%	10%	8%	8%
Rail trips	8%	8%	8%	8%

8.4 Network Performance

The 2031 DS1 model includes more than 4km of additional highway for the Leeds/Langley Bypass. However both the AM and PM peak models have a similar total travel distance to the 2031 DM model, but with a reduced total travel time on the network. This suggests that the network operates more efficiently than the 2031 Do Minimum scenario.

Table 8-4: 2031 DS1 Network Performance Summary (AM Peak)

AM Model	**2031 DM**	**2031 DS**	**% change from 2031 DM**
Total Travel Distance (veh km)	144500	146700	2%
Total Travel Time (veh hrs)	11400	10800	-6%
Average Vehicle Speed (kph)	13	14	

Table 8-5: 2031 DS1 Network Performance Summary (PM Peak)

PM Model	2031 DM	2031 DS	% change from 2031 DM
Total Travel Distance (veh km)	137500	140200	2%
Total Travel Time (veh hrs)	10000	9500	-5%
Average Vehicle Speed (kph)	14	15	

8.5 Link Flows

The 2031 DM model and the 2031 DS1 model have the same level of traffic demand on the network. However the 2031 DS1 model includes improvements at key junctions and also additional road space in the form of the Leeds/Langley bypass.

Figure 8.1 and Figure 8.2 compare the 2031 DM and 2031 DS1 two way traffic flows at the locations indicated in Figure 5.1. The 2031 DS1 highway improvements appear to have a limited impact on the two way traffic volumes on A20 London Road, Hermitage Lane, A26 Tonbridge Road and A26 Linton Road.

Figure 8.1: 2031 DM & DS1 - AM Peak Two-way Flow

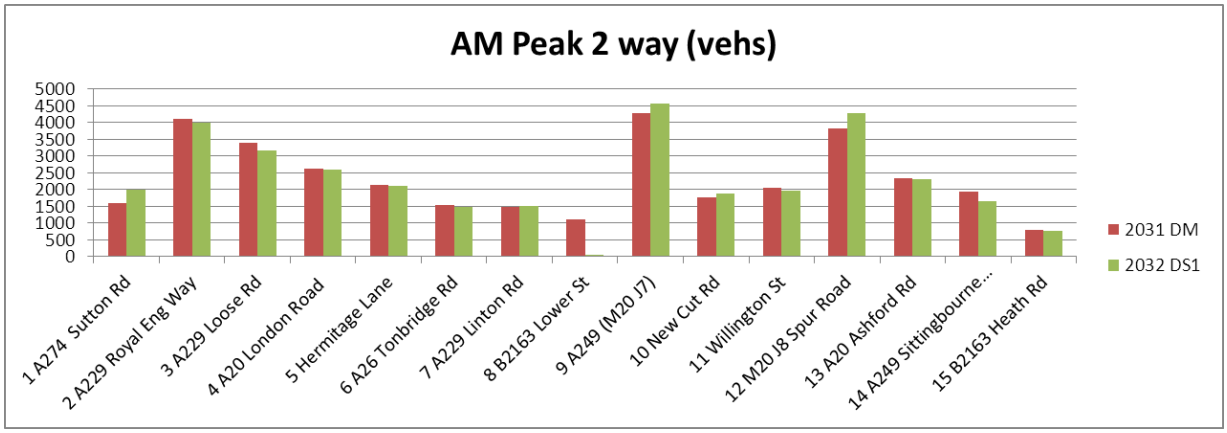
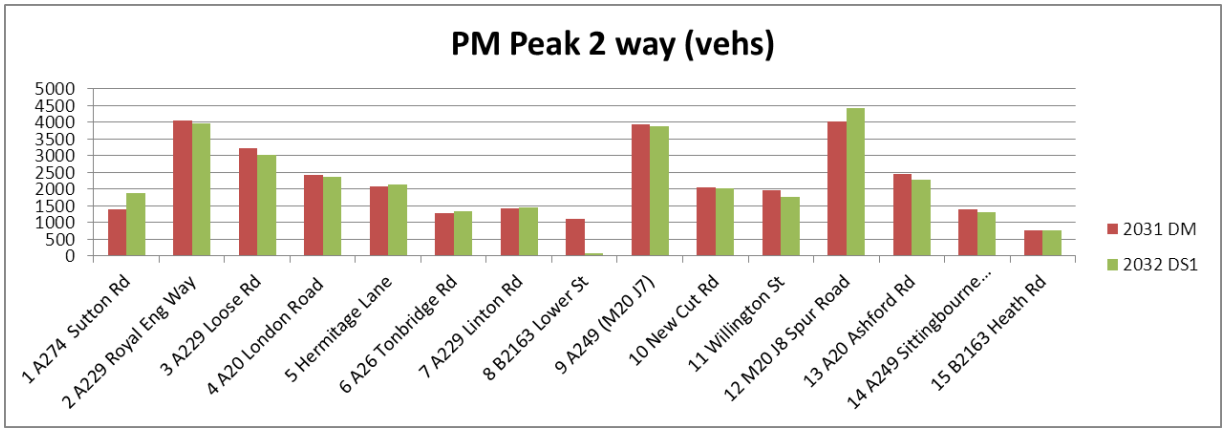


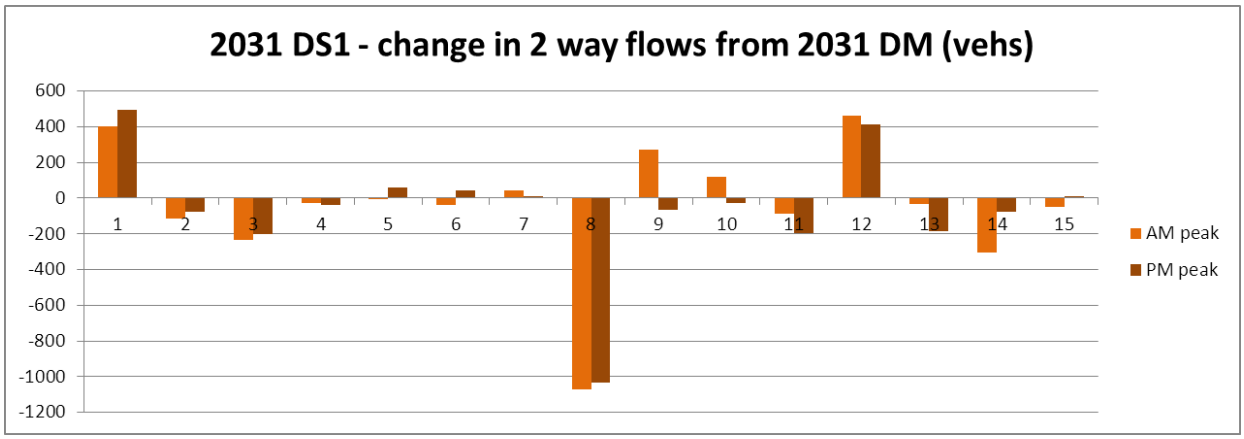
Figure 8.2: 2031 DM & DS1 - PM Peak Two-way Flow



As might be expected the inclusion of the Leeds/Langley bypass appears to have an impact on routes to the east and north of the town. Figure 8.3 shows the difference in the 2031 DM and 2031 DS1 two way flows.

There is an increase in traffic using the A249 and A20 approaches to the M20 at junctions 7 and 8 respectively. The B2163 Heath Road is effectively closed to through traffic. The A274 Sutton Road indicates an increase in flow as traffic reroutes to access the new link. There is a small decrease in traffic using Willington Street.

Figure 8.3: 2031 DS1 - Change in Two Way Flows from 2031 DM (vehs)



8.6 Travel Times

The 2031 DS1 model includes improvements at key junctions across the town as well as a significant addition to the highway provision in the form of the Leeds/Langley bypass. The net impact of these changes on travel times on selected routes are summarised in Figure 8.4 to Figure 8.7.

The 2031 DS1 models demonstrate a small reduction in travel times compared to the 2031 DM scenario for most of the selected routes; apart from the A20 London Road and A249 Sittingbourne Road inbound in the PM peak.

The A20, A274 and A229 Loose Rd routes probably benefit most from the inclusion of the Leeds / Langley Bypass, in the AM in particular. The journey times on these routes in the AM peak are over 1 minute shorter than for the 2031 DM model.

Figure 8.4: 2031 DM & DS - AM Peak Inbound Travel Times

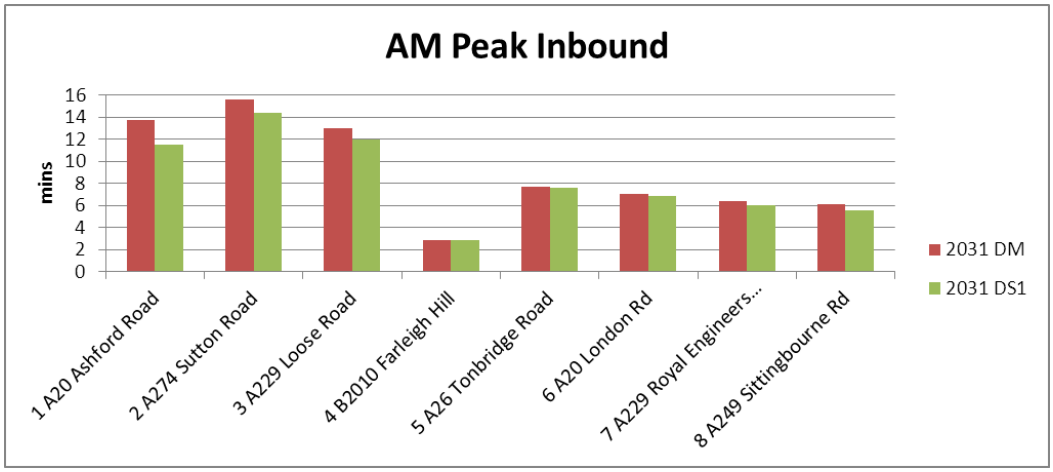


Figure 8.5:2031 DM & DS - AM Peak Outbound Travel Times

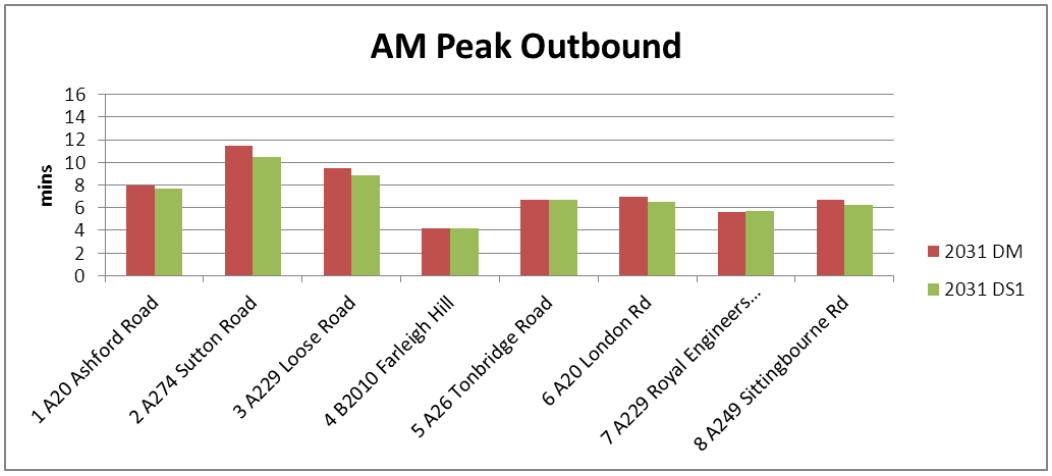


Figure 8.6: 2031 DM & DS PM - Peak Inbound Travel Times

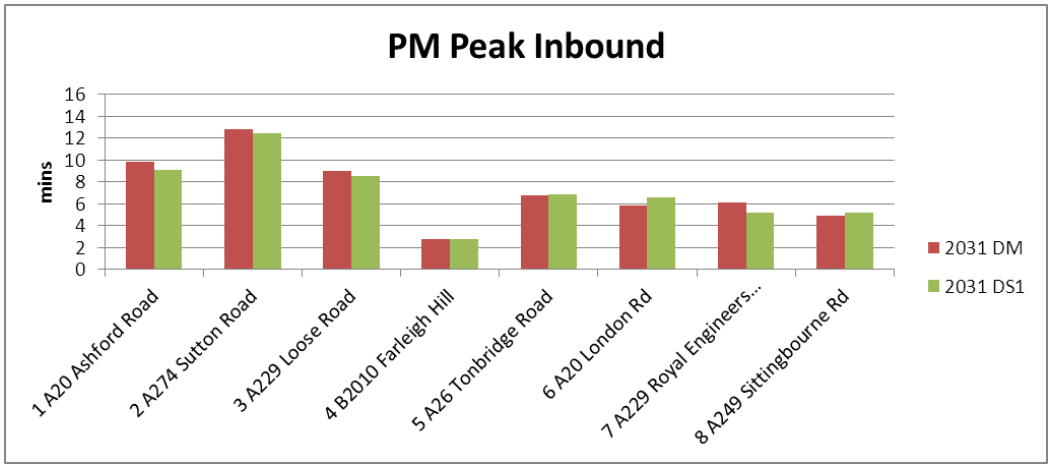
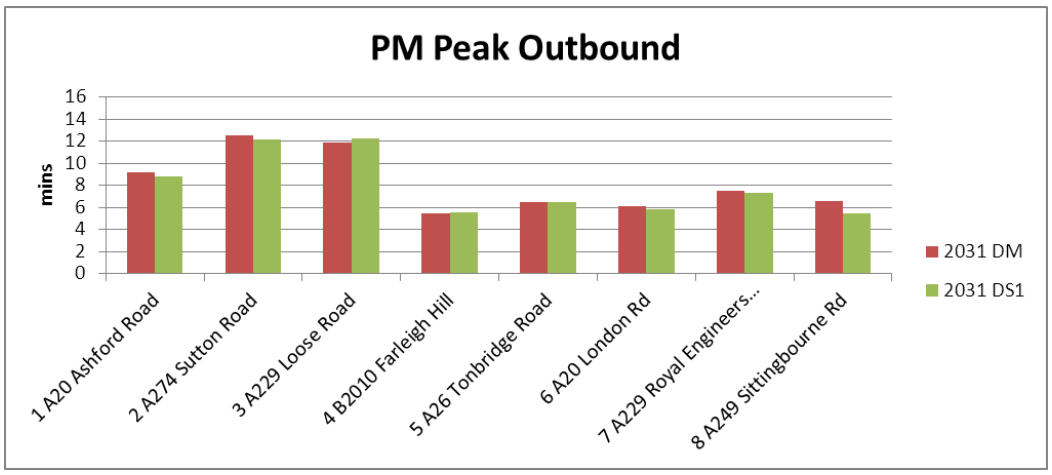


Figure 8.7: 2031 DM & DS - PM Peak Outbound Travel Times



8.7 Summary of Model Performance

The most significant change to the network, with the inclusion of the Leeds/Langley Bypass, clearly reduces traffic on the B2163. The link offers a longer but faster route for an element of traffic from the south and east of the town. This is reflected in the lower total travel time while the total travel distance remains similar to the 2031 DM model.

The bypass attracts traffic to access the M20 via the spur road at junction 8 where flows increase. The A20 Ashford Rd, A274 Sutton Rd and A229 Loose Rd corridors all benefit from reduced travel times; especially in the AM peak. This is likely due to the combined impact of the Leeds/Langley Bypass and key junction improvements.

The key junction improvements across the town contribute to the small reductions in travel times on the key radial routes in/out of the town.

9 2031 Do Something 2

9.1 Summary Description

The 2031 Do something 2 (2031 DS2) model is based on the Integrated Transport Strategy Action Plan, as provided by Maidstone Borough Council. The measures in the ITS Action Plan that can be reflected in the model include junction improvements, network improvements, public transport changes, changes to walking and cycling mode share; and car occupancy.

The 2031 DS2 model includes the same forecast development assumptions as the 2031 DM and 2031 DS1 models. The 2031 DM model has been used as a benchmark against which to assess the performance of the 2031 DS2 model.

9.2 2031 Do Something 2 Model Assumptions

Table 9-1: 2031 DS2 Transport Interventions Summary

Transport Improvement	Description
Bridges Gyratory	New northbound link to bypass the gyratory
A20 / Coldharbour Lane Junction	Junction Capacity and signals – no change to M20 J5
A249 / Bearsted Rd roundabout	Junction improvements
Bearsted Rd / New Cut junction	Junction improvements
Dual carriageway between A249 and New Cut junctions	Increased capacity and junction arrangement
A20 Ashford Road / Willington Street	Junction capacity and signals arrangement
A229 / A274 Wheatsheaf Junction	Close exit to Cranbourne Avenue
A274 / Willington Street Junctions	Junction capacity improvements
A274 / Wallis Avenue Junction	Junction capacity improvements
A26 Fountain Lane Junction	Changes to accommodate right turn vehicles within the junction
PR Fare	£3.00 Park and Ride parking cost
New PR service from Linton corner	New service with 15 minute frequency assumed
Existing PR bus services	15 minute frequency assumed for existing PR
M20 Junction 7 improvement	Signals on M20 eastbound approach and A249 approaches to the roundabout
New Cut / A20 left turn slip	Junction expansion to include left hand turn slip with give way at A20 (to allow for bus priority right hand turn lane). NB Bus priority not modelled.

Transport Improvement	Description
Hermitage Lane pedestrian signals	New pedestrian signals near vehicle access to Barming Station
New link between Gore Court Rd and Bicknor Wood	New link with priority junctions assumed at each end
Widening of Gore Court Road	Increased capacity on Gore Court Rd
Car parking charges	50% increase in parking charges
Notcutts shuttle bus	New shuttle bus route from Notcutts to the bus station with 20 minute frequency
Bus services	Bus services on main radial routes increased to 7 minute frequencies
Car sharing	Increase in car sharing by 5%.
Romney Place bus lane	Bus only lane from Lower Stone Street to Romney Place
Walking mode share	Mode share target - 8.5% increase in walking mode share over 2014 base
Cycling mode share	Mode share target - 8.5% increase in cycling mode share over 2014 base
Circular bus route to hospital	Linking town centre, Hermitage Lane, the hospital, Howard Drive (via a bus only link) and London Rd

Bridges Gyratory

The Bridges gyratory as included as modelled in the 2031 DM and 2031 DS1 models.

Highway Improvements

The 2031 DS2 model include the same junction improvements as the 2031 DS1 model at A20/Coldharbour Lane, A249/Bearsted Rd, Bearsted Rd/New Cut, A20/Willington St, A229/ A274 Wheatsheaf, A274/Willington St, A274/Wallis Ave and A26/Fountain Lane.

In addition improvements are also included for M20 J7 and for A20/New Cut. Proposed junction configuration and signal arrangements are based on drawings and details provided, where possible.

The 2031 DS2 also includes a new link between Gore Court Rd and the A274 and a bus only link from Lower Stone Street to Romney Place.

Bus Services

A number of improvements to bus services have been identified including:

- an increase service frequency of 7 minutes on the main radial routes;

- a new shuttle service to Notcutts; and
- a circular service linking Hermitage Lane, the hospital, Howard Drive and the A20. This includes a bus only link to Howard Drive.

In addition, a new Park & Ride service is provided at Linton Corner and the frequency of Park & Ride bus services to all sites increased to 15 minute intervals.

A complex matrix of services operates on the key corridors providing a variety of alternative route options and bus frequencies. To achieve the proposed 7 minute frequency on the main radial routes over a 3 hour peak period requires a total of 26 buses. The A274, A20(W) and A26 corridors are all currently served by services with sufficient frequency to provide enough buses.

Additional buses were added to the services operating along the A229(S), A229(N) and A20(E) corridors to achieve the target frequency. A total of 65 buses over the 3 hour peak period were added to the AM model and 56 to the PM model.

The Notcutts shuttle bus operates every 20 minutes and runs along New Cut Road and along the A20 to the bus station via King Street. This service stops only at Notcutts and the bus station.

The circular service linking Hermitage Lane and Howards Drive operates via a new bus only link and is an extension of the 79 bus route. This bus operates on a 15 minute frequency and stops at all the stops on route as well as on Howards Drive.

The new Park & Ride service from Linton Corner operates along the A220 Loose Road, approaching the town centre via Mill Street. This service is assumed to stop at the proposed Linton Corner Park & Ride site, Mill Street, High Street and Kings Street.

The addition of bus services within the model takes no account of the practicality of their provision or capacity available for additional buses within the town.

Park and Ride

The park and ride sub-mode choice model estimates the number of cars that might be expected to switch to park and ride based on travel time and cost. The park and ride journey includes a parking or fare cost which for the 2014, 2031 DM and 2031 DS1 models is £2.50 per vehicle. For the 2031 DS2 model it is proposed that cars using the park and ride service should pay to park the car and travel on the bus for free. A parking charge of £3.00 is proposed.

Car Parking Charges

A 50% increase in car parking charges is proposed for public long and short stay parking. Representative car parking costs per zone are used within the model for the mode choice process. These costs were uplifted by 50% to represent the aspired increase in public parking charges.

Walking and Cycling Mode Share

The ITS action plan has the objective of increasing the number of walking and cycling trips. The aspiration is for an 8.5% increase in the cycling mode share over the 2014 base, representing a 0.5% increase per year to 2031. A similar increase is envisaged for the walking mode share.

The Maidstone Model is essentially a highway model with a mode choice option to estimate the potential transfer of trips between car, bus or rail. The model does not include walking and cycling modes of travel.

The most appropriate way to reflect the anticipated increase in walking and cycling in the Maidstone model is to reduce the number of trips assigned within the model to car travel. This approach requires an interpretation of a '% increase in walking and cycling trips' into a reasonable adjustment of car trips that are modelled.

Walking and cycling trips, as part of the wider sustainable modes, have been the subject of various studies into the possibility of reducing the number of car trips. A wide range of estimates have been produced to describe the potential to change the way in which people choose to travel under different circumstances.

A study for the Depart for Transport (DfT)[1] reported estimates for a potential reduction in car trips from 5% to 21% in the urban peak hour, depending on the transport interventions employed

A study of the impact of sustainable transport interventions in Darlington, Peterborough and Worcester reported a decrease in car trips of 9% in response to a range of measures employed.[2]

[1] Cairns, S., Sloman, L., Newson, C., Anable, J., & Goodwin, P. 2004. 'Smarter Choices – Changing the way we travel'.

Some care is needed in the interpretation of the outcomes of the different studies as the estimated reduction in car trips is the outcome of measures related to all sustainable modes of travel and not directly related to specific changes in walking and cycling provision only. Guidance in DfT Tag Unit M5.2 suggests establishing a benchmark for car trip reduction using target values as a starting point.

In the absence of detailed information on the existing levels of walking and cycling in Maidstone for different purposes, a relatively simplistic approach to this complex issue has been agreed with MBC/KCC and adopted, based on broad assumptions about the impact of a sustainable travel strategy. As a proxy for the aspired increase in walking and cycling trips the 2031 home based car trips have been adjusted down based on achieving 25% of the target values.

The adjustment was applied only to home based work and home based other highway trips with an origin and destination within the Maidstone urban area zones and no consideration to trip distance was applied.

The net result is a reduction of 1395 (3.5%) vehicle trips in the AM peak and 1351 (3.5%) vehicle trips in the PM peak.

9.3 Car Sharing

An increase in car sharing of 5% by 2031 is proposed.

Car sharing is reflected in the model by the level of average car occupancy assumed which originally set at 1.23 within the model. The car occupancy assumed for the DS2 model is 1.29. This value has been used in the trip generation assumptions for forecast development and in the conversion of vehicle trips to person trips for the mode choice process.

The net impact of the increase in car occupancy is a reduction of 228 (0.5%) vehicle trips in the AM peak.

[2] Sloman, L., Cairns, S., Newson, C., Anable, J., Pridmore, A. & Goodwin, P. 2010. 'The Effects of Smarter Choice Programmes in the Sustainable Travel Towns: Summary Report (Report to the DfT, February 2010)

9.4 Travel Demand

The total travel demand, in person trips, by highway and public transport is summarised in Table 9-2 below. The total travel demand included in the 2031 DS2 model, in person trips, decreases by around 4% compared with the 2031 DM model, reflecting the increase in the proportion of walk and cycle trips and the increase in car occupancy allowed for in the transport interventions.

Table 9-2: 2031 DS2 Travel Demand (Person Trips)

	AM Peak			PM Peak		
	2014	**2031 DM**	**2031 DS2**	**2014**	**2031 DM**	**2031 DS2**
All person trips	50300	58600	56600	44900	52800	50800
% diff from 2014		17%	12%		18%	13%
% diff from 2031 DM			-4%			-4%

The total travel demand, in vehicle trips, decreases by 9% in the AM peak and 8% in the PM peak (Table 9-3) in the 2031 DS2 model. The decrease in vehicle trips is the net outcome of the impact of the decrease in total demand, increase in vehicle occupancy and the enhanced public transport provision. The increase in bus frequencies and the new bus services, together with the increased cost of parking, promotes a shift in the mode share toward public transport and to buses in particular (Table 9-4).

Table 9-3: 2031 DS2 Travel Demand (Vehicle Trips)

	AM Peak			PM Peak		
	2014	**2031 DM**	**2031 DS2**	**2014**	**2031 DM**	**2031 DS2**
All vehicles	35500	41500	37700	32,000	38000	34800
% diff from 2014		17%	6%		19%	9%
% diff from 2031 DM			-9%			-8%

Table 9-4: 2031 DS2 Modal Split

Person Trips	AM Peak		PM Peak	
	2031 DM	2031 DS2	2031 DM	2031 DS2
Car (all purposes)	81%	75%	84%	80%
Bus	11%	15%	8%	11%
Rail	8%	10%	8%	9%

As a result of the additional park and ride site at Linton Corner and changes to bus frequencies there is a significant increase in the number of peak hour park and ride cars in the AM peak to 1290 vehicles, which account for around 4% of all car movements (Table 9-5).

Table 9-5: Park and Ride Car Trips

AM Peak	2031 DM	2031 DS1	2031 DS2
Park and ride cars	276	286	1290
P&R as % of all cars	<1%	<1%	4%

9.5 Network Performance

The 2031 DS2 model includes a wide range of transport interventions from highway capacity improvements to sustainable transport measures Both the AM and PM peak models show a significant reduction in the total travel distance and total travel time compared with the 2031 DM model. This suggests that there would be a significant improvement in network efficiency compared with the 2031 Do Minimum scenario if all of the proposed transport interventions could be successfully implemented.

Table 9-6: 2031 DS2 Network Performance Summary (AM Peak)

AM Model	2031 DM	2031 DS2	% change from 2031 DM
Total Travel Distance (veh km)	144500	126900	-12%
Total Travel Time (veh hrs)	11400	8500	-26%
Average Vehicle Speed (kph)	13	15	

Table 9-7: 2031 DS2 Network Performance Summary (PM Peak)

PM Model	2031 DM	2031 DS2	% change from 2031 DM
Total Travel Distance (veh km)	137500	125700	-9%
Total Travel Time (veh hrs)	10000	8100	-19%
Average Vehicle Speed (kph)	14	16	

9.6 Link Flows

The reduction in travel demand assigned to the network for the 2031 DS2 is reflected in lower vehicle flows at many of the locations selected, in both peaks (Figure 9.1 and Figure 9.2).

Figure 9.1: 2031 DM & DS2 - AM Peak Two-way Flow

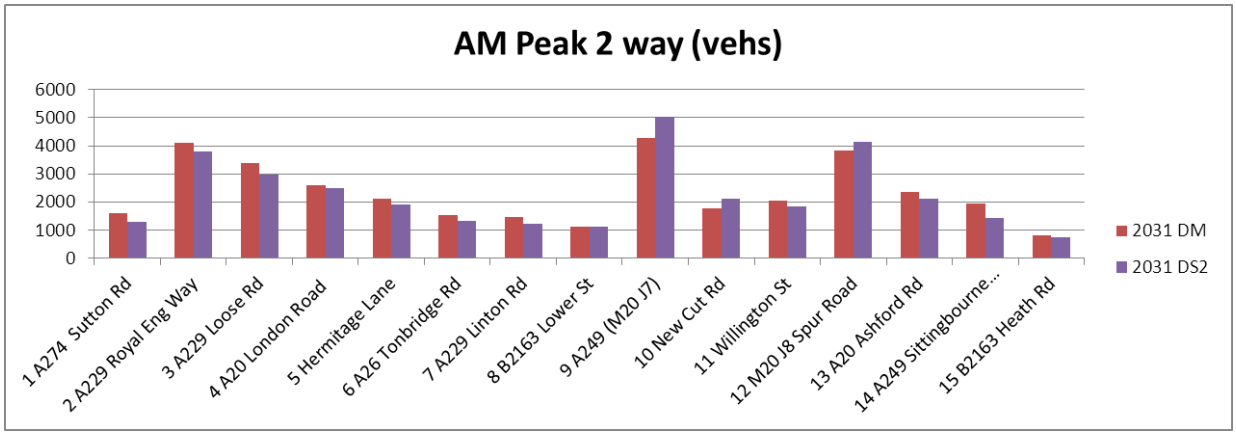
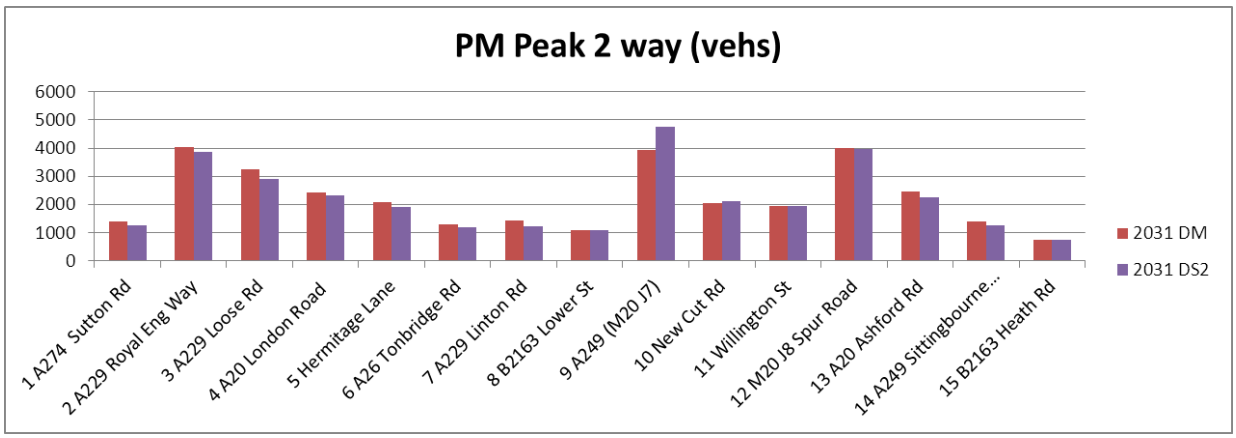
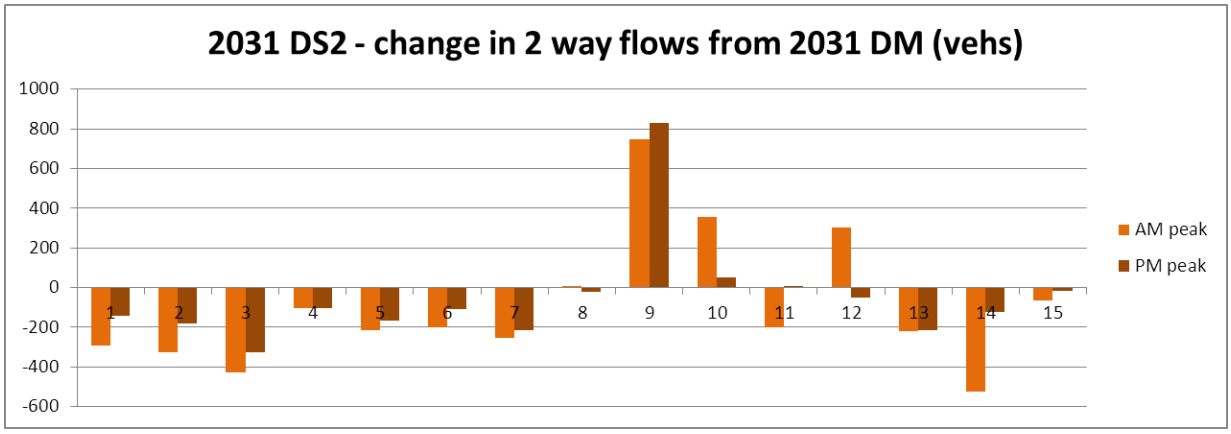


Figure 9.2: 2031 DM & DS2 - PM Peak Two-way Flow



However, despite the lower overall vehicle demand, the link flows in the AM peak in particular show a significant increase on the A249 approach to M20 J7, M20 J8 Spur Road and New Cut compared to the 2031 DM (Figure 9.3).

Figure 9.3: 2031 DS2 – Change in Two Way Flows from 2031 DM (vehs)



9.7 Travel Times

With the lower travel demand for the 2031 DS2 model the travel times on most of the radial routes are lower than for the 2031 DM model. The A274, A20 Ashford Road and A229 Loose Road inbound movements benefit most in the AM peak (Figure 9.4 to Figure 9.7).

The modelled changes have a different impact on the AM and PM networks. This is a consequence of the change in levels of pressure on sections of the networks and the different composition of traffic and traffic movements in the AM and PM peaks.

Figure 9.4: 2031 DS2 Journey Times – AM Peak Inbound

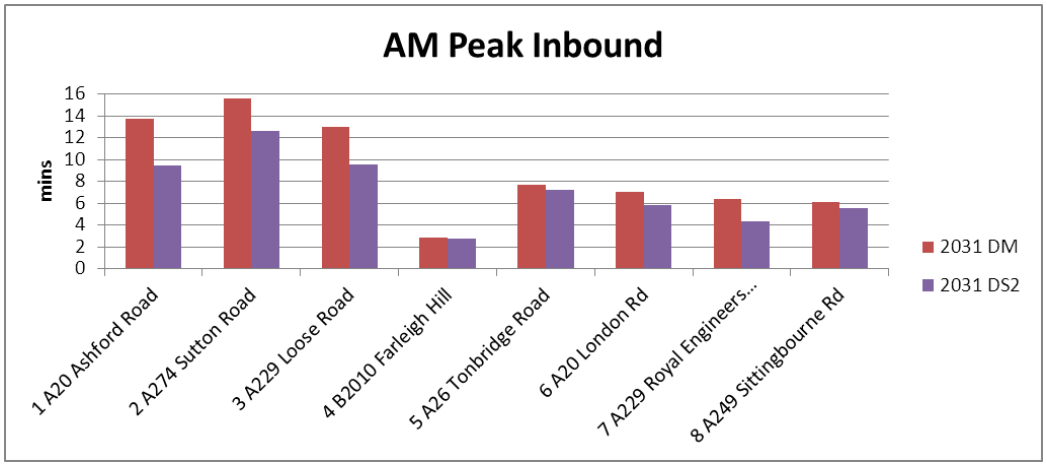


Figure 9.5: 2031 DS2 Journey Times – AM Peak Outbound

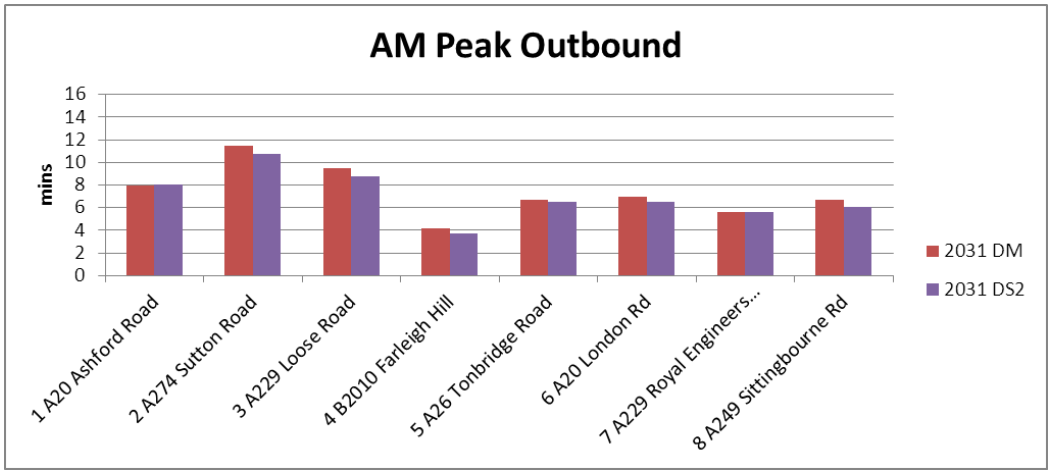


Figure 9.6: 2031 DS2 Journey Times – PM Peak Inbound

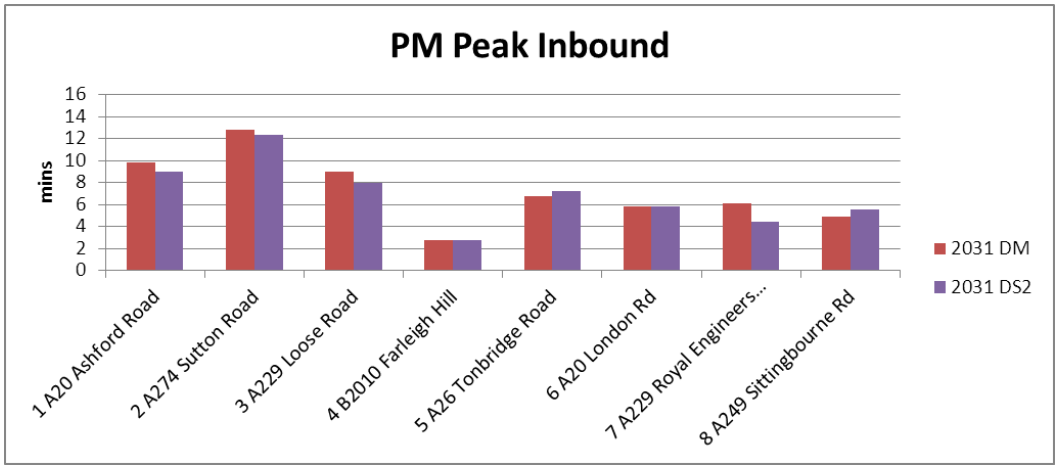
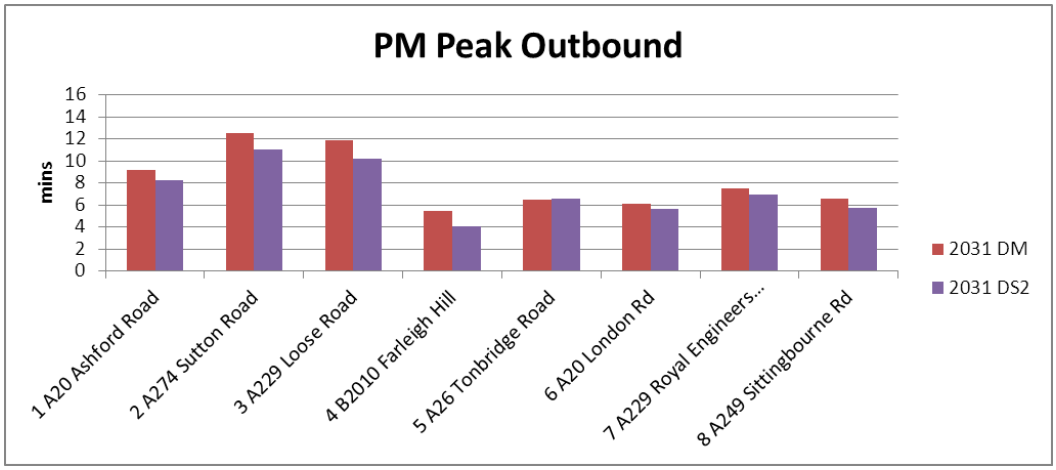


Figure 9.7: 2031 DS2 Journey Times – PM Peak Outbound



9.8 Summary of Model Performance

The 2031 DS2 has a significantly reduced travel demand compared with the 2031 DM and 2031 DS1 models. This is the outcome of assumptions around walking and cycling modes and car occupancy as well as an additional Park & Ride site, a very high level of public transport provision and a significant increase in parking costs.

In addition the model includes improvements to key junctions across the town which would be expected to improve the efficiency of the network. The model outcomes are a reflection of a package of highway, public transport and policy changes.

The net impact is a general reduction in traffic flows compared with the 2031 DM, although there are some parts of the network showing an increase in vehicle movements. Travel times on the radial routes are generally shorter for the 2031 DS2 models although again there are one or two routes where times increase.

10 Overview of Forecast Models

10.1 Model Inputs

Forecast Development Data

The model inputs in terms of the forecast quantum of development in 2031 have been kept constant throughout the modelled scenarios.

Transport Interventions

A summary of the various transport interventions incorporated into each of the forecast model scenarios is provided in Table 10-1 below.

Table 10-1: Summary of Transport Interventions

Transport Improvement	Description	2031 DM	2031 DS1	2031 DS2
Bridges Gyratory	New northbound link to bypass the gyratory	Yes	Yes	Yes
A20 / Coldharbour Lane Junction	Junction Capacity and signals – no change to M20 J5		Yes	Yes
A249 / Bearsted Rd roundabout	Junction improvements		Yes	Yes
Bearsted Rd / New Cut junction	Junction improvements		Yes	Yes
Dual carriageway between A249 and New Cut junctions	Increased capacity and junction arrangement		Yes	Yes
A20 Ashford Road / Willington Street	Junction capacity and signals arrangement		Yes	Yes
A229 / A274 Wheatsheaf Junction	Close exit to Cranbourne Avenue		Yes	Yes
A274 / Willington Street Junctions	Junction capacity improvements		Yes	Yes
A274 / Wallis Avenue Junction	Junction capacity improvements		Yes	Yes
A26 Fountain Lane Junction	Changes to accommodate right turn vehicles within the junction		Yes	Yes

Transport Improvement	Description	2031 DM	2031 DS1	2031 DS2
Leeds Langley Relief Road	New route linking the A274 and the A20 and including improvements to the A274. Single carriageway with roundabouts at each end and replacing the 5 Wents junction. Existing B2163 closed south of Horseshoes Lane		Yes	
PR Fare	£3.00 Park and Ride parking cost			Yes
New PR service from Linton corner	New service with 15 minute frequency assumed			Yes
Existing PR bus services	15 minute frequency assumed for existing PR			Yes
M20 Junction 7 improvement	Signals on M20 eastbound approach and A249 approaches to the roundabout			Yes
New Cut / A20 left turn slip	Junction expansion to include left hand turn slip with give way at A20 (to allow for bus priority right hand turn lane). NB Bus priority not modelled.			Yes
Hermitage Lane pedestrian signals	New pedestrian signals near vehicle access to Barming Station			Yes
New link between Gore Court Rd and Bicknor Wood	New link with priority junctions assumed at each end			Yes
Widening of Gore Court Road	Increased capacity on Gore Court Rd			Yes
Car parking charges	50% increase in parking charges			Yes
Notcutts shuttle bus	New shuttle bus route from Notcutts to the bus station with 20 minute frequency			Yes
Bus services	Bus services on main radial routes increased to 7 minute frequencies			Yes
Car sharing	Increase in car sharing by 5%.			Yes

Transport Improvement	Description	2031 DM	2031 DS1	2031 DS2
Romney Place bus lane	Bus only lane from Lower Stone Street to Romney Place			Yes
Walking mode share	Mode share target - 8.5% increase in walking mode share over 2014 base			Yes
Cycling Mode Share	Mode share target - 8.5% increase in walking mode share over 2014 base			Yes
Circular bus route to hospital	Linking town centre, Hermitage Lane, hospital, Howard Drive and London Rd			Yes

10.2 Travel Demand

The AM and PM peak travel demand by all modelled modes and purposes is summarised in Table 10-2 below. The 2031 Do Minimum models indicate an increase of 17- 18% in person trips compared with the 2014 AM and PM respectively. The total person trips remain the same for the 2031 DM and 2031 DS1 models.

The 2031 DS2 models incorporate changes to assumptions around the walking and cycling mode share. Consequently the travel demand in person trips is reduced by approximately 4% compared with the 2031 DM and 2031 DS1.

Table 10-2: Summary of Total Travel Demand (Person Trips)

Person Trips	2014	2031 DM	2031 DS1	2031 DS2
AM Peak	50300	58600	58600	56600
% difference from 2014		17%	17%	12%
% difference from 2031 DM			0%	-4%
PM Peak	44900	52800	52800	50800
% difference from 2014		18%	18%	13%
% difference from 2031 DM			0%	-4%

Vehicle demand on the network in the 2031 DM models increases by 17-19% compared with the 2014 models (Table 10-3). This amounts to approximately 6000 additional vehicle trips on the highway network.

Highway changes incorporated into the 2031 DS1 models attract a small number of trips from public transport resulting in increase of <1% in the total vehicle trips compared with the 2031 DM models. This is also reflected in a slight change in the mode share (Table 10-4).

Table 10-3: Summary of Total Travel Demand (Vehicle Trips)

Vehicle Trips	2014	2031 DM	2031 DS	2031 DS2
AM Peak	35500	41500	41600	37700
% difference from 2014		17%	17%	6%
% difference from 2031 DM			<1%	-9%
PM Peak	32,000	38000	38100	34800
% difference from 2014		19%	19%	9%
% difference from 2031 DM			<1%	-8%

The transport interventions included in the 2031 DS2 model are focussed on public transport provisions together with car parking policy etc. The net impact of the reduced person trips, increase in car occupancy and transport interventions is a much smaller increase in vehicle demand from 2014 of 6-9% (2200 to 2800 vehicles) in the AM and PM peaks respectively, significantly lower than for 2031 DS1. This again is reflected in a decrease in the mode share for cars and an increase in trips by public transport.

Table 10-4: Summary of Modal Splits

Person Trips	AM Peak			PM Peak		
	2031 DM	2031 DS1	2031 DS2	2031 DM	2031 DS1	2031 DS2
Cars (all purposes)	81%	82%	75%	84%	84%	79%
Bus	11%	10%	15%	8%	8%	11%
Rail	8%	8%	10%	8%	8%	10%

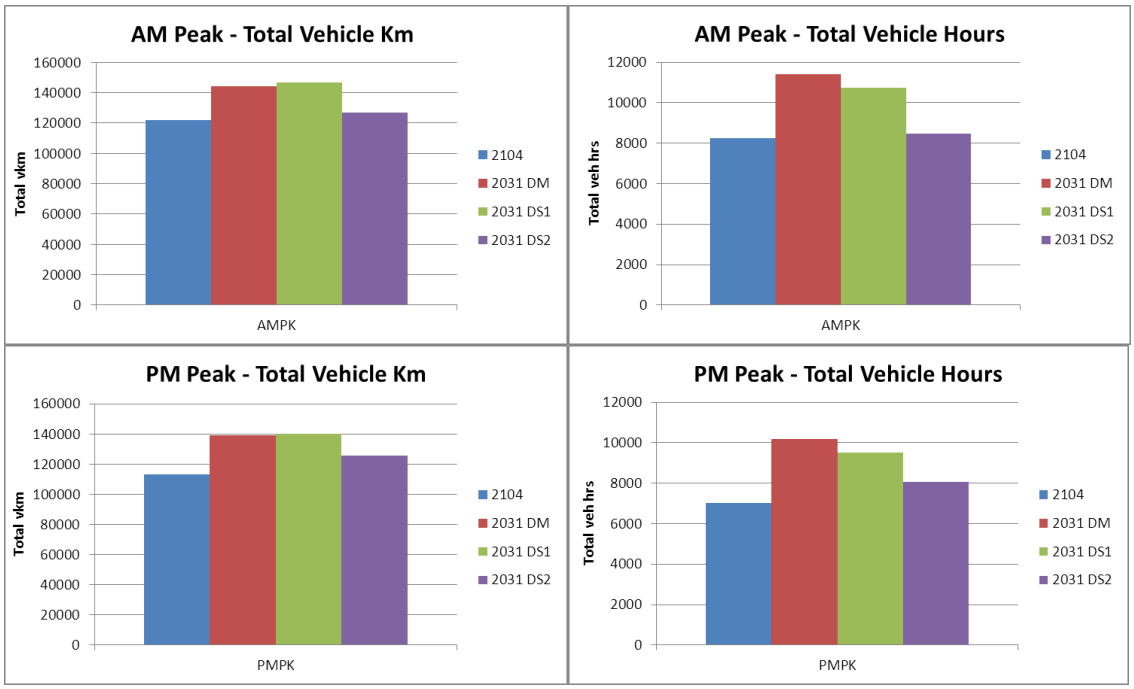
10.3 Network Performance

Data has been extracted from the models to provide an overall measure of the network performance for each scenario. The criteria used to gauge the efficiency of the highway network are the total travel distance, total travel time and the Maidstone wide average vehicle speed. The data summarised in Table 10-5 and illustrated in Figure 10.1 relate to the Maidstone urban area only. It should be noted that the values presented are indicative for comparison purposes only.

Table 10-5: Summary of Network Performance

	AM Peak			PM Peak		
	2031 DM	**2031 DS1**	**2031 DS2**	**2031 DM**	**2031 DS1**	**2031 DS2**
Travel distance (vkm)	144500	146700	126900	137500	140200	125700
% diff from 2014	18%	20%	4%	21%	24%	11%
Travel time (veh hrs)	11400	10800	8500	10000	9500	8100
% diff from 2014	38%	30%	3%	42%	35%	15%

Figure 10.1: Network Performance



Higher values for the total travel distance for the forecast models reflect the increase in vehicles on the network and may also indicate that vehicles are taking longer routes to reach their destination, avoiding more congested shorter routes.

The reduced total travel time for 2031 DS1 compared to the 2031 DM reflects the benefits of the provision of the Leeds Langley Bypass which offers a faster route option. However the total travel distance is only marginally changed as traffic may opt to travel further but quicker on the new route.

The 2031 DS2 model has a reduced total vehicle travel distance and vehicle travel time compared with the 2031 DS1. This is the net impact of a reduction in travel demand, due to assumptions around walking and cycling, and an increase in travel by public transport in response to changes to car parking costs and increased bus services.

10.4 Link Flows

A selection of representative link flows have been extracted from the models to provide a comparison of the level flows on key routes. The locations of the links are shown in Figure 5.1 and the flow comparisons are summarised in Figure 10.2 and Figure 10.3.

Both of the 2031 Do Something scenarios modelled indicate a reduction in traffic flows on the selected links compared to the 2031 DM model. The 2031 DS2 model with the reduced vehicle demand generally demonstrates a lower level of traffic apart from the approach the M20 via the A249.

Figure 10.2: 2031 DM, DS1 & DS2 – AM Peak Two-way Flow

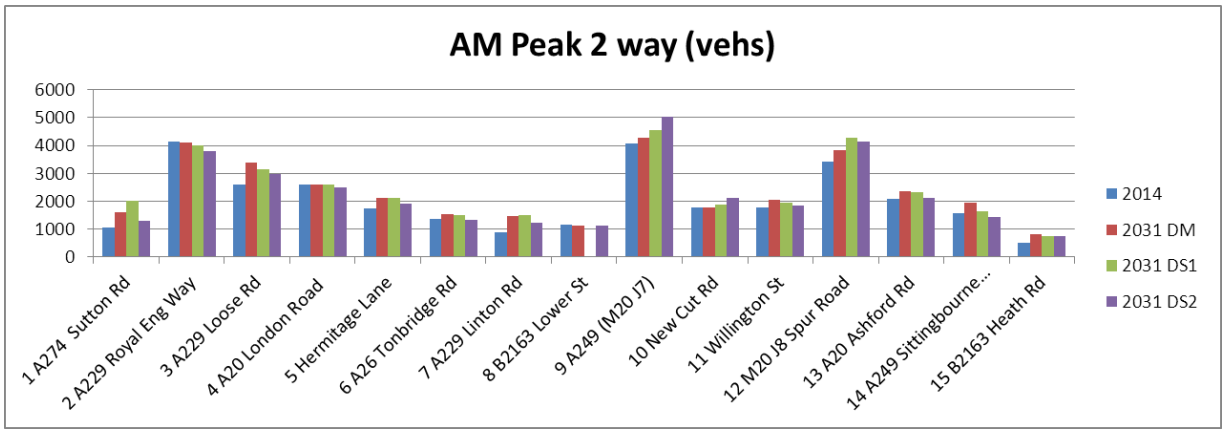
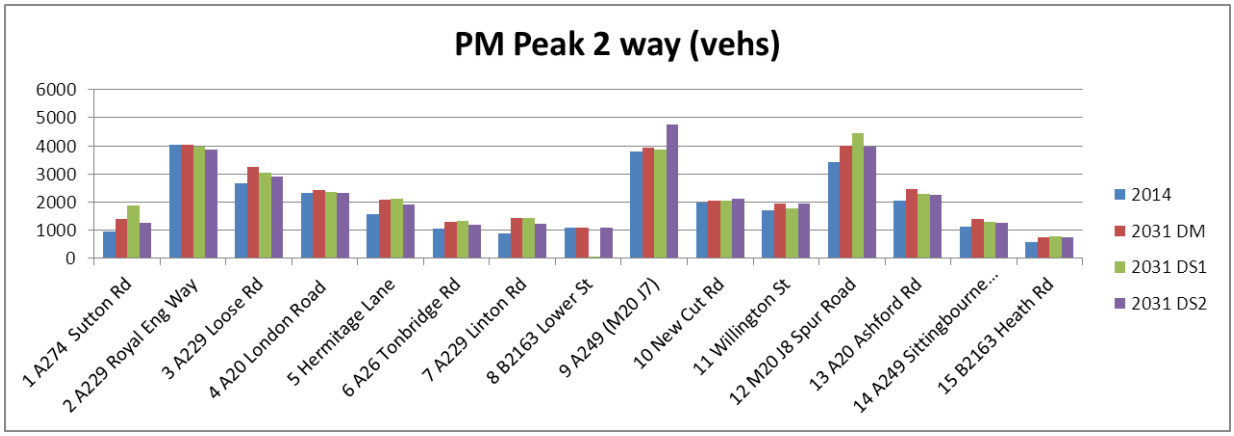


Figure 10.3: 2031 DM, DS1 & DS2 – PM Peak Two-way Flow



10.5 Travel Times

The travel times on the radial routes provide an indication of the performance of different parts of the network. Travel times on the key radial routes have been extracted for each of the models, for the AM and PM peaks. The routes selected are shown in Figure 5.2 and the journey times are summarised in Figure 10.4 to Figure 10.7.

The 2031 DS1 model has the most impact on travel times on routes to the east and south of the town. The 2031 DS2 model has a significantly lower demand than the 2031 DS1 model and generally shows a reduction in travel time compared with the 2031 DS1 scenario. However some routes show a slightly increased travel time which is a reflection of a change in travel patterns around the town.

Figure 10.4: Comparison of Journey Times - AM Peak Inbound

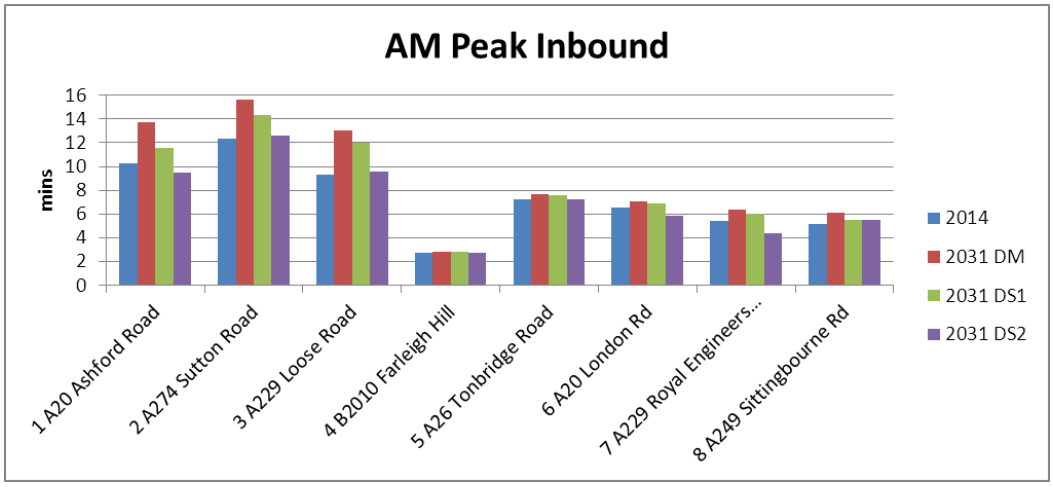


Figure 10.5: Comparison of Journey Times - AM Peak Outbound

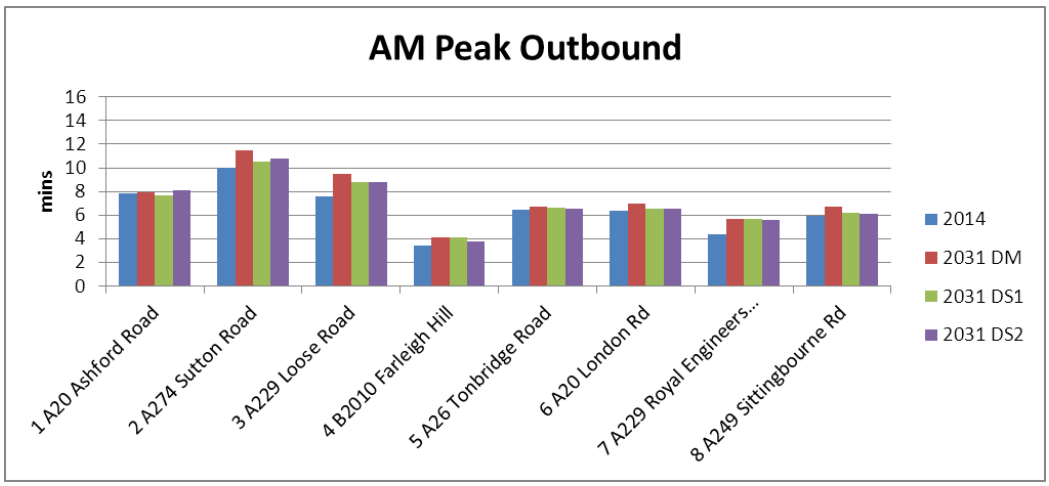


Figure 10.6: Comparison of Journey Times - PM Peak Inbound

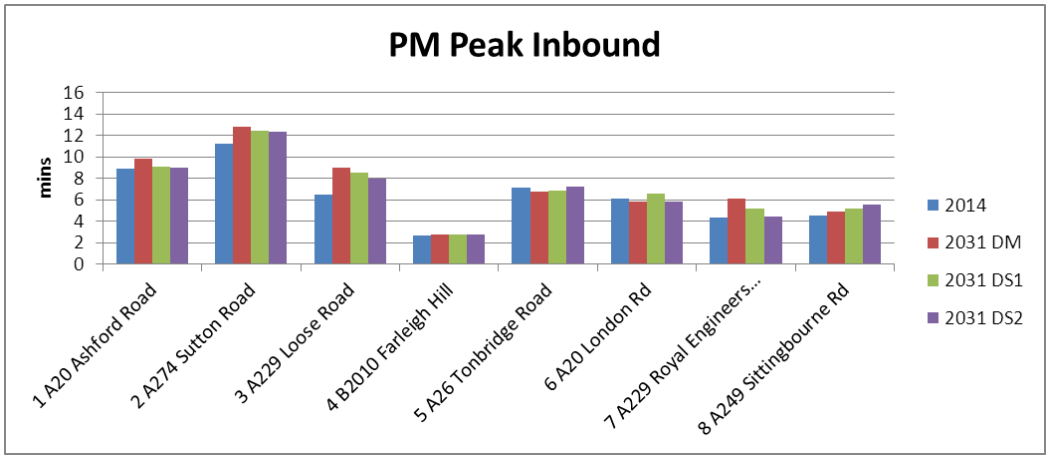
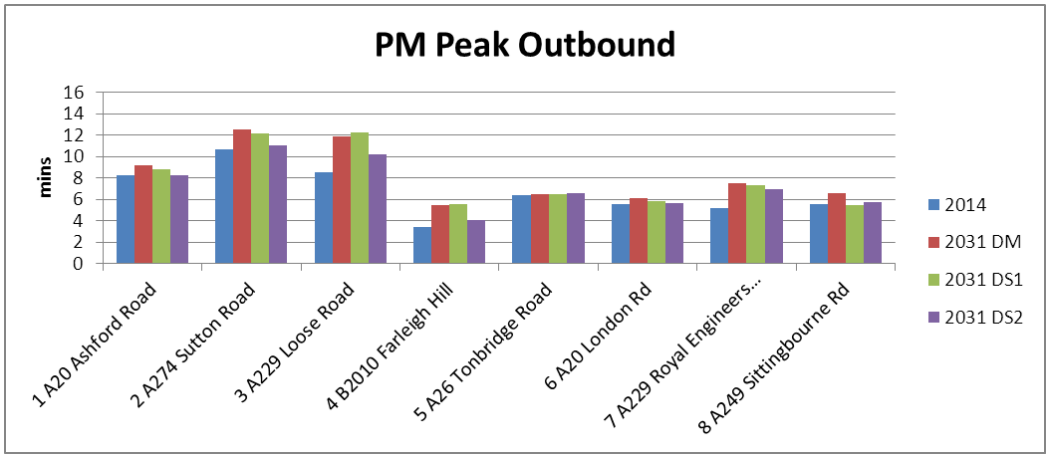


Figure 10.7: Comparison of Journey Times - PM Peak Outbound



10.6 Summary

The network is already operating under stress during peak periods and movement on some of the key radial routes is constrained. The 2031 DM scenario presents a worst case scenario with the minimum intervention envisaged. Although this situation is not expected to arise is provides a benchmark against which to gauge alternative scenarios.

Trips are assigned within the model to the shortest and quickest routes. As the pressures on the system change with the introduction of different measures, the route options for each trip changes and consequently the travel patterns around the town shift.

The outcome of a series of different interventions included in the do something models may not be immediately apparent from link flows or travel times on particular roads, as trips are assigned to alternative routes in response to delays. The individual link flows and indicative travel times therefore only provide part of the picture for the highway model. They should be weighed alongside wider network performance indicators and the level of demand assigned.

11 Concluding Comments

2031 Do Minimum

The 2031 DM provides a worst case scenario, giving an indication of the potential impact of the current forecast development on a largely unchanged network, apart from the Bridges Gyratory which is included in all the forecast models. The Bridges Gyratory scheme will provide some benefit for movements through the town from south to north.

In reality the 2031 Do minimum is an unlikely scenario as highway and public transport provision would be expected to evolve alongside development over time. It does, however, provide a useful benchmark against which to gauge the impact of alternative scenarios. In the absence of proactive measures to attract trips to sustainable modes an additional 6000 vehicle trips will need to be accommodated on the highway network by 2031.

With no intervention other than the Bridge Gyratory improvement scheme the 2031 DM scenario demonstrates that there would be a significant increase in travel time and travel distance over current conditions. The increase in total travel time is a response to the additional demand on the network which generates more delay. The additional traffic and the diversion of traffic on longer routes around the town to avoid congestion contribute to the increase in the network total travel distance. The outputs suggest a significant increase in congestion and delay on the urban highway network when compared with 2014 baseline conditions.

2031 Do Something 1

The 2031 DS1 model is essentially a highway based scenario with the same forecast total travel demand as the 2031 DM model. This model is focussed largely on highway improvements at key junctions across the town and also on the provision of a Leeds/Langley bypass to the east of Maidstone. The Leeds/Langley route as modelled is based on broad assumptions about alignment, junctions and connections. This scheme accounts for approximately 4km of a new major road, various link roads and a number of new junctions.

Compared to the 2031 DM model the 2031 DS1 model shows a small increase in total travel distance but a reduction in total travel time, suggesting a more efficient use of the network. The increase in travel distance is the net result of an element of traffic having the option of a longer but faster route. The knock on effect of this will be the release of some capacity and the reassignment of an element of traffic that was diverting around the town in the 2031 DM, back to a shorter route through the town.

This scenario has limited impact on the mode of travel chosen.

The impact of the Leeds/Langley route alone cannot be separated from the rest of the highway package.

2031 DS2

The 2031 DS2 model includes a number of highway improvements across the town as well as a package of improvements to public transport, a new Park & Ride site at Linton Corner, increased parking charges and some fundamental changes to assumptions around car occupancy and the proportion of trips by walking or cycling modes.

The Maidstone model is essentially a highway based model which does not include walking and cycling modes of travel. Consequently the very broad assumptions proposed for growth around walking and cycling mode share have been reflected in the model by a simple reduction in home based car trips within the detailed modelled area.

The reduced trip demand, together with the attraction of trips to public transport, is reflected in a reduced number of vehicles on the network and consequently in a more moderate impact on the total travel time and travel distance compared with the 2031 DM and 2031 DS1.

Despite the more constrained demand, there are parts of the network where traffic flows and travel times increase.

Issues to be Considered

The 2031 DM model indicates that the network will have to cater for some 6,000 additional vehicle movements during the peak periods by 2031. In the absence of a specific package of transport interventions there will be a significant increase in travel time and travel distance across the network.

Although the 2031 DS1 and DS2 models have some features in common, they present different approaches to the management of potential problems generated by the forecast development in and around Maidstone, as indicated in the 2031 DM model. Neither of the scenarios modelled may actually be achievable in reality, but they demonstrate the possibilities of different strategies.

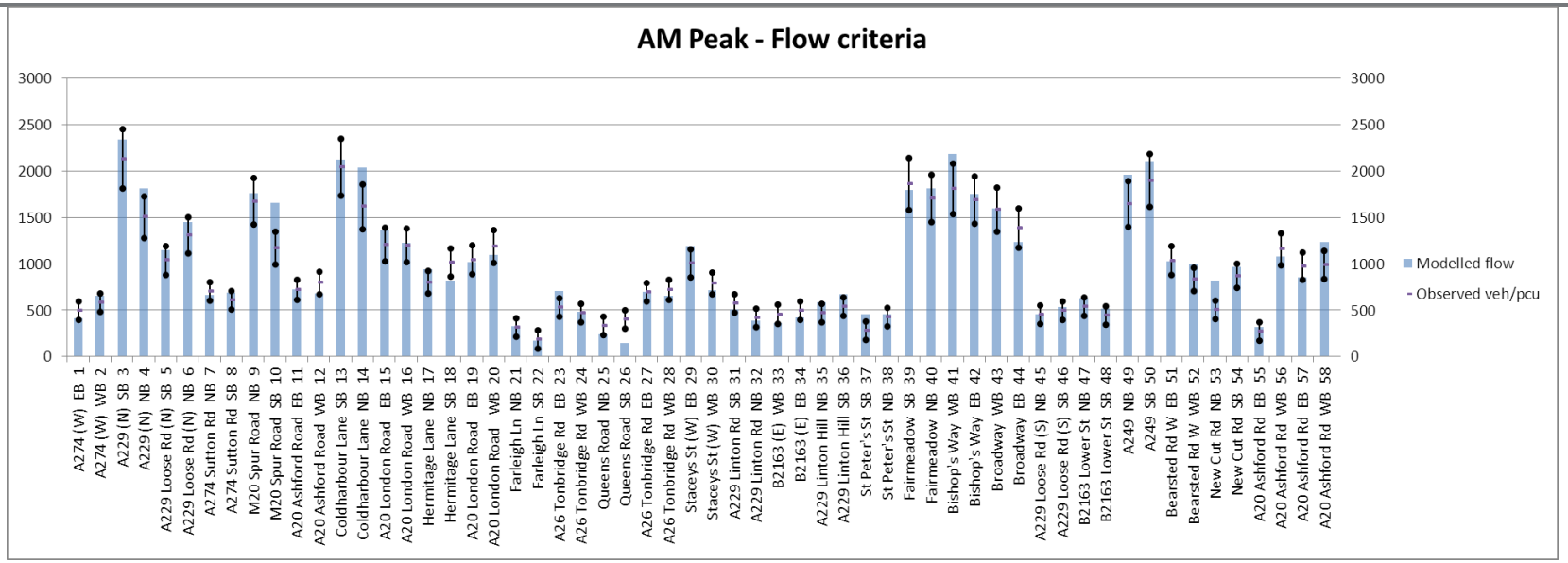
The highways based transport strategy (2031 DS1) includes a major new extension to the network in the form of a Leeds/Langley bypass. This scenario caters for a similar number of vehicles on the network to the 2031 DM and has an increase in the vehicle distance but operates more efficiently in terms of travel time.

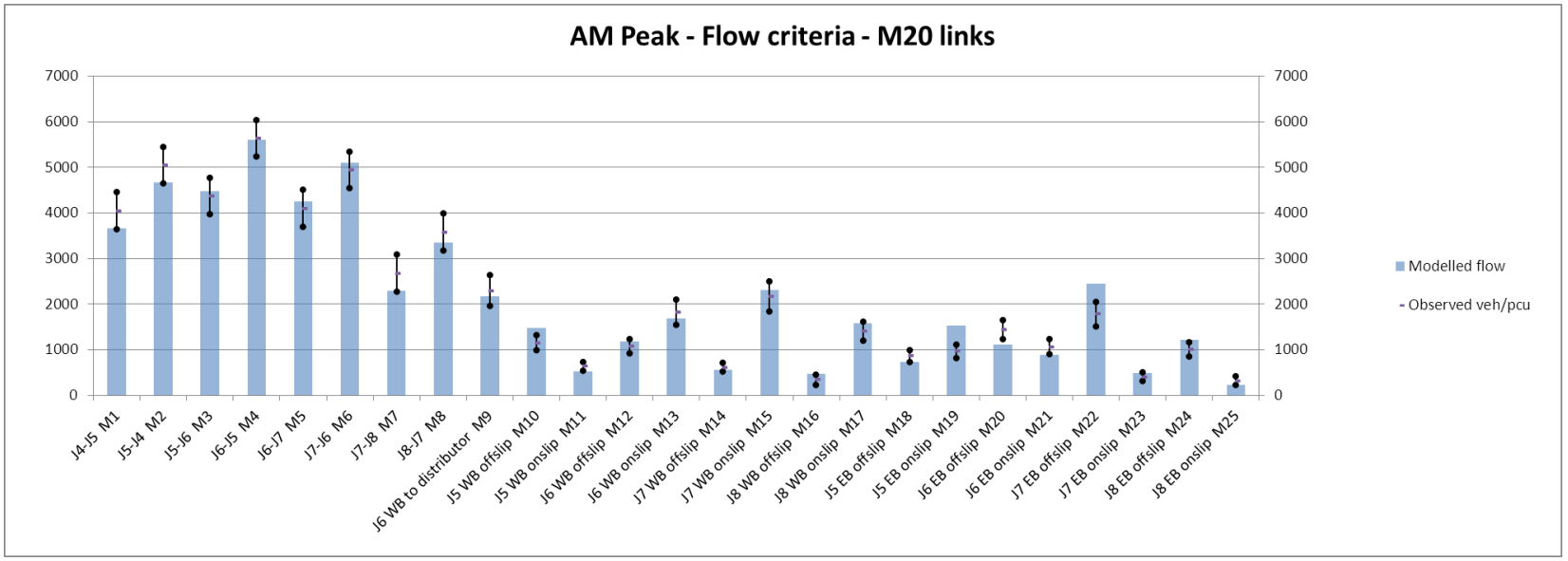
The 2031 DS2 scenario is based on a constrained trip generation (allowing for increased walking and cycling) and significant incentives for public transport. As a consequence this version of the 2031 Do something handles a lower forecast traffic demand reflected in the lower travel distance and travel time.

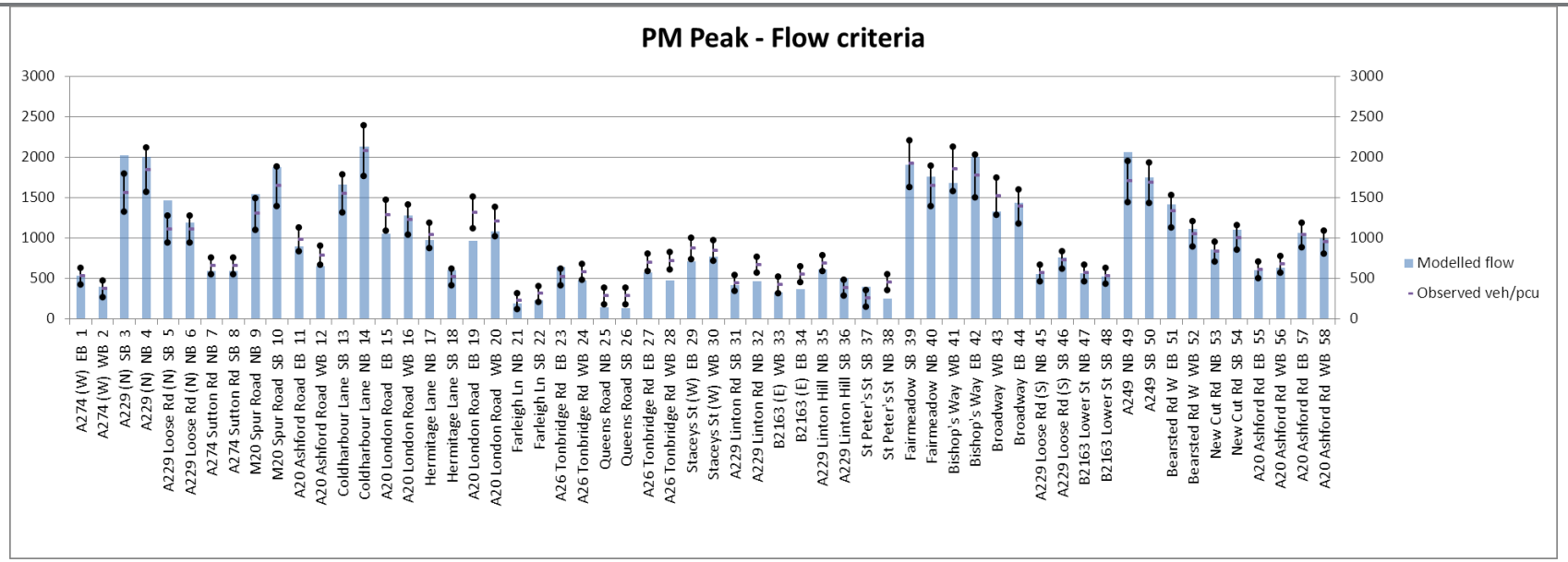
It is important to note, however, that the model results should be regarded as indicative only as both of the 2031 Do Something scenarios modelled have some level of uncertainty regarding their achievability. These are summarised below:

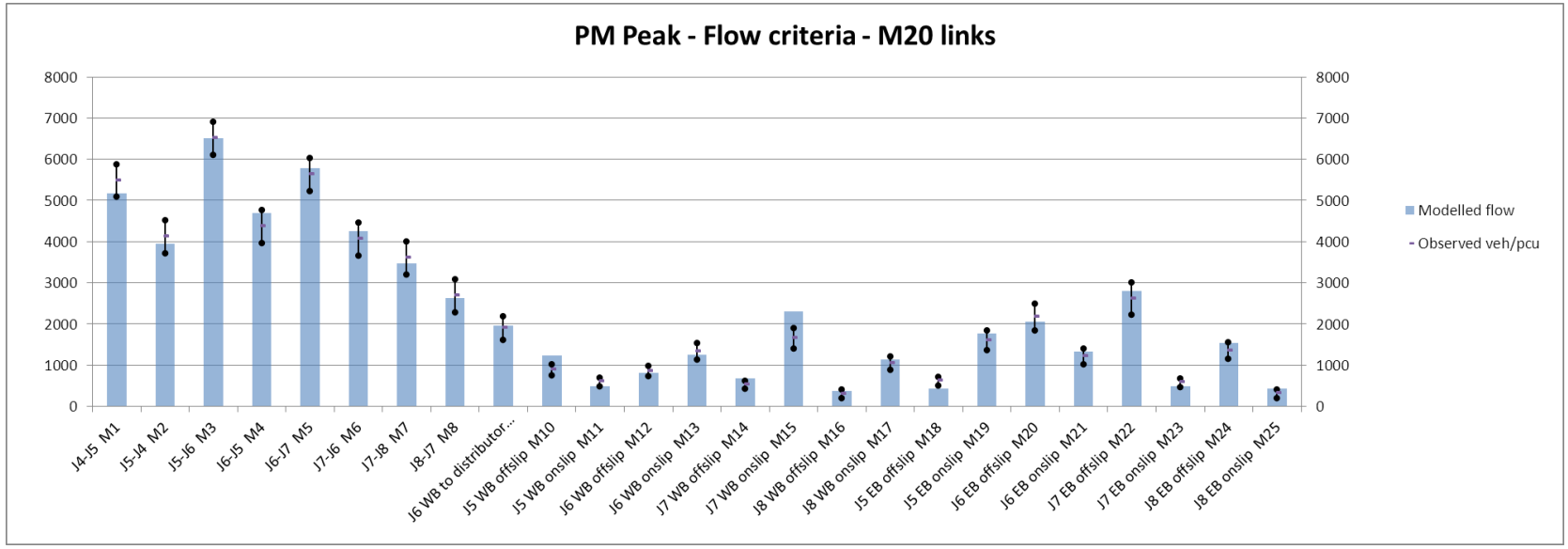
- The key element of the 2031 DS1 model, in the form of the Leeds/Langley bypass, will need to be considered in terms of deliverability and a more detailed appraisal of the potential benefits that may be attributed to it.
- The aspirations for sustainable mode share and public transport provision included in the 2031 DS2 model are very ambitious and will need to be supported by a sense check on what is practical and achievable. In particular, the levels of mode shift from car to walking and cycling and also the increased level of car occupancy which have been pre-determined within the model will need to be sense checked against comparable case studies to ensure they are reasonable assumptions

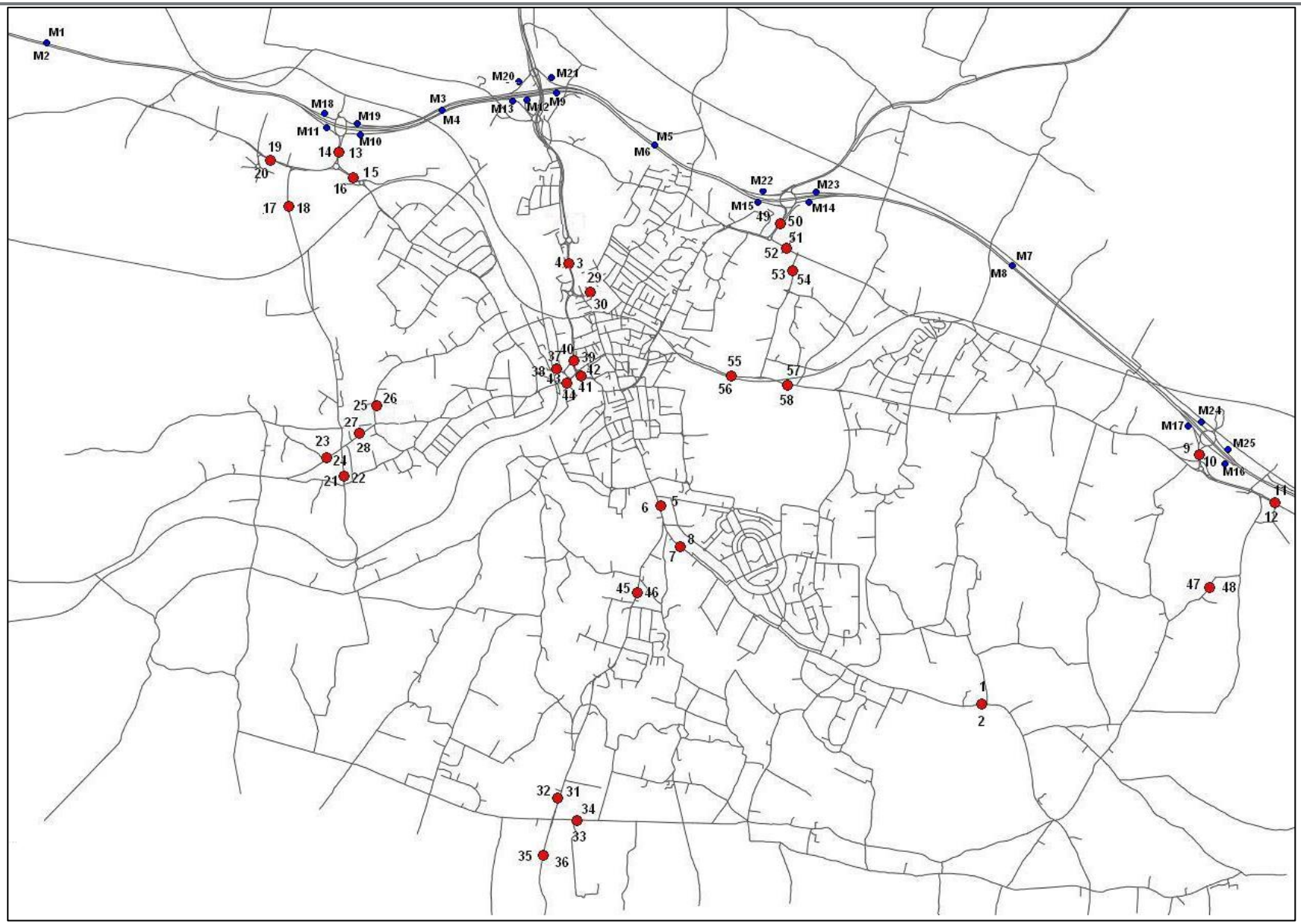
Appendix A 2014 Model Output Summary


AM Peak - Flow criteria
3000
2500
2000
1500
1000
500
0
A274 (W) EB 1
A274 (W) WB 2
A229 (N) SB 3
A229 (N) NB 4
A229 Loose Rd (N) SB 5
A229 Loose Rd (N) NB 6
A274 Sutton Rd NB 7
A274 Sutton Rd SB 8
M20 Spur Road NB 9
M20 Spur Road SB 10
A20 Ashford Road EB 11
A20 Ashford Road WB 12
Coldharbour Lane SB 13
Coldharbour Lane NB 14
A20 London Road EB 15
A20 London Road WB 16
Hermitage Lane NB 17
Hermitage Lane SB 18
A20 London Road EB 19
A20 London Road WB 20
Farleigh Ln NB 21
Farleigh Ln SB 22
A26 Tonbridge Rd EB 23
A26 Tonbridge Rd WB 24
Queens Road NB 25
Queens Road SB 26
A26 Tonbridge Rd EB 27
A26 Tonbridge Rd WB 28
Staceys St (W) EB 29
Staceys St (W) WB 30
A229 Linton Rd SB 31
A229 Linton Rd NB 32
B2163 (E) WB 33
B2163 (E) EB 34
A229 Linton Hill NB 35
A229 Linton Hill SB 36
St Peter's St SB 37
St Peter's St NB 38
Fairmeadow SB 39
Fairmeadow NB 40
Bishop's Way WB 41
Bishop's Way EB 42
Broadway WB 43
Broadway EB 44
A229 Loose Rd (S) NB 45
A229 Loose Rd (S) SB 46
B2163 Lower St NB 47
B2163 Lower St SB 48
A249 NB 49
A249 SB 50
Bearsted Rd W EB 51
Bearsted Rd W WB 52
New Cut Rd NB 53
New Cut Rd SB 54
A20 Ashford Rd EB 55
A20 Ashford Rd WB 56
A20 Ashford Rd EB 57
A20 Ashford Rd WB 58
Modelled flow
Observed veh/pcu


AM Peak - Flow criteria - M20 links
7000
6000
5000
4000
3000
2000
1000
0
J4-J5 M1
J5-J4 M2
J5-J6 M3
J6-J5 M4
J6-J7 M5
J7-J6 M6
J7-J8 M7
J8-J7 M8
J6 WB to distributor M9
J5 WB offslip M10
J5 WB onslip M11
J6 WB offslip M12
J6 WB onslip M13
J7 WB offslip M14
J7 WB onslip M15
J8 WB offslip M16
J8 WB onslip M17
J5 EB offslip M18
J5 EB onslip M19
J6 EB offslip M20
J6 EB onslip M21
J7 EB offslip M22
J7 EB onslip M23
J8 EB offslip M24
J8 EB onslip M25
Modelled flow
Observed veh/pcu


PM Peak - Flow criteria
3000
2500
2000
1500
1000
500
0
A274 (W) EB 1
A274 (W) WB 2
A229 (N) SB 3
A229 (N) NB 4
A229 Loose Rd (N) SB 5
A229 Loose Rd (N) NB 6
A274 Sutton Rd NB 7
A274 Sutton Rd SB 8
M20 Spur Road NB 9
M20 Spur Road SB 10
A20 Ashford Road EB 11
A20 Ashford Road WB 12
Coldharbour Lane SB 13
Coldharbour Lane NB 14
A20 London Road EB 15
A20 London Road WB 16
Hermitage Lane NB 17
Hermitage Lane SB 18
A20 London Road EB 19
A20 London Road WB 20
Farleigh Ln NB 21
Farleigh Ln SB 22
A26 Tonbridge Rd EB 23
A26 Tonbridge Rd WB 24
Queens Road NB 25
Queens Road SB 26
A26 Tonbridge Rd EB 27
A26 Tonbridge Rd WB 28
Staceys St (W) EB 29
Staceys St (W) WB 30
A229 Linton Rd SB 31
A229 Linton Rd NB 32
B2163 (E) WB 33
B2163 (E) EB 34
A229 Linton Hill NB 35
A229 Linton Hill SB 36
St Peter's St SB 37
St Peter's St NB 38
Fairmeadow SB 39
Fairmeadow NB 40
Bishop's Way WB 41
Bishop's Way EB 42
Broadway WB 43
Broadway EB 44
A229 Loose Rd (S) NB 45
A229 Loose Rd (S) SB 46
B2163 Lower St NB 47
B2163 Lower St SB 48
A249 NB 49
A249 SB 50
Bearsted Rd W EB 51
Bearsted Rd W WB 52
New Cut Rd NB 53
New Cut Rd SB 54
A20 Ashford Rd EB 55
A20 Ashford Rd WB 56
A20 Ashford Rd EB 57
A20 Ashford Rd WB 58
Modelled flow
Observed veh/pcu


PM Peak - Flow criteria - M20 links
8000
7000
6000
5000
4000
3000
2000
1000
0
J4-J5 M1
J5-J4 M2
J5-J6 M3
J6-J5 M4
J6-J7 M5
J7-J6 M6
J7-J8 M7
J8-J7 M8
J6 WB to distributor...
J5 WB offslip M10
J5 WB onslip M11
J6 WB offslip M12
J6 WB onslip M13
J7 WB offslip M14
J7 WB onslip M15
J8 WB offslip M16
J8 WB onslip M17
J5 EB offslip M18
J5 EB onslip M19
J6 EB offslip M20
J6 EB onslip M21
J7 EB offslip M22
J7 EB onslip M23
J8 EB offslip M24
J8 EB onslip M25
Modelled flow
Observed veh/pcu


M1
M2
M20
M21
M18
M19
M3
M4
M13
M12
M9
M11
M10
M5
M6
M22
M23
M15
M14
M7
M8
M24
M17
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42
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56
57
58
25
26
27
28
23
24
21
22
6
5
8
7
9
10
11
12
45
46
47
48
1
2
32
31
34
33
35
36

Summary of model link flows (Maidstone links only)

	AM Peak	PM Peak
Number of sites	58	58
Total meeting GEH criteria	44	39
Total meeting flow criteria	42	40
Total meeting GEH and/or flow criteria	45	42
% meeting GEH and/or flow criteria	78%	72%

Summary of model link flows (including M20 traffic)

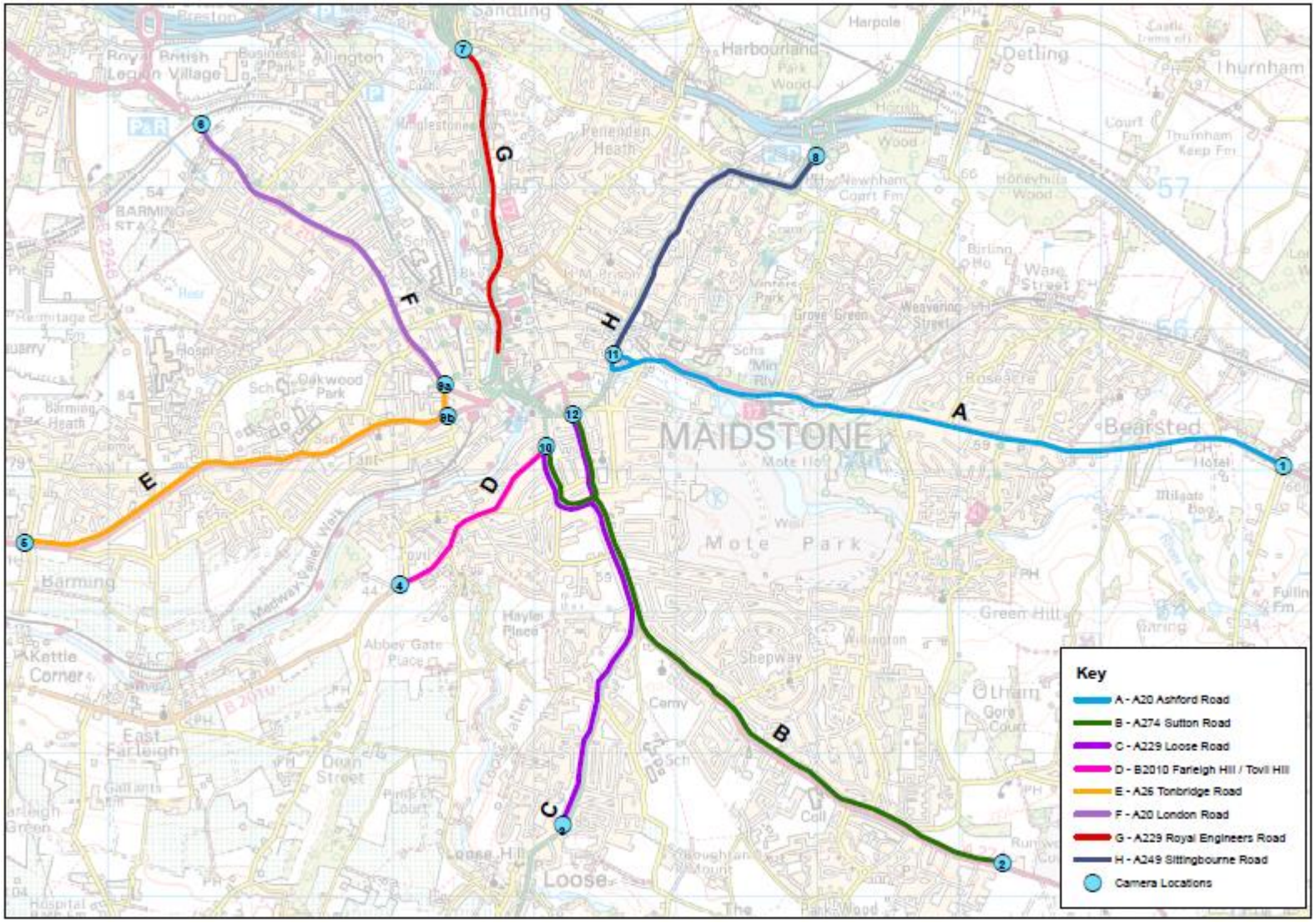
	AM Peak	PM Peak
Number of sites	83	83
Total meeting GEH criteria	58	57
Total meeting flow criteria	57	56
Total meeting GEH and/or flow criteria	63	61
% meeting GEH and/or flow criteria	76%	73%

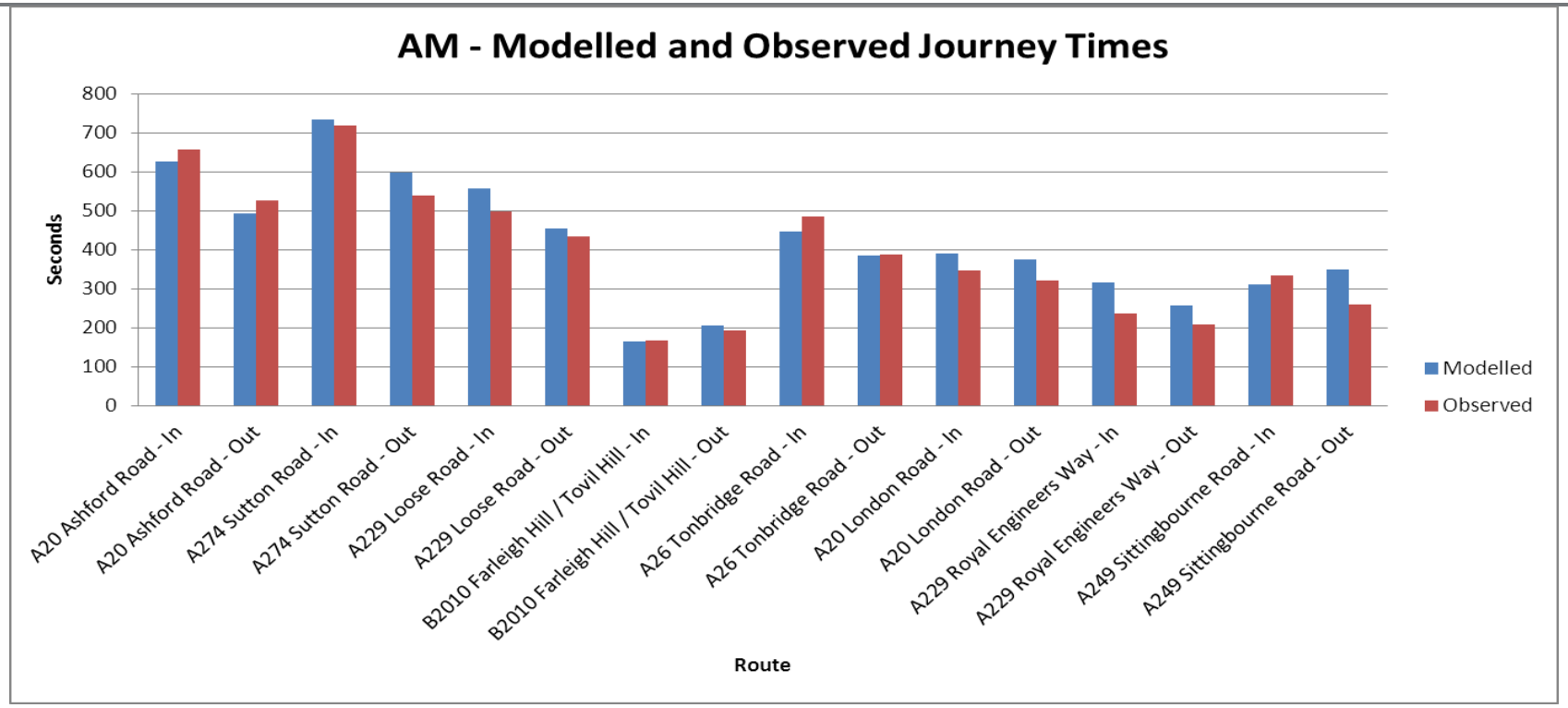
Note:

The model flows have been compared with available data from a variety of sources. The data has been recorded for different purposes, at different times of the year, and in some cases appears to be recorded as pcus and in others as vehicles. The M20 flows are reported separately. Some through movements on the M20 and slip roads have been manually adjusted to give a reasonable representation of flows on the motorway. These movements have no connection with the Maidstone area.

AM Peak Journey Time

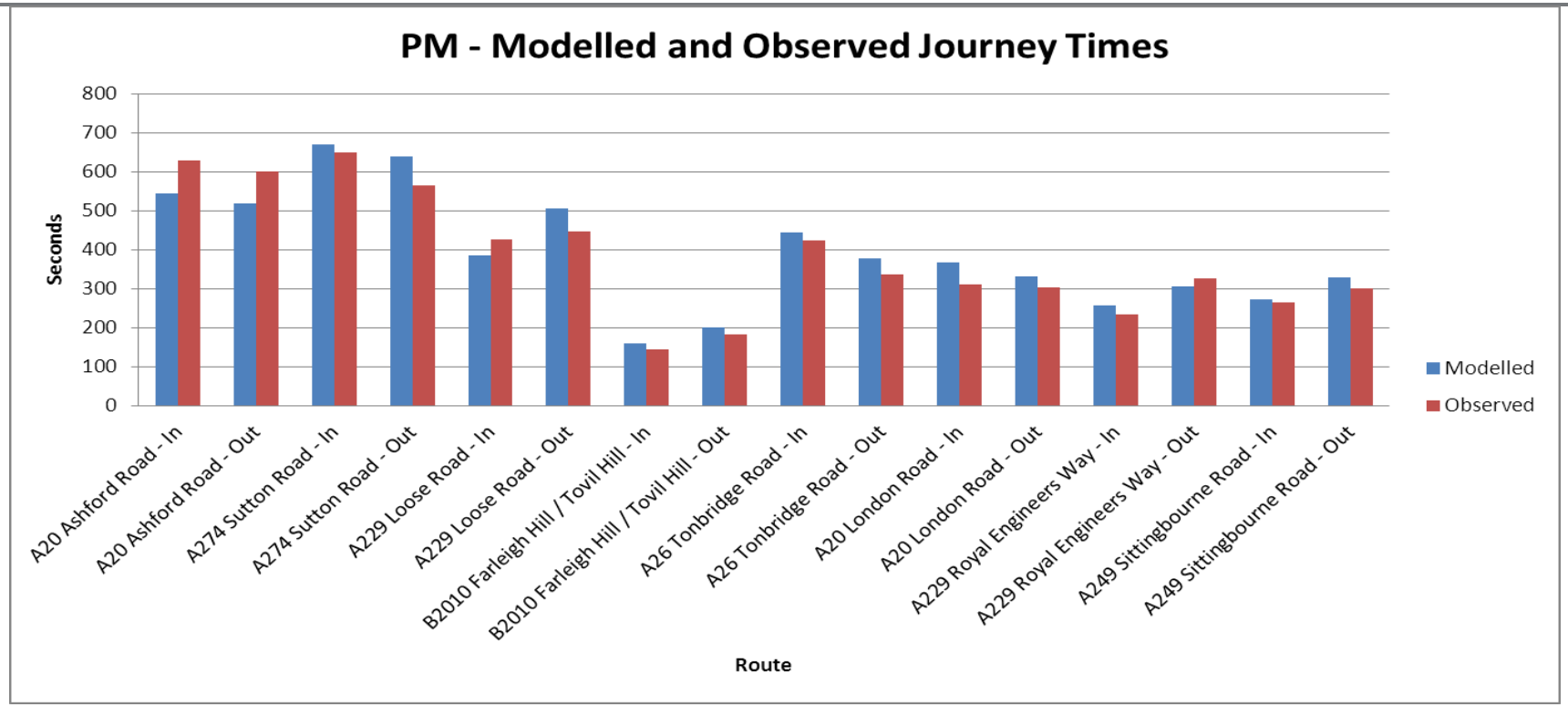
Route Ref	Route Description	Direction		Journey time in seconds			Difference (%)	DMRB Criteria
				Modelled	Observed	Difference		
A	A20 Ashford Road	W	In	627	658	31	-5%	pass
		E	Out	493	528	35	-7%	pass
B	A274 Sutton Road	NW	In	736	720	-16	2%	pass
		SE	Out	600	540	-60	11%	pass
C	A229 Loose Road	N	In	557	499	-58	12%	pass
		S	Out	455	435	-20	4%	pass
D	B2010 Farleigh Hill / Tovil Hill	NE	In	166	170	4	-2%	pass
		SW	Out	208	195	-13	7%	pass
E	A26 Tonbridge Road	E	In	447	486	39	-8%	pass
		W	Out	387	390	3	-1%	pass
F	A20 London Road	SE	In	391	348	-43	12%	pass
		NW	Out	377	324	-53	17%	pass
G	A229 Royal Engineers Way	S	In	318	238**	-80	34%	fail
		N	Out	259	209	-50	24%	pass
H	A249 Sittingbourne Road	SW	In	311	335	24	-7%	pass
		NE	Out	351	261*	-90	35%	fail


MAIDSTONE
Key
A - A20 Ashford Road
B - A274 Sutton Road
C - A229 Loose Road
D - B2010 Farleigh Hill / Tovil Hill
E - A26 Tonbridge Road
F - A20 London Road
G - A229 Royal Engineers Road
H - A249 Sittingbourne Road
Camera Locations


AM - Modelled and Observed Journey Times
Seconds
800
700
600
500
400
300
200
100
0
A20 Ashford Road - In
A20 Ashford Road - Out
A274 Sutton Road - In
A274 Sutton Road - Out
A229 Loose Road - In
A229 Loose Road - Out
B2010 Farleigh Hill / Tovil Hill - In
B2010 Farleigh Hill / Tovil Hill - Out
A26 Tonbridge Road - In
A26 Tonbridge Road - Out
A20 London Road - In
A20 London Road - Out
A229 Royal Engineers Way - In
A229 Royal Engineers Way - Out
A249 Sittingbourne Road - In
A249 Sittingbourne Road - Out
Route
Modelled
Observed

PM Peak Journey Time

Route Ref	Route Description	Direction		Journey time in seconds			Difference (%)	DMRB Criteria
				Modelled	Observed	Difference		
A	A20 Ashford Road	W	In	545	630	85	-13%	pass
		E	Out	521	601	80	-13%	pass
B	A274 Sutton Road	NW	In	671	650	-21	3%	pass
		SE	Out	639	566	-73	13%	pass
C	A229 Loose Road	N	In	387	427	40	-9%	pass
		S	Out	507	447	-60	13%	pass
D	B2010 Farleigh Hill / Tovil Hill	NE	In	161	145	-16	11%	pass
		SW	Out	202	184	-18	10%	pass
E	A26 Tonbridge Road	E	In	445	424	-21	5%	pass
		W	Out	379	338	-41	12%	pass
F	A20 London Road	SE	In	369	311	-58	19%	pass
		NW	Out	333	305	-28	9%	pass
G	A229 Royal Engineers Way	S	In	259	236	-23	10%	pass
		N	Out	308	328	20	-6%	pass
H	A249 Sittingbourne Road	SW	In	273	265	-8	3%	pass
		NE	Out	331	303*	-28	9%	pass



Note:

The majority of observed times are from ANPR camera data. Where anomalies were identified alternative data has been used where available.

*A249 Sittingbourne Road - timing outbound is likely to be affected by Enterprise Park signals and revised layout at the Bearsted Road roundabout. Additional data was collected during July for the PM as a sense check (as used in table above). The outbound model times remain longer than the July observed times but fall within the normal criteria. No new data is available for AM peak outbound.

**A229 Royal Engineers Way – Anomalies were noted between modelled and ANPR journey times across the town centre. A limited number of travel times were recorded in July for the radial route only, between the M20 slip roads and Earls Street signals. The PM timings indicated a reasonable match with modelled data. The model AM timings were around 80 seconds longer than the recorded times in July. It would be reasonable to expect AM peak observed travel times inbound on this route to be longer in the usual neutral months.

Appendix B ITS Model Specification

ITS Action Plan Number	ITEM	DESCRIPTION		MODELLING SPECIFICATION / COMMENTS	To be Included in ITS Package?
P&R Schemes					
5	Change P&R fare structure to pay-to-park rather than pay-to-ride	As with most other P&R schemes, cars should pay to park and catch the bus for free. £3 per vehicle should be assumed.		Cant be modelled?	Include if can
17	Maintain existing P&R	Maintain existing P&R		Not to be modelled (enhanced service to be included)	N
18	P&R management and objectives	Ensure the objectives, management and budgets for both P&R and Parking Services remain combined and integrated		N/A	N
19	P&R Marketing	Fund and implement a strong marketing campaign for P&R to encourage modal shift to P&R by 2012 and continue indefinitely		N/A	N
N/A	New Park and Ride service from Linton Crossroads to Maidstone town centre	Running non-stop along Loose Road (A229) and terminating at High Street/King Street		Frequency of every 15 minutes	Y
N/A	Improve existing P&R	Increase patronage of existing park and ride sites by increasing capacity, improving the offering, changing fare structure, running later into the evening, live departure screens at bus stops.		Assume a 15-min frequency from all sites, and capacities of 20% higher than now. Services to run 4 per hour until 9pm Monday to Friday, and 3 per hour all weekend (until 6pm on Sundays).	
N/A	P&R priority measures	Bus lanes almost the full length of the routes from P&R sites – London Road, Sittingbourne Road, Loose Road, Ashford Road into town. Each signal junction would have bus priority phasing.		Not to be included	N
N/A	1000 space minimum P & R scheme for J8	1000 space minimum P & R scheme for J8		Cant be modelled?	Include if can
Other Schemes					
1	Implement highway improvement schemes at M20 J7 and J8	This includes work around Sittingbourne Road and Ashford Road	M20, Junction 7 updates. This includes converting the M20 eastbound approach and the two A249 approaches to the roundabout to traffic signals, whilst leaving the M20 westbound approach as a give way; to prevent traffic tailing back on to the motorway during peak periods. In addition, road markings will be rearranged to improve visibility on the roundabout	This includes converting the M20 eastbound approach and the two A249 approaches to the roundabout to traffic signals, whilst leaving the M20 westbound approach as a give way; to prevent traffic tailing back on to the motorway during peak periods. In addition, road markings will be rearranged to improve visibility on the roundabout	Y
			A249 / Bearsted Road Roundabout. This includes capacity improvements and provision of a pedestrian crossing at Bearsted Roundabout	As per KCC Highway package Do Something: - Signalised Junctions at A249 / Bearsted Road junction and Bearsted Road / New Cut Junction - Dual Carriageway between junctions, through changed link capacity and lane provision	Y
			Bearsted Road / New Cut Road Roundabout. This includes capacity improvements and an enlargement of the roundabout		
			Bearsted Road, between Bearsted Roundabout and New Cut Road Roundabout. This includes the upgrading of the road to a dual carriageway in both directions		
			a) Constructing bus priority measures on New Cut Road	Change junction from new cut road onto A20 so that: - Eat into the verge to allow left hand turns to have a slip road with give way at A20 - Allowing room for a bus priority right hand turn lane.	Y
			a) Signalising bus priority measures at the junction of New Cut Road and A20 Ashford Road		
			M20, Junction 5. This will include providing additional capacity on the M20 link roads to Coldharbour Roundabout; Coldharbour Roundabout itself; the 20/20 roundabout and the Hermitage Lane / London Road junction	As per KCC Highway package Do Something: Junction Capacity and Signals at A20 / Coldharbour	Y
			Queens Rd / St Andrews Rd / Tonbridge Rd / Fountain Lane junctions. This includes an opening up of the eastern end of St Andrews Road onto the Queens Road / Tonbridge Road junction. The direction of traffic between each of these junctions would be made one way in a clockwise direction	Include junction proposals for A26 Tonbridge Road / Fountain Lane included in west of hermitage Lane planning application (DHA) http://applications.maidstone.gov.uk/AnitePublicDocs/00652669.pdf0	Y
			a) Hermitage Lane in the vicinity of Barming Rail Station. This would include a new pedestrian crossing near the vehicle access to the rail station. To accommodate this, there will be a requirement to reorganise the existing bus stop layout	Include a signalised pedestrain crossing by barming station	Y
			a) Constructing a new access road between Gore Court Road and Bicknor Wood to provide sufficient access to the new strategic site north of Bicknor Wood	Include new link between Sutton Road and Gore Court Road, see red line in tab "Gore Court Road"	Y
			Widening Gore Court Road between Bicknor Wood and White Horse Lane	Widen Gore Court Road, see orange line in tab "Gore Court Road"	Y
			Willington St / Sutton Rd junction. This includes a widening of the approaches from Willington St to create an additional left turning lane into A274 Sutton Road and provision for entry into a new bus lane	As per KCC Highway package Do Something: - Junction capacity improvments through changed lane provisions and signal adjustment	Y
			a) Constructing a new footway on the north side of Sutton Road	N/A	N
			a) Constructing a new northbound dedicated bus lane on the A274 Sutton Road	See No.15	See No.15
			a) Signalising the A20 Ashford Rd / Penford Hill Roundabout	Based on junction 8 development (not in demand model) therefore do not include	N
			a) Signalising the A20 Ashford Rd / Eyhorne Street / Great Danes Hotel Access	Based on junction 8 development (not in demand model) therefore do not include	N
			Improving the A20 Ashford Rd / M20 Link road Roundabout. The type of roundabout improvement here will depend upon which strategic site is selected (if any) for development as the existing roundabout may need to be upgraded to a four arm roundabout to provide access to site to the south, if this site is selected for development. This difference is reflected in the differing costs shown in the table under paragraph 6.2.5 below	Based on junction 8 development (not in demand model) therefore do not include?	N
			A20 Ashford Rd / Willington Street junction. This includes a widening of the left turning movement from Ashford Road into Willington Street	As per KCC Highway package Do Something: - Junction Capacity and signal improvements, through adjusting the signals	Y
			M20 Junction 8. This includes building a two lane dedicated left slip to the westbound M20 slip road, and a reorganisation of the westbound merge	Based on junction 8 development (not in demand model) therefore do not include	N

2	Selected improvements at Rural Service Centres	Harrietsham	New pedestrian and cycling link between Harrietsham Primary School and Harrietsham railway station	N/A - inlcuded through mode share updates	N
		Headcorn	Footway, carriageway and street-lighting improvements on Grigg Lane and Oak Lane. Improved pedestrian access to the railway station from the east will also be investigated and implemented if viable.	N/A - inlcuded through mode share updates	N
		Staplehurst	An increase of approximately 100 car parking spaces at Staplehurst Railway Station to accommodate the additional movements expected as a result of new development in the village	Cant be modelled	N
			A new pedestrian and cycling link between the railway station and the residential area to the south of the Lodge Road Industrial Estate	N/A - inlcuded through mode share updates	N
			Improvements to the ease and quality of bus/rail interchange within the vicinity of the railway station	Cant be modelled	N
			Construction of a new pedestrian crossing of Marden Road in the vicinity of its junction with Limetrees	Include a signalised pedestrain crossing on Marden Road in the vicinity of its junction with Limetrees	Y
3	Enlarge Barming Station car park	200 space increase		Cant be modelled?	Include if can
4	Introduce 16+ travel pass	KCC has committed to introduce a new bus pass for 16-19 year olds, to make travel more affordable for sixth formers, college students and apprentices		N/A	N
6	Introduce parking standards appropriate to the borough's requirements	Adopt LCC's standards in the short term - Report on this to follow in the next 2 weeks		N/A	N
7	Increasing long stay parking tariffs on council-owned sites above inflation	50% increase in real terms above inflation by 2031		Cant be modelled?	Include if can
8	Increasing short stay parking tariffs on council-owned sites above inflation	50% increase in real terms above inflation by 2031		Cant be modelled?	Include if can
9	Implement travel plans	Implement MBC and KCC travel plans to more effeciently manage travel behaviour		N/A	N
10	Establish A20 Quality Bus Partnership scheme	Establish A20 Quality Bus Partnership scheme		N/A	N
11	Lobby Government for improved rail services	Lobby Government for improved rail services		No Change (noting DM already included thameslink enhancements)	N
12	Subsidised shuttle bus between M20 J7 and town centre	Subsidised shuttle bus between M20 J7 and town centre		To run every 20 minutes from notcutts, down new cut road, along A20 to the bus station - where it can turn around and go back down wat tyler way and along the A20 back to notcutts.	Y
13	Intelligent transport systems	Maintain and develop Maidstone's intelligent transport systems and proactive sharing of real time		N/A	N
14	Public realm improvement	Pedestrianisation of key thoroughfares, streetscaping etc		N/A - inlcuded through mode share updates	N
15	Bus Only northbound lane on A274	Bus Only northbound lane on A274 Sutton Road from Willington Street to the Wheatsheaf		Bus Only northbound lane on A274 Sutton Road from Willington Street to the Wheatsheaf	Y
16	Public bus service improvements	A regular bus service along all of Maidstone's key radial roads		7-minute frequencies on main radial routes into the town centre between 7am and 7pm	Y
20	Expansion of the County Hall Car Club	Specific funding to promote car clubs in Maidstone		N/A	N
21	Implement Maidstone Cycling Strategy	Implement Maidstone Cycling Strategy		N/A - inlcuded through mode share updates	N
22	Implement Air Quality Action Plan	Implement Air Quality Action Plan		N/A	N
23	Maintain and promote KCC's car sharing website	Assume car sharing increases by 5% of overall mode share into Maidstone town centre by 2031?		Cant be modelled?	Include if can
24	Real Time Information	Install real-time / up-to-date travel information in selected bus shelters across the borough		N/A	N
25	Secure Travel Plans for new development coming forward	Secure Travel Plans for new development coming forward		N/A	N
26	Ensure road safety education continues to be provided for	Ensure road safety education continues to be provided for across the borough		N/A	N
27	Romney Place Bus Lane	Bus Only Lane turning left onto Romney Place from Lower Stone Street		Bus Only Lane turning left onto Romney Place from Lower Stone Street	Y
28	Maintain the Kent Messenger 'Walk to School' Charity and 'New Ways 2 Work' Initiatives	Maintain the Kent Messenger 'Walk to School' Charity and 'New Ways 2 Work' Initiatives		N/A	N
29	Wayfinding Improvments	Improve street signage with better pedestrian wayfinding and reduce footway clutter, in particular in town and rural centres		N/A - inlcuded through mode share updates	N
30	Bridges Gyratory	New Northbound link to bypass the gyratory via the two bridges		Already included in the DM	DM
N/A	Cycle Mode Share (by implementing the cycle strategy)	A borough-wide increase in cycle and walking mode share, as a result of improved cycle links, parking, wayfinding, street lighting, crossings and so on. The sugested mode shares form part of the ITS targets		An 8.5% increase in cycling mode share over 2014 base (0.5% per year).	Y
N/A	Walking Mode Share			An 8.5% increase of walking mode share over 2014 base year (0.5% per year).	Y

N/A	£3m LEP funding for cycleway (from Teston CP to Aylesford village	£3m LEP funding for cycleway (from Teston CP to Aylesford village	N/A - inlcuded through mode share updates	N
N/A	NW Bus Loop	Circular Bus route connecting the town centre - hermitage lane - hospital - howar drive - london road	From the east of hermitage lane site a bus only route will be built from the site linking onto Howard Drive which will create the loop route for the buses to use. Frequency: every 15 minutes Stopping Pattern: all stops on route and one on Howards Way	Y
N/A	Cycleway a274-Brishing Lane	Cycleway a274-Brishing Lane	N/A - inlcuded through mode share updates	N
N/A	A229/A274 Wheatsheaf Junction	Close exit to Cranbourne Avenue, Adjusting turning movements and signal adjustment	Include as coded in KCC highway run: Close exit to Cranbourne Avenue, Adjusting turning movements and signal adjustment	Y
N/A	A274 / Wallis Avenue Junction	Junction Capacity improvements, through lane provision and signal changes	Include as coded in KCC highway run: Junction Capacity improvements, through lane provision and signal changes	Y
N/A	Leeds - Langley Bypass	New route linking A274 and A20 based on 1997 approved route	Not to be included	N

Appendix C Housing and Commercial Development Allocation

Source	Housing Allocation
completions 11 12	873
completions 12 13	630
completions 13 14	423
MBWLP 2000 Allocations	49
approved subject to S106 to 280214	219
Extant Permissions to April 2014	1758
LP allocations SHLAA sites (LP policy H1) - NW strategic	1155
LP allocations SHLAA sites (LP policy H1) - SE strategic	2781
LP allocations SHLAA sites (LP policy H1) - other	2052
LP allocations SHLAA sites (LP policy RMX1) - retail & mixed use	520
H1 rural service centre - Harrietsham	315
H1 rural service centre - Lenham	245
H1 rural service centre - Marden	398
H1 rural service centre - Staplehurst	905
H1 rural service centre - Headcorn	350
H1 Larger villages - Coxheath	410
H1 Larger villages - Yalding	65
H1 Larger villages - Boughton Monchelsea	45
H1 Larger villages - Eyhorne Street (Hollingbourne)	45
Sites Likely to come forward	243
Future locations for housing (locate across town centre)	600
Future locations-Lenham	1300

Source	Housing Allocation
Future locations-Invicta Barracks	1500
Windfall allowance estimate for final 5 years of trajectory	500
TOTAL	17381

Local Plan Employment Sites Location	Use Class	m2
Mote Road, Maidstone	B1a	8000
South of Claygate, Pattenden Lane, Marden	B1/B2/B8	6800
West of Wheelbarrow Industrial Estate, Pattenden Lane, Marden	B2/B8	14500
West of Barradale Farm, Maidstone Road, Headcorn	B1b & c /B2/B8	5500

Local Plan Mixed Use Sites Location	Use Class	m2
Newham Court, Bearsted Road, Maidstone	A1e	700
Newham Court, Bearsted Road, Maidstone	C2	75000
Newham Court, Bearsted Road, Maidstone	C2	25000
Maidstone East and Maidstone Sorting Office, Sandling Road, Maidstone	A1/A1e	10000
King Street car park and former AMF Bowling site, Maidstone	A1	1400
Clockhouse Farm, Heath Road, Coxheath	B1	7700
Former Syngenta works, Hampstead Lane, Yalding	B1/B2	8600

Appendix D ITS Interventions Modelled for 2031 DS1

ITS Action Plan Number	Transport Intervention Proposed	Description / modelling	Modelling comment
5	Change PR fare structure to pay-to-park rather than pay-to-ride. £3 per vehicle should be assumed	As with most other P&R schemes, cars should pay to park and catch the bus for free. £3 per vehicle should be assumed.	PR cost (as fare or parking charge) included in PR mode choice process. PR cost (previously £2.50) adjusted to £3.00
17	Maintain existing P&R	Maintain existing P&R	No change to existing P&R
No number	New Park and Ride service from Linton Crossroads to Maidstone town centre.	Running non-stop along Loose Road (A229) and terminating at High Street/King Street. Assume a 15-min frequency from all sites, and capacities of 20% higher than now. Services to run 4 per hour until 9pm Monday to Friday, and 3 per hour all weekend (until 6pm on Sundays).	The new park and ride service is assumed to access the site via the A229 south of Linton crossroads. The service is assumed to stop at the Linton Corner Park and Ride site, Mill Street, High Street and terminate at Kings Street. The additional stop at Mill Street is on the route into town and increases accessibility to trips from that side of town. Bus capacity is not reflected in the model.

ITS Action Plan Number	Transport Intervention Proposed	Description / modelling	Modelling comment
No number	Improve existing P&R	Increase patronage of existing park and ride sites by increasing capacity, improving the offering, changing fare structure, running later into the evening, live departure screens at bus stops. Assume a 15-min frequency from all sites, and capacities of 20% higher than now. Services to run 4 per hour until 9pm Monday to Friday, and 3 per hour all weekend (until 6pm on Sundays).	All P&R services are at 15 minute intervals. P&R site capacity is not reflected in the model. Peak periods modelled only.
1	Implement highway improvement schemes at M20 J7 and J8	M20, Junction 7 updates. This includes converting the M20 eastbound approach and the two A249 approaches to the roundabout to traffic signals, whilst leaving the M20 westbound approach as a give way; to prevent traffic tailing back on to the motorway during peak periods. In addition, road markings will be rearranged to improve visibility on the roundabout	Signal arrangement and junction layout from the planning application for Newnham Court.
		A249 / Bearsted Road Roundabout. This includes capacity improvements and provision of a pedestrian crossing at Bearsted Roundabout	Signalised Junctions at A249 / Bearsted Road junction and Bearsted Road / New Cut Junction.

ITS Action Plan Number	Transport Intervention Proposed	Description / modelling	Modelling comment
		Bearsted Road / New Cut Road Roundabout. This includes capacity improvements and an enlargement of the roundabout	Dual Carriageway between junctions includes changed link capacity and lane provision.
		Bearsted Road, between Bearsted Roundabout and New Cut Road Roundabout. This includes the upgrading of the road to a dual carriageway in both directions	
		a) Constructing bus priority measures on New Cut Road	Junction layout reconfigured. Bus priority measures not modelled specifically.
		b) Signalising bus priority measures at the junction of New Cut Road and A20 Ashford Road	
		M20, Junction 5. This will include providing additional capacity on the M20 link roads to Coldharbour Roundabout; Coldharbour Roundabout itself; the 20/20 roundabout and the Hermitage Lane / London Road junction	Junction capacity, lane allocation and signal arrangement as per planning application TA.
		Queens Rd / St Andrews Rd / Tonbridge Rd / Fountain Lane junctions. This includes an opening up of the eastern end of St Andrews Road onto the Queens Road / Tonbridge Road junction. The direction of traffic between each of these junctions would be made one way in a clockwise direction.	Reconfiguration of network around St Andrews Road not modelled. Improvements to signal arrangements included in the model as per planning application TA.

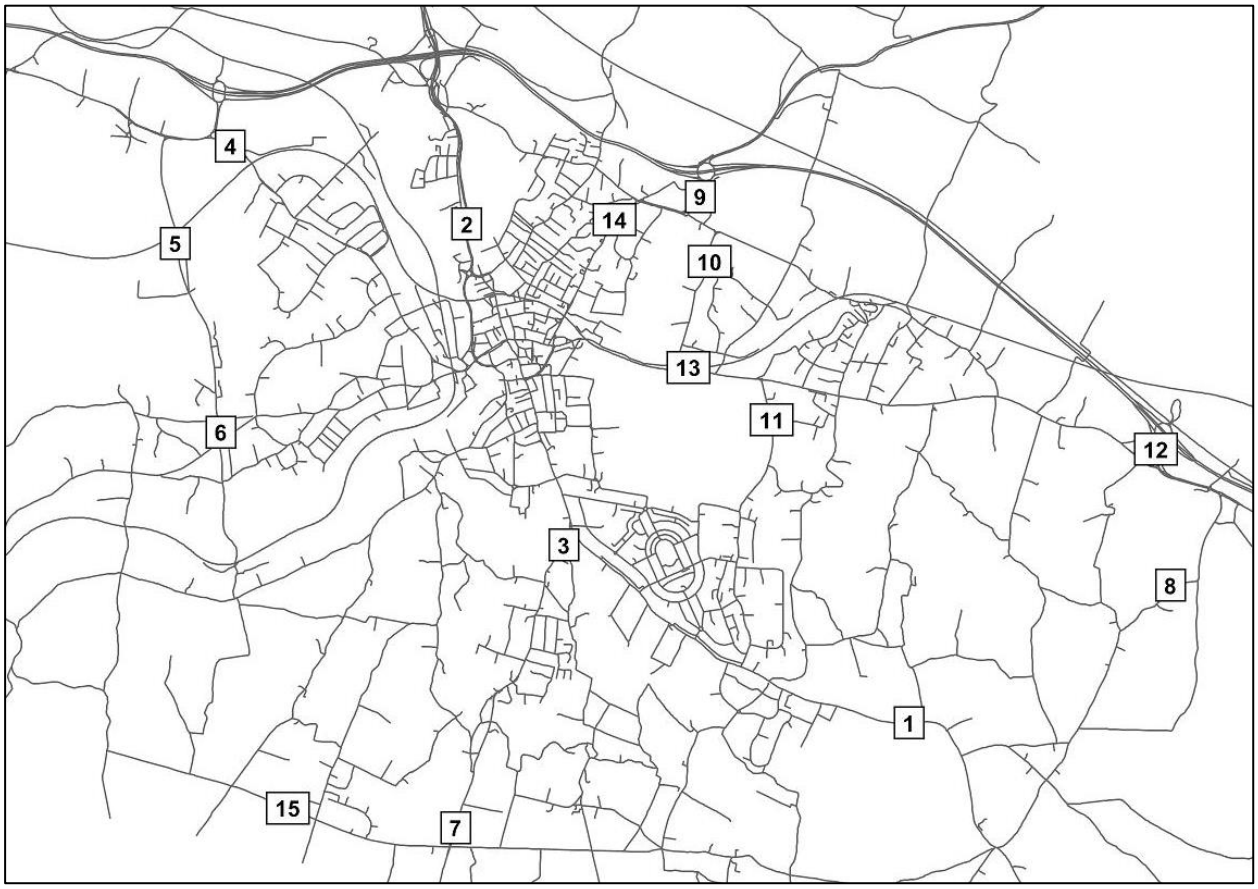
ITS Action Plan Number	Transport Intervention Proposed	Description / modelling	Modelling comment
		a) Hermitage Lane in the vicinity of Barming Rail Station. This would include a new pedestrian crossing near the vehicle access to the rail station. To accommodate this, there will be a requirement to reorganise the existing bus stop layout	New pedestrian signals included near to Barming Station.
		a) Constructing a new access road between Gore Court Road and Bicknor Wood to provide sufficient access to the new strategic site north of Bicknor Wood.	New link between Gore Court Rd and Bicknor Wood modelled. Give way junction assumed at each end.
		Willington St / Sutton Rd junction. This includes a widening of the approaches from Willington St to create an additional left turning lane into A274 Sutton Road and provision for entry into a new bus lane.	Junction capacity improvements through changed lane provisions and signal adjustment.
		a) Constructing a new northbound dedicated bus lane on the A274 Sutton Road.	Bus lanes are not modelled specifically. The impact of a bus lane on traffic can be reflected in available road capacity. The bus lane is assumed to be offline and to stop in advance of junctions and will have no impact on available road capacity for other vehicles.
		A20 Ashford Rd / Willington Street junction. This includes a widening of the left turning movement from Ashford Road into Willington Street.	Junction Capacity and signal improvements, through adjusting the signals. Signal arrangement from planning application TA.

ITS Action Plan Number	Transport Intervention Proposed	Description / modelling	Modelling comment
7	Increase long stay parking tariffs on council owned sites above inflation.	50% increase in real terms above inflation.	Car park cost per zone (representing balance of long stay and short stay) is included in the mode choice model. 50% increase applied.
8	Increase short stay parking tariffs on council owned sites above inflation.	50% increase in real terms above inflation.	
12	Subsidised shuttle bus between M20 J7 and town centre.	Subsidised shuttle bus between M20 J7 and town centre. To run every 20 minutes from Notcutts, down new cut road, along A20 to the bus station - where it can turn around and go back down Watt Tyler way and along the A20 back to Notcutts.	New shuttle bus route from Notcutts to the bus station with no stops in between, to run at 2o minute intervals.
15	Bus Only northbound lane on A274.	Bus Only northbound lane on A274 Sutton Road from Willington Street to the Wheatsheaf.	Bus lanes are not modelled specifically. The impact of a bus lane on traffic can be reflected in available road capacity. The bus lane is assumed to be offline and to stop in advance of junctions and will have no impact on available road capacity for other vehicles.

ITS Action Plan Number	Transport Intervention Proposed	Description / modelling	Modelling comment
16	Public bus service improvements.	A regular bus service along all of Maidstone's key radial roads (7-minute frequencies on main radial routes into the town centre between 7am and 7pm).	Bus services on main radial routes into the town centre increased to 7 minute frequencies. Additional services for A229 (S), A229 (N) and A20€ corridors. 65 buses added over 3 hour AM peak period and 56 for the PM peak period.
23	Maintain and promote KCC's car sharing website.	Assume car sharing increases by 5% of overall mode share into Maidstone town centre by 2031?	Car sharing reflected in the model by car occupancy. Existing average car occupancy is 1.23 for both AM and PM peaks. An increase in car occupancy of 5% will take this to a new occupancy level of 1.29. This has been applied to trip generation for the new development.
27	Romney Place Bus Lane.	Bus Only Lane turning left onto Romney Place from Lower Stone Street.	Buses only allowed to turn left from Lower Stone Street to Romney Place.
30	Bridges Gyratory	New Northbound link to bypass the gyratory via the two bridges.	New link included and lane allocation and signal arrangements adjusted.
No number	Cycle Mode Share (by implementing the cycle strategy).	An 8.5% increase in cycling mode share over 2014 base (0.5% per year).	Walking and cycling modes not modelled and 2014 base levels of walking and cycling are not known. A reduction in car trips (for home based trips in the Maidstone urban area only) has been used as a proxy for the increase in walking and cycling mode share.
No number	Walking Mode Share.	An 8.5% increase of walking mode share over 2014 base year (0.5% per year).	

ITS Action Plan Number	Transport Intervention Proposed	Description / modelling	Modelling comment
No number	NW Bus Loop.	Circular Bus route connecting the town centre - Hermitage Lane - Hospital - Howard Drive - London Road. From the east of Hermitage Lane site a bus only route will be built from the site linking onto Howard Drive which will create the loop route for the buses to use. Frequency: every 15 minutes. Stopping Pattern: all stops on route and one on Howards Way.	Extension of existing route 79 to create a loop route linking Howard Drive, Hermitage Lane and the hospital. Plan of bus route from TA for Land east of Hermitage Lane.
No number	A229/A274 Wheatsheaf Junction.	Close exit to Cranbourne Avenue, Adjusting turning movements and signal adjustment.	Exit from Wheatsheaf junction to Cranbourne Avenue closed. Signals and lane allocations adjusted.
No number	A274 / Wallis Avenue Junction.	Junction Capacity improvements, through lane provision and signal changes.	Lane allocation and signal arrangement adjusted as per Planning application TA.

Appendix E Model Output



AM Link Flows

Site	Link	Dir	2014 Refresh	2031 DM	2031 DS1	2031 DS2
1	A274 (W)	EB	400	900	1050	800
	A274 (W)	WB	650	700	950	500
2	A229 (N)	SB	2350	2400	2350	2050
	A229 (N)	NB	1800	1700	1650	1750
3	A229 Loose Rd (N)	SB	1150	1500	1400	1500
	A229 Loose Rd (N)	NB	1450	1900	1750	1500
4	A20 London Road	EB	1350	1350	1350	1350
	A20 London Road	WB	1250	1300	1250	1150

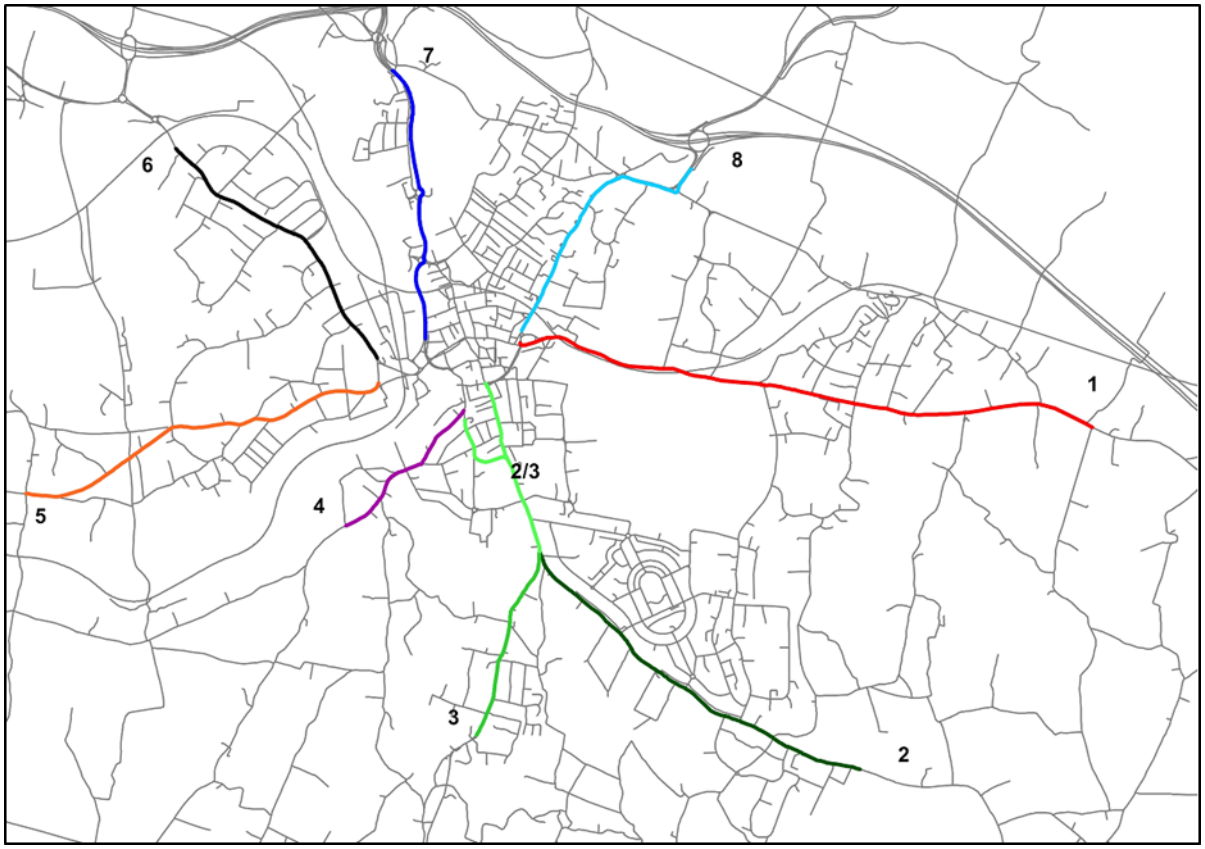
Site	Link	Dir	2014 Refresh	2031 DM	2031 DS1	2031 DS2
5	Hermitage Lane	NB	950	1150	1150	1100
	Hermitage Lane	SB	800	950	950	800
6	A26 Tonbridge Rd	EB	700	800	800	550
	A26 Tonbridge Rd	WB	650	750	700	800
7	A229 Linton Rd	SB	500	750	800	700
	A229 Linton Rd	NB	400	700	750	550
8	B2163 Lower St Leeds	NB	650	600	0	550
	B2163 Lower St Leeds	SB	500	500	50	550
9	A249	NB	1950	1850	2100	2050
	A249	SB	2100	2400	2450	3000
10	New Cut Rd	NB	800	850	1000	1050
	New Cut Rd	SB	950	900	900	1100
11	Willington St (N)	NB	1000	1150	1150	1050
	Willington St (N)	SB	750	900	850	800
12	M20 Spur Road	NB	1750	1950	2150	2150
	M20 Spur Road	SB	1650	1850	2100	2000
13	A20 Ashford Rd	EB	850	850	800	1000
	A20 Ashford Rd	WB	1250	1450	1500	1100
14	A249 Sittingbourne Rd	NB	950	1150	1000	950
	A249 Sittingbourne Rd	SB	600	800	650	450
15	B2163 (W)	EB	200	350	350	350
	B2163 (W)	WB	300	450	400	400

PM Link Flows

Site	Link	Dir	2014 Refresh	2031 DM	2031 DS1	2031 DS2
1	A274 (W)	EB	550	750	1000	650
	A274 (W)	WB	400	650	900	600
2	A229 (N)	SB	2000	2000	1900	1800
	A229 (N)	NB	2000	2050	2100	2050
3	A229 Loose Rd (N)	SB	1450	1700	1600	1600
	A229 Loose Rd (N)	NB	1200	1550	1400	1300
4	A20 London Road	EB	1050	1000	1050	900
	A20 London Road	WB	1300	1400	1300	1450
5	Hermitage Lane	NB	950	1200	1250	1100
	Hermitage Lane	SB	600	900	900	800
6	A26 Tonbridge Rd	EB	600	600	650	550
	A26 Tonbridge Rd	WB	500	700	700	600
7	A229 Linton Rd	SB	400	700	700	600
	A229 Linton Rd	NB	450	700	750	600
8	B2163 Lower St Leeds	NB	550	600	0	550
	B2163 Lower St Leeds	SB	550	550	50	550
9	A249	NB	2050	2200	2250	2700
	A249	SB	1750	1700	1600	2050
10	New Cut Rd	NB	850	800	750	800
	New Cut Rd	SB	1100	1250	1300	1300
11	Willington St (N)	NB	900	1100	900	1050
	Willington St (N)	SB	800	900	850	900
12	M20 Spur Road	NB	1550	1800	2100	2000
	M20 Spur Road	SB	1850	2250	2350	1950
13	A20 Ashford Rd	EB	1050	1250	1200	1200
	A20 Ashford Rd	WB	1000	1200	1050	1050
14	A249 Sittingbourne Rd	NB	650	750	800	750

Site	Link	Dir	2014 Refresh	2031 DM	2031 DS1	2031 DS2
	A249 Sittingbourne Rd	SB	500	650	500	500
15	B2163 (W)	EB	350	350	350	350
	B2163 (W)	WB	250	400	400	400

Travel Time Routes



Route	AM Inbound	Distance (miles)	2014 Refresh	2031 DM	2031 DS1	2031 DS2
1	A20 Ashford Road	3.0	10.3	13.7	11.5	9.5
2	A274 Sutton Road	3.0	12.3	15.6	14.4	12.6
3	A229 Loose Road	1.9	9.3	13.0	12.0	9.6
4	B2010 Farleigh Hill	0.9	2.8	2.8	2.8	2.8
5	A26 Tonbridge Road	2.0	7.2	7.7	7.6	7.2
6	A20 London Rd	1.6	6.6	7.1	6.9	5.8

Route	AM Inbound	Distance (miles)	2014 Refresh	2031 DM	2031 DS1	2031 DS2
7	A229 Royal Engineers Way	1.5	5.4	6.4	6.0	4.4
8	A249 Sittingbourne Rd	1.4	5.2	6.1	5.5	5.5

Route	AM Outbound	Distance (miles)	2014 Refresh	2031 DM	2031 DS1	2031 DS2
1	A20 Ashford Road	3.0	7.9	7.9	7.7	8.1
2	A274 Sutton Road	3.0	10.0	11.5	10.5	10.8
3	A229 Loose Road	1.9	7.6	9.5	8.8	8.8
4	B2010 Farleigh Hill	0.9	3.5	4.1	4.1	3.8
5	A26 Tonbridge Road	2.0	6.5	6.7	6.7	6.5
6	A20 London Rd	1.6	6.3	7.0	6.6	6.5
7	A229 Royal Engineers Way	1.5	4.4	5.6	5.7	5.6
8	A249 Sittingbourne Rd	1.4	5.9	6.7	6.2	6.1

Route	PM Inbound	Distance (miles)	2014 Refresh	2031 DM	2031 DS1	2031 DS2
1	A20 Ashford Road	3.0	8.9	9.9	9.1	9.0
2	A274 Sutton Road	3.0	11.2	12.9	12.5	12.3
3	A229 Loose Road	1.9	6.5	9.0	8.5	8.0
4	B2010 Farleigh Hill	0.9	2.7	2.7	2.7	2.7
5	A26 Tonbridge Road	2.0	7.1	6.8	6.9	7.3
6	A20 London Rd	1.6	6.1	5.8	6.6	5.8
7	A229 Royal Engineers Way	1.5	4.3	6.2	5.2	4.4
8	A249 Sittingbourne Rd	1.4	4.6	4.9	5.2	5.6

Route	PM Outbound	Distance (miles)	2014 Refresh	2031 DM	2031 DS1	2031 DS2
1	A20 Ashford Road	3.0	8.3	9.2	8.8	8.3
2	A274 Sutton Road	3.0	10.7	12.6	12.1	11.1
3	A229 Loose Road	1.9	8.5	11.9	12.3	10.2
4	B2010 Farleigh Hill	0.9	3.4	5.5	5.5	4.1
5	A26 Tonbridge Road	2.0	6.4	6.5	6.5	6.5
6	A20 London Rd	1.6	5.6	6.1	5.8	5.6
7	A229 Royal Engineers Way	1.5	5.2	7.5	7.3	7.0
8	A249 Sittingbourne Rd	1.4	5.6	6.6	5.5	5.7