Hemel Hempstead Urban Transport Model

Future Year Issues

Report

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Prepared for:

Hertfordshire Highways

Prepared by:

Steer Davies Gleave
West Riding House
67 Albion Street
Leeds
LS1 5AA

+44 (0)113 389 6400
www.steerdaviesgleave.com

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1 Introduction

1.1 This report details the construction of two future year versions of the Hemel Hempstead PARAMICS model, representing 2021 and 2031.

1.2 The future year models were built primarily as Do-Minimum scenarios for the purpose of testing strategic impacts of potential options for delivering housing and employment growth aspirations specified in the Regional Spatial Strategy.

1.3 The Do-Minimum scenarios are comprised of an array of both committed and aspirational future year developments including those:

- already granted planning permission by Dacorum Borough Council;
- with legal agreements for development granted;
- outstanding DBLP sites without planning permission;
- in the Strategic Housing Land Availability Assessment (SHLAA);
- other major aspirational developments.

1.4 There are a number of infrastructure schemes intended for Hemel Hempstead that have been classified by Dacorum Borough Council and Hertfordshire Highways as committed, and are therefore included in the Do-Minimum scenarios:

- North East Relief Road REF: Daxorum Local Plan Policy 53 (T5 – T7)(completion by 2012);
- Access arrangements on Station Road and Leighton Buzzard Road to Kodak development (completion by 2021);
- Access arrangements to Maylands Gateway (completion by 2031);
- Improvements to London Road/Two Waters Road signal settings (completion by 2021).

1.5 The following infrastructure schemes have not been implemented because detailed plans were not available:

- Signalisation of Durrants Hill Road/London Road junction associated with Manor Estate Development;
- Improvements to Featherbed Lane and junctions with London Road associated with Manor Estate Development.

1.6 Instead, where possible generic improvements to traffic flow in the London Road area have been made to accommodate increased future year traffic levels in the Do-Minimum scenarios.

1.7 In consultation with Dacorum Borough Council and Hertfordshire Highways, it has been assumed that minor additional infrastructure requirements will have been put in place as necessary to accommodate the growth assumed in the 2021 and 2031 Do-Minimum scenarios. This is limited to changes to signal timings, and minor changes to junction design (such as changes to approach lanes at roundabouts where physically feasible).

1.8 Additionally, because of the level of future year demand it has been necessary to assume some trips predicted for the peak hour of the morning period Do-Minimum model will shift their departure time to the peak shoulder hours.

1.9 The remaining chapters of this report consider all the assumptions outlined above in more detail, and present summary statistics demonstrating the performance of the Hemel Hempstead traffic network in each modelled time period for the 2021 and 2031 Do-Minimum scenarios:

- Chapter 2 – demand, infrastructure and other assumptions made for the 2021 Do –Minimum scenario;
- Chapter 3 - demand, infrastructure and other assumptions made for the 2031 Do –Minimum scenario;
- Chapter 4 – a summary of potential future year traffic issues and network improvements/assumptions potentially necessary to accommodate the Do-Minimum levels of future year development.

2 Future Year Model Assumptions: 2021

Demand Assumptions

2.1 In agreement with Dacorum Borough Council and Hertfordshire Highways, the Do-Minimum 2021 scenario includes the schedule of committed and aspirational development sites for 2021 provided by Dacorum Borough Council and summarised in Table 2.1. A more detailed breakdown of residential sites included in the future year model for both 2021 and 2031, broken down into numbers of houses and flats, is provided at Appendix A. Information relating to the breakdown of residential units into houses or flats has been provided by Dacorum Borough Council.

2.2 The Do-Minimum scenarios do not include additional background growth constrained by localised TEMPRO growth projections. Effectively, the TEMPRO projections include planning data which reflects both the committed and aspirational development recognised by Dacorum Borough Council, and the additional growth suggested by the Regional Spatial Strategy. This extra growth from the RSS is represented by the potential development scenarios that will be tested in the Option Testing phase of this study, and is therefore not included in the Do-Minimum scenarios.

2.3 Estimates of windfall site allocations have also been included in the Do-Minimum model. Some 355 windfall units are estimated by 2021, with the potential for a further 592 units by 2031. By their nature, we are unable to define with any level of certainty where these windfall sites will occur and, as such, the distribution of trips associated with these sites is distributed across the network, in proportion to demand within the base model for each appropriate time period.

TABLE 2.1 SUMMARY OF DEVELOPMENT EXPECTED BY 2021

Type	Sub-Type	Size
Housing	Houses	2197 houses
	Flats	3075 flats
Employment	Non-food retail (Jarman Park)	6700 m^2
	B1 Office (Maxted Road, Belswains Lane, London Road, Whiteleaf Road)	17282 m^2
	B8 Warehousing (Whiteleaf Road, Riversend Road)	15815 m^2
	Hospital	5778 m^2
	Leisure (Ski Centre)	10502 m^2
Mixed	Kodak Site	6983 m^2 B1 1631 m^2 Retail/Cafe

2.4 It is worth noting at this stage that the B1 office development on London Road will replace an existing car dealership and trips associated with the existing uses have been subtracted. Similarly, net increases in flow for the Whiteleaf Road site are provided in the associated Transport Assessment for that site.

2.5 Where available, trip numbers were taken from individual Transport Assessment documents provided by Dacorum Borough Council and these are summarised in Table 2.2.

TABLE 2.2 SUMMARY OF TRIPS FROM TRANSPORT ASSESSMENTS PREDICTED FOR 2021

Development	AM		PM		SAT	
	IN	OUT	IN	OUT	IN	OUT
Housing						
Manor Estate	55	172	159	75	66	64
Morton House	0	31	19	8	0	0
Three Cherry Tree Lane (AE6)	71	211	187	92	60	59
Three Cherry Tree Lane (AE44)	129	381	339	167	109	107
Sappi Nash Mills	79	173	173	79	64	63
Employment						
Jarman Park	52	28	182	194	281	298
EEB, Whiteleaf Rd	-7	-19	-8	63	0	0
Riversend Rd	7	7	7	7	7	7
Gen Hospital	63	6	0	52	11	11
Ski Centre	0	0	132	119	79	97
Mixed						
Kodak Site	138	192	187	104	0	0

2.6 For aspirational sites, or other sites where no detailed trip forecasts existed, a set of generic trip rates was derived and applied using TRICS. These trip rates are summarised in Table 2.3. The Saturday trip rate for houses was also used for flats because of a lack of data for flats in the area.

TABLE 2.3 GENERIC PEAK HOUR TRIP RATES 2021

Development type	AM		PM		SAT	
	IN	OUT	IN	OUT	IN	OUT
Houses (per household)	0.125	0.415	0.337	0.193	0.203	0.198
Flats (per household)	0.067	0.194	0.142	0.083	0.203	0.198
B1 Office (per 100 m^2)	1.455	0.165	0.168	1.220	0	0

2.7 Table 2.4 summarises the projected number of peak hour trips for each modelled time period in 2021.

TABLE 2.4 PEAK HOUR DEVELOPMENT TRIPS 2021

Development Type		AM		PM		SAT	
		IN	OUT	IN	OUT	IN	OUT
Housing							
Committed	Houses	71	225	202	99	92	89
	Flats	27	110	77	42	71	69
Aspirational	Houses	320	941	822	423	354	346
	Flats	191	542	431	234	425	415
	Total	608	1816	1531	798	942	919
Employment							
Committed		251	24	311	554	342	372
Aspirational		0	0	0	0	0	0
	Total	251	24	311	554	342	372
Mixed							
	Kodak	138	192	187	104	0	0
Total		**998**	**2033**	**2029**	**1457**	**1284**	**1291**

2.8 Each development site was assigned to a single existing zone in the PARAMICS model based on its location. In the case of three sites, which did not represent extensions to existing zones, but rather significant individual developments, new zones were coded:

- Zone 63: Kodak site; distribution from Zone 32 assumed.
- Zone 64: Maylands Gateway; distribution from Zone 48 assumed.
- Zone 65: Three Cherry Trees Lane housing site; distribution from Zone 49 assumed.

2.9 The generic time profile for the release of demand from existing internal Hemel Hempstead zones was used for each of the new development zones.

2.10 A number of potential development sites fell outside the boundaries of the modelled area, or it was not possible to assign them to a specific zone. Specifically, these are the small sites (4 or less units) with planning permission and the proposals at Belswains Lane. Therefore a small number of trips were not added to the model.

TABLE 2.5 SUMMARY OF TRIPS NOT ADDED TO DO-MINIMUM 2021

	AM		PM		SAT	
	IN	OUT	IN	OUT	IN	OUT
Trips	24	74	58	33	53	52

2.11 Instead of using generic factors to derive trip forecasts for the non-peak hours in each three hour modelled period, the ratio of existing trip numbers in each hour of the model was used because it was felt this would better reflect local conditions (see Table 2.6).

TABLE 2.6 PEAK HOUR TO 3-HOUR MODEL TRIP FACTORS 2021

	AM	PM	SAT
Factor	2.540	2.680	2.923

2.12 Any imbalance between total number of origins and destinations in the forecast development trips was assumed to represent the need for either in- or out-commuting to/from the modelled area. In the morning peak, for instance, there was more forecast origins than destinations, suggesting that in 2021, the net amount of out-commuting will increase. To account for this, any imbalance in origin and destination totals was balanced against external zone totals.

2.13 The forecast development trip row and column totals were furnessed using the existing zone trip distributions, and the resulting matrix of development trips was added to the PARAMICS model as a separate matrix (matrix level 3 in the model files) for each time period.

2.14 For the morning period model, the level of future year demand increased traffic levels in the peak hour to unrealistic levels for the available network infrastructure and caused gridlock in the model. It has therefore been assumed that 10% of the demand predicted for the peak hour of the morning period model will shift its departure time to the peak shoulder hours (5% each).

2.15 No profile changes were assumed for either the evening peak period or the Saturday period models.

Infrastructure Assumptions

2.16 Dacorum Borough Council and Hertfordshire Highways supplied a list of infrastructure improvements expected to be in place by 2021. For improvements where detailed plans were not available, the models were run to observe the effects of future year demands; at these locations appropriate mitigation measures were tested and are described later in this chapter.

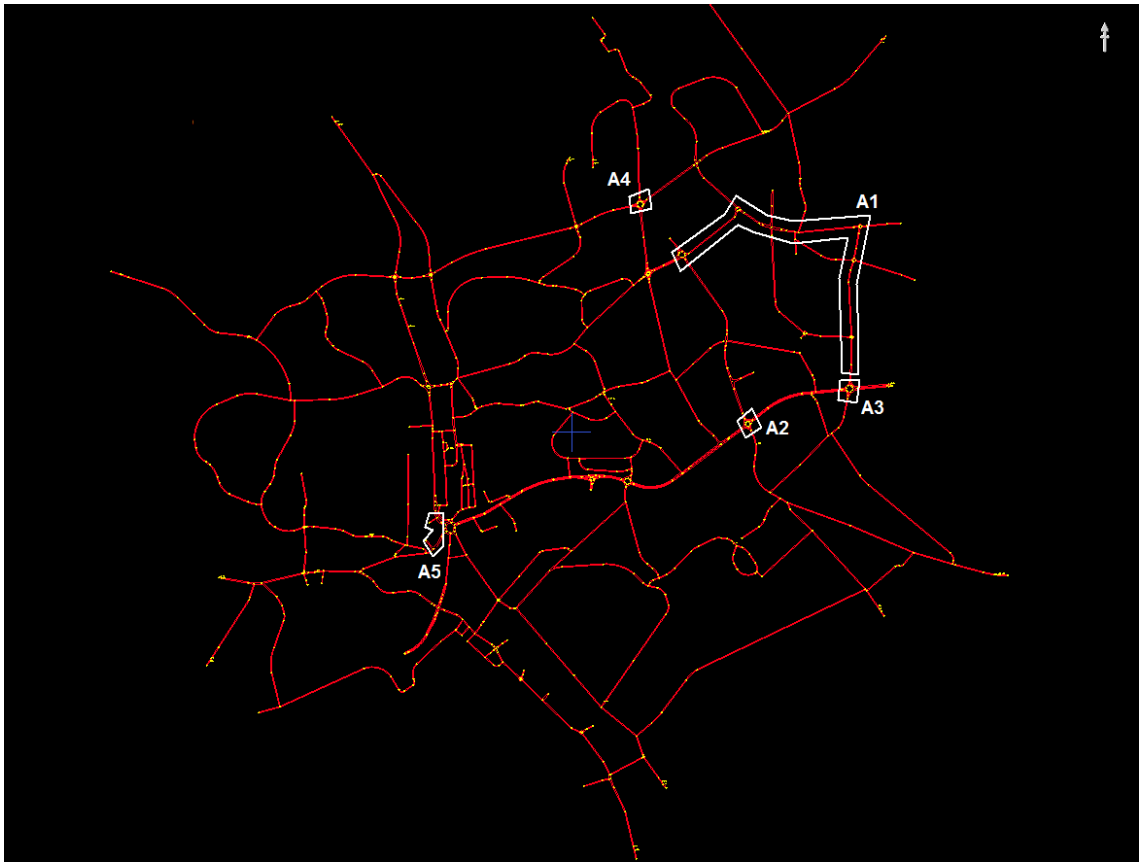
2.17 Table 2.7 lists these committed infrastructure schemes and any key assumptions relating to their coding in the 2021 PARAMICS model.

TABLE 2.7 COMMITTED INFRASTRUCTURE IMPROVEMENTS IN 2021 DO-MINIMUM SCENARIO

Ident. Code	Scheme	Assumptions
A1	North East Relief Road	Layout as plans supplied; Signal timings optimised for model flows. Coded as major route to reflect re-distributory nature.
A2	Improvements to A414 / Maylands Avenue roundabout	No plans available. Improvements appropriate to mitigate observed problems in future year model to be tested.
A3	Improvements to A414 / Green Lane roundabout	Free-flow left turn lane added from Green Lane North to Breakspear Way East.
A4	Improvements to Redbourn Road / St Agnells Lane roundabout	No plans available. Improvements appropriate to mitigate observed problems in future year model to be tested.
A5	Access arrangements for Kodak site	Access roads from Station Road and Leighton Buzzard Road controlled by signals.

2.18 Figure 2.1 shows the location of each of the committed infrastructure upgrades summarised above.

FIGURE 2.1 LOCATION OF COMMITTED INFRASTRUCTURE IMPROVEMENTS IN DO-MINIMUM SCENARIO 2021



2.19 In addition to the commited schemes detailed in Table 2.7, a strategy of developing the road network in line with the intended amount of development was adopted.

2.20 This process of identification of likely necessary infrastructure upgrades included those committed infrastructure changes where detailed plans were not available; engineering judgement was used to develop appropriate likely junction and road layouts and/or signal timings dependent on any problems in traffic flow observed in the future year models.

2.21 However, this was limited to relatively minor infrastructure upgrades such as changes to signal timings, and minor changes to junction design (such as changes to approach lanes at roundabouts where physically feasible.

2.22 Issues with network operation observed in the 2021 Do-Minimum models are listed below along with the infrastructure improvements that were used as mitigation in each case:

- Heavy queue build-up on St Albans Road eastbound, from Maylands Avenue back to the Plough. Mitigated by improvements to A414 / Maylands Avenue and A414 / Green Lane junctions.
- Queue build-up on Green Lane southbound, from A414 along length of North East Relief Road. Mitigated by improvements to A414 / Green Lane junction.

- Severe queueing on Shenley Road East and West and at Holtsmere End. Caused because of difficulty of making right turns across the increased flows on Redbourn Road. Mitigated by improvements to Shenley Road West / Redbourn Road and Holtsmere End / Redbourn Road junctions.
- Queue build-up on Redbourn Road northbound, from St Agnells Lane junction back through the Maylands area. Mitigated by improvements to the Redbourn Road / St Agnells lane junction.
- Gridlocking in the St Johns Road / Station Road area. Due to the network layout in this area, and the limited space available for right turners, a relatively small number of vehicles can cause serious problems in the model. This effect was mitigated in the model by the addition of signals at the St Johns Road / Station Road junction.

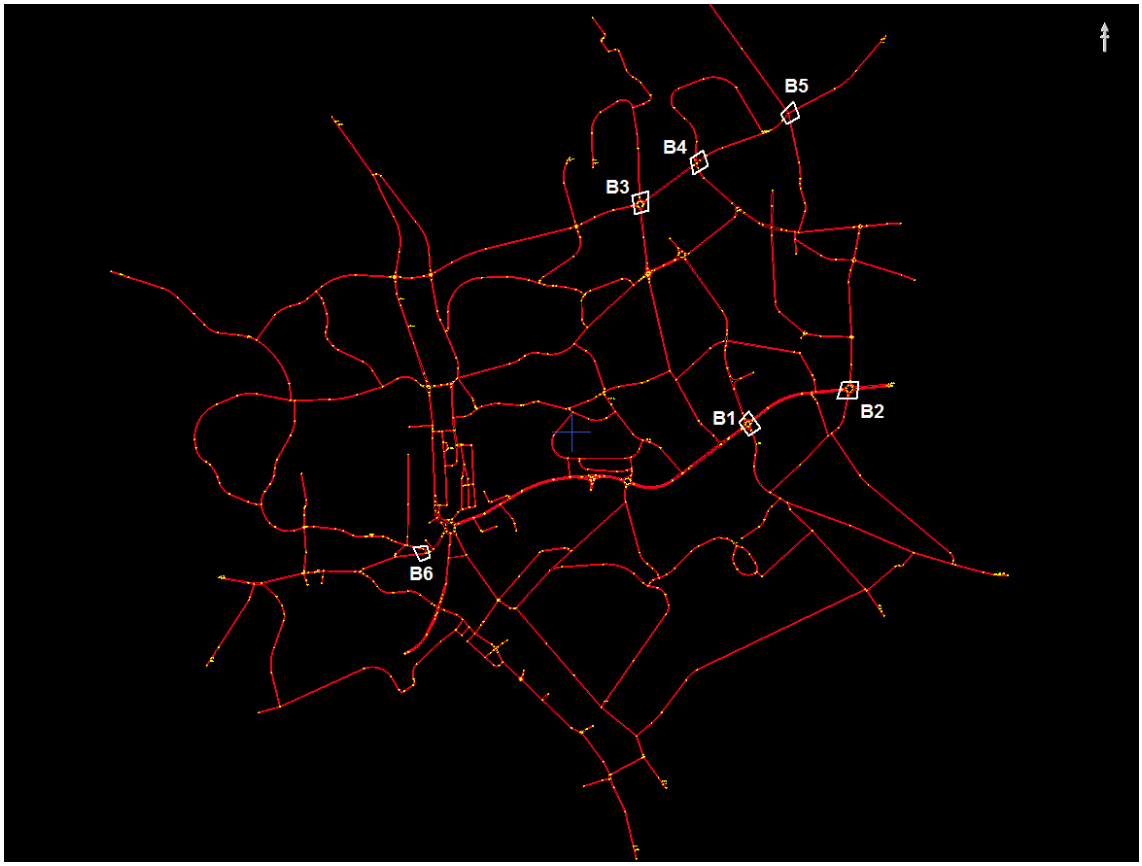
2.23 Table 2.8 lists the additional infrastructure upgrades identified via this process and any key assumptions relating to their coding in the 2021 Do-Minimum PARAMICS model.

TABLE 2.8 ADDITIONAL INFRASTRUCTURE UPGRADES FOR MITIGATION IN 2021 DO-MINIMUM SCENARIO

Ident. Code	Scheme	Assumptions
B1	Improvements to A414 / Maylands Avenue roundabout	No plans available. Circulatory expanded to 3 lanes on west-to-east arm. Lane definitions changed to provide 2 right turn lanes from north.
B2	Improvements to A414 / Green Lane roundabout	Lane definitions changed to provide 2 right turn lanes from north and east.
B3	Improvements to Redbourn Road / St Agnells Lane roundabout	Lane definitions changed to provide two right turn lanes from south.
B4	Improvements to Shenley Road West / Redbourn Road	Midi-roundabout upgraded to signalised crossroads with ped stage.
B5	Modifications to Holtsmere End / Redbourn Road	South arm becomes left-in/left-out only to reflect downgrading of route.
B6	Improvements to St Johns Road / Station Road junction	Priority junction upgraded to signalised junction.
B7	General signal timings	All signal timings optimised for network performance.

2.24 Shows the location of each of the additional infrastructure upgrades identified for mitigation in the 2021 Do-Minimum Scenario.

FIGURE 2.2 LOCATION OF ADDITIONAL INFRASTRUCTURE UPGRADES FOR MITIGATION IN 2021 DO-MINIMUM SCENARIO



2.25 It should be noted that it is likely that the infrastructure improvements (or similar) identified in this exercise represent the minimum infrastructure that will be needed in Hemel Hempstead in 2021 considering the intended level of development.

Network Performance

2.26 Five random seeds were run for each time period to provide a robust assessment of future year network conditions. Unless otherwise noted, all statistics presented are averages of the network performance measures over the five random seeds.

2.27 In addition to a visual inspection of traffic behaviour in each run, the overall network performance is quantified by a number of key measures output from the model and presented in Table 2.9. These statistics will be one of the measures used to compare option test performance against the Do-Minimum Scenarios in further work.

2.28 The general network performance of the 2021 Do-Minimum Scenario is slightly worse than the base year whilst accommodating substantially more trips (5500+ in the morning and evening periods).

2.29 In 2021 the average network speeds are around 5-10% slower than the base year in the morning and evening period models.

2.30 In 2021 the average queuing delay is around 10 seconds more per vehicle than in the base year in the morning period models. Evening period and Saturday delays are similar between 2021 and the base year.

TABLE 2.9 OVERALL NETWORK STATISTICS DO-MINIMUM 2021

Performance Measure	AM	PM	SAT
Total vehicle trips	61122	64582	58520
Total distance travelled (km)	204048	209579	185791
Average speed of vehicles on network (mph)	22.7	22.0	26.2
Average time spend on network (s)	328	329	272
Average queuing delay (s)	58	45	24
Total time spent on network (hr)	5573	5907	4414
Total queuing delay (hr)	977	809	384

2.31 In Figures 2.3, 2.4 and 2.5, time series graphs demonstrating average vehicle speeds across the network over the morning, evening and Saturday modelled periods respectively are presented. Individual time series are given for each random seed, in addition to the mean of the 5 seeds for each time period.

FIGURE 2.3 TIME SERIES: MODELLED MEAN NETWORK SPEED DO-MINIMUM AM 2021

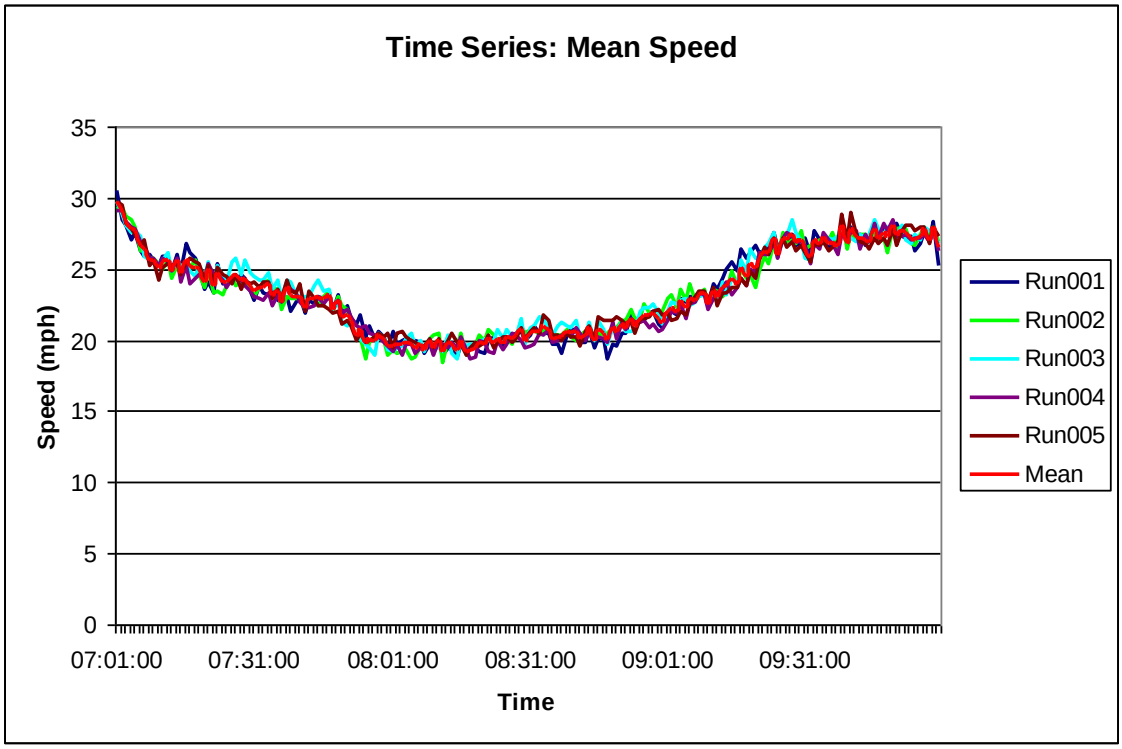


FIGURE 2.4 TIME SERIES: MODELLED MEAN NETWORK SPEED DO-MINIMUM PM 2021

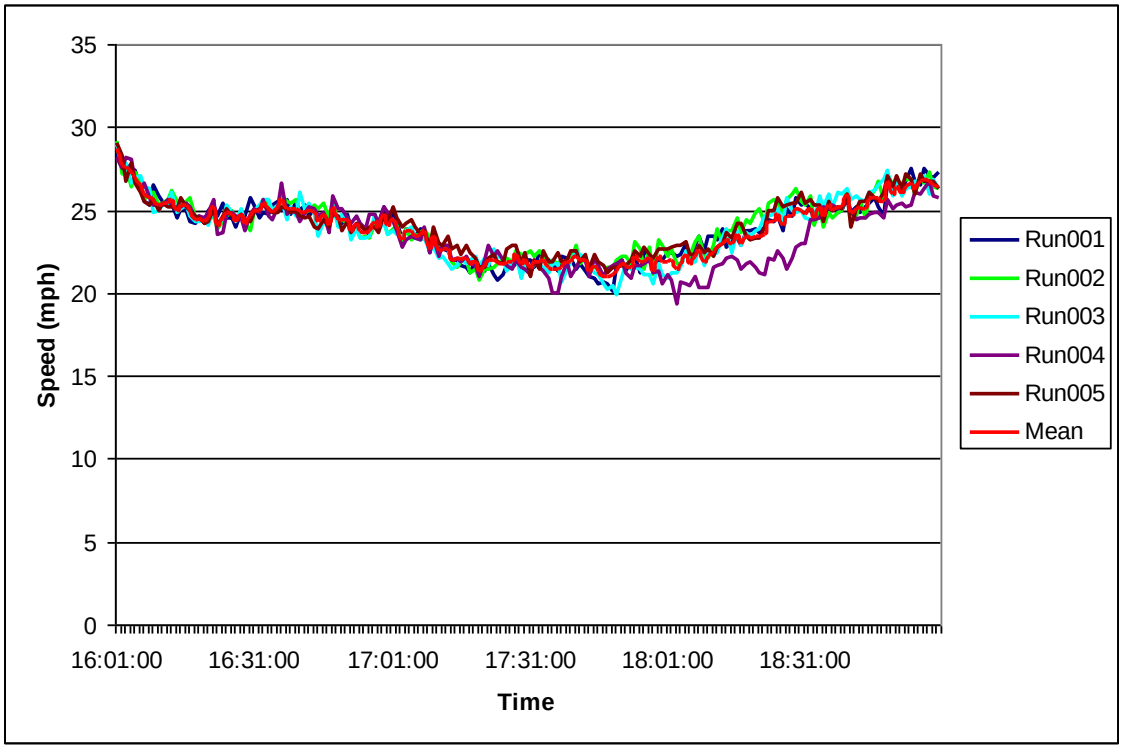
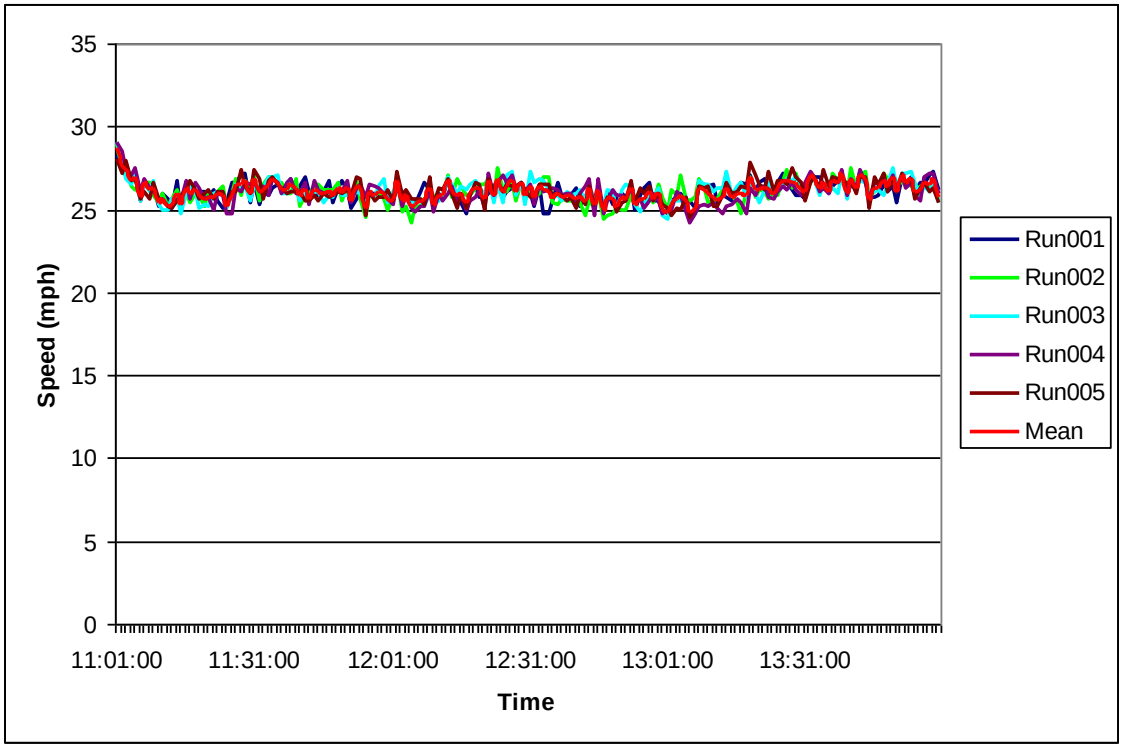


FIGURE 2.5 TIME SERIES: MODELLED MEAN NETWORK SPEED DO-MINIMUM SAT 2031



2.32 The morning period model time series shows that in the peak hour average speeds decrease, as may be expected, but that there is relatively little divergence between the random seeds.

2.33 The evening period model is similar, but slightly less stable, with a very small amount of divergence in average speeds between different random seeds in the peak (second) and third modelled hours.

2.34 The Saturday period model time series shows stable average speeds across the network and very little divergence between random seeds. This matches with observations of the Saturday period model runs, which showed few, if any, congestion problems, due to the network upgrades necessary for the morning and evening periods. The flatter, lower level of demand in the Saturday period model also contributes to the stable average modelled speed which is maintained following the initial few minutes of 'model warm-up'.

2.35 Although additional infrastructure was assumed to help mitigate the level of increased demand in the 2021 Do-Minimum Scenario, there are areas of the network where some minor queuing and delays are observed in the models.

2.36 In the morning period model the residual issues are:

- St Albans Road: eastbound queues at Maylands Avenue and Green Lane during peak hour;
- Redbourn Road /St Agnells junction: near capacity for periods of the peak hour, particularly on St Agnells approach;
- Redbourn Road / Shenley Road West junction: near capacity for periods of the peak hour;
- Maylands Avenue: southbound queues at St Albans Road for periods of the peak hour;
- London Road: southeastbound queues at London Road / Apsley Mills signals for periods of the peak hour.

2.37 In the evening period model the residual issues are:

- Jarman Park junction: queues eastbound on St Albans Road and northbound from Jarman Park exit for periods of the peak hour;
- Redbourn Road / St Agnells junction: queues on eastbound and northbound arms during the peak hour;
- Redbourn Road / Swallowdale junction: queues on all approaches during the peak hour;

2.38 There were no notable residual traffic flow issues in the Saturday period model in 2021.

3 Future Year Model Assumptions: 2031

Demand Assumptions

3.1 In agreement with Dacorum Borough Council and Hertfordshire Highways, the Do-Minimum 2031 scenario includes the schedule of committed and aspirational development sites for 2031 provided by Dacorum Borough Council and summarised in Table 3.1.

3.2 Additional background growth was not applied as in the 2021 model.

TABLE 3.1 SUMMARY OF DEVELOPMENT EXPECTED BY 2031

Type	Sub-Type	Size	Additional 2021-2031
Housing	Houses	3005 houses	808 houses
	Flats	4227 flats	1152 houses
Employment	Non-food retail (Jarman Park)	6700 m^2	-
	B1 Office (Maxted Road, Belswains Lane, London Road, Whiteleaf Road)	115282 m^2	98000 m^2
	B8 Warehousing (Whiteleaf Road, Riversend Road)	15815 m^2	-
	Hospital	5778 m^2	-
	Leisure (Ski Centre)	10502 m^2	-
Mixed	Kodak Site	6983 m^2 B1 1631 m^2 Retail/Cafe	-

3.3 There were no sites with individual Transport Assessments for which development is proposed beyond 2021. For aspirational sites up to 2031 the same generic trip rates as used for 2021 sites have been applied.

3.4 Table 3.2 summarises the projected number of additional peak hour trips for each modelled time period between 2021 and 2031.

TABLE 3.2 ADDITIONAL PEAK HOUR DEVELOPMENT TRIPS 2021-2031

Development Type		AM		PM		SAT	
		IN	OUT	IN	OUT	IN	OUT
Housing							
Committed	Houses	0	0	0	0	0	0
	Flats	0	0	0	0	0	0
Aspirational	Houses (243 units)	101	336	272	156	164	160
	Flats (186 units)	77	223	164	96	234	228
	Total	178	559	436	252	398	388
Employment							
Committed		0	0	0	0	0	0
Aspirational		1426	162	165	1196	0	0
	Total	1426	162	165	1196	0	0
Mixed							
	Kodak	0	0	0	0	0	0
Total		**1604**	**721**	**601**	**1447**	**398**	**398**

3.5 Development trips were assigned to zones and profiled as in the 2021 model.

3.6 Peak hour development trip forecasts were expanded to 3 hour demands, origins and destinations were balanced, and departure time re-distribution was assumed as in the 2021 model.

Infrastructure Assumptions

3.7 Dacorum Borough Council and Hertfordshire Highways supplied a list of infrastructure improvements expected to be in place by 2031. The only major committed improvement additional to what is already in the 2021 scenario is the infrastructure related to the Maylands Gateway development scheme.

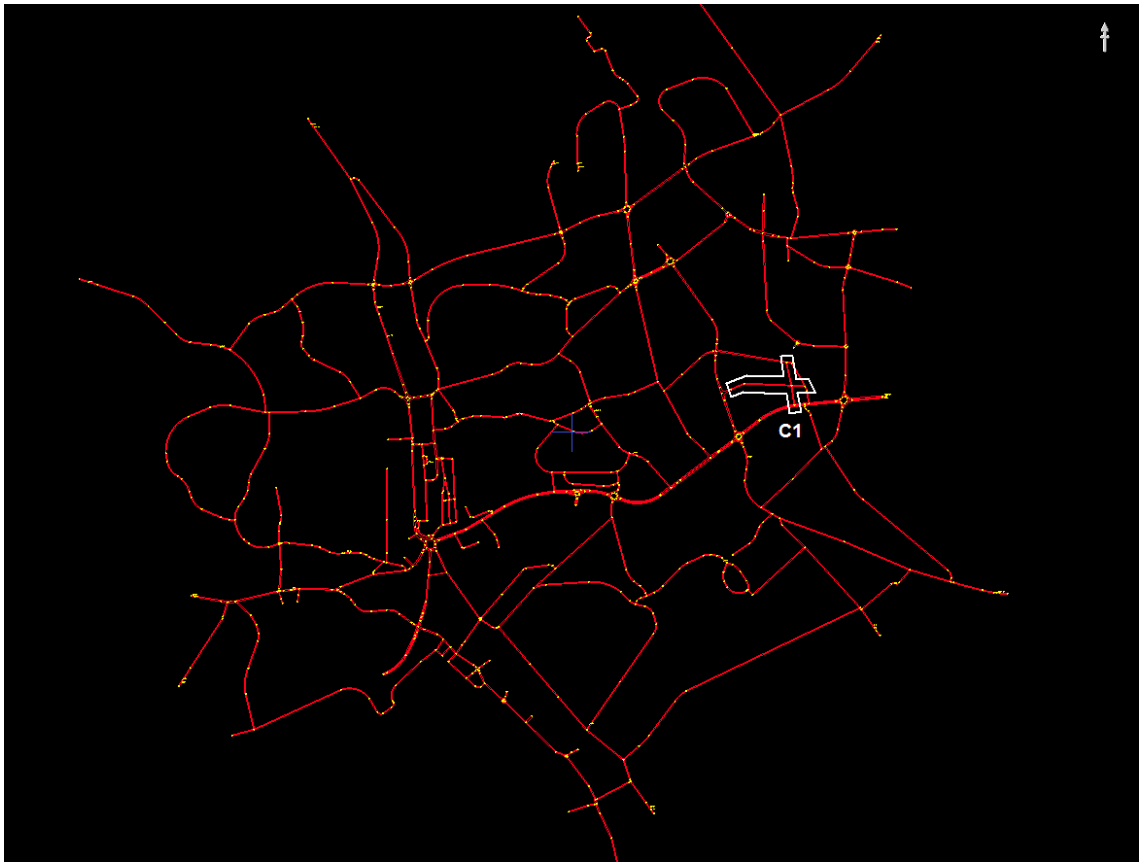
3.8 Table 2.7 shows this committed infrastructure scheme and any key assumptions relating to its coding in the 2031 PARAMICS model.

TABLE 3.3 COMMITTED INFRASTRUCTURE IMPROVEMENTS IN 2031 DO-MINIMUM SCENARIO

Ident. Code	Scheme	Assumptions
C1	Access arrangements for Maylands Gateway	Access roads and junctions with Maylands Avenue (signals/priority) and Breakspear Way (left-in/left-out).

3.9 Figure 3.1shows the location of the committed infrastructure upgrade in 2031 additional to that which is already included in the 2021 models.

FIGURE 3.1 LOCATION OF COMMITTED INFRASTRUCTURE IMPROVEMENTS IN DO-MINIMUM SCENARIO 2031



3.10 The 2021 and 2031 Do-Minimum scenario levels of demand are very similar; a proportion of the employment, and most of the housing, is already scheduled to be developed by 2021. The resulting traffic issues revealed by the model and the recommended infrastructure improvements for mitigation are therefore the same for the 2021 and 2031.

3.11 Effectively this means that a view would need to be taken on whether the infrastructure improvements could be delivered by 2021, and if not, then perhaps

some of the development aspirations could be pushed back into the 2021 – 2031 period.

Network Performance

3.12 Five random seeds were run for each time period to provide a robust assessment of future year network conditions. Unless otherwise noted, all statistics presented are averages of the network performance measures over the five random seeds.

3.13 In addition to a visual inspection of traffic behaviour in each run, the overall network performance is quantified by a number of key measures output from the model and presented in Table 3.4.

3.14 The general network performance of the 2031 Do-Minimum Scenario is significantly worse than the base year although accommodating substantially more trips (7000+ in the morning and evening periods).

3.15 In 2031 the average network speeds are around 10-20% slower than the base year in the morning and evening period models.

3.16 In 2031 the average queuing delay is around 70 seconds more per vehicle than in the base year in the morning period models and 15 seconds per vehicle in the evening period models. Saturday delays are similar between 2031 and the base year.

3.17 The general network performance of the 2031 Do-Minimum Scenario is slightly worse than the 2021 Do-Minimum Scenario with speeds around 10% slower and delays around 10% higher. Delays are significantly worse in the 2031 morning period models than in 2021 reflecting the increased demand stretching the additional infrastructure to capacity.

TABLE 3.4 OVERALL NETWORK STATISTICS DO-MINIMUM 2031

Performance Measure	AM	PM	SAT
Total vehicle trips	62937	66768	59659
Total distance travelled (km)	213144	217180	188129
Average speed of vehicles on network (mph)	18.4	20.1	26.0
Average time spend on network (s)	413	363	271
Average queuing delay (s)	115	56	24
Total time spent on network (hr)	7221	6731	4496
Total queuing delay (hr)	2011	1032	400

3.18 In Figure 3.2, Figure 3.3 and Figure 3.4 time series graphs demonstrating average vehicle speeds across the network over the morning, evening and Saturday modelled periods respectively are presented. Individual time series are given for each random seed, in addition to the mean of the 5 seeds for each time period.

FIGURE 3.2 TIME SERIES: MODELLED MEAN NETWORK SPEED DO-MINIMUM AM 2031

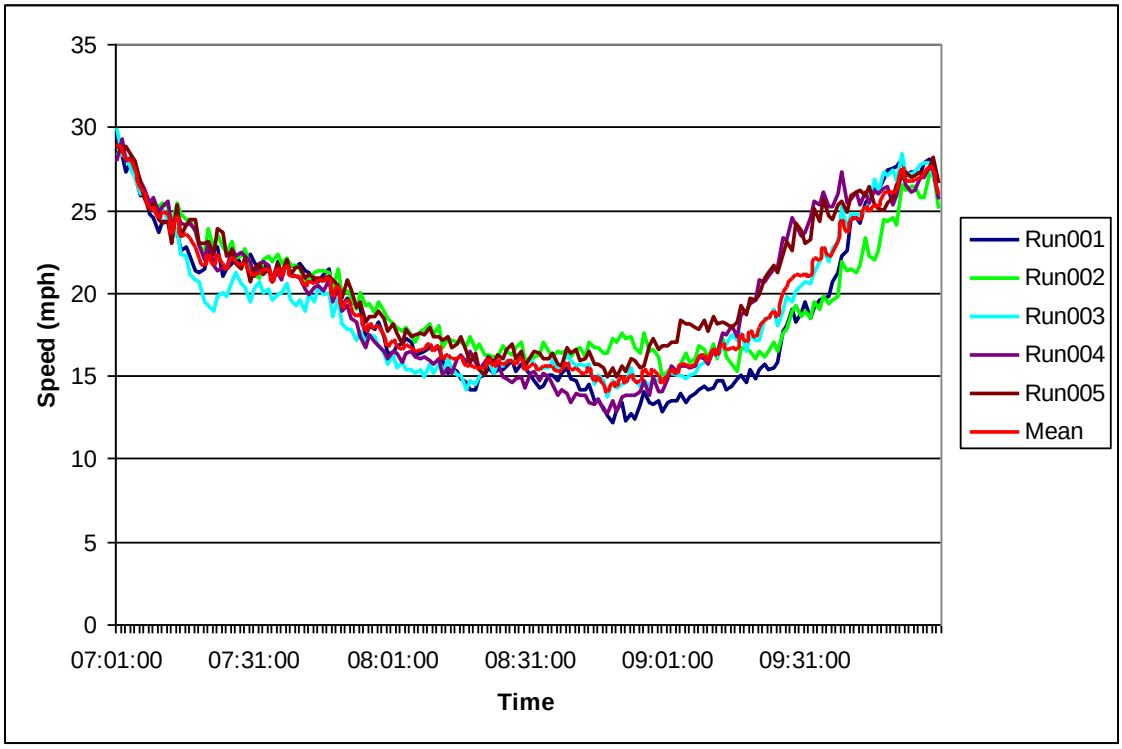


FIGURE 3.3 TIME SERIES: MODELLED MEAN NETWORK SPEED DO-MINIMUM PM 2031

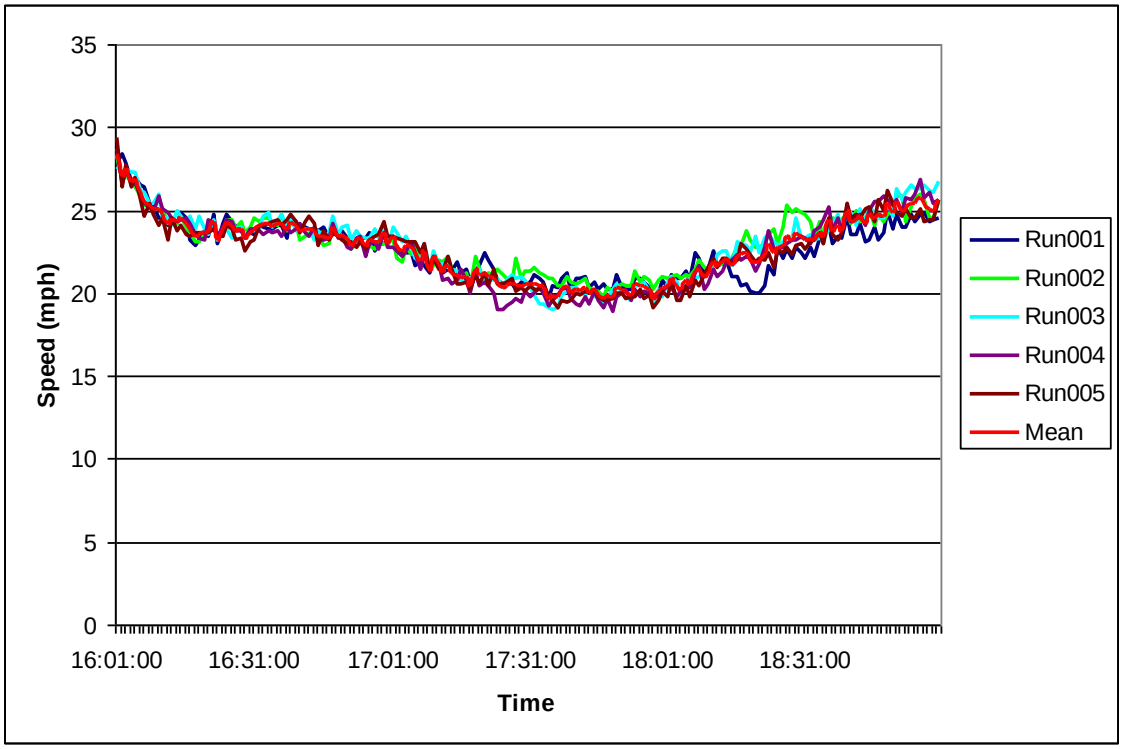
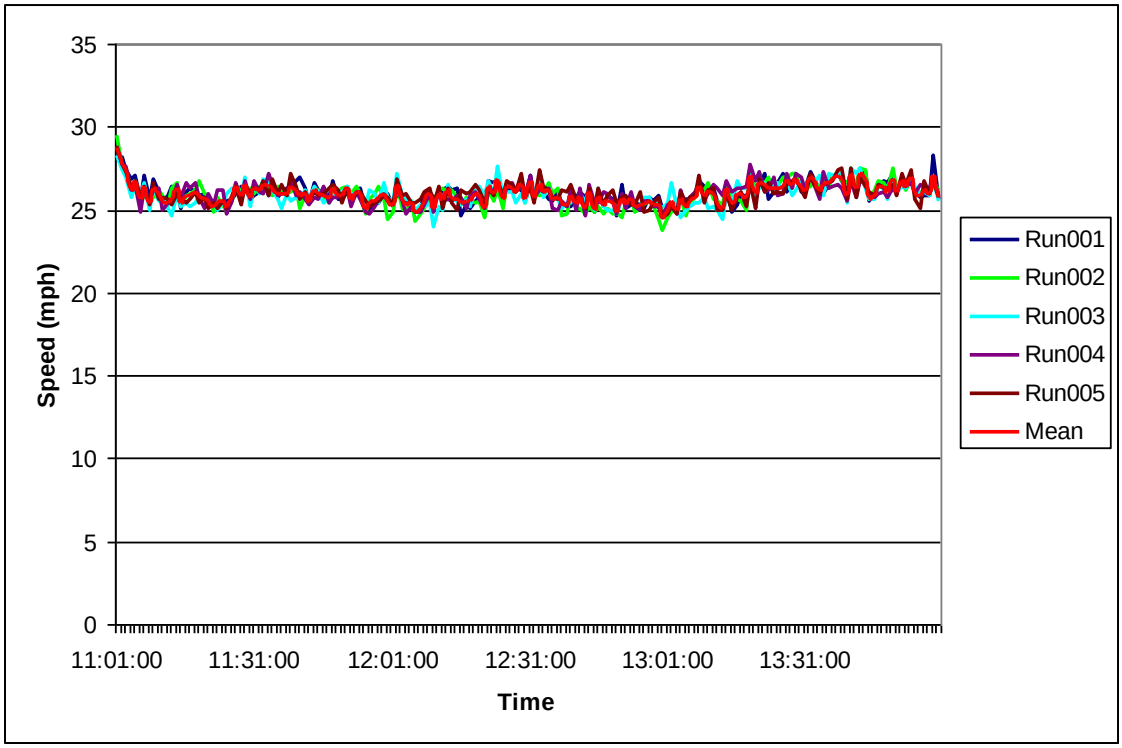


FIGURE 3.4 TIME SERIES: MODELLED MEAN NETWORK SPEED DO-MINIMUM SAT 2031



3.19 The time series graphs exhibit very similar behaviour in the evening and Saturday time periods in 2031 as in the 2021 models.

3.20 However, the morning period model shows a significant deterioration in 2031 compared to 2021 with much slower average speeds and less stability between random seeds.

3.21 Apart from the committed, no additional infrastructure changes have been made in above those already in the 2021 model. There are areas of the network where some residual queuing and delays are observed in the 2031 Do-Minimum Scenario.

3.22 In the morning period model the residual issues are:

- St Albans Road: eastbound and westbound queues at Maylands Avenue and Green Lane during peak hour; in some random seeds queues block back across most of St Albans Road for short periods;
- Redbourn Road /St Agnells junction: near capacity for most of the peak hour; in some random seeds significant queuing and interaction with queues at Redbourn Road / Swallowdale junction;
- Redbourn Road / Shenley Road West junction: near capacity for periods of the peak hour;
- Maylands Avenue: southbound queues at St Albans Road for periods of the peak hour;
- London Road: southeastbound queues at London Road / Apsley Mills signals for periods of the peak hour.

- Town Centre: Leighton Buzzard Road, Queensway and Marlowes all show some traffic flow and queuing issues in some random seeds but are less problematic in others;

3.23 The 2031 morning period model shows traffic flow issues in the same locations as the 2021 model but the increased demand in 2031 causes flow breakdown more often and to a greater degree. The increased development in the town centre in 2031 is contributed to the increased queueing and instability in traffic flow in that area.

3.24 In the evening period model the residual issues are:

- Jarman Park junction: queues eastbound on St Albans Road and northbound from Jarman Park exit for most of the peak hour;
- Redbourn Road / St Agnells junction: queues on eastbound and northbound arms during the peak hour;
- Redbourn Road / Swallowdale junction: queues on all approaches during the peak hour;
- St Albans Road / Maylands Avenue junction: southbound and westbound queues during the peak hour;
- Redbourn Road / Shenley Road West junction: close to capacity with some queueing during the peak hour;
- London Road: in some random seeds minor queueing at all signals;
- Breakspear Way: westbound queueing at Green Lane during peak hour.

3.25 The 2031 evening period model shows traffic flow issues in more locations than in the 2021 model. However, the issues are relatively minor and do not cause significant flow breakdown across the network.

3.26 There were no notable residual traffic flow issues in the Saturday period model in 2021.

4 Future Year Issues

4.1 The intended development for Hemel Hempstead up to 2021 and 2031 produces additional traffic demand, which can be accommodated on the road network with a number of infrastructure upgrades. Assuming this level of demand, we consider that as a minimum the infrastructure upgrades (or different upgrades achieving a similar capacity increasing effect) needed would be:

- North East Relief Road;
- Improvements to A414 / Maylands Avenue roundabout;
- Improvements to A414 / Green Lane roundabout;
- Improvements to Redbourn Road / St Agnells Lane roundabout;
- Improvements to Shenley Road West / Redbourn Road junction;
- Modifications to Holtsmere End / Redbourn Road junction;
- Improvements to St Johns Road / Station Road junction;
- Optimisation of traffic signals across network to future year traffic levels;

4.2 We consider these upgrades to be a minimum because the Do-Minimum future year scenarios developed and tested here specifically do not include background growth, or an equivalent amount of growth related to the Regional Spatial Strategy. In the Option Testing phase of this study, the option scenarios will include this extra growth which will bring the future year demand levels up to a level constrained by TEMPRO projections for the local area. Notwithstanding other issues, these option scenarios could therefore be considered the most likely scenarios in terms of traffic demand levels and behaviour in future years if the TEMPRO projection of growth is accepted as reasonable, achievable and likely to occur.

4.3 We also consider that that the growth outlined in the Regional Spatial Strategy is likely to be constrained given the relatively modest levels of infrastructure upgrade currently provisioned for Hemel Hempstead.

4.4 The PARAMICS model reveals that the major threats to network operation in the future will be a lack of capacity on the St Albans Road / Breakspear Way corridor, and also on the A4147 / Redbourn Road corridor.

4.5 All junctions on the St Albans Road and Breakspear Way corridor to the M1 are likely to have severe queues and delays in the future, unless capacity upgrades, particularly on the west-east and east-west movements, are implemented.

4.6 The Redbourn Road / St Agnells junction providing an exit from the Maylands area to the A4147 corridor is the key constraint in the north of the town. Development in the Maylands area will need to be supported by capacity improvements to this junction.

4.7 The London Road corridor may also need further improvement by 2031; however, this need is likely to be mitigated somewhat once more detailed plans are made for the development and improvements already in discussion.

4.8 Finally, it is worth noting that because of the simplifications to the coding of The Plough junction as described in the base year model validation report, future year effects of increased traffic demand on this junction are difficult to judge. It is possible, given the projected levels of development, that this junction will also become a constraint to traffic flow across the town in the future.

APPENDIX

A

FUTURE YEAR DEVELOPMENT SITES

A1. FUTURE YEAR DEVELOPMENT SITES

Development Site	2021 Houses	2021 Flats	2031 Houses	2031 Flats
(a) Large sites with planning permission	325	0	0	0
Land to south of Manor Estate	0	5	0	0
31 Wood Lane End	0	7	0	0
235-237 London road, HH	0	48	0	0
1-8 Grover Close, HH	0	6	0	0
Winifred Road	7	17	0	0
Primrose Engineering Co, Adeyfield Road	0	7	0	0
Land north of Ellen Close (r/o 33-45 Great Road) HH	0	13	0	0
Lovedays Yard, Cotterells	4	0	0	0
42 Sheethanger Lane, HH	0	56	0	0
Convent, Woodland Avenue	0	10	0	0
3 Durrants Hill, HH	0	434	0	0
Kodak site, HH	0	13	0	0
150 Jupiter Drive, HH	0	4	0	0
107-109 Adeyfield Road, HH	0	11	0	0
Lime Kiln PH, St Albans Hill, HH	0	54	0	0
Lord Alexander House, Waterhouse Street	0	0	0	0
	336	685	0	0
(b) Small sites (4 or less units) with planning permission				
Hemel Hempstead	92	0	0	0
(c) Conversions with planning permission				
Hemel Hempstead	0	72	0	0
(d) Legal Agreements				
177-191 London Road, HH	0	35	0	0
Headlock Works, Ebberns Road, HH	8	22	0	0
Morton House, Adeyfield Road, HH	0	142	0	0
Gadebridge Church, Galley Hill, HH	0	10	0	0
	8	209	0	0
(e) Outstanding DBLP sites				
Lockers Park School, HH	0	0	0	0
St George'sChurch, School Row,	0	0	0	0
r/o 162-238 Belswains Lane, HH	15	15	0	0
	15	15	0	0
Windfall sites				
Hemel Hempstead	178	178	296	296
Defined Locations				
Heart of Maylands	0	100	0	0
Maylands (other)	0	0	200	200
Heme Hempstead Town Centre	0	0	0	400
General Hospital	35	35	69	70
	35	135	269	670
Other SHLAA sites				
Three Cherry Tree Lane	223	74	0	0
Hammer Lane	0	0	8	8
Hammer Lane	0	0	34	0
Longlands	0	0	19	19
Greenhills Day Centre, Tenzing Road	0	34	0	0
Site off Farmhouse Lane	0	25	0	0
Three Cherry Tree Lane	403	134	0	0
Turners Hill	22	22	0	0
Hardy Road	4	4	0	0
London Road	0	0	22	22
London Road	0	0	7	7
London Road	0	0	18	18
London Road	58	58	0	0
Ebberns Road	32	32	0	0
Storey Street	0	39	0	0
Featherbed Lane	0	7	0	0
Featherbed Lane	0	0	0	0
London Road (218)	0	0	13	13
London Road (32)	0	0	15	15
White Lion Street	13	13	0	0
London Road	11	11	0	0
Fairway Road	0	0	3	3
Kimps Way	0	0	4	4
off SunnyHill Gardens (89)	0	0	17	17
Anchor Lane	9	9	0	0
St Albans Hill	0	0	19	19
Deaconsfield Road	17	17	0	0
Sempill Road	17	0	0	0
St Albans Road	22	22	0	0
Dowling Court	13	13	0	0
Two Waters Road	0	11	0	0
Fennycroft Road	0	0	5	5
Ninian Road	14	0	0	0
Stevenage Rise	0	0	18	0
Turnpike Green	0	0	10	10
Barncroft Primary School, Washington Avenue	0	26	0	0
Bury Road	5	5	0	0
Leighton Buzzard Road	11	11	0	0
Cotterells	3	3	0	0
Marlowes	300	900	0	0
Wheatfield (off Fletcher Way)	11	0	0	0
Queensway	0	0	5	5
Cattsdell/Fletcher Way	0	0	0	10
Jupiter Drive JMI School Jupiter Drive	14	14	0	0
Coniston Road	0	0	9	9
Westwick Farm, Pancake Lane	39	39	0	0
Buncefield Lane	60	60	0	0
Land at Leverstock Green Lawn Tennis Club	0	0	0	0
Leverstock Green Road	0	12	0	0
Former Sappi Nash Mills	236	79	0	0
The Cart Track	0	0	15	0
adj to 457 Warners End Road	0	0	7	7
Martindale Primary School, Boxted Road	0	60	0	0
Redbourn Road	0	45	0	0
Kimpton Close	0	5	0	0
	1533	1781	243	186

CONTROL SHEET

Project/Proposal Name	Hemel Hempstead Urban Transport Model
Document Title	Future Year Issues
Client Contract/Project No.	
SDG Project/Proposal No.	

ISSUE HISTORY

Issue No.	Date	Details

REVIEW

Originator	Jon Peters	
Other Contributors	Steve Oliver	
Review by	**Print**	Steve Oliver
	Sign	

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Steer Davies Gleave: