Hemel Hempstead transport model update

DACORUM BOROUGH COUNCIL

2031 Scenario Testing

Revision 4

10 July 2015

JACOBS

Hemel Hempstead transport model update

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Document history and status

Revision	Date	Description	By	Review	Approved
Rev 1	25 Sep 2014	Draft Final report	EHR	FN	
Rev 2	10 Oct 2014	Final report (incorporating DBC/HCC comments)	EHR	GD	
Rev 3	23 Mar 2015	Final report (demand updated)	SL	MH	FN
Rev4	10 July 2015	Final report (incorporating DBC and HCC comments)	SL	MH	FN

Contents

Important note about your report

The sole purpose of this report and the associated services performed by Jacobs is to assess the performance of a 2031 demand scenario, when assigned to the Hemel Hempstead Paramics model network, in accordance with the scope of services set out in the contract between Jacobs and the Client. That scope of services, as described in this report, was developed with the Client.

In preparing this report, Jacobs has relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Client and/or from other sources. Except as otherwise stated in the report, Jacobs has not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

Jacobs derived the data in this report from information sourced from the Client (if any) and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination of the project and subsequent data analysis, and re-evaluation of the data, findings, observations and conclusions expressed in this report. Jacobs has prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

This report should be read in full and no excerpts are to be taken as representative of the findings. No responsibility is accepted by Jacobs for use of any part of this report in any other context.

Our scope is to report on the impact of the demand scenario and suggest possibly high-level mitigation measures. This report does not discuss testing or detailed design of any of these mitigation measures.

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1. Introduction

1.1 Background

This report describes the use of the recalibrated Hemel Hempstead Paramics model (2012 model year) to assess a 2031 scenario. The recalibration of the model was undertaken by Jacobs in 2013 and, following a hiatus, Dacorum Borough Council (DBC) issued us with the necessary data to enable the 2031 scenario to be constructed. This scenario includes changes to road infrastructure and traffic demand as we will describe in the main body of the report.

We will report on two 2031 scenarios: Weekday AM and Weekday PM.

1.2 Base model specifications

The recalibrated base model has a base year of 2012 and covers three periods as follows:

1) Weekday AM: 0700-1000
2) Saturday peak: 1100-1400
3) Weekday PM: 1600-1900

In each scenario the middle hour is the peak hour. We will be reporting on the Weekday AM and Weekday PM Peaks only in this report. The model was built using S-Paramics version 2011.1 with a 4000 vehicle licence. Figure 1.1 shows the extent of the model.

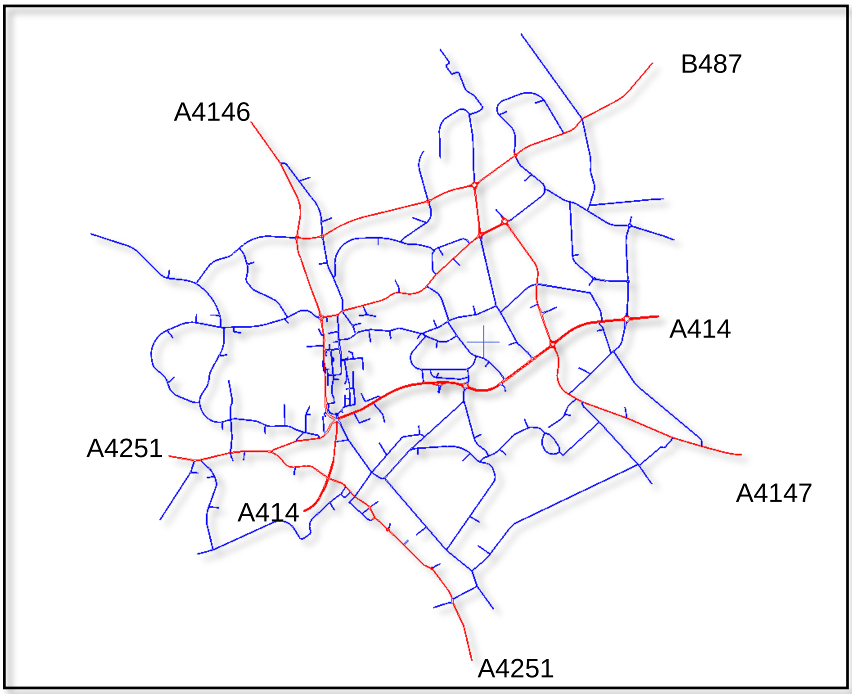

Figure 1.1 : Model extent

The model demands are disaggregated into different trip-type matrices as follows:

- Matrix 1 - General traffic
- Matrix 2 - HGV traffic
- Matrix 3 - 2031 housing development traffic
- Matrix 4 – Town Centre Masterplan traffic

2. 2031 demand scenario

2.1 Introduction

This section provides details in the changes made to the Base demand scenario to accommodate:

- background growth from 2012 to 2031
- traffic associated with housing developments within Hemel Hempstead (using base data as at 1st April 2014)
- traffic associated with the revised town centre Masterplan

Each of these types of traffic is discussed in turn with a summary of the overall result following.

2.2 Background growth

The methodology used to apply background growth to our 2021 model was also used to apply the growth appropriate to a 2031 model year. Background growth was applied to “external – external” trips only as any growth within Hemel Hempstead would be captured by modelling of specific developments. Growth factors were extracted from the Tempro dataset as follows:

- **AM growth multiplier** from 2012 to 2031 = **1.133**
- **PM growth multiplier** from 2012 to 2031 = **1.138**

The result of this added growth was that in the AM period the model’s traffic demand was increased by 0.5% from the 2012 scenario; in the PM period the demand was increased by 1.0%.

2.3 Large housing developments

2.3.1 Location and size of developments built by 2031

Figure 2.1 shows the location of the large housing development sites (i.e. sites of 25 or more units) included in the 2031 scenario. These are sites that we have individually added to the traffic demand for the model using base data as at 1st April 2014. Note that we have not included any development on the “Maylands Gateway”, land to the north of section of Breakspear Way in between Maylands Avenue and Green Lane.

This figure also shows a blue box defining the sites falling within a nominal “town centre” area. When determining the number of trips for each site we have used different trip rates depending on whether developments are inside or outside the “town centre”. This is discussed in more detail in section 2.3.2.

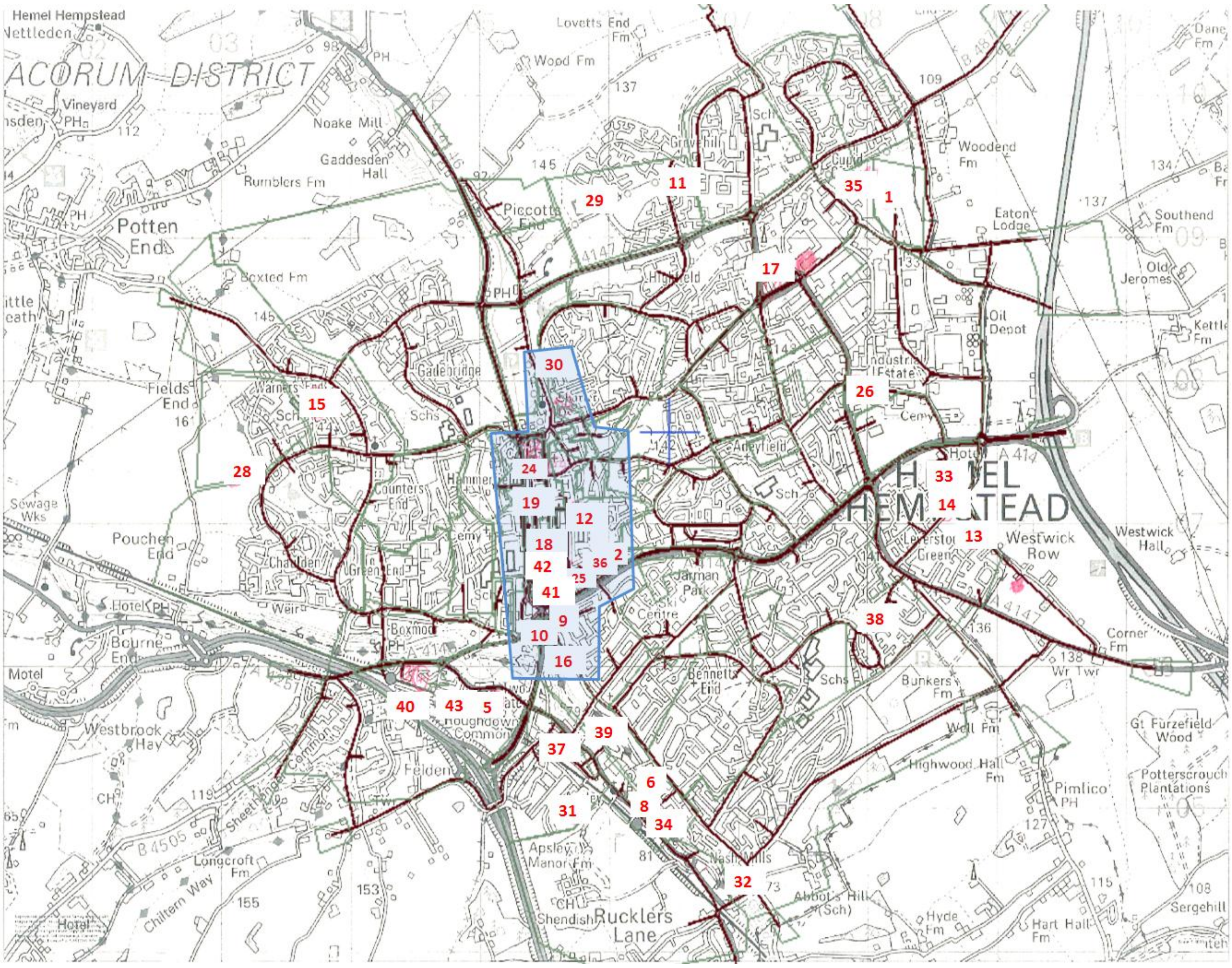

Figure 2.1 : 2031 development sites ("town centre" sites defined as those within blue box)

Details of the location and size of each site are shown in Table 2.1. These large sites are expected to contribute a total of **5,913 units** of housing by 2031.

Table 2.1 : 2031 Large development sites (map nos. refer to Figure 2.1)

Map Number	Paramics Zone	Development	Number of Housing units built by 2031
1	101	AE 44 Three Cherry Tree Lane	537
2	119	H/8 Land at Turners Hill	43
5	53	H/2 National Grid land, London Road	160
6	55	H/4 Ebberns Road	30
8	56	H/10 Apsley Paper Trail land, London Road	35
9	40	CH24 St Albans Road	84
10	40	H/11 The Point (former petrol filling station), Two Waters Road (former pertrol filling station)	25
11	61	Grovehill Local Centre (Henry Wells Square)	200
12	119	MU/2 Hemel Hempstead Hospital site, Hillfield Road	200
13	45	Land between Westwick Row and Pancake Lane	26
14	45	H/12 Land to r/o St Margaret's Way / Datchworth Turn	32
15	17	H/13 Former Martindale Primary School, Boxted Road	50
16	55	Business Park, Corner Hall	70
17	49	Viking House, Swallowdale Lane	64
18	108	Stephyns Chambers, Marlowes	29
19	120	1-5 The Waterhouse, Waterhouse Street	30
24	122	MU/1 West Herts College site and Civic Zone, Queensway / Marlowes / Combe Street (north) / Leighton Buzzard Road	600
25	119	MU/3 Paradise / Wood Lane End	75
26	57	Heart of Maylands (c/o Maylands Avenue / Wood Lane End)	475
28	103	LA3 West Hemel Hempstead	900
29	61	LA1 Marchmont Farm	350
30	24	LA2 Old Town	80
31	34	Land to south of Manor Estate	253
32	36	Sappi Site, Lower Road	299
33	45	Buncefield Lane / Green Lane	42
34	56	Land opp. Cavendish Court, London Road	58
35	49	NE HH, Three Cherry Trees Lane	357
36	119	Royal Mail, Paradise	86
37	34	175-189 London Road	36
38	43	H/7 Leverstock Green Tennis Club, Grasmere Close	25
39	55	H/14 Frogmore Road	150
40	52	MU/4 Hemel Hempstead Station Gateway, London Road	200
41	104	Hempstead House, Selden Hill	39
42	108	Swan Court, Waterhouse Street	65
43	53	Symbio House, London Road	208
		Total	**5913**

2.3.2 Trip generation and distribution

As previously described, we split the sites into “inner” and “outer” areas. This enabled us to use appropriate trip rates for each area. Trip rates were used that had been agreed with DBC for the Morrisons / 2021 Masterplan work and for the West Hemel Transport Assessment. These trip rates are summarised in Table 2.2.

Table 2.2 : Trip rates for residential areas (vehicles per hour per housing unit)

Area	AM peak – In	AM peak - Out	PM peak - In	PM peak - Out	Source
Inner	0.0948	0.2840	0.2920	0.1170	SKM note: "*Morrisons, Hemel Hempstead Assessment Scenarios Note v2.docx*"
Outer	0.20	0.50	0.40	0.25	Stomor West Hemel Transport Assessment: "*js2-traffic.pdf*"

It should be noted that the trip rates for the Outer area are relatively high and do not account for any modal change that might occur between now and the model year of 2031. The demand scenario generated using these rates is therefore likely to be very robust (or a worst-case scenario). When these trip rates were used to calculate the actual number of trips for each development we obtained the following totals for large housing developments:

- **3,745 trips** in the **AM peak hour**
- **3,548 trips** in the **PM peak hour**

A detailed breakdown of the trip generation is shown in Table 2.3.

Following trip generation, the new development trips were distributed as per the existing neighbouring areas. This distribution was largely based on the 2001 census journey-to-work information supplemented with some information on school "drop offs" (see section 5 in "Hemel Hempstead Urban Transport Model – Local Model Validation Report", May 2009, SDG). In the process of distributing trips, it was assumed that the new development trips will not distribute to other new 2031 housing sites.

Table 2.3 : 2031 Large development sites trip generation (vehicles per hour)

Map number	Paramics Zone	Development	Inner / Outer	AM peak - In	AM peak - Out	PM peak - In	PM peak - Out
1	101	AE 44 Three Cherry Tree Lane	Outer	107	269	215	134
2	119	H/8 Land at Turners Hill	Inner	4	12	13	5
5	53	H/2 National Grid land, London Road	Outer	32	80	64	40
6	55	H/4 Ebberns Road	Outer	6	15	12	8
8	56	H/10 Apsley Paper Trail land, London Road	Outer	7	18	14	9
9	40	CH24 St Albans Road	Inner	8	24	25	10
10	40	H/11 The Point (former petrol filling station), Two Waters Road (former pertrol filling station)	Inner	2	7	7	3
11	61	Grovehill Local Centre (Henry Wells Square)	Outer	40	100	80	50
12	119	MU/2 Hemel Hempstead Hospital site, Hillfield Road	Outer	40	100	80	50
13	45	Land between Westwick Row and Pancake Lane	Outer	5	13	10	7
14	45	H/12 Land to r/o St Margaret's Way / Datchworth Turn	Outer	6	16	13	8
15	17	H/13 Former Martindale Primary School, Boxted Road	Outer	10	25	20	13
16	55	Business Park, Corner Hall	Inner	7	20	20	8
17	49	Viking House, Swallowdale Lane	Outer	13	32	26	16
18	108	Stephyns Chambers, Marlowes	Inner	3	8	8	3
19	120	1-5 The Waterhouse, Waterhouse Street	Inner	3	9	9	4
24	122	MU/1 West Herts College site and Civic Zone, Queensway / Marlowes / Combe Street (north) / Leighton Buzzard Road	Inner	57	170	175	70
25	119	MU/3 Paradise / Wood Lane End	Inner	7	21	22	9
26	57	Heart of Maylands (c/o Maylands Avenue / Wood Lane End)	Outer	95	238	190	119
28	103	LA3 West Hemel Hempstead	Outer	180	450	360	225
29	61	LA1 Marchmont Farm	Outer	70	175	140	88
30	24	LA2 Old Town	Inner	8	23	23	9
31	34	Land to south of Manor Estate	Outer	51	127	101	63
32	36	Sappi Site, Lower Road	Outer	60	150	120	75
33	45	Buncefield Lane / Green Lane	Outer	8	21	17	11
34	56	Land opp. Cavendish Court, London Road	Outer	12	29	23	15
35	49	NE HH, Three Cherry Trees Lane	Outer	71	179	143	89
36	119	Royal Mail, Paradise	Inner	8	24	25	10
37	34	175-189 London Road	Outer	7	18	14	9
38	43	H/7 Leverstock Green Tennis Club, Grasmere Close	Outer	5	13	10	6
39	55	H/14 Frogmore Road	Outer	30	75	60	38
40	52	MU/4 Hemel Hempstead Station Gateway, London Road	Outer	40	100	80	50
41	104	Hempstead House, Selden Hill	Inner	4	11	11	5
42	108	Swan Court, Waterhouse Street	Inner	6	18	19	8
43	53	Symbio House, London Road	Outer	42	104	83	52
		Total		1054	2692	2233	1315

2.4 Smaller housing developments

Smaller housing developments (i.e. those of 24 units or less) have also been included in the 2031 scenario. These are defined as developments that are expected on small or windfall sites. These smaller sites are expected to contribute **1,091 units** of housing by 2031.

For the generation of trips for these sites, we have used the “Inner” trip rates as previously specified in Table 2.2. Table 2.4 shows the number of trips associated with these smaller developments.

Table 2.4 : 2031 smaller development site trip generation (vehicles per hour)

Development	AM peak – In	AM peak – Out	PM peak - In	PM peak - Out
Smaller housing developments (1,091 units total)	103	310	319	128

In total the number trips for these sites during each peak hour are:

- **413 trips** in the **AM peak hour**
- **446 trips** in the **PM peak hour**

By their very nature these sites do not have specified locations. As such, we have distributed the trips associated with these sites as per the 2012 base matrix i.e. adding these sites will result in a general increase of trips in every zone in the network.

2.5 Revised Town Centre Masterplan

We previously created a 2021 model scenario which included trips associated with the Masterplan for the town centre. This included: cinema, theatre, primary school, retail outlets and relocation of Civic trips to the Water Gardens car park.

Following recent discussions with DBC we have revised the trip generation for the Masterplan such that the **proposed theatre is not included**. Removing the theatre gives a reduction of around 50 trips/hour in the PM period; there is no reduction in AM trips. All other elements of the Masterplan remain in the model.

As such, following our previous methodology, the revised trip totals for the Masterplan are as follows:

Table 2.5 : 2031 Masterplan trip generation (vehicles per hour)

Element of Masterplan	AM peak	PM peak
Civic relocation addition	219	82
Civic relocation reduction (assuming reduction in overall Civic trips due to mode shift)	-292	-120
Revised Masterplan (without theatre)	398	396
Total	**325**	**358**
Difference from previous total	*0*	*-50*

2.5.1 "Morrisons" site

The **Morrisons development** which was proposed for the town centre is no longer going ahead. We have therefore removed the trips associated with this development from the 2031 demand scenario. The "Morrisons" site is now being developed as "Gade Zone Central" for housing.

The zone in the model that includes this site also includes the site of the West Herts College. This is also being redeveloped for housing. Therefore the number of trips generated for this zone is somewhat reduced, as shown in Table 2.6. The Gade Zone Central and West Herts College developments are included in the model as large housing developments, as discussed in section 2.3.

Housing on the Morrisons's site and associated trip generation is now included within site MU/1 (Map Number 24) in Table 2.1.

Table 2.6 : 2031 "Morrisons" site redevelopment (vehicles per hour)

"Morrisons site" element	AM peak	PM peak
Morrisons (no longer being built)	**335**	**464**
Gade Zone Central – housing development	189	205
West Herts College – housing development	19	20
Housing developments total	**208**	**225**
Zone difference (Housing trips – Morrisons trips)	*-117*	*-239*

2.6 Summary

This section describes separate elements that together make up the 2031 demand scenario. Starting from the 2012 Base scenario we have added growth for external to external trips, trips due to large housing developments, trips due to other smaller housing developments and trips due to the revised town centre masterplan.

The total number of trips for each of these generators is presented in Table 2.7 along with the percentage increase that each is responsible for over the 2012 Base demand.

Table 2.7 : Summary of AM and PM 2031 demand scenarios

Demand	AM trips (peak hour)	AM change from 2012 Base	PM trips (peak hour)	PM change from 2012 Base
2012 Base	23,524	-	21,769	-
2012 – 2031 growth (external-external[1] only)	120	+0.5%	222	+1.0%
Large housing sites	3,745	+15.9%	3,548	+16.3%
Smaller housing sites	413	+1.8%	446	+2.1%
Masterplan (excluding Morrisons and Theatre)	325	+1.4%	358	+1.6%
2031 total	**28,127**	**+19.6%**	**26,343**	**+21.0%**

[1] External to External trips are trips from zones on the periphery of the model to other zones on the periphery of the model.

3. 2031 network development

3.1 Introduction

The 2031 network has been developed from the calibrated 2012 model and incorporates a housing base data as at 1st April 2014. This section describes all changes made to the network in detail. It was not within the remit of this piece of work to mitigate any network issues that became apparent when the model was run. Instead, we will report on the issues that will likely occur and suggest high level improvements that could be necessary. This discussion is presented in section 4.4

3.2 2031 network changes

3.2.1 High Street one-way conversion

High Street is coded as one-way northbound from Queensway to Fletcher Way (Figure 3.1). Access from Fletcher Way to High Street is coded right turn only.

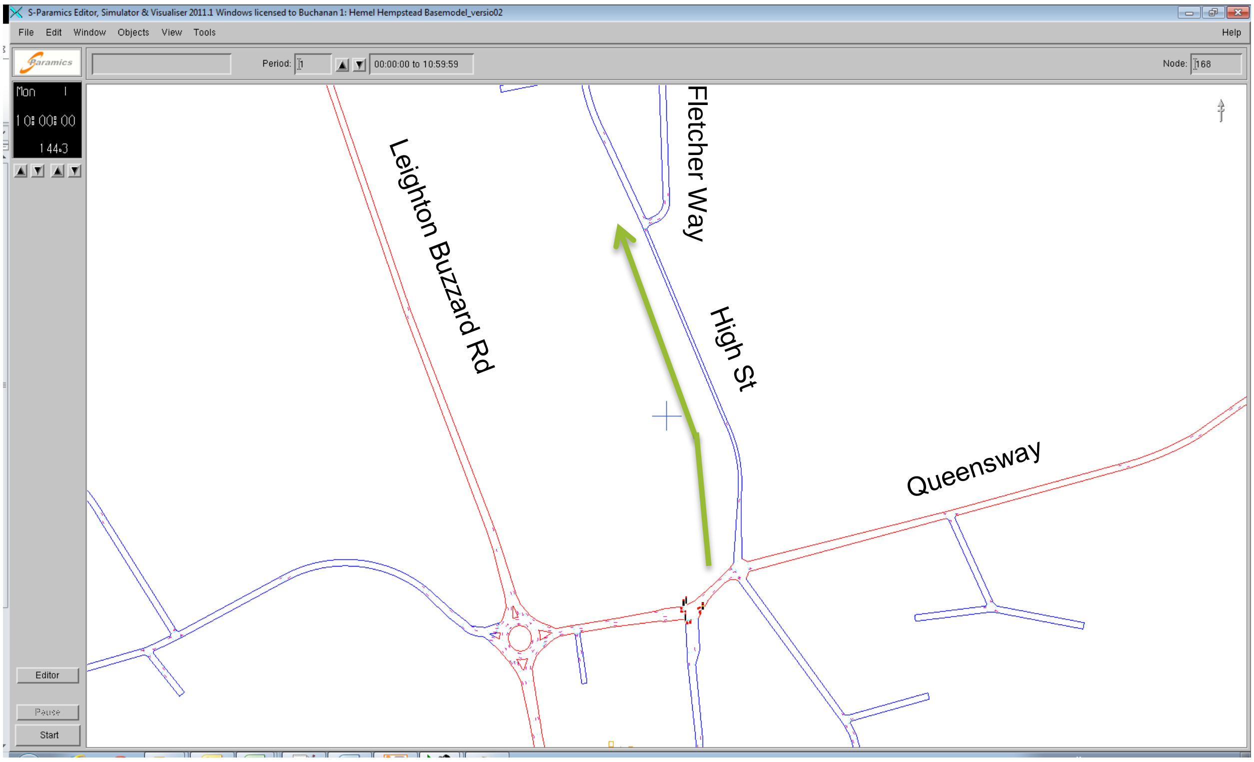

Figure 3.1 : High St conversion to one-way

3.2.2 Breakspear Way / Green Lane Junction Improvement

This scheme is a trial signalisation of the M1 arm at this junction. Following results from the trial and discussion with DBC this scheme has **not been included** in the 2031 model network.

3.2.3 New development access at Leighton Buzzard Road / Bury Road

This junction was originally designed to allow access to the proposed Morrisons development to the east of Leighton Buzzard Road. Although this development is not now going ahead, we have retained this signalised junction in order to provide access for alternative proposed developments on the same site.

The layout of this junction is shown in Figure 3.2. It has 2 northbound and southbound lanes, two lanes on the east approach from the development and a single lane approach from Bury Rd.

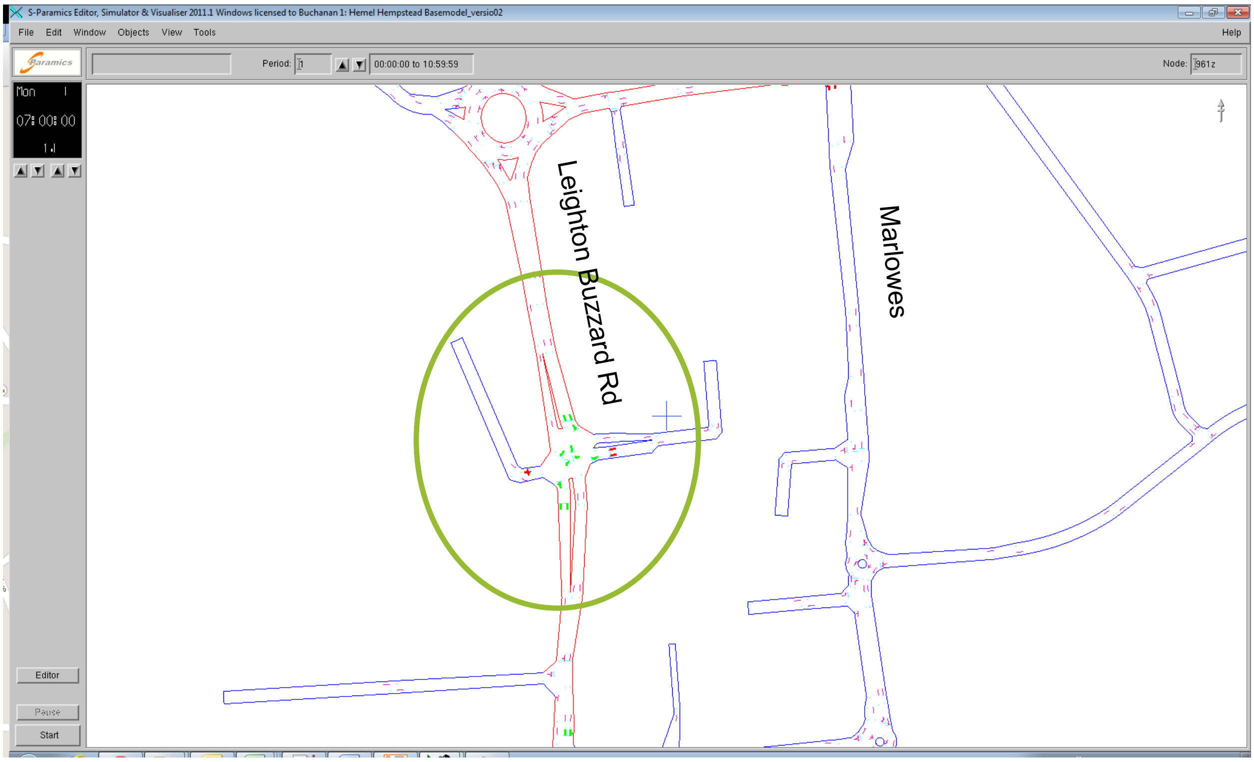

Figure 3.2 : Leighton Buzzard Rd / Bury Rd signalised development access

3.2.4 New development access onto Marlowes (Priority Junction)

This new priority controlled access was originally included in the network as part of the proposed Morrisons development. It originally allowed access to a small car park defined by zone 123. This zone is no longer allocated any demand and, as such, this junction is not currently used.

We have included this junction in the network (Figure 3.3) to allow for any traffic that will be allocated to this zone in future versions of the model.

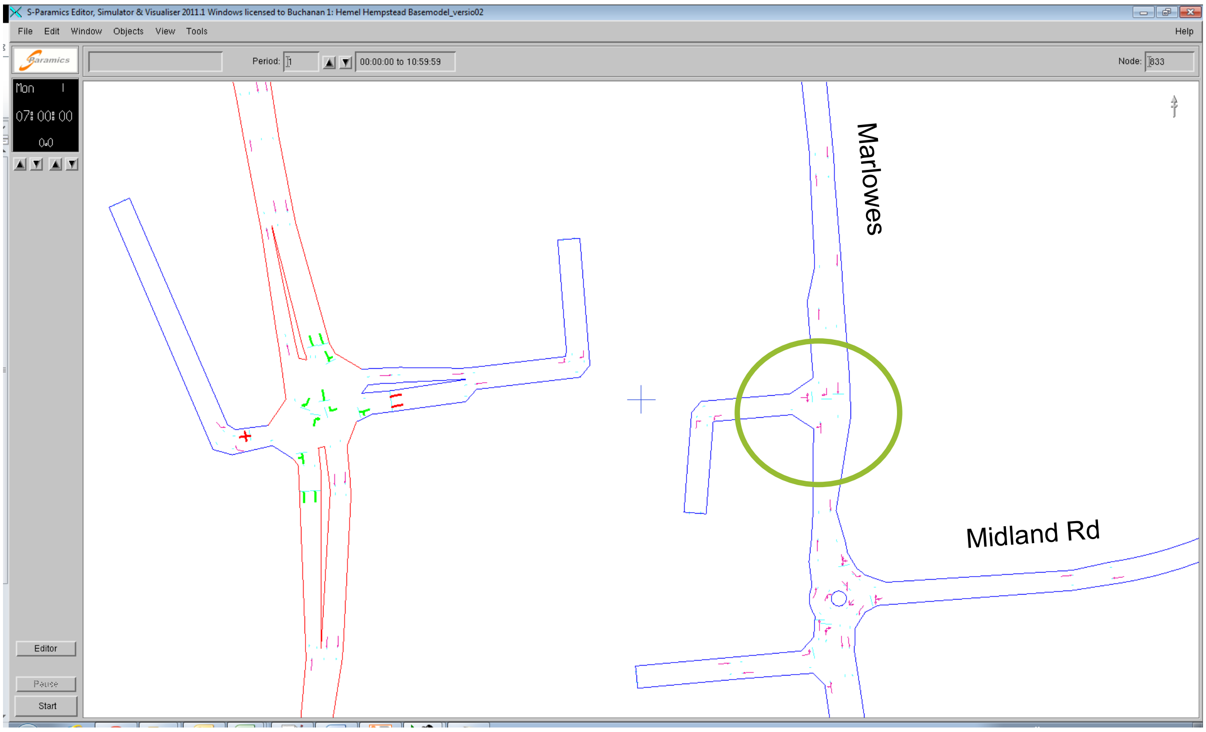

Figure 3.3 : Marlowes priority controlled development access

3.2.5 Relocation of bus station

Hemel Hempstead bus station has been moved from its previous location on Waterhouse Street to the south end of Marlowes as shown in Figure 3.4.

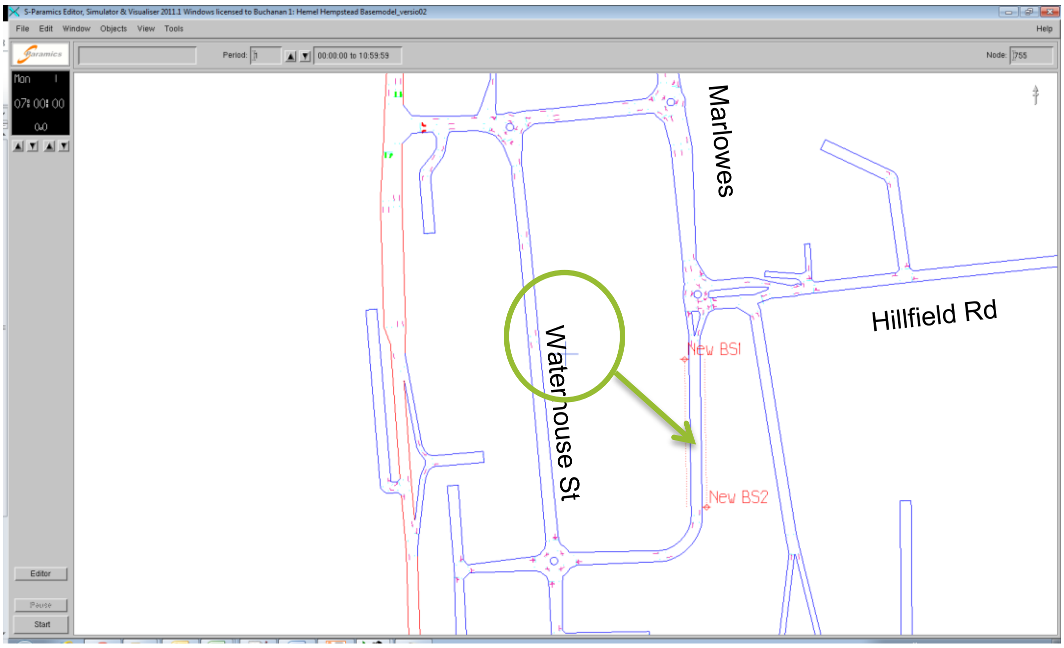

Figure 3.4 : Relocation of bus station

3.2.6 Leighton Buzzard Road / Combe Street signalisation

The signalisation of Leighton Buzzard Rd / Combe St was identified as being necessary in future years during modelling work for the Morrisons planning application. This junction design has now been included in the 2031 scenario. The junction layout is as shown in Figure 3.5.

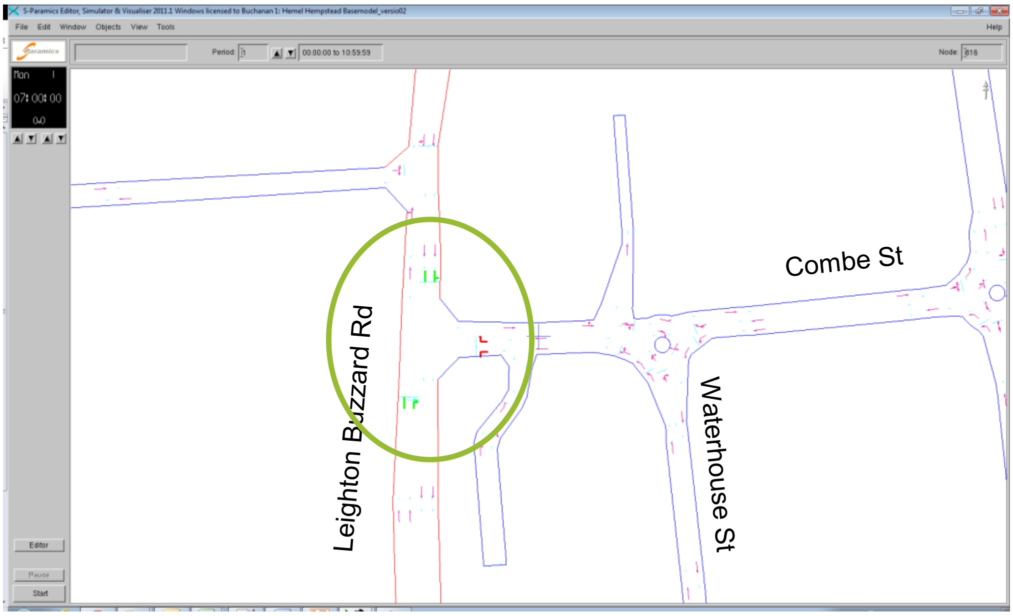

Figure 3.5 : Combe Street / Leighton Buzzard Road signalisation

3.2.7 Water Gardens Car Park access at Combe Street

Due to its proximity to the proposed signalised Leighton Buzzard Rd / Combe St junction, it is necessary to stop up the access to and from Water Gardens Car Park. This allows the main junction to operate efficiently and stops vehicles turning in from blocking back through the junction. The stopped up access is highlighted in Figure 3.6.

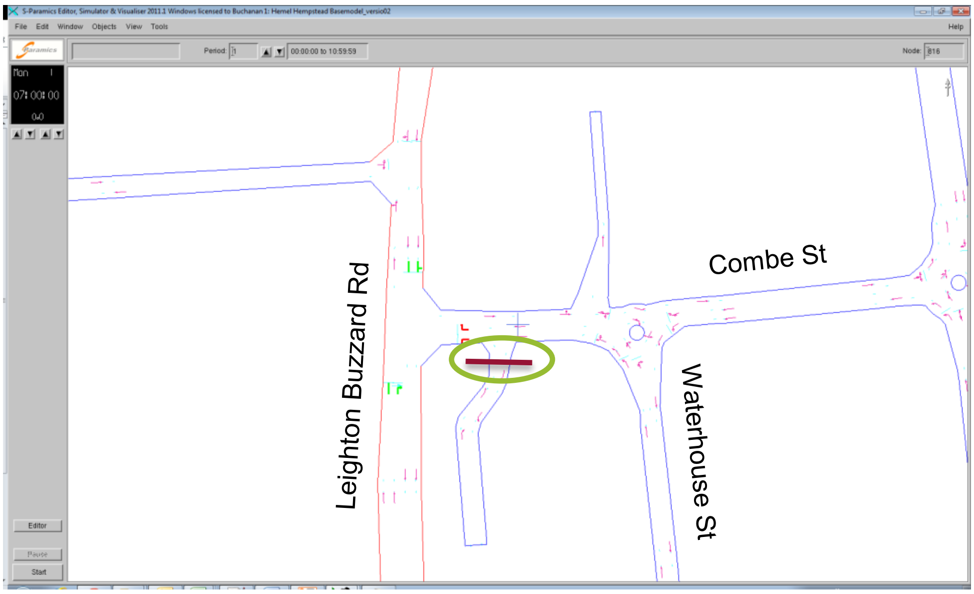

Figure 3.6 : Water Gardens car park access stopped up

3.2.8 Queensway / Marlowes signalisation

Signalisation of the Queensway / Marlowes junction was identified in the Morrisons application as necessary to relieve queuing in this key area. The existing mini-roundabout was unable to cope with the new volume and balance of traffic. As such this junction design has been carried forward to the 2031 model.

Including this junction (with pedestrian crossing stage) allows the removal of the current standalone pedestrian crossing on Queensway. The revised junction layout is shown in Figure 3.7.

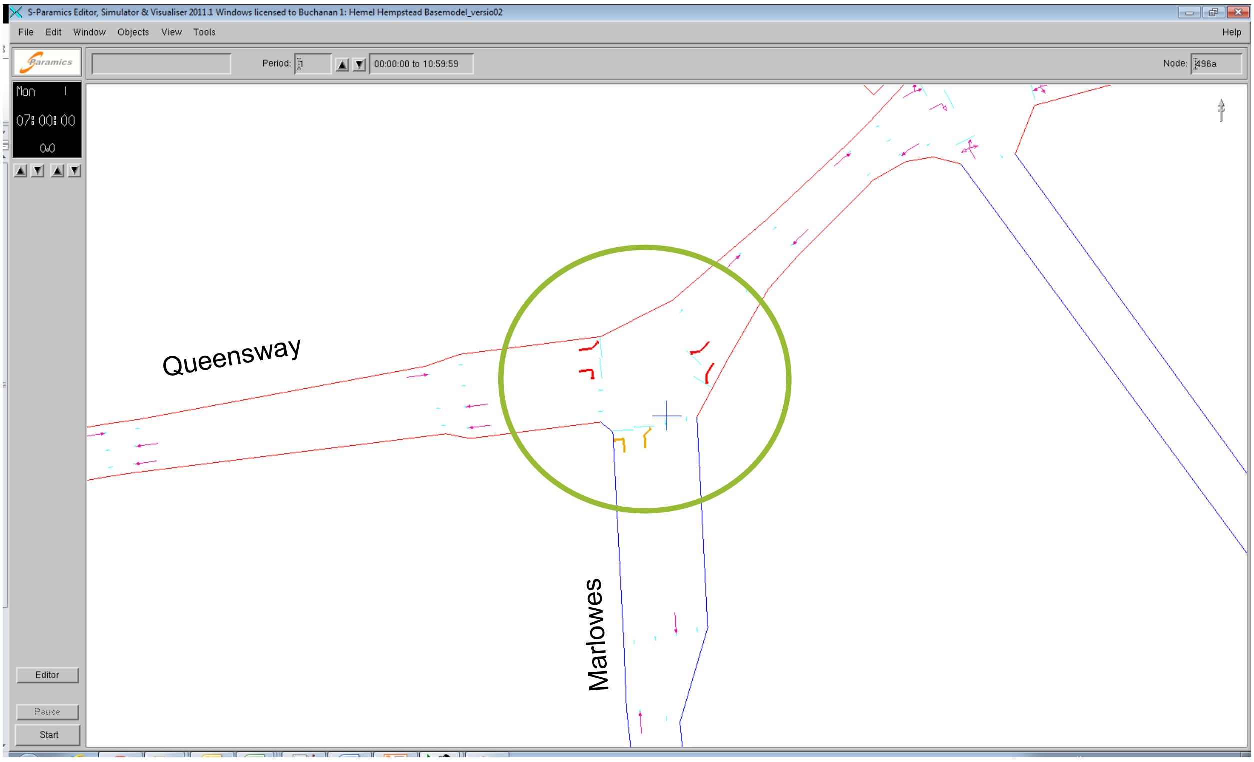

Figure 3.7 : Queensway / Marlowes signalisation

3.2.9 Leighton Buzzard Road / A4147 Link Road

The need for a left turn, east-to-south bypass lane at this junction was identified as part of the Morrisons application. The configuration of this lane is shown in Figure 3.8.

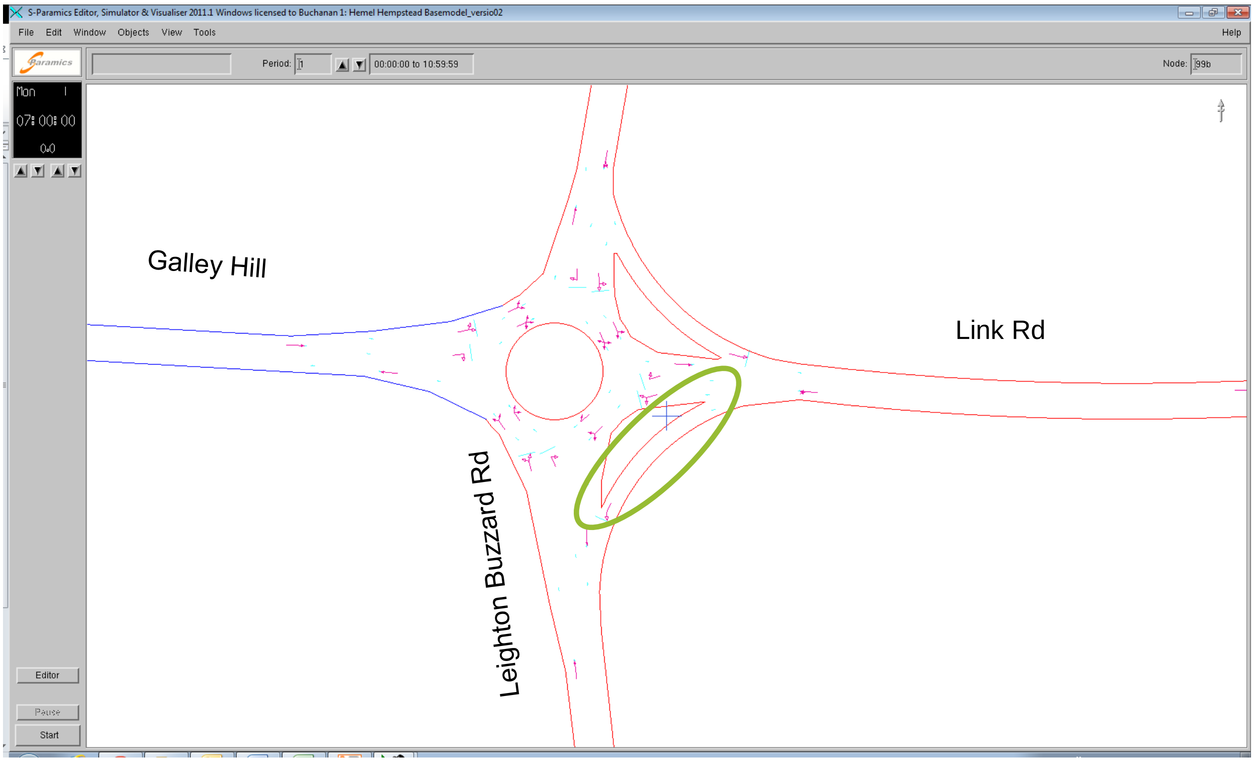

Figure 3.8 : Leighton Buzzard Rd / Link Rd east-to-south bypass lane

3.2.10 A4147 Link Road / Piccotts End Road

The need for more capacity on the westbound exit onto Link Rd was identified in the Morrisons application. This improvement took the form of an extra exit and subsequent merge to allow two lanes of westbound traffic to exit the roundabout onto Link Rd. Figure 3.9 shows how this improvement looks in the 2031 model.

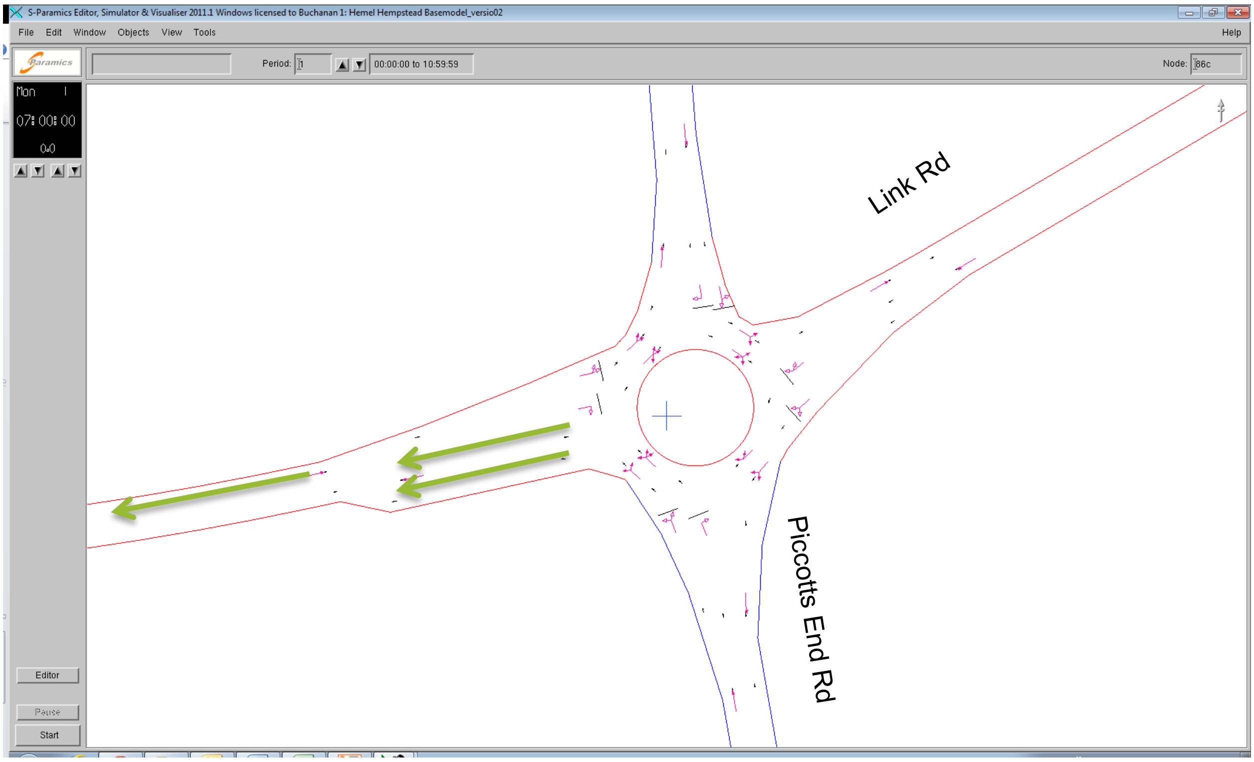

Figure 3.9 : Link Rd / Piccotts End Rd westbound exit – additional lane

3.2.11 Leighton Buzzard Road / Queensway

The need for more southbound capacity through the Leighton Buzzard Rd / Queensway roundabout was identified in the Morrisons application. The approach lanes on Leighton Buzzard Rd have been reallocated to allow two southbound lanes of traffic. This amendment is illustrated in Figure 3.10.

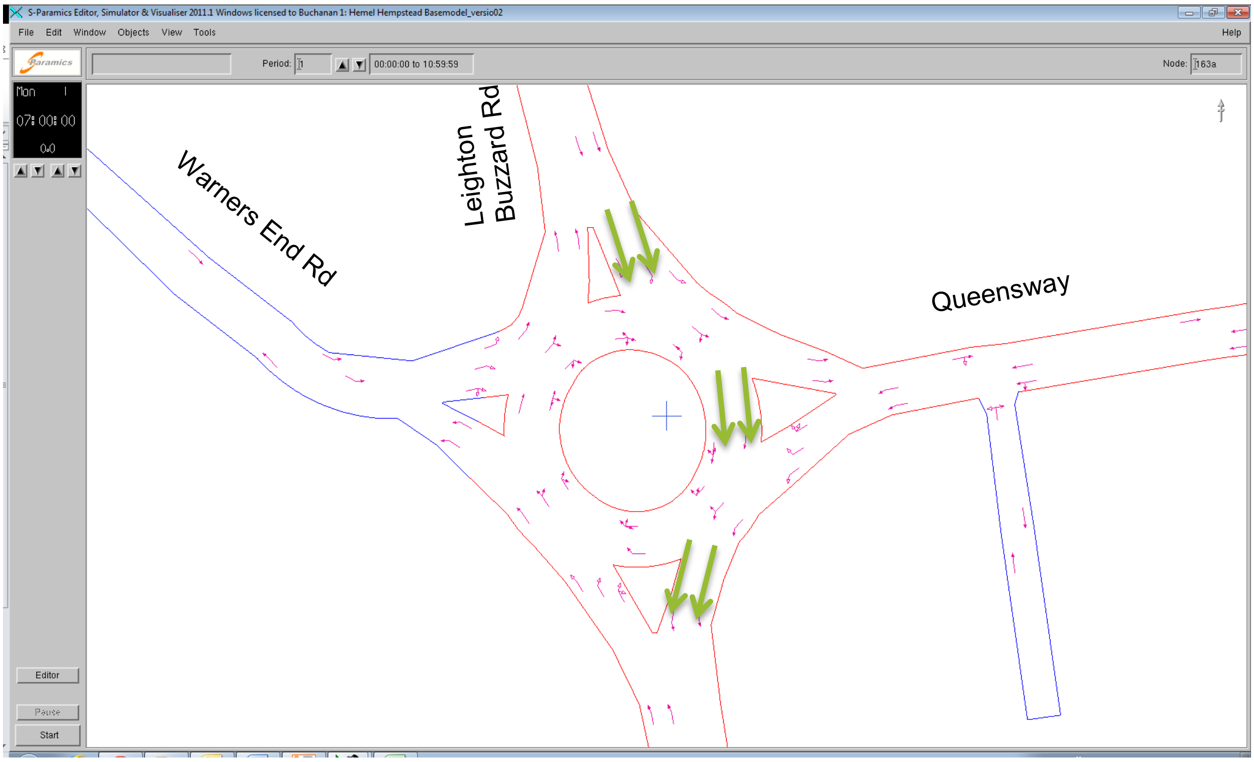

Figure 3.10 : Leighton Buzzard Rd / Queensway southbound lane reallocation

3.2.12 New car park access from Bridge Street onto Leighton Buzzard Road

This scheme was identified in JMP's "Access and Vehicle Strategy" and also in the Hemel Town Centre Masterplan. Following discussion with DBC we have **not included** this proposed junction in the 2031 network.

3.2.13 Site access onto Long Chaulden

This new access junction was described in the Stomor West Hemel LA3 transport analysis. It will provide access to the proposed housing development to the west of Long Chaulden and will comprise a priority controlled junction with a dedicated right turn lane on Long Chaulden. Figure 3.11 shows the location of this junction in the 2031 model with the detailed layout shown in an inset box.

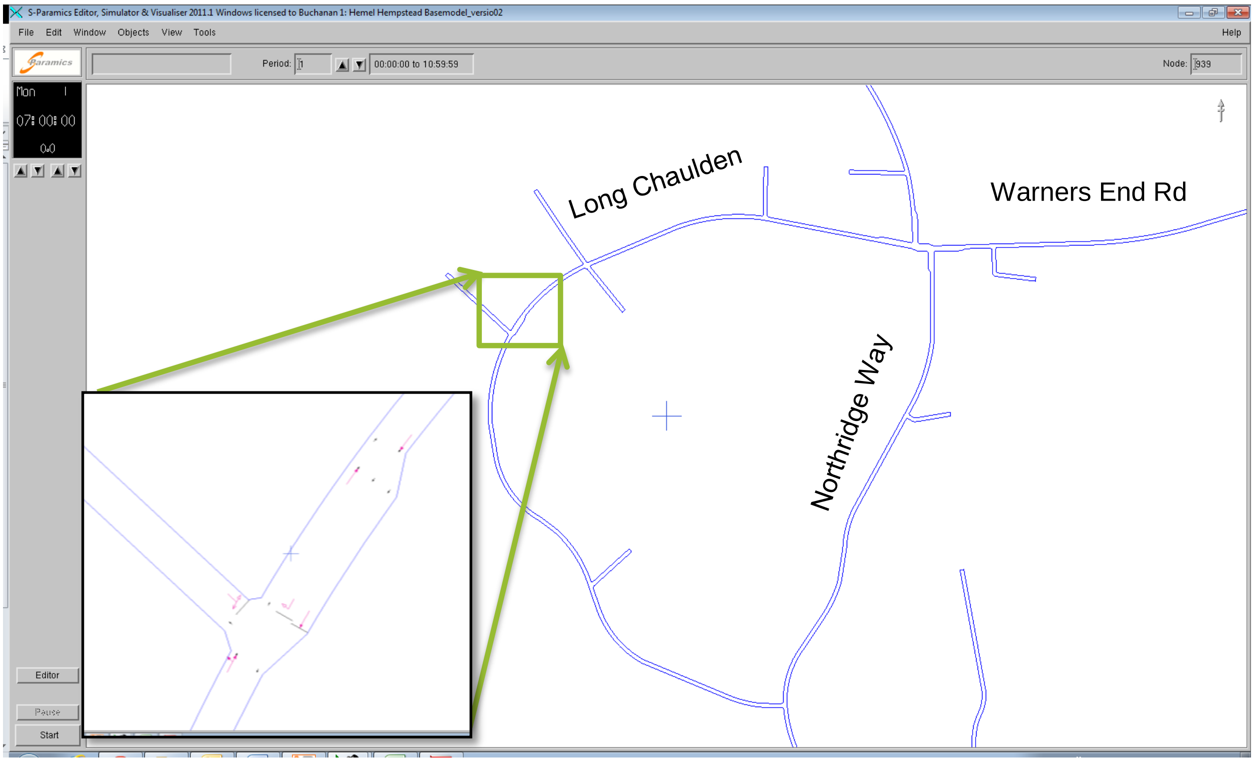

Figure 3.11 : Long Chaulden site access

3.2.14 Site access onto The Avenue

Similarly to the site access onto Long Chaulden, this site access was identified in the Stomor West Hemel LA3 transport analysis. The Avenue wasn't included in the Hemel Hempstead Base model and so we have coded this link and a new car park to allow traffic for the relevant zone to access Boxted Rd. The junction of Boxted Rd / Warmark Rd was uncontrolled in the Base model and so we have left it as such in the 2031 scenario.

Figure 3.12 shows the location of this new access.

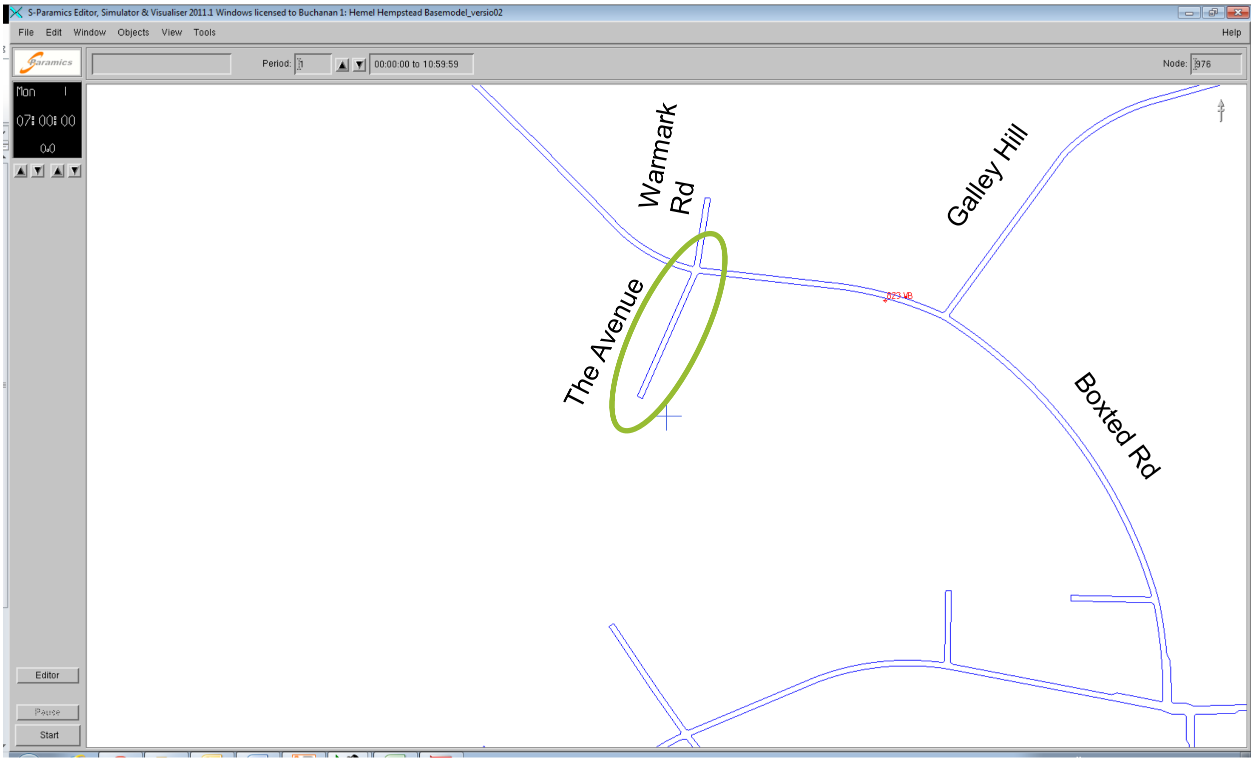

Figure 3.12 : The Avenue site access

3.2.15 Warners End Road / Northridge Way & Long Chaulden / Boxted Road signalisation

This scheme was identified in the Stomor West Hemel LA3 transport analysis. Currently two mini-roundabouts, these junctions have been coded as a single signalised junction in the 2031 network Figure 3.13 illustrates the coding used.

No detail was available on the proposed signal timing or staging for this junction and so we have coded signals with three traffic stages and a 90 second cycle time (Figure 3.14). A pedestrian crossing stage is also included to improve pedestrian access here.

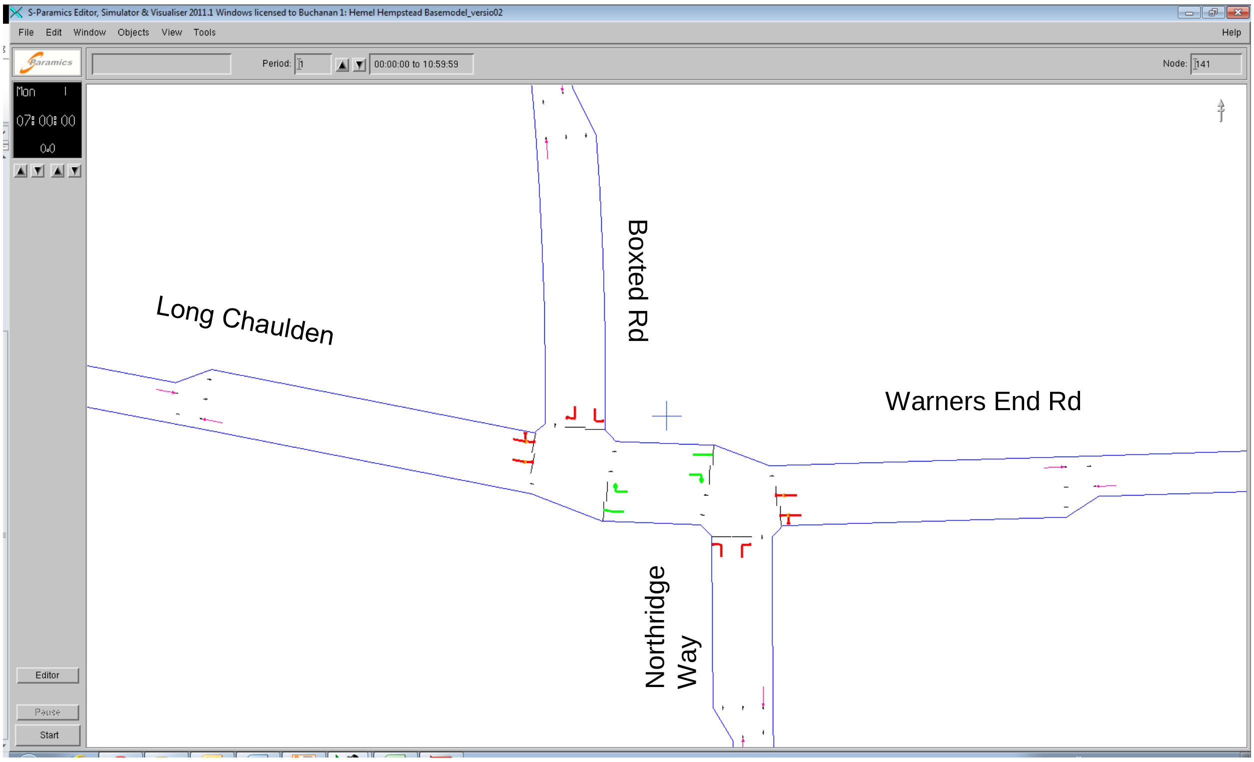

Figure 3.13 : Warners End Rd / Northridge Way & Long Chaulden / Boxted Rd signalisation layout

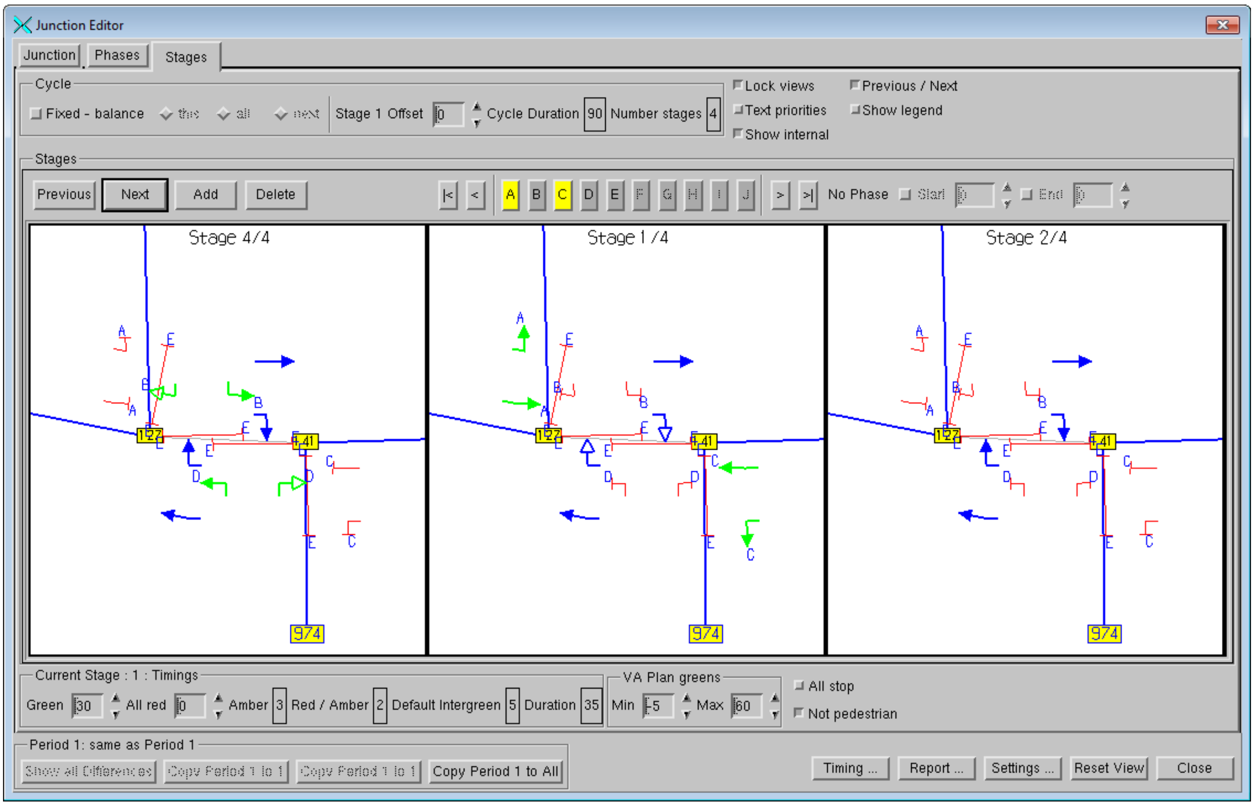

Figure 3.14 : Traffic signal staging for revised junction (pedestrian crossing stage not shown but also included)

3.2.16 Marchmont Farm access onto A4147 Link Road

The proposed Marchmont Farm development (LA1) has a proposed access onto Link Rd between the junctions of Piccotts End Rd and Aycliffe Dr (as shown in Figure 3.15). No drawing was available for this junction and so we have made assumptions on its location and layout. Subsequent discussions with DBC confirmed that our assumptions were acceptable.

We have therefore coded a two-lane roundabout with two approach lanes on the eastbound and westbound Link Rd approaches and a single approach lane from the north access.

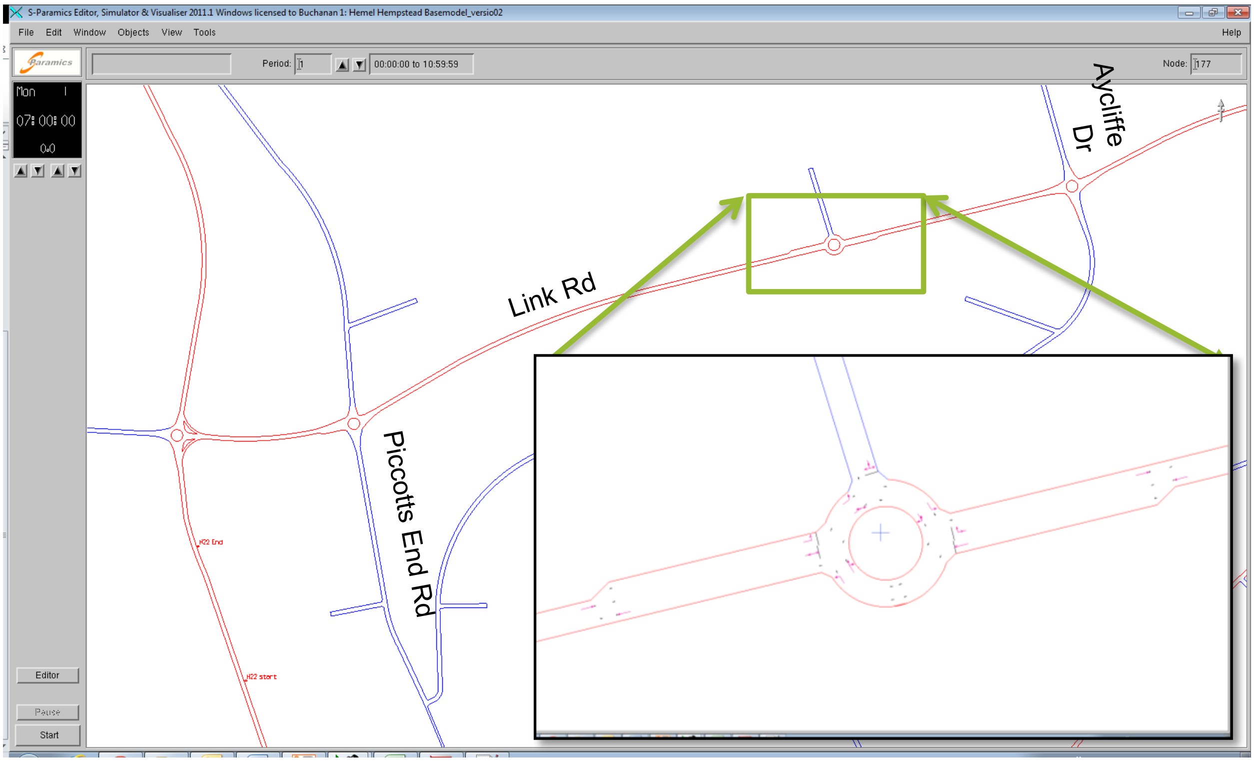

Figure 3.15 : Proposed Marchmont Farm roundabout access

3.2.17 Old Town development access onto Fletcher Way

The proposed Old Town (LA2) development will have an access directly onto Fletcher Way. As no details were available on this new junction we have included it in the 2031 scenario as an uncontrolled junction to ensure that all traffic will get onto the network during model runs.

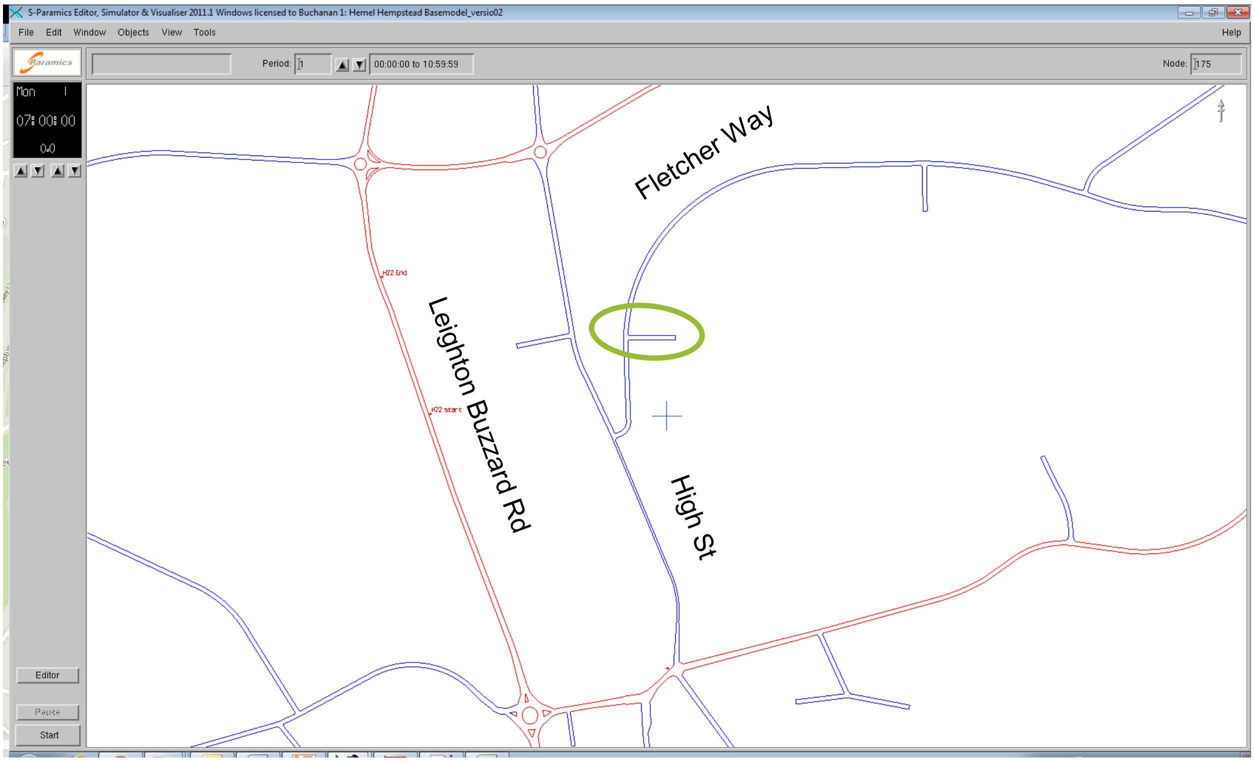

Figure 3.16 : Old Town access on Fletcher Way

4. Testing

4.1 Introduction

In this 2031 scenario we are adding approximately 20% more traffic (see section 2) to an already congested network. We can therefore expect that, without serious mitigating measures, the 2031 scenario will be very congested indeed in both AM and PM peaks.

The mitigation we have included is described in section 3. Some of these measures are concerned with allowing access to various development sites and do not generally improve the capacity of the strategic network. This section of the report will do two things:

1. **Full traffic demand:** describe where the network struggles to cope when the full demand scenario is assigned to the network

2. **Reduced traffic demand:** traffic demand is reduced until the model can simulate the peak hours without reaching gridlock

Following our reporting of the various model runs we will discuss possible high-level mitigation which could help to improve the traffic situation.

4.2 Full traffic demand

4.2.1 AM period

In the AM period, traffic levels grow relatively quickly to form queues at key locations. Figure 4.1 and Figure 4.2 show how the congestion builds from 08:00 to 08:15. Following this point the network reaches gridlock.

The peak hour for the model is 08:00-09:00; the model therefore fails before reaching half-way through the peak hour.

The key junctions which are over capacity are listed below:

- Link Rd / Redbourn Rd roundabout
- Leighton Buzzard Rd / Queensway roundabout
- Boundary Way / Buncefield Lane roundabout
- Breakspear Way / Green Lane roundabout
- Two Waters Rd / London Rd signalised junction
- Fishery Rd / London Rd roundabout

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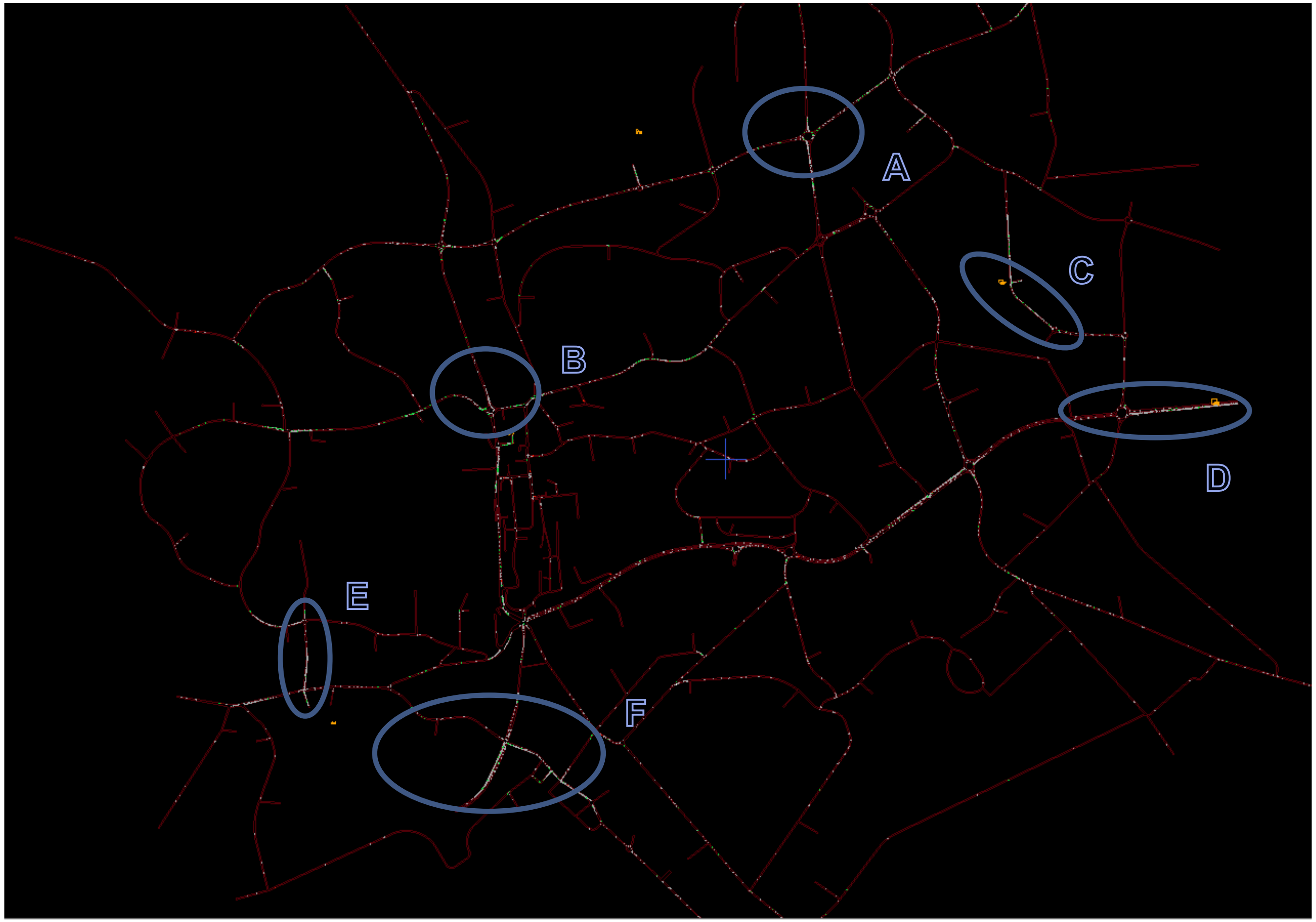

Figure 4.1 : 2031 | 100% demand | AM period | 08:00

A: Link Rd / Redbourn Rd roundabout - queues on north and south approaches to roundabout

B: Leighton Buzzard Rd / Queensway roundabout – queues forming on Leighton Buzzard Rd's north approach

C: Boundary Way / Buncefield Lane roundabout - southbound traffic on Boundary Way queuing, traffic prevented from leaving zone

D: Breakspear Way / Green Lane roundabout – traffic from east approach (from M1) forming queue and 216 vehicles not released from zone

E: Fishery Rd / London Rd roundabout – traffic queuing on Fishery Rd on approach to roundabout

F: Two Waters Rd / London Rd signalised junction – queues forming on both south and east approaches

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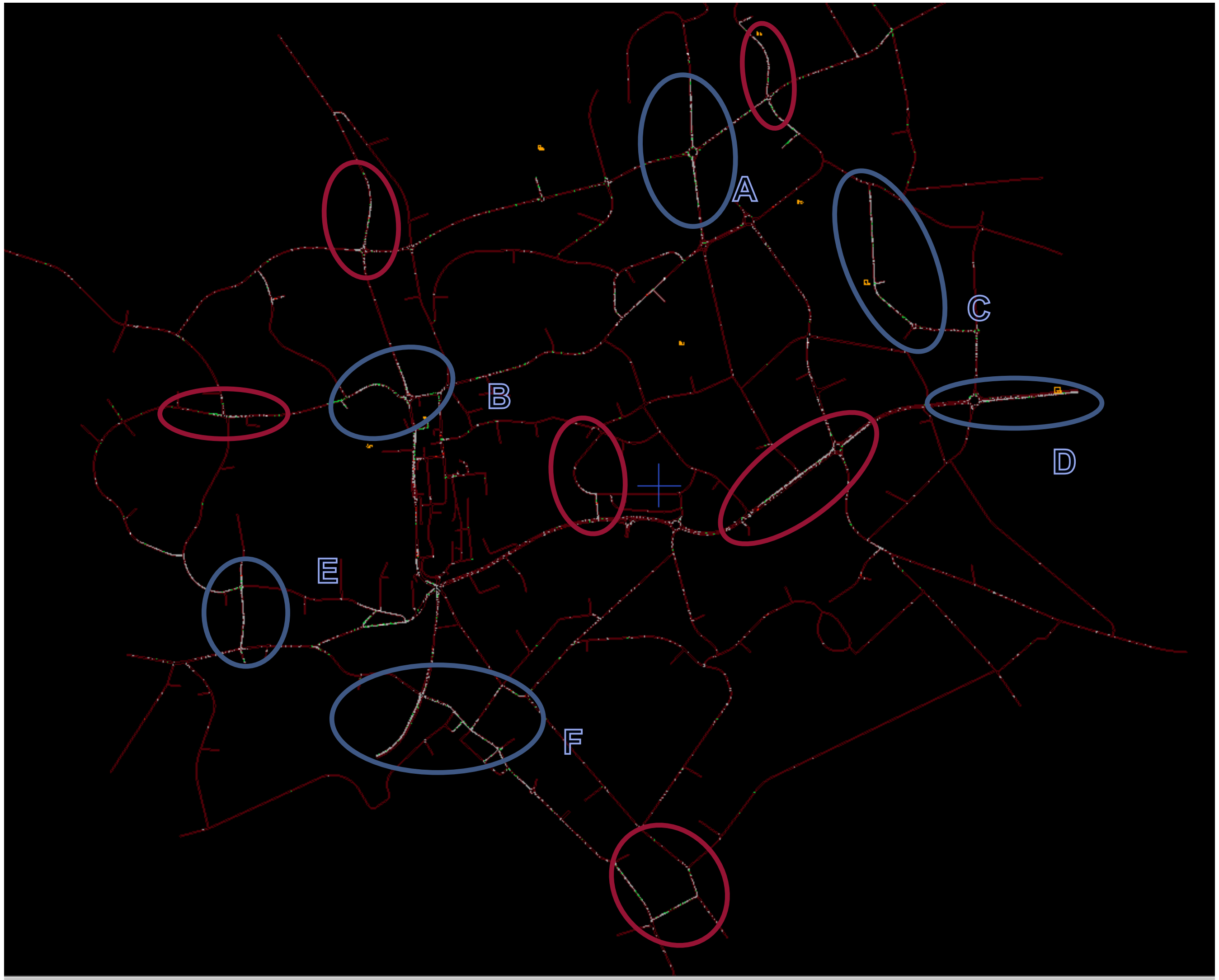


Figure 4.2 : 2031 | 100% demand | AM period | 08:15

A: Link Rd / Redbourn Rd roundabout – queue on north and south approach now extend.

B: Leighton Buzzard Rd / Queensway roundabout – queues on Leighton Buzzard Rd now extend. Traffic is now also queueing on Warners End Rd from Leighton Buzzard Rd to Gadebridge Rd.

C: Boundary Way / Buncefield Lane roundabout - southbound traffic on Boundary Way now queued back to Three Cherry Trees Lane

D: Breakspear Way / Green Lane roundabout – traffic from east approach (from M1) forming queue and 303 vehicles not released from zone

E: Fishery Rd / London Rd roundabout – queue on Fishery Rd now reaches to Northridge Way

F: Two Waters Rd / London Rd signalised junction – queues on both south and east approaches.

Red ellipses - various other queues forming due to weight of traffic

Please note that capacity issues at these junctions (and others) may affect the pattern of congestion in the town. Consider Breakspear Way on-street between Maylands Avenue and Green Lane. This section of road is currently very congested in both AM and PM peaks. In the 2031 model's AM period, we see that the roundabouts at each end of this section have queues (highlighted with red ellipses in Figure 4.3) on the approaches to this section. Capacity issues at these junctions are therefore preventing congestion on the central section building to reach current levels.

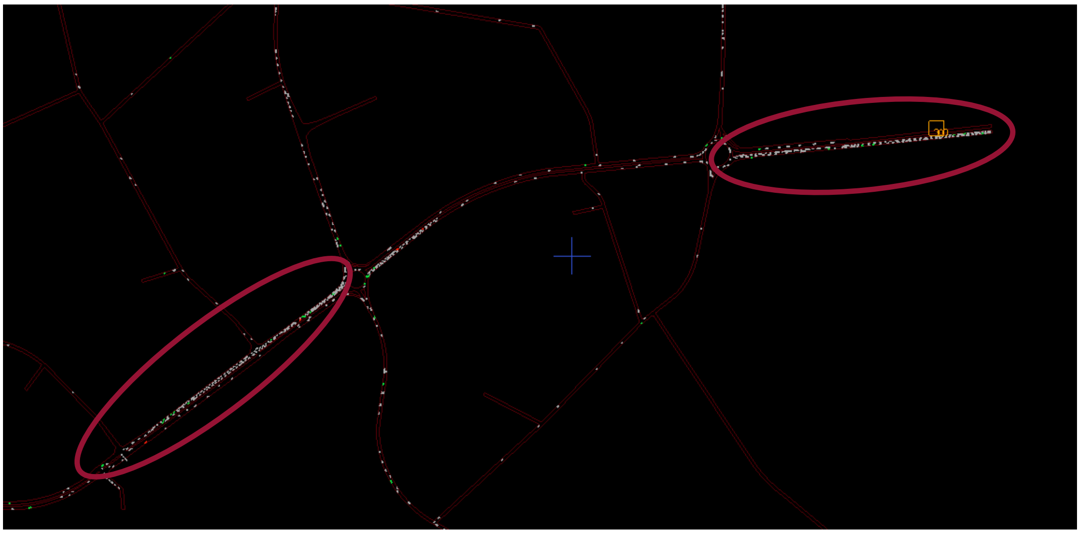


Figure 4.3 : 2031 | 100% demand | AM period | 08:15 | Congestion on Breakspear Way

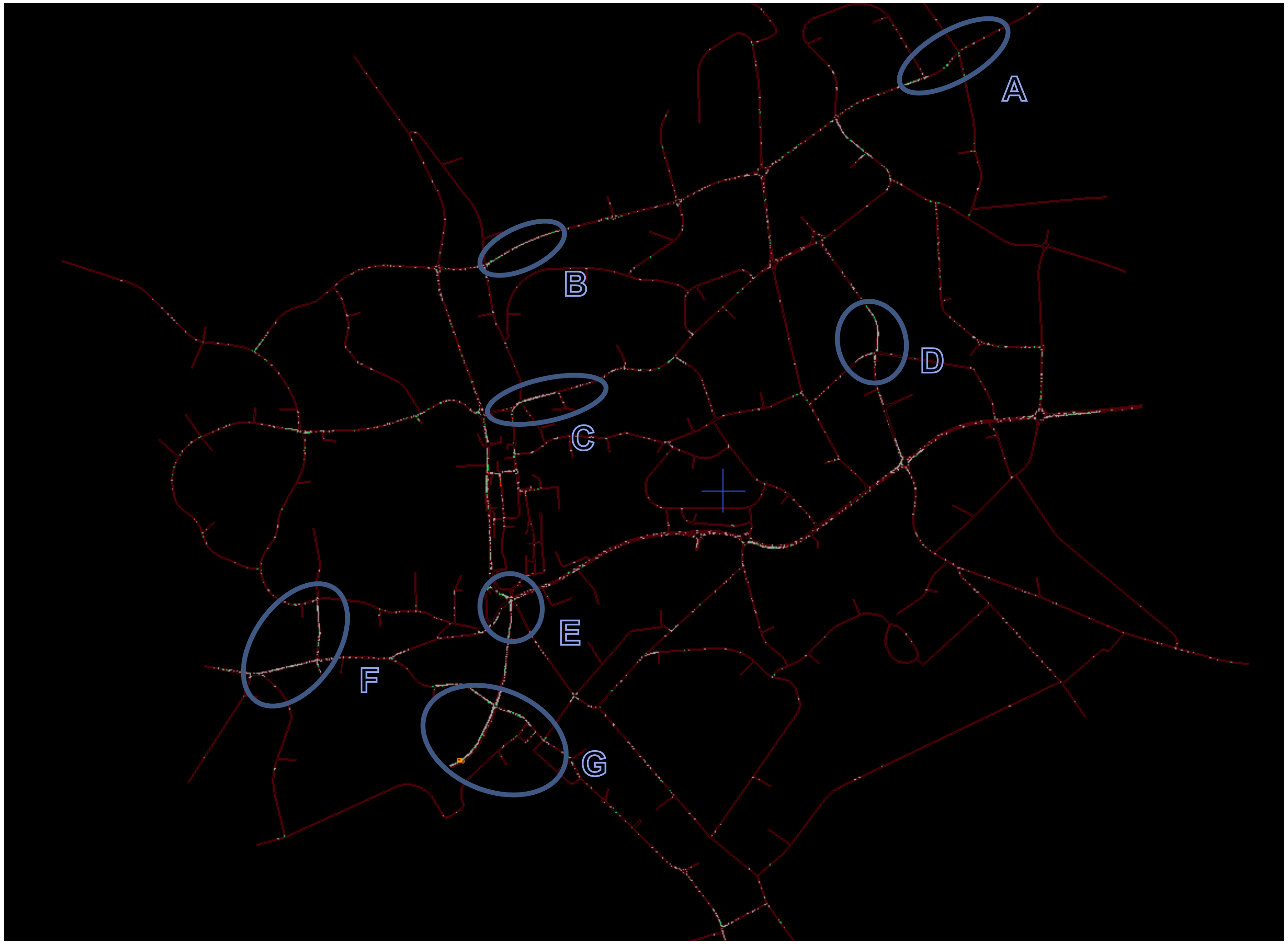
4.2.2 PM period

In the PM period, traffic levels increase more gradually than in the AM period. Figure 4.4 shows the model at 16:30 where queues have started to form but the model is still running smoothly. In Figure 4.5 we have reached 17:00 and the queues have become much more severe. Following this point the network reaches gridlock.

The model's peak hour is 17:00-18:00; the model fails before reaching halfway through the peak hour.

The junctions with most capacity issues in the PM peak are as follows:

- Redbourn Rd / Shenley Rd priority controlled junction
- Piccotts End Rd / Link Rd roundabout
- Queensway / Marlowes signalised junction
- Maylands Ave / Wood Lane End signalised junction
- Leighton Buzzard Rd / St Albans Rd (Plough Roundabout)
- Fishery Rd / Northridge Way roundabout
- Two Waters Rd / London Rd signalised junction



A: Redbourn Rd / Shenley Rd priority controlled junction – slow moving queues forming on Redbourn Rd westbound

B: Piccotts End Rd / Link Rd roundabout – queues forming on Link Rd westbound

C: Queensway / Marlowes signalised junction – queues forming on Queensway westbound

D: Maylands Ave / Wood Lane End signalised junction – queues forming on north and west arms of junction

E: Leighton Buzzard Rd / St Albans Rd (Plough Roundabout) – southbound traffic forming queues on Leighton Buzzard Rd and Two Waters Rd

F: Fishery Rd / Northridge Way roundabout – northbound traffic forming queues on Fishery Rd, also queuing eastbound traffic on London Rd

G: Two Waters Rd / London Rd signalised junction– traffic on southeast and southwest approaches forming queues, 90 vehicles unreleased from Two Waters Rd zone.

Figure 4.4 : 2031 | 100% demand | PM period | 16:30

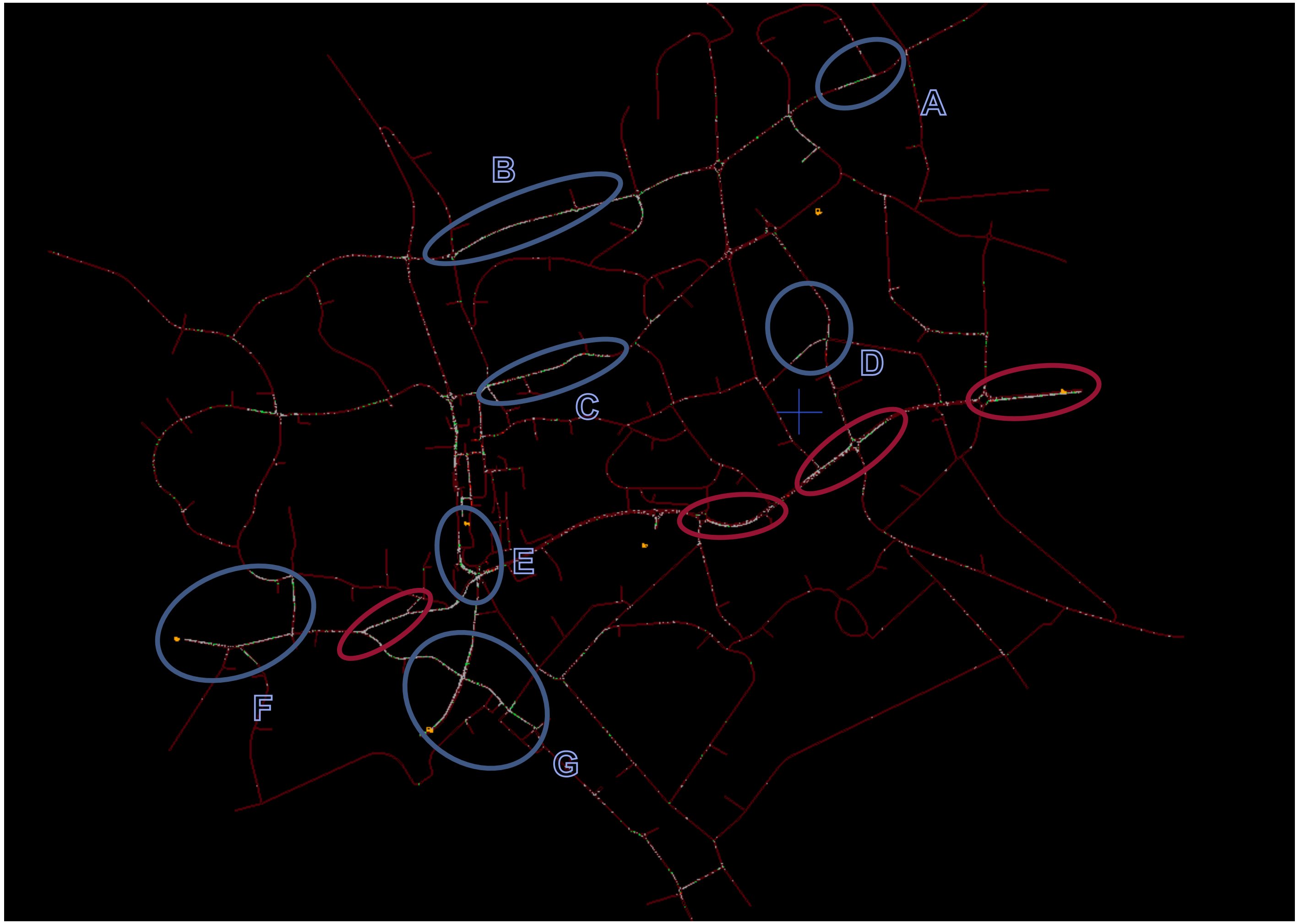


Figure 4.5 : 2031 | 100% demand | PM period | 17:00

A: Redbourn Rd / Shenley Rd priority controlled junction – long queues behind right turning traffic on Redbourn Rd westbound.

B: Piccotts End Rd / Link Rd roundabout – queues on Link Rd westbound now extend to Cambrian Way

C: Queensway / Marlowes signalised junction – queues on Queensway westbound now reach to Woodhall Lane

D: Maylands Ave / Wood Lane End signalised junction – queue on Maylands Ave southbound extend.

E: Leighton Buzzard Rd / St Albans Rd – queue on Leighton Buzzard Rd southbound now reaches Water Gardens Car Park (16 vehicles not released from zone)

F: Fishery Rd / Northridge Way roundabout – queue on Fishery Rd northbound and London Rd eastbound now back to edge of network. 47 vehicles not released from zone.

G: Two Waters Rd / London Rd –queue on southeast approach now reaches retail park. 126 vehicles now unreleased from Two Waters Rd zone.

Red ellipses - show other notable queues

4.3 Reduced (85%) traffic demand scenario

4.3.1 Demand scenario

This section discusses the results when 85% of the full 2031 demand scenario is run through the model. In other words we take the full 2031 demand scenario and apply a multiplier of 0.85 to reduce the demand by 15%.

This has the end result that our scenarios have demand totals as shown in Table 4.1. The “85%” scenarios are therefore **adding 384 trips (+1.63%)** to the standard 2012 Base AM demand and **623 trips (+2.86%)** to the standard Base PM demand.

Table 4.1 : Summary of “85%” AM and PM 2031 demand scenarios

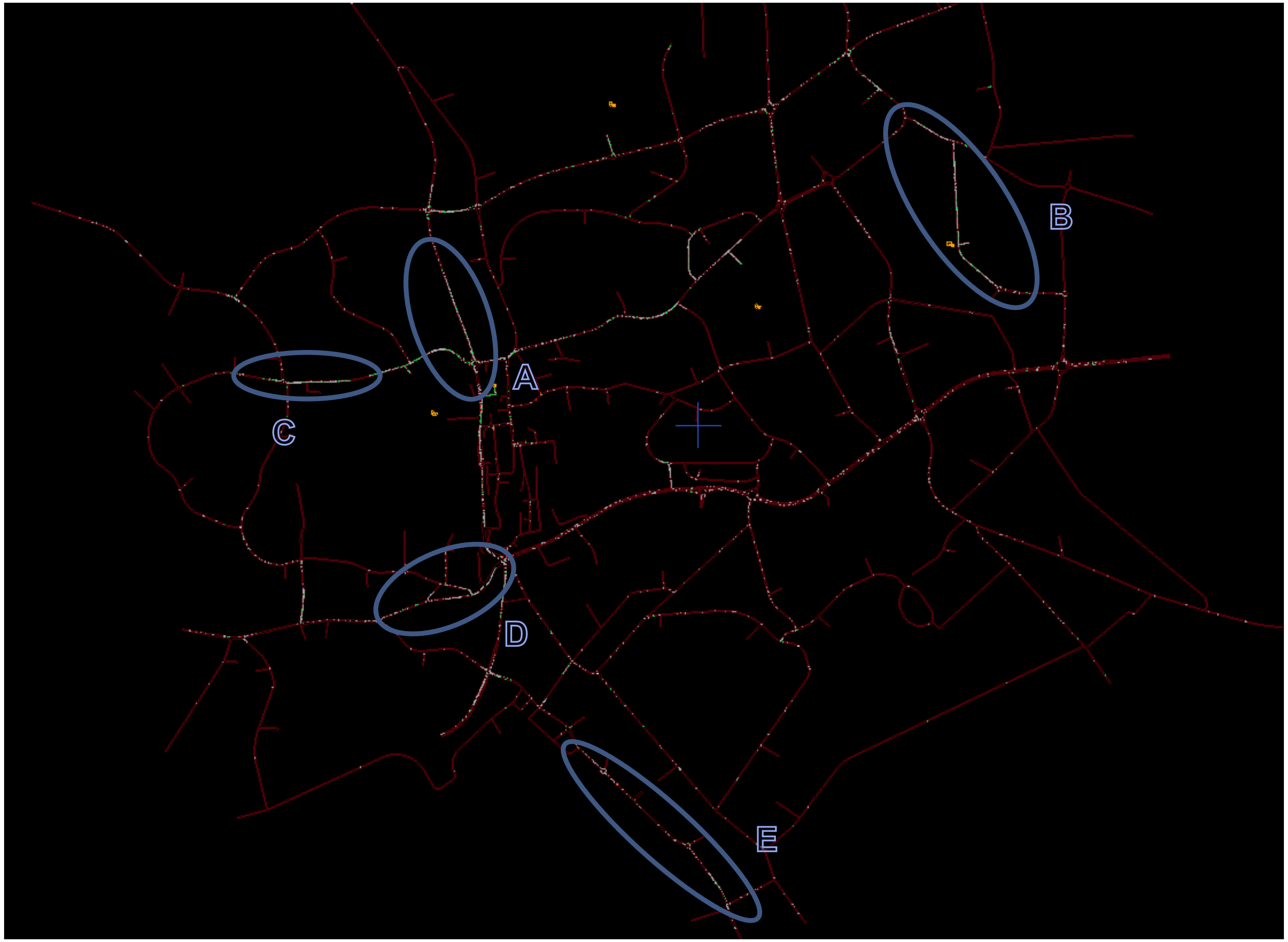
Demand	AM trips (peak hour)	AM change from full 2031 scenario (no. of trips)	PM trips (peak hour)	PM change from full 2031 scenario (no. of trips)
2012 Base (-15%)	19,995	-3,529	18,504	-3,265
2012 – 2031 growth (external-external only)	102	-18	189	-33
Large housing sites (-15%)	3,183	-562	3,016	-532
Smaller housing sites (-15%)	351	-62	379	-67
Masterplan (excluding Morrisons and Theatre) (-15%)	276	-49	304	-54
“85%” 2031 totals	**23,908**	**-4,220**	**22,392**	**-3,951**

We have used the “85%” 2031 scenario to show where the issues may be at the end of the peak hour. This gives another interpretation as to the possible level of traffic on the network for a 2031 scenario. Because of the relatively high trips rates for the “outer zone” (as discussed in section 2.3.2) this scenario could be considered more realistic than the 100% demand scenario.

4.3.2 AM period

Figure 4.6 shows the model network at the end of AM period (09:00). There are clearly some large queues in the network, particularly in the north of the town (Leighton Buzzard Rd & Link Rd). These queues back up from the Leighton Buzzard Rd / Queensway roundabout despite the mitigation already applied here (see section 3.2.11). This capacity issue is the major problem in the AM period.

Elsewhere, Boundary Way has a large queue of southbound traffic, primarily due to traffic leaving the Maylands Business Park. There is also a reasonably long queue on London Rd southbound which backs up from the signalised junction with Red Lion Lane.



A: Leighton Buzzard Rd / Queensway roundabout – traffic on southbound approaches forms queues.

B: Boundary Way – southbound queues form from roundabout with Buncefield Lane. 158 vehicles unreleased from zone 57.

C: Warners End Rd / Long Chaulden signalised junction – westbound queues form on Warners End Rd.

D: Station Rd – general congestion here caused by traffic going to and from St John's Rd

E: London Rd / Red Lion Lane signalised junction – southbound queues form on London Rd.

Figure 4.6 : 2031 | 85% demand | AM period | 09:00

4.3.3 PM period

Figure 4.7 shows the model at the end of the PM peak hour. The PM peak operates with markedly less congestion than the AM. Queues are mostly associated with traffic accessing the new housing development sites e.g. right turning traffic blocking back on Redbourn Rd.

Queues also occur on Maylands Ave southbound at its junction with Wood Lane End and on Fishery Rd on the approach to the roundabout at Northridge Way.

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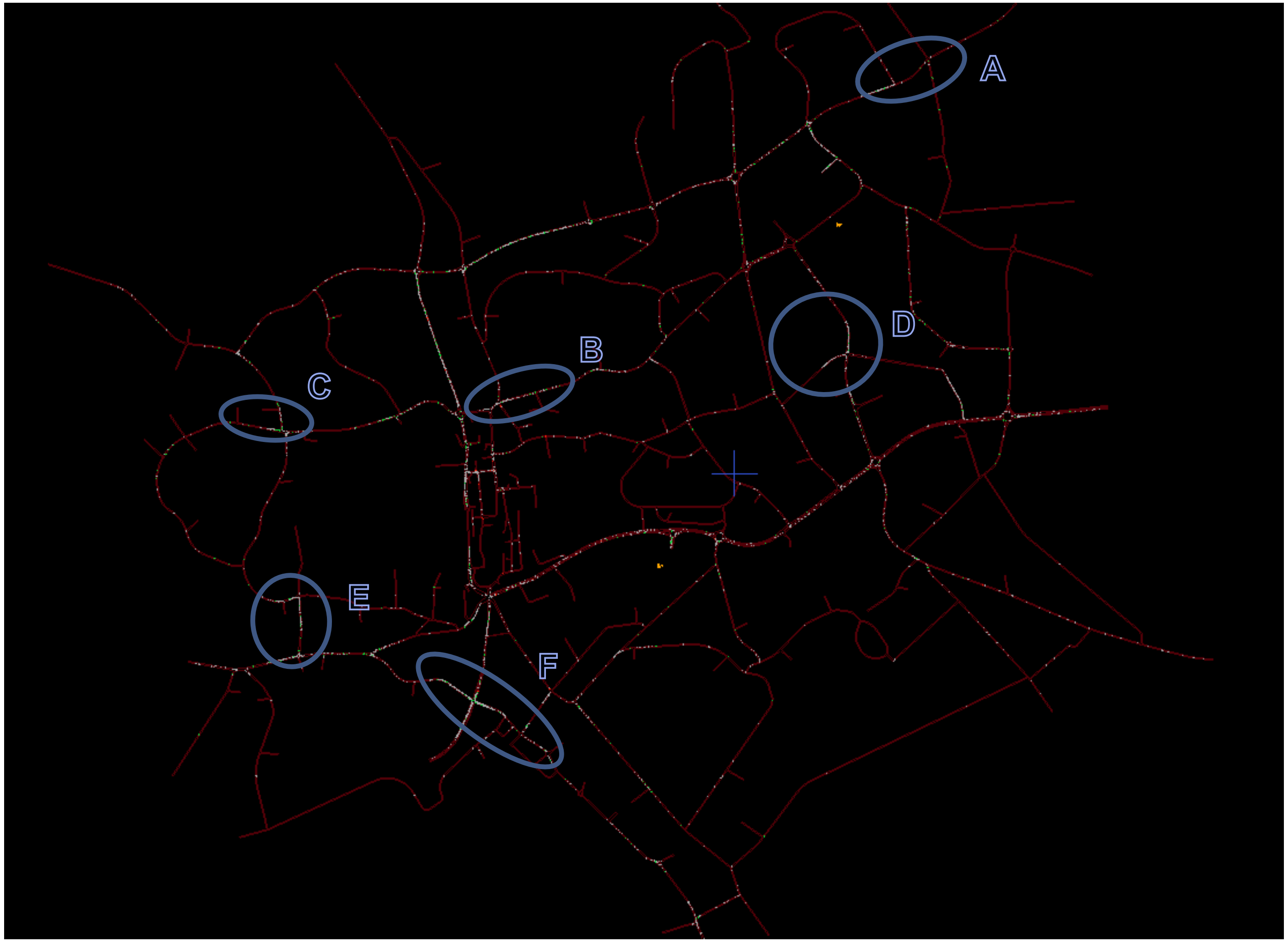

Figure 4.7 : 2031 | 85% demand | PM period | 18:00

A: Redbourn Rd / Shenley Rd priority junction – minor queues form on northeast and northwest approaches. This is due to right turning traffic blocking other movements.

B: Queensway / Marlowes – short queues forming on Queensway westbound

C: Warners End Rd / Long Chaulden signalised junction – short eastbound queues form on Long Chaulden.

D: Maylands Ave / Wood Lane End signalised junction – queues on north and west approaches

E: Fishery Rd / Northridge Way roundabout – northbound traffic queuing back from this junction

F: London Rd / Two Waters Rd signalised junction – queues on southeast approach

4.4 Suggested mitigation measures

This section deals with some approaches to mitigating for the increase in traffic demand at specific locations. These will need to be developed further and tested to determine whether they offer the required benefits. It should be noted that we have concentrated on mitigating for the “85%” scenario as presented in section 4.3.

Achieving a satisfactory operation of the network with full demand scenario would probably require major infrastructure changes or a significant mode-shift in favour of active travel and/or public transport.

4.4.1 Leighton Buzzard Rd / Queensway

The Leighton Buzzard Rd / Queensway roundabout is one of the key junctions in the network. In the AM period queues form on the north approach and in the PM period the roundabout mostly operates with small delays.

One possible way that the AM queue could be mitigated is to install part-time signals at the Leighton Buzzard Rd / Queensway roundabout. By adding signals to the Warners End Rd arm of the roundabout, as shown in Figure 4.8, the flow of traffic opposing the Leighton Buzzard Rd southbound approach will be metered thus improving capacity at the north approach. This would also have the effect of increasing capacity on the Warners End Rd approach by providing regular “gaps” in the opposing northbound traffic flow.

In order to implement this mitigation, suitable traffic islands would need to be installed to allow traffic signal heads to be mounted. Vegetation on the roundabout would likely need to be cut back. In addition, care would need to be taken to allow enough space for long vehicles to complete their movements without mounting the new islands. Given the likely short cycle of any new signals, stacking capacity on the roundabout itself should not be an issue.

As a complement to the above approach, it may also be worth investigating the installation of left-turn bypass lanes at the north and west approaches. These lanes could increase capacity while working together with any partial signalisation scheme.

This “add signals” approach could be extended by signalisation of the entire roundabout. However, given the conflicting movements from the north and west, this approach may not actually be any more efficient that the simpler one described above. Full signalisation would also be more difficult to implement – possibly requiring further enlargement of the roundabout.

A final option is to replace the roundabout with a large signalised junction. This approach would probably give the most control of the available road capacity but at obviously higher expense. With this approach, it would be straightforward to implement improved pedestrian and cycling facilities.

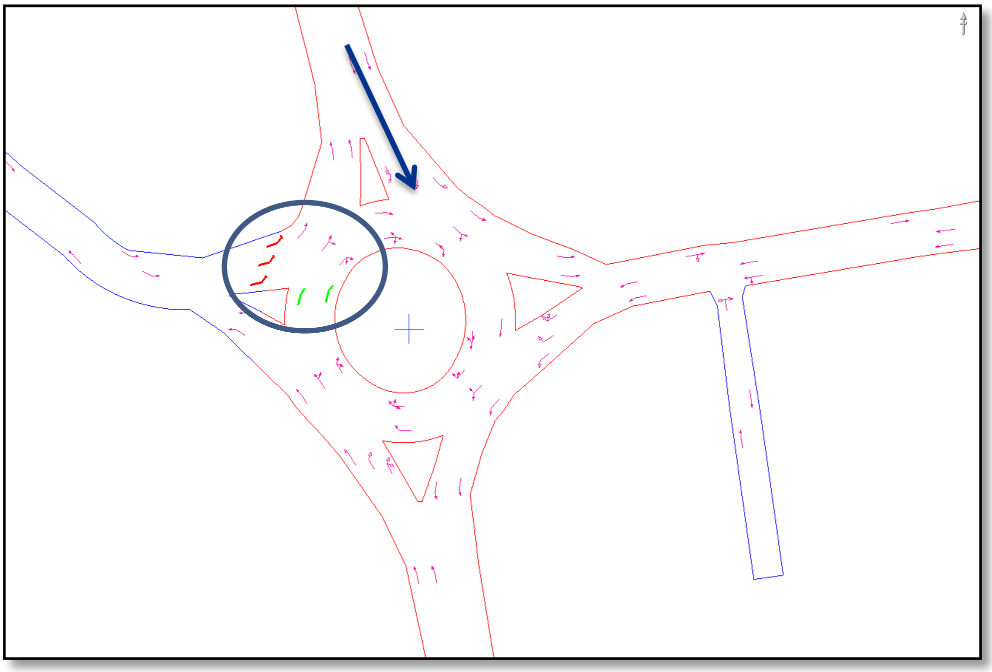

Figure 4.8 : Possible mitigation (part time signals) at Leighton Buzzard Rd / Queensway roundabout to improve capacity from north approach

4.4.2 Boundary Way

In the AM peak hour, queues on Boundary Way southbound originate from the Boundary Way / Buncefield Lane roundabout. Increasing southbound capacity here would certainly help to alleviate this issue. This could be accomplished by increasing the number of southbound approach lanes from the current single lane or alternatively replacing the roundabout with a signalised junction.

If released from this bottleneck, southbound traffic may cause capacity issues elsewhere. This could particularly be a problem at the A414 / Green Lane roundabout with traffic from Boundary Way / Green Lane opposing the major flow of traffic from the M1. Initial modelling work has indicated that there may be some benefit from introducing partial signalisation at the A414 /Green Lane roundabout in the AM peak.

4.4.3 Link Rd / Redbourn Rd

In the AM period queues can form on the approaches to the Link Rd / Redbourn Rd roundabout. To mitigate for these queues an approach similar to that suggested for the Leighton Buzzard Rd / Queensway roundabout may be appropriate. This would involve partially signalising the roundabout at the west arm. This would improve capacity for eastbound traffic by metering the steady stream of northbound traffic on the roundabout. This may also have the benefit of providing more regular gaps for traffic approaching on St Agnells Lane.

The suggested mitigation is shown in Figure 4.9.

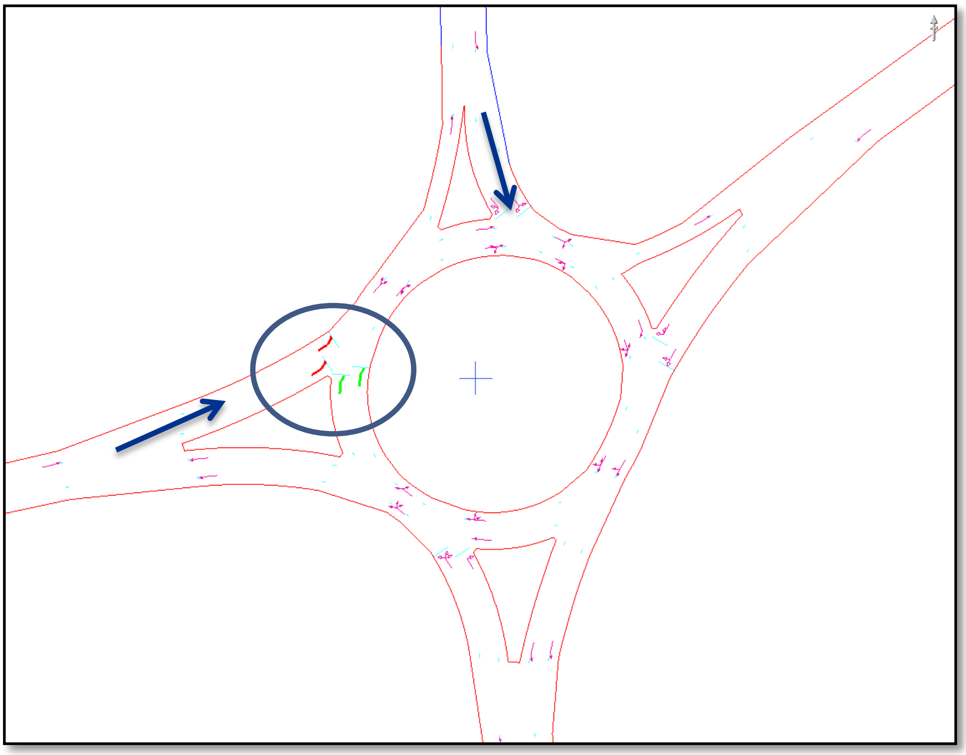

Figure 4.9 : Possible mitigation (signals) at Link Rd / Redbourn Rd roundabout to improve capacity on west and north approaches

4.4.4 Redbourn Rd / Shenley Rd

In the PM peak hour, this junction can cause queues on Redbourn Rd westbound. The mechanism that causes this queue is right-turning traffic trying to access Shenley Rd and then blocking back on Redbourn Rd. This queue could be removed by adding traffic signals to the junction to create gaps that would allow right-turning traffic to complete their manoeuvres.

An alternative approach would be to install a mini-roundabout at the junction: giving priority to right-turning traffic over east-bound traffic.

4.4.5 Warners End Rd / Long Chaulden

Mitigation of this junction has already been included in our current 2031 network as discussed in section 3.2.15. This mitigation transformed the junction from a double mini-roundabout to a signal controlled junction. Our model included estimated signal timings here as no detail was available on signal staging or timings. As such our timings have not been optimised to account for the expected flow of traffic.

As such, a queue of westbound traffic builds on Warners End Rd in the AM period. We are confident that this queue could be alleviated by optimisation of the signal timings at the junction. No further mitigation would be necessary at this stage.

In the PM period, a queue of eastbound traffic builds on Long Chaulden. Again this queue could be solved through optimisation of the existing signals.

4.4.6 Station Rd / St John's Rd / Heath Lane

This is a complex area to model because of the congestion and the multiple route options available. During model assignment, traffic tends to flip between available routes as the congestion changes. As such, we would recommend removing some route options in this area in order to make designing mitigation a simpler process.

This area becomes congested in the AM peak hour due to the amount of traffic trying to access / exit St John's Rd. The two existing junctions on Station Rd are priority controlled with a right-turn filter lane at the St John's Rd junction.

A solution to the congestion in this area may be to stop up Heath Lane at Station Rd and to amend the St John's Rd / Station Rd junction to a signal controlled junction.

Alternatively the number of available movements at Heath Lane / Station Rd could be reduced e.g. making Heath Lane left in / left out. Installing a mini-roundabout at St John's Rd / Station Rd would then give priority to traffic turning right into St John's Rd.

4.4.7 London Rd / Red Lion Lane

In the AM period, southbound traffic form queues back from this signalised junction. Clearly space is limited at this junction due to the railway bridge and surrounding buildings. Any mitigation would therefore have to take the form of re-optimisation of signal staging and/or minor realignment of the road layout.

4.4.8 Fishery Rd / Northridge Way

In the PM peak hour, northbound traffic forms queues from this roundabout on Fishery Rd. Mitigation should therefore be considered to allow more northbound traffic to join this roundabout. Possible options are: installation of part-time traffic signals, banning some opposing movements or replacement of the roundabout with a redesigned priority controlled junction.

Without further analysis it isn't clear which would be the best option for this residential area.

4.4.9 Maylands Ave / Wood Lane End

In the PM peak hour, traffic forms queues on the north and west arms of this signalised junction. The most straightforward way to reduce the impact of these queues would be to optimise the signal staging for the new balance of flows at this junction. We don't envisage that it would be necessary to physically amend the layout of this junction.

4.4.10 Two Waters Road / London Road

In both AM and PM peak hour, traffic forms queues at this signalised junction. The mitigation method should be considered to optimise the signal staging for the new balance of flows at this junction.

4.4.11 Breakspear Way / Green Lane

In the AM peak hour, east approach traffic (from M1) forms queues at this roundabout. Hertfordshire County Council is currently investigating the option to partially signalise the roundabout on the eastern and southern arms in the AM peak period. This should improve capacity for westbound traffic by metering the steady stream of opposing traffic on the roundabout.

4.4.12 Fishery Road / London Road

In the AM peak hour, southbound traffic forms queues from this roundabout queue on Fishery Rd and reaches to Northridge Way. The mitigation method should be adding traffic signals to the junction to create gaps that would allow more southbound traffic to join this roundabout.

4.4.13 Leighton Buzzard Road / St Albans Road (Plough Roundabout)

In the PM peak hour, traffic forms queues from this roundabout on Leighton Buzzard Rd and Two Waters Rd. The mitigation method should be considered to optimise the existing signals on Leighton Buzzard Rd and Two Waters Rd.

5. Conclusion

2031 scenario - demand and infrastructure

In this report we discuss the methodology used to create a robust 2031 demand scenario. Starting with the 2012 Base scenario demand, we added growth for external to external trips, added trips for small and large housing developments and trips for the revised Town Centre Masterplan.

The creation of our 2031 model network is then described through the addition of previously mooted mitigation measures. These measures include new junctions allowing access to various developments and mitigation of key junctions within the network (e.g. signalisation of Warners End Rd / Long Chaulden).

It should be emphasised that we have run the following two development scenarios on the same network with no further mitigation tested. In this report we show which areas of the network come under stress and suggest further mitigation measures. No further infrastructure mitigation has been tested at this stage. It should be noted that in most cases these schemes are conceptual and further detailed work needs to be undertaken to identify their feasibility.

Full demand scenario

We have run the 2031 scenario with full-demand i.e. with 100% of the expected trips. This scenario became very congested within both the AM and PM peak hours. As such, we were unable to complete model runs for either period. The full demand scenario has been discussed as far as possible but given the level of congestion and the curtailment of the model runs due to gridlock we feel that taking forward this scenario for further testing would be impracticable. On the basis of the modelled assumptions to date, this indicates that the current road network would be unable to cope with the full level of proposed development. Further assessment is required to understand whether the proposed additional mitigation measures are sufficient to accommodate the proposed development growth.

85% demand scenario

As an alternative scenario we reduced the level of demand by 15%, giving “85%” scenarios for AM and PM periods. While this scenario was obviously less congested than the full scenario, it nevertheless requires mitigation in some key locations. These locations are discussed in detail along with possible mitigation that could be installed to improve the traffic congestion.

To summarise, in the AM peak, the major issue is the large queue of southbound traffic that forms to the north of the Leighton Buzzard Rd / Queensway roundabout. This queue eventually reaches Link Rd and causes knock-on effects here. Mitigation of this bottleneck will be a key factor in obtaining a reasonable 2031 scenario. Elsewhere it is feasible that queues could be resolved with relatively simple mitigation measures albeit at some cost.

In the PM peak, there is no single issue that dominates the model run. Small queues do form but simple mitigation should be able to resolve these issues reasonably easily.

In conclusion, we have reported on modelling work completed to assess the likely impacts of a proposed development scenario on a mitigated Hemel Hempstead road network. We have found that there will be significant network issues which should be resolved before even a scaled-back level of development can be completed. Suggestions for additional mitigation measures have been discussed. These measures have not yet been tested or refined but will need to be before this level of development can progress.