Appendix 10: AECOM St Albans East Emerging Transport Strategy Jan 2016

Strategic Local Plan: St Albans East (Oaklands)

Emerging Transport Strategy

Prepared on behalf of Oaklands College and Taylor Wimpey North Thames

January 2016

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Contents

“Our vision for the site is to create high quality new homes set within an integrated sustainable masterplan connecting directly into the College; putting the College even more firmly at the heart of the community with public access through footpaths and cycle paths to our parkland and our agricultural setting.”

Oaklands College Strategic Local Plan Submission

Oaklands College Masterplan

01

Oaklands College Masterplan

Draft Strategic Local Plan

St Albans' draft Strategic Local Plan for the period 2011-2031 includes the potential release of Green Belt land in East St Albans (Oaklands) for a residential development of at least 1,000 units.

Highway capacity and access to Hatfield Road and Sandpit Lane are identified as key constraints on future residential development in this location, with development proposals required to deliver:

- *Substantial Green Infrastructure provision, including… extensively improved and new countryside access, public footpaths, cycleways and bridleways;*
- *Transport network (including walking and cycling links) and public transport services upgrades/improvements; and*
- *Provision of improvements to the accesses to Hatfield Road and Sandpit Lane.*

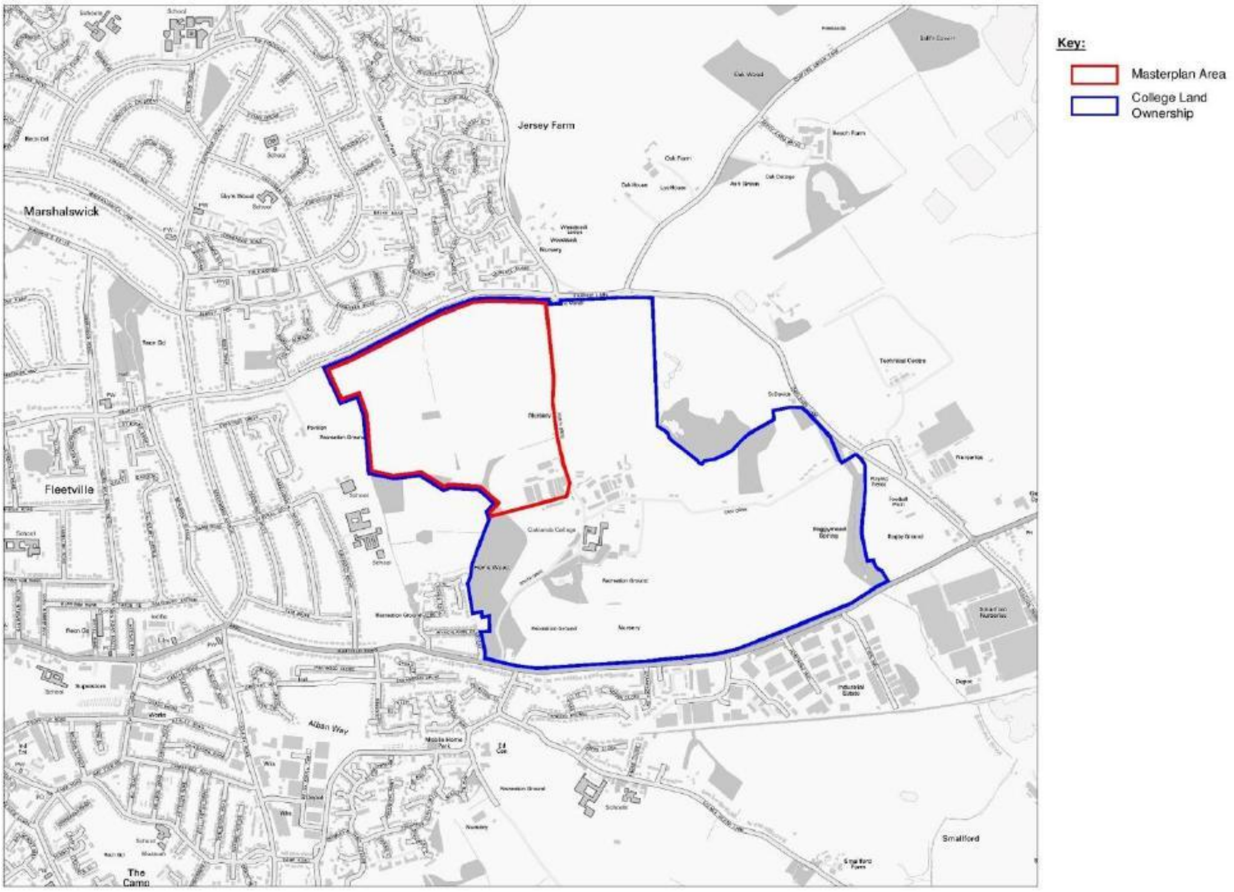
Oaklands College Masterplan

The College's vision is to create an exemplar high quality residential development of approximately 1,000 units on land to the north of the existing College development.

A planning application for an initial phase of approximately 350 residential units has already been submitted to St Albans City and District Council (Application reference 5/2013/2589). This is an enabling development, the receipts of which would fund improvements to the College facilities.

Figure 1 shows the extent of land currently owned by the College (outlined in blue) and indicative extents of the masterplan area (outlined in red).

Figure 1: Oaklands College Masterplan Area



Access Strategy: Overview

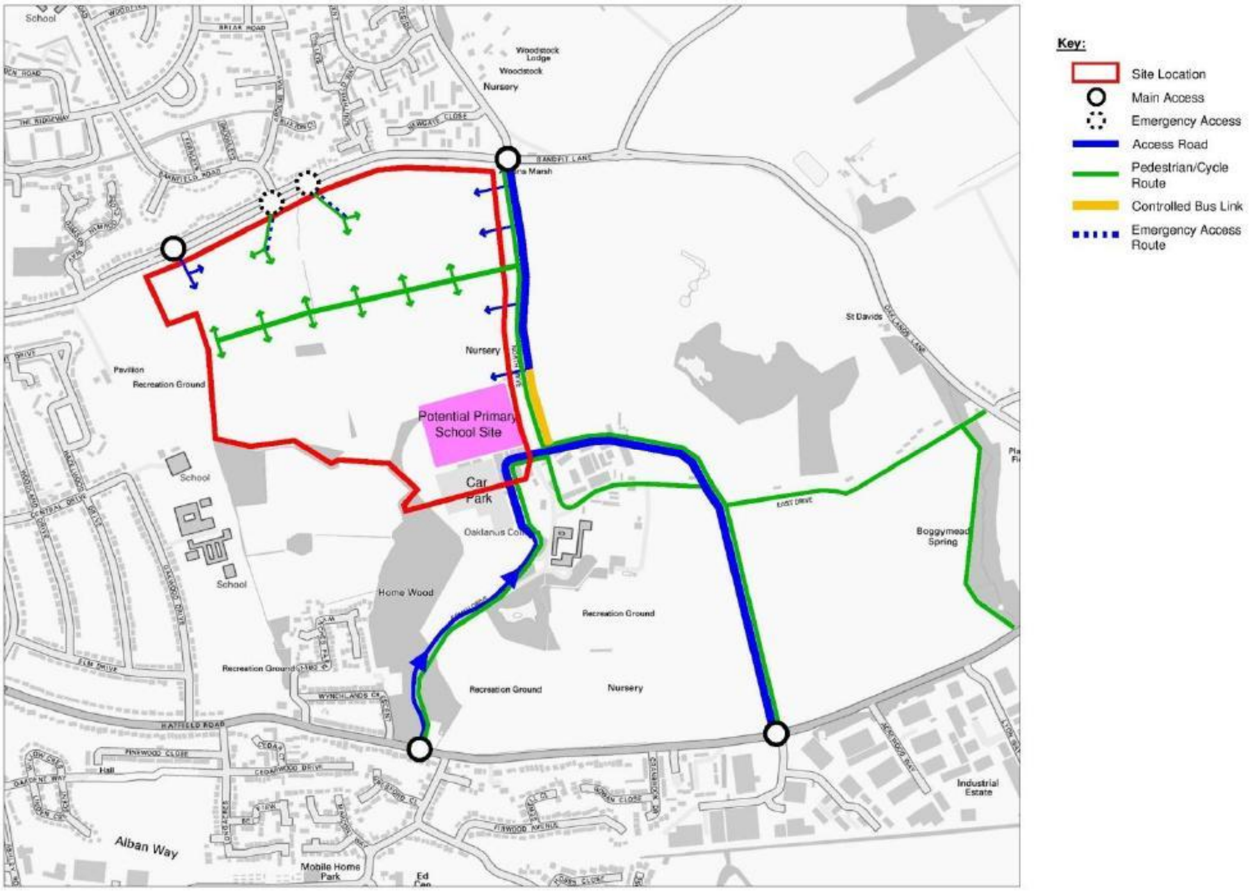
The College's vision for the St Albans Campus is to create a high quality sustainable residential development with public access to the College and surrounding areas via a network of footpaths and cycle paths that cross the site.

The emerging masterplan includes improved access to the College for all modes of transport from Hatfield Road with new pedestrian, cycle and vehicle accesses created on Sandpit Lane to serve the residential development.

A controlled road link would be provided between the College and residential developments offering opportunities for significantly improved bus access.

The emerging access strategy is shown in **Figure 2**.

Figure 2: Emerging Access Strategy

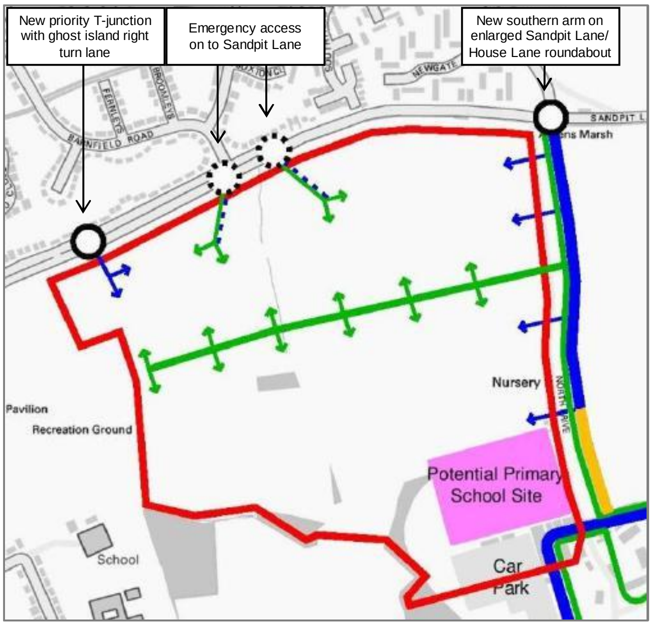


Access Strategy: Residential Development

It is envisaged that the residential development would be served by two main points of vehicular access on Sandpit Lane, with two further emergency access junctions, which would also serve as pedestrian and cycle accesses.

Figure 3 shows the emerging access strategy for the residential site.

Figure 3: Residential Site Access Strategy



The main access to the initial phase of the development would be located in the north western corner of the site on Sandpit Lane, approximately 200m east of the junction with Damson Way. The junction would be a priority T-junction with a ghost island right turn lane (**Figure 4**).

A separate emergency access would be provided onto Sandpit Lane, immediately to the east of the junction with Barnfield Road. This would also serve as pedestrian and cycle access, linking the development in to the network of routes in the predominantly residential areas further to the north.

Access to the later phases of the development would be located further east on Sandpit Lane. It is envisaged that the existing roundabout at the junction of Sandpit Lane and House lane could be enlarged with a new southern arm added to serve the expanded residential development (**Figure 5**).

Another emergency access point would be provided on Sandpit Lane, between the junctions with Barnfield Road and House Lane. This access would also provide pedestrians and cyclists with access to the development from the north.

Figure 4: Western Access Junction (Proposed Layout)

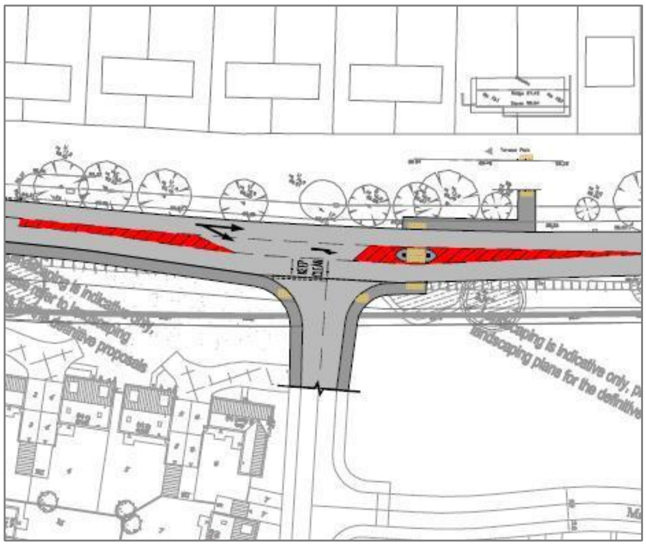
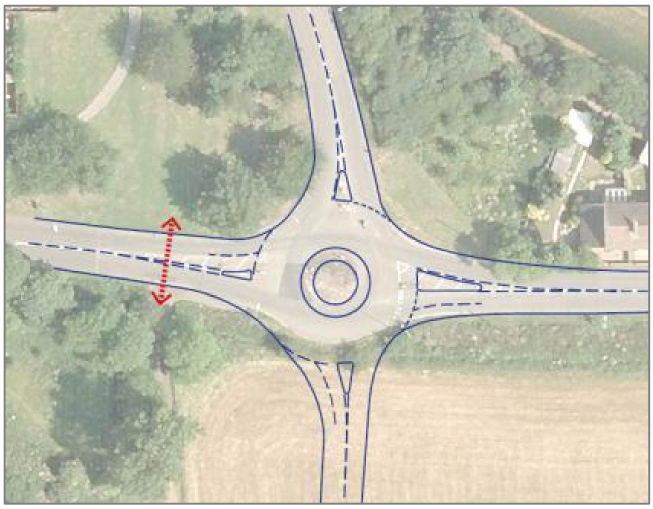


Figure 5: Eastern Access Junction (Indicative Layout)

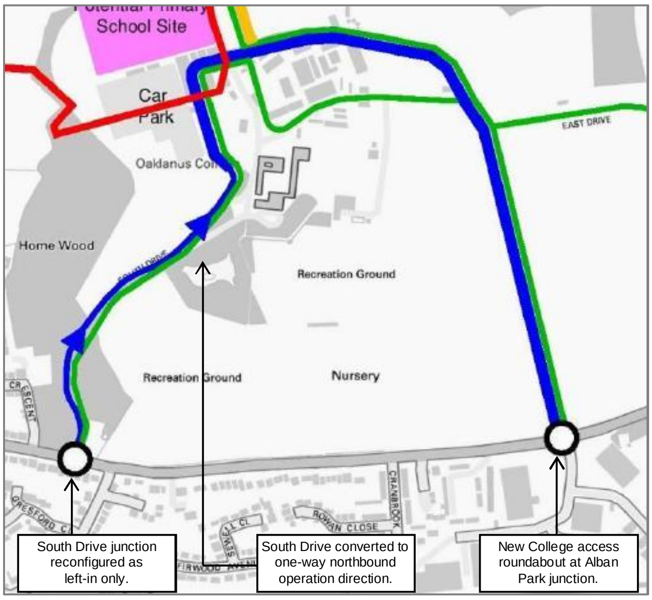


Access Strategy: College Development

The masterplan includes a new access to the site on Hatfield Road, which would become the main entrance to the College. Access to the College via South Drive would become one-way with improvements made to the facilities for pedestrians and cyclists.

Figure 6 shows the emerging access strategy for the College.

Figure 6: College Access Strategy



A new access to the College would be created on Hatfield Road at the junction with Alban Park. The existing priority T-junction would be replaced by a roundabout, with a new northern arm serving the College, as shown in **Figure 7**. This junction would become the main access into the College for staff and students, with only visitors, buses and taxis permitted to use the current access to the west.

As a result of the reduced use of the current access, it is proposed that the South Drive junction would be reconfigured so that traffic can only turn left in from Hatfield Road. This would enable South Drive to become one-way northbound, with the existing southbound lane used to provide a segregated cycle route into the College.

The removal of right turning traffic from this junction creates the potential for improvements to be made to the nearby Hatfield Road/Colney Heath Lane junction. Two potential options are being considered; the first would be to replace the existing junction with a roundabout (see **Figure 8**) while the second option involves signalising the junction (see **Figure 9**). Both options offer potential to provide improved pedestrian and cycle crossing facilities at this busy junction.

Figure 7: Hatfield Road/Alban Park Junction (Indicative Layout)

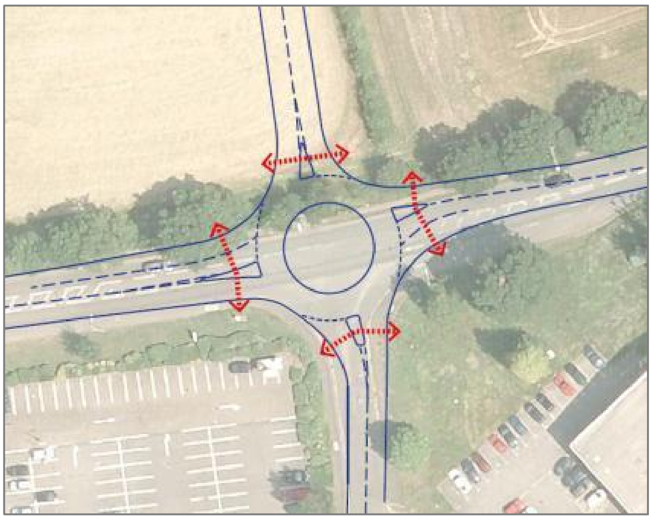


Figure 8: Hatfield Road/Colney Heath Lane Junction (Indicative Layout – Roundabout Option)

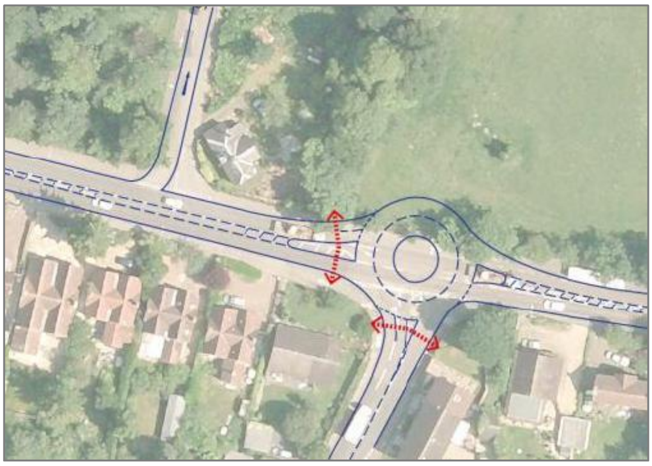
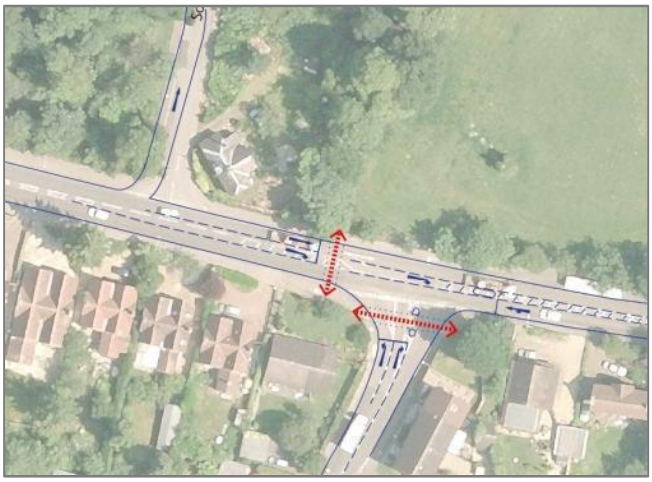


Figure 9: Hatfield Road/Colney Heath Lane Junction (Indicative Layout – Signalised Junction Option)



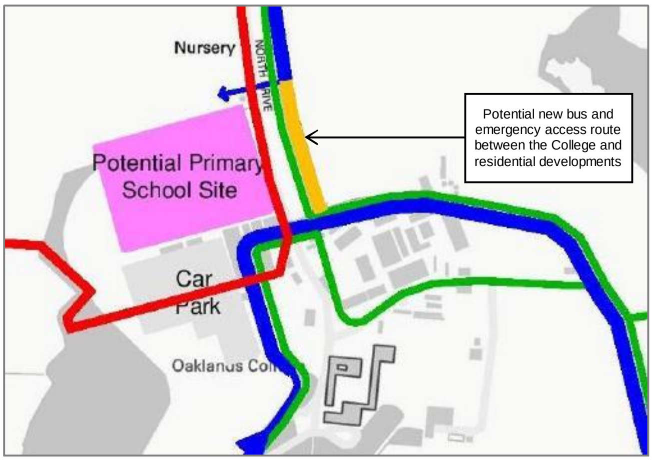
Access Strategy: Internal Connections

It is envisaged that a new road link would be created across the St Albans Campus, linking Sandpit Lane and Hatfield Road. It is not currently proposed that this route would be open to general traffic, as this would potentially encourage traffic to rat-run through the College site to avoid congestion on the local road network, particularly as the new route would offer a shorter and quicker journey than the alternative route via Oaklands Lane.

To prevent the link road being used as a through route, it is proposed that the section of road adjacent to the potential primary school site, which links the residential and College developments, would be a controlled link for use by buses and emergency vehicles only. Use of the link would be controlled by means of rising bollards or similar physical measures. The location of the link is shown in **Figure 10**.

Consideration will be given to whether it is necessary to allow some traffic from the residential development to use the link road to access Hatfield Road to spread demand across both road corridors. Further work would be required to determine what level of use is appropriate, taking account of the potential security and safety implications of routing additional traffic through the College campus; the ability of the Hatfield Road corridor to accept additional traffic; and the means of managing access between the two developments.

Figure 10: Potential Internal Bus Link



Sustainable Transport Strategy

02

Sustainable Transport Strategy: Overview

From a transport perspective, the sustainability credentials of a future residential development on the Oaklands site would depend on establishing high quality walking, cycling and public transport links that offer residents with a credible alternative to car travel.

The emerging masterplan for the College's St Albans Campus site envisions a range of improvements to the network of walking and cycling routes that cross the campus in combination with enhancements to bus access that would significantly improve the accessibility of both the College and residential developments and provide improved connections towards St Albans, Hatfield and Welwyn Garden City.

A potential sustainable transport strategy for the site is described in more detail in the following pages.

Sustainable Transport Strategy: Walking & Cycling

Existing Network

The St Albans Campus is already crossed by a number of public rights of way; North Drive and South Drive form a continuous north-south bridleway linking Sandpit Lane to Hatfield Road, while East Drive is designated as a footpath and connects the College campus to Oaklands Lane to the east.

To the south of the site, the Alban Way forms a major off-road cycle route linking Hatfield and St Albans, while to the north The Ridgeway, Jersey Lane and House Lane/Sandringham Road provide on and off-road options for cyclists.

The existing walking and cycling links on the Oaklands College site and in the local area are shown in **Figure 11**.

Emerging On-Site Strategy

A range of enhancements are envisaged to the rights of way network on the College site as part of the emerging masterplan.

South Drive would become a one-way road in the northbound direction which would allow part of the existing carriageway to be converted into a segregated two-way cycle lane providing improved cycle access into the College from the south.

A shared footway/cycleway would be provided alongside the residential access road from Sandpit Lane with an east-west spur serving the residential site.

East Drive would be upgraded from footpath to bridleway status, while a new footpath would be provided along the south-eastern boundary of the site linking East Drive with Hatfield Road.

The masterplan also includes identified routes for walking, jogging or running around the perimeter of the Oaklands site.

Emerging Off-Site Strategy

In addition to the on-site improvements, consideration will also be given to providing new and improved connections that link both the College and residential development into the surrounding network of walking and cycling routes.

To the north of the site, the potential to provide shared footway/cycleway connections alongside Barnfield Road and House Lane will be investigated, connecting the College to the existing routes on The Ridgeway and Sandringham Road.

To the south of the site, the importance of providing improved connections to the Alban Way is recognised, with new pedestrian and cycle crossings on Hatfield Road at the new College access roundabout and at the Colney Heath Lane junction.

The masterplan envisions improvements to the shared footway/cycleway through Alban Park providing a more attractive link onto the Alban Way towards Hatfield and the establishment of a new shared footway/cycleway alongside Colney Heath Lane providing a new walking and cycling link on to the Alban Way towards St Albans City Centre.

The on-site and wider area enhancements that are envisaged as part of the emerging masterplan are shown indicatively in **Figure 12**.

Figure 11: Existing Walking & Cycling Networks

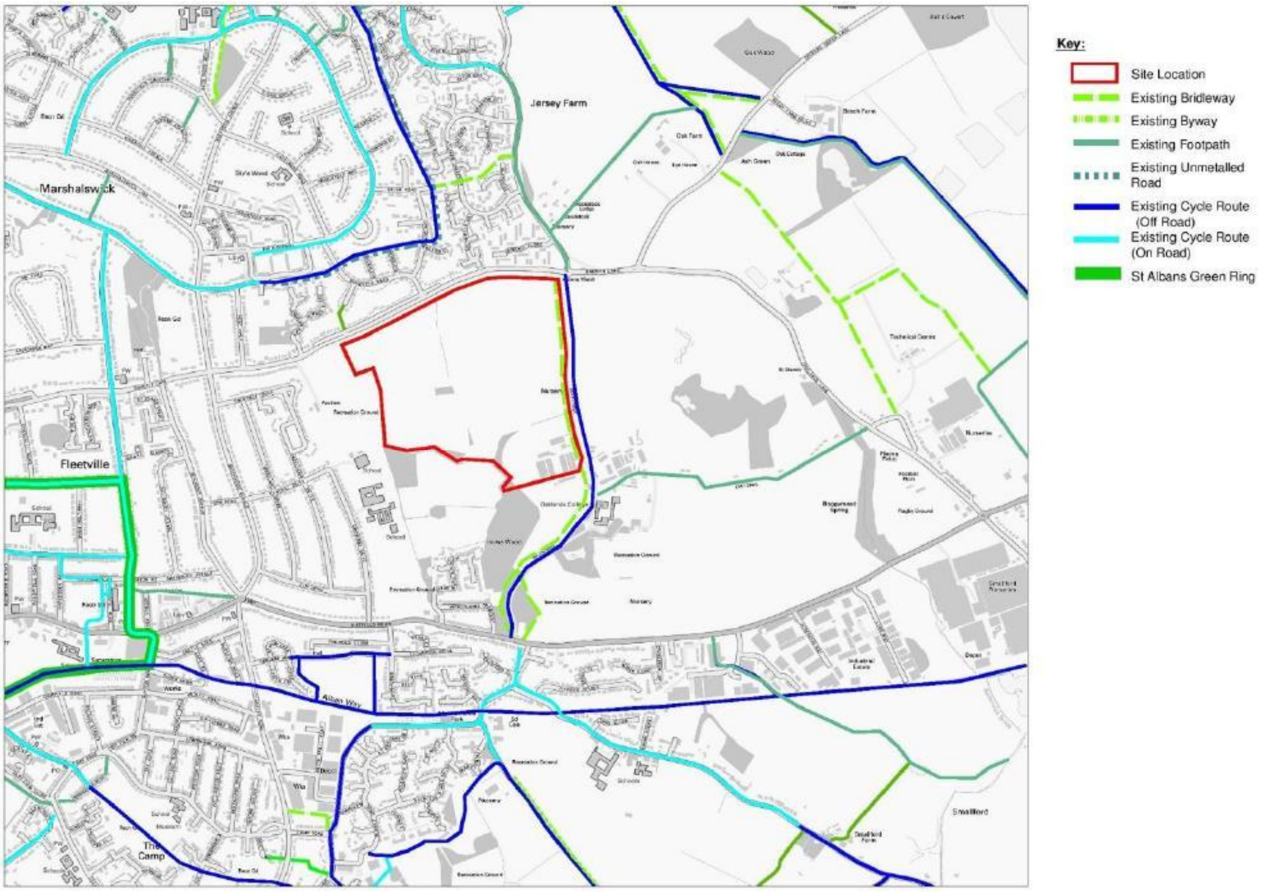
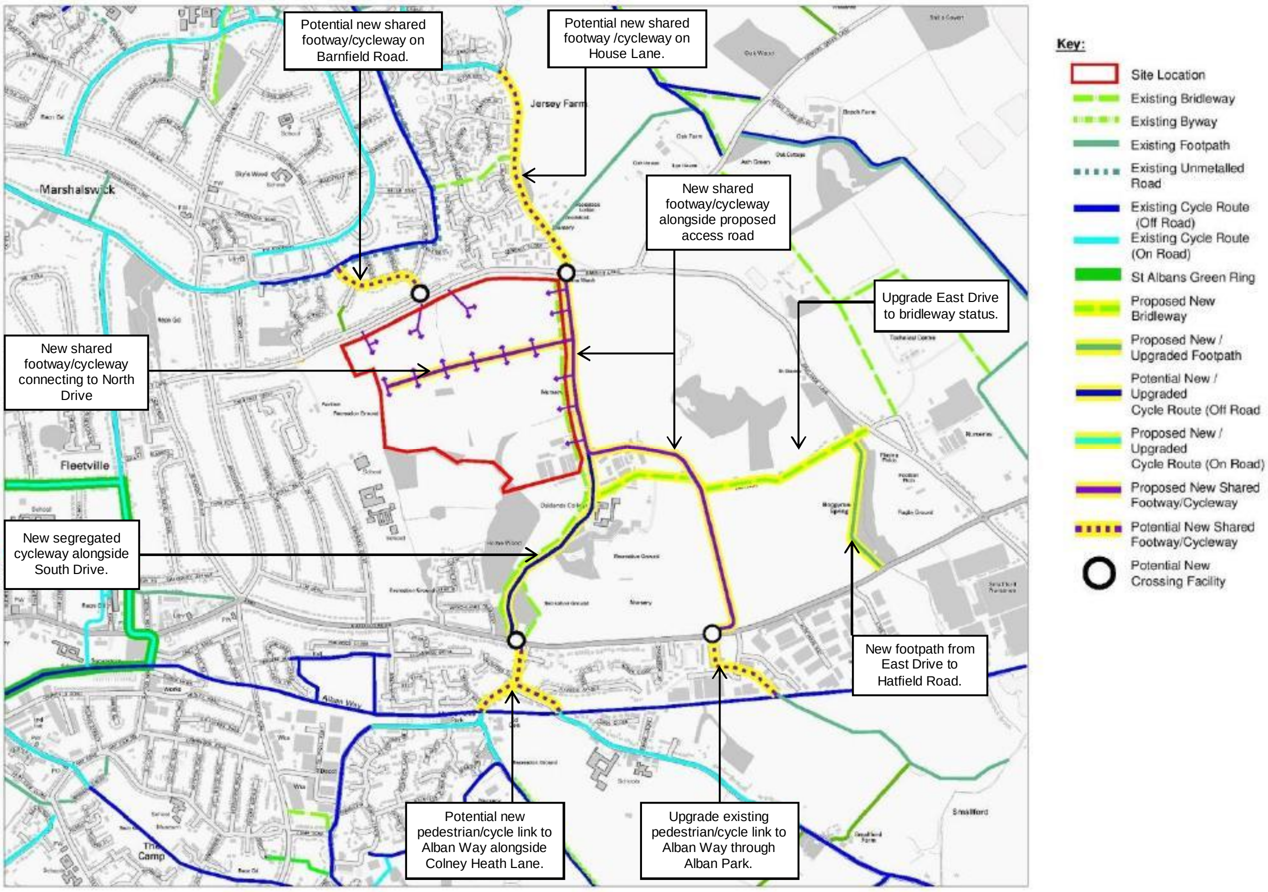


Figure 12: Indicative Walking & Cycling Strategy



Sustainable Transport Strategy: Public Transport

Existing Bus Links

The St Albans Campus is already served by numerous bus routes that operate along Hatfield Road, with the closest bus stops being located on Hatfield Road either side of the junctions with Colney Heath Lane and South Drive. These services provide fast and frequent connections to a range of destinations, most notably towards St Albans city centre and City rail station to the west and towards Hatfield and Welwyn Garden City to the east. College staff and students benefit from discounts on services operated by Uno, including the 601 (St Albans to Welwyn Garden City) and 602 (Hatfield to Watford).

Uno's 653 bus service operates along Sandpit Lane to the north of the site, providing a 20 minute frequency service between St Albans and Welwyn Garden City via Hatfield. The closest stops to the site are located on Sandpit Lane at the junctions with Marshalswick Lane to the west and the junction with House Lane to the north.

Emerging Bus Strategy

While the bus routes on Hatfield Road are used by College staff and students, the fact that bus services do not penetrate the College site means some potential passengers may be deterred from using them and that they would be unlikely to be extensively used by residents of a new residential development to the north.

The emerging masterplan therefore includes proposals to provide a bus link through the Oaklands College site connecting Sandpit Lane and Hatfield Road. This would allow the existing 653 bus service to be diverted through the site, thereby serving both the residential development and College campus, rather than along Oaklands Lane to the east.

The bus link also introduces the potential for a new circular service to be established that links the College and residential developments to St Albans city centre and City rail station.

In addition, the changes proposed to the College access arrangements would create a loop through the site, which would enable bus services operating along Hatfield Road such as the 601 and 602 to directly serve the College campus.

In combination these changes would ensure that the whole of the College campus and residential development are within 400m walk of a bus stop that is served by a high frequency bus service (at least 3 buses per hour).

The potential diversions of existing bus routes are shown in **Figure 13** and **Figure 14** while the new circular route is shown in **Figure 15**.

Figure 13: Potential diversion of 653 Bus Service

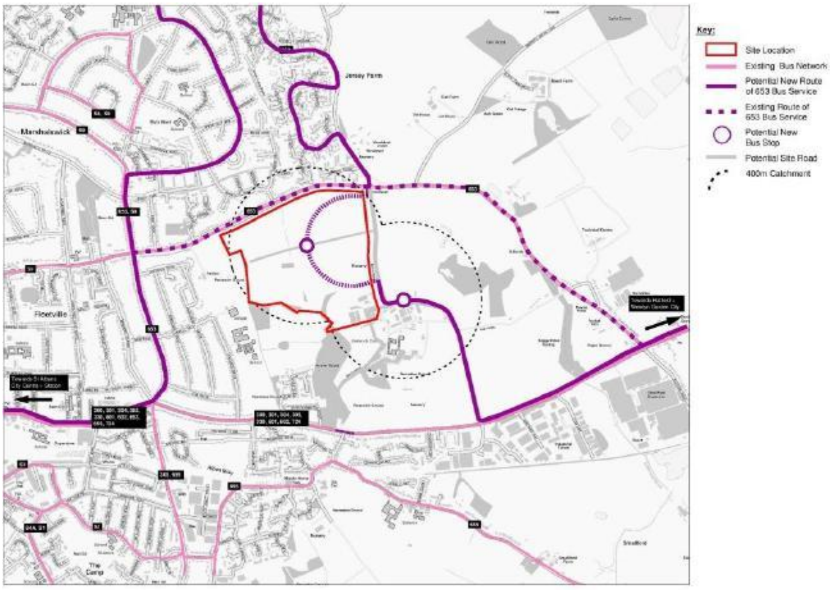


Figure 14: Potential diversion of 601 and 602 Bus Services

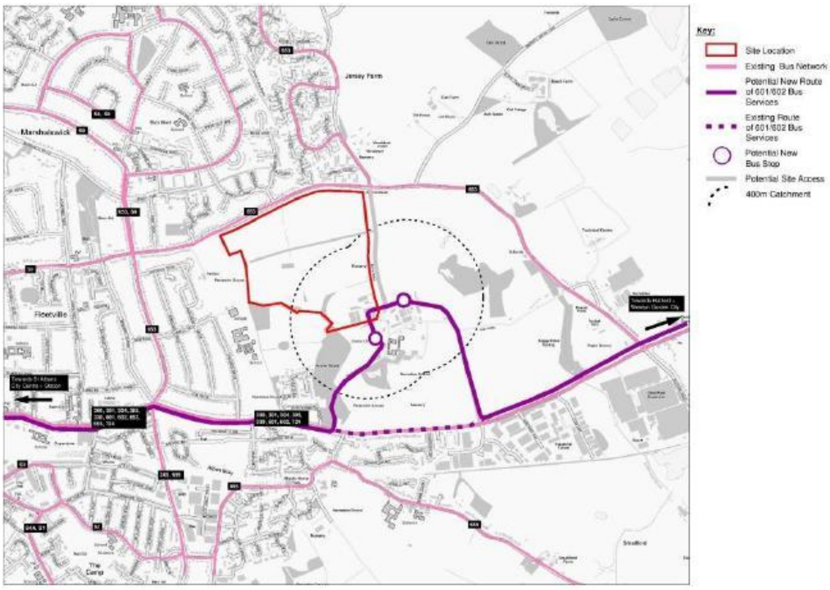
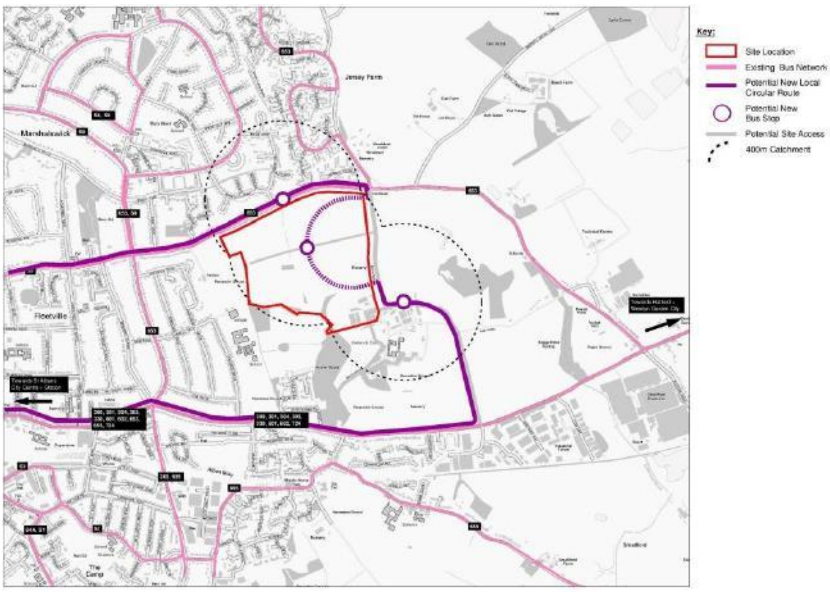


Figure 15: Potential new circular route



Highway Strategy

03

Highway Strategy: Vehicle Trip Generation

An initial high-level trip generation and distribution exercise has been carried out to determine the potential number of car trips that would be generated by a development of 1,000 residential units and the potential implications of this traffic on the surrounding local road network.

The private and affordable residential vehicular trip rates underpinning the planning application for the initial phase of the residential development have been used as the basis for this initial assessment.

The emerging masterplan includes an aspiration to provide 40% affordable housing, which is typically a lower traffic generator than private housing.

As the masterplan also includes a new two form primary school, it is expected that the majority of primary school aged children living within the residential development would attend this new school and therefore would not need to leave the development. These education trips have therefore been discounted in the trip generation calculations.

The emerging masterplan also envisages a small number of affordable units specifically targeted at College staff and students. It is expected that these units would generate very few external vehicular trips in the peak hours and therefore these trips have also been discounted in the trip generation calculations.

Table 1 summarises the estimated peak hour vehicular trip generation for the full allocation of 1,000 residential units.

Table 1: Initial Peak Hour Vehicular Trip Generation Estimates

	AM Peak (0800-0900)			PM Peak (1700-1800)		
Housing Type	**Arr**	**Dep**	**2-Way**	**Arr**	**Dep**	**2-Way**
Private	65	178	243	234	141	375
Affordable	16	61	78	107	68	174
Total Vehicle Trips	**81**	**239**	**320**	**341**	**208**	**549**

Highway Strategy: Initial Impact Assessment

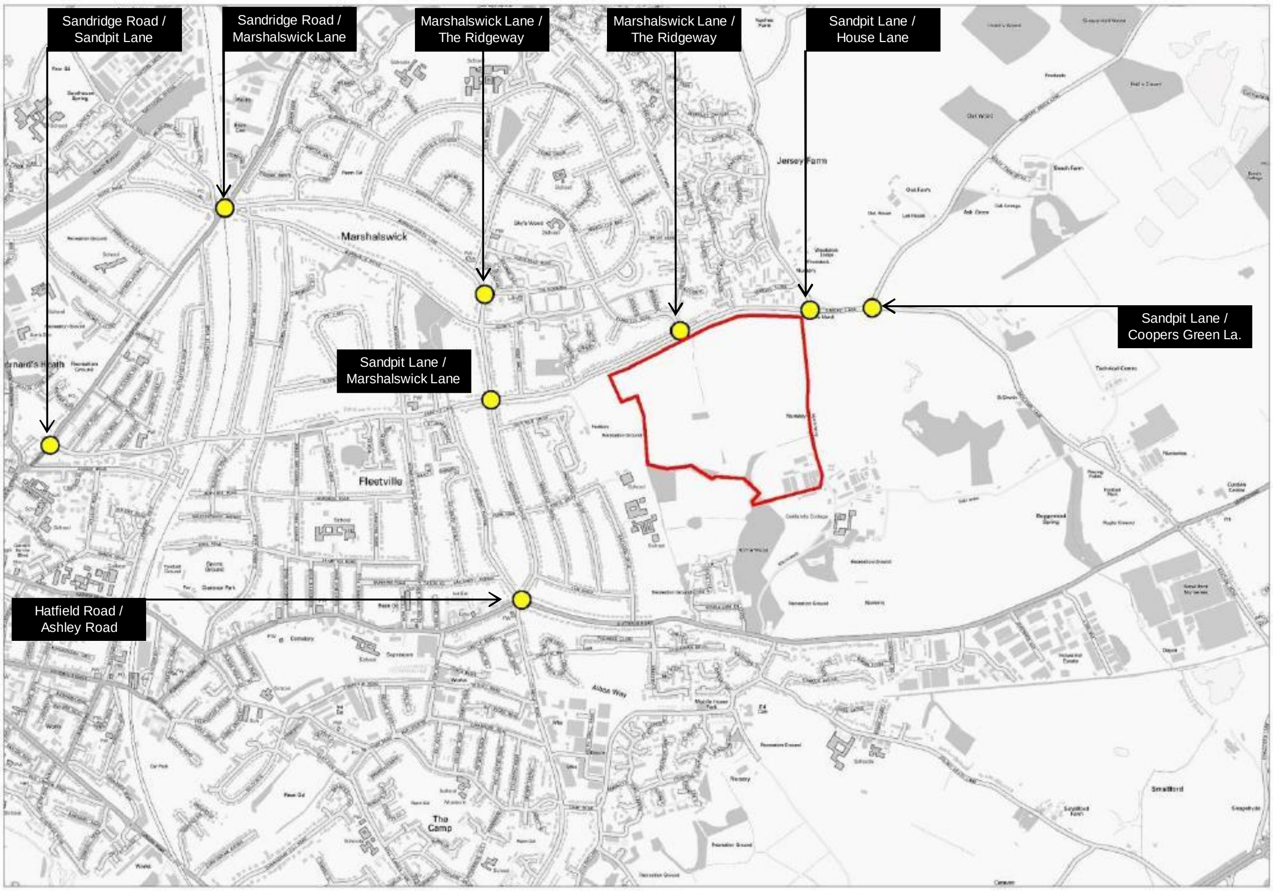
Vehicular trips have been assigned to the local highway network using the same distribution assumptions as used in the planning application for the initial phase of the residential development. The resultant development flows have been compared with future traffic forecasts in 2021 to determine the potential implications of the residential development on the surrounding local road network.

Figure 16 shows the junctions where traffic flows would be likely to increase by 5% or more in either the morning or evening peak hour as a result of the full residential development.

The largest increase in traffic flows is forecast to occur at the Marshalswick Lane/Sandpit Lane junction as the majority of the traffic from the residential development would be expected to pass through this junction. Significant traffic increases are also anticipated on Sandpit Lane at the junctions with Barnfield Road and House Lane, while there is potential for traffic flows to increase by more than 5% in the following locations:

- Marshalswick Lane/The Ridgeway (mini-roundabout);
- Sandridge Road/Sandpit Lane (priority T-junction); and
- Hatfield Road/Beechwood Avenue/Ashley Road (double mini-roundabout)

Figure 16: Initial Assessment of Impact in 2021



Highway Strategy: Off-Site Mitigation

The initial assessment of the potential development impacts suggests that a number of junctions in the local area may require improvement to accommodate the forecast levels of traffic associated with a residential development of 1,000 units. Consideration has therefore been given to the potential nature of the improvements that may be required at key off-site junctions.

Sandpit Lane/Marshalswick Lane Junction

Improvements to this junction were put forward as part of the planning application submitted for the initial phase of the residential development to provide additional capacity to accommodate the extra traffic generated by the development. The proposed improvements included removal of the existing pedestrian refuges and widening of the western and southern approaches to improve the overall throughput of the junction.

In order to accommodate the additional traffic that would be generated by a larger housing allocation, further improvements at this junction would be required. Two preliminary options have been considered for this junction.

The first option builds upon the improvements that are proposed as part of the initial phase of the residential development. It would involve widening the eastern approach to the existing junction to provide two lanes in the westbound direction and potentially banning the right turn movement from Marshalswick Lane (north) into Sandpit Lane (west).

The second option would involve replacing the existing signalised junction with a compact roundabout. Peak hour traffic flows on all four arms of the junction are relatively balanced, so a roundabout solution may improve traffic flow compared with the existing traffic signals. However, consideration would also need to be given to the impacts of a roundabout pedestrians and cyclists.

Initial concept designs have been developed for both options (see **Figure 17** and **Figure 18**), which indicate that the improvements could be delivered within the available highway land. However, both options would result in the loss of verges and some mature trees.

Initial junction assessments suggest that both of these options have potential to achieve nil-detriment (i.e. traffic conditions that are no worse with the development than if it did not go ahead). This indicates that the impact of the development on this junction can be overcome with careful mitigation, although further design and detailed modelling would need to be undertaken to confirm the most appropriate solution.

Figure 17: Sandpit Lane/Marshalswick Lane Junction (Indicative Layout – Signalised Junction Option)

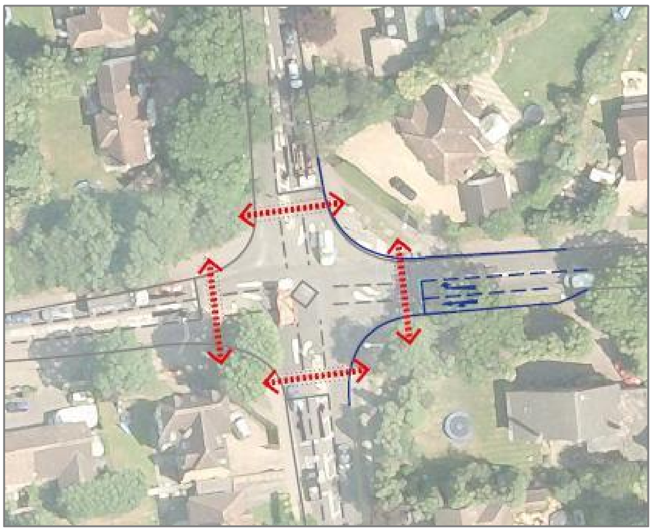
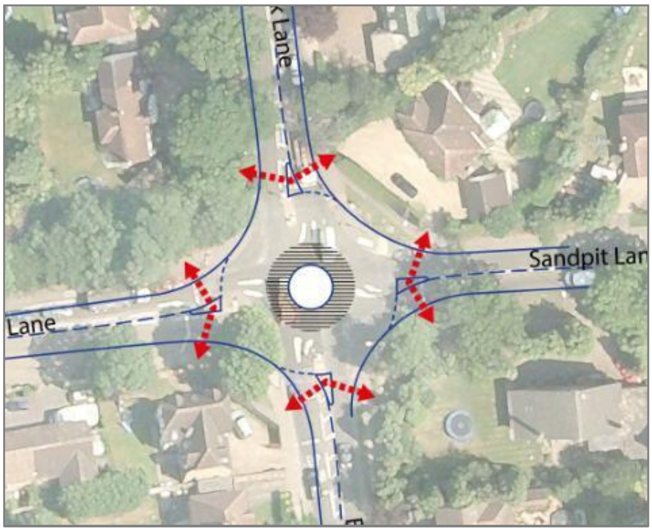


Figure 18: Sandpit Lane/Marshalswick Lane Junction (Indicative Layout – Compact Roundabout Option)



Sandpit Lane/House Lane Junction

As discussed earlier in this document, it is proposed that existing roundabout at the junction of Sandpit Lane and House Lane would be enlarged to accommodate an additional arm serving the residential development and also to provide increased capacity for the additional development traffic that would use this junction.

Sandpit Lane/Coopers Green Lane Junction

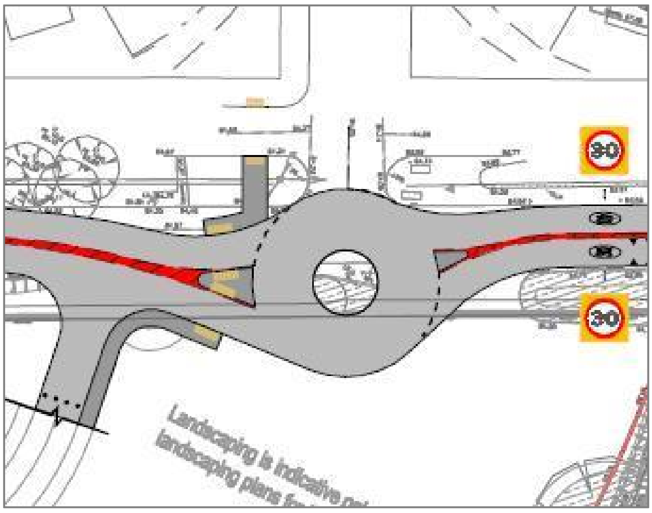
Improvements would also be required at the junction of Sandpit Lane and Coopers Green Lane to accommodate the additional development traffic and improve the existing layout. The potential improvements could include enlarging the existing roundabout within the available highway land to provide additional capacity and increasing deflection to slow approach speeds and improve safety. An indicative junction layout is shown in **Figure 19**, although this would require further design and detailed modelling to determine the appropriate geometry.

Figure 19: Sandpit Lane/Coopers Green Lane Junction (Indicative Layout)

Sandpit Lane/Barnfield Road Junction

The highway proposals associated with the initial phase of the residential development included conversion of the Sandpit Lane/ Barnfield Road junction from a priority T-junction into a compact roundabout in order to help enforce the proposed reduction in speed limit on Sandpit Lane to 30mph. The proposed layout is shown **Figure 20**.

Figure 20: Sandpit Lane/Barnfield Road Junction (Proposed Layout)



Sandpit Lane/Damson Way Junction

In order to further reduce vehicle speeds on Sandpit Lane the highway proposals associated initial phase of the residential development also included minor alterations to the junction with Damson Way, including moving the give-way line to improve visibility on the minor arm and introducing a traffic island to the west of the junction.

Need for Additional Mitigation

There are a number of other junctions where traffic flows are predicted to increase as a result of the development. A detailed Transport Assessment would need to be undertaken to determine the extent of the development impacts in these locations, with further work required to determine whether mitigation is required and the nature of the potential interventions.

Demand Management

Any future development would be supported by detailed Travel Plans, which set out the measures and initiatives that would be implemented to promote sustainable modes of transport and reduce the reliance on car travel.

The College already has a comprehensive Travel Plan that includes a wide range of measures to promote walking, cycling and bus travel, including discounted bus travel and improvements to the existing bus stops on Hatfield Road.

A similar document would be prepared for the residential development, which would detail the measures that would be implemented to encourage sustainable travel behavior and deter unnecessary car use.

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Summary

04

Summary

The emerging masterplan for Oaklands College's envisions a high quality and sustainable residential development of 1,000 units on land to the north of the existing College development. A high proportion of this housing would be affordable tenure (42%) and it would include some College specific housing.

In addition to the proposed housing, the masterplan also includes allowance for a new primary school which would serve the needs of the development and help to reduce the travel demand generated by the development, particularly during the morning peak period.

From a transport perspective, the masterplan includes a range of potential transport interventions, including:

- A new entrance to the College on Hatfield Road that would reduce the amount of traffic using South Drive, thereby facilitating improvements to arrangements for pedestrians and cyclists on this busy part of the road network;
- Two new vehicular accesses on Sandpit Lane combined with additional emergency accesses to serve the proposed residential development. All new accesses would also incorporate provision for pedestrians and cyclists;
- Improvements to the existing network of footpaths and bridleways that cross the site supported by a network of new pedestrian and cycle routes that enhance access to the campus from Sandpit Lane to the north and Hatfield Road to the south as well as ensuring interconnectivity between the College and residential developments;
- Enhancements to existing walking and cycling routes to the north and south of the site to link the campus into the surrounding network of walking and cycling routes including the Alban Way;
- A new road link across the site that links Sandpit Lane and Hatfield Road, opening up opportunities for significantly improved bus access to both the College and residential developments;
- A range of improvements to existing junctions in the immediate vicinity of the site to improve safety and provide increased capacity to accommodate the additional traffic movements that could be generated by the residential development.

The proposed transport interventions would significantly enhance access to the College's St Albans Campus, while also putting in place the transport infrastructure required to support a major residential development in East St Albans.

It is considered that there are no fundamental transport issues associated with the emerging masterplan that could not be overcome through careful planning and considerate design combined with the provision of an appropriate package of sustainable transport proposals, demand management measures and on- and off-site highway improvement schemes.

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“The Oaklands Masterplan provides a once in a generation opportunity to establish a community which can offer a wide range of benefits and opportunity to its residents that at its heart is focused on education and the improvement of lives.”

Oaklands College Strategic Local Plan Submission

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Contact
John Webber
Associate Director
T +44 (0)1727 535779
E john.d.webber@aecom.com

Ross Westwood
Senior Project Surveyor
T +44 (0)20 7061 7581
E ross.westwood@aecom.com

Appendix 11: AECOM St Albans East Initial Assessment of Highway Impacts March 2016

Strategic Local Plan: St Albans East (Oaklands)

Initial Assessment of Highway Impacts

Prepared on behalf of Oaklands College and Taylor Wimpey North Thames

March 2016

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Contents

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Oaklands College Strategic Local Plan Submission

Oaklands College Masterplan

01

01 Introduction & Background

Draft Strategic Local Plan

The draft Strategic Local Plan (SLP) produced by St Albans City and District Council (SACDC) covers the period 2011-2031 and includes the potential release of Green Belt land in East St Albans (Oaklands) for a residential development of 1,000 units.

Oaklands College's vision is to create an exemplar high quality residential development of approximately 1,000 units on land to the north of the existing College development. A planning application for an initial phase of approximately 350 residential units has already been submitted to SACDC (Application reference 5/2013/2589). This is an enabling development, the receipts of which would fund improvements to the College facilities.

Background

As part of the ongoing consultation process for the draft SLP, SACDC invited landowners/promoters to submit their vision for the development sites allocated within the draft SLP. An initial masterplan for the Oaklands College site was developed and submitted to SACDC in November 2015. The area covered by the masterplan is shown in Figure 1.1 below.

Following submission of the masterplan document, an emerging transport strategy for the East St Albans (Oaklands) allocation was submitted to SACDC in February 2016, which outlined a potential access strategy for all modes of transport and a range of potential on- and off-site improvements designed to improve the accessibility of the site on foot, by cycle and by public transport as well as identifying the nature of potential off-site highway mitigation measures. The emerging access strategy is illustrated in Figure 1.2

Purpose of this Report

This report builds upon the information set out in the emerging transport strategy document. It sets out initial trip generation forecasts for the full allocation of 1,000 units and goes on to assess the impact that this level of development is likely to have on the key junctions surrounding the Oaklands College site. It goes on to consider the potential nature of junction improvements that may be required to accommodate the additional traffic that would be generated by the full allocation.

Figure 1.1: Oaklands College Masterplan Area

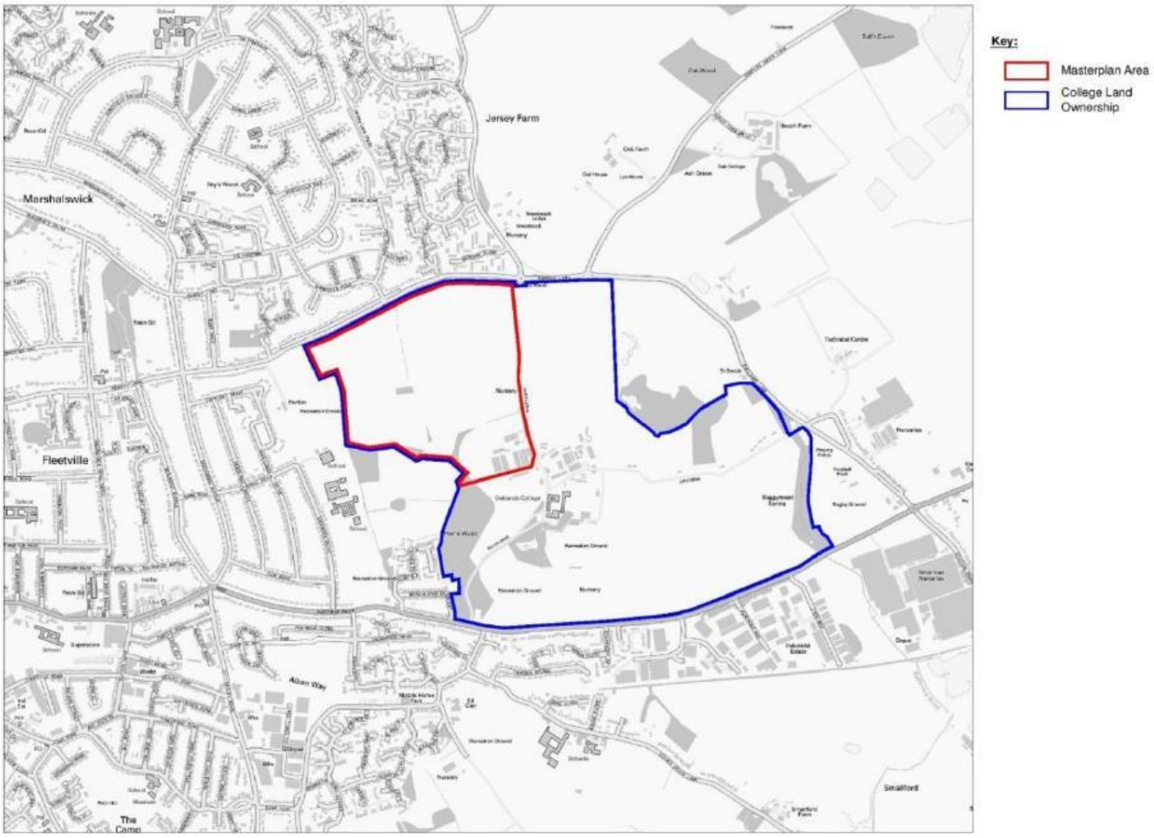
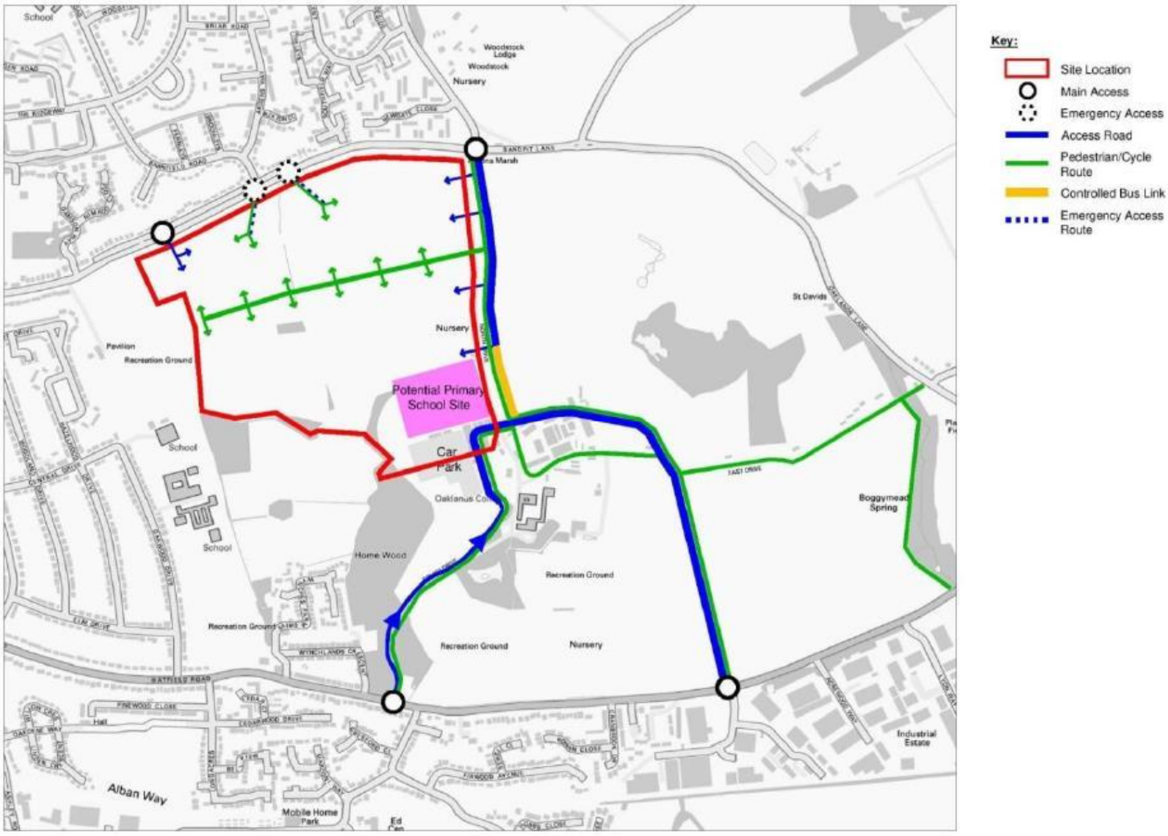


Figure 1.2: Emerging Access Strategy



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Trip Generation Forecasts

02

02 Trip Generation Forecasts

Development Quantum

The draft SLP indicates that the East St Albans (Oaklands) site could accommodate 1,000 dwellings. As noted above a planning application for an initial phase of approximately 350 units has already been submitted to SACDC.

The College's emerging masterplan includes an aspiration to provide 42% affordable housing across the whole site, which is typically a lower traffic generator than private housing. This includes a small number of affordable units specifically for College staff and students.

Table 2.1 below summarises the proposed quantum of development by phase. It is envisaged that the development would comprise a mixture of unit types, ranging from 1 and 2-bed flats to 5-bed houses.

Table 2.1: Indicative Quantum of Development

Housing Type	Initial Phase	Later Phases	Total
Private	227	357	584
Affordable (General)	123	273	396
Affordable (College)	0	20	20
Total	**350**	**650**	**1,000**
% Affordable	**35%**	**45%**	**42%**

Vehicle Trip Rates

The private and affordable residential vehicular trip rates underpinning the planning application for the initial phase of the masterplan have been used as the basis for this assessment.

The trip rates applied reflect the anticipated mix of tenures and unit types. As the masterplan includes a small number of affordable units for use by the College it is expected that these units would generate very few if any vehicular trips in the peak hours and therefore for the purposes of this initial assessment the trip rates for these units have been set to zero.

Table 2.2 below summarises the peak hour vehicle trip rates for private, affordable and College accommodation.

Table 2.2: Peak Hour Vehicular Trip Rates

	AM Peak (0800-0900)			PM Peak (1700-1800)		
Housing Type	**Arr**	**Dep**	**2-Way**	**Arr**	**Dep**	**2-Way**
Private	0.153	0.418	0.5711	0.410	0.246	0.656
Affordable (General)	0.056	0.214	0.270	0.276	0.175	0.451
Affordable (College)	**0.000**	**0.000**	**0.000**	**0.000**	**0.00**	**0.000**

Initial Vehicular Trip Generation Forecasts

In order to calculate the vehicular trip generation for the site, the vehicular trip rates in Table 2.2 have been applied to the indicative housing mix in Table 2.1. Table 2.3 below summarises the peak hour vehicular trip generation forecasts for the initial and later phases of the masterplan.

Table 2.3: Indicative Peak Hour Vehicular Trip Generation

	AM Peak (0800-0900)			PM Peak (1700-1800)		
Housing Type	**Arr**	**Dep**	**2-Way**	**Arr**	**Dep**	**2-Way**
Initial Phase (350 units)						
Private	35	95	130	93	56	149
Affordable (General)	7	26	33	34	21	55
Affordable (College)	0	0	0	0	0	0
Total	**42**	**121**	**163**	**127**	**77**	**204**
Later Phases (650 units)						
Private	55	149	204	147	88	235
Affordable (General)	15	58	74	75	48	123
Affordable (College)	0	0	0	0	0	0
Total	**70**	**208**	**278**	**222**	**136**	**358**
Combined (1,000 units)						
Private	90	245	334	240	144	384
Affordable (General)	22	85	107	109	69	178
Affordable (College)	0	0	0	0	0	0
Total	**112**	**329**	**441**	**349**	**213**	**562**

Internalisation of Primary School Trips

The masterplan includes a new two form of entry (2FE) primary school and therefore it is expected that all of the primary school aged pupils living within the site would attend this new school. The vehicular trip rates include education and education escort trips and therefore these trips have been discounted from the trip generation forecasts.

In order to calculate the proportion of education trips relating to primary school students, data from the National Travel Survey (September 2015) and 2011 Census have been used. The NTS indicates that in the morning (0800-0900) 50% of weekday trips are classified as 'Education' or 'Education Escort', while in the evening (1700-1800) only 4% of trips are education related.

Population age data has been extracted from the 2011 Census for the Lower Super Output Area (LSOA) around the Oaklands site (St Albans 015D). This indicates that there were 250 people of school age (5-16 years old) in this LSOA in 2011, of which 137 (55%) were of primary school age (age 5-10 old) and 113 (45%) are of secondary school age (11-16 years old).

The reduction in vehicle trips has been calculated by applying the proportion of education and education escort trips (50% in morning, 4% in evening) to the percentage of primary school age pupils (55%). Table 2.4 summarises the peak hour reduction that has been applied to the vehicle trip generation forecasts in Table 2.3 above.

Table 2.4: Primary School Reduction

	AM Peak (0800-0900)	PM Peak (1700-1800)
% Education Trips	50%	4%
Primary Age	55%	55%
Trip Rate Reduction	**27%**	**2%**

Adjusted Vehicular Trip Generation Forecasts

Table 2.5 below summarises the resultant peak hour vehicular trip generation forecasts for the site which have been adjusted to remove the internal trips to and from primary school.

Table 2.5: Adjusted Peak Hour Vehicular Trip Generation

	AM Peak (0800-0900)			PM Peak (1700-1800)		
Housing Type	**Arr**	**Dep**	**2-Way**	**Arr**	**Dep**	**2-Way**
Initial Phase (350 units)						
Private	25	69	94	91	55	146
Affordable (General)	5	19	24	33	21	54
Affordable (College)	0	0	0	0	0	0
Total	**30**	**88**	**118**	**124**	**76**	**200**
Later Phases (650 units)						
Private	40	109	148	143	86	229
Affordable (General)	11	42	54	74	47	120
Affordable (College)	0	0	0	0	0	0
Total	**51**	**151**	**202**	**217**	**133**	**349**
Combined (1,000 units)						
Private	65	178	243	234	141	375
Affordable (General)	16	61	78	107	68	174
Affordable (College)	0	0	0	0	0	0
Total	**81**	**239**	**320**	**341**	**208**	**549**

Future Traffic Forecasts

03

03 Future Traffic Forecasts

Baseline Traffic Data

Traffic surveys undertaken as part of the work underpinning the planning application for the initial phase of the masterplan have been used as the basis for assessing the potential impacts of a development of 1,000 homes on the Oaklands College site.

A set of manual classified turning counts (MCTCs) were undertaken between 0700 and 1900 on Wednesday 28 November 2012 at the following junctions.

- A1057 Hatfield Road / Colney Heath Lane / South Drive;
- Sandpit Lane / Beechwood Avenue / Marshalswick Lane;
- Sandpit Lane / House Lane; and
- Sandpit Lane / Coopers Green Lane / Oaklands Lane.

Future Base Traffic Flows

The draft SLP covers the period up to 2031, therefore for the purpose of this exercise growth factors covering the period 2012-2031 have been applied to the base traffic surveys to produce initial forecasts of future base traffic flows in 2031.

HCC is currently developing a Countywide Transport Model (COMET) which will provide a platform to test strategic mitigation measures and growth scenarios across Hertfordshire. This model will feed into the emerging HCC 'Transport Vision' (a successor to Local Transport Plan 3), which will then identify packages of transport interventions to enable growth across the county to 2050. COMET is considered to be the best source of future traffic growth forecasts, however the COMET model is still under development and is not due to be available to test options until later in the year.

As data from the COMET model is currently unavailable, a number of alternative data sources of traffic growth factors have been analysed including:

- TEMPRO;
- DfT Annual Average Daily Flow; and
- DIAMOND.

The TEMPRO 6.2 database with dataset 62 has been used to forecast background traffic growth in St Albans (26UG2) over the period from 2012 to 2030 based on the National Trip End Model (NTEM) and local planning data. The TEMPRO factor for the morning peak period (0700-1000) is 1.2431 while the factor for the evening peak period (1600-1900) is 1.2365.

The DfT hold annual traffic data figures for A-roads in Hertfordshire covering the period from 2000 to 2014. Annual Average Daily Flow (AADF) figures are provided for a number of sites in St Albans. For the purpose of this exercise, two sites on Hatfield Road were chosen; the first is located at the junction with Lyon Way (site 7074) and the second is located at the junction with Clarence Road (site 78321). The growth in traffic between 2012 and 2014 on the Lyon Way site was 1.026 while growth on the Clarence Road site was 1.028. As these sites have very similar levels of growth, an average of the two values has been taken (1.027).

DIAMOND (Development Impact Assessment Model of Network Demand) is a model that has been jointly developed by AECOM and the Highways Agency to assess the traffic impact of proposed growth. There are several instances of DIAMOND covering different areas of the UK. The work undertaken for the initial phase of the Oaklands development is based on the Hertfordshire DIAMOND model. Base year traffic forecasts from DIAMOND for the roads in the immediate vicinity of the site have been analysed for the period from 2012 to 2021. The growth factor in the morning peak hour is 1.099 while the factor for the evening peak hour is 1.117.

Table 3.1 summarises the different sources of traffic growth factors discussed above and converts them to average annual growth factors to allow direct comparison. For the purposes of this assessment the highest of these annual growth factors has been used for forecast potential future traffic levels, as this represents a worst case scenario.

Table 3.1: Traffic Growth Factors

Source	Annual Growth Factors	
	AM Peak (0800-0900)	PM Peak (1700-1800)
TEMPRO	1.0122	1.0119
DfT	1.0135	1.0135
DIAMOND	1.0106	1.0124
Maximum	**1.0135**	**1.035**

Traffic Distribution from Masterplan Site

Vehicular trips have been assigned to the local highway network using the same distribution assumptions as used in the planning application for the initial phase of the residential development. Table 3.2 below summarises the assignment of masterplan site traffic by time period.

Table 3.2: Distribution of Traffic from Masterplan Site

Route	Corridor	AM Peak (0800-0900)		PM Peak (1700-1800)	
		Arr	Dep	Arr	Dep
St Albans	Sandpit Lane	29%	24%	39%	29%
	Hatfield Road (W)	9%	10%	7%	1%
	Marshalswick Lane	10%	22%	14%	12%
	Ashley Road	4%	10%	3%	0%
	Colney Heath Lane	9%	16%	9%	33%
	House Lane	2%	0%	0%	0%
	Barnfield Road	0%	0%	0%	0%
	The Ridgeway	0%	0%	0%	0%
	Sub-Total	**63%**	**83%**	**72%**	**76%**
Hatfield	Hatfield Road (E)	12%	8%	17%	15%
	Station Road	15%	0%	10%	0%
	Sub-Total	**28%**	**8%**	**27%**	**15%**
Welwyn Garden City	Coopers Green Lane	9%	9%	2%	9%
	Sub-Total	**9%**	**9%**	**2%**	**9%**
Total		**100%**	**100%**	**100%**	**100%**

Table 4.2 indicates that the majority of traffic generated by the site is forecast to use the Sandpit Lane, Marshalswick Lane and Hatfield Road corridors in both the morning and evening peak hours.

Future Base + Development Traffic Flows

Traffic flows for the 2031 'Future Base + Development' scenario have been derived from combining the traffic flows associated with the full allocation (1,000 units) with the 2031 'Future Base' traffic flows.

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Development Impacts

04

04 Development Impacts

Initial Assessment of Impact

As discussed above, runs from the COMET model are currently unavailable and therefore for the purposes of this assessment detailed junction analysis has only been undertaken for the junctions assessed as part of the planning application for the initial phase of the residential development.

Table 4.1 below summarises the impact that the additional traffic is likely to have on each of these junctions in terms of overall traffic volumes in 2031 with and without the traffic generated by the Oaklands masterplan. For the avoidance of doubt, the future base traffic forecasts assume that no development has taken place on the Oaklands College site and therefore do not include any development traffic associated with the Oaklands masterplan.

Table 4.1: Impact of Masterplan Traffic on Total Junction Flows

Junction	Base (2012)	Future Base (2031)	Future Base+Dev (2031)	Impact
AM Peak (0800-0900)				
Sandpit Lane/House Lane	2,325	2,356	2,584	+10%
Sandpit Lane/Coopers Green Lane	2,281	2,312	2,380	+3%
Sandpit Lane/Marshalswick Lane	2,446	2,479	2,729	+10%
Hatfield Road/Colney Heath Lane	1,885	1,911	1,854	-3%
PM Peak (1700-1800)				
Sandpit Lane/House Lane	1,944	1,970	2,372	+20%
Sandpit Lane/Coopers Green Lane	1,765	1,789	1,931	+8%
Sandpit Lane/Marshalswick Lane	2,391	2,423	2,830	+17%
Hatfield Road/Colney Heath Lane	1,646	1,668	1,677	+1%

Sandpit Lane/House Lane and Sandpit Lane/Marshalswick Lane junctions are forecast to experience the largest change in overall traffic flows, with potential for increases in traffic of up to 20%. The Sandpit Lane/Coopers Green Lane junction is forecast to experience lower levels of growth at around 3-8%, while traffic flows are forecast to marginally reduce at the Hatfield Road/Colney Heath Lane junction due to the reassignment of College traffic associated with the proposed new access junction further to the east on Hatfield Road at the junction with Alban Park.

Further assessment of the potential impacts of the masterplan traffic on the wider road network would need to be undertaken once traffic forecasts from the initial COMET runs become available

Performance of Existing Junctions

Junction capacity assessments have been undertaken for the 2031 'Future Base' and 2031 'Future Base + Development' scenarios in the morning and evening peak hours. Traffic flows have been input into models of the existing junctions prepared as part of the Transport Assessment submitted with the planning application for the initial phase of the masterplan. For reference the geometry underpinning the existing junction assessments is included in Appendix A.

The performance of each junction has been assessed by comparing the forecast ratio of flow to capacity (RFC) or degree of saturation (DoS) and forecast queue lengths on each of the approach arms in the 2031 'Future Base' (i.e. without the additional masterplan traffic)and 'Future Base + Development' (i.e. with the additional masterplan traffic) scenarios.

Sandpit Lane/House Lane

The operational performance of the Sandpit Lane/House Lane junction has been assessed using ARCADY6 software, which is the industry standard for predicting capacities, queues and delays at priority controlled roundabouts. The results of the junction capacity assessments presented in Table 4.2 below.

Table 4.2: Summary of Junction Capacity Assessments: Sandpit Lane/House Lane

Junction	2031 Future Base (Existing Layout)	
	Max RFC (%)	Queue (Vehs)
AM Peak (0800-0900)		
House Lane	78%	3
Sandpit Lane (E)	75%	3
Sandpit Lane (W)	107%	46
Max RFC / Queue	**107%**	**46**
PM Peak (1700-1800)		
House Lane	28%	0
Sandpit Lane (E)	91%	8
Sandpit Lane (W)	88%	6
Max RFC / Queue	**91%**	**8**

The results indicate that in the 2031 'Future Base' scenario, the junction is forecast to operate in excess of capacity in the morning peak hour with a maximum RFC of 107% and a maximum queue of 46 vehicles on Sandpit Lane (W). In the evening peak hour the junction is forecast to operate within capacity with a maximum RFC of 91% and a maximum queue of 8 vehicles on Sandpit Lane (E).

The performance of the existing junction in the 2031 'Future Base + Development' scenario has not been assessed as it is proposed to add a fourth arm to the junction to serve the masterplan site.

Sandpit Lane/Coopers Green Lane

The operational performance of the Sandpit Lane/Coopers Green Lane junction has been assessed using ARCADY6 software, which is the industry standard for predicting capacities, queues and delays at priority controlled roundabouts. Table 4.3 summarises the results of the 2031 'Future Base' and 2031 'Future Base + Development' junction capacity assessments

Table 4.3: Summary of Junction Capacity Assessments: Sandpit Lane/Coopers Green Lane

Junction	2031 Future Base (Existing Layout)		2031 Future Base+Dev (Existing Layout)		Development Impact	
	Max RFC (%)	Queue (Vehs)	Max RFC (%)	Queue (Vehs)	Max RFC (%)	Queue (Vehs)
AM Peak (0800-0900)						
Coopers Green Lane	100%	17	102%	21	+2%	+4
Oaklands Lane	51%	1	53%	1	+2%	-
Sandpit Lane (W)	97%	17	100%	27	+3%	+10
Max RFC / Queue	**100%**	**17**	**102%**	**27**	**+2%**	**+10**
PM Peak (1700-1800)						
Coopers Green Lane	83%	5	86%	5	+3%	-
Oaklands Lane	67%	2	80%	4	+13%	+2
Sandpit Lane (W)	49%	1	53%	1	+4%	-
Max RFC / Queue	**83%**	**5**	**86%**	**5**	**+3%**	**-**

The results indicate that in the 2031 'Future Base' scenario, the junction is forecast to operate at capacity in the morning peak hour but well within capacity in the evening peak hour. In the morning peak hour the junction is forecast to operate with a maximum RFC of 100% and a maximum queue of 17 vehicles on the Coopers Green Lane approach while in the evening peak hour the junction is forecast to operate with a maximum RFC of 83% and a maximum queue of 5 vehicles on the Coopers Green Lane approach.

In the 2031 'Future Base + Development' scenario, the junction is forecast to operate marginally in excess of capacity in the morning peak hour, with a maximum RFC of 102% and a maximum queue of 21 vehicles on the Coopers Green Lane approach. In the evening peak hour the junction is forecast to continue to operate within capacity with a maximum RFC of 86% and a maximum queue of 5 vehicles on the Coopers Green Lane approach.

Sandpit Lane/Marshalswick Lane

The operational performance of the Sandpit Lane/Marshalswick Lane junction has been assessed using LINSIG V3 software, which is the industry standard for predicting capacities, queues and delays at signalised junctions. Table 4.4 summarises the results of the 2031 'Future Base' and 2031 'Future Base + Development' junction capacity assessments.

Table 4.4: Summary of Junction Capacity Assessments: Sandpit Lane/Marshalswick Lane

Junction	2031 Future Base (Existing Layout)		2031 Future Base+Dev (Existing Layout)		Development Impact	
	Max DoS (%)	Queue (Vehs)	Max DoS (%)	Queue (Vehs)	Max DoS (%)	Queue (Vehs)
AM Peak (0800-0900)						
Marshalswick Lane	121%	38	142%	98	+21%	+60
Sandpit Lane (E)	133%	94	141%	143	+8%	+49
Beechwood Avenue	128%	32	157%	73	+29%	+41
Sandpit Lane (W)	124%	84	102%	34	-22%	-50
Max DoS / Queue	**133%**	**94**	**157%**	**143**	**+24%**	**+49**
PM Peak (1700-1800)						
Marshalswick Lane	100%	19	90%	20	+59%	+1
Sandpit Lane (E)	130%	88	189%	207	+59%	+119
Beechwood Avenue	111%	31	170%	157	+59%	+126
Sandpit Lane (W)	124%	83	170%	190	+46%	+107
Max DoS / Queue	**130%**	**88**	**189%**	**207**	**+59%**	**+119**

The results indicate that in the 2031'Future Base' scenario, the junction is forecast to operate significantly above capacity in both the morning and evening peak hours. In the morning peak hour the junction is forecast to operate with a maximum DoS of 133% and a mean maximum queue of 94 vehicles on the Sandpit Lane (E) approach. In the evening peak hour the junction is forecast to operate with a maximum DoS of 130% and a mean maximum queue of 88 vehicles on the Sandpit Lane (E) approach.

In the 2031 'Future Base + Development' scenario, the junction is forecast to continue to operate significantly in excess of capacity in both the morning and evening peak hours. In the morning peak hour the junction is forecast to operate with a maximum DoS of 157% on the Beechwood Avenue approach and a mean maximum queue of 143 vehicles on the Sandpit Lane (E) approach. In the evening peak hour the junction is forecast to operate with a maximum DoS of 189% and a mean maximum queue of 207 vehicles on the Sandpit Lane (E) approach.

Hatfield Road/Colney Heath Lane

The operational performance of the Hatfield Road/Colney Heath Lane junction has been assessed using PICADY5 software, which is the industry standard for predicting capacities, queues and delays at priority controlled junctions. Traffic flows have been input into a model of the existing junction. Table 3.5 summarises the results of the 2031 'Future Base' and 2031 'Future Base + Development' junction capacity assessments.

Table 3.5: Summary of Junction Capacity Assessments: Hatfield Road/Colney Heath Lane

Junction		2031 Future Base (Existing Layout)		2031 Future Base+Dev (Existing Layout)		Development Impact	
		Max RFC (%)	Queue (Vehs)	Max RFC (%)	Queue (Vehs)	Max RFC (%)	Queue (Vehs)
AM Peak (0800-0900)							
Colney Heath Lane	L	127%	49	148%	52	+21%	+3
	R	124%	19	149%	66	+25%	+47
Hatfield Road (W)	A+R	50%	1	48%	1	-2%	-
Max RFC / Queue		**127%**	**49**	**149%**	**66**	**+22%**	**+17**
PM Peak (1700-1800)							
Colney Heath Lane	L	61%	1	71%	2	+10%	+1
	R	51%	1	78%	3	+27%	+2
Hatfield Road (W)	A+R	48%	1	54%	1	+6%	-
Max RFC / Queue		**61%**	**1**	**78%**	**3**	**+17%**	**+2**

The results indicate that in the 2031 'Future Base' scenario, the junction is forecast to operate in excess of capacity in the morning peak hour, with a maximum RFC of 127% and a maximum queue of 49 vehicles on the left turn out of Colney Heath Lane. In the evening peak hour the junction is forecast to operate well within capacity with a maximum RFC of 61% and a maximum queue of 1 vehicle on the left turn movement out of Colney Heath Lane.

The College's development proposals are only expected to result in a small change in the overall volume of traffic forecast to use the Colney Heath Lane/Hatfield Road junction. However, as the College development proposals potentially include a new access at the Alban Park junction, with access to South Drive restricted to visitors and taxis only, there is expected be some localised reassignment of traffic which would change the turning proportions at this junction. For the purpose of this assessment it is assumed that only 20% of traffic from Hatfield Road (W) would continue to access the College via South Drive.

With the re-assigned 2031 'Future Base + Development' traffic flows, the junction is forecast to continue to operate significantly above capacity in the morning peak hour with a maximum RFC of 149% and a maximum queue of 66 vehicles on the right turn from Colney Heath Lane. In the evening peak hour the junction is forecast to continue to operate well within capacity with a maximum RFC of 78% and a maximum queue of 3 vehicles on the right turn movement from Colney Heath Lane.

Potential Highway Improvements

05

05 Potential Highway Improvements

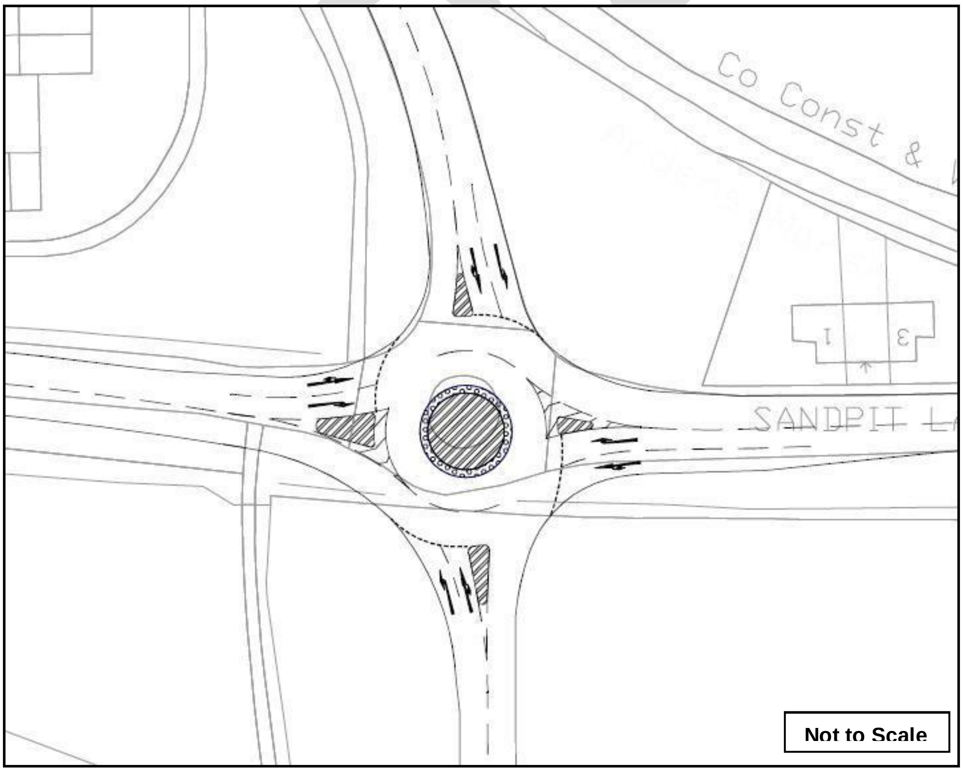
Introduction

The initial impact assessment suggests that a number of junctions in the local area may require improvement to accommodate the forecast levels of traffic associated with a residential development of 1,000 units. Consideration has therefore been given to the potential nature of the improvements that may be required at key off-site junctions.

Sandpit Lane/House Lane

It is envisaged that the existing roundabout at the junction of Sandpit Lane and House Lane would be enlarged to accommodate a southern arm serving the Oaklands residential development and also to provide increased capacity for the additional development traffic that would use this junction. The preliminary layout is shown in Figure 3.1 below.

Figure 3.1: Preliminary Layout of Sandpit Lane/House Lane Junction



The operational performance of the preliminary design layout above has been assessed using ARCADY6 software, which is the industry standard for predicting capacities, queues and delays at priority controlled roundabouts. Traffic flows have been input into a model based on the above preliminary design. Table 3.6 summarises the results of the assessments undertaken for the preliminary layout based on the 2031 ‘Future Base + Development’ scenario and compares the results back to the results of the assessments of the existing junction layout in the 2031 ‘Future Base’ scenario (i.e. without the additional development traffic).

Table 3.6: Summary of Junction Capacity Assessments: Sandpit Lane/House Lane

Junction	2031 Future Base (Existing Layout)		2031 Future Base+Dev (Preliminary Layout)		Development Impact	
	Max RFC (%)	Queue (Vehs)	Max RFC (%)	Queue (Vehs)	Max RFC (%)	Queue (Vehs)
AM Peak (0800-0900)						
House Lane	78%	3	63%	2	-15%	-1
Sandpit Lane (E)	75%	3	61%	2	-14%	-1
Residential Accewss	-	-	21%	0	-	-
Sandpit Lane (W)	107%	46	78%	3	-29%	-43
Max RFC / Queue	**107%**	**46**	**78%**	**3**	**-29%**	**-43**
PM Peak (1700-1800)						
House Lane	28%	0	24%	0	-4%	-
Sandpit Lane (E)	91%	8	82%	4	-9%	-4
Residential Accewss	-	-	21%	0	-	-
Sandpit Lane (W)	88%	6	75%	3	-13%	-3
Max RFC / Queue	**91%**	**8**	**82%**	**4**	**-9%**	**-4**

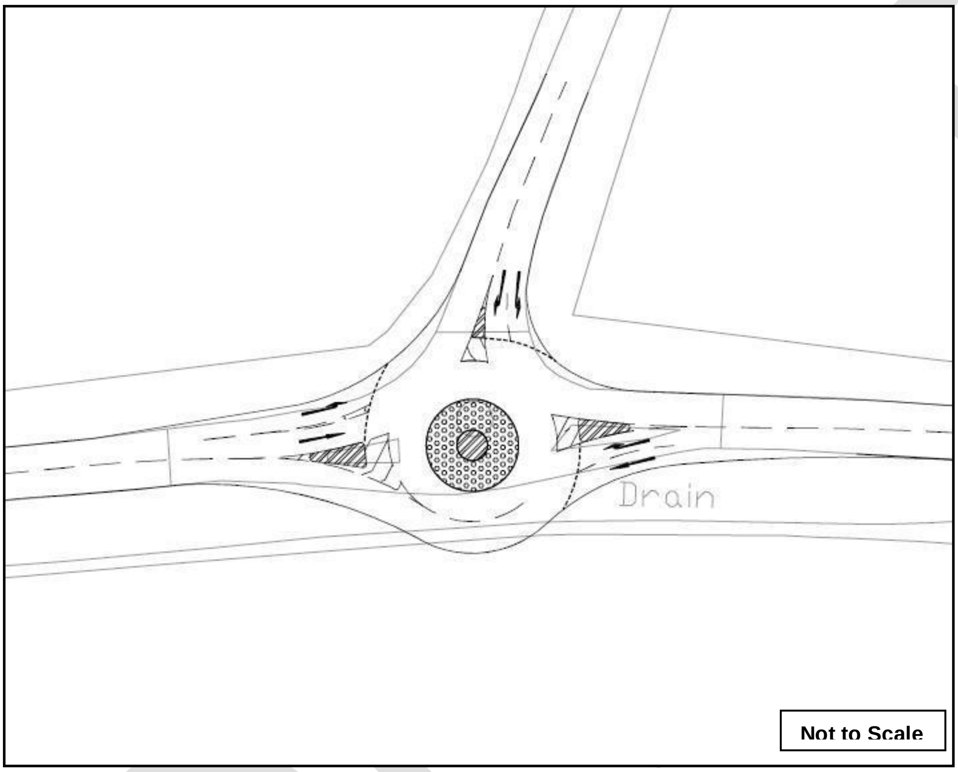
The results indicate that the site access junction is forecast to operate well within design capacity in both the morning and evening peak hour. In the morning peak hour the junction is forecast to operate with a maximum RFC of 78% and a maximum queue of 3 vehicles on the Sandpit Lane (W) approach. In the evening peak hour the junction is forecast to operate with a maximum RFC of 82% and a queue of 4 vehicles on the Sandpit Lane (E) approach.

The junction is forecast to operate well within design capacity and would provide significant betterment in the morning peak hour compared with the forecast conditions if the development did not go ahead.

Sandpit Lane/Coopers Green Lane Junction

Improvements would also be required at the junction of Sandpit Lane and Coopers Green Lane to accommodate the additional development traffic and improve the existing layout. The potential improvements could include enlarging the existing roundabout within the available highway land to provide additional capacity and increasing deflection to slow approach speeds and improve safety. A preliminary junction layout is shown in Figure 3.2 below.

Figure 3.2: Preliminary Layout of Sandpit Lane/Coopers Green Lane Junction



The operational performance of the preliminary design option has been assessed using ARCADY6. Traffic flows have been input into a model based on the above preliminary design. Table 3.7 summarises the results of the assessments undertaken for the preliminary layout based on the 2031 'Future Base + Development' scenario and compares the results back to the existing layout in the 2031 'Future Base' scenario (i.e. without the additional development traffic).

Table 3.7: Summary of Junction Capacity Assessments: Sandpit Lane/Coopers Green Lane

Junction	2031 Future Base (Existing Layout)		2031 Future Base+Dev (Preliminary Layout)		Development Impact	
	Max RFC (%)	Queue (Vehs)	Max RFC (%)	Queue (Vehs)	Max RFC (%)	Queue (Vehs)
AM Peak (0800-0900)						
Coopers Green Lane	100%	17	83%	5	-17%	-12
Oaklands Lane	51%	1	42%	1	-9%	-
Sandpit Lane (W)	97%	17	95%	14	-2%	-3
Max RFC / Queue	**100%**	**17**	**95%**	**14**	**-5%**	**-3**
PM Peak (1700-1800)						
Coopers Green Lane	83%	5	70%	2	-13%	-3
Oaklands Lane	67%	2	62%	2	-5%	-
Sandpit Lane (W)	49%	1	51%	1	+2%	-
Max RFC / Queue	**83%**	**5**	**70%**	**2**	**-13%**	**-3**

In this option the junction is forecast to operate within capacity in both time periods, with a maximum RFC of 95% and a maximum queue of 14 vehicles on Sandpit Lane (W) in the morning peak hour and a maximum RFC of 70% and a maximum queue of 2 vehicles on the Coopers Green Lane approach in the evening peak hour.

The results indicate that the performance of the junction would be improved on all arms of the junction compared with the 2031 'Future Base' scenario, with the exception of the Sandpit Lane (W) arm in the PM peak hour. On this approach, there would be a slight deterioration in performance compared with the 2031 'Future Base' scenario, however, the arm would continue to operate well within capacity indicating that the additional development traffic is unlikely to have a material impact on junction operation.

Overall the results of the initial junction capacity assessments indicate that an enlarged roundabout would improve the operation of the Sandpit Lane/Coopers Green Lane junction compared with the 2031 'Future Base' scenario, resulting in some betterment in both peak hours.

Sandpit Lane/Marshalswick Lane

The results of the assessments undertaken on the existing junction layout indicate that the additional masterplan traffic is likely to worsen performance in the morning peak hour by up to 29%, while in the evening peak hour performance is likely to deteriorate by around 59%.

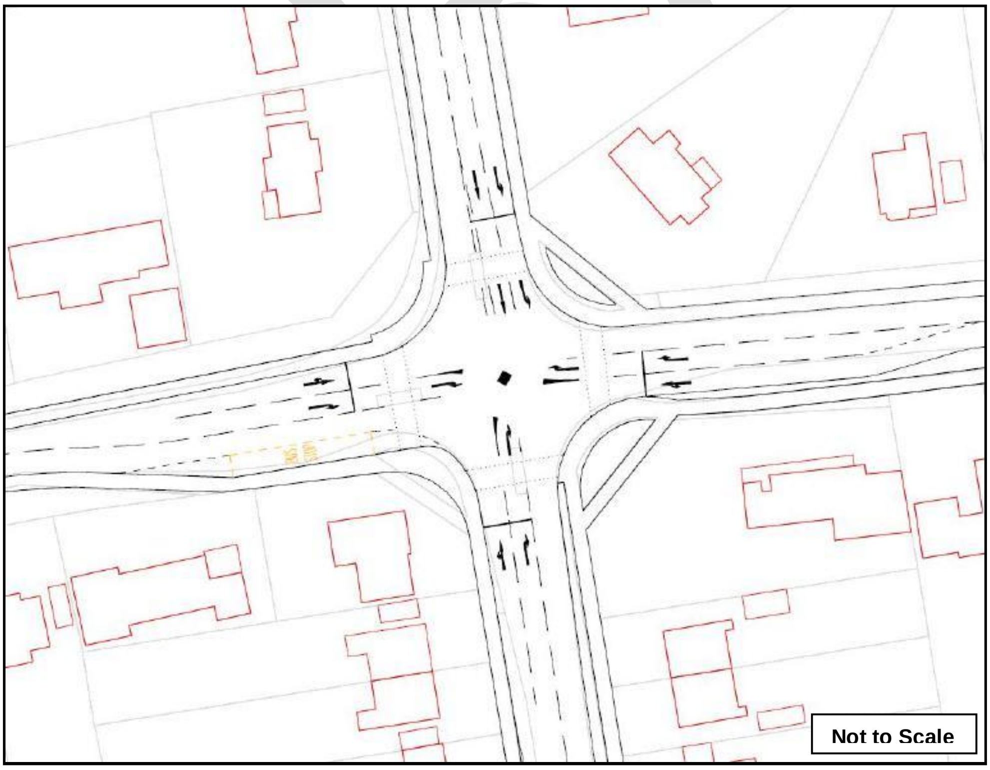
Improvements to this junction were put forward as part of the planning application submitted for the initial phase of the masterplan to provide additional capacity to accommodate the extra traffic generated by the development. The proposed improvements included removal of the existing pedestrian refuges and widening of the western and southern approaches to improve the overall throughput of the junction.

In order to accommodate the additional traffic that would be generated by the full allocation, further improvements at this junction would be required. Three potential options have been considered for this junction.

Signalised Junction Option

The first option builds upon the improvements that are proposed as part of the initial phase of the masterplan. It would involve widening the eastern approach to the existing junction to provide two lanes in the westbound direction and potentially banning the right turn movement from Marshalswick Lane (north) into Sandpit Lane (west). A preliminary design of this option is shown in Figure 3.3 below, which indicates that the improvements could be delivered with the available highway land, although it would result in the loss of verges and some mature trees.

Figure 3.3: Preliminary Layout of Sandpit Lane/Marshalswick Lane Junction (Signalised Junction Option 1)



The operational performance of the preliminary design option above has been assessed using LINSIGV3 software, which is the industry standard software for assessing signalised junctions. Traffic flows have been input into a model based on the above preliminary design. Table 3.8 summarises the results of the assessments undertaken for the preliminary layout based on the 2031 'Future Base + Development' scenario and compares the results back to the existing layout in the 2031 'Future Base' scenario (i.e. without the additional development traffic).

Table 3.8: Summary of Junction Capacity Assessments: Sandpit Lane/Marshalswick Lane (Signalised Junction Option 1)

Junction	2031 Future Base (Existing Layout)		2031 Future Base+Dev (Preliminary Layout)		Development Impact	
	Max DoS (%)	Queue (Vehs)	Max DoS (%)	Queue (Vehs)	Max DoS (%)	Queue (Vehs)
AM Peak (0800-0900)						
Marshalswick Lane	121%	38	101%	29	-20%	-9
Sandpit Lane (E)	133%	94	102%	38	-31%	-56
Beechwood Avenue	128%	32	100%	28	-28%	-4
Sandpit Lane (W)	124%	84	84%	17	-30%	-67
Max DoS / Queue	**133%**	**94**	**102%**	**38**	**-31%**	**-56**
PM Peak (1700-1800)						
Marshalswick Lane	100%	19	109%	44	+9%	+25
Sandpit Lane (E)	130%	88	111%	61	-19%	-27
Beechwood Avenue	111%	31	107%	29	-4%	-2
Sandpit Lane (W)	124%	83	111%	62	-13%	-21
Max DoS / Queue	**130%**	**88**	**111%**	**62**	**-19%**	**-26**

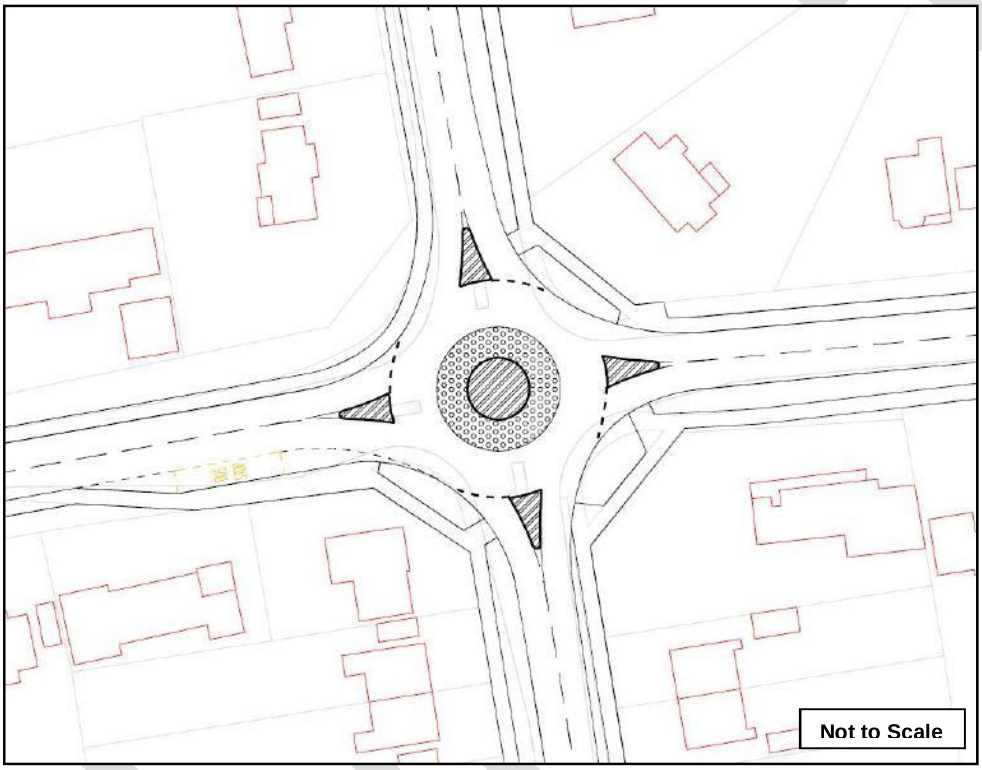
In this option, the junction is forecast to operate above capacity in both time periods. In the morning peak hour the junction is forecast to operate with a maximum DoS of 102% and a mean maximum queue of 38 vehicles on the Sandpit Lane (E) approach while in the evening peak hour the junction is forecast to operate with a maximum DoS of 111% and a mean maximum queue of 62 vehicles on the Beechwood Avenue approach.

While the junction would continue to operate at or above theoretical capacity, the results indicate that there would be an improvement in performance on all arms of the junction compared with the 2031 'Future Base' scenario. This represents a significant betterment at this junction in both the morning and evening peak hours compared with the forecast conditions if the development did not go ahead.

Compact Roundabout Option

The second option that has been considered for the Sandpit Lane / Marshalswick Lane junction involves replacing the existing signalised junction with a compact roundabout with an inscribed diameter of 28m. Peak hour traffic flows on all four arms of the junction are relatively balanced, so a roundabout solution may improve traffic flow compared with the existing traffic signals. However, consideration would also need to be given to the impacts of a roundabout on pedestrians and cyclists. A preliminary design for this option is shown in Figure 3.4 and indicates that it is likely that a scheme of this nature could be delivered within the available highway land, although it may result in the loss of verges and some mature trees.

Figure 3.4: Preliminary Layout of Sandpit Lane/Marshalswick Lane Junction (Compact Roundabout Option)



The operational performance of the preliminary design option above has been assessed using ARCADY6, which is the industry standard software for assessing priority roundabouts. Table 3.9 summarises the results of the assessments undertaken for the preliminary layout based on the 2031 'Future Base + Development' scenario and compares the results back to the existing layout in the 2031 'Future Base' scenario (i.e. without the additional development traffic).

Table 3.9: Summary of Junction Capacity Assessments: Sandpit Lane/Marshalswick Lane (Preliminary Layout – Compact Roundabout Option)

Junction	2031 Future Base (Existing Layout)		2031 Future Base+Dev (Preliminary Layout)		Development Impact	
	Max DoS (%)	Queue (Vehs)	Max RFC (%)	Queue (Vehs)	Max DoS (%)	Queue (Vehs)
AM Peak (0800-0900)						
Marshalswick Lane	121%	38	90%	6	-31%	-32
Sandpit Lane (E)	133%	94	111%	49	-22%	-45
Beechwood Avenue	128%	32	82%	4	-46%	-28
Sandpit Lane (W)	124%	84	85%	5	-39%	-79
Max DoS / Queue	**133%**	**94**	**111%**	**49**	**-22%**	**-45**
PM Peak (1700-1800)						
Marshalswick Lane	100%	19	91%	8	-9%	-11
Sandpit Lane (E)	130%	88	97%	14	-33%	-74
Beechwood Avenue	111%	31	92%	9	-19%	-22
Sandpit Lane (W)	124%	83	109%	41	-15%	-42
Max DoS / Queue	**130%**	**88**	**109%**	**41**	**-21%**	**-47**

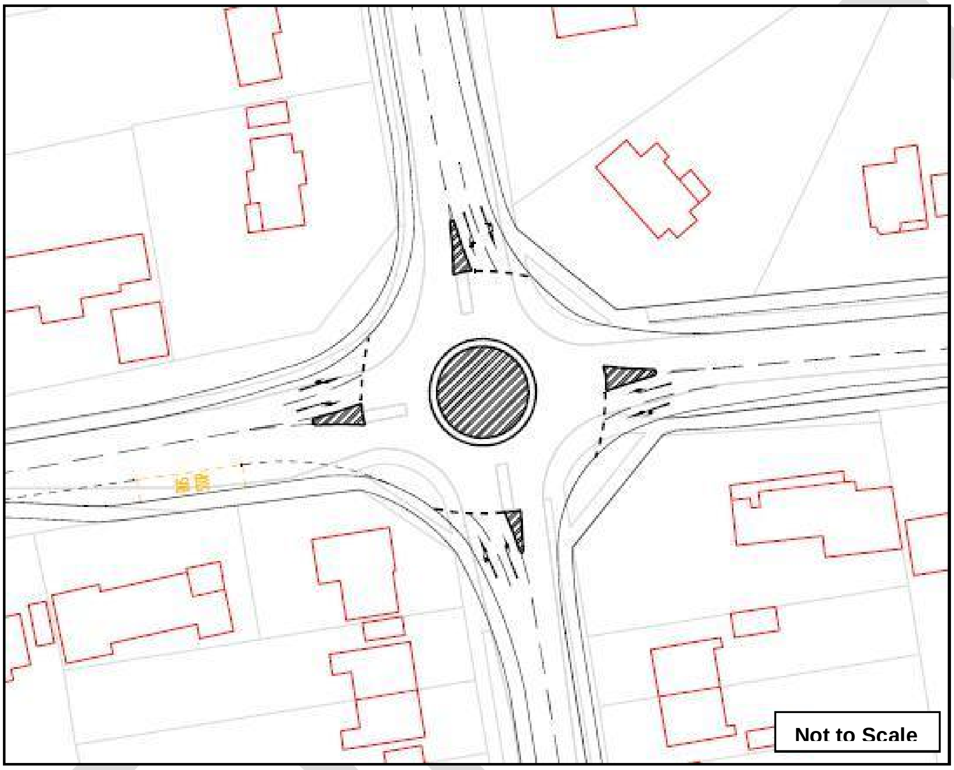
In this option the junction is forecast to operate above capacity on only one arm in each time period. In the morning peak hour the junction is forecast to operate with a maximum DoS of 111% and a mean maximum queue of 49 vehicles on the Sandpit Lane (E) approach while in the evening peak hour the junction is forecast to operate with a maximum DoS of 109% and a mean maximum queue of 41 vehicles on the Sandpit Lane (W) approach.

These results indicate an improvement in performance on all arms of the junction in comparison with the 2031 'Future Base' scenario and are a marginal improvement on the first signalised junction option. Overall, the results suggest that a compact roundabout option could provide significant betterment compared with the forecast conditions if the development did not go ahead, albeit that some arms of the junction would continue to operate above theoretical capacity.

Standard Roundabout Option

The final option that has been considered for the Sandpit Lane / Marshalswick Lane junction would involve replacing the existing signalised junction with a standard roundabout with an inscribed diameter of 32m. This is slightly larger than a compact roundabout and means that the approaches can be flared to provide two lane entries, which provide increased capacity. A preliminary design for this option is shown in Figure 3.5. Again, it appears that this option could be delivered within the available highway land, although it would result in the loss of verges and some mature trees.

Figure 3.5: Preliminary Layout of Sandpit Lane/Marshalswick Lane Junction (Preliminary Layout – Standard Roundabout Junction Option)



The operational performance of the preliminary design option above has been assessed using ARCADY6. Traffic flows have been input into a model based on the above preliminary design. Table 3.10 summarises the results of the assessments undertaken for the preliminary layout based on the 2031 'Future Base + Development' scenario and compares the results back to the existing layout in the 2031 'Future Base' scenario (i.e. without the additional development traffic).

Table 3.10: Summary of Junction Capacity Assessments: Sandpit Lane/Marshalswick Lane (Preliminary Layout – Standard Roundabout Option)

Junction	2031 Future Base (Existing Layout)		2031 Future Base+Dev (Preliminary Layout)		Development Impact	
	Max DoS (%)	Queue (Vehs)	Max RFC (%)	Queue (Vehs)	Max DoS (%)	Queue (Vehs)
AM Peak (0800-0900)						
Marshalswick Lane	121%	38	73%	3	-48%	-35
Sandpit Lane (E)	133%	94	78%	3	-55%	-91
Beechwood Avenue	128%	32	71%	2	-57%	-30
Sandpit Lane (W)	124%	84	73%	3	-51%	-81
Max DoS / Queue	**133%**	**94**	**78%**	**3**	**-55%**	**-91**
PM Peak (1700-1800)						
Marshalswick Lane	100%	19	76%	3	-24%	-16
Sandpit Lane (E)	130%	88	70%	2	-60%	-86
Beechwood Avenue	111%	31	78%	3	-33%	-28
Sandpit Lane (W)	124%	83	93%	9	-31%	-74
Max DoS / Queue	**130%**	**88**	**93%**	**9**	**-37%**	**-79**

In this option the junction is forecast to operate within capacity in both time periods. In the morning peak hour the junction is forecast to operate with a maximum DoS of 78% and a mean maximum queue of 3 vehicles on the Sandpit Lane (E) approach while in the evening peak hour the junction is forecast to operate with a maximum DoS of 93% and a mean maximum queue of 9 vehicles on the Sandpit Lane (W) approach.

These results indicate an significant improvement in performance on all arms of the junction in comparison with the 2031 'Future Base' scenario. This option represents an improvement over the signalised junction and compact roundabout options considered and would provide significant betterment in both the morning and evening peak hours compared with the forecast conditions if the development did not go ahead.

Hatfield Road/Colney Heath Lane

A new access to the College would be created on Hatfield Road at the junction with Alban Park. The existing priority T-junction would be replaced by a roundabout, with a new northern arm serving the College. This junction would become the main access into the College for staff and students, with only visitors, buses and taxis permitted to use the current access to the west.

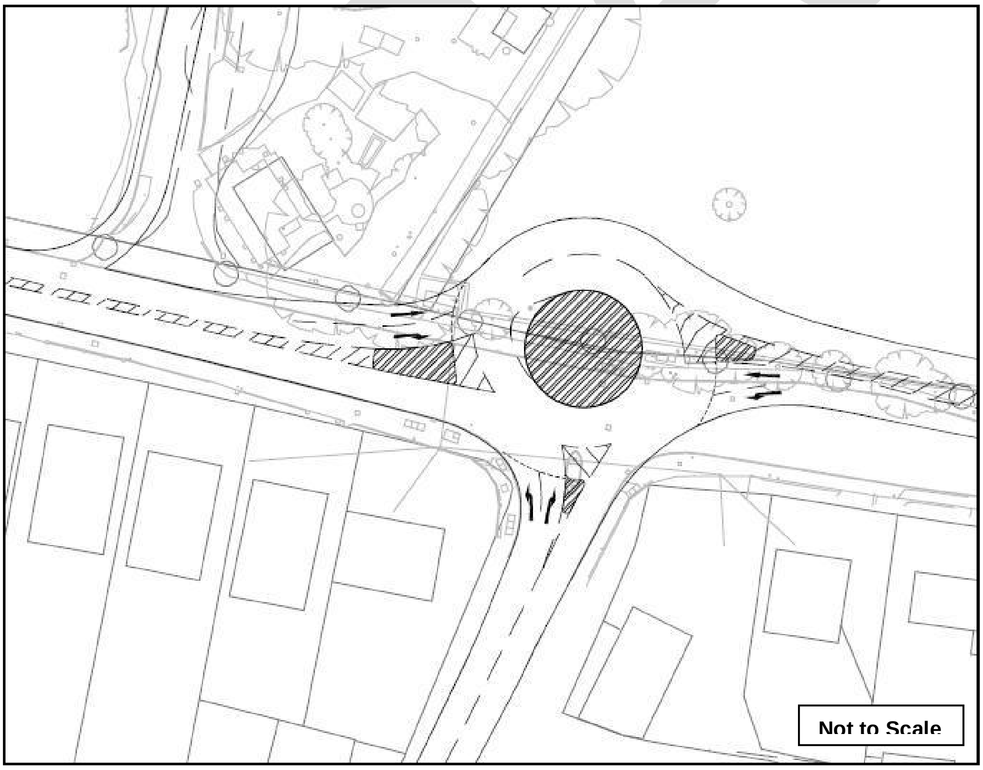
As a result of the reduced use of the current access, it is proposed that the South Drive junction would be reconfigured so that traffic can only turn left in from Hatfield Road. This would enable South Drive to become one-way northbound, with the existing southbound lane used to provide a segregated cycle route into the College.

The removal of right turning traffic from this junction creates the potential for improvements to be made to the nearby Hatfield Road/Colney Heath Lane junction and two potential options have been considered.

Roundabout Option

The first option would be to replace the existing junction with a roundabout. It is envisaged that the roundabout would be approximately 32m in diameter. A preliminary junction layout is shown in Figure 3.6.

Figure 3.6: Preliminary Layout of Hatfield Road/Colney Heath Lane Junction (Preliminary Layout – Roundabout Junction Option)



The operational performance of the preliminary design option has been assessed using ARCADY6. Traffic flows have been input into a model based on the above preliminary design. Table 3.11 summarises the results of the assessments undertaken for the preliminary layout based on the 2031 'Future Base + Development' scenario and compares the results back to the existing layout in the 2031 'Future Base' scenario (i.e. without the additional development traffic).

Table 3.11: Summary of Junction Capacity Assessments: Hatfield Road/Colney Heath Lane (Preliminary Layout – Roundabout Option)

Junction	2031 Future Base (Existing Layout)		2031 Future Base+Dev (Preliminary Layout)		Development Impact	
	Max RFC (%)	Queue (Vehs)	Max RFC (%)	Queue (Vehs)	Max RFC (%)	Queue (Vehs)
AM Peak (0800-0900)						
Hatfield Road (E)	-	-	45%	1	-	-
Colney Heath Lane	127%	68	64%	2	-63%	-66
Hatfield Road (W)	50%	1	69%	2	-19%	+1
Max RFC / Queue	**127%**	**68**	**69%**	**2**	**-63%**	**-66**
PM Peak (1700-1800)						
Hatfield Road (E)	-	-	63%	2	-	-
Colney Heath Lane	61%	2	44%	1	-17%	-1
Hatfield Road (W)	48%	1	47%	1	-1%	-
Max RFC / Queue	**61%**	**1**	**63%**	**2**	**+2%**	**-1**

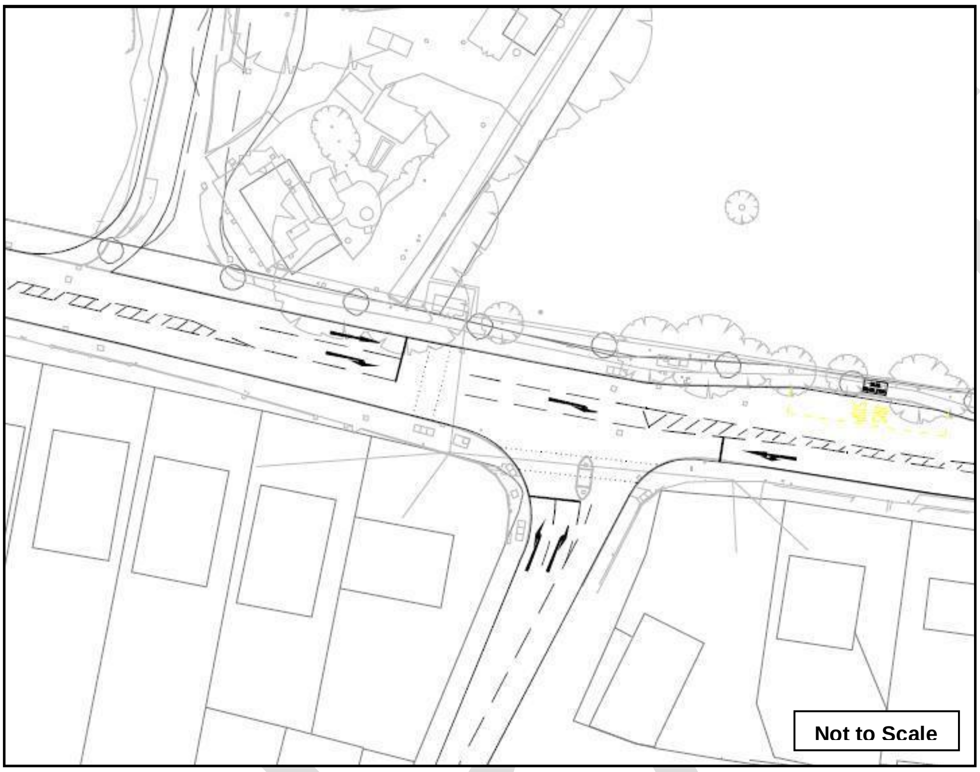
The operational assessment indicates that in the morning peak hour and the junction is forecast to operate well within capacity with a maximum RFC of 69% and a maximum queue of 2 vehicles on the Hatfield Road (W) approach. In the evening peak hour, the junction is forecast to operate well within capacity, with a maximum RFC of 63% and a maximum queue of 2 vehicles on the Hatfield Road (E) approach.

The results of the assessment indicate that the roundabout option would operate well within capacity in both peak hours, with conditions in the morning peak hour significantly improved compared with the 2031 'Future Base' scenario.

Signalised Junction Option

The second option would be to signalise the junction and a preliminary design of the junction is shown in Figure 3.7. The preliminary junction design includes pedestrian crossings on both the Hatfield Road (W) and Colney Heath Lane approaches.

Figure 3.7: Preliminary Layout of Hatfield Road/Colney Heath Lane Junction (Preliminary Layout – Signalised Junction Option)



The operational performance of the signalised junction option has been assessed using LINSIG V3 software. Traffic flows have been input into a model based on the above preliminary design. Table 3.12 summarises the results of the assessments undertaken for the preliminary layout based on the 2031 'Future Base + Development' scenario and compares the results back to the existing layout in the 2031 'Future Base' scenario (i.e. without the additional development traffic).

Table 3.12: Summary of Junction Capacity Assessments: Hatfield Road/Colney Heath Lane (Preliminary Layout – Signalised Junction Option)

Junction	2031 Future Base (Existing Layout)		2031 Future Base+Dev (Preliminary Layout)		Development Impact	
	Max RFC (%)	Queue (Vehs)	Max RFC (%)	Queue (Vehs)	Max RFC (%)	Queue (Vehs)
AM Peak (0800-0900)						
Hatfield Road (E)	-	-	69%	15	-	-
Colney Heath Lane	127%	68	92%	20	-35%	-48
Hatfield Road (W)	50%	1	91%	28	+41%	+27
Max RFC / Queue	**127%**	**68**	**92%**	**28**	**-35%**	**-40**
PM Peak (1700-1800)						
Hatfield Road (E)	-	-	79%	21	-	-
Colney Heath Lane	61%	2	89%	13	-28%	+11
Hatfield Road (W)	48%	1	90%	14	+42%	+3
Max RFC / Queue	**61%**	**1**	**90%**	**21**	**+42%**	**+20**

The results indicate that the signalised junction option is forecast to operate within capacity in the morning peak hour, with a maximum DoS of 92% on the Colney Heath Lane approach and a maximum queue of 28 vehicles on the Hatfield Road (W) approach. In the evening peak hour the junction is forecast to operate within capacity, with a maximum DoS of 90% and a maximum queue of 14 vehicles on Hatfield Road (W).

The results of the assessment indicate that the signalised junction option would operate within theoretical capacity in both peak hours, with conditions in the morning peak hour significantly improved compared with the 2031 'Future Base' scenario, but some worsening of performance in the evening peak hour.

The performance of the signalised junction option is forecast to be worse than the roundabout option, however as the preliminary design also incorporates pedestrian crossing facilities on both the Colney Heath Lane and Sandpit Lane (W) approaches, this represents a significant improvement in facilities for pedestrians over existing conditions.

Summary

Table 3.13 below summarises the results of the initial junction capacity assessments (maximum RFC/DoS) for the existing junctions with the ‘Future Base’ traffic flows compared with the results of the potential junction layouts with the ‘Future Base + Development’ traffic flows.

Table 3.13: Summary of Initial Junction Capacity Assessments (Maximum RFC/DoS)

Junction	Option	2031 Future Base (Existing)	2031 Future Base+Dev (Improved)	Development Impact
AM Peak (0800-0900)				
Sandpit La/House La	Roundabout	107%	78%	-29%
Sandpit La/Coopers Green La	Roundabout	100%	95%	-5%
Sandpit La/Marshalswick La	Signalised Junction	133%	102%	-31%
	Compact Roundabout		111%	-22%
	Standard Roundabout		79%	-54%
Hatfield Rd/Colney Heath La	Roundabout	127%	69%	-58%
	Signalised Junction		92%	-35%
PM Peak (1700-1800)				
Sandpit La/House La	Roundabout	91%	82%	-9%
Sandpit La/Coopers Green La	Roundabout	83%	70%	-13%
Sandpit La/Marshalswick La	Signalised Junction	130%	111%	-19%
	Compact Roundabout		109%	-21%
	Standard Roundabout		93%	-37%
Hatfield Rd/Colney Heath La	Roundabout	61%	72%	+2%
	Signalised Junction		90%	+29%

The results of these initial junction capacity assessments indicate that the potential mitigation schemes are forecast to significantly improve the operation of most of the junctions in both the morning and evening peak hours compared with the existing junction layouts in the 2031 ‘Future Base’ scenario. At all junctions, options have been identified that would allow the junctions to operate within theoretical capacity in both peak hours.

Summary

06

06 Summary

Background

The draft Strategic Local Plan (SLP) produced by St Albans City and District Council (SACDC) covers the period 2011-2031 and includes the potential release of Green Belt land in East St Albans (Oaklands) for a residential development of 1,000 units on land to the north of the existing Oaklands College development.

As part of the ongoing consultation process, SACDC invited landowners/promoters to submit their vision for the development sites allocated within the draft SLP. An initial masterplan for the Oaklands College site was developed and submitted to SACDC in November 2015 with an emerging transport strategy submitted to SACDC in February 2016.

This note builds upon the information set out in the emerging transport strategy document. It sets out initial trip generation forecasts for the full allocation of 1,000 units and goes on to assess the potential impact that this level of development is likely to have on the key junctions and the potential nature of junction improvements that may be required to accommodate the additional traffic that would be generated by the full allocation.

Initial Trip Generation Forecasts

The draft SLP indicates that the East St Albans (Oaklands) site could accommodate 1,000 dwellings. A planning application for an initial phase of approximately 350 residential units has already been submitted to SACDC, with the later phases providing a further 650 units and a 2FE primary school.

The College's emerging masterplan includes an aspiration to provide 42% affordable housing across the whole site, including a small number of affordable units for specifically for College staff and students.

Initial vehicular trip generation forecasts for the full allocation of 1,000 units have been developed using the private and affordable residential vehicular trip rates underpinning the planning application for the initial phase of the masterplan and discounting trips associated with the primary school and College affordable housing. This initial assessment indicates that the development would generate in the region of 320 vehicle movements in the morning peak hour and around 550 vehicle movements in the evening peak hour (2-way).

Initial Assessment of Development Impacts

An initial assessment of the potential impacts of a development of 1,000 residential units has been undertaken. In the absence of traffic forecasts from HCC's COMET model, traffic growth forecasts have been based on a range of sources, with the highest traffic growth rate assumed as a worst-case scenario.

This assessment indicates that the Sandpit Lane/House Lane and Sandpit Lane/Marshalswick Lane junctions are forecast to experience the largest change in overall traffic flows, with potential for increases in traffic of up to 20% in 2031 compared with the 'Future Base' scenario. The Sandpit Lane/Coopers Green Lane junction is forecast to experience lower levels of growth at around 3-7%, while traffic flows are forecast to marginally reduce at the Hatfield Road/Colney Heath Lane junction due to the reassignment of College traffic associated with the proposed new access junction further to the east on Hatfield Road at the junction with Alban Park. Further assessment of the potential impacts of the masterplan traffic on the wider road network would need to be undertaken once traffic forecasts from the initial COMET runs become available.

Potential Mitigation Schemes

Given the potential level of impact on the key junctions around the Oaklands College site, consideration has been given to the potential nature of the improvements that may be required in each location. At the Sandpit Lane/House Lane junction, it is proposed to enlarge the existing roundabout to accommodate a new southern arm serving the residential development and provide additional capacity for the development traffic. The Sandpit Lane/Coopers Green Lane roundabout would also be enlarged to provide additional capacity and improve safety.

Three potential options have been identified for the Sandpit Lane/Marshalswick Lane junction; the first option increases the capacity of the existing signalised junction by widening the eastern approach to the existing junction to provide two lanes in the westbound direction and potentially banning the right turn movement from Marshalswick Lane (north) into Sandpit Lane (west). Two alternative options that involve replacing the existing signalised junction with a roundabout have also been investigated; the first based on a compact roundabout and the second based on a slightly larger standard roundabout .

Two potential options have been identified for the Hatfield Road/Colney Heath Lane junction. The first option would replace the existing priority junction with a roundabout, while the second option would introduce traffic signals at the junction.

The results of these initial junction capacity assessments indicate that the potential mitigation schemes are forecast to significantly improve the operation of most of the junctions in both the morning and evening peak hours compared with the existing junction layouts in the 2031 'Future Base' scenario. At all of the locations assessed, including the Sandpit Lane/Marshalswick Lane junction, options have been identified that would ensure the junctions would operate within theoretical capacity in both peak hours.

Conclusion

Overall this initial assessment indicates that there are a range of potential highway improvements that could be implemented which would not only mitigate the potential impacts of a residential development of 1,000 units on the Oaklands College site, but also result in significant improvements in performance across the local road network compared with the situation if the development did not take place.

The impact of a residential development of this size and the nature of the improvements required would need to be considered in more detail as part of any future planning application, in consultation with the local highway authority, Hertfordshire County Council.

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“The Oaklands Masterplan provides a once in a generation opportunity to establish a community which can offer a wide range of benefits and opportunity to its residents that at its heart is focused on education and the improvement of lives.”

Oaklands College Strategic Local Plan Submission

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Contact
John Webber
Associate Director
T +44 (0)1727 535779
E john.d.webber@aecom.com

Ross Westwood
Senior Project Surveyor
T +44 (0)20 7061 7581
E ross.westwood@aecom.com

Hertfordshire County Council

Appendix 12: Hertfordshire County Council COMET progress Slides April 2016

HPG Dev Plans Meeting 22nd April 2016
COMET Model Update

– Model Format

– 2031 Forecast Year assumptions

– 2031 Forecast Year results (inc corridor results)

– Ongoing development and use of the model

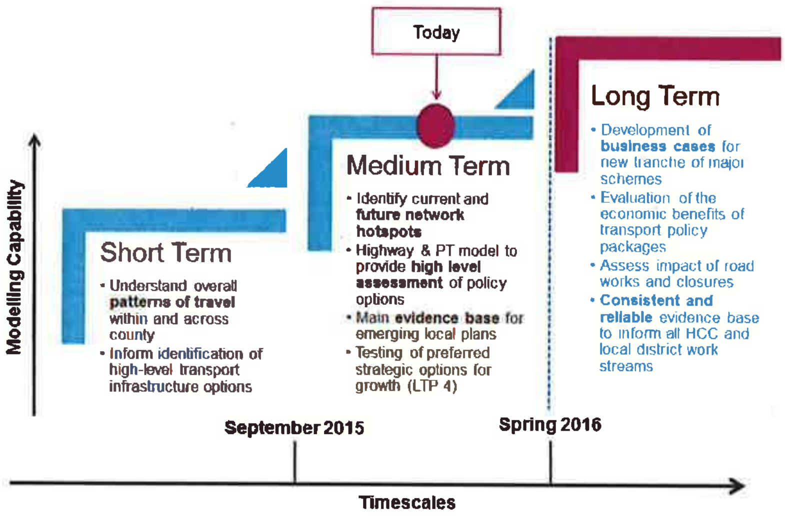
– Link with Local Plan process and protocol

COMET – COunty ModEl of Transport

– New suite of models covering Hertfordshire and the surrounding area

- Highway model - all A, B C roads
- Public Transport Model (scheduled bus and rail services)
- Demand model - Links models and allows tests of time shifts and mode shift

Model development - a staged approach



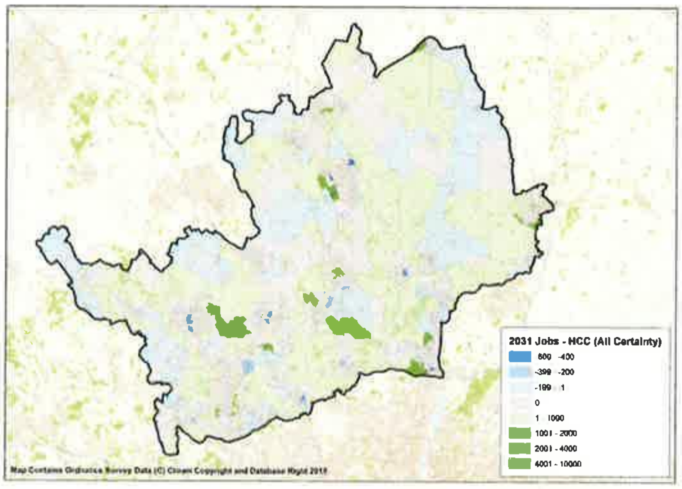
Model performance
AM %Difference Cordon and Screenlines

Forecast Model Assumptions

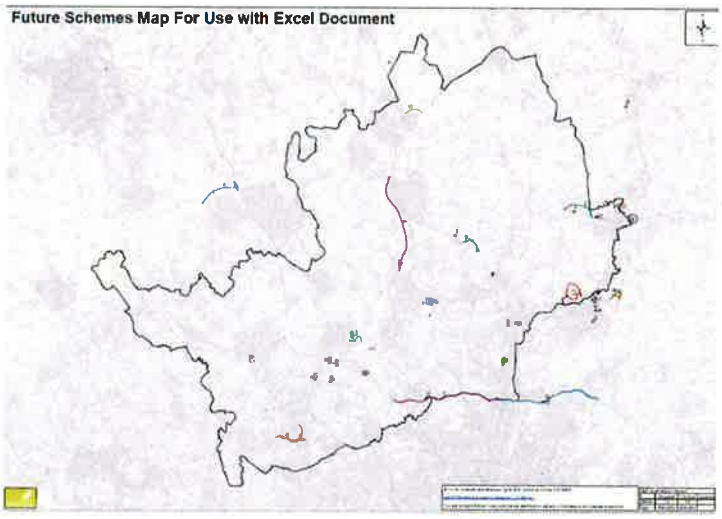
Housing Growth to 2031

District	2031 HCC Dwellings	2031 NTEM v6.2 Dwellings	2031 Difference
Broxbourne	5905	2700	-3205
Dacorum	7710	5548	-2162
East Hertfordshire	13324	5475	-7849
Hertsmere	3829	3836	7
North Hertfordshire	13301	12727	-574
St Albans	7833	1556	-6277
Stevenage	7362	9005	1643
Three Rivers	1842	3612	1770
Watford	4141	3624	-517
Welwyn Hatfield	12589	2035	-10554
Total	77,836	50,119	-27,717

Planning Data Employment Forecasts



Forecast Model Transport Schemes

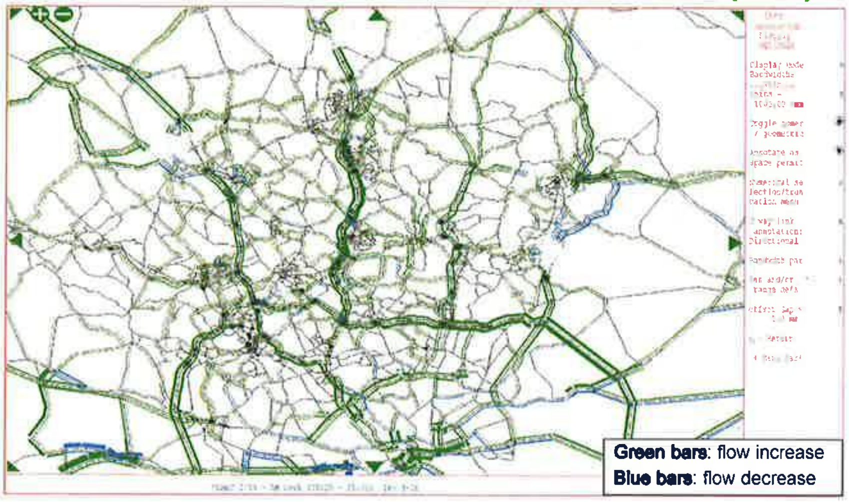


Forecast Model Results

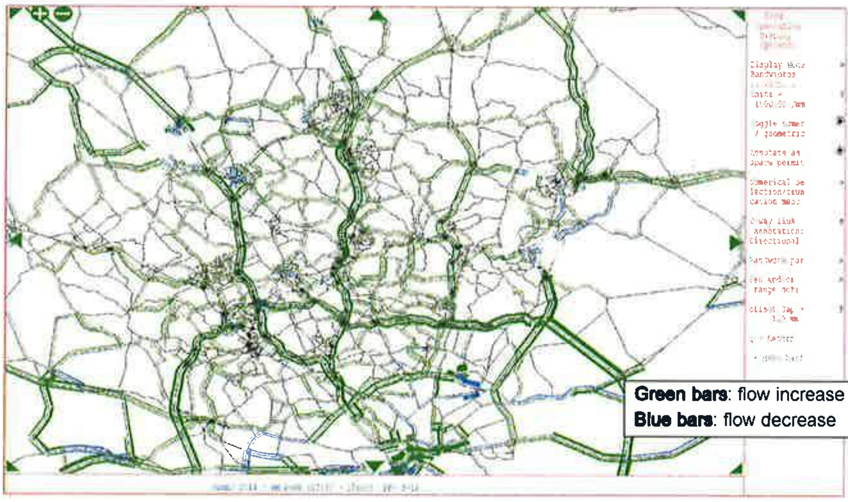
Impact of Growth on the Transport Network – Key headlines

- Population and employment growth leads to growth in demand
- Increase greater in inter peak and off peak periods
- AM peak 0700-1000 – 13% increase overall. 61,000 additional vehicle trips in Hertfordshire.
- Interpeak – 20% increase overall.
- PM peak 1600-1900 – 15% increase overall. 82,000 additional vehicle trips.
- Larger increases in LGV trips and non work trips.
- Passenger transport trips increase by similar percentages. Most of growth is for rail.

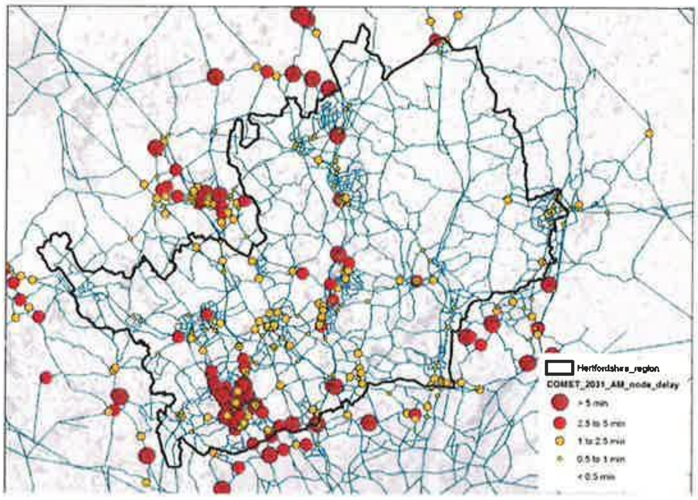
Forecast Model Results - Highway Model
Actual Flow Differences 2031 vs 2014 (AM)



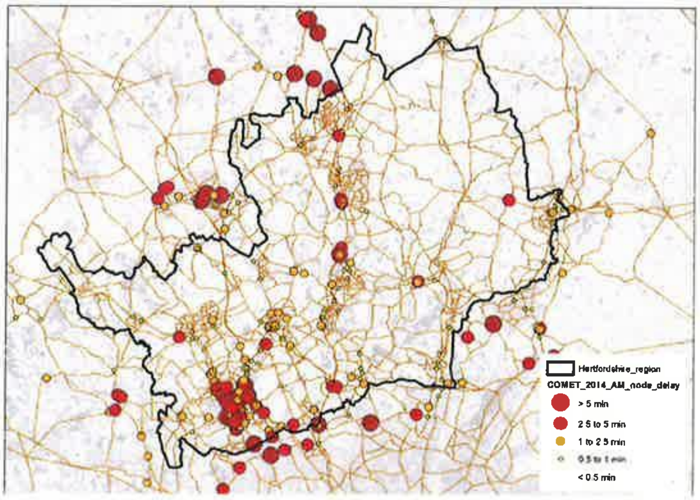
Forecast Model Results - Highway Model
Actual Flow Differences 2031 vs 2014(PM)



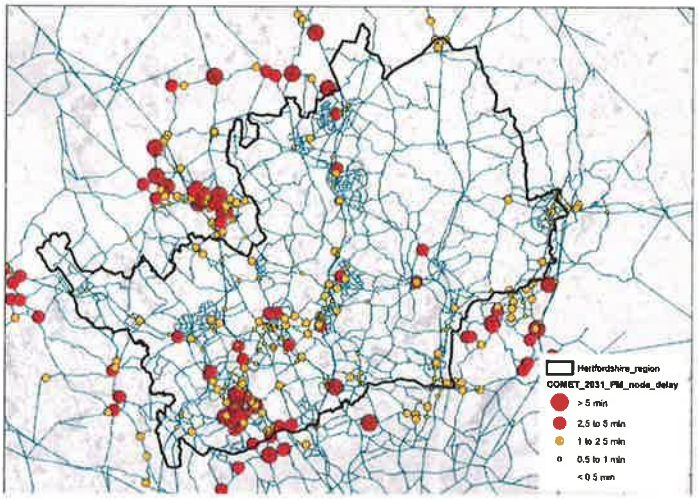
2031 COMET AM Junction Delay



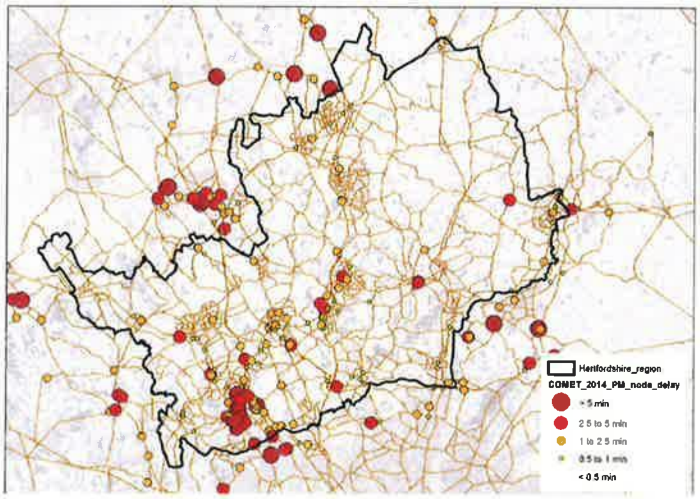
2014 COMET AM Junction Delay



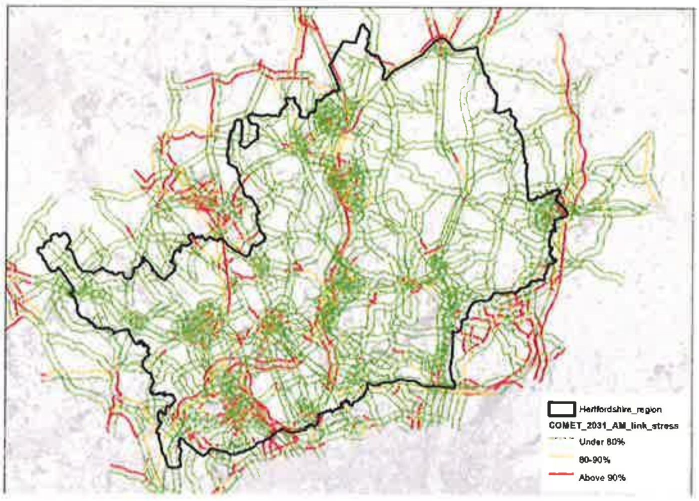
2031 COMET PM Junction Delay



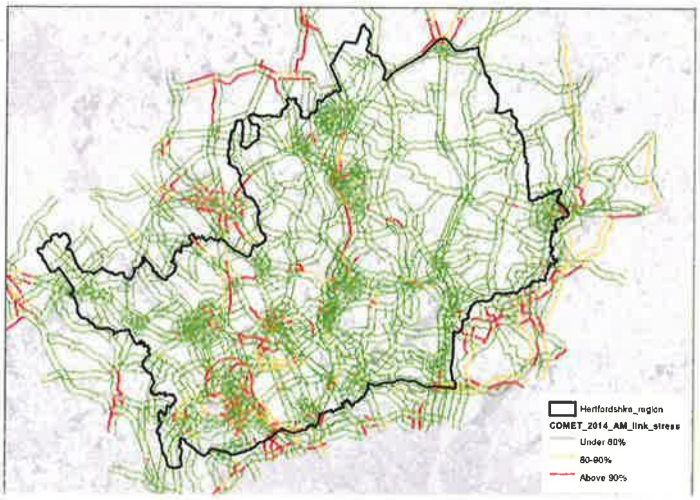
2014 COMET PM Junction Delay



2031 COMET AM Link Stress



2014 COMET AM Link Stress



Key Results – A414 corridor

– Increase in flow

- Flow increases are evident mainly on the section between Harlow and the A1m. Capacity issues south of St Albans limit the amount of additional traffic further west and a high level of latent demand is evident on this section.

– Increase in delay

- Journey times increase across the corridor. Greatest in PM peak WB direction (19%)
- In the AM peak the main increase in delays is at the Rush Green roundabout in Hertford, Holwell Lane roundabout, A1000 junction (Mill Green), A1(m) junction 4 and at the Colney Heath longabout as well as key junctions in Hemel Hempstead. Delay at the Park Street roundabout is however reduced.
- In the PM peak the delays increase primarily on the eastern section around Eastwick (especially for WB traffic) and remain high on the junctions in Hertford and at the London Colney roundabout.

– Caveats / issues – the model overestimates flows and journey times on the section between the M1 and A1m. On other sections traffic flows are better replicated but some journey times are over / underestimated

Key Results – A10 corridor

– Increase in flow

- Flow increases are evident in both directions on the A10 between Buntingford and Cheshunt (south of here some rerouting is evident). The single lane section south of Buntingford becomes close to capacity in the peak periods

– Increase in delay

- In the AM peak further increases in delay are evident on the A10 in Cheshunt, at Rush Green and at the A10/ A602 junction north of Ware.
- In the PM peak increases in delay are evident on the southern section in Cheshunt.

– Latent demand

- Additional latent demand is evident on the section south of the A602 junction with additional traffic wanting to use the A10 SB in the AM peak and NB in the PM.

– Caveats / issues the model replicates flow well along the length of the corridor and is picking up capacity issues on the southern section in Broxbourne reasonably well along this corridor but tends to underestimate journey times in the AM peak southbound direction between Hertford and the M25 and in the AM peak northbound north of the A507

Key Results – A505 corridor

– Increase in flow

– In the AM peak the largest increases in flow are evident east of Hitchin.

– Increase in delay

– In the peak hours increases in delay are evident at the Pirton Road, Bedford Road/ Old Park Road and Woolgrove Road junctions in Hitchin and at the junction with Old North Road in Royston. Within Baldock increases in delay are predicted on the old A505 at the Weston Road junction and the junction with the A507 Clothall Road remains congested.

– Latent demand

– It is evident that additional traffic wants to use the route in both directions particularly in the EB direction east of the A1m in the AM peak.

– Caveats / issues The model is not replicating flows well on the A505 west of Hitchin and underestimates journey times in the eastbound direction in all time periods. On the section through Hitchin and Letchworth again journey times are underestimated especially in the westbound direction in the AM peak and the EB direction in the PM peak. It does however appear to pick up congestion issues in Hitchin and Letchworth and around Royston.

Key Results – A1 corridor

– Increase in flow

– Large increases in flow are evident in both directions, particularly in the AM peak. This is a combination of the impact of development and the additional capacity provided by the Smart motorway proposals.

– Increase in delay

– The Smart motorway proposals reduce southbound journey times between junctions 4-7 in the AM peak but there are increases in delay to the north and south. In AM peak NB and the PM peak (both directions) overall journey times increase by 2-3 minutes despite the improvements.

– Delays increase on slip roads and approaches to the junctions. In the AM peak the key increases are at junctions 3, 4, 5, 8 □ 9. In the PM peak the increases are concentrated at junctions 3 and 5.

– Latent demand - Despite the increase in capacity even more traffic wants to use this corridor with a high level of supressed demand SB in the AM peak.

– Caveats / issues – Model appears to be underestimating NB stress and delays between junctions 6-8 in the PM peak.

Key Results – M1 corridor

– Increase in flow

- Large increases in flow are evident along corridor length especially in NB direction in the AM peak and both directions in the PM peak.

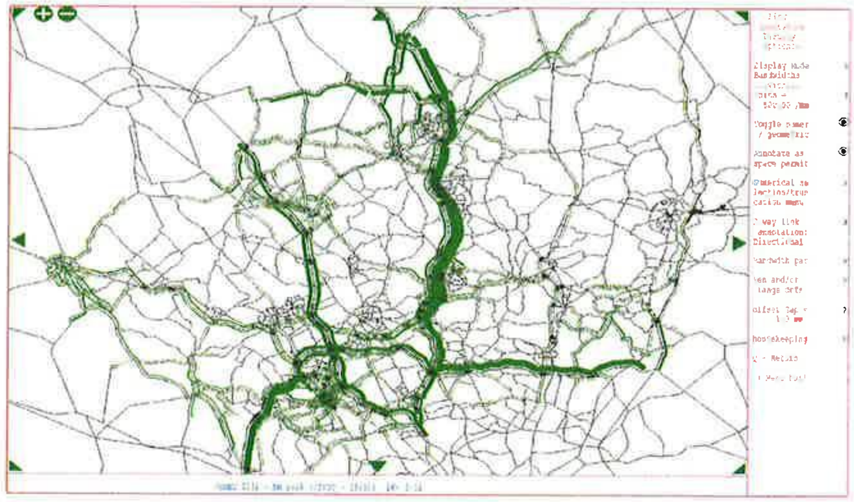
– Increase in delay

- Steady increases in journey times expected across all time periods, with the largest increases in journey times experienced in the AM peak (between 14-16%).
- There are also increases in delay at junctions on the on and off slips and on the approach roads. In the AM peak the key increases are evident at junctions 6, 6a and junction 9. In the PM peak increases are evident at junctions 6, 9 and 10 and long delays are evident at junction 6a.

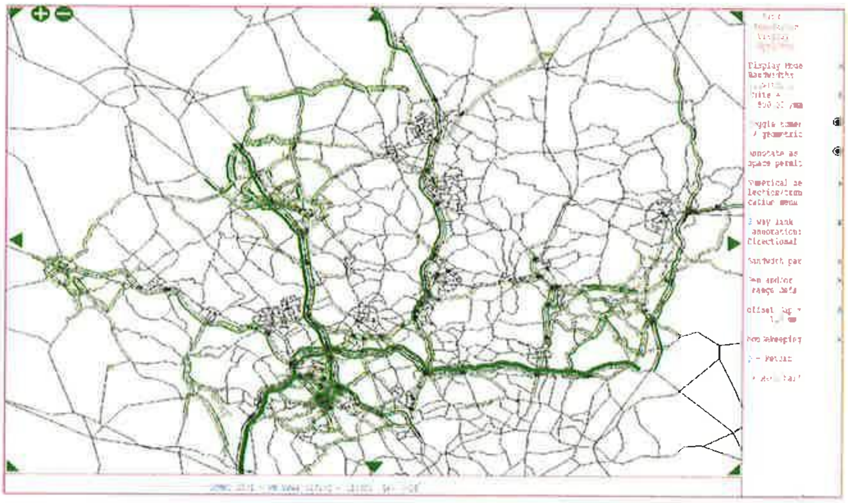
– Latent demand

- A high level of latent demand is evident, particularly in the AM peak

Latent Demand
Demand Flow less Actual Flow 2031 AM



Latent Demand
Demand Flow less Actual Flow 2031 PM

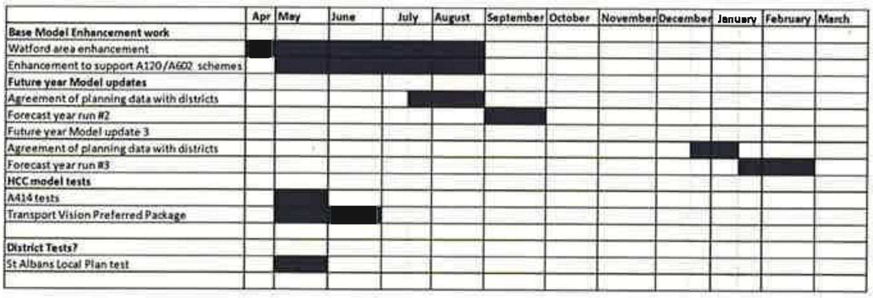


Ongoing Model Use □ Development

Principles of ongoing model use

- Use of current forecast model to support Transport Vision □ Local Plan work
- Planned enhancement of base year model to support GTP □ major project work.
- Twice yearly update of Forecast model (September □ February) to be commissioned with up to date planning data and potentially more schemes.
- 2021, 2031 (□ possibly 2026) reference cases to be developed (to support developer use □ scheme tests).

COMET Proposed Work Programme



Use of Model to support Local Plan process

- Districts to continue to use pre existing models where appropriate (eg WHaSH).
- Use of COMET to provide cross checks with modelling work done to date □ indication of cumulative impacts of development
- HCC could provide district / SHMA specific notes / workshops to support developing Local Plans
- COMET model available for option testing to fill in gaps / test strategic impacts of schemes
- Under new contract AECOM can be commissioned directly by districts but initial inception meeting with HCC and ongoing liaison is strongly recommended.

Use of Model By Developers

- Medium term (unenhanced model) suitable for high level assessment only
- Can provide information on routeing from developments, likely scale of impact □ highlight locations of concern but unsuitable for detailed development / mitigation scheme testing
- Encouragement of use of enhanced longer term model by developers in time to ensure consistent evidence base and identification of wider impacts.
- Likely to still be need for more detailed localised modelling

Local Plan Protocol

- Updated protocol reflecting use of COMET to be circulated
- Broad principles
  - Role of site promoters to provide evidence on standalone impacts and then to develop detail as part of planning process
  - Role of LPA to test cumulative impact of growth in their district (using pre existing / COMET model)
  - Role of HCC as LHA
    - Share results on cumulative forecast runs of COMET model
    - Advise districts on additional locations of concern caused by cumulative growth advise on cross boundary impacts
    - Work with LPAs HE to identify suitability, feasibility deliverability of transport mitigation measures to feed into IDP
    - Feed in information on priority strategic transport projects from Vision work whilst developing more local measures through Growth and Transport Plan process

<u>Appendix 13 A:</u> Hertfordshire County Council COMET Report: Hertfordshire County Council Transport Planning Framework: St Albans Local Plan Support Technical Note

Technical Note

Project:	**Hertfordshire County Council Transport Planning Framework**
Subject:	**St Albans Local Plan Support**
Date:	**June 2016**

1. Introduction

1.1. Task objective

St Albans District Council (SADC) is due to finalise its Local Plan in June and is currently seeking support in terms of highway network analysis from AECOM to inform its submission.

The Hertfordshire County Council's (HCC) existing 2014 Base Year and 2031 Forecast Year COMET models (version 1, March 2016) have been used to identify areas of pressure on the highway network. The 2031 Forecast currently includes Local Plan growth from all 10 Hertfordshire districts as well as the most significant planned transport infrastructure changes (i.e. committed schemes/very likely schemes). Although COMET is a multi-modal model, the focus of this work is interpreting the results of highway network assignment, modelled in SATURN. Given the available timescales, AECOM has made use of available material and model runs and has not undertaken any further modelling work.

1.2. Caveats

COMET is a strategic countywide model which has not been developed specifically for the St Albans area. Based on the current stage of development of the model (March 2016), there are some issues with performance of the Base Year model in the St Albans area which need to be taken into account when interpreting the results presented in this note. This has an implication on the level of robustness of the outputs and our ability to identify impacts and appropriate mitigation.

Further work outside the scope of this commission would therefore be required to understand the traffic impacts of Local Plan development in more detail. Work at this stage relies on readily available existing commissioned cumulative growth and does not include a scenario without St Albans Local Plan growth.

The COMET model suite uses SATURN for the purpose of highway assignment modelling. It should be noted that COMET is a strategic model and is not intended to provide detailed results due to its strategic nature (e.g. detailed junction and corridor assessment). At this stage, therefore, the results presented here should be interpreted as high level indications of likely traffic conditions.

All plots and schemes presented in this note are oriented with the North at the top.
Given the high level strategic nature of the model, some of the road layouts presented in this note may not be fully representative on the actual (or future) highway network.
Similarly all figures provided in the plots are indicative only.

2. Review of Base Year Conditions

2.1. Travel Pattern analysis

During the earlier stages of the development of COMET, AECOM undertook analysis into the travel patterns in Hertfordshire based on the following data sources:

- 2011 Census Journey to Work data (JTW);
- Hertfordshire 2012 Household Travel Survey;
- LENNON rail ticket sales data;
- Electronic Ticket Machine data from bus operators; and
- Mobile phone origin-destination data.

The results of this analysis were presented in a technical note issued by AECOM in September 2015 – *Hertfordshire COMET: TN 07 – Pattern of Travel across Hertfordshire*.

The study identified four key corridors of travel within Hertfordshire, two of which are applicable to St Albans; the East – West corridor and the M1, A41 and M25 triangle.

East – West corridor

The main travel pattern for towns along this corridor is towards London. Nevertheless, there are still some significant flows between adjacent towns along the corridor, linked principally by the A414.

Based on JTW data within this corridor, there is a significant volume of trips to St Albans from Hemel Hempstead (~1200 – 87% car), whilst the main outbound travel is towards Hatfield (~1100 – 81% car) and Welwyn Garden City (~1000 – 90% car). The predominant form of travel for these journeys and within the East – West corridor is car, likely due to the limited East – West public transport connectivity. These high level patterns are reflected in the figures shown in **section 3.3**.

Mobile phone data has been used to gain a high level understanding of the potential flows along this corridor. In the AM peak period, flows of approximately 1,500 are estimated between the Welwyn Garden City – Hatfield – St Albans City route in both directions. However, the main flow in the AM peak period is between Hemel Hempstead and St Albans, with this relationship being reversed in the PM peak period.

Journey time data from TrafficMaster reveals that low vehicle speeds are observed on the A414 around London Colney and Park Street junctions, most likely as they are access points to the M25 – see **Figure 1**.

Note that the plot shows speed in absolute terms rather than speed relative to the speed limit for that road. Links shown as orange / red in urban areas therefore do not necessary indicate problematic congestion.

Figure 1 – A414 TrafficMaster Journey Time Data (AM Peak)

Google data suggests that the most appropriate route from St Albans to Hatfield is via Sandpit lane as the other routes are susceptible to delays and have wider journey time variations. TrafficMaster data for this route is shown in **Figure 2**. Average speeds are seen to be particularly low at the junctions along Sandpit Lane with Woodstock Road and Beechwood Avenue.

Note that the plot shows speed in absolute terms rather than speed relative to the speed limit for that road. Links shown as orange / red in urban areas therefore do not necessary indicate problematic congestion.

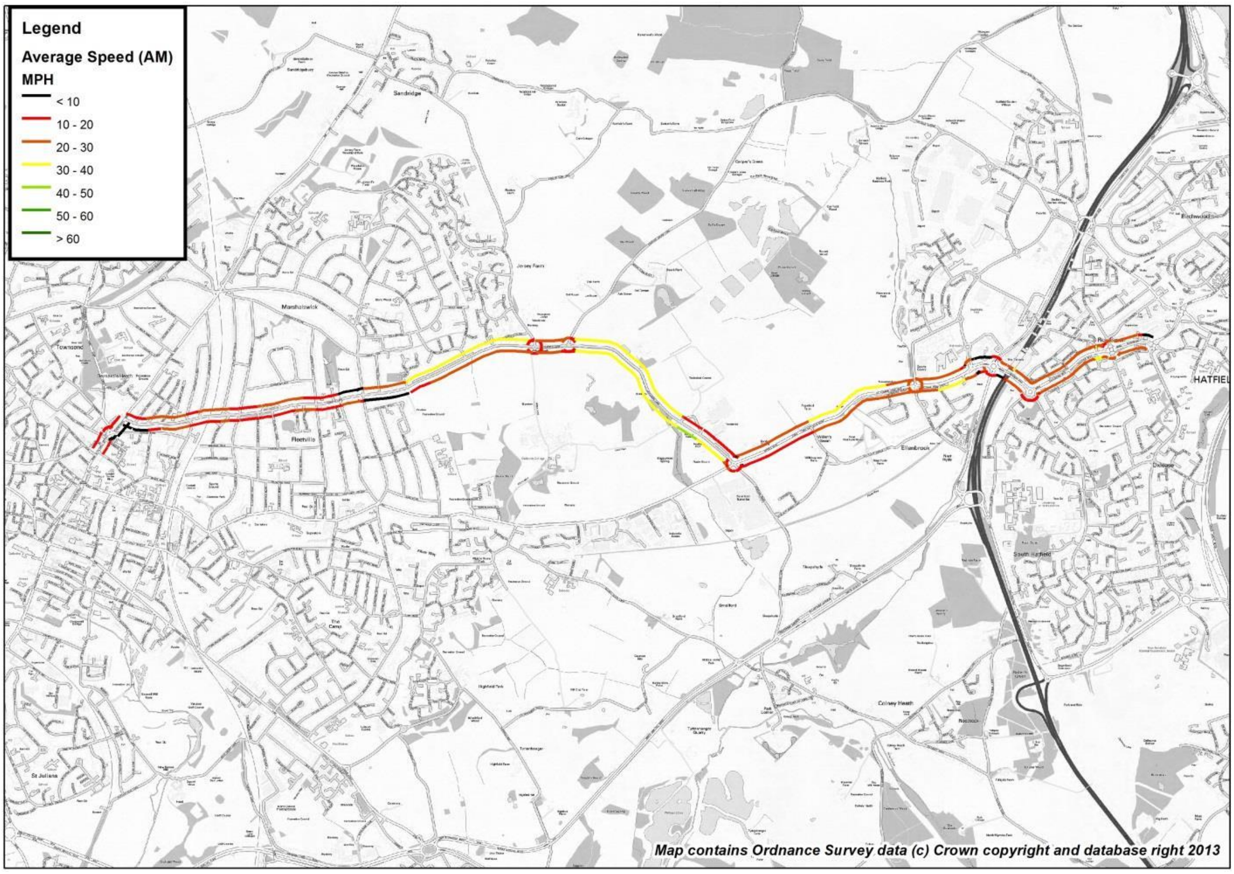


Figure 2 – St Albans ↔ Hatfield TrafficMaster Journey Time Data (AM Peak)

M1, A41 and M25 triangle

This area of interest is comprised of a triangle formed by Hemel Hempstead, Watford and St Albans. JTW data suggests that the urban areas in this triangle have a strong relationship with London and Luton & Dunstable. For the 3 urban areas, the majority outward flow is towards London, whereas a large proportion of inward flow is from Luton and Dunstable, and to a lesser extent, Three Rivers and north London boroughs.

The strongest JTW patterns in this area of interest relevant to St Albans district are:

- St Albans City to London (~6,600 trips, 92% public transport)
- Luton & Dunstable to St Albans City (~1,500 tips, 78% car)
- Hemel Hempstead to St Albans City (~1,200 trips, 87% car)

Google data for a neutral weekday suggests that the most appropriate route from Hemel Hempstead to St Albans is via Redbourn Rd as the other routes (e.g. via A414 or A4147) are susceptible to delays during peak periods and may not always be faster. TrafficMaster data for this route is shown in **Figure 3.** Speeds are particularly low in St Albans due to queuing at the Bluehouse Hill Roundabout and on the approach to George St and Chequer St.

Note that the plot shows speed in absolute terms rather than speed relative to the speed limit for that road. Links shown as orange / red in urban areas therefore do not necessary indicate problematic congestion.

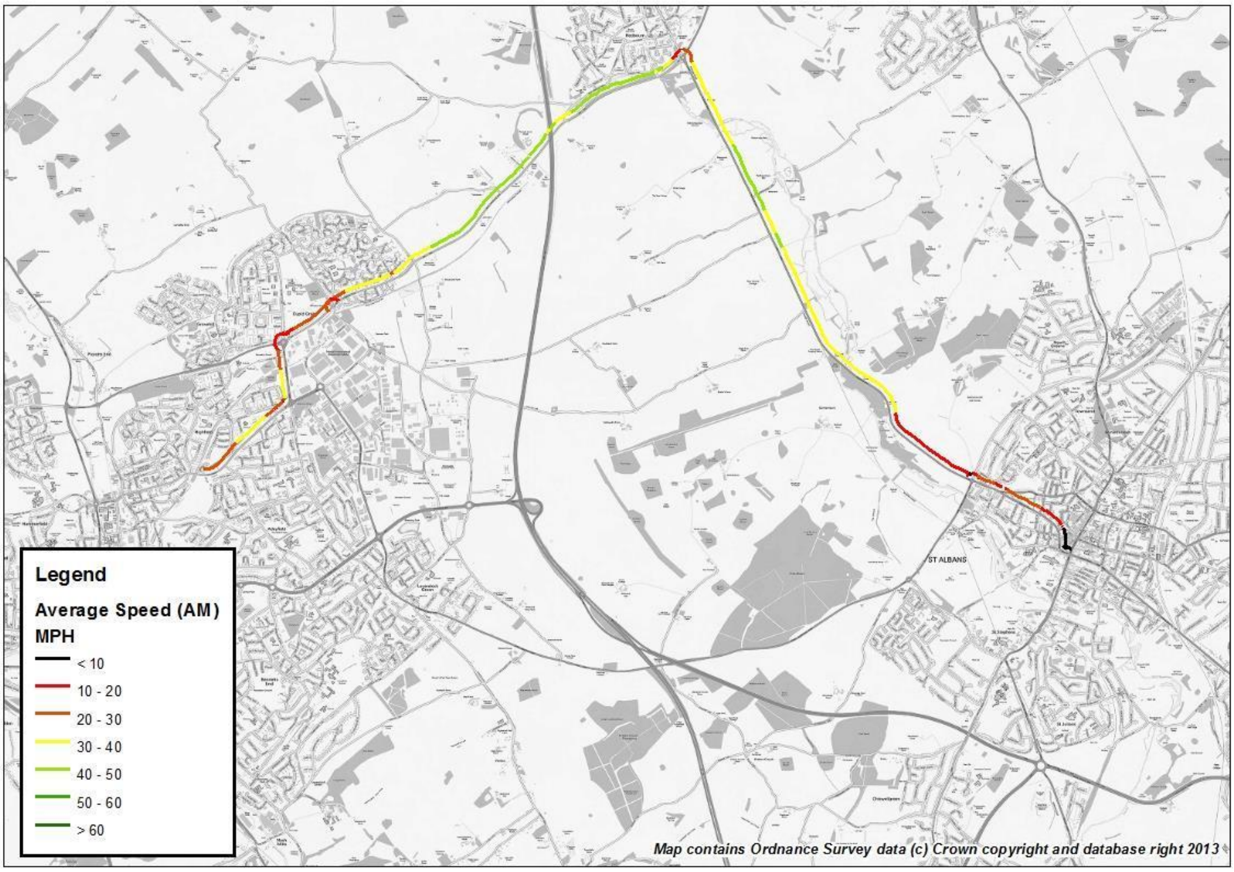


Figure 3 – Hemel Hempstead to St Albans City TrafficMaster Journey Time Data (AM Peak)

2.2. Congestion hotspots identified by HCC

HCC has provided data highlighting the locations of known existing congestion hotspots to be considered as part of this work. The hotspots have been identified as junctions where two or more approach arms have speeds significantly below the speed limit for some distance before the junctions.

Figure 4 presents the spatial distribution of known congestion hotspots according to TrafficMaster data provided by HCC. **Figure 5** shows the spatial distribution of known congestion hotspots defined by previous studies including urban transport plans.

This hotspot data is presented here primarily for the purpose of comparison with COMET Base Year model stress/node delay, and is discussed further in **section 2.3**.

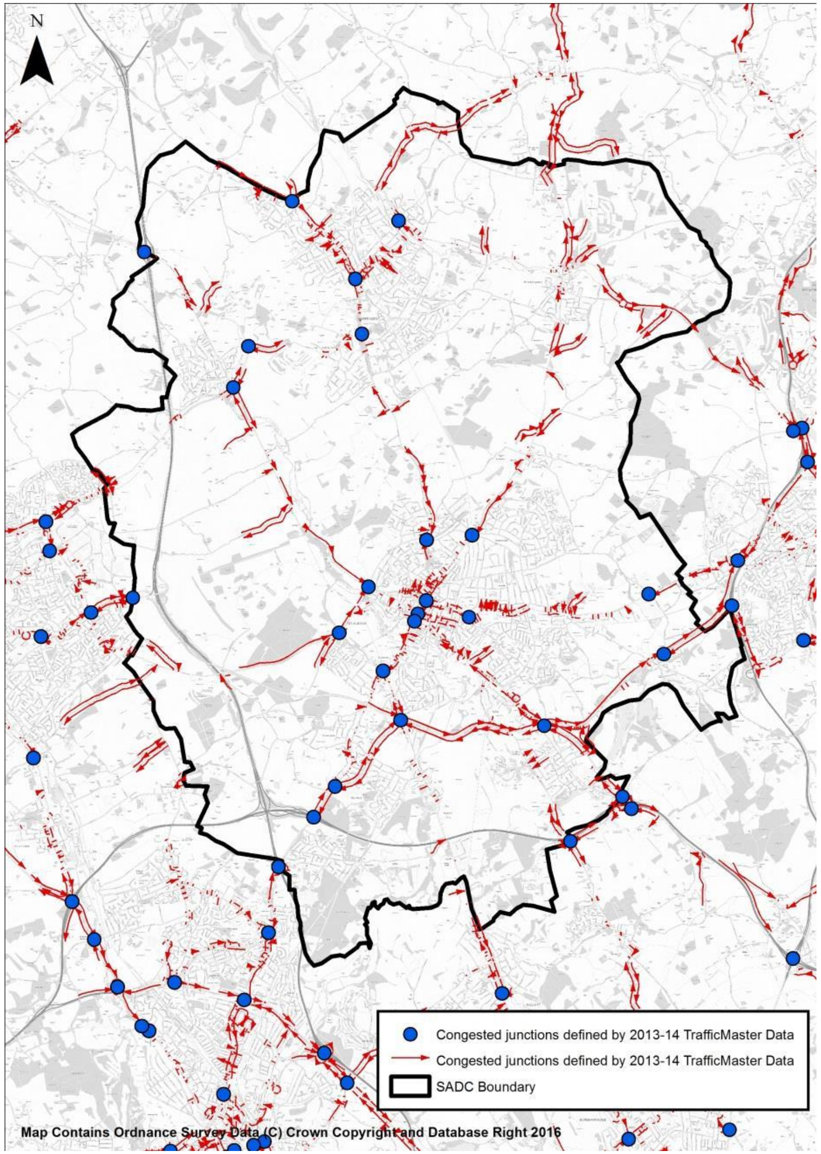


Figure 4 – TrafficMaster Congestion Locations

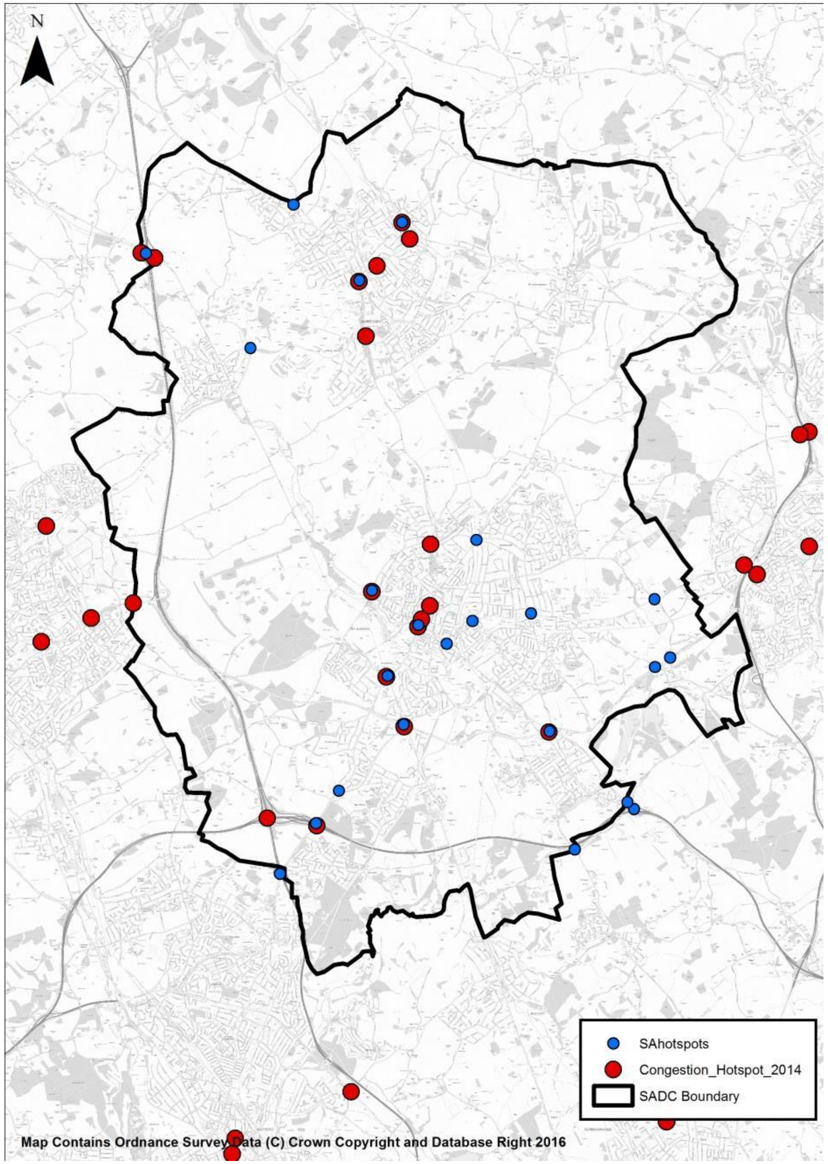


Figure 5 – Hotspots defined by previous studies

2.3. COMET Base Year stress/node delay plots

Figure 6 and **Figure 7** show the junction delay and link stress in the COMET Base Year (2014) model in St Albans District for the AM and PM Peaks, respectively.

- Junction delay is defined by the average delay for the possible turns at the given model node, weighted by the vehicular flow making each turn. The results are rounded to the nearest ½ minute. Note that the delay for a specific turn at a junction may therefore be significantly higher or lower than this value indicates, but still gives an overall impression of junction operation.
- Link stress is calculated by SATURN as a ratio of volume over capacity (V/C). Links are generally considered to be approaching capacity at 80% V/C, beyond which there is a material deterioration in operation.

There are strong consistencies between the AM and PM peak in terms of junction delay and link stress. COMET results suggest a higher concentration of delays and link stress towards the south of the district, particularly within St Albans City centre and in the vicinity of the A414 and M25. Less delay and link stress is evident from the Base Year model in Harpenden, Redbourn and Wheathampstead.

Table 1 highlights the junctions with the highest delay in the COMET Base Year model, and provides commentary validation performance and comparison with known hotspot data from HCC. The information in the table is not intended as an exhaustive list of delays and link stress in the District.

There is generally a good level of agreement between known hotspot locations and delays in COMET; however, some differences are evident. In Harpenden, for example, COMET results suggest less delay/link stress than hotspot data indicates.

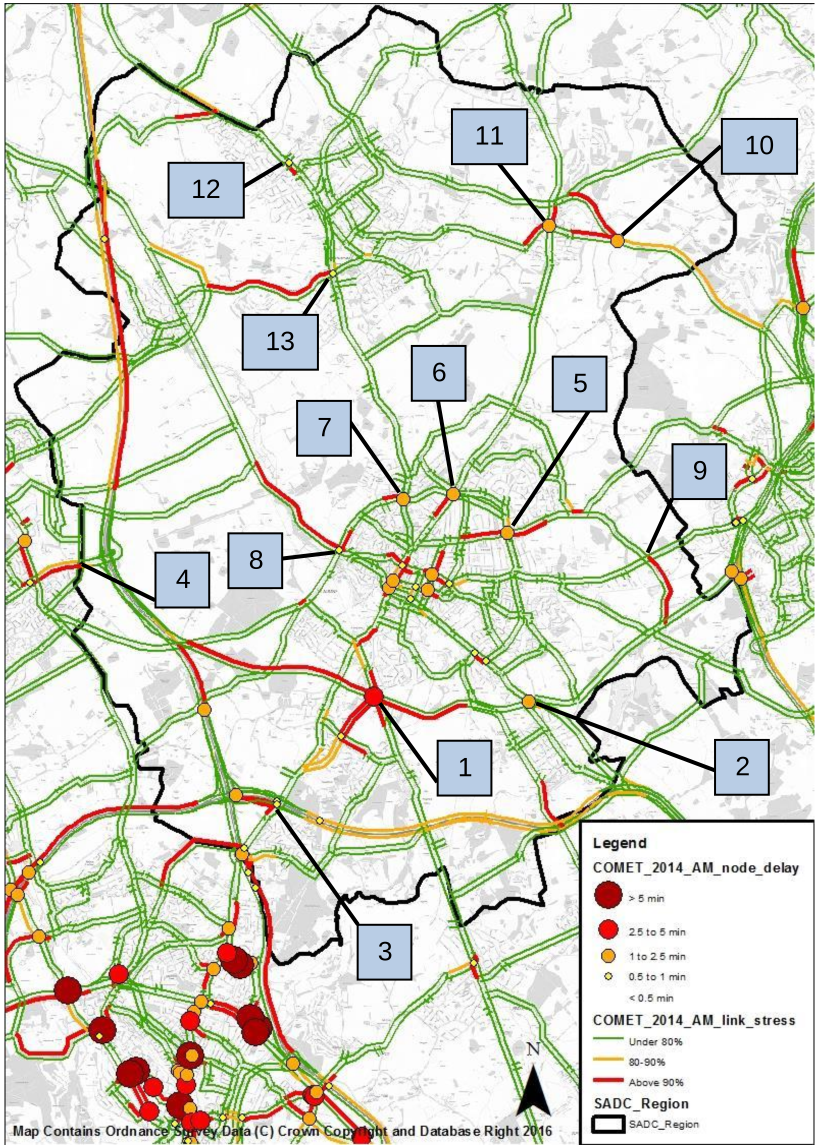


Figure 6 – Base year link stress and node delay – AM Peak

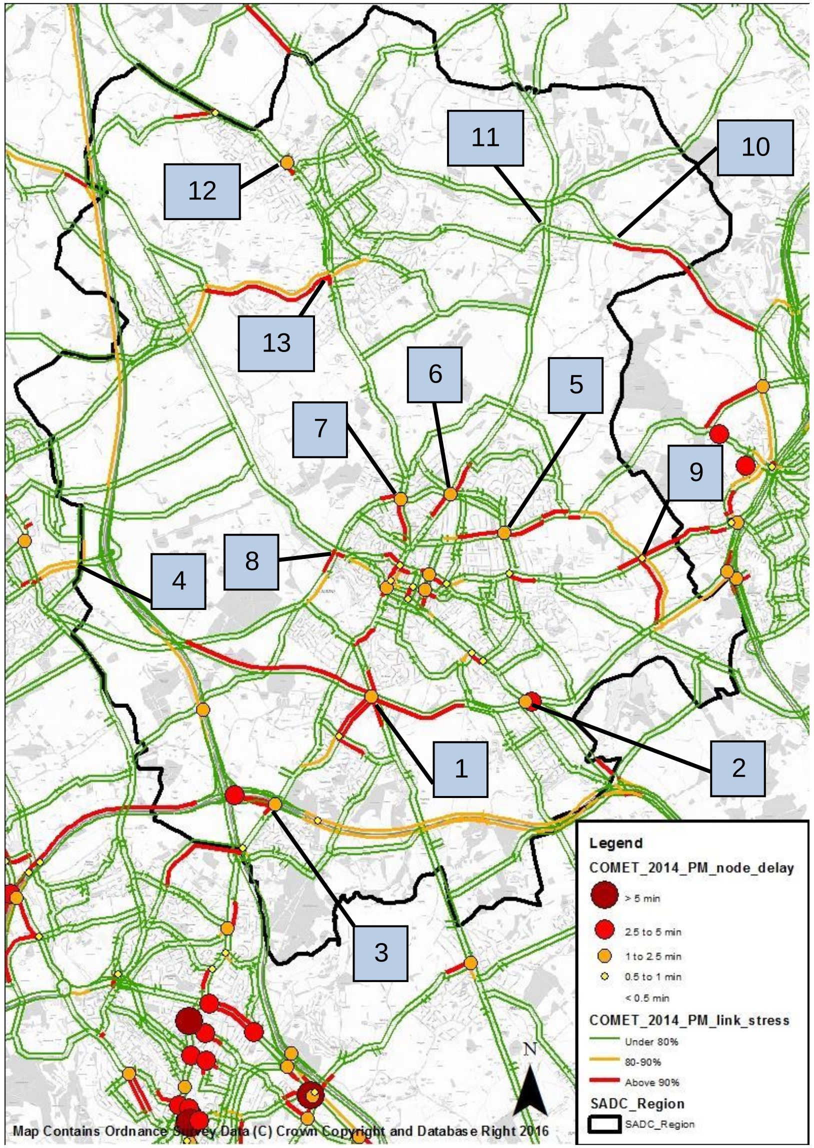


Figure 7 – Base year link stress and node delay – PM Peak

Table 1 – Key Junction Delays and Links under Stress

Map ID	Junction in given time period	Local COMET Validation (where data exists)	COMET Base Year Congestion	Comparison with HCC Congestion Hotspot Data
1	Park Street Roundabout AM Peak	Model flow on EB A414 approach ~3x higher than observed. Model flow on WB A414 departure ~2.5x higher than observed.	Junction delay: 2.5-5 mins V/C: >90% on all approaches Possible model delay overestimation	Identified as a congestion hotspot in TrafficMaster data and in previous studies
1	Park Street Roundabout PM Peak	Model flow on EB A414 approach ~2.5x higher than observed. Model flow on WB A414 departure ~2x higher than observed.	Junction delay: 1-2.5 mins V/C: >90% on all approaches Possibly model delay overestimation	See above
2	London Colney Roundabout AM Peak	Model flow on NB A1081 approach ~1.5x lower than observed. Model flow on SB A1081 departure marginally lower than observed.	Junction delay: 1-2.5 mins V/C: ~70-100% on all approaches (not visible on plot) Possible model delay underestimation	Identified as a congestion hotspot in TrafficMaster data and in previous studies
2	London Colney Roundabout PM Peak	GEH pass on NB A1081 approach. Model flow on SB A1081 departure ~1.5x higher than observed.	Junction delay: 2.5-5 mins V/C: 50% on NB A1081 approach. ~80-110% elsewhere (not visible on plot) Possible model delay overestimation	See above
3	M25 Junction 21a Both peaks	No local validation data available	Junction delay: 0.5-1 min (AM Peak) 1-2.5 mins (PM Peak) V/C: NB approach: >90% (both peaks) Note: delay is also shown on anti-clockwise on-slip and anti-clockwise mainline, but this is likely due to a coding error.	Identified as a congestion hotspot in TrafficMaster data and in previous studies

Map ID	Junction in given time period	Local COMET Validation (where data exists)	COMET Base Year Congestion	Comparison with HCC Congestion Hotspot Data
N/A	Various junctions within St Albans City Centre	No local validation data available.	Junction delay: 1-2.5 min (both peaks) V/C: significant number of links >80% Note: SATURN is not the appropriate tool to understand junction delay in detailed urban networks such as St Albans City centre.	Multiple links and junctions identified.
4	Green Ln/A414 Roundabout Both Peaks	GEH pass on WB approach and EB departure.	V/C: WB, EB & SB approaches >80% (AM Peak) SB & EB approaches >80% (PM Peak)	Identified as a congestion hotspot in TrafficMaster data
5	Sandpit Ln/ Beechwood Ave/ Marshalswick Ln Junction Both peaks	No local validation data available	Junction delay: 1-2.5 mins (both peaks) V/C: EB, WB & NB approaches >90% (both peaks)	Not identified as a congestion hotspot
6	St Albans Rd/ Sandridge Rd/ Marshalswick Ln/ Beech Rd Junction Both peaks	No local validation data available	Junction delay: 1-2.5 mins (both peaks) V/C: NB, EB & WB approaches >90% (AM Peak) NB, SB & WB approaches >90% (PM Peak)	Identified as a congestion hotspot in TrafficMaster data and in previous studies
7	Harpenden Rd/ Beech Rd/ Batchwood Dr Junction Both peaks	No local validation data available	Junction delay: 1-2.5 mins (both peaks) V/C: EB & SB approaches >80% (AM Peak) NB, EB & SB approaches >80% (PM Peak)	Identified as a congestion hotspot in TrafficMaster data and in previous studies
8	Redbourn Rd/ Verulam Rd/ Batchwood Dr/ A4147 Roundabout Both peaks	No local validation data available	Junction delay: 0.5-1 min (AM Peak) V/C: EB & SB approaches >90% (AM Peak) NB & WB approaches >90% (PM Peak)	Identified as a congestion hotspot in TrafficMaster data and in previous studies

Map ID	Junction in given time period	Local COMET Validation (where data exists)	COMET Base Year Congestion	Comparison with HCC Congestion Hotspot Data
9	Hatfield Rd/ Oaklands Ln/ Station Rd Roundabout AM Peak	Model flow on EB Hatfield Rd approach ~2.5x lower than observed. Model flow on WB Hatfield Rd approach ~1.5x lower than observed. GEH pass on NB Station Rd approach.	No indication of delay in model. Possible model delay underestimation	Identified as a congestion hotspot in TrafficMaster data and in previous studies
9	Hatfield Rd/ Oaklands Ln/ Station Rd Roundabout PM Peak	Model flow on EB Hatfield Rd approach ~1.5x lower than observed. Model flow on WB Hatfield Rd approach ~1.5x lower than observed. Model flow on NB approach ~1.5x higher than observed.	Junction delay: 1-2.5 mins V/C: NB and EB approaches >90% SB approach >80%. Possible model delay underestimation	Identified as a congestion hotspot in TrafficMaster data and in previous studies
10	B653/ Marford Rd Roundabout (Wheathampstead) AM Peak	GEH pass on EB B653 departure. Model flow on WB B653 approach marginally lower than observed.	Junction delay: 1-2.5 mins V/C: EB & SB approaches >90% Possible model delay underestimation	B653 approach links identified as congested in March 2016 TrafficMaster data
10	B653/ Marford Rd Roundabout (Wheathampstead) PM Peak	Model flow on EB B653 departure marginally lower than observed. Model flow on WB B653 approach ~1.5x lower than observed.	Junction delay: <0.5 mins V/C: WB approach >90% Possible model underestimation	B653 approach links identified as congested in March 2016 TrafficMaster data
11	Church St/High St (Wheathampstead) Junction AM Peak	No local validation data available	Junction delay: 1-2.5 mins V/C: SB & EB approach >90%.	Links identified as congested in March 2016 TrafficMaster data

Map ID	Junction in given time period	Local COMET Validation (where data exists)	COMET Base Year Congestion	Comparison with HCC Congestion Hotspot Data
12	Luton Rd/Park Hill Junction (Harpenden) Both peaks	No local validation data available	Junction delay: 0.5-1 mins (AM Peak) 1-2.5 mins (PM Peak) V/C: NB approach >90% (both peaks) SB approach >80% (both peaks)	Links identified as congested in March 2016 TrafficMaster data
13	St Albans Rd/ B487/Walkers Rd Roundabout (Harpenden) Both peaks	No local validation data available	Junction delay: 0.5-1 mins (AM Peak) V/C: SB approach >80% EB approach >100% (AM Peak) EB & WB approaches >80%. NB approach >90% (PM Peak)	Identified as a congestion hotspot in TrafficMaster data and in previous studies

2.4. Hemel Hempstead Base Year S-Paramics Model

In partnership with HCC, AECOM has developed an S-Paramics model of Hemel Hempstead (Base Year 2015) which has some overlap with St Albans District. As specified in the Task Order, results have been extracted from this model and are compared in the following section.

It should be noted that S-Paramics results cannot be compared directly with those from SATURN as the two traffic modelling software packages are different in their intended application and spatial scale. S-Paramics is a more detailed tool, and can be used to understand network operation at a relatively detailed level, whereas SATURN is a strategic modelling tool.

At a high level, however, a useful comparison can be made between S-Paramics vehicle speed and SATURN link stress (**Figure 6** and **Figure 7**). **Figure 8** and **Figure 9** show the vehicle speeds in the Hemel Hempstead model for the AM and PM Peaks.

Slow moving traffic associated with congestion is modelled to occur on the approaches to the Green Lane/A414 roundabout in both time periods, particularly on the A414 arms. This is reflected in the SATURN model, where certain approaches have a V/C value over 80%. In both models, the four east/west routes (Hemel Hempstead Rd, Redbourn Rd, Hogg End Ln Punchbowl Ln) do not indicate material levels of congestion within St Albans District.

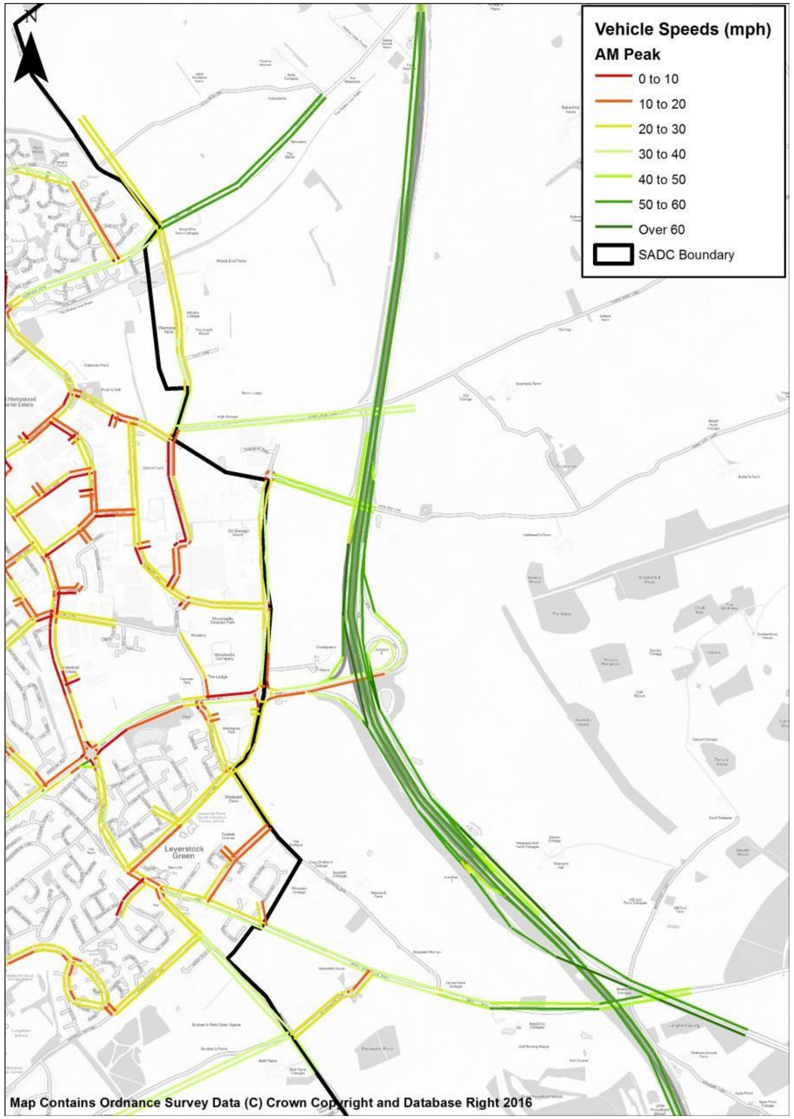


Figure 8 – Hemel Hempstead S-Paramics Base Year Model Vehicle Speeds (AM Peak)

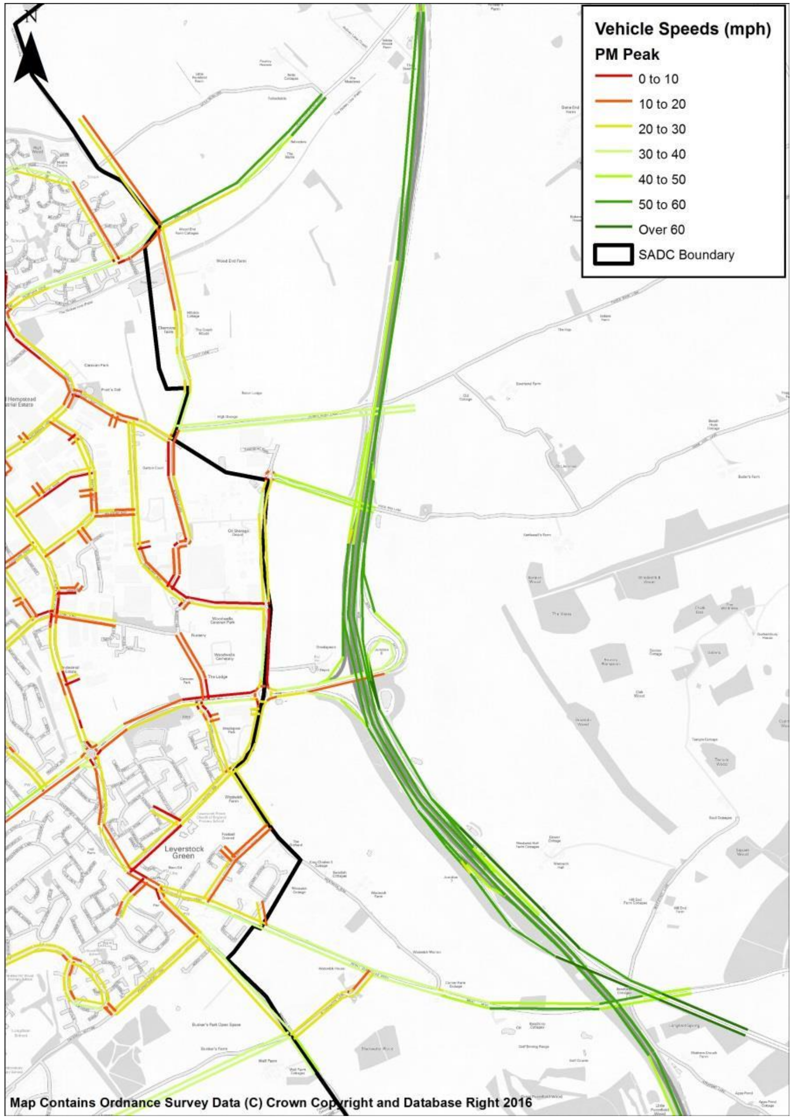


Figure 9 – Hemel Hempstead S-Paramics Base Year Model Vehicle Speeds (PM Peak)

3. Further review of COMET Base Year Performance

This section provides an overview of the performance of the COMET Base Year model in St Albans district for the AM and PM Peaks. The metrics of model performance are limited to those initially defined during the model development process, and AECOM understands that there is currently no intention to undertake further model validation in St Albans district.

The validation results presented here should be interpreted with an appreciation that COMET is currently a work in progress and is likely to be locally enhanced in the future as appropriate. Results presented in **section 2**, however, suggest that COMET is already broadly able to correctly simulate delays on the highway network, and can therefore be used to give high level indications of problematic areas.

3.1. COMET Base Year journey time performance

Fourteen routes were defined during the model development process to understand the performance of the COMET highway model in terms of modelled journey time relative to observed journey time. In order to meet WebTAG guidance[1], the modelled journey time should be within 15% of observed times (or 1 minute, if higher than 15%).

Of the fourteen routes, three are within the St Albans district boundary (see **Figure 10**), the results of which are presented in **Table 2**.

- A414 between A1(M) and M1
- M25 between A1(M) and M1
- M1 west of St Albans

[1] Section 3.2.10 of *WebTAG Unit M3.1 – Highway Assignment Modelling*

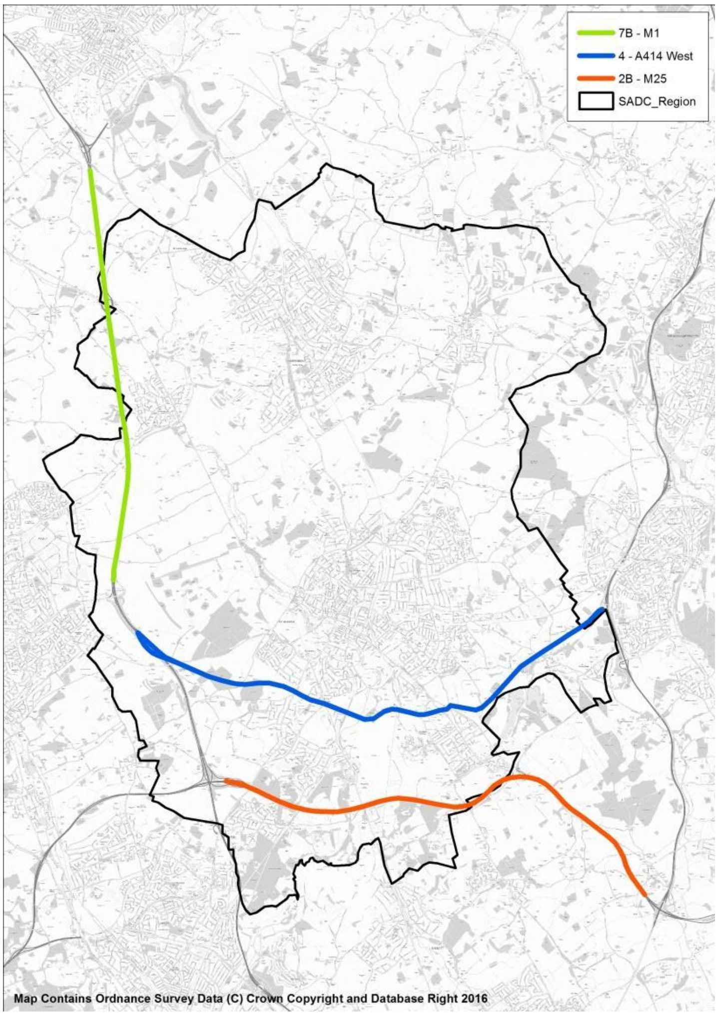


Figure 10 – Journey Time Routes within St Albans District

It should be noted that these journey time results are for the route as a whole, and do not necessarily guarantee model validity at individual junctions along the route. Rather, they should be interpreted as a high level indication of delay representation.

Table 2 – Journey Time Performance (minutes)

Route	Direction	AM			PM		
		Observed	Model	Difference	Observed	Model	Difference
A414 between A1(M) and M1	Eastbound	17	15	-2 (-12%)	13	15	2 (18%)
	Westbound	13	13	0 (1%)	14	17	3 (25%)
M1 between J5 and J7	Northbound	7	7	0 (2%)	9	8	-2 (-18%)
	Southbound	8	10	2 (22%)	7	6	0 (-5%)
M25 between J21a and J23	Clockwise	7	8	1 (12%)	10	8	-2 (-18%)
	Anti-clockwise	7	9	2 (22%)	7	9	2 (29%)

Journey time validation performance on the 3 routes is stronger in the AM peak than PM peak, where differences of up to 3 minutes occur. The results suggest that the AM peak delays on the A414 between the A1(M) and M1 are most accurately represented, whereas larger discrepancies are observed in the PM peak for most routes.

These results present the modelled delay along a given route, and should be considered alongside any analysis regarding the likely scale of change in corridor level delay.

3.2. Link performance in St Albans District

This section presents the validation results of the COMET highway assignment model according to the GEH statistic[2] (formula given below). According to WebTAG criteria, the GEH for individual model links should be less than 5.

$$GEH = \sqrt{\frac{(M-C)^2}{(M+C)/2}}$$

Where:

- GEH is the GEH statistic;
- M is the modelled flow; and
- C is the observed flow.

Figure 11 and **Figure 12** present the link performance in terms of GEH, whereby links coloured green meet WebTAG guidelines, and links coloured red are the furthest from meeting the criteria. **Table 3** summarises the performance of key links in St Albans district for both peak periods.

As a district, the performance of COMET in terms of link GEH within St Albans is therefore mixed. The performance of any given link should be borne in mind when drawing conclusions about likely traffic conditions on that link or adjacent junctions.

[2] GEH is defined in section 3.2.7 of *WebTAG Unit M3.1 – Highway Assignment Modelling*

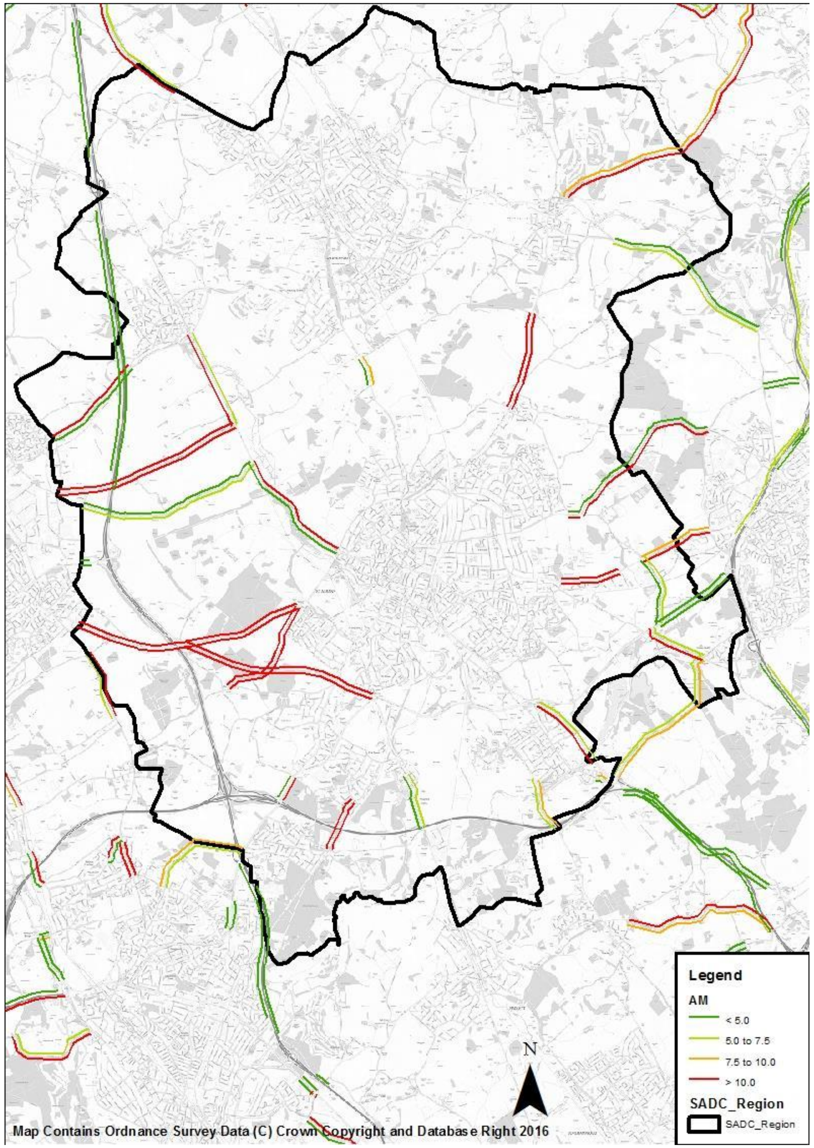


Figure 11 – Base Year GEH – AM peak period

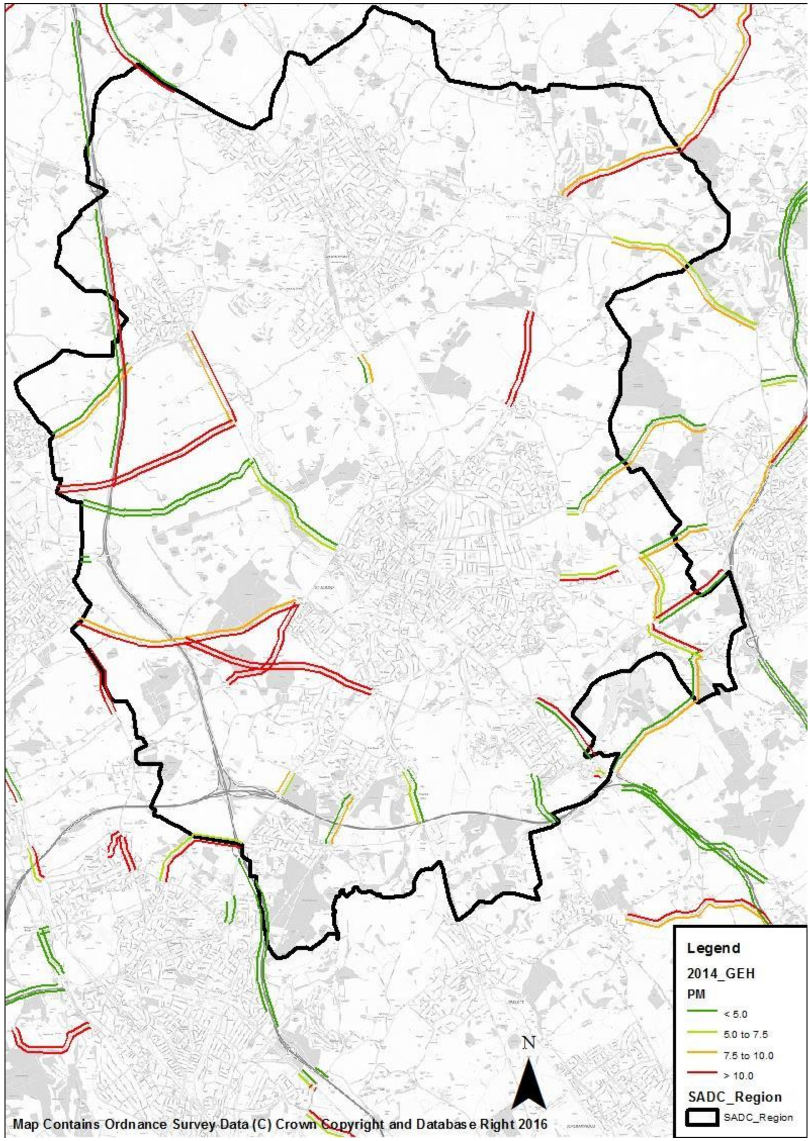


Figure 12 – Base Year GEH – PM peak period

Table 3 – Validation Results of Key Links in St Albans District

AM Peak		PM Peak	
GEH below 5	GEH above 5	GEH below 5	GEH above 5
M1 north of Hemel Hempstead – both directions North Orbital Road and Radlett Road north of the M25 – northbound A414 near the A1(M) in both directions Hemel Hempstead Road west of M1 – westbound Harpenden Rd near Childwickbury – northbound Redbourn Road north of Batchwood Drive – northbound	A414 between M1 Junction 8 and Park Street Roundabout – both directions A4147 between King Harry Lane and Hemel Hempstead – both directions Hatfield Road between St Albans and Hatfield – both directions Redbourn Road north of Batchwood Drive – southbound High Street between Sandridge and Wheathampstead – both directions Park St Lane between Bricket Wood and Park Street – both directions A1081 near London Colney – northbound	M1 north of Hemel Hempstead – northbound A414 near the A1(M) in westbound Radlett Road north of the M25 – southbound Park St Lane between Bricket Wood and Park Street – northbound Shenley Ln north of M25 – both directions A1081 near London Colney – northbound Redbourn Road north of Batchwood Drive – southbound Hemel Hempstead Road west of M1 – eastbound	M1 north of Hemel Hempstead – southbound A414 near the A1(M) in eastbound A414 between M1 Junction 8 and Park Street Roundabout – both directions A4147 between King Harry Lane and Hemel Hempstead – both directions High Street between Sandridge and Wheathampstead – both directions Hatfield Road between St Albans and Hatfield – westbound A1081 near London Colney – southbound Hatfield Road between St Albans and Hatfield – westbound

3.3. St Albans trip distribution analysis

This section provides an overview of the origins and destinations of trips modelled in COMET to and from St Albans City in the AM and PM Peaks. The analysis presented in this section is not directly compared to any observed origin / destination data collected for the purpose of this work, however, is intended to give an impression of the modelled travel patterns to and from the city.

Figure 13 and **Figure 14** show the distribution of trips entering St Albans, whilst **Figure 15** and **Figure 16** show the distribution of trips leaving St Albans. These plots are produced using select link analysis of inbound and outbound routes to and from St Albans City. Note that through-trips through St Albans are also shown in these diagrams.

It should be noted that, for the purposes of this work, the confidence in origin / destination patterns into and out of the St Albans urban area should be treated with some caution, particularly in the AM peak.

Inbound

In both time periods, the main origins of inbound trips are (among others) Hemel Hempstead, Harpenden, Stevenage, Welwyn Garden City, Hertford and Watford. Longer distance trips are also modelled using the M25 and M1 to reach St Albans. Large proportions inbound movements use key radial routes including A4147, Redbourn Rd, Harpenden Rd, St Albans Rd, Sandpit Ln, A1081 and Napsbury Lane, N Orbital Rd, and Potterscrouch Ln.

Based on validation cordon results, it is likely that movements into St Albans City from the north are underrepresented in both time periods, and overestimated from the south in the AM peak.

Outbound

The outbound trips in both time periods are broadly inversely consistent in terms of distribution to the inbound trips. Key destinations include Hemel Hempstead, Harpenden, Welwyn Garden City, Stevenage, Hertford, and Watford.

Based on cordon performance, outbound movements to the south are likely to be overestimated in both time periods, whereas outbound movements to the north are underestimated in the AM Peak.

In the following Figure 13 to Figure 16, the width of the green bands adjacent to model links is proportionate to the traffic flow. For scale, the maximum inbound/outbound flow has been annotated on each figure.
In figures below, PCU refers to "Passenger Car Unit". It is a vehicle unit used for highway assignment.

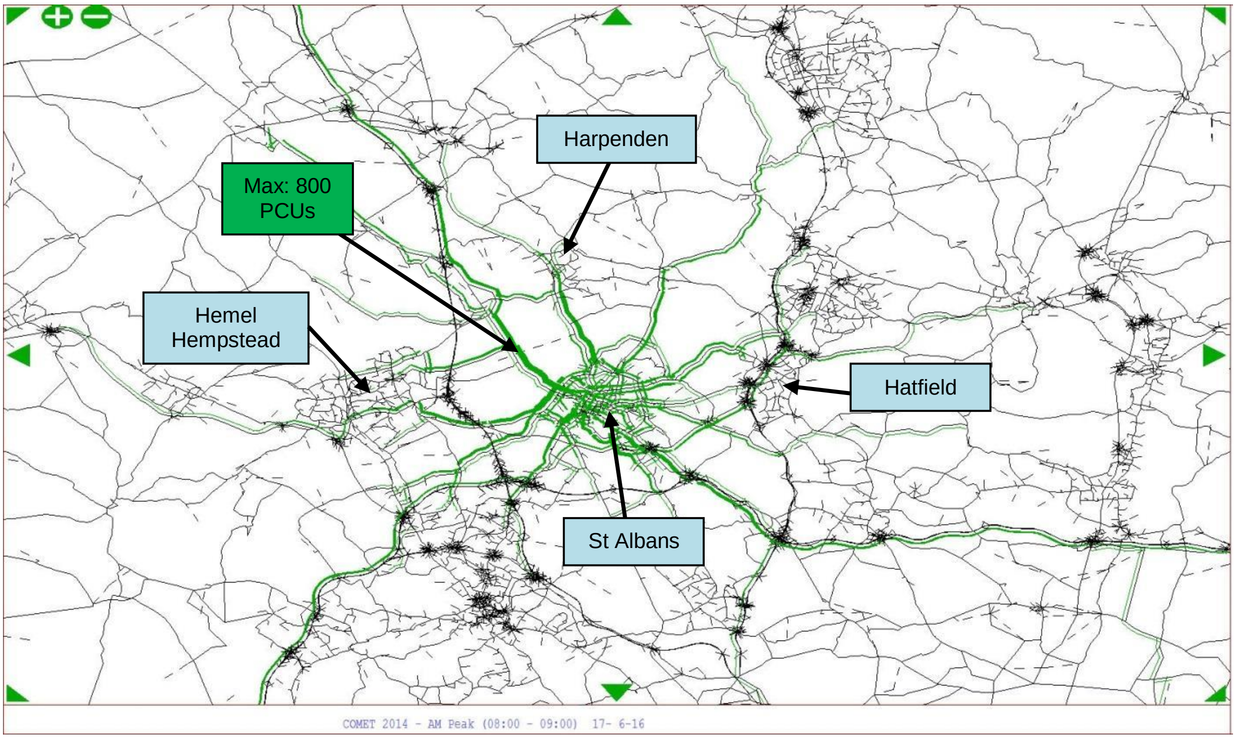


Figure 13 – Distribution of PCU trips into St Albans during the AM Peak period

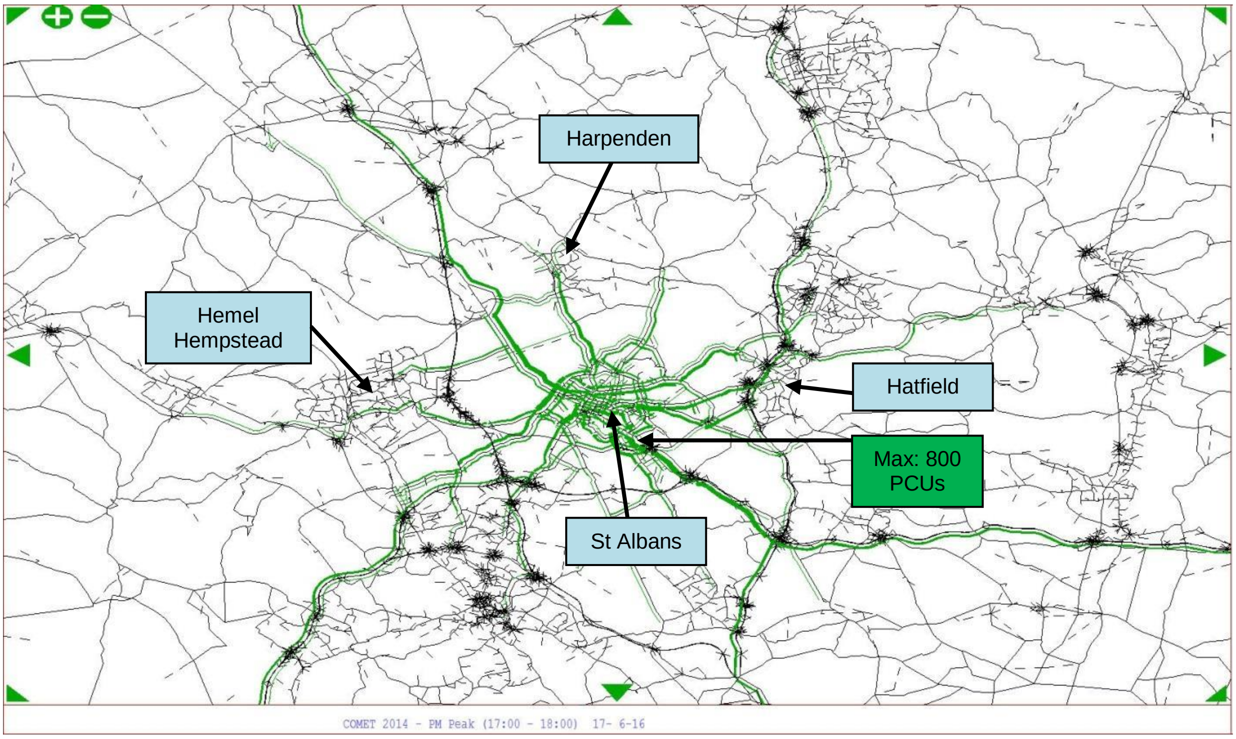


Figure 14 – Distribution of PCU trips into St Albans during the PM Peak period

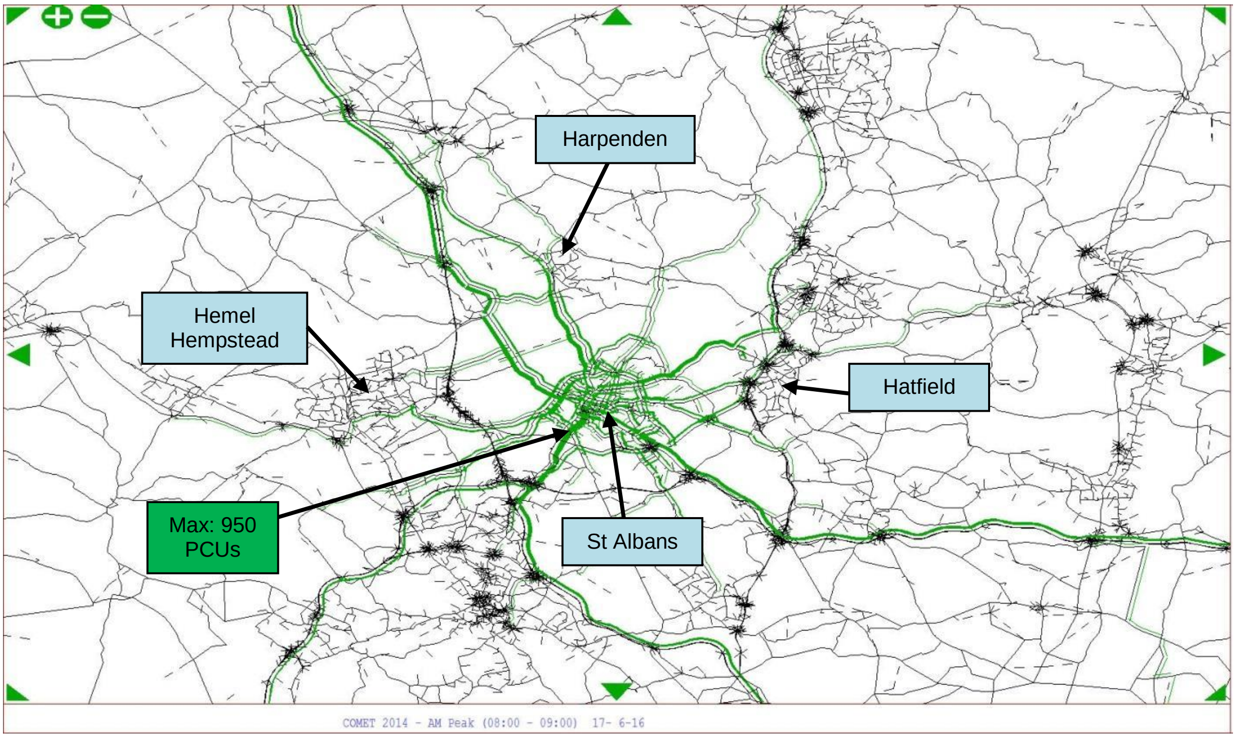


Figure 15 – Distribution of PCU trips out of St Albans during the AM Peak period

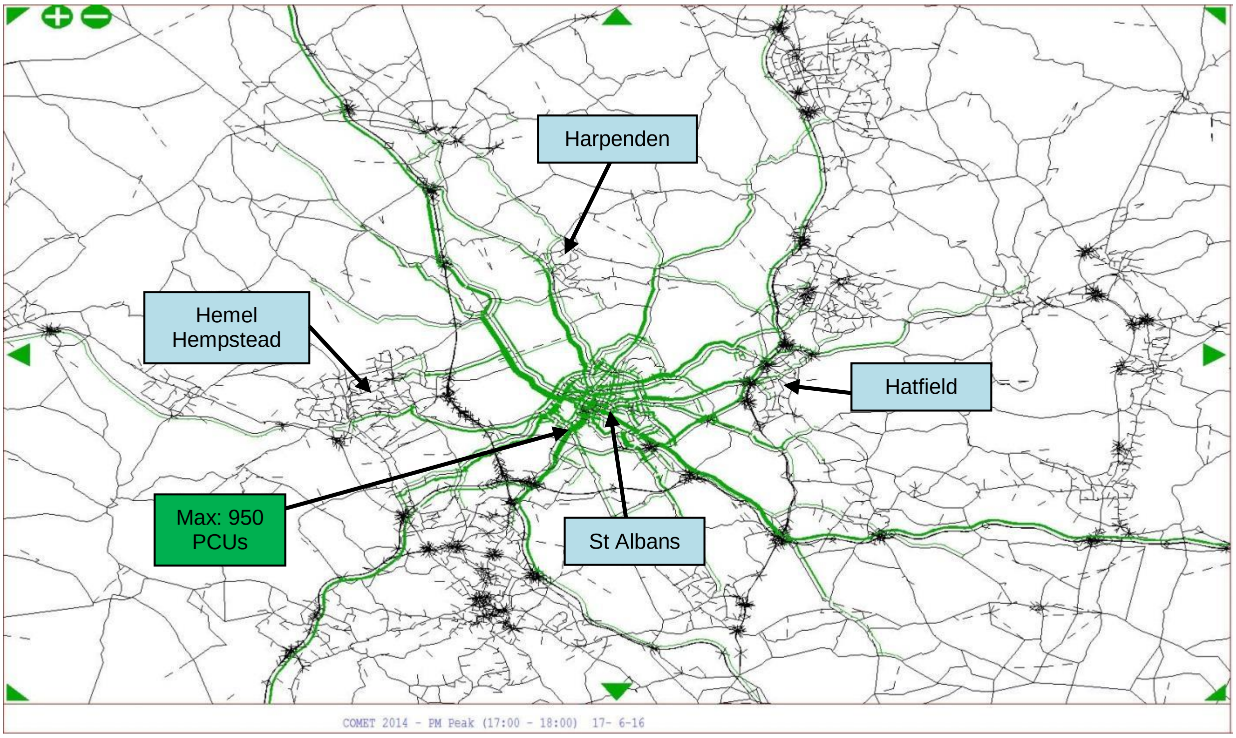


Figure 16 – Distribution of PCU trips out of St Albans during the PM Peak period

4. Review of 2031 Forecast Conditions (COMET)

4.1. COMET Forecast Year stress/node delay plots

As was shown in **section 2.3** for the Base Year node delay and link stress, **Figure 17** and **Figure 18** present the equivalent results for 2031. As expected, delay and link stress generally increase across the District due to growth in traffic volumes.

The most problematic junctions in terms of delay are broadly those that are also most problematic in the Base Year model. Link stress follows a similar pattern. In most instances, delay in already problematic locations increases, a notable exception to which is Park Street roundabout, where delay falls slightly (most likely due to the planned changes as part of the Radlett Rail Freight planning application – see **section 4.3**). When considering the delay reduction at Park St roundabout, the following two points should be borne in mind:

- In the Forecast Year results, the roundabout is split into several separate model nodes in order to correctly simulate a signalised roundabout in SATURN. In the Base Year, the roundabout is represented by a single node, such that the delay cannot be directly compared between the two scenarios.
- The addition of the new junction between Park St and Napsbury (associated with the Radlett Rail Freight planning application) creates some additional delay. Otherwise it is likely that this delay would occur at the Park St roundabout.

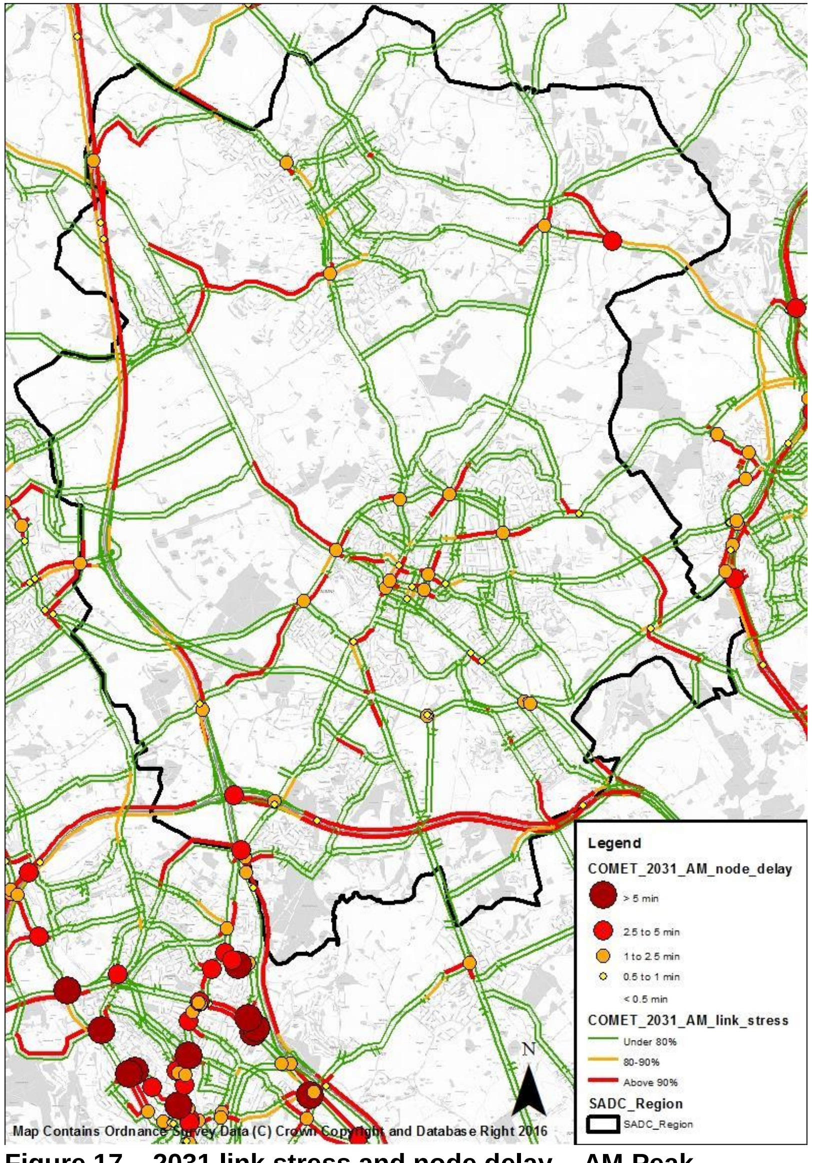


Figure 17 – 2031 link stress and node delay – AM Peak

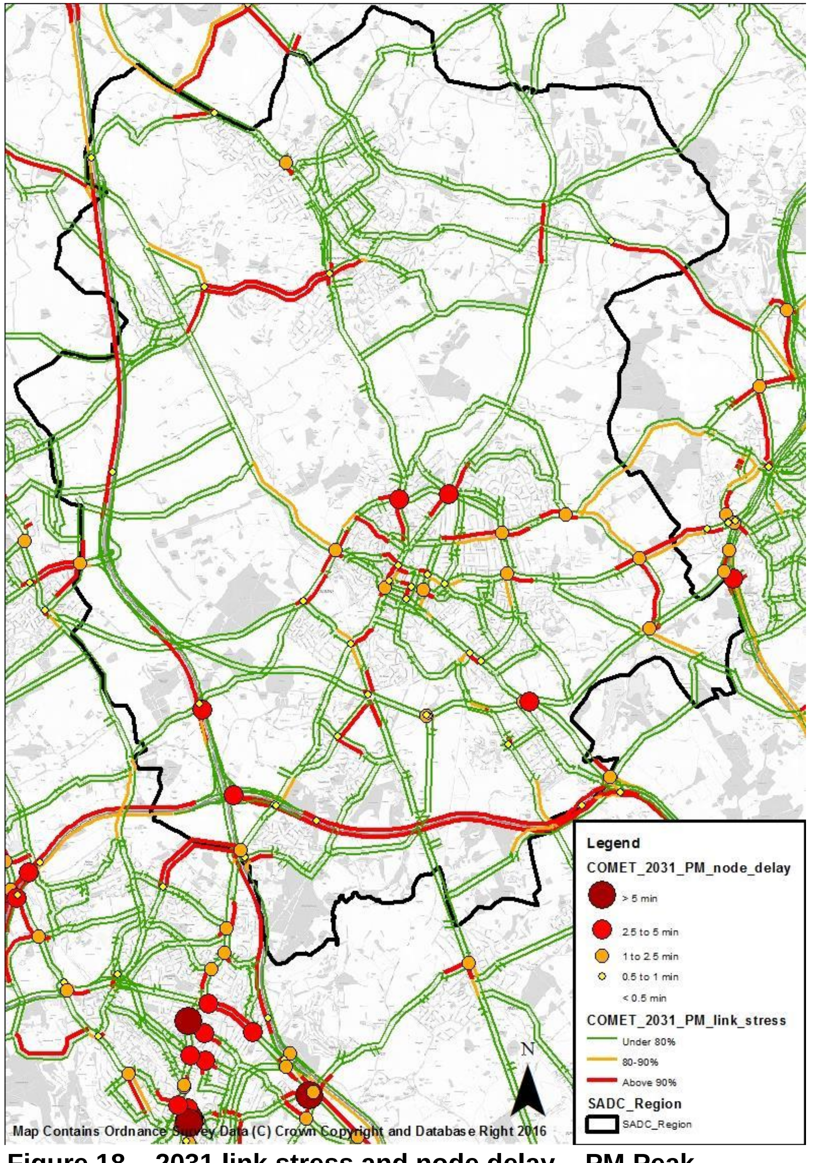


Figure 18 – 2031 link stress and node delay – PM Peak

4.2. Problematic junction analysis

The following section presents flow and delay results in terms of the change relative to the Base Year 2014.

It is important to note that:

- Rather than an exhaustive analysis, the results presented here provide an overview of key junctions.
- The results prepared in this section do not include junctions where mitigation is proposed as part of the East Hemel Hempstead (Maylands Growth Corridor) development, North West Harpenden or East St Albans (Oaklands). See **Table 7** for details of these junctions.
- Results are shown for the peak hour in which the most significant congestion is identified at the junction.
- Results at this scale should be interpreted with some caution due to strategic nature of SATURN.

Flow changes are in terms of passenger car unit (PCU) change, whilst delay changes are in terms of seconds for each vehicle.
*The colours of arrows shown in figures such as **Figure 22** are not an expression of congestion or stress for that turn. The colours (1 colour for each approach arm) are for illustrative clarity and “colour code” the approach arm of each movement through the junction.*

London Colney Roundabout (ID 2 in Figure 6 / Figure 7)

As discussed in **Table 1**, delay and link stress is modelled at London Colney roundabout in the Base Year, and this is also indicated in the forecast. In relative terms, flow and link stress are not materially different in the forecast relative to the Base Year, principally as the junction is already operating close to capacity.

Figure 19 and **Figure 20** show AM Peak flow and delay change plots relative to the Base Year.

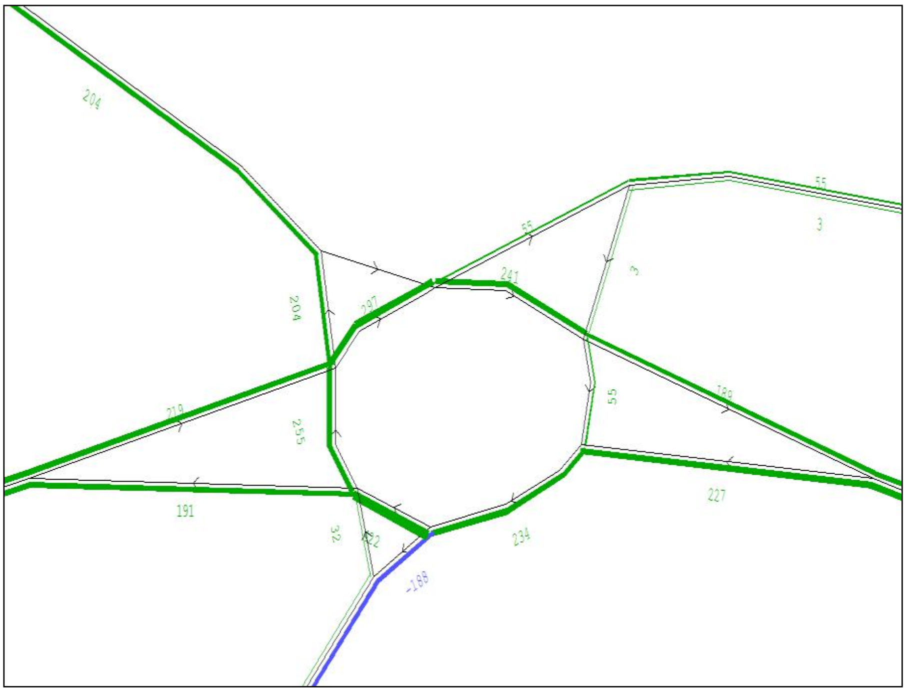


Figure 19 – Indicative flow change in PCUs at London Colney Roundabout – AM Peak; green: flow increases, blue: flow decreases

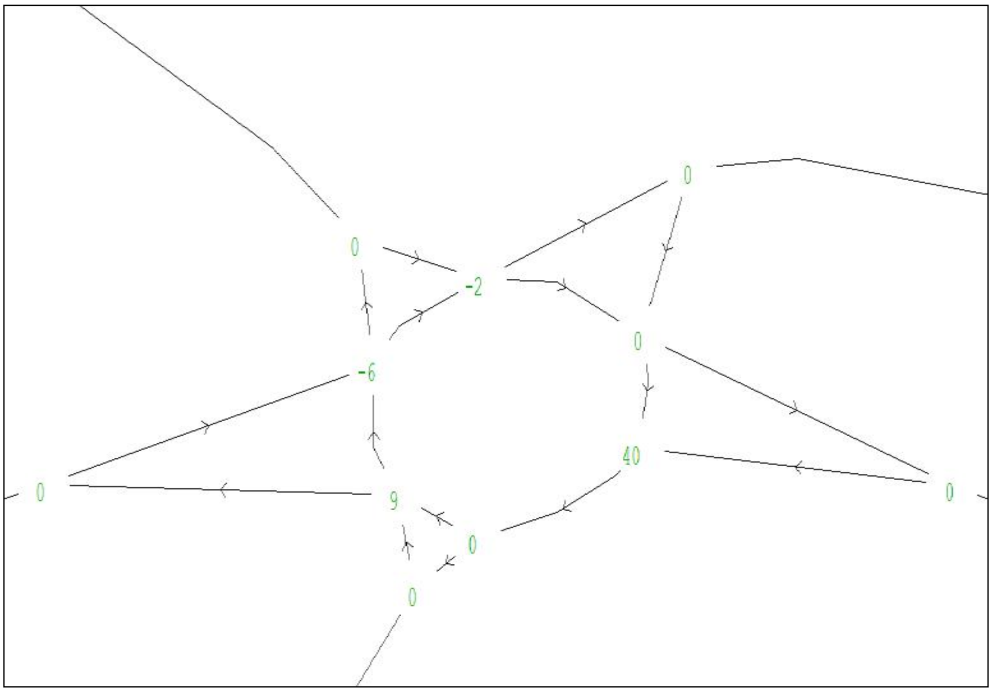


Figure 20 – Indicative delay change in seconds at London Colney Roundabout – AM Peak

St Albans Rd / Sandridge Rd / Marshalswick Ln / Beech Rd Junction (ID 6 in Figure 6 / Figure 7)

Delay is likely to increase in the Forecast Year at the St Albans Rd / Sandridge Rd / Marshalswick Ln / Beech Rd Junction). Although the flow increase is fairly modest (see **Figure 21**), delay increase is more significant (see **Figure 22**), particularly from the south as this approach is already at capacity in the Base Year.

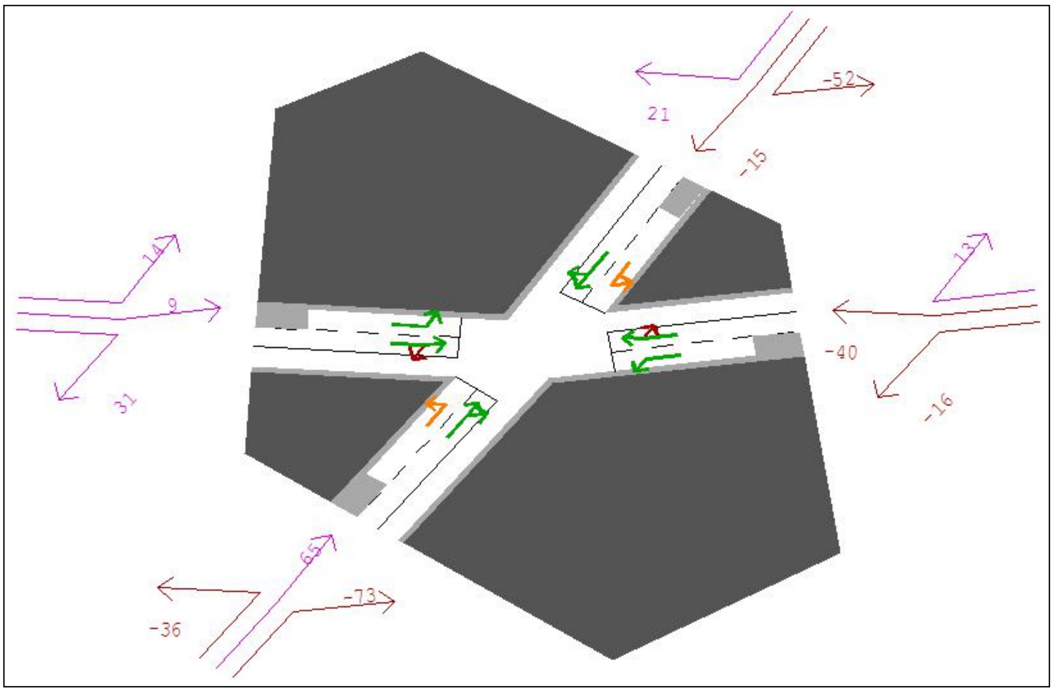


Figure 21 – Indicative flow change by movement in PCUs at St Albans Rd / Sandridge Rd / Marshalswick Ln / Beech Rd Junction – PM Peak

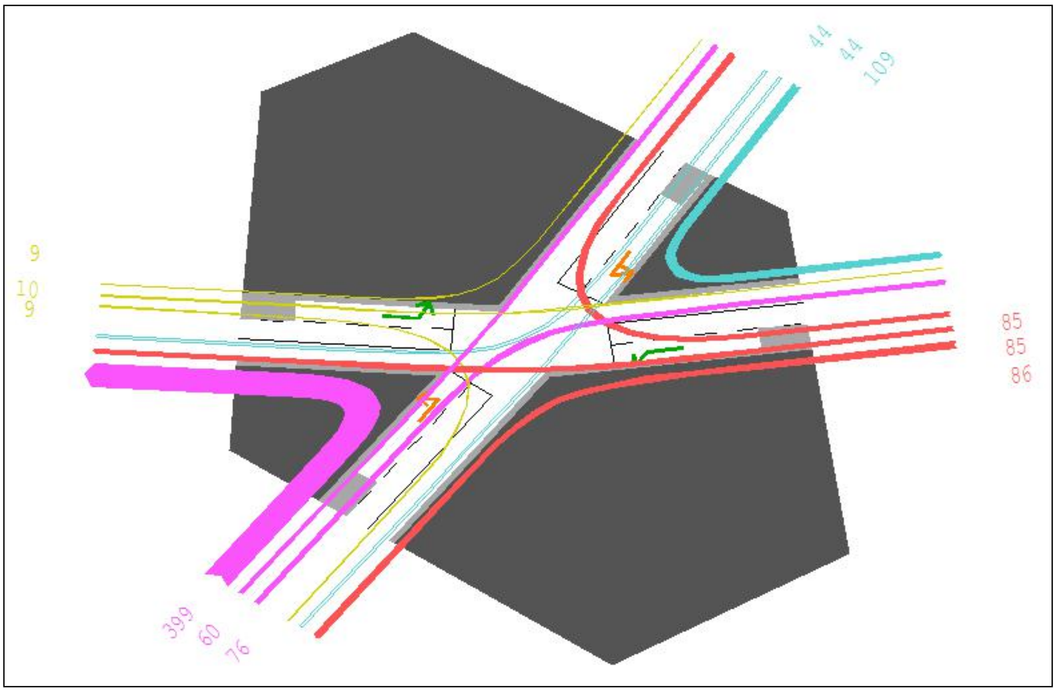


Figure 22 – Indicative delay change by movement in seconds at St Albans Rd / Sandridge Rd / Marshalswick Ln / Beech Rd Junction – PM Peak

Harpenden Rd / Beech Rd / Batchwood Dr Junction (ID 7 in Figure 6 / Figure 7)

As discussed in **Table 1**, the Harpenden Rd / Beech Rd / Batchwood Dr Junction experiences delay in the Base Year, and modelling suggests delay increases in the forecast. **Figure 23** and **Figure 24** show the PM Peak flow and delay change relative to the Base Year. The thickness of the tube is proportionate to the change. There are increased delays on all 4 arms with the most significant increases occurring on Harpenden Rd followed by the northern and western arms.

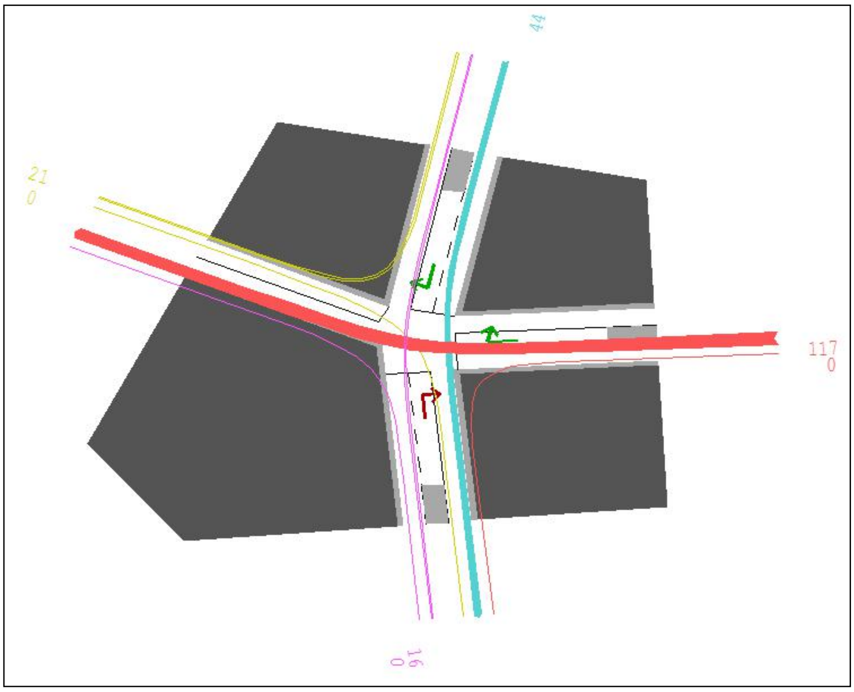


Figure 23 – Indicative flow change by movement in PCUs at Harpenden Rd / Beech Rd / Batchwood Dr Junction – PM Peak

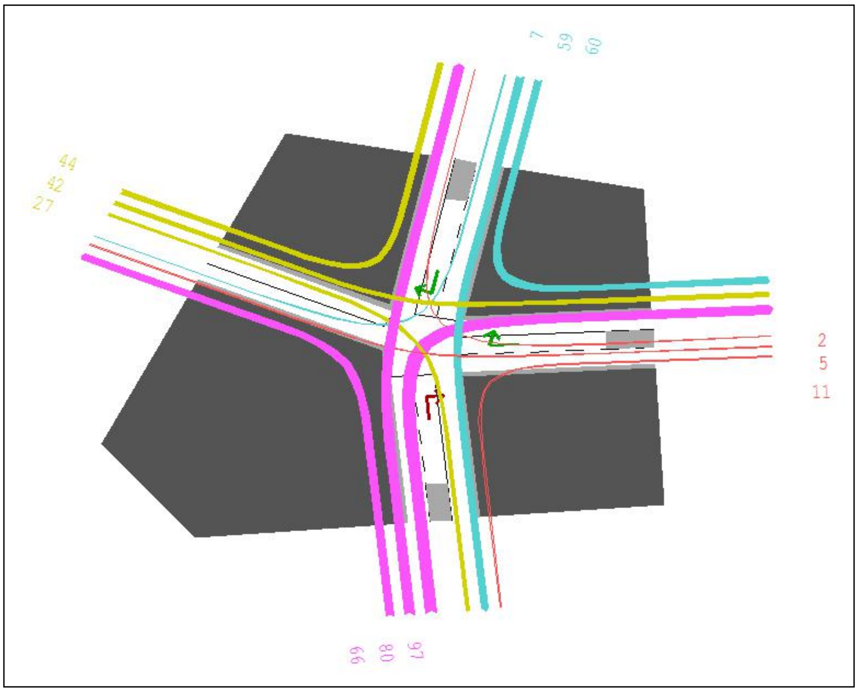


Figure 24 – Indicative delay change by movement in seconds at Harpenden Rd / Beech Rd / Batchwood Dr Junction – PM Peak

Redbourn Rd / Verulam Rd / Batchwood Dr / A4147 Roundabout (ID 8 in Figure 6 / Figure 7)

Modelled delay increases at the Redbourn Rd / Verulam Rd / Batchwood Dr / A4147 Roundabout, most significantly on the Verulam Rd approach. It should be noted that there is increase in southbound traffic from Batchwood Drive, to which vehicles on the Verulam Road approach have to give way.

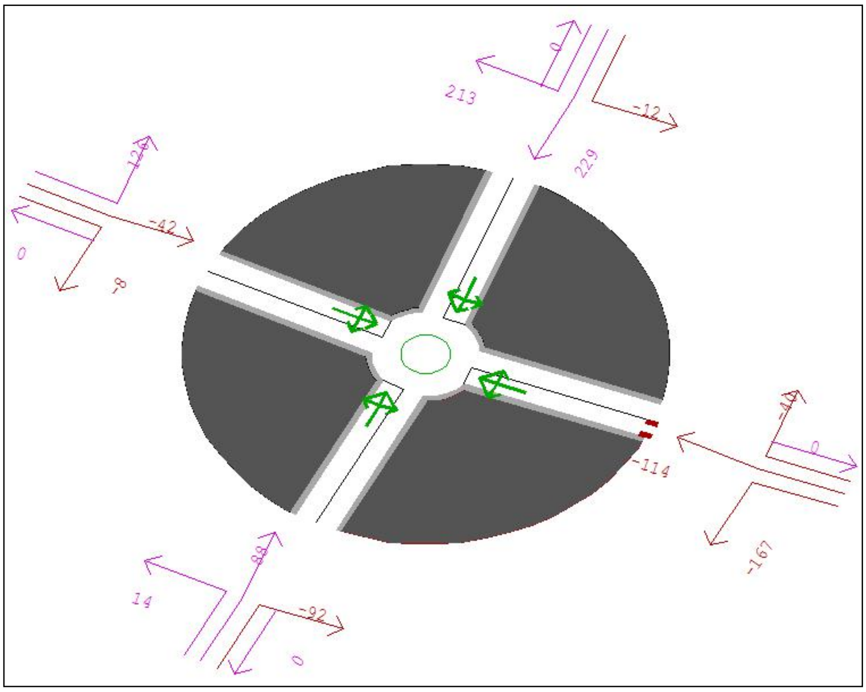


Figure 25 – Indicative flow change by movement in PCUs at Redbourn Rd / Verulam Rd / Batchwood Dr / A4147 Roundabout – PM Peak

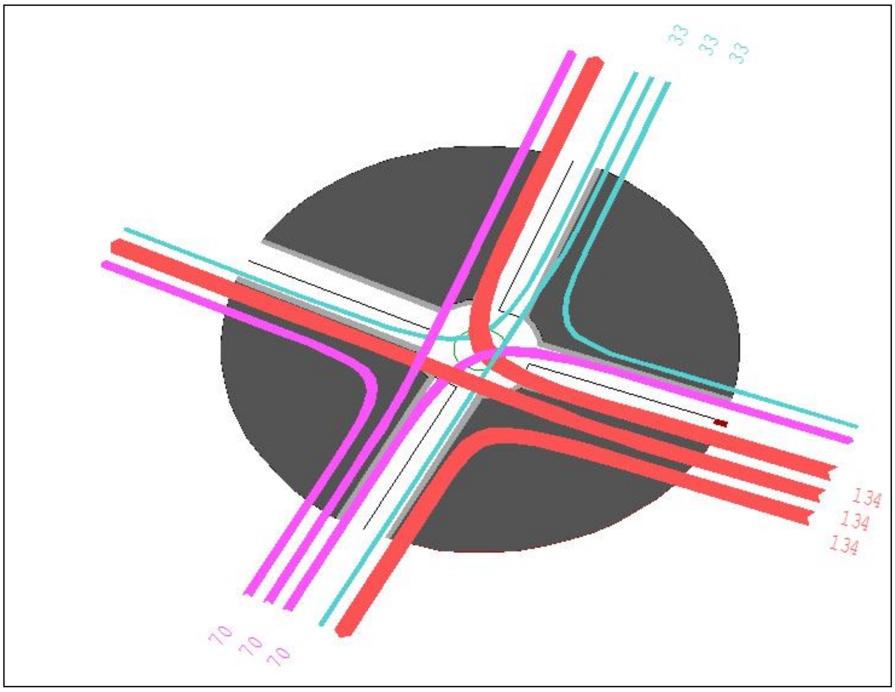


Figure 26 – Indicative delay change by movement in seconds at Redbourn Rd / Verulam Rd / Batchwood Dr / A4147 Roundabout – PM Peak

B653 / Marford Rd Roundabout (Wheathampstead) (ID 10 in Figure 6 / Figure 7)

The modelled delay increase at this junction is most significant on the B653 approach from the north (~3 mins increase in average), as shown in **Figure 27** and **Figure 28**.

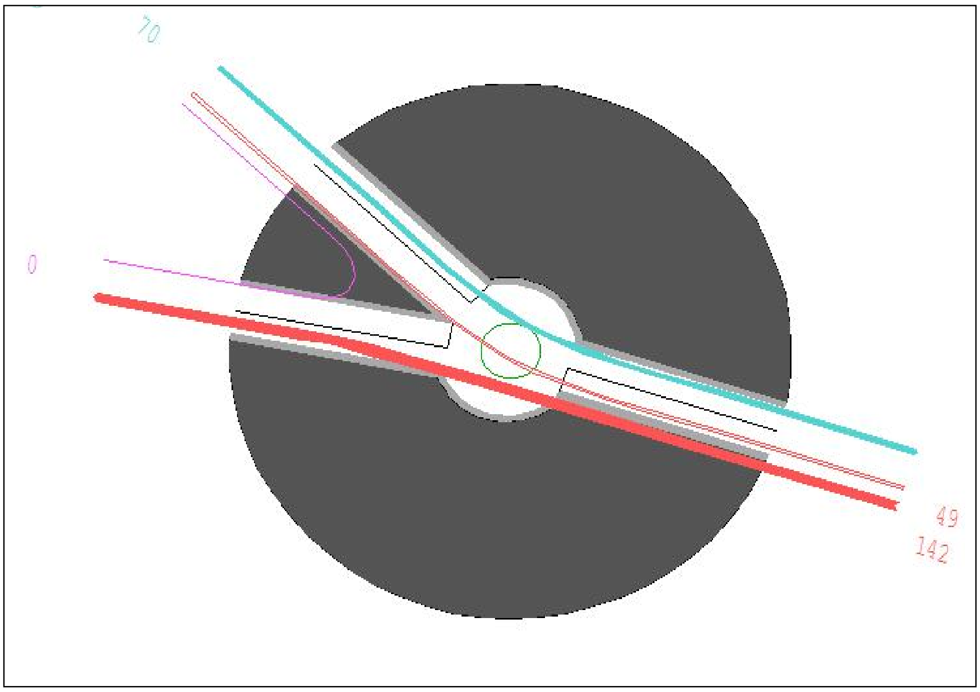


Figure 27 – Indicative flow change by movement in PCUs for the B653 / Marford Rd Roundabout junction – AM Peak

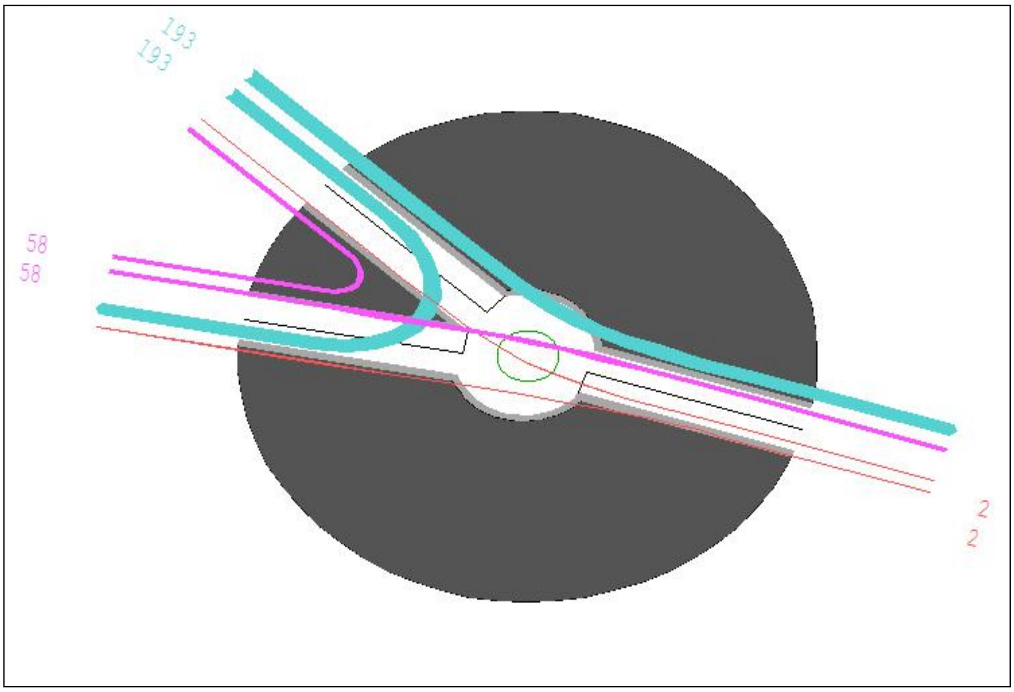


Figure 28 – Indicative delay change by movement in seconds for the B653 / Marford Rd Roundabout junction – AM Peak

St Albans Rd / B487 / Walkers Rd Roundabout (Harpenden) (ID 13 in Figure 6 / Figure 7)

At the St Albans Rd / B487 / Walkers Rd Roundabout, the modelled delay increase is most significant on the western arm (see **Figure 29** and **Figure 30**) despite a relatively modest flow increase. This is due to this arm already being at capacity in the Base Year and therefore unable to accommodate more traffic.

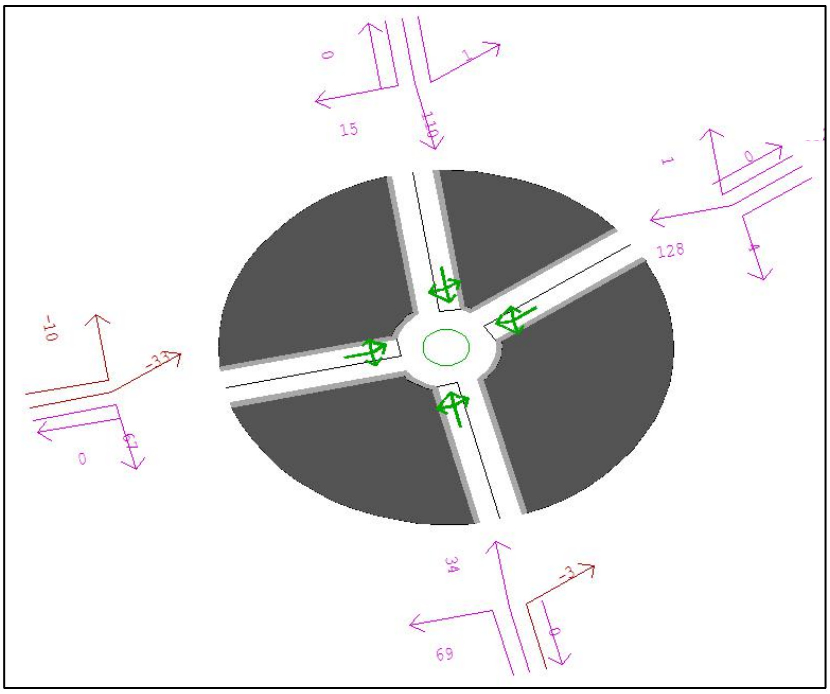


Figure 29 – Indicative flow change by movement in PCUs at St Albans Rd / B487 / Walkers Rd Roundabout – AM Peak

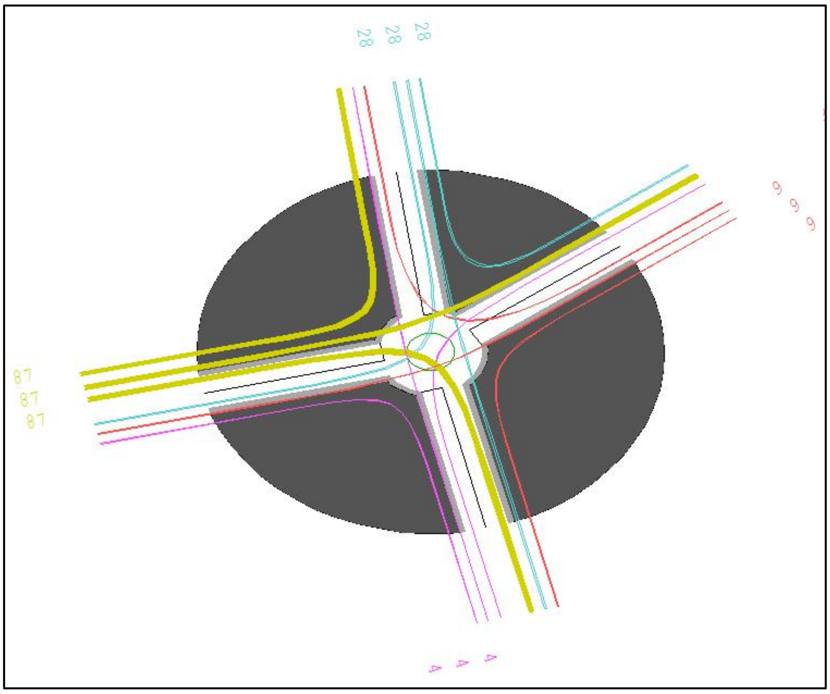


Figure 30 – Indicative delay change by movement in seconds at St Albans Rd / B487 / Walkers Rd Roundabout – AM Peak

A4147 / King Harry Lane Roundabout (No ID given in Figure 6 / Figure 7)

At the A4147 / King Harry Lane Roundabout, the modelled delay increase is most significant on the southern arm (see **Figure 31** and **Figure 32**) despite a relatively modest flow increase. This is due to this arm already being at capacity in the Base Year and therefore unable to accommodate more traffic.

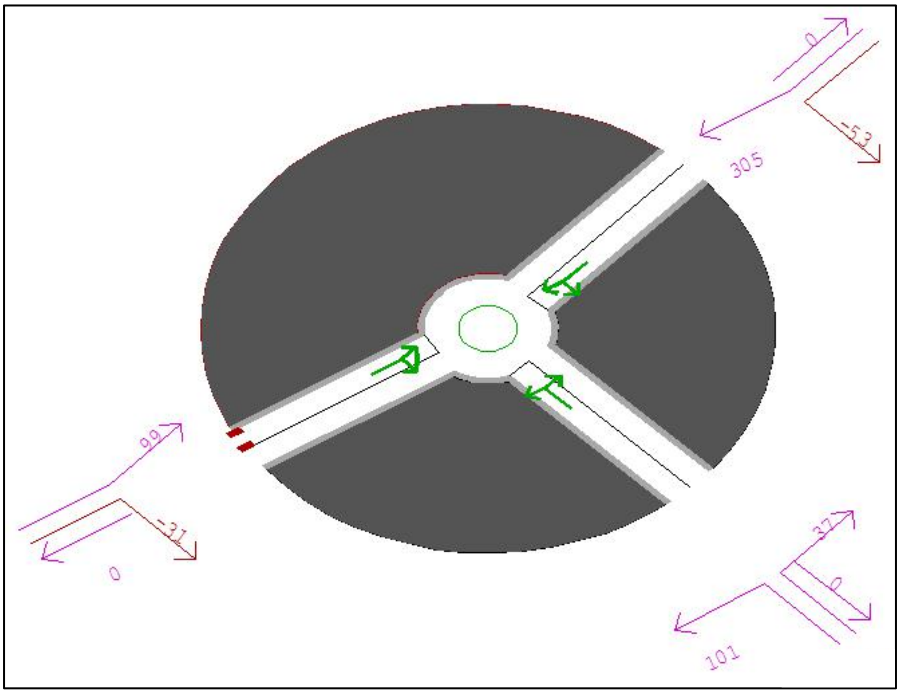


Figure 31 – Indicative flow change by movement in PCUs at A4147 / King Harry Lane Roundabout – AM Peak

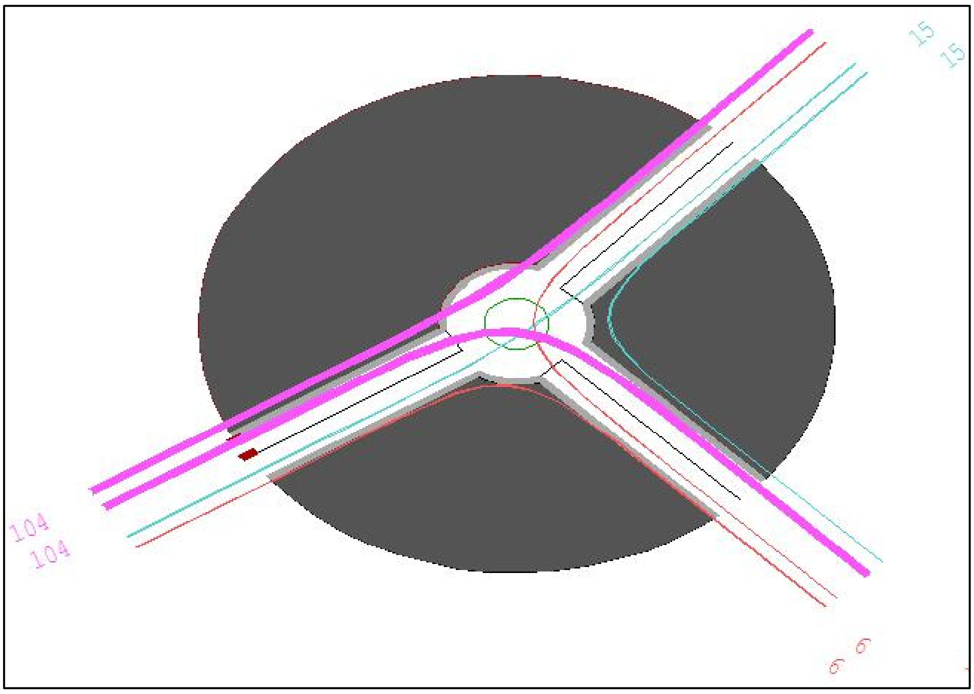


Figure 32 – Indicative delay change by movement in seconds at A4147 / King Harry Lane Roundabout – AM Peak

4.3. Planned highway mitigation measures

For the current 2031 Forecast Year COMET model, the additional highway infrastructure included in the forecast network was limited to schemes which were either committed or highly likely to come forward between 2014 and 2031. The schemes in the St Albans area falling into these categories were as follows:

- Three junction improvements plus a new 'relief road' associated with the Radlett Rail Freight planning application
- A414 Colney Heath Longabout signalisation (it should be noted that this has been identified primarily as a safety scheme rather than mitigation relevant to any specific development)

Regarding larger development schemes, new appropriate access points have also been added in order to better represent the expected loading points for traffic onto the forecast network. It is important to note that no additional mitigation has been tested with regards to these schemes.

Three Junction Improvements associated with Radlett Rail Freight planning application

The junction improvements associated with the Radlett Rail Freight planning application are coded as a package in the 2031 Forecast, as illustrated in **Figure 33**. The package includes enhancements at Park St Roundabout plus an additional junction on the A414 south of St Albans and an access junction on Radlett Rd in order to provide access to the new 'relief road' through the development site.

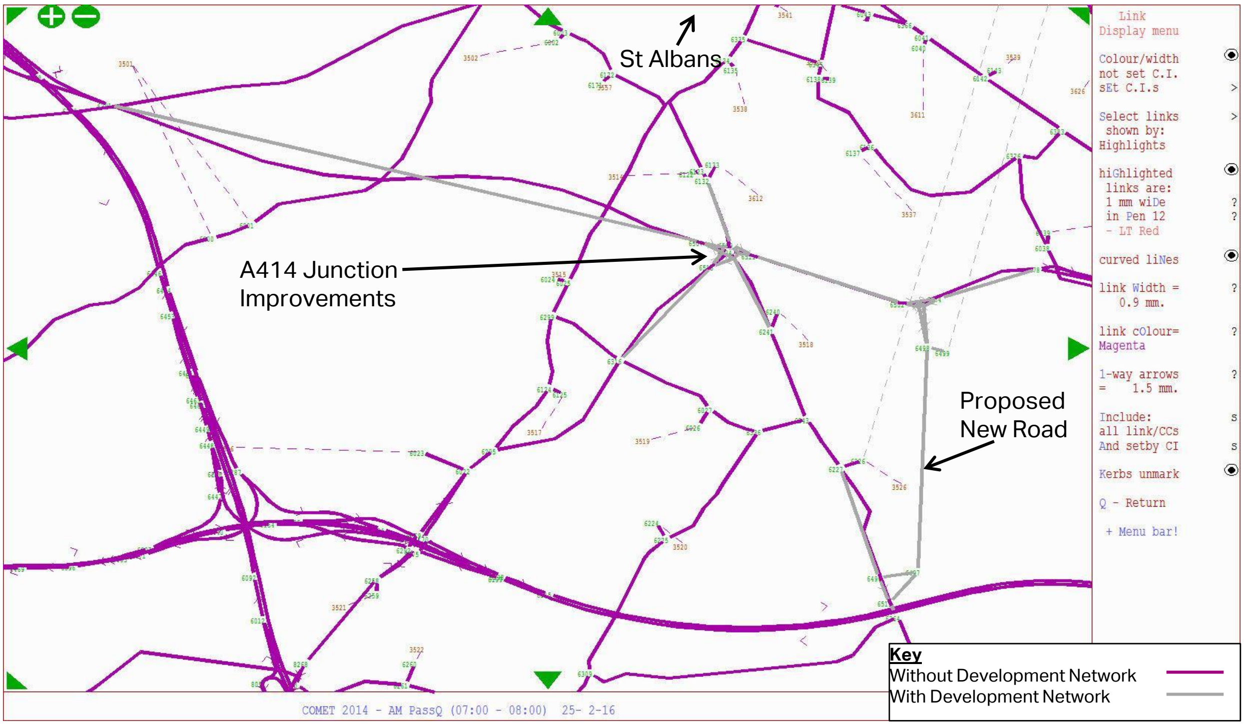


Figure 33 – Three junction Improvements and new 'relief road' associated with Radlett Rail Freight planning application; purple: Base Year highway network

Figure 34 and **Figure 35** show the node delay and link stress at the Park St Roundabout in the Forecast year, and both suggest congestion on the Watling St and A414 approaches. Relative to the Base Year (see **Figure 6** and **Figure 7**), there is a significant reduction in delay at this location. This roundabout is assumed to have three lanes on the circulatory and signals in the 2031 forecast scenario.

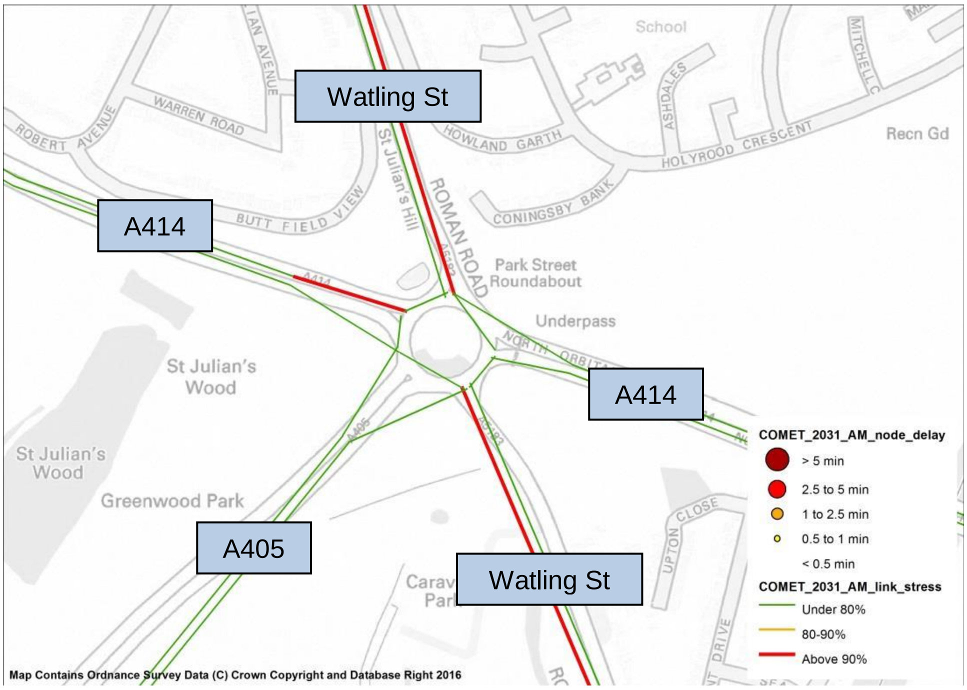


Figure 34 – Park St Roundabout – AM Peak

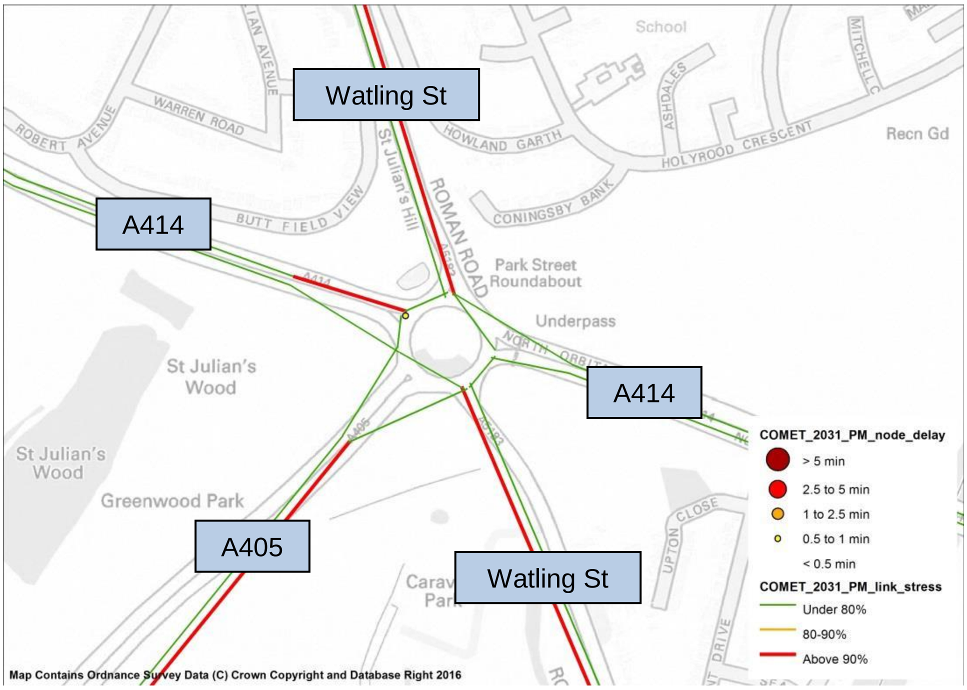


Figure 35 – Park St Roundabout – PM Peak

Figure 36 and **Figure 37** show node delay and link stress at the new A414 at-grade roundabout junction associated with the Radlett Rail Freight planning application in the Forecast year. The model suggests delay of up to 2.5 mins is possible at this junction in both peak hours, and in particular on the northbound approach from the new 'relief road', which will need to give way to the westbound traffic on the A414.

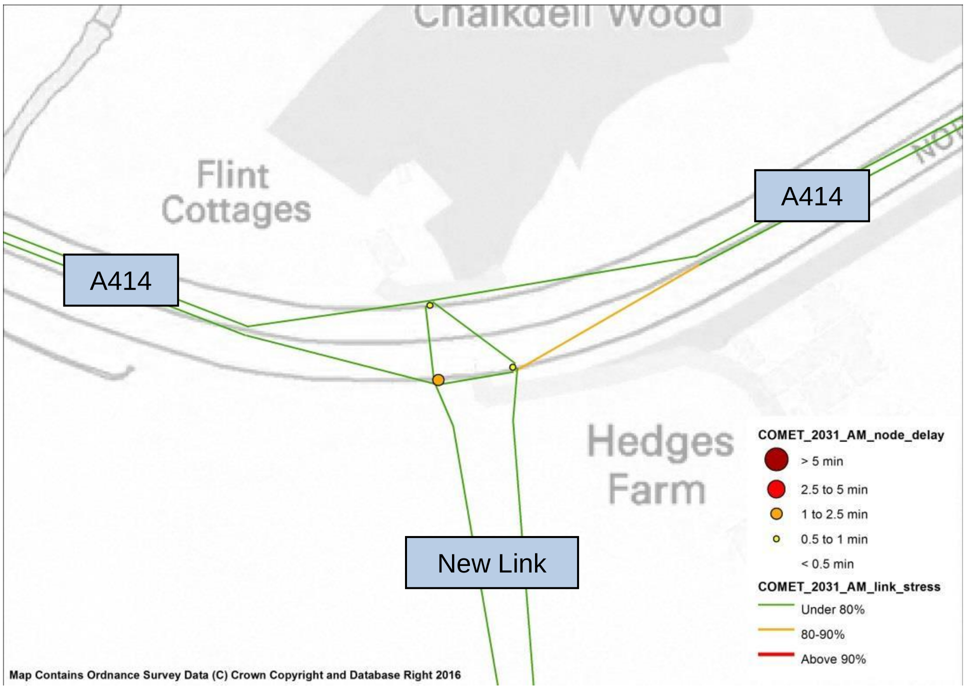


Figure 36 – New A414 Junction associated with Radlett Rail Freight planning application – AM Peak

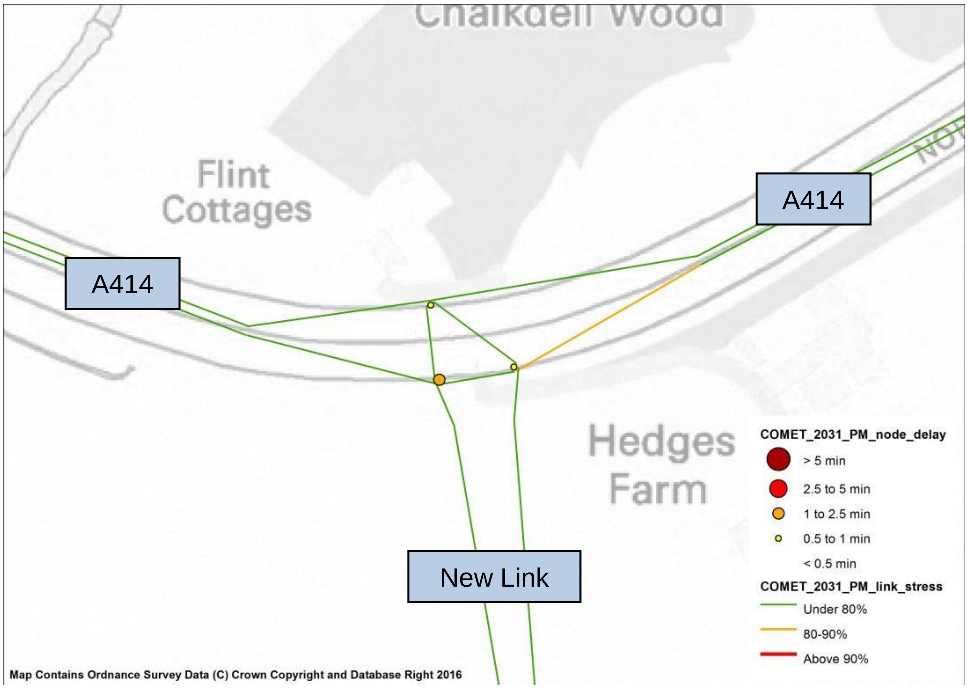


Figure 37 – New A414 Junction associated with Radlett Rail Freight planning application – PM Peak

Figure 38 and **Figure 39** show node delay and link stress in the Forecast Year at the new A5183/Radlett Rd junction at Frogmore. This junction connects Radlett Rd with the new 'relief road' associated with the Radlett Rail Freight planning application. Modelling suggests that there is minimal delay or link stress in this location.

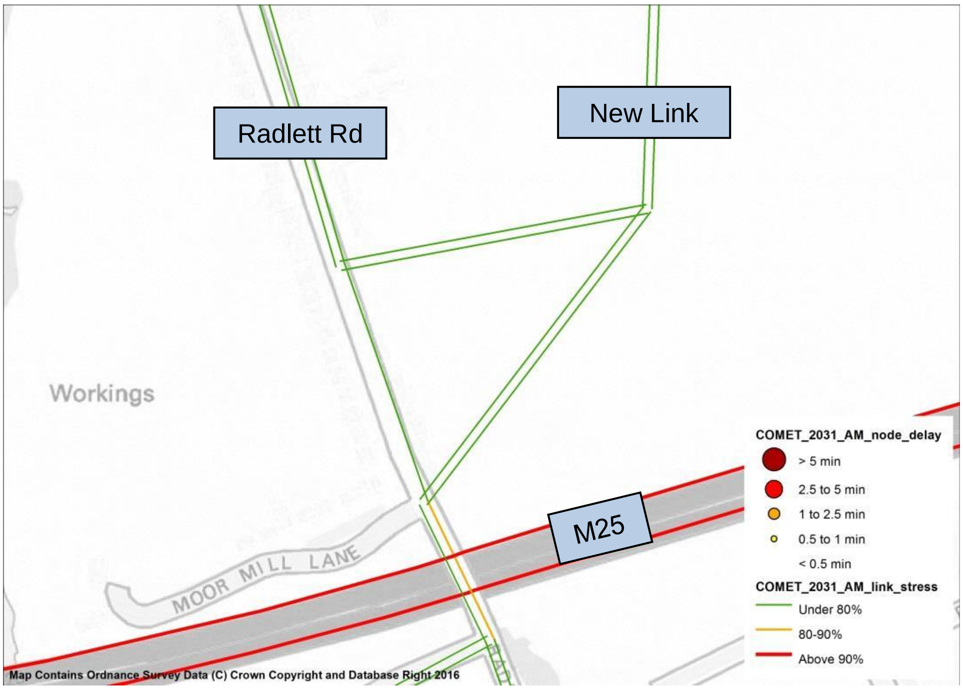


Figure 38 – New Radlett Rd Junction associated with Radlett Rail Freight planning application – AM Peak

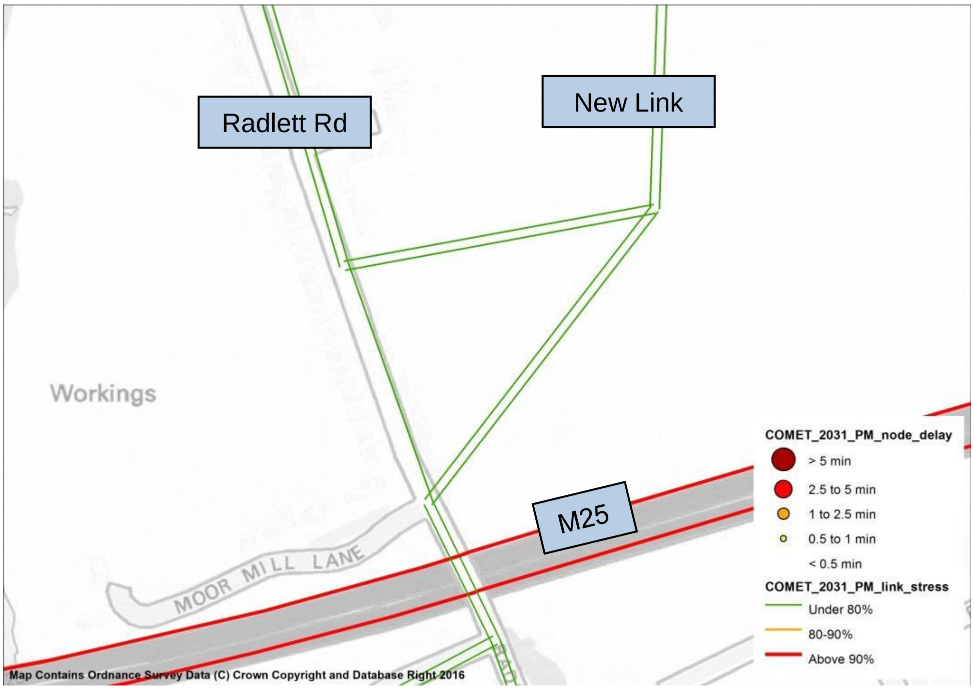


Figure 39 – New Radlett Rd Junction associated with Radlett Rail Freight planning application – PM Peak

A414 Colney Heath Longabout signalisation

Figure 40 and **Figure 41** show node delay and link stress at the A414 Colney Heath Longabout in its signalised form. It should be noted that this has been identified primarily as a safety scheme rather than mitigation relevant to any specific development. In the AM Peak, the Smallford Ln and High St approaches are over capacity, and there is some evidence of congestion on the longabout itself. The movement with the highest delay is from High St northbound to Colney Heath. In the PM Peak, link stress on the westbound longabout is high on the approach to the signalised node. The movement with the highest delay is on Colney Heath westbound.

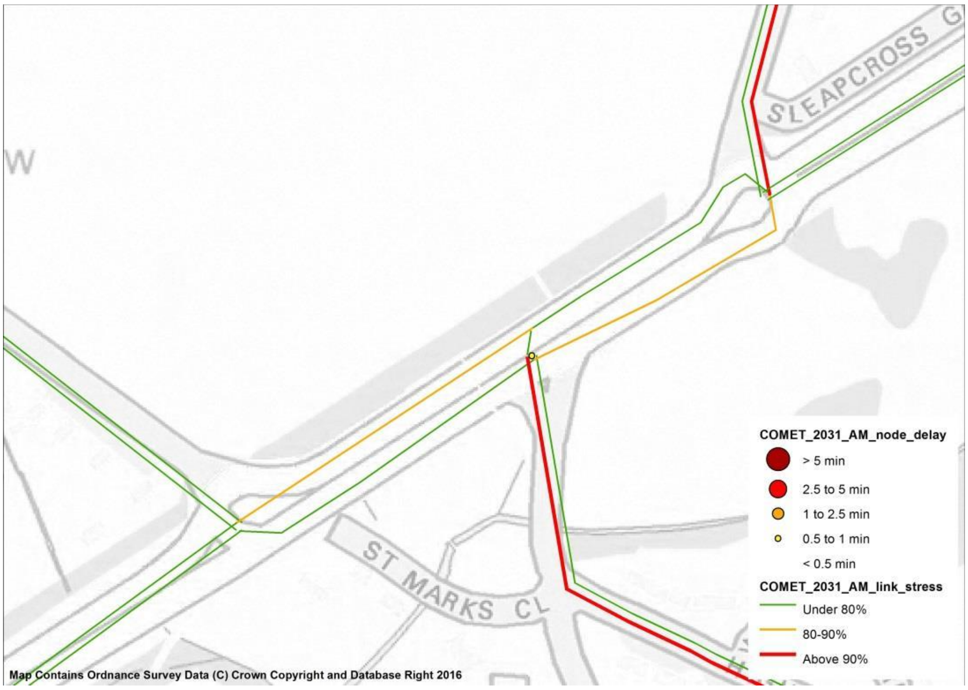


Figure 40 – A414 Colney Heath Longabout – AM Peak

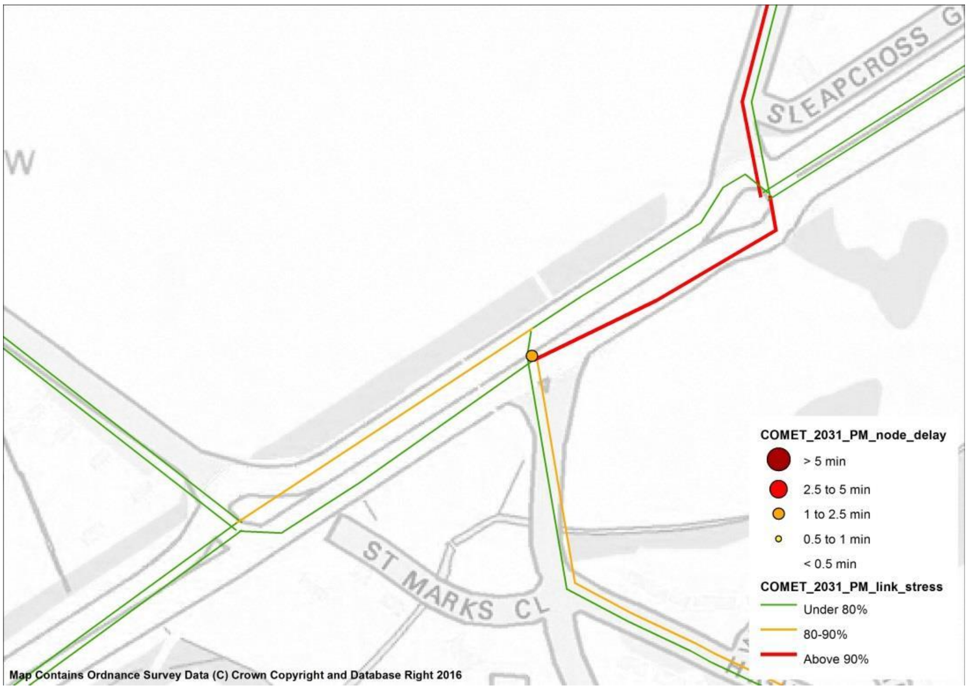


Figure 41 – A414 Colney Heath Longabout – PM Peak

4.4. Major developments in St Albans District

The 5 most major developments in St Albans District in terms of employment and/or dwelling growth between the Base Year and Forecast Year are:

- East Hemel Hempstead South
- East Hemel Hempstead North
- Radlett Rail Freight planning application
- East St Albans (Oaklands)
- North West Harpenden

As was highlighted in **section 4.3**, it is currently not possible to attribute any of the local delay or link stress to a particular development, as no comparison can be made with a scenario without the development. In order to provide an indication of the major developments' possible impact on the highway network, however, an analysis of the trip distribution (to and from the zones) is provided in the following section.

It is possible that the modelled highway network access points for these developments are not in line with the most current assumptions as the Forecast scenario was created with the information available at the time. Should more up-to-date assumptions be available, these should be incorporated into a future model scenario.

For reference, the total inbound / outbound flow is indicated on each figure. This section contains the AM Peak plots; for PM Peak plots see Appendix A – Traffic impact of major developments.

East Hemel Hempstead South

The model zone used to represent East Hemel Hempstead South is "empty" in the Base Year, and therefore does not attract or generate any trips. Therefore, all trips to and from the zone can be directly attributed to the development.

Figure 42 (wider zoom) and **Figure 43** (narrower zoom) show the select-link analysis results for the AM Peak. The most used routes to and from the East Hemel Hempstead South are via the A4147, A414, Green Ln, Bedmond Rd and the M1. Within St Albans District, the most significant implication of this development is at the Green Ln/A414 junction, where delay and link stress are modelled to be problematic (see **Figure 44** and **Figure 45**). Mitigation options for this junction are summarised in **section 4.5**.

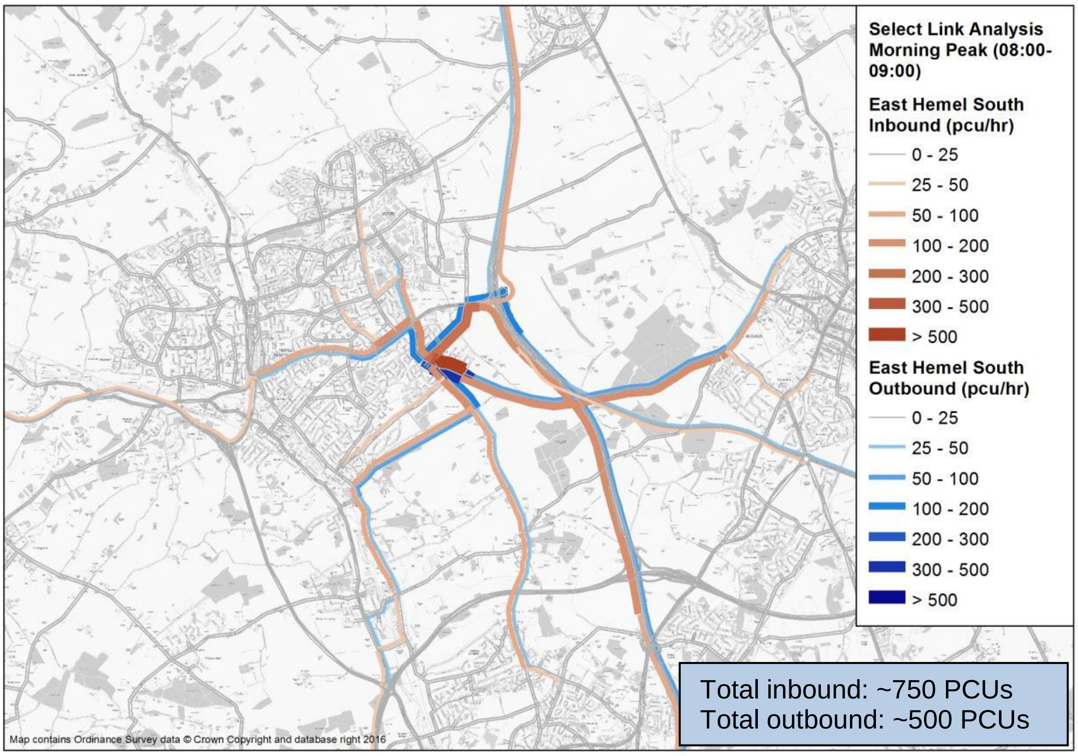


Figure 42 – Trip Distribution to and from East Hemel Hempstead South – AM Peak

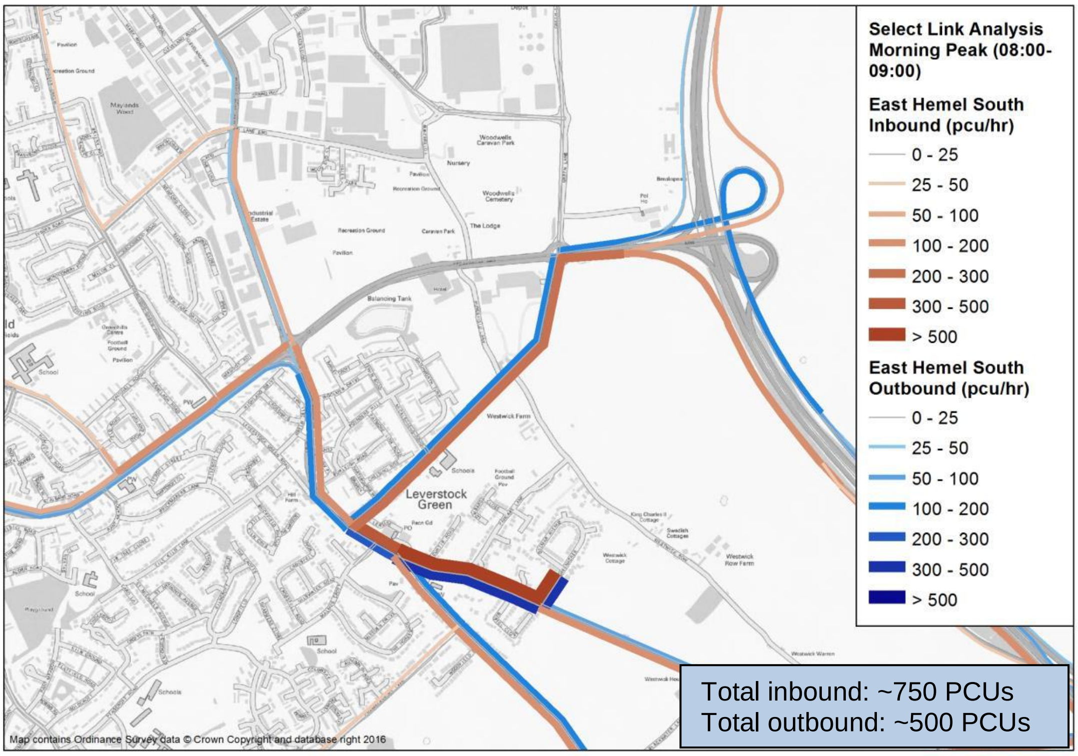


Figure 43 – Trip Distribution to and from East Hemel Hempstead South – AM Peak

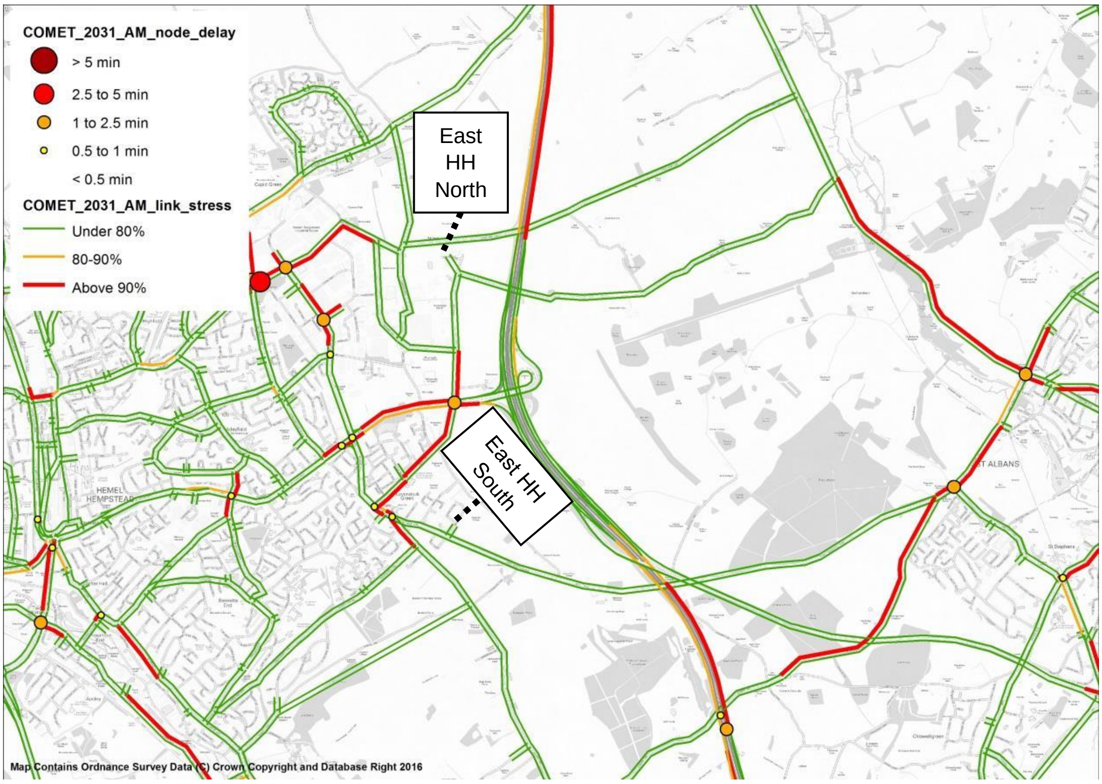


Figure 44 – East Hemel Hempstead North (& South) vicinity – AM Peak

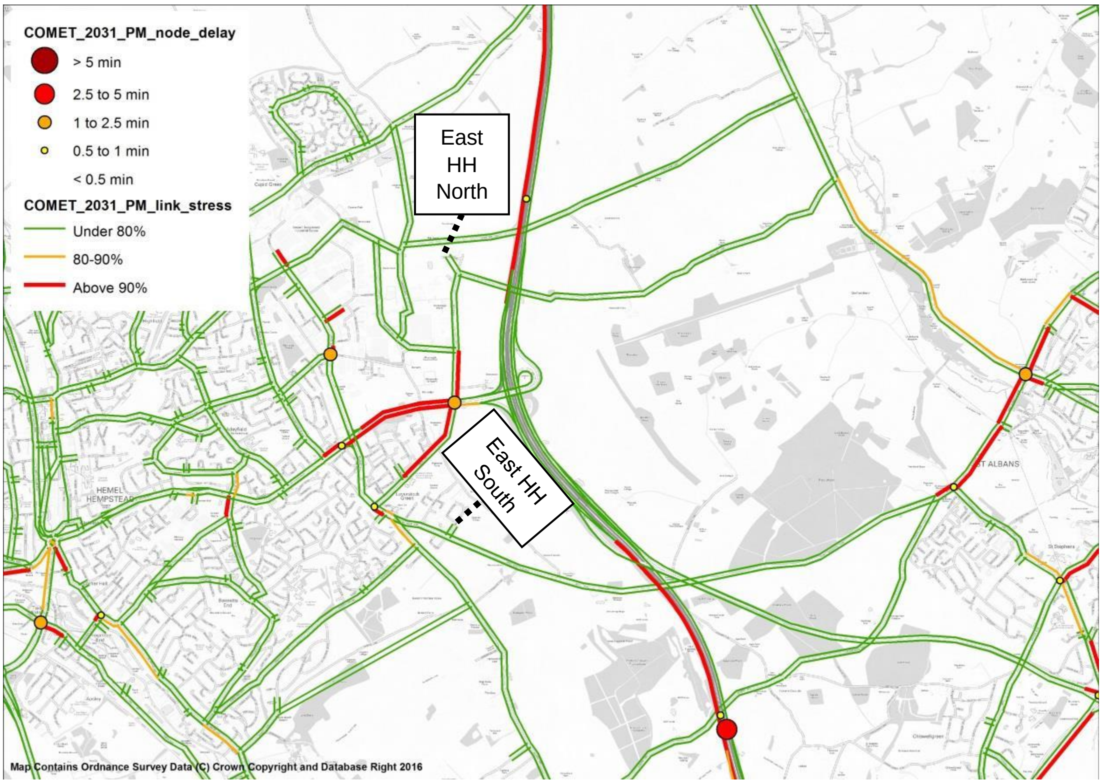


Figure 45 – East Hemel Hempstead North (& South) vicinity – PM Peak

East Hemel Hempstead North

The model zone used to represent East Hemel Hempstead North is “empty” in the Base Year, and therefore does not attract or generate any trips. Therefore, all trips to and from the zone can be directly attributed to the development.

Trips associated with East Hemel Hempstead North are predominantly outbound in the AM Peak (see **Figure 46** and **Figure 47**) as this development is residential in composition. Outbound trips principally use Hogg End Ln, Green Ln, A414, A4147, Boundary Way and the M1. As with East Hemel Hempstead South, the most significant implication of this development is at the congested Green Ln / A414 junction (see **Figure 44** and **Figure 45**). Mitigation options for this junction are summarised in **section 4.5**.

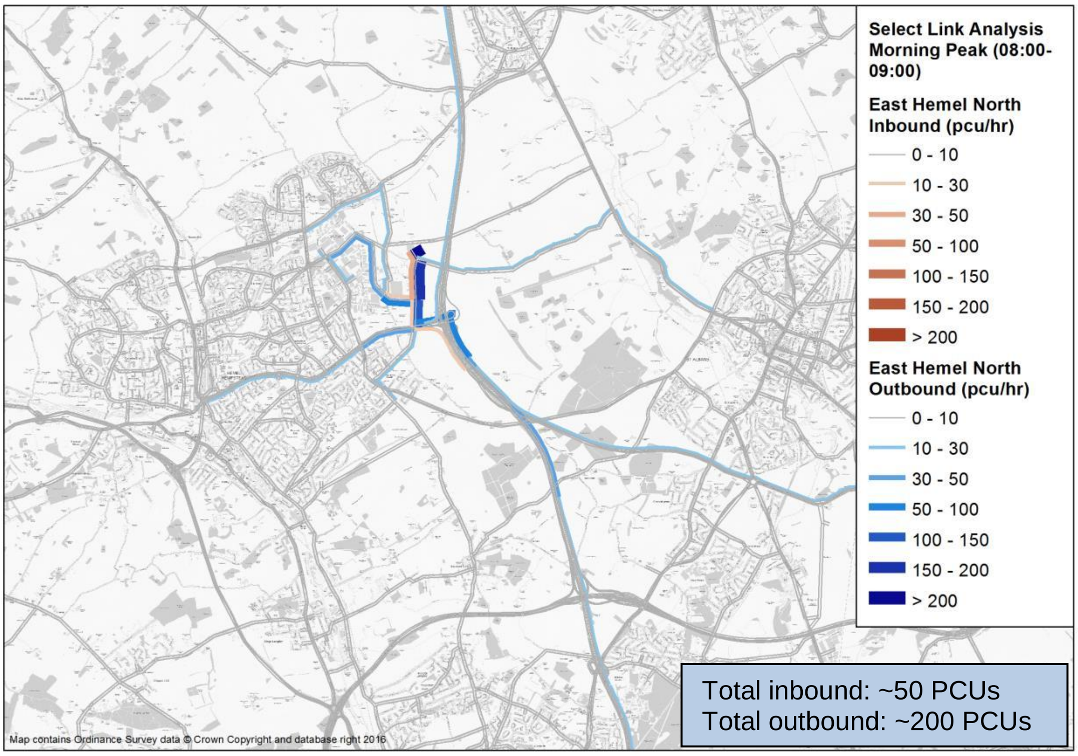


Figure 46 – Trip Distribution to and from East Hemel Hempstead North – AM Peak

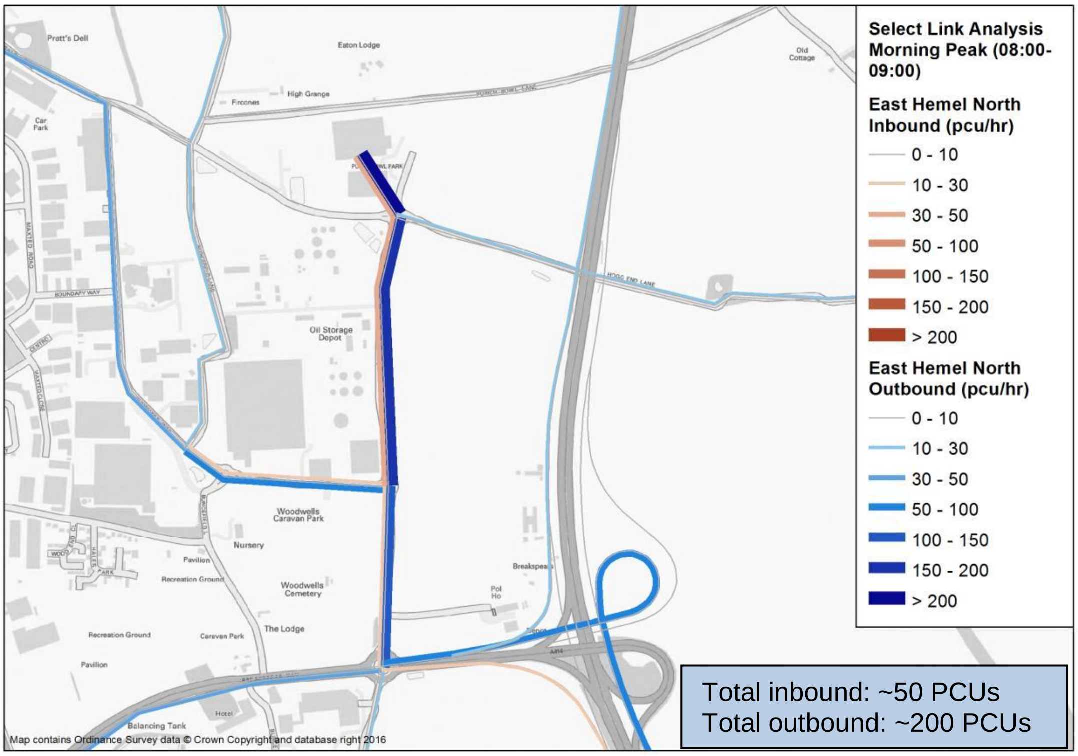


Figure 47 – Trip Distribution to and from East Hemel Hempstead North – AM Peak

Radlett Rail Freight planning application
The model zone used to represent East Hemel Hempstead North is "empty" in the Base Year, and therefore does not attract or generate any trips. Therefore, all trips to and from the zone can be directly attributed to the development.

Table 4 shows the change in inbound and outbound trips to and from the Radlett Rail Freight model zone between the Base Year and Forecast Year. The assumptions regarding the derivation of demand for this zone can be found in the *Hertfordshire COMET: Local Plan Forecasting Report*.

Table 4 – Change in inbound/outbound trips to/from the Radlett Rail Freight model zone (PCUs)

	AM Inbound	AM Outbound	PM Inbound	PM Outbound
Base Year	0	0	0	0
Forecast Year	275	125	150	250
Increase	**275**	**125**	**150**	**250**

In the AM Peak (**Figure 48**), inbound trips access the area principally through the A414, North Orbital Rd via Tippendell Ln, and Radlett Rd. Approximately 50 PCUs of inbound traffic passes through the Park St and London Colney roundabouts, both of which are likely to experience delay in the Forecast Year (see **Figure 17** and **section 4.3**). A further 50 PCUs each approach the zone via Tippendell Ln and Radlett Rd.

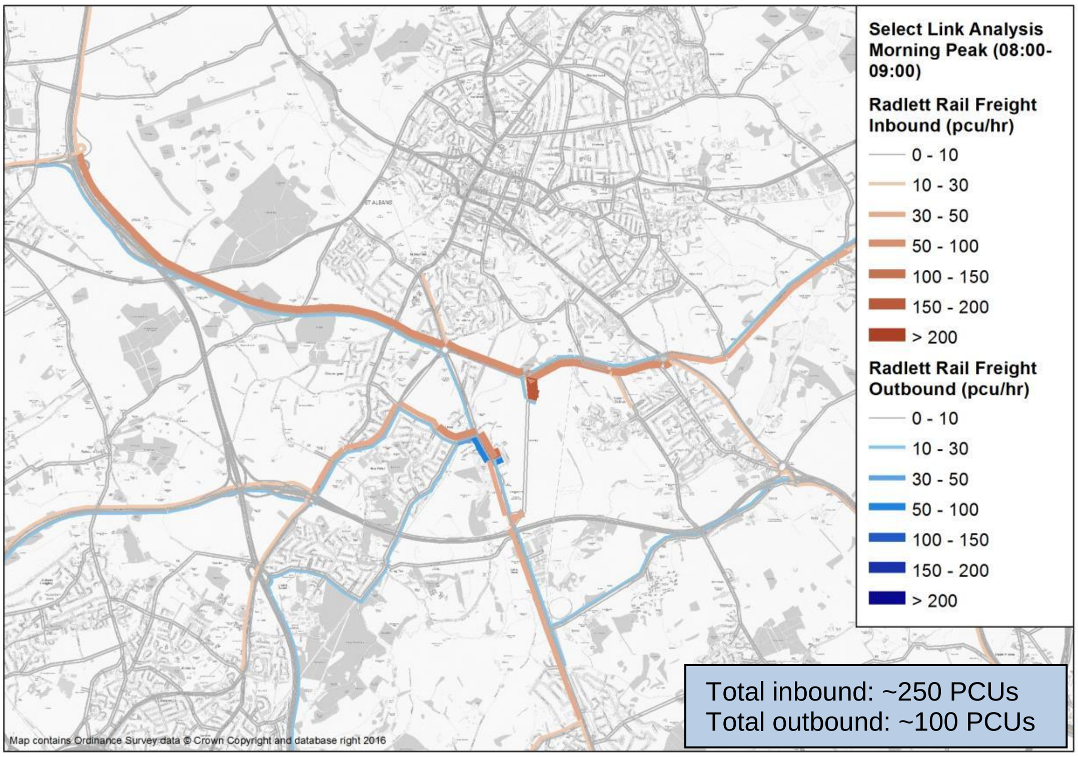


Figure 48 – Trip Distribution to and from Radlett Rail Freight planning application – AM Peak

East St Albans (Oaklands)

Figure 49 and **Figure 50** show the assumed loading points of the model zone 3535 (containing the East St Albans development in 2031) in the Base Year and Forecast Year, respectively. In the Forecast Year, two additional loading points are added onto Sandpit Lane, which do not exist in the Base Year network.

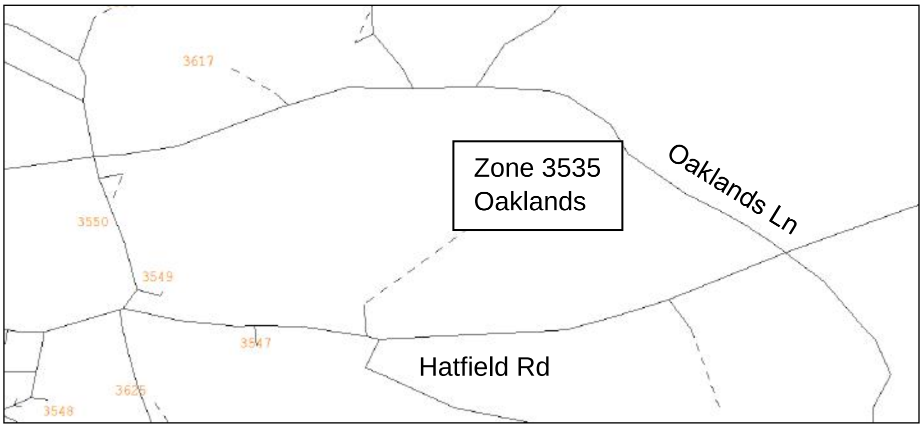


Figure 49 – Zone 3535 (Oaklands) Loading (Base Year)

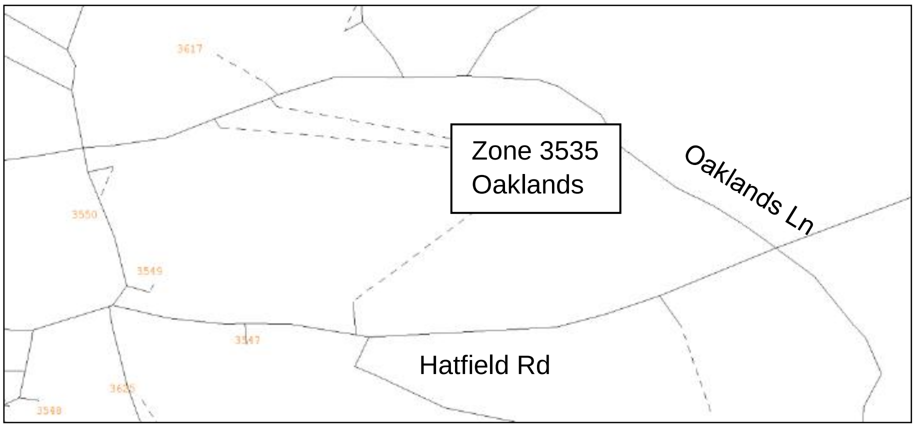


Figure 50 – Zone 3535 (Oaklands) Loading (Forecast Year)

The zone containing the East St Albans development is not “empty” in terms of employment and dwellings in the Base Year model, therefore the trips to and from that zone in the Forecast cannot be directly associated to the growth between 2014 and 2031. Consequently, the plot below (**Figure 51**) shows trip distribution flow difference i.e. the trip distribution in 2031 minus the trip distribution in 2014. Note that where the network differs in the Forecast Year relative to the Base Year (e.g. near development access points), differences are not shown.

In addition, modelling suggests that the new accesses to the development site on Sandpit Lane are slightly more attractive that the existing access on A1057/Hatfield Rd, and in particular for the eastbound traffic in the AM peak. It should be noted that the existing access is still used by traffic related to the development site, and that there is an increase in traffic from the site in AM (up to 60 PCU) and to the site in PM (up to 50 PCU), although the traffic flows decrease on the A1057 overall.

Table 5 shows the change in inbound and outbound trips to and from the East St Albans model zone between the Base Year and Forecast Year. The assumptions regarding the derivation of demand for this zone can be found in the *Hertfordshire COMET: Local Plan Forecasting Report*.

Table 5 – Change in inbound/outbound trips to/from the East St Albans model zone (PCUs)

	AM Inbound	AM Outbound	PM Inbound	PM Outbound
Base Year	150	75	100	125
Forecast Year	225	200	250	225
Increase	**75**	**125**	**150**	**100**

AM Peak trips associated with the growth in this zone principally depart in the direction of St Albans City Centre via Sandpit Ln and the A414 via Colney Heath Ln. In the PM Peak, inbound trips also approach the zone from these two directions, as well as on Hatfield Rd and Coopers Green Ln. The growth between 2014 and 2031 creates up to ~50 more peak hour PCU trips on Sandpit Ln and on the access link from Hatfield Rd.

The Sandpit Ln / Beechwood Ave / Marshalswick Ln Junction identified as being under stress in **Table 1** is likely to experience higher demand due to development trips, as is the A414 London Colney Longabout, and various junctions within St Albans City centre.

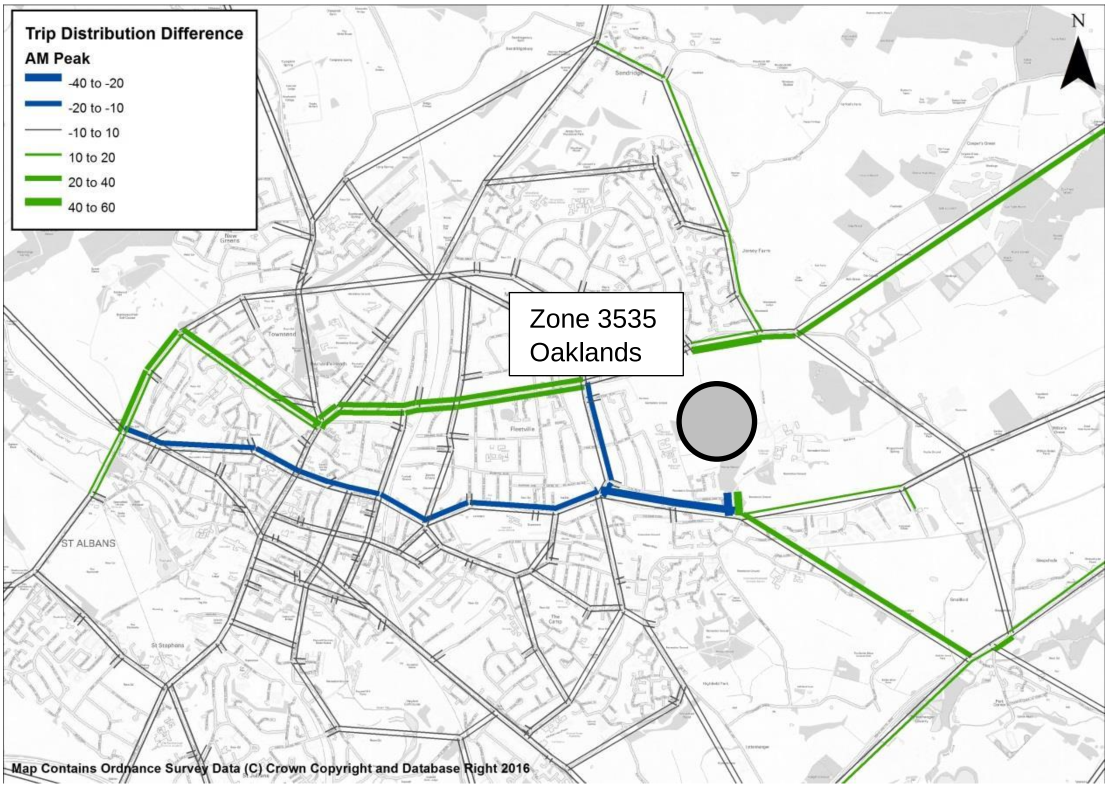


Figure 51 – Trip Distribution to and from East St Albans (2031 minus 2014) – AM Peak

Figure 52 and **Figure 53** show the node delay and link stress in the vicinity of East St Albans. In both time periods, the results suggest likely congestion (1-2.5 mins delay) at the Sandpit Ln / Beechwood Ave / Marshalswick Ln Junction, particularly affecting traffic approaching from the west, east and south. This junction is also identified in the Base Year where delay is likely, although no local validation data is available.

In the AM Peak, there is also an indication of delay at the Coopers Green Ln / Oaklands Ln roundabout that is principally affecting traffic approaching from the west on Oaklands Ln. Link stress on this arm is also high in the Base Year (see **Figure 17**).

In the PM Peak, delay of 1-2.5 mins is modelled at the Hatfield Rd / Beechwood Ave / Ashley Rd junction (compared to 0.5-1 min in Base Year), and highest on the westbound Hatfield Rd approach. A similar scale of delay is modelled in the PM Peak at the Sandpit Ln / House Ln roundabout, where both Sandpit Lane approaches indicate delay. PM Peak delay is also indicated on all approaches to the Hatfield Rd / Oaklands Ln / Station Rd Roundabout (a location where the model is known to be underrepresenting delay in the Base Year – see **Table 1**).

Mitigation options at four junctions in the vicinity of East St Albans are presented in **section 4.5**.

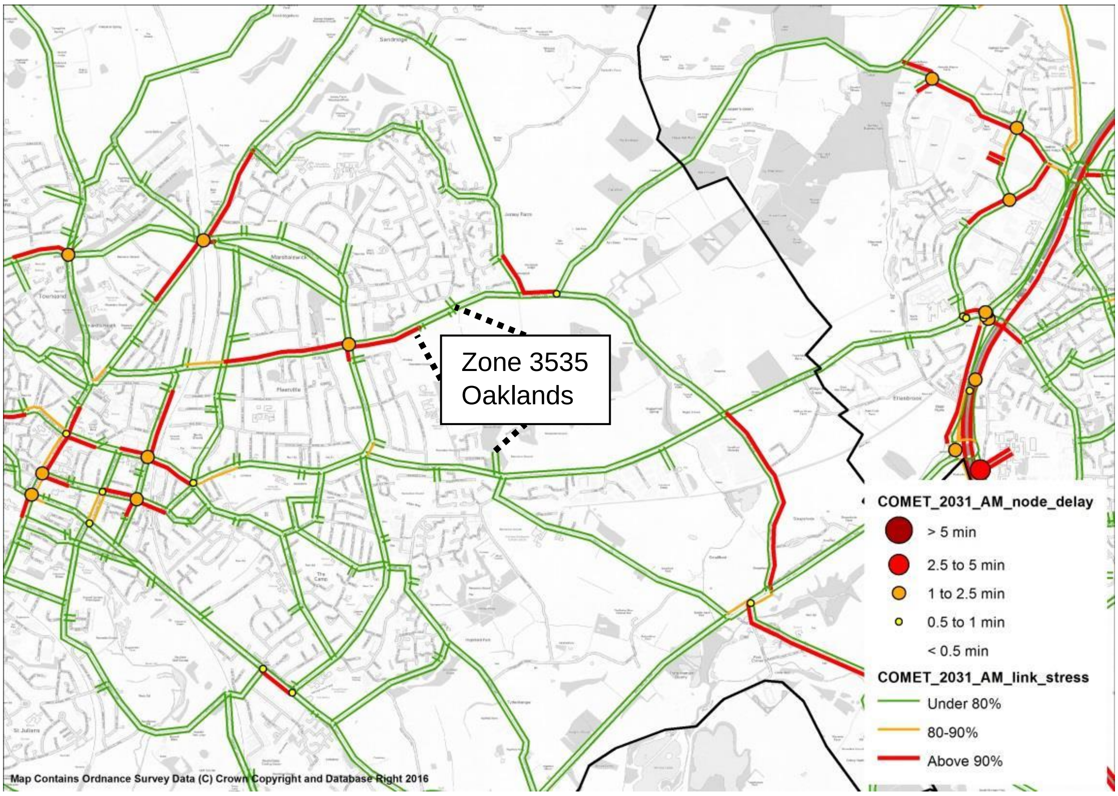


Figure 52 – East St Albans vicinity – AM Peak

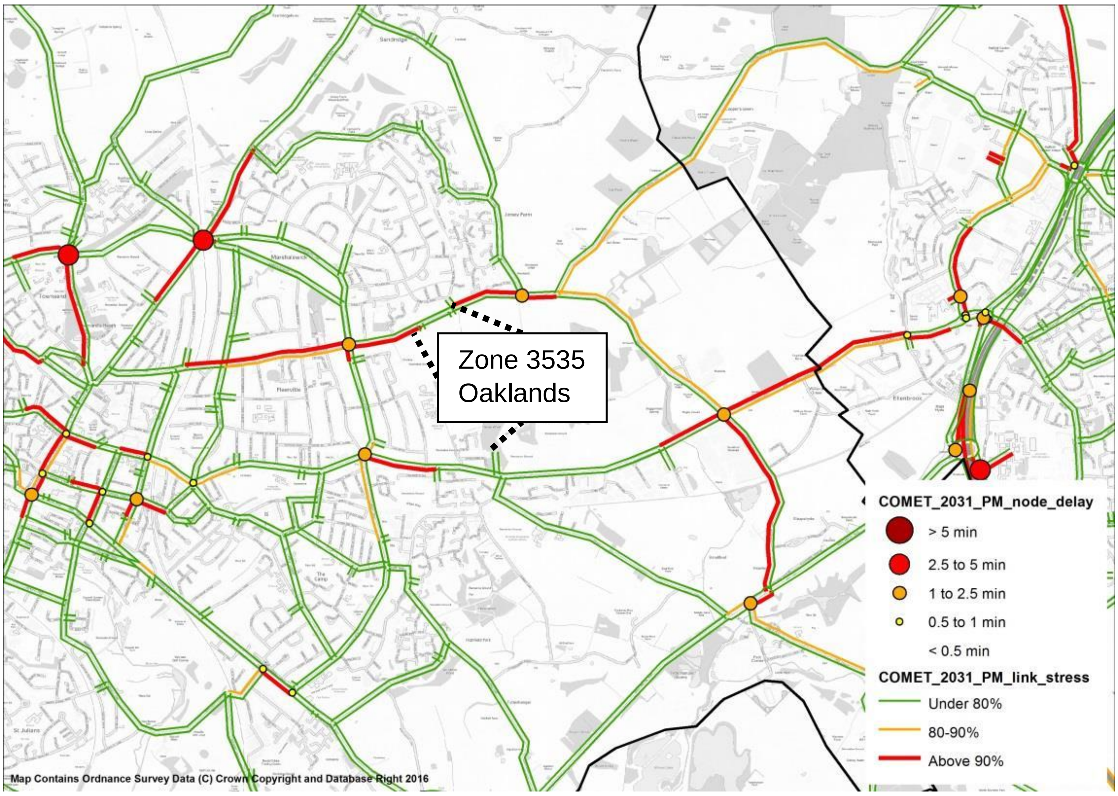


Figure 53 – East St Albans vicinity – PM Peak

North West Harpenden

Figure 54 and **Figure 55** show the assumed loading points of the model zone 3603 (containing the North West Harpenden development in 2031) in the Base Year and Forecast Year, respectively. In the Forecast Year, two additional loading points are added onto Luton Rd, which do not exist in the Base Year network.

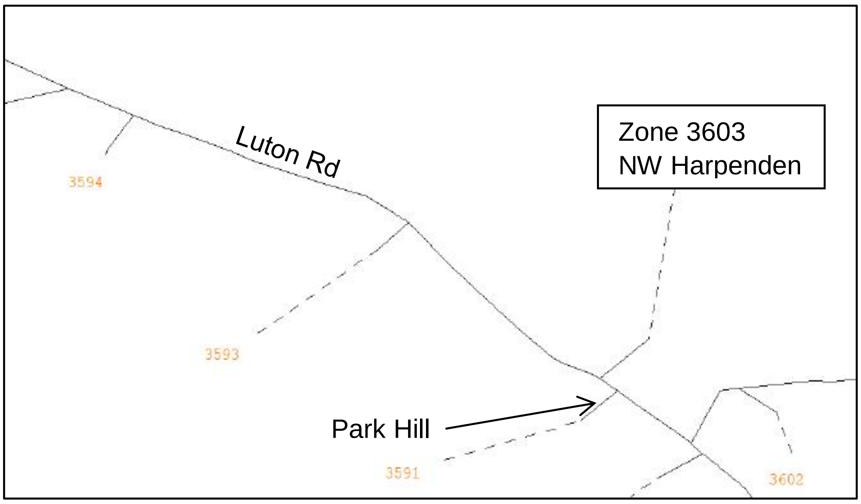


Figure 54 – Zone 3603 Loading (Base Year)

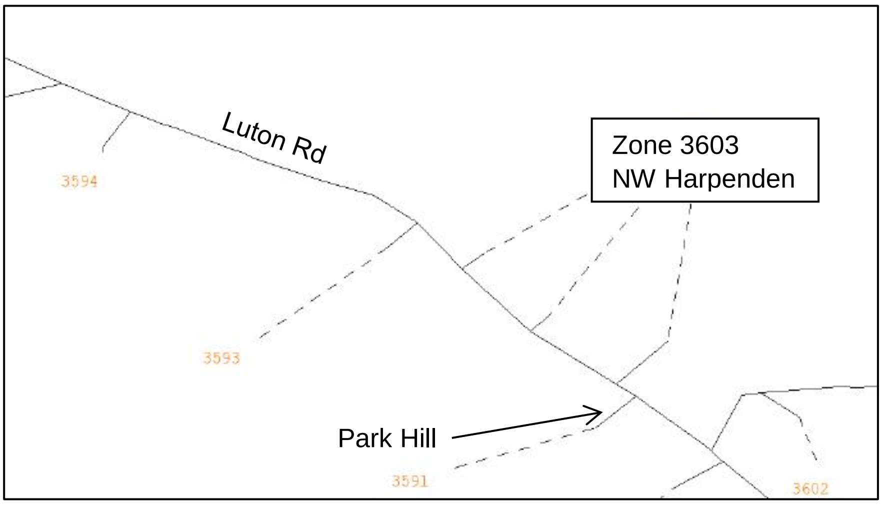


Figure 55 – Zone 3603 Loading (Forecast Year)

The zone containing the North West Harpenden development is not "empty" in terms of employment and dwellings in the Base Year model, therefore the trips to and from that zone in the Forecast cannot be directly associated to the growth between 2014 and 2031. Consequently, the plot below (**Figure 56**) shows trip distribution flow difference i.e. the trip distribution in 2031 minus the trip distribution in 2014. Note that where the network differs in the Forecast Year relative to the Base Year (e.g. near development access points), differences are not shown.

Table 6 shows the change in inbound and outbound trips to and from the NW Harpenden model zone between the Base Year and Forecast Year. The assumptions regarding the derivation of demand for this zone can be found in the *Hertfordshire COMET: Local Plan Forecasting Report*.

Table 6 – Change in inbound/outbound trips to/from the NW Harpenden model zone (PCUs)

	AM Inbound	AM Outbound	PM Inbound	PM Outbound
Base Year	250	175	250	325
Forecast Year	300	325	350	400
Increase	**50**	**150**	**100**	**75**

AM Peak trips associated with the growth in this zone principally depart in the direction of M1 Junction 9, Luton, St Albans City, and Wheathampstead. In the PM Peak, the pattern is broadly the inverse for inbound trips. The growth over this period creates up to ~80 more PCU trips on Luton Rd in the AM Peak and ~60 more in the PM Peak.

In terms of local junctions and links identified as being under stress, the Park Hill / Luton Rd junction (see **Table 1**) is likely to experience higher demand due to development trips. Increased demand is also likely at the Luton Rd/The Common roundabout where delay is shown in the Forecast Year (see **Figure 18**).

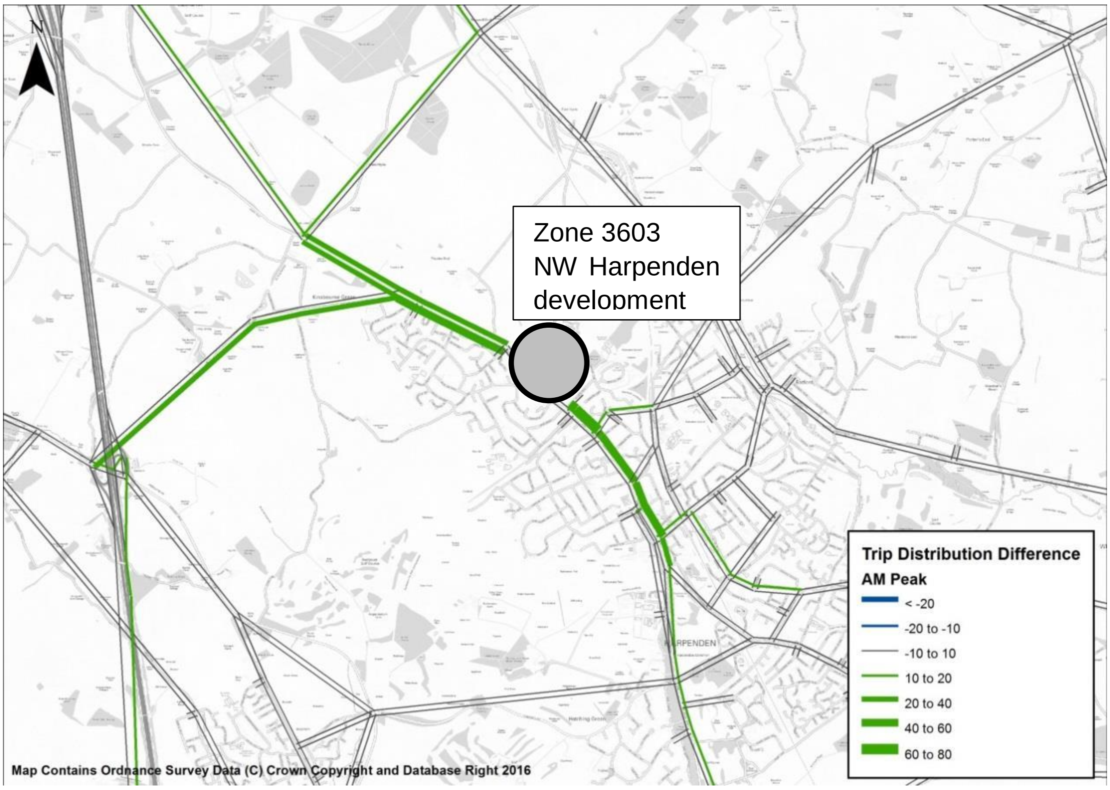


Figure 56 – Trip Distribution to and from North West Harpenden (2031 minus 2014) – AM Peak

Figure 57 and **Figure 58** show the node delay and link stress in the vicinity of North West Harpenden. In both time periods, results suggest likely congestion at the Park Hill / Luton Rd junction of 1-2.5 mins, particularly affecting traffic approaching from Luton Rd itself. This junction is also identified in the Base Year where delay is likely, although no local validation data is available.

Mitigation options at five junctions in the vicinity of North West Harpenden are presented in **section 4.5**.

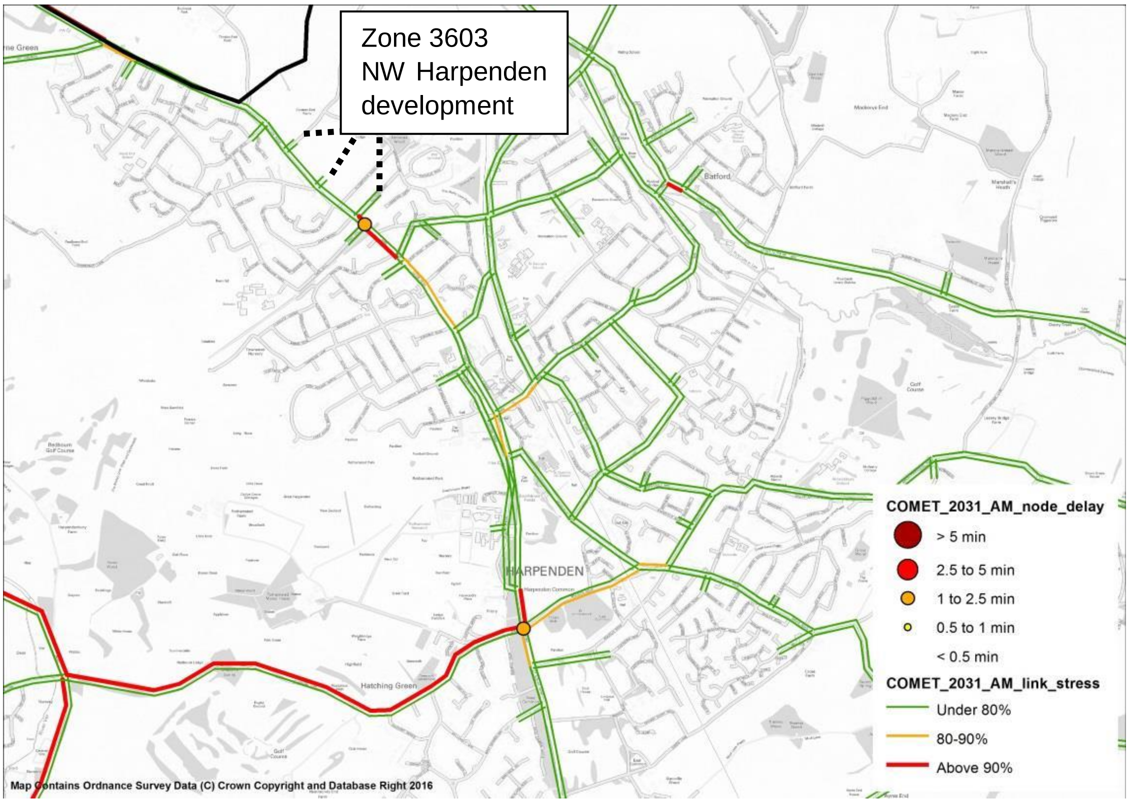


Figure 57 – North West Harpenden vicinity – AM Peak

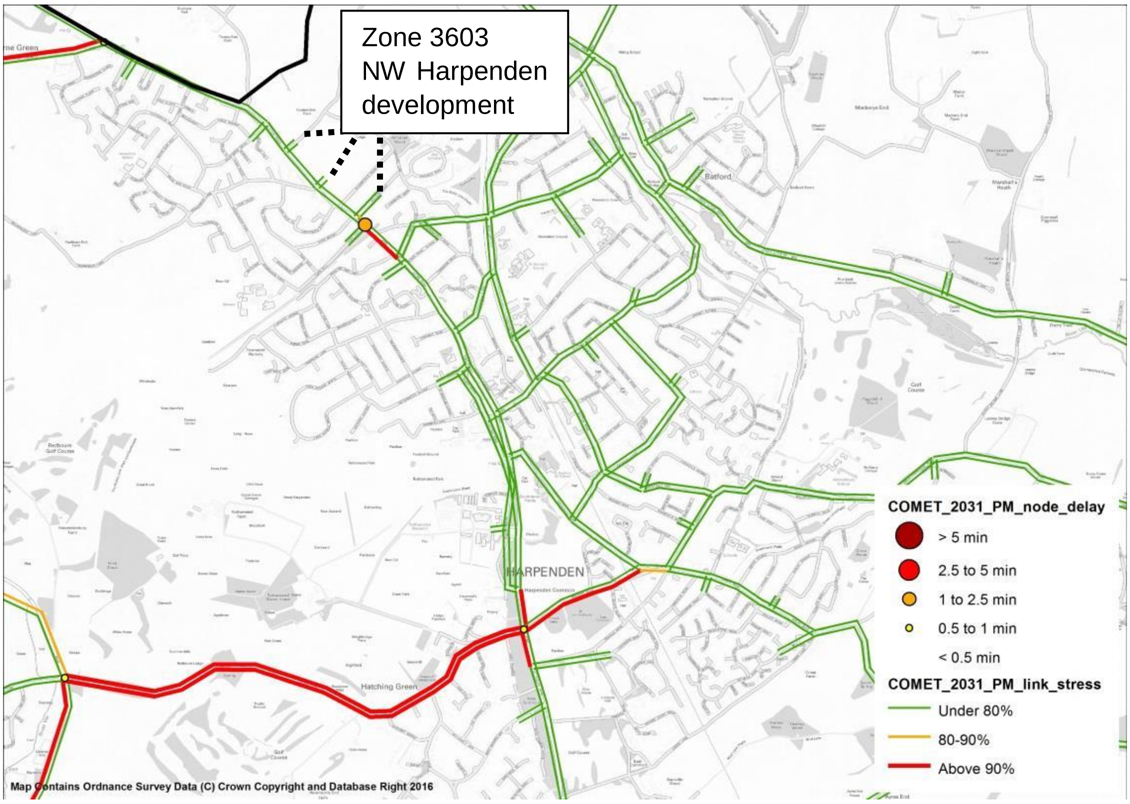


Figure 58 – North West Harpenden vicinity – PM Peak

4.5. Potential mitigation measures

Based on the problematic junctions which were identified in the Forecast Year (**section 4.2**), **Table 7** presents the type of potential mitigation measures that may be appropriate at these locations.

At this stage, these mitigation measures should be interpreted at a very high level, and would require further testing at an operational scale. Note that this is not intended as an exhaustive analysis of all problematic junctions in the Forecast Year, rather, a selection of those identified as most congested. In addition, it should be noted that potential assessments of any mitigation measure (at a later stage, out of the present scope) should rely on a range of indicators which are not limited to congestion.

Potential mitigation options associated with the East St Albans (Oaklands), North West Harpenden and Maylands Growth Corridor are also summarised in **Table 7**. The junction mitigation information is a summary of the relevant sections in the following documents:

- Strategic Local Plan: St Albans East (Oaklands) Initial Assessment of Highway Impacts – AECOM March 2016
- Land at Luton Road North West Harpenden: Local Plan Transportation Study – Brookbanks June 2016
- Maylands Growth Corridor Study: Progress Meeting 7 – AECOM May 2016

Table 7 - Potential mitigation measures

ID in Figure 13 / Figure 14	Problematic Junction	Details of Congestion in 2031 Forecast Year	Affected time period(s)	Potential Mitigation
2	London Colney Roundabout	Delay of up to 4.5 mins on approach arms.	AM & PM Peaks	Potential grade separation or conversion to "hamburger-style" to cater for strong A414 through-traffic.
6	St Albans Rd/ Sandridge Rd/ Marshalswick Ln/ Beech Rd Junction	Delay of up to 4.5 mins on approach arms. Left turn delay from Sandridge Rd ~10 mins.	PM Peak (and to a lesser extent AM Peak)	Difficult to expand due to proximity of railway bridge and nearby buildings. Banned turns could be investigated further, although may cause problematic re-routing.
7	Harpenden Rd/ Beech Rd/ Batchwood Dr Junction	Delay of up to ~4 mins on northern arm (AM), ~3 mins on western arm (PM) and ~4 mins on southern arm (PM).	AM & PM Peaks	Difficult to expand due to proximity of nearby buildings. Banned turns could be investigated further, although may cause problematic re-routing.
8	Redbourn Rd/ Verulam Rd/ Batchwood Dr/ A4147 Roundabout	Delay of up to 4 mins on approach arms.	AM Peak (inbound) PM Peak (outbound)	Addition of left turn filter lane on Redbourn Rd and/or Verulam Rd.

ID in Figure 13 / Figure 14	Problematic Junction	Details of Congestion in 2031 Forecast Year	Affected time period(s)	Potential Mitigation
10	B653/Marford Rd Roundabout	Delay of up to ~8.5 mins northern arm, ~2 mins on western arm, and ~1 min on eastern arm.	AM Peak (and to a lesser extent PM Peak)	Addition of flares at stop lines to allow 1 lane per movement may be beneficial. (Partial) Signalisation
N/A	A4147/King Harry Ln	Delay of up to ~2 mins in AM Peak and ~1 min in PM Peak.	AM & PM Peaks	Right turn from A4147 into King Harry Ln is a fairly strong movement and blocks traffic approaching from the north. Addition of flares at stop lines to allow 1 lane per movement may be beneficial.
13	St Albans Rd/ B487/Walkers Rd Roundabout (Harpenden)	Delay of up to 2.5 mins on western arm in AM Peak and 1 min on southern and eastern arm.	AM Peak (and to a lesser extent PM Peak)	Widening of 2 approach arms suggested in: *Land at Luton Road North West Harpenden: Local Plan Transportation Study – Brookbanks, June 2016*. AECOM Comment: Brookbanks mitigation suggestion seems to be conceptually valid, but no conclusive comment can be made without further testing.
N/A	A5183/Redbourn Ln/Harpenden Ln Roundabout (Redbourn)	Delay of up to ~ 0.5 mins in the AM Peak and ~1.5 mins in the PM Peak.	PM Peak (and to a lesser extent AM Peak)	Widening of 3 approach arms suggested in: *Land at Luton Road North West Harpenden: Local Plan Transportation Study – Brookbanks, June 2016*. AECOM Comment: Brookbanks mitigation suggestion seems to be conceptually valid, but no conclusive comment can be made without further testing.
N/A	High St/St Albans Rd/Station Rd Roundabout (Harpenden)	Delay of up to ~0.5 mins in the AM Peak and PM Peak.	AM & PM Peaks	Widening of 3 approach arms suggested in: *Land at Luton Road North West Harpenden: Local Plan Transportation Study – Brookbanks, June 2016*. AECOM Comment: Brookbanks mitigation suggestion seems to be conceptually valid, but no conclusive comment can be made without further testing.
N/A	The Common/ Luton Rd Roundabout (Harpenden)	Delay of up to ~0.5 mins in the AM Peak and ~1.5 mins in the PM Peak.	PM Peak (and to a lesser extent AM Peak)	Widening of 2 approach arms suggested in: *Land at Luton Road North West Harpenden: Local Plan Transportation Study – Brookbanks, June 2016*. AECOM Comment: Brookbanks mitigation suggestion seems to be conceptually valid, but no conclusive comment can be made without further testing.

ID in Figure 13 / Figure 14	Problematic Junction	Details of Congestion in 2031 Forecast Year	Affected time period(s)	Potential Mitigation
N/A	Roundwood Ln/ Luton Rd Junction (Harpenden)	Delay of up to ~0.5 mins in the AM Peak and PM Peak.	AM & PM Peaks	Addition of development access road and widening of NB Luton Rd approach: *Land at Luton Road North West Harpenden: Local Plan Transportation Study – Brookbanks, June 2016*. AECOM Comment: Brookbanks mitigation suggestion seems to be conceptually valid, but no conclusive comment can be made without further testing.
4	Green Ln/A414 Roundabout	Delay of ~3 mins on northern arm and ~2.5 mins on western arm in AM and PM Peak. ~1.5 min delay on southern arm in PM Peak.	AM & PM Peaks	Various concepts for roundabout upgrade (some including grade-separation): *Maylands Growth Corridor Study: Progress Meeting 7 – AECOM May 2016.* AECOM Comment: AECOM mitigation suggestion seems to be conceptually valid, but no conclusive comment can be made without further testing.
5	Sandpit Ln/ Beechwood Ave/ Marshalswick Ln Junction	Delay of ~5 mins on eastern arm in PM Peak and ~2 mins in AM Peak. Delay of ~1 min on western and southern arm, and ~0.5 mins on northern arm in both peaks.	PM Peak (and to a lesser extent AM Peak)	3 Options presented in: *Strategic Local Plan: St Albans East (Oaklands) Initial Assessment of Highway Impacts – AECOM March 2016* a. Signalised Junction Option. Widening eastern arm to provide an additional lane and potentially banning right turn movement from Marshalswick Ln. b. Compact Roundabout Option. No flared approaches. c. Standard Roundabout Option. Flared approaches on all arms. AECOM Comment: AECOM mitigation suggestion seems to be conceptually valid, but no conclusive comment can be made without further testing.
N/A	Sandpit Ln/ House Ln Roundabout	Delay of ~2.5 mins on western arm and ~0.5 mins on western arm in PM Peak. AM Peak delay less than 0.5 mins.	PM Peak	Enlarge roundabout to accommodate a southern development access arm, and widening to create additional lanes on all existing arms: *Strategic Local Plan: St Albans East (Oaklands) Initial Assessment of Highway Impacts – AECOM March 2016.* AECOM Comment: AECOM mitigation suggestion seems to be conceptually valid, but no conclusive comment can be made without further testing.

ID in Figure 13 / Figure 14	Problematic Junction	Details of Congestion in 2031 Forecast Year	Affected time period(s)	Potential Mitigation
N/A	Sandpit Ln/ Coopers Green Lane	Delay of ~1 min on western arm in AM Peak. Other arms and other time periods less than ~0.5 mins.	AM Peak	Widening to create additional lanes approach arms: *Strategic Local Plan: St Albans East (Oaklands) Initial Assessment of Highway Impacts – AECOM March 2016.* AECOM Comment: AECOM mitigation suggestion seems to be conceptually valid, but no conclusive comment can be made without further testing.
N/A	Hatfield Rd/ Colney Heath Lane Junction	Delay of less than ~0.5 mins in both peaks.	AM & PM Peaks	2 Options presented in: *Strategic Local Plan: St Albans East (Oaklands) Initial Assessment of Highway Impacts – AECOM March 2016* a. Roundabout Option. Flare approaches on all arms. b. Signalised Junction Option. Flared approach on southern and western arms. AECOM Comment: AECOM mitigation suggestion seems to be conceptually valid, but no conclusive comment can be made without further testing.

Sustainable Strategies and Modal Shift

The mitigation options presented in **Table 7** are highway-based capacity upgrade measures (e.g. additional entry lanes, banning turns, widening of junction entries) at certain junctions in the district where future congestion is expected.

Whilst it is recognised that such measures may be necessary and effective in some cases, it is suggested that longer term and more sustainable mitigation should be achieved through transport strategies / schemes that promote modal shift (i.e. encouraging trips to be made by walking, cycling or public transport). Potential modal shift strategies are not within the current scope, but may be investigated in further work.

4.6. AQMAs and hazardous sites

Air Quality Management Areas (AQMAs)

HCC has provided the locations of the three air quality management areas within St Albans District, as shown in **Figure 59**. SATURN is not designed to forecast air quality, however, results are provided in the following section on the likely increase in traffic flow (as a proxy for vehicle emissions) between the Base Year and Forecast Year at these locations.

M1/A414/A4147

- Overall traffic volumes on the 3 roads are expected to increase by ~2,000 PCUs (+11%) in the AM Peak and ~2,400 PCUs (+16%) in the PM Peak
- Overall traffic volumes on the M1 only are expected to increase by ~800 PCUs (+6%) in the AM Peak and ~1,200 PCUs (+10%) in the PM Peak

High St/Chequer St/London Rd/Holywell Hill

- Overall traffic volumes at the junction are expected to decrease negligibly (-1%) in the AM Peak and increase by ~75 PCUs (+4%) in the PM Peak.

Radlett Rd near M25

- Overall traffic volumes on Radlett Rd and M25 are expected to increase by ~1,300 PCUs (+10%) in the AM Peak and ~1,800 PCUs (+15%) in the PM Peak
- Overall traffic volumes on the M25 only are expected to increase by ~700 PCUs (+6%) in the AM Peak and ~1,200 PCUs (+10%) in the PM Peak

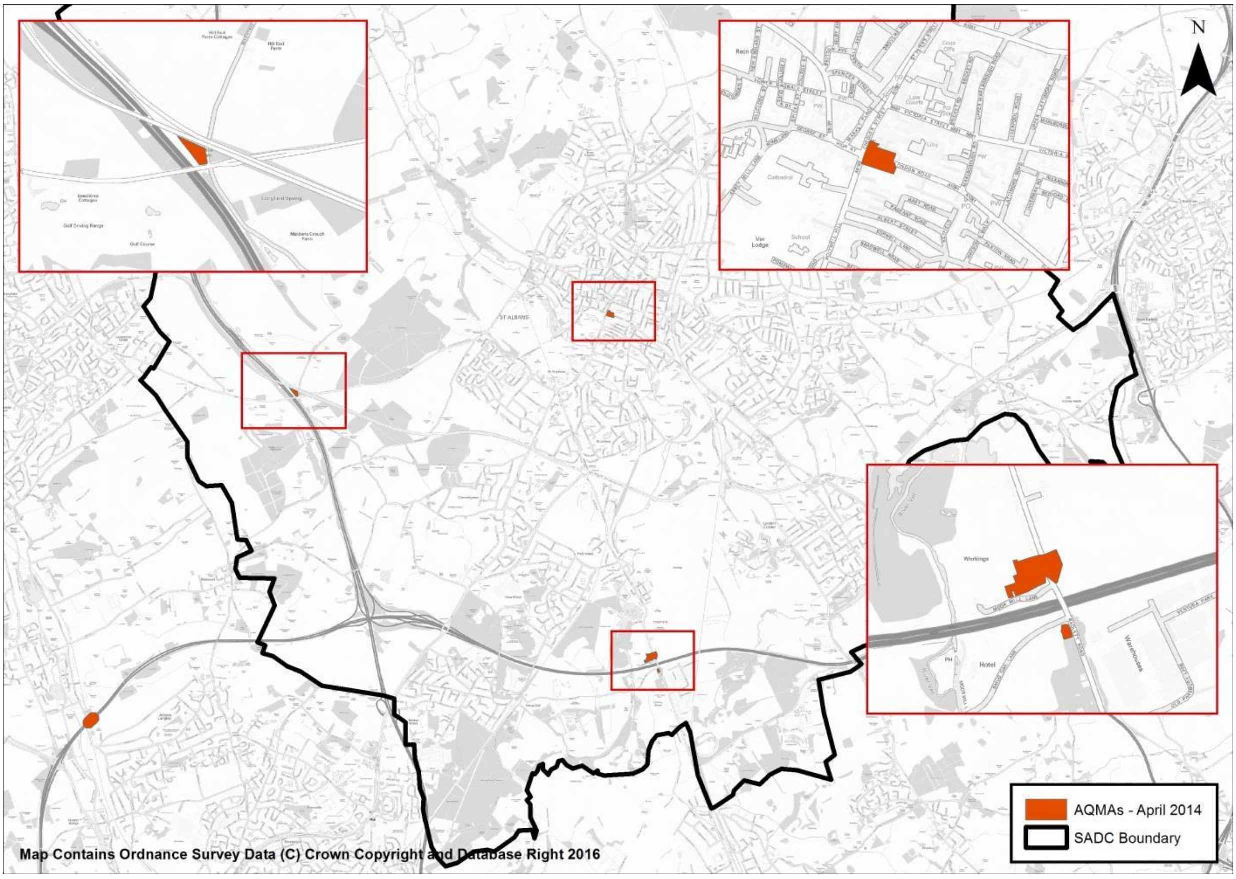


Figure 59 – AQMAs in St Albans District

Hazardous Sites

HCC has provided the locations of hazardous sites within St Albans District, as shown in **Figure 60** and **Figure 61**. The hazardous sites are based on accident data collected between 2013 and 2015, and only cover personal injury collisions reported to the Police (those on private property are excluded). Two sets of hazardous sites are shown:

- Standard Hazardous Sites (6 or more collisions within 75m)
- Mass Action (3 or more collisions within 75m that are wet, bend, skid or dark related)

SATURN is not designed to forecast traffic collisions, however, results are provided in the following section on the likely increase in traffic flow (as a proxy for collisions) between the Base Year and Forecast Year at these locations. Further work may be required to understand in more detail the causes of collisions at these locations.

London Colney Roundabout

- Overall traffic volumes are expected to increase by ~475 PCUs (+8%) in the AM Peak and ~125 PCUs (+2%) in the PM Peak.

Park St Roundabout

- Overall traffic volumes are expected to increase by ~1,300 PCUs (+26%) in the AM Peak and ~1,300 PCUs (+28%) in the PM Peak.

Harpenden Rd/Beech Rd/Batchwood Dr Junction

- Overall traffic volumes are expected to increase by ~50 PCUs (+3%) in the AM Peak and ~200 PCUs (+17%) in the PM Peak.

A414 Colney Heath Longabout

- Overall traffic volumes are expected to increase by ~325 PCUs (+7%) in the AM Peak and fall slightly by ~50 PCUs (-1%) in the PM Peak.

M25 J21a

- Due to network coding issues identified in **Table 1**, it is not currently possible to give realistic flow change values at this location.

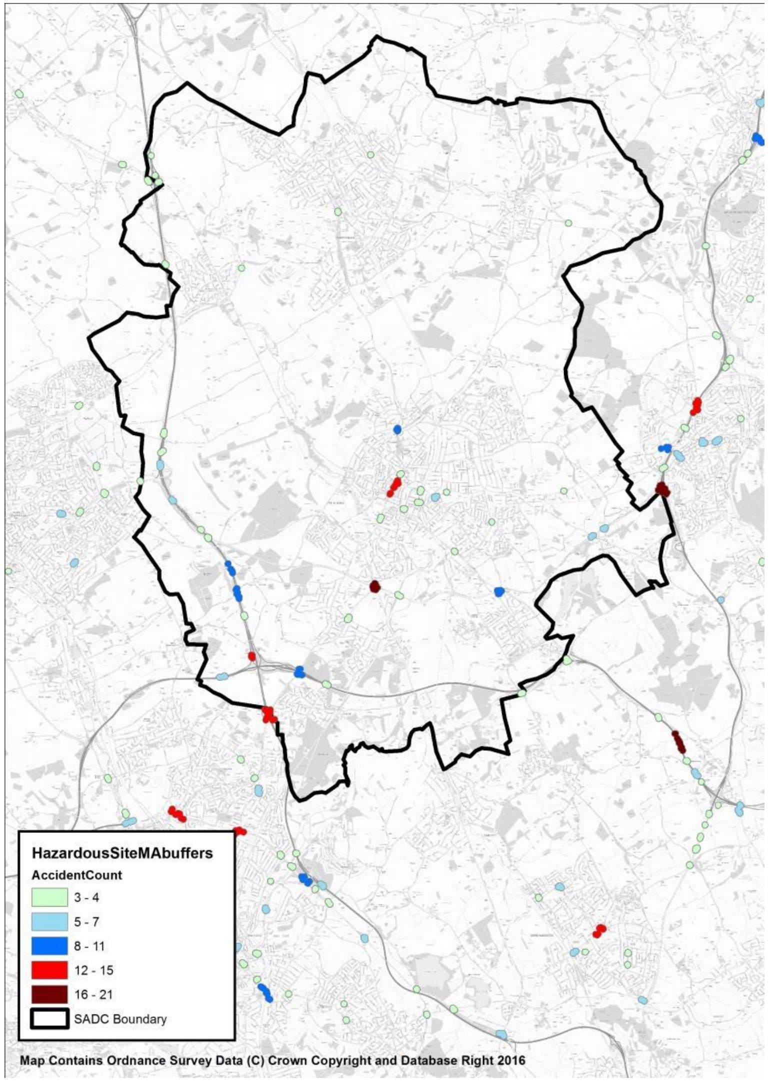


Figure 60 – Mass Action Hazardous Sites in St Albans District

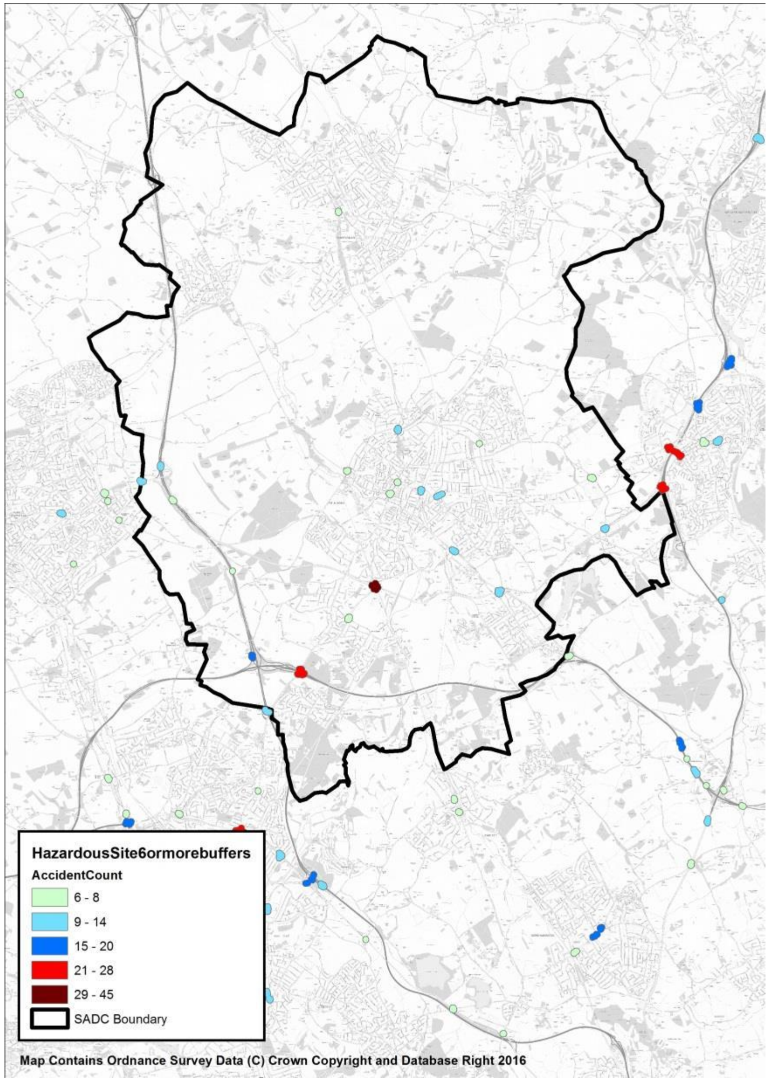


Figure 61 – Standard Hazardous Sites in St Albans District

5. Summary and Next Steps

5.1. Summary

This Technical Note presents COMET modelling results in St Albans District in order to provide support for the council's Local Plan. The risks associated with this support are shown in Appendix B – Risk Register. The analysis presented here has highlighted the following main points:

- The performance of the Base Year model in terms of validation is below WebTAG criteria in St Albans District
- Congestion is identified at various junctions in the District (in the 2014 Base Year and 2031 Local Plan Forecast Year Models), however, is generally concentrated in the vicinity of St Albans City, the A414 and M25. Congestion is also identified at locations where changes to the highway network between 2014 and 2031 are modelled.
- Major developments in terms of employment and housing are proposed in the vicinity of junctions where congestion is identified.

5.2. Next steps

It is noted at this stage that the analysis contained within this note relies on readily available existing commissioned cumulative growth and does not include a scenario without St Albans Local Plan growth, or a scenario with potential mitigation measures as outlined in **section 4.5**.

Equally, as has been demonstrated, COMET is currently not fully WebTAG compliant in St Albans District, and this has an implication of the robustness of outputs and our ability to identify impacts and appropriate mitigation. It may be appropriate to undertaken local model enhancement (calibration) in order to improve its reliability. Although the model may represent some of the congestion hotspots in the urban area, the validity of modelled results within the St Albans cordon should be explored further.

It should be noted that the countywide COMET model is strategic in nature and that operational modelling (using an alternative approach / software) may be a more appropriate tool to assess the local operation of a given scheme or a detailed urban area (e.g. St Albans City).

6. Appendices

6.1. Appendix A – Traffic impact of major developments

East Hemel Hempstead South

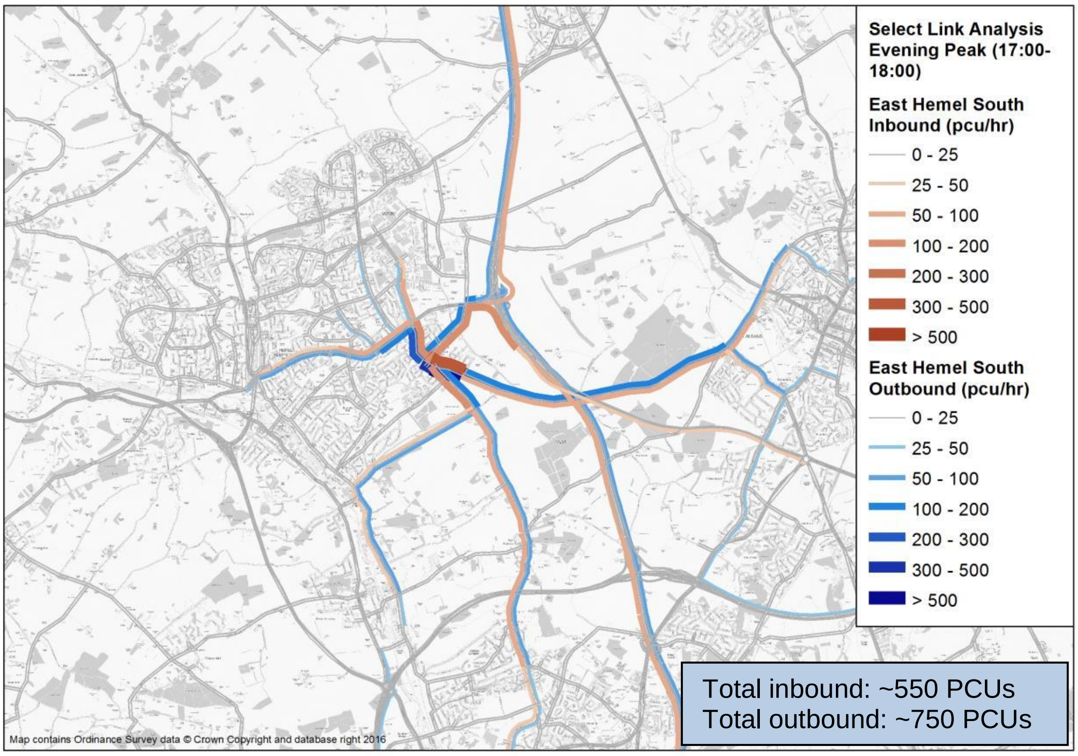


Figure 62 – Trip Distribution to and from East Hemel Hempstead South – PM Peak

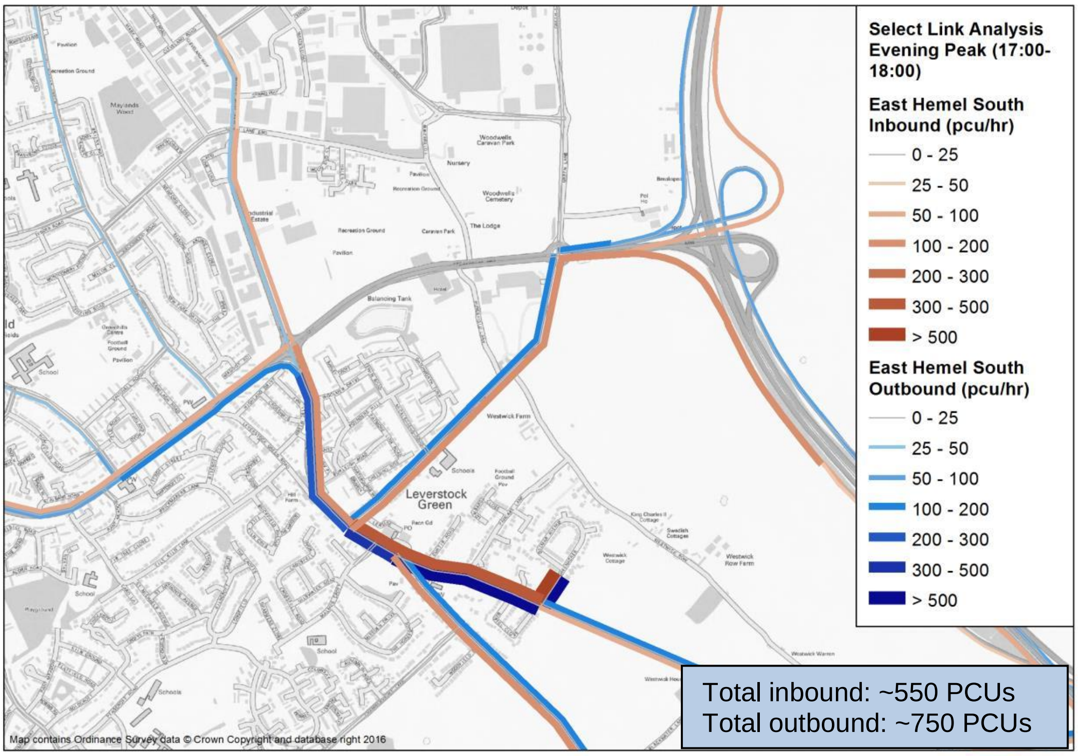


Figure 63 – Trip Distribution to and from East Hemel Hempstead South – PM Peak

East Hemel Hempstead North

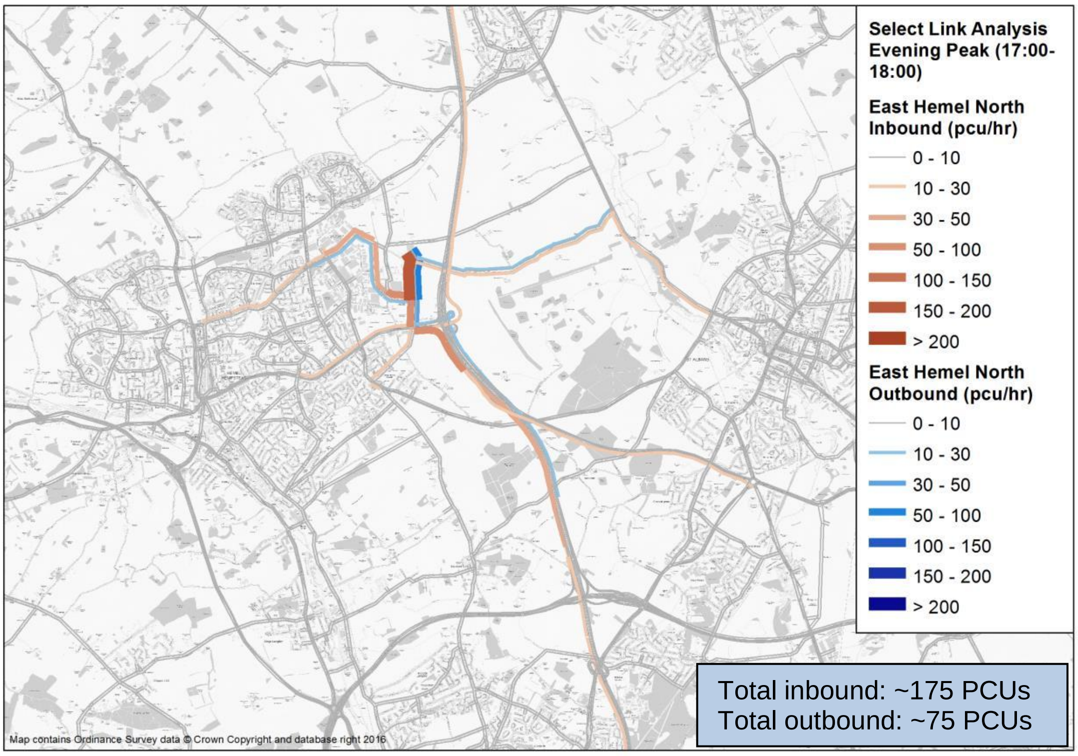


Figure 64 – Trip Distribution to and from East Hemel Hempstead North – PM Peak

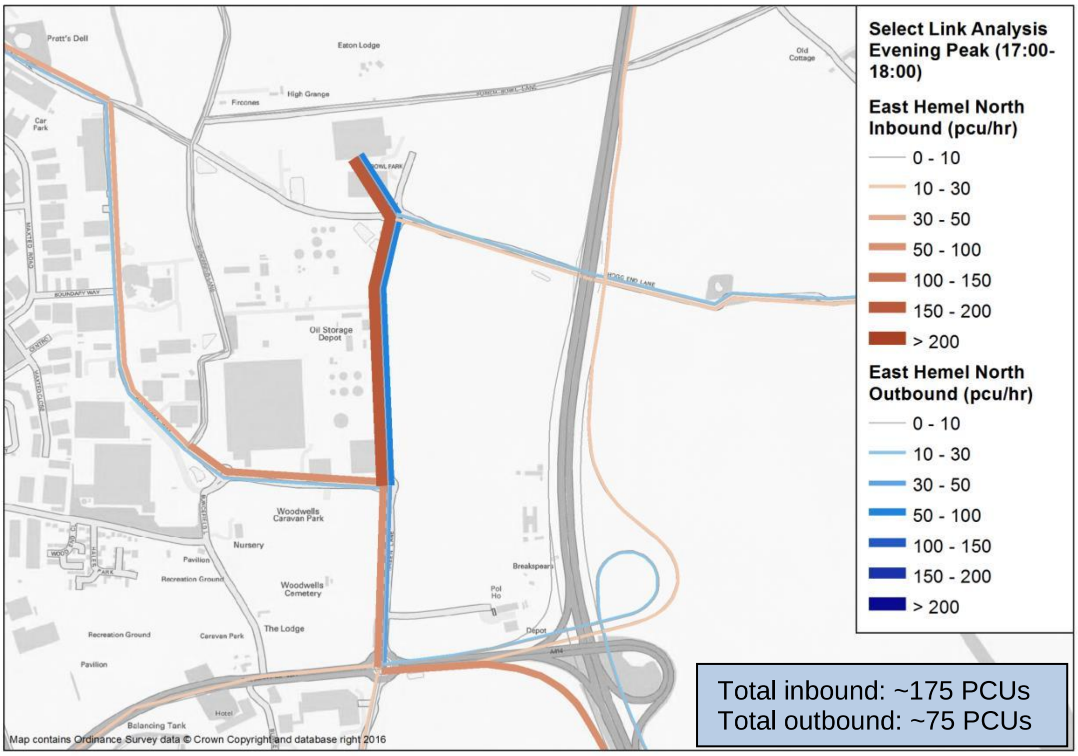


Figure 65 – Trip Distribution to and from East Hemel Hempstead North – PM Peak

Radlett Rail Freight planning application

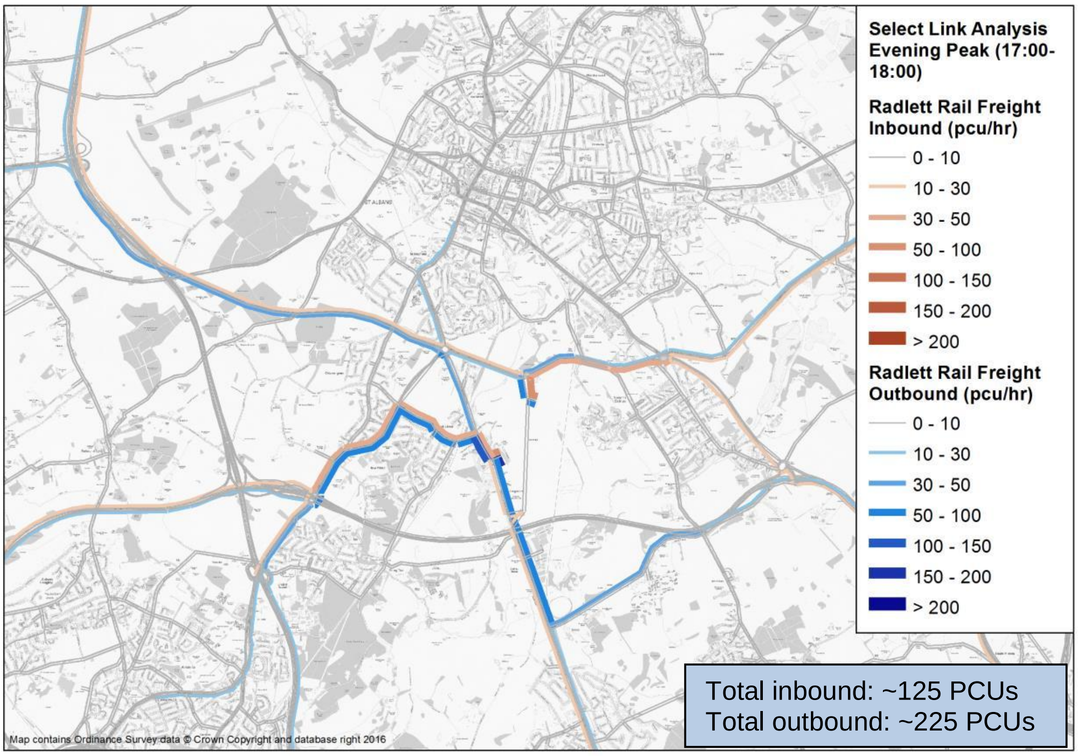


Figure 66 – Trip Distribution to and from Radlett Rail Freight planning application – PM Peak

East St Albans (Oaklands)

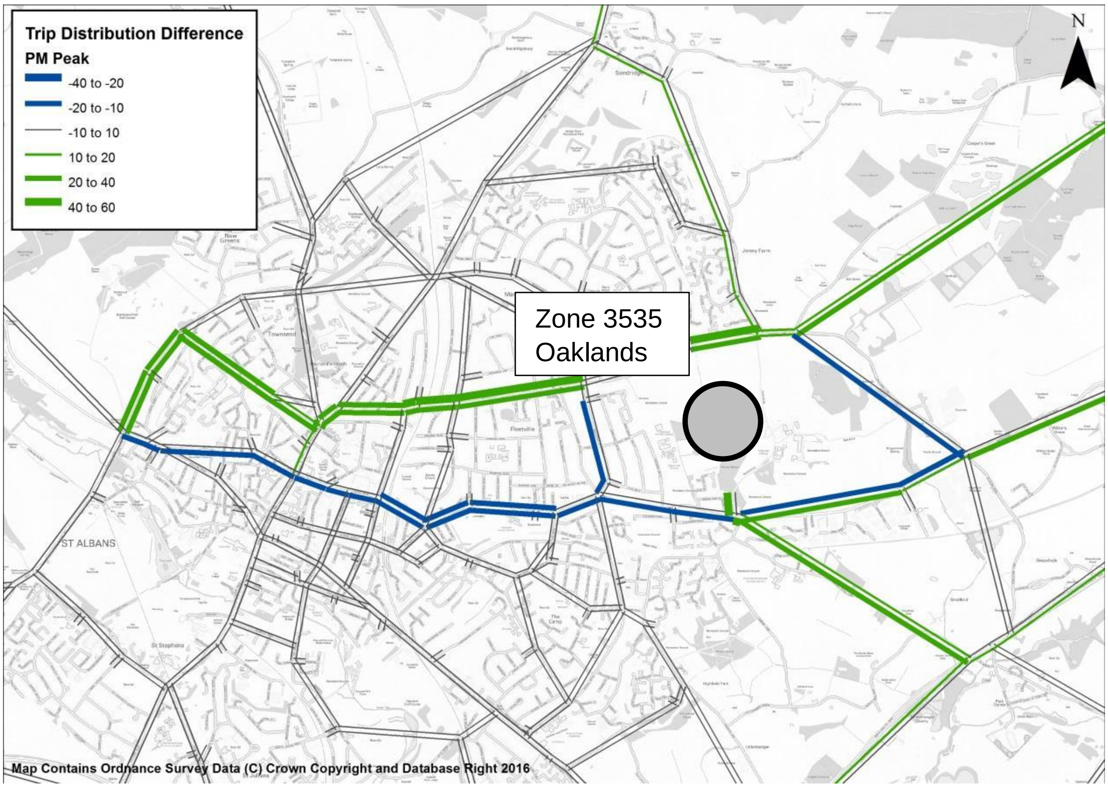


Figure 67 – Trip Distribution to and from East St Albans (2031 minus 2014) – PM Peak

North West Harpenden

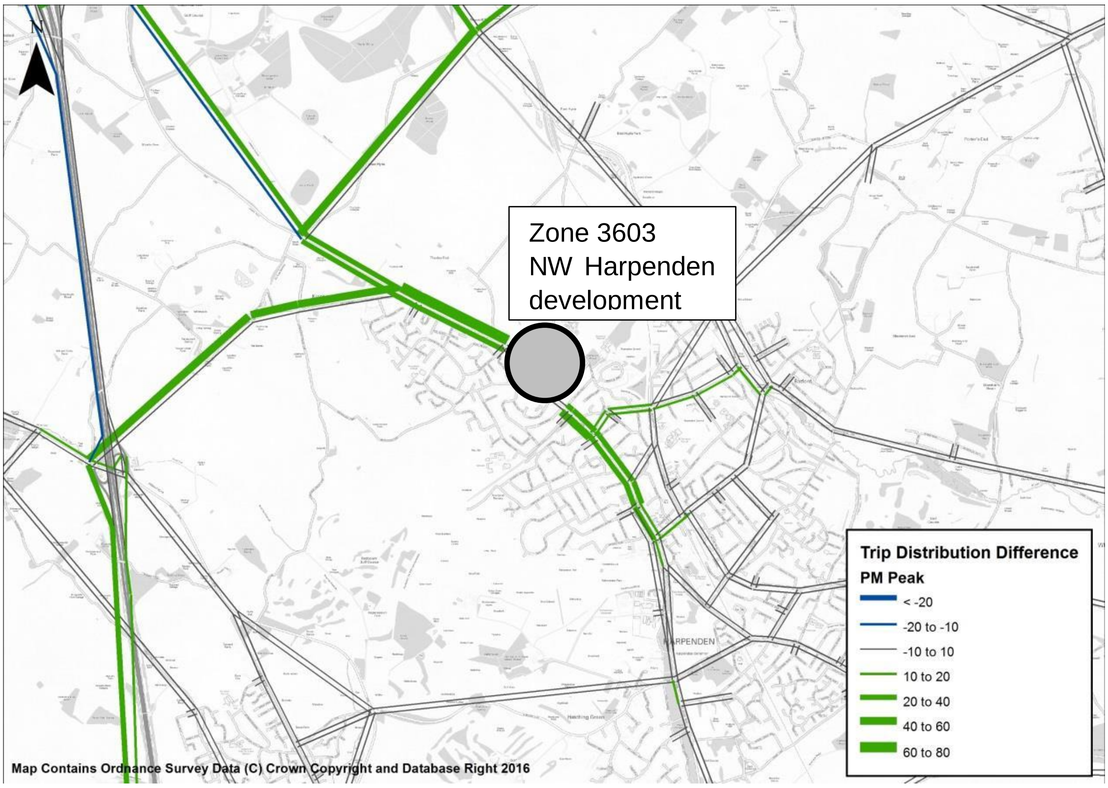


Figure 68 – Trip Distribution to and from North West Harpenden (2031 minus 2014) – PM Peak

6.2. Appendix B – Risk Register

ID	Description of risk and context	Effect	Likelihood L/M/H	Impact L/M/H	RAG	Acceptance Level	Owner	Actions/ Date description of specific mitigation	Live?
1	**Model limitations** Results are inconclusive owing to current calibration / validation results and / or model noise in St Albans District	- Further work might be required to constitute an evidence base for decision-making regarding the St Albans Local Plan - Quantitative analyses to be considered with caution	H	M	H	Highly sensitive – Monitor regularly	SADC / HCC	- No mitigation - HCC/SADC has been made aware of the current version's limitations and should expect an initial high level strategic test only. - AECOM will highlight the model limitations whenever necessary in the Technical Note. - All figures provided in the Technical Note will be rounded and / or put within intervals.	Y
2	**Model limitations** COMET results are interpreted at a scale that is not appropriate given its strategic nature.	- COMET results are used to draw inappropriate conclusions	M	M	M	Monitor - Proceed with caution	SADC / HCC	- It will be clarified in the Technical Note that the results should not be interpreted in a detailed way given COMET's strategic nature.	Y