

2036 COMET Dacorum Local Plan Scenario

Date
April 13th 2018

Revision History

Revision	Revision date	Details	Prepared	Checked	Approved	Position
3	27 April 2018	Final 1	CW	CW	CW	Senior Consultant
2	13 April 2018	Final	CW	SK	SK	Associate Director
1	16 February 2018	Draft for comment	CW	SK	IB	Regional Director

1. Introduction

- 1.1. The development of the COMET model suite was commissioned by Hertfordshire County Council (HCC) in February 2015 in order to provide a structured evidence base for assessing transport policies and strategies on a consistent basis across the county. COMET is a multi-modal (i.e. highways and public transport) model with variable demand modelling capability.
- 1.2. Following the development of the COMET Base Year (2014) model, HCC commissioned AECOM to produce a 2031 forecast including the Local Plan aspirations (all employment and dwelling growth, regardless of certainty) of the 10 Hertfordshire districts. The forecasts also include the most likely/significant future year highway and public transport infrastructure schemes in the county.
- 1.3. This scenario was referred to as “Do Minimum” as it did not include a number of transport infrastructure schemes in the county that are currently considered to be less certain. Local Plan growth aspirations from districts were included regardless of certainty, however. Full details of this COMET model scenario can be seen in the “Hertfordshire COMET: Local Plan Do Minimum Forecasting Report” issued in January 2017.
- 1.4. As a separate but related piece of work, a 2031 “Do Something” forecast was created in Spring 2017 for districts that included the same level of growth and most likely/significant transport schemes as the “Do Minimum”, plus a number of less certain transport infrastructure schemes (e.g. those included in the districts’ Infrastructure Delivery Plans). A presentation issued by AECOM to HCC in March 2017¹ detailed the results of this scenario and compared results to the “Do Minimum” scenario. A copy of this presentation was shared with districts in Hertfordshire²
- 1.5. The 2031 forecasts that have been developed are therefore a reflection of the total cumulative growth within the county rather than a test of any specific (set of) developments/schemes.
- 1.6. Using the 2031 Do Something forecast as a base, Dacorum Borough Council now wishes to examine the impact of an alternative growth scenario across the district which includes revised housing and employment projections up to 2036, and a series of infrastructure schemes. The new scenario created will be referred to as the 2036 Dacorum Local Plan scenario.
- 1.7. This report forms deliverable 2 as detailed in the “AECOM COMET Dacorum Test Specification FINAL2” Technical Specification issued on 23 August 2017. The format of this report was agreed with Dacorum Borough Council and

¹ “COMET Local Plan 2031 DS (Do Something) Outputs” presentation issued by AECOM, March 2017

² Entitled ‘COMET 2031 DS (District Schemes) User Friendly outputs February 2017’.

follows the presentation of deliverable 1 which detailed the key results from the 2036 Dacorum Local Plan scenario³.

1.8. The findings and conclusions / recommendations of the 2036 Dacorum Local Plan scenario modelling should be seen in the context of other current, on-going and future local transport / area specific studies including:

- The Maylands Growth Corridor study;
- South West Herts Growth and Transport Plan;
- Further potential runs of the Hemel Hempstead Paramics Microsimulation Model; and
- Two Waters Master Plan Guidance

Such work will form part of the evidence base to the Local Plan and help inform future transport decisions.

1.9. It is recommended that the model run is further refined when Dacorum Borough Council is clearer on the spatial scenario they wish to take forward and as progress is made on the East Hemel development in St Albans district. This will allow for more detailed localised junction modelling to be tested on individual development options. These broad points are discussed further in section 8.

1.10. The remaining sections of this technical note are structured as follows:

- Section 2 sets the context, objectives and assumptions of the project;
- Section 3 details the modelling caveats;
- Section 4 details results from the 2036 COMET Dacorum Local Plan highway assignment;
- Section 5 details results from the 2036 COMET Dacorum Local Plan public transport assignment;
- Section 6 contains a high level assessment of possible mitigation measures across Dacorum district;
- Section 7 details flow distribution analysis; and
- Section 8 details conclusions and next steps.

³ This presentation was held on 11th January 2018 at Dacorum's offices

2. Context, Objectives and Assumptions

- 2.1. Dacorum Borough Council has recently published its Issues and Options consultation for its new Local Plan⁴. This will cover the period up to 2036. This involves looking at different growth level options and alternative spatial scenarios for this growth. For this purpose, it has appointed AECOM to test one growth option with alternative spatial scenarios.
- 2.2. It should be highlighted that the scenario created and analysed is one of many which are currently under consideration by Dacorum Borough Council and does not represent a definitive, approved final scenario. The key findings of this scenario will be used to further refine and inform the eventual final scenario progressed by the district.
- 2.3. AECOM was assigned with the task to “assess the strategic impact of the potential additional Local Plan Allocations within Dacorum up to 2036 in conjunction with anticipated transport infrastructure in the current version of the 2031 COMET Transport Model”. The new scenario created will be referred to as the 2036 Dacorum Local Plan scenario.

Planning Data Assumptions

- 2.4. The current 2031 Local Plan Do-Something forecast serves as the basis for the model. The scenario chosen to be tested was based on the Objectively Assessed Need (OAN) of around 760 dwellings a year (17,400 total new dwellings between 2013 - 2036) which Dacorum Borough Council recently consulted on under their emerging Local Plan. This represents an additional 7,844 dwellings in addition to the Local Plan allocation already tested up to 2031. The scenario provides a broad mid-point between lower and higher options that were also consulted on at the same time.
- 2.5. The additional allocations are expected to be within three sites, which are as follows⁵:
 - Land at north Hemel with around 3,000 units by 2036;
 - East of Tring with around 1,000 units by 2036; and
 - Land south of Berkhamsted with around 1,000 units by 2036.
- 2.6. The outstanding number of allocations is located within a series of smaller sites edging the aforementioned three towns and the villages Bovingdon, Kings Langley and Markyate within Dacorum.
- 2.7. All other unconstrained housing and employment projections across Hertfordshire remain the same as those used in the 2031 Do-Minimum and Do Something scenarios. It should be noted that due to an amendment in the processing of employment data⁶, there was an overall reduction in the number of jobs estimated in Dacorum compared to the 2031 Do Something scenario.

Infrastructure Assumptions

- 2.8. The 2031 Do Something formed the base from which the 2036 COMET Dacorum Local Plan scenario was created. The schemes in Dacorum included in this scenario are highlighted in Table 1. Please note that not all schemes proposed in the district could be modelled in COMET.

⁴ Dacorum Borough Council consulted on their draft (Issues and Options) Local Plan during November-December 2017 (<http://www.dacorum.gov.uk/docs/default-source/strategic-planning/local-plan--issues-and-options---consultation-final---13-november-2017.pdf?sfvrsn=21>). Growth options are discussed in section 10 of the document.

⁵ Details of these schemes can be found within the Schedule of Site Appraisals (For Large Greenfield Sites) October 2017 (<http://www.dacorum.gov.uk/docs/default-source/strategic-planning/schedule-of-site-appraisals-draft---october-2017.pdf?sfvrsn=8>).

⁶ Email from Gary Beaumont at HCC 12 September 2017. “Completed Losses” are now included in the HCC data processing which resulted in approximately 1,500 fewer projected jobs across Dacorum.

Table 1: 2031 Do Something schemes in Dacorum District

Scheme ID	Scheme Name	Details
T/8	Junction of Bedmond Road / Leverstock	Standard mini roundabout with approach lanes as existing
T/9	Leighton Buzzard Road / Combe Street signalisation	Signalised junction
T/17	Junction improvements	Kingshill Way and Shootersway. Junction improvements including traffic lights and pedestrian crossings required in association with MU/6: Land at Durrants Lane / Shootersway (Egerton Rothesay School) and Local Allocation LA4: Hanburys.
T/18	Traffic calming	High Street corridor. Extension of 20mph zone and pedestrian crossing facilities
T/19	Public car park	This could not be modelled in COMET
T/21	LA5 – New junctions	Local Allocation LA5, Icknield Way. New priority junctions to development with associated highway improvements, including new cycle and pedestrian routes in line with the site master plan
T/23	LA6 – New junctions	Scheme not modelled in COMET as model coverage not sufficient to include it
D/24	Leighton Buzzard Road / Queensway r/bout	Part time signals and a left turn bypass
D/25	Boundary Way / Buncefield Lane r/bout	Wood Lane End added to the model, along with a new link between Boundary Way and Wood Lane End (assumed single carriageway with 3 way traffic and 30mph as per layout in Appendix F of the report).
D/26	Link Road / Redbourn Road r/bout	This could not be modelled in COMET
D/27	Redbourn Road / Shenley Road	Removal of the approach flare on the eastern arm
D/28	Station Road / St Johns Road / Heath Lane	New mini roundabout
D/29	London Road / Red Lion Lane	Signals optimised
D/30	Fishery Road / Northridge Way	Temporary signals prioritising northbound flows on Fishery Road in the PM
D/31	Maylands Avenue / Wood Lane End	Signals optimised
D/32	Two Waters Road / London Road	Signals optimised
D/33	Breakspear Way / Green Lane	Not modelled as superseded by scheme MG S1
D/34	Fishery Road / London Road	Signalisation of roundabout
D/35	Leighton Buzzard Road / St Albans Road (Plough r/bout)	Signals optimised
SC1C	M1 Junction 8	Option C - new link road to M1 junction 8
SC2a,b and c	Scheme Concept 2 - Redbourn Road to St Albans Rd	New link road with roundabout junctions at either end

SC4	Scheme 4 - Wood End Lane to Boundary Way	Same as D/25 above
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2.9. In addition, the 2036 COMET Dacorum Local Plan scenario highway network was amended to ensure the latest designs of the following Maylands Growth corridor schemes⁷, were included in the modelling;

- The signalisation of M1 Junction 8 (scheme SC1C including the new eastern roundabout);
- The upgrade, signalisation and extension of Green Lane (referred to as the “East Hemel Hempstead Development Link Road”)between the A414 and Hemel Hempstead Road (scheme SC2a, b and c);
- The signalisation of junctions on the A414 Breakspear Way near the M1 and a speed reduction on a section of the A414 between Green Lane and Maylands Avenue (scheme SC1h and speed limit reduction identified from a parallel microsimulation modelling project using the Hemel Paramics model);
- Quietway on Cherry Tree Lane (scheme SC3a);
- Lorry bans on parallel local roads between M1 junctions 8 and 9 (scheme SC7); and
- The provision of local bus services around Maylands Business Park⁸ (scheme SC8)

Other Maylands schemes such as the Nickey Line accesses (scheme SC5), and the new pedestrian crossings (scheme SC6) were too minor in nature to be modelled within COMET.

2.10. Finally, a local distributor road through the new proposed north Hemel development (as currently proposed by Crown Estates) connecting the B440 Leighton Buzzard Road with the B487 Redbourn Road was added. This was designed as a single carriageway 40mph road.

2.11. The public transport model component in COMET was also updated to include the new bus services around Maylands Business Park⁵. All other public transport assumptions from the 2031 Do Something scenario remained.

⁷ HCC confirmed that the plans submitted on 15 August 2017 represented the latest scheme designs to be included in the 2036 Dacorum Local Plan Scenario

⁸ As detailed in Figure 22 of “Maylands Growth Corridor Study - Scheme Concept 8 (Bus Service Provision) Option Report” issued in August 2016

3. Modelling Caveats

- 3.1. There are a number of modelling caveats associated with this piece of work which should be highlighted. These caveats should be considered when considering the results of the 2036 Dacorum Local Plan scenario.
- 3.2. The scenario reported here only represents one scenario which was current at the time of commissioning the work in Autumn 2017. Dacorum are still finalising the locations and quantum of development proposed in its new Local Plan. The results reported represent only one option of many under consideration.
- 3.3. The limitations of COMET should be carefully considered. COMET is a strategic countywide model and has not been developed to represent traffic conditions in urban areas. COMET cannot model cyclist or pedestrian flows, bar representing pedestrian crossing timings at signalised junctions. The public transport element of the model assumes that all demand for public transport services can be met. The COMET model does not include every road in Dacorum and only models the key strategic routes and links between areas. Therefore some local routes will be excluded from the model in the district.
- 3.4. The 2036 scenario created for this scenario only includes 2036 housing development, initial employment sites and limited infrastructure in Dacorum. All other housing, employment and infrastructure inputs for other districts in Hertfordshire remain at 2031 levels. Therefore the results reported are purely indicative. Additional trips on Dacorum's highway and public transport networks generated by surrounding areas housing and employment growth between 2031 and 2036 are not represented. Growth in all other Hertfordshire Districts and surrounding areas is limited to 2031 levels. Although this enables a standalone assessment of the impact of further growth in Dacorum between 2031 and 2036, this may mask the real impacts of the development proposed and the true levels of congestion on Dacorum's transport network.
- 3.5. Results presented in this report focus on the Dacorum area as this is the area in which demand and infrastructure changes have occurred compared to previously issued COMET scenarios. Sense checks were made on the impacts on the wider COMET network across Hertfordshire in the Dacorum 2036 scenario which confirmed results mirrored those seen previously. This is to be expected as demand and infrastructure assumptions in other areas of the model have not changed.
- 3.6. In total, the highway network modelled in the 2036 Dacorum Local Plan Scenario includes approximately 30 new schemes to the existing highway network. This report does not make any reference to the engineering feasibility, economic viability or political support of implementing these schemes.
- 3.7. The COMET forecasting model suite incorporates a variable demand model. This has various inputs in addition to the forecast year highway/public transport schemes and housing/employment data. They include future year economic assumptions, travel demand and costs, which all impact the forecast flows and demand reported. In simple terms, this means that projected trip rates from different types of developments are subject to change using the variable demand element of the COMET forecasting model.
- 3.8. COMET's main purpose is to simulate inter-urban movements in Hertfordshire, and the calibration/validation process has been conducted accordingly⁹. This has an implication on the level of confidence that can be placed on results in urban areas. The performance of the 2014 COMET Base Model around Dacorum should be considered. The 2036 Dacorum Local Plan Scenario pivots from this base year scenario. The calibration of the base year model in Dacorum used a cordon around Hemel Hempstead and east-west screenlines passing through the borough. Whilst the cordon around Hemel Hempstead passed WebTAG¹⁰ modelling criteria, this only compared flows into and out of Hemel Hempstead in peak periods. This means that the model was accurately modelling the number of vehicles entering and leaving the Hemel Hempstead urban area (i.e., the cordon), but flows within the urban area were not investigated further. To fully model all flows within an urban area microsimulation models should be used (such as the Hemel Paramics Model).
- 3.9. Flows around the other major settlements in Dacorum of Tring and Berkhamsted were not subject to further analysis and were analysed by wider east-west screenlines only. A screenline is a line covering multiple roads in a

⁹ Please refer to the COMET Local Model Validation Report for details (available from HCC)

¹⁰ WebTAG (Transport Analysis Guidance) is the Department for Transport's online guidance about how transport modelling should be undertaken and the performance of models which should be aimed for. Please see <https://www.gov.uk/guidance/transport-analysis-guidance-webtag> for more details

model over which flows are recorded. This means that the model only recorded strategic east or westbound movements towards or from these urban areas. More localised movements were not assessed¹¹. This should be considered when viewing the results from the 2036 Dacorum Local Plan scenario as all results are purely indicative and provide a high level indication of likely traffic conditions.

3.10. The original screenlines and cordons are highlighted in Figure 1 by the solid purple and blue lines. The dotted lines represent additional cordons and screenlines which will be applied in the latest update to the COMET model. These will help provide greater accuracy in modelling flows of traffic around Dacorum’s network.

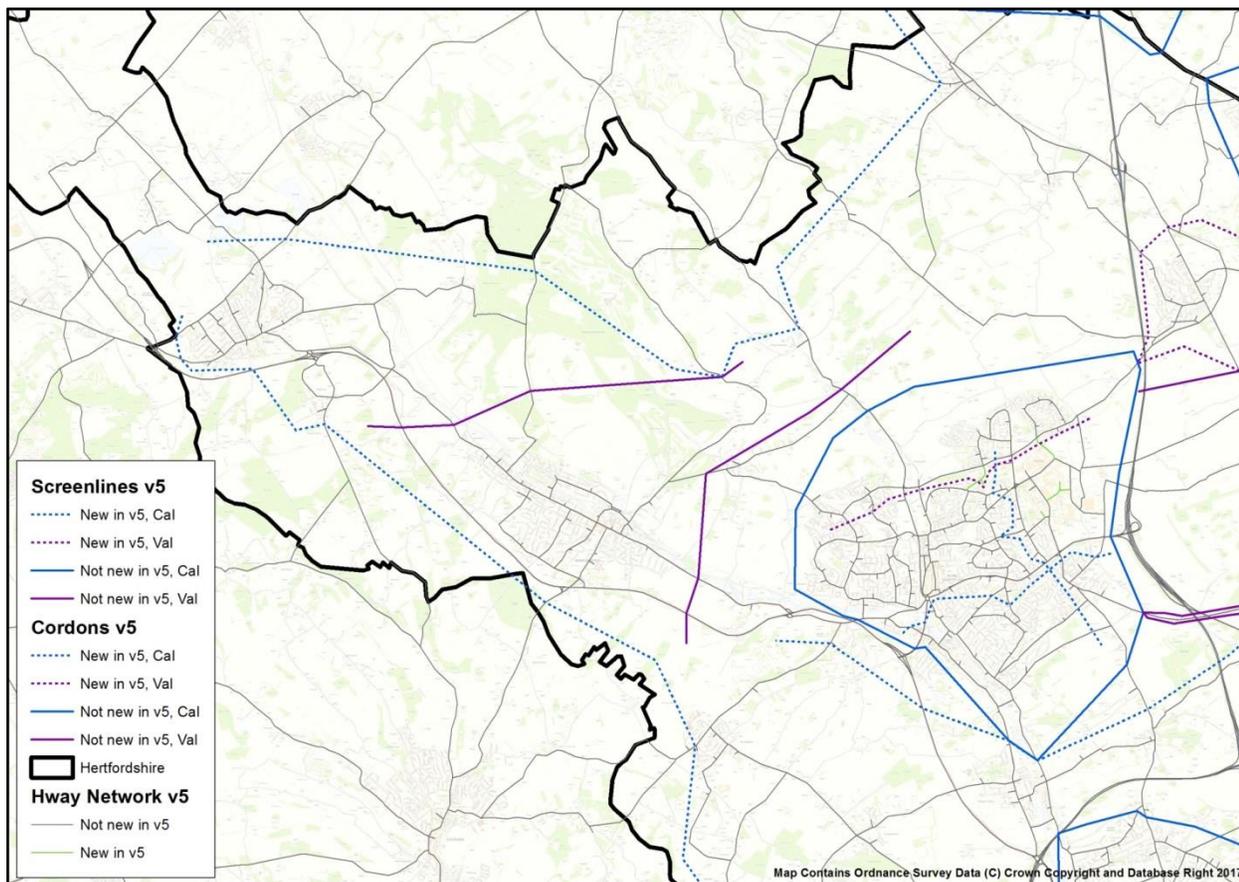


Figure 1: Screenlines and Cordons used in the COMET Calibration / Validation Process

3.11. Journey time validation in the 2014 COMET Base Model focussed on two key routes in Dacorum. These were the A41 between the M25 and Tring and the A414 through central Hemel Hempstead to junction 8 of the M1. It should be noted that the journey times modelled in the base year scenario were quicker in the model approaching the M25 on the A41 in the AM peak, and quicker along the A414 approaching junction 8 of the M1 in both AM and PM peaks when compared to observed data. These results would suggest that the model does not represent enough congestion on these routes in the peak periods, however the overall results reported in this document are still valid. These journey time routes are shown in Figure 2.

¹¹ For more information on model calibration and validation and the roles of screenlines and cordons, please see TAG unit M3-1 available to download from <https://www.gov.uk/government/publications/webtag-tag-unit-m3-1-highway-assignment-modelling>

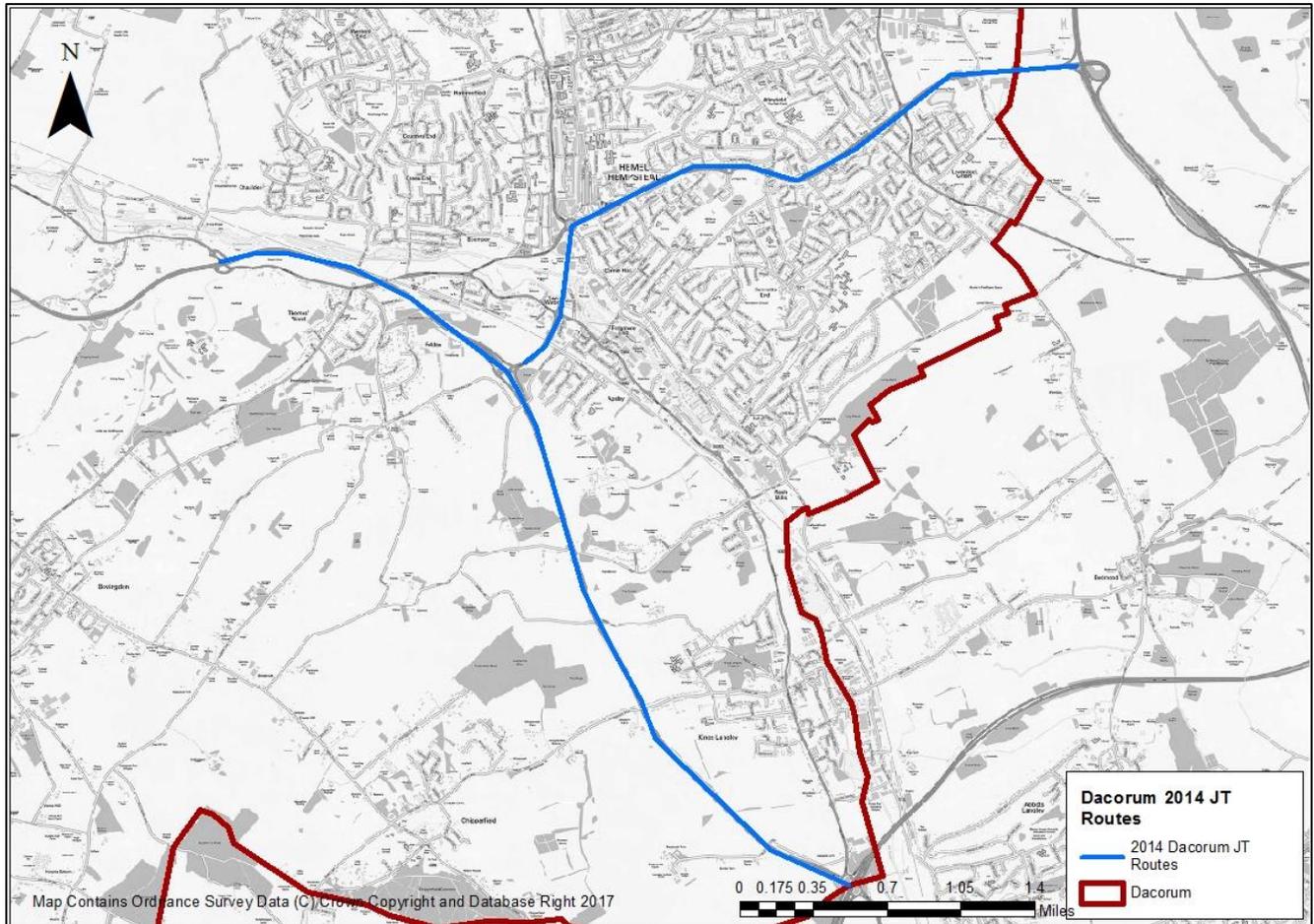


Figure 2: Journey Time Routes in the 2014 COMET Base Year model - Dacorum

3.12. Further evidence may be required to underpin and understand specific network issues as well as specific development impacts as they come forward. At this stage, the results presented here should only be interpreted as a high level indication of likely traffic conditions.

4. 2036 Dacorum Local Plan Highway Assignment Results

4.1. This section details the results from the highway network assignment and compares impacts to previous scenarios.

Highway Network Congestion and Delay Results

4.2. The following sections details the volume over capacity (V/C) and node delay results from the 2036 Dacorum Local Plan scenario. Results concentrate on AM (8am-9am) and PM (5pm -6pm) peak periods. For reference volume over capacity is an indication of how congested a road is:

- Under 80% is relatively free flowing
- 80%-90% is a sign that speeds will lower and queuing at junctions will start,
- Over 90% indicated slow moving traffic and long queues would develop at junctions.

4.3. Node (junction) delay is an indication of how much delay each vehicle passing through a junction is expected to experience. This is regardless of which movement they make and is averaged across flows. For clarity on the figures, any junction experiencing less than 30 seconds delay is not displayed.

4.4. It should be noted that link stress is impacted by the level of delay at junctions (nodes) at either end of the link. In urban areas within Dacorum, link stress is impacted by the surrounding junctions.

4.5. Figure 3 highlights network link stress and delays bordering Dacorum in the AM Peak. It can be identified that there are delays accessing or exiting Watford in the AM peak from Dacorum. There are also delays on the M1 North of Dacorum travelling towards Luton. Further east, there are long delays around the A414/ A1(M) junction 3 and 4 in Hatfield. High link stress can be seen on the M25 between Watford and the M1 and on the M1 travelling southbound towards junction 8. Although network coverage diminishes outside of Hertfordshire there is an indication that there may be delays access/exiting Dacorum to South Buckinghamshire or the north towards Bedfordshire.

4.6. Figure 4 focuses on Dacorum and Figure 5 focuses on the Hemel Hempstead area. These figures highlight that there are delays accessing Hemel Hempstead from the south on Box Lane (B4505) and the approaches to the Plough Roundabout (Two Waters Road and Station Road). Many junctions within Hemel Hempstead can expect up to 1.5 minutes of delay specifically those on the A414 (A4147 Maylands Avenue and Green Lane junction) and routes parallel to Maylands Business Park in the north (for example junctions on the A4147 Redbourn Road). Higher levels of network stress can be identified in Maylands Business Park and southern Hemel Hempstead with some links experiencing greater than 90% link stress. Examples include the A4251 past Hemel Hempstead Railway Station, Two Waters Road approach to the Plough Roundabout, A4251 London Road in Apsley and Belswains Lane.

4.7. Congestion is also experienced along the M1 southbound approach to Junction 8 and on accesses to the M1 Junction 9 situated on the Dacorum border. Further delays can be identified on all approaches to the Plough Roundabout situated in central Hemel Hempstead and at Junction 20 on the M25 which links to the A41. The A41 itself appears to experience limited congestion, although there are some delays around Tring and at the Two Waters junction in southern Hemel. Berkhamsted town centre experiences some congestion although this may be due to traffic trying to access the A41. Further north there are some delays on the A5183 near Markyate and the B487 Redbourn Lane (between Redbourn and Harpenden) is very congested in both directions.

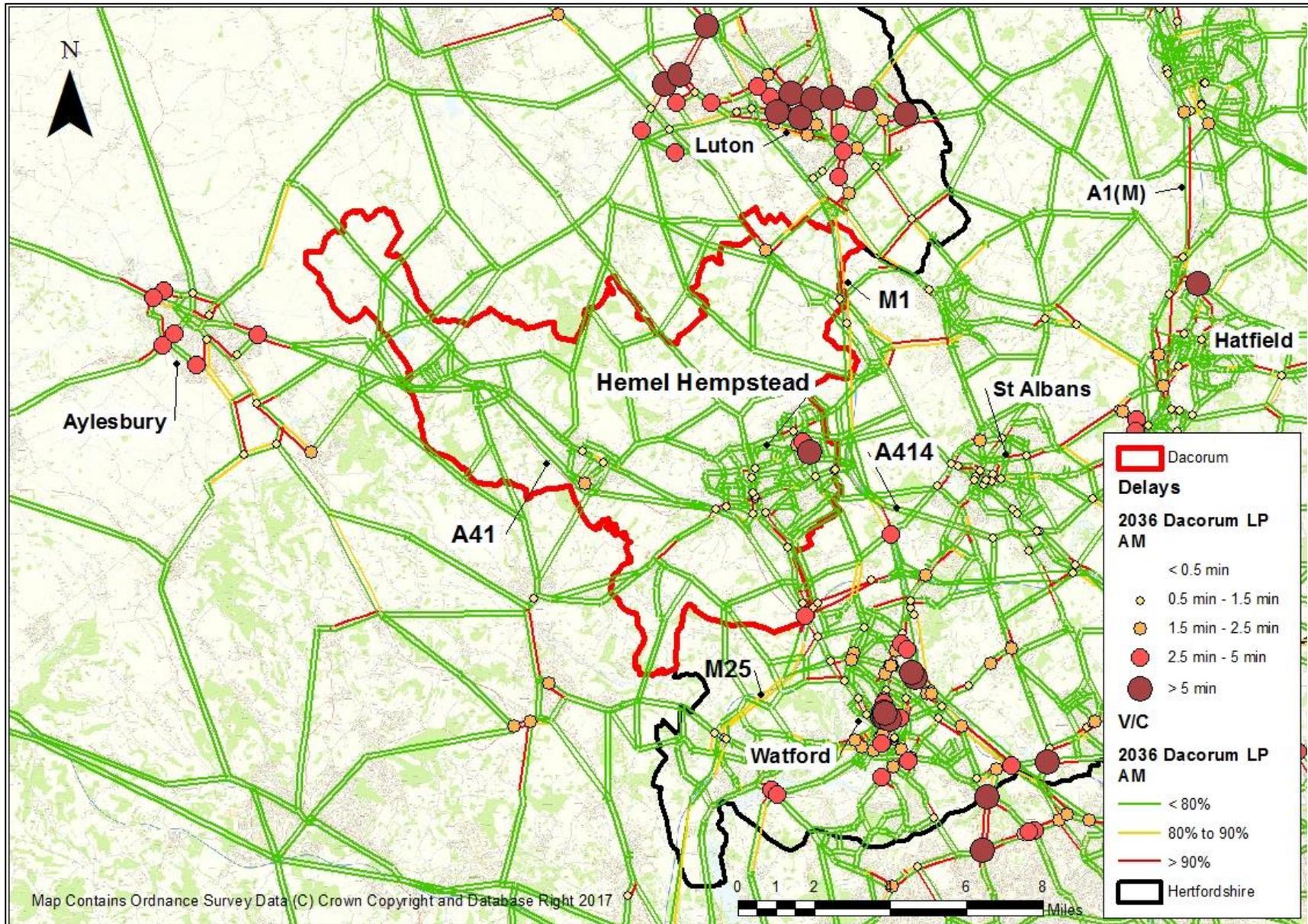


Figure 3: Delays and V/C for West Hertfordshire and Dacorum - AM peak, 2036 Dacorum Local Plan

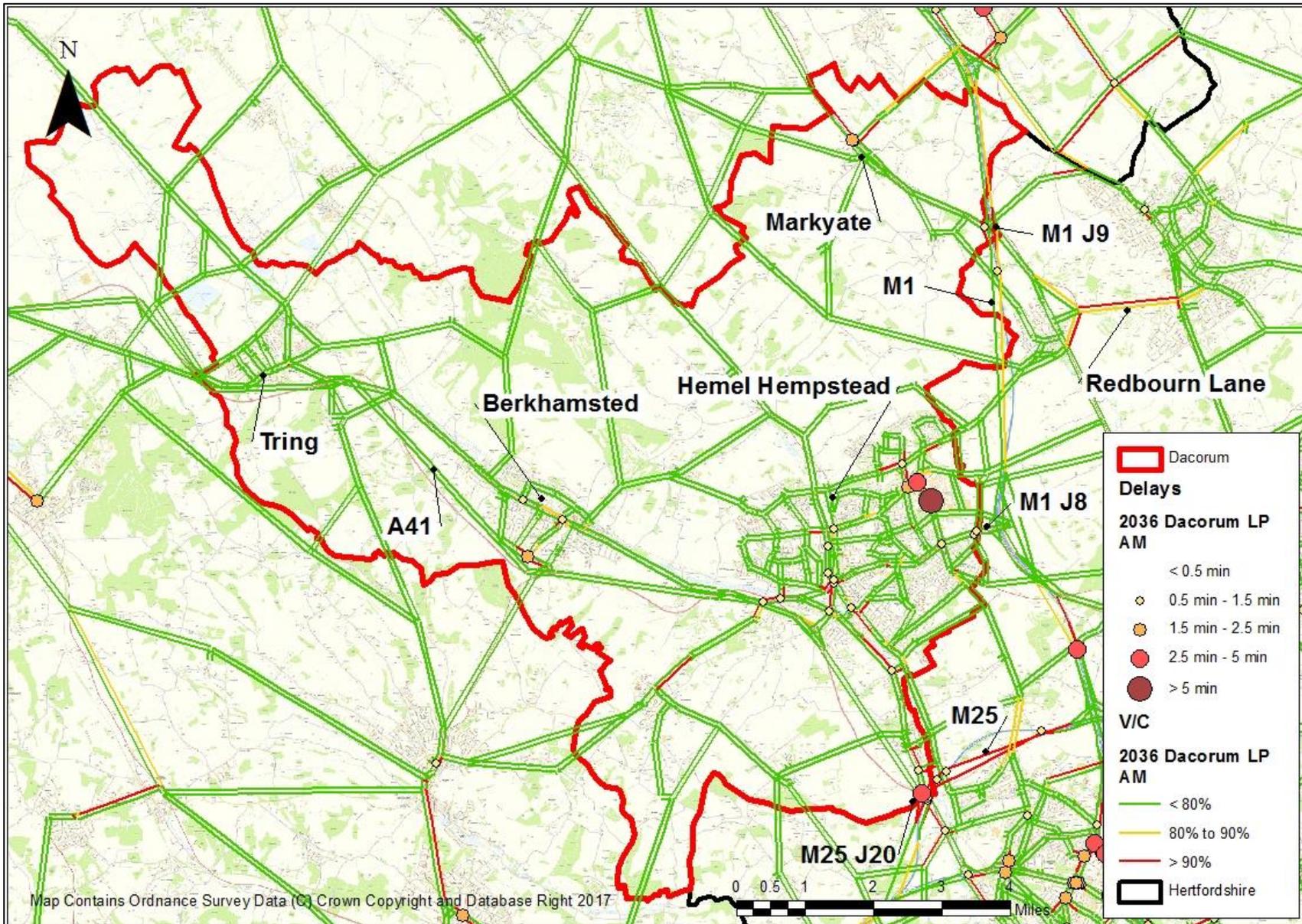


Figure 4: Delays and V/C in Dacorum District - AM peak, 2036 Dacorum Local Plan (Dacorum View)

4.8. Figure 5 focusses on Hemel Hempstead and highlights the delays on the approaches to the Plough Roundabout in central Hemel Hempstead. Link stress levels along the A414 through to junction 8 of the M1 are generally under 80%, however there are delays of up to 1.5 minutes at some of the junctions (A4147 Maylands Avenue and Green Lanes junction). The longest delays in Hemel are on Maylands Avenue around the Maxted Road, Swallowdale Lane and Queensway junction, and the approaches to the Redbourn Road roundabout. Delays will be due to the demand for inbound trips to Maylands Business Park in the AM peak. Some of the delays accessing the Maylands Business Park area may not be totally representative as the COMET model does not represent the full road network in this area.

4.9. Links leading out of Hemel towards Kings Langley also display congestion. It should be noted that the new distributor road through the North Hemel Development is operational in this scenario and it relieves congestion along and through central Hemel Hempstead.

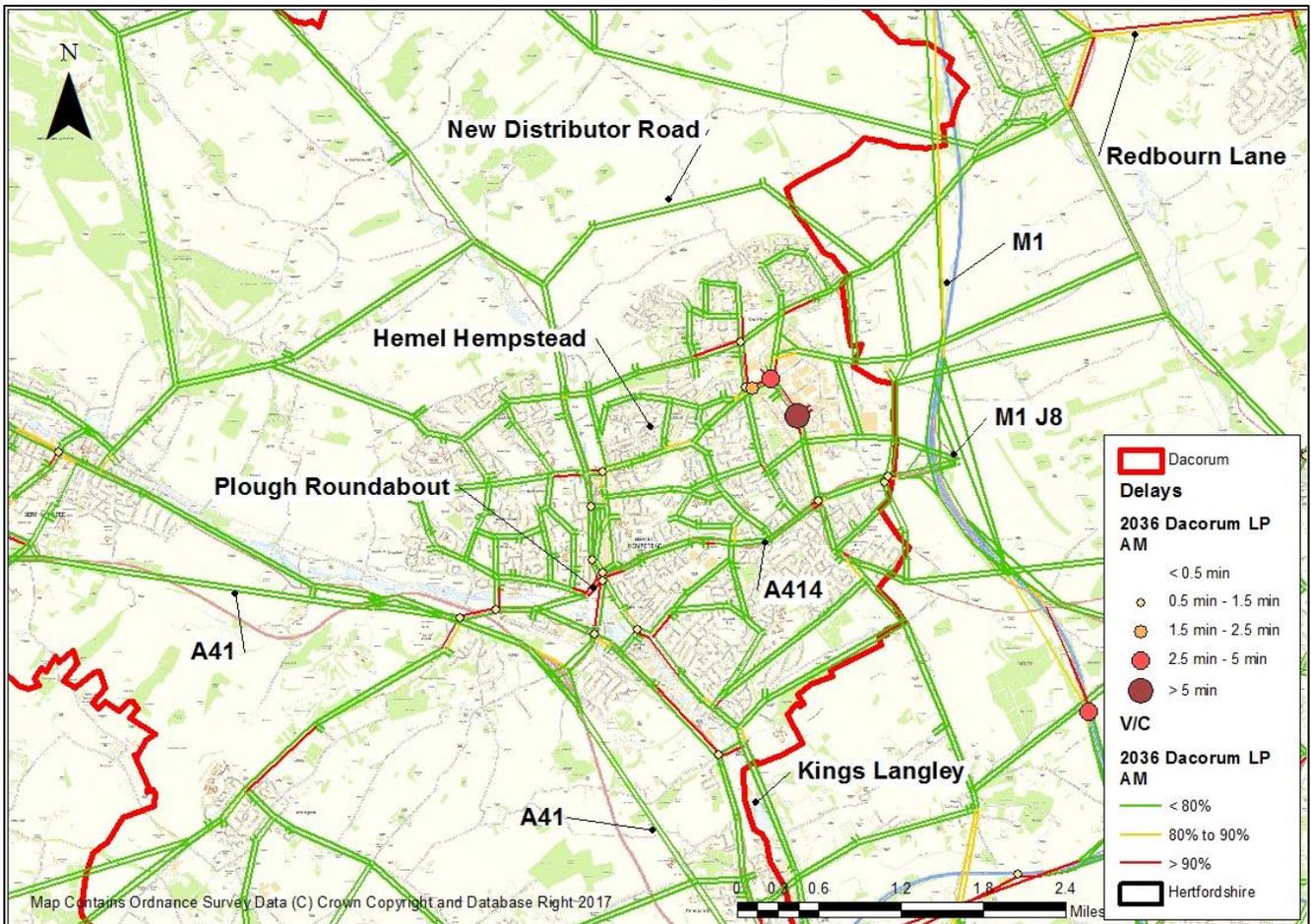


Figure 5: Delays and V/C in Hemel Hempstead area - AM peak, 2036 Dacorum Local Plan

4.10. Figure 6 highlights network link stress and delays in Tring and Berkhamsted in the AM Peak. There are some delays on the A4251 London Road through central Berkhamsted and on the approaches to the A416/A41 junction. There are delays of up to 2.5 minutes at the A416 / Shootersway junction (it should be highlighted signals could be optimised here to reduce delays in forecast scenarios).

4.11. There are minimal delays in Tring and the only point of congestion is around the B4635 / B488 roundabout, but delays are still small. Both junctions with the A41 experience minimal delays. Although new developments are planned in these areas, it should be noted that both are in close proximity to the railway stations in either town. It is therefore expected that the proximity of the railway stations will be influencing travel choice and reducing the number of car trips from the developments.

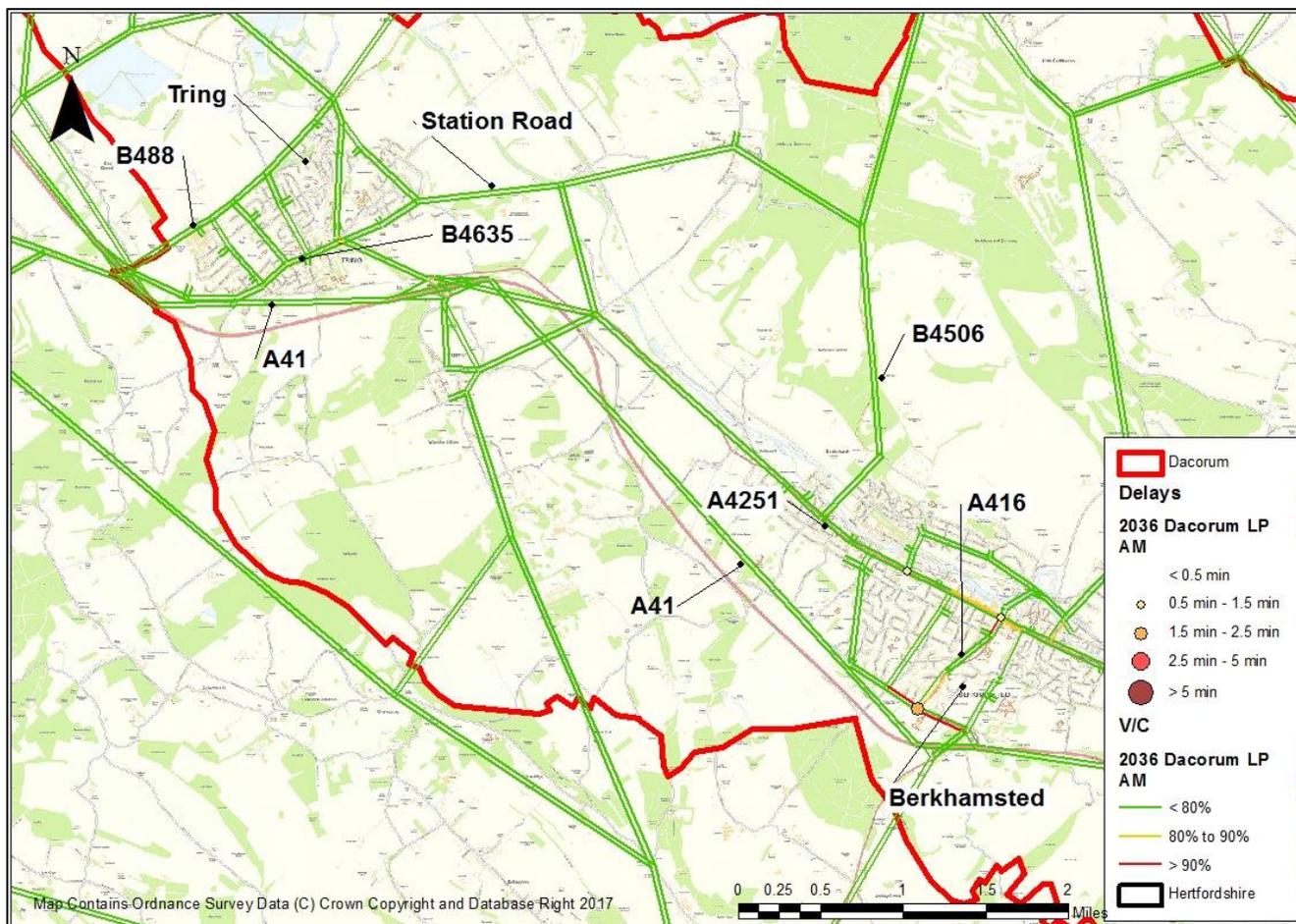


Figure 6: Delays and V/C in Tring and Berkhamsted area - AM peak, 2036 Dacorum Local Plan

4.12. Figure 7 highlights network link stress and delays bordering Dacorum in the PM Peak. It can be identified that there are fewer delays between Watford and Dacorum compared to the AM peak but higher levels of congestion on the M25 travelling clockwise (noting this may not be necessarily linked to Dacorum growth). Long delays can be identified along the M1 North of Dacorum around Luton, further east, there are long delays around the A414/AA1(M) junctions 3 and 4 in Hatfield. Although network coverage of the model diminishes outside of Hertfordshire, it can be seen that there may be delays access/exiting Dacorum to the South of Buckinghamshire or Northbound towards Bedfordshire, similar to the AM peak.

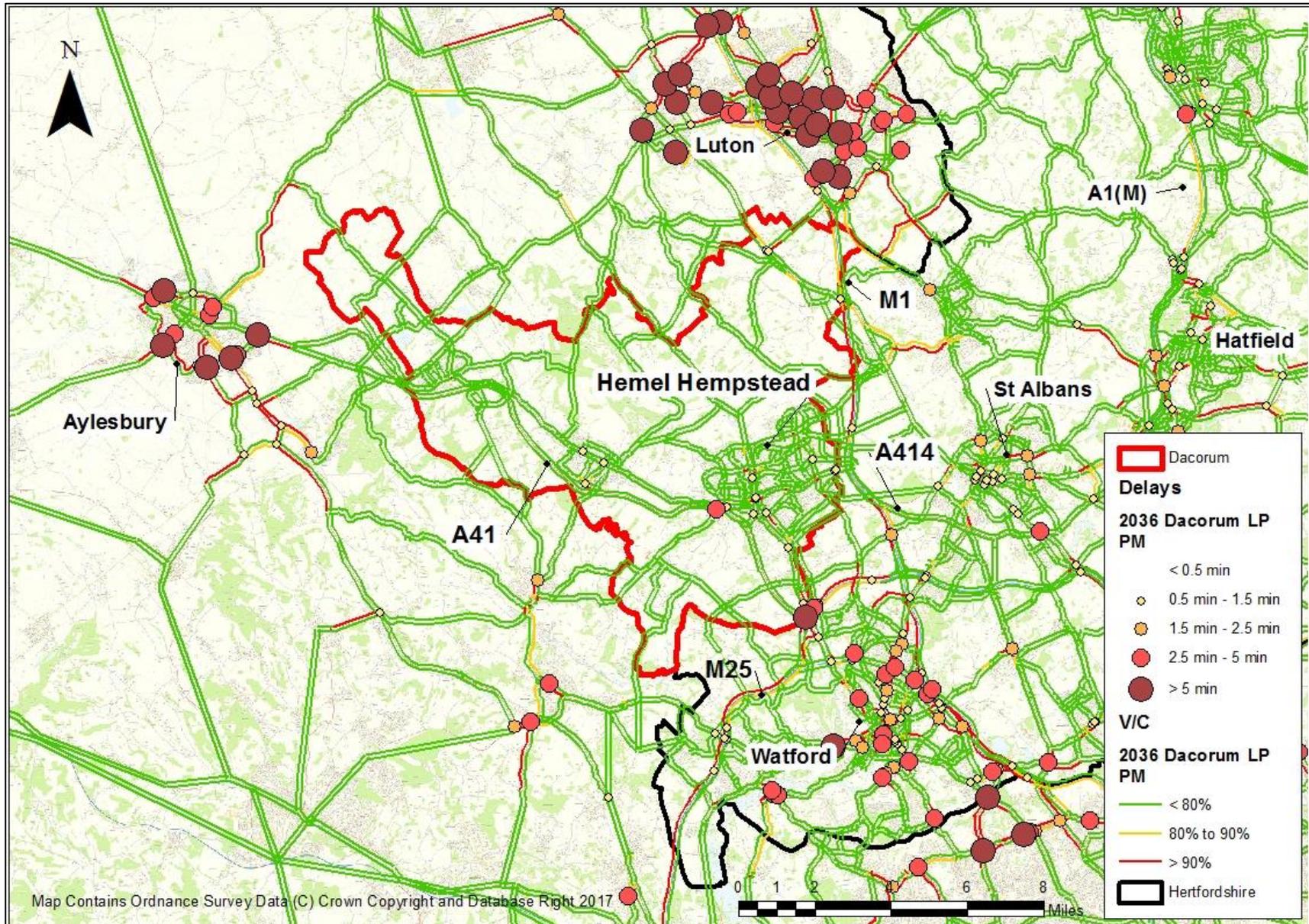


Figure 7: Delays and V/C for West Hertfordshire and Dacorum - PM peak, 2036 Dacorum Local Plan.

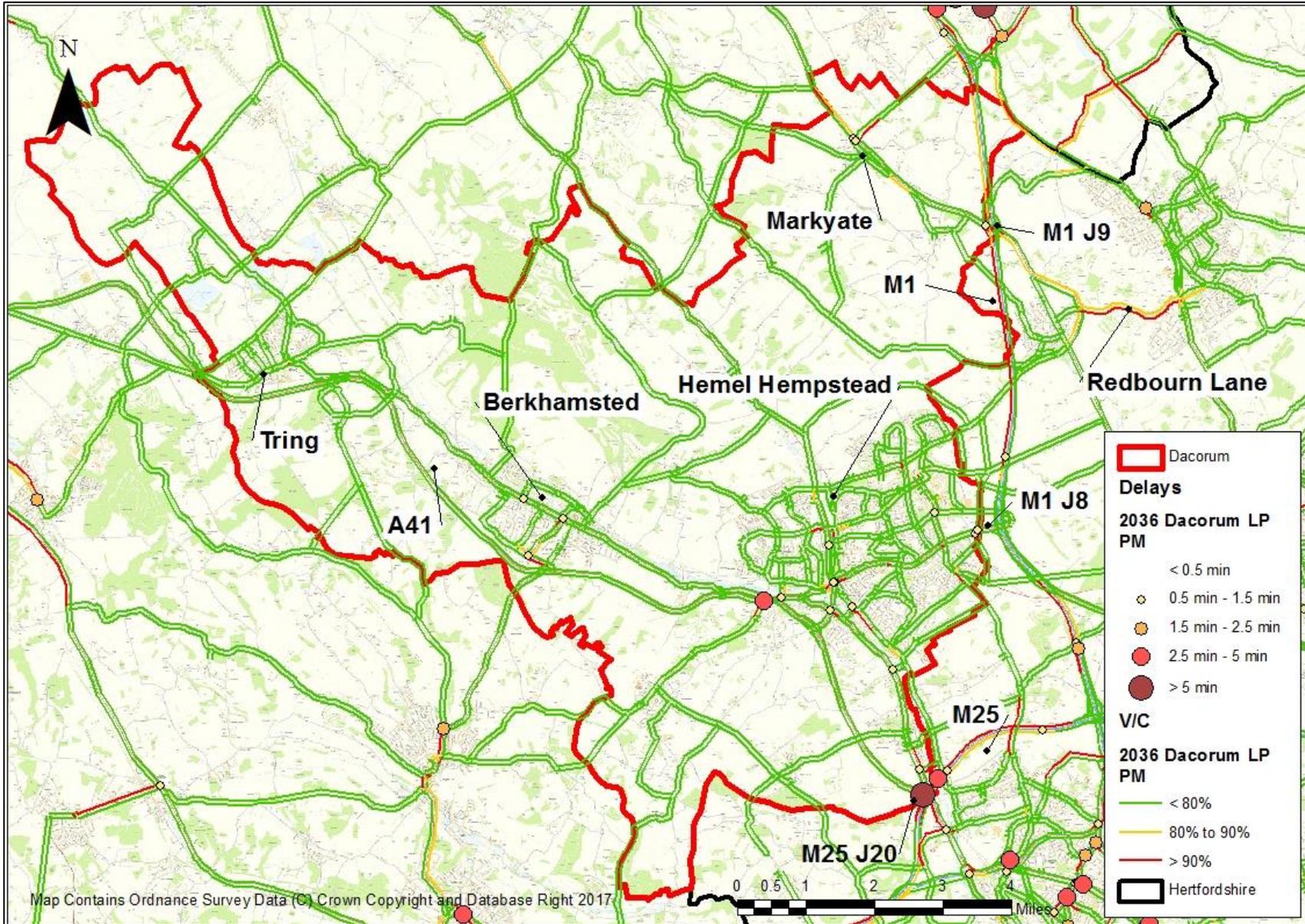


Figure 8: Delays and V/C in Dacorum District - PM peak, 2036 Dacorum Local Plan (Dacorum View)

- 4.13. Figure 8 (above) focuses on Dacorum and Figure 9 focuses on the Hemel Hempstead area. From these figures it can be identified that there are delays along the A4251 from Hemel Hempstead through to Apsley.
- 4.14. The longest delays in Hemel Hempstead are at the A4251 / B4505 Box Lane junction north west of the railway station. The M25 / A41 junction (junction 20) experiences long delays similar to the AM peak as highlighted in Figure 8 The A41 itself appears to experience limited congestion.
- 4.15. Redbourn Lane between Redbourn and Harpenden is very congested in both directions and delays are evident on the A5183 Redbourn bypass and near Markyate, similar to those observed in the AM peak.
- 4.16. Figure 9 highlights that there are many junctions within Hemel Hempstead where vehicles can expect delays, however the severity is not as significant as in the AM peak. These are predominantly on the A414 or around the town centre. There is some delay on the northbound M1 from junction 8 and around junction 9 (acknowledging these will not purely be due to Dacorum growth).
- 4.17. Some links are over 90% congestion in southern Hemel, such as approaches to the Plough Roundabout, B4505 Box Lane, A4251 and Lawn Lane/Belswains Lane.

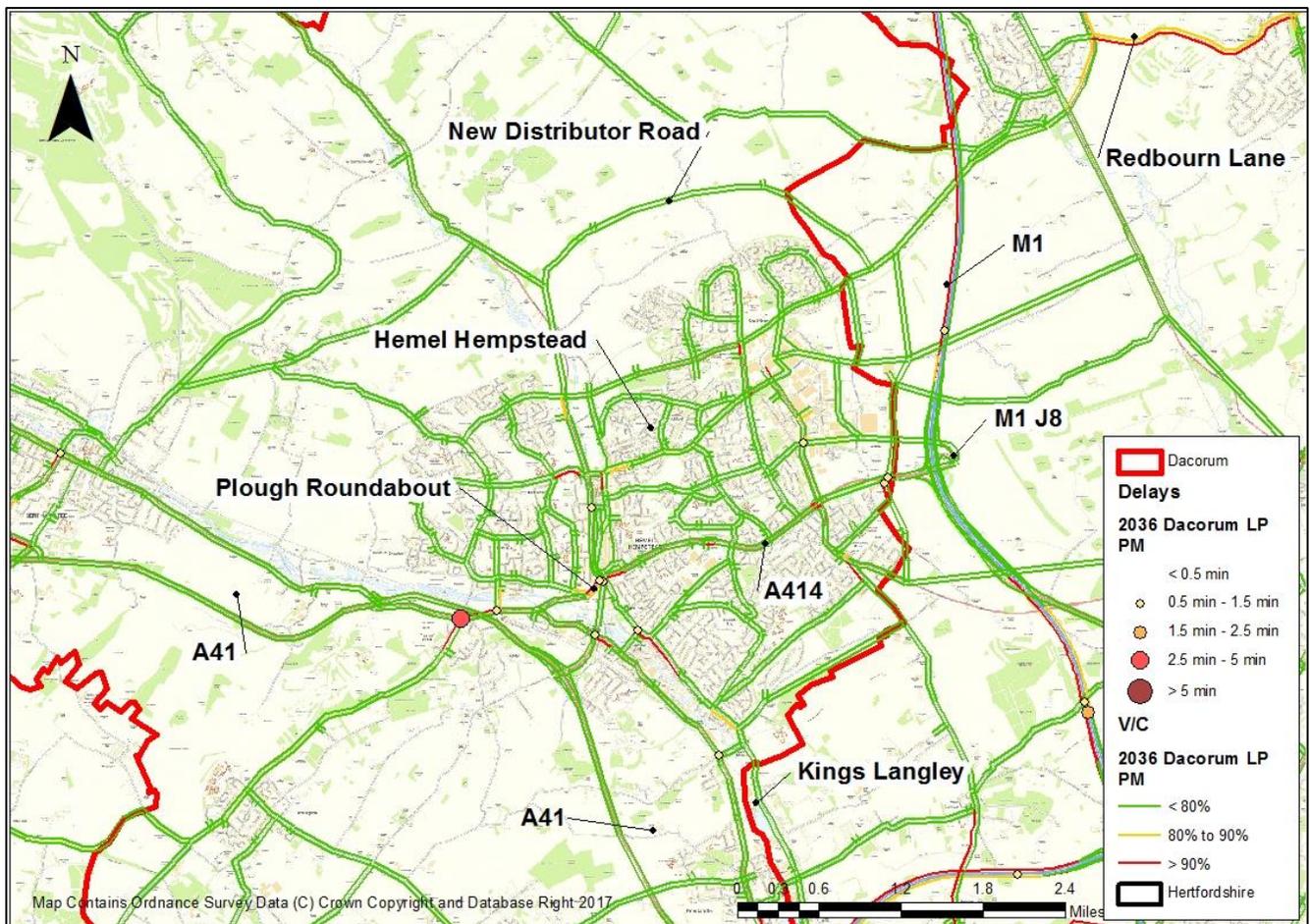


Figure 9: Delays and V/C in Hemel Hempstead area - PM peak, 2036 Dacorum Local Plan

4.18. Figure 10 highlights network link stress and delays in Tring and Berkhamsted in the PM Peak. There are some delays on the A4251 London Road through central Berkhamsted and on the approaches to the A416 / A41 junction. There are delays of up to 1.5 minutes at the A416 / Shootersway junction (acknowledging again that signals could be optimised further).

4.19. Similar to the AM peak, there are minimal delays in Tring and the only point of congestion is around the B4635 / B488 roundabout (adjacent to the A41, west of Tring), but delays are still small. Both junctions with the A41 experience minimal delays. Although new developments are planned in these areas, it should be noted that both are in close proximity to the railway stations in either town. It is therefore expected that the proximity of the railway stations will be influencing travel choice to some extent.

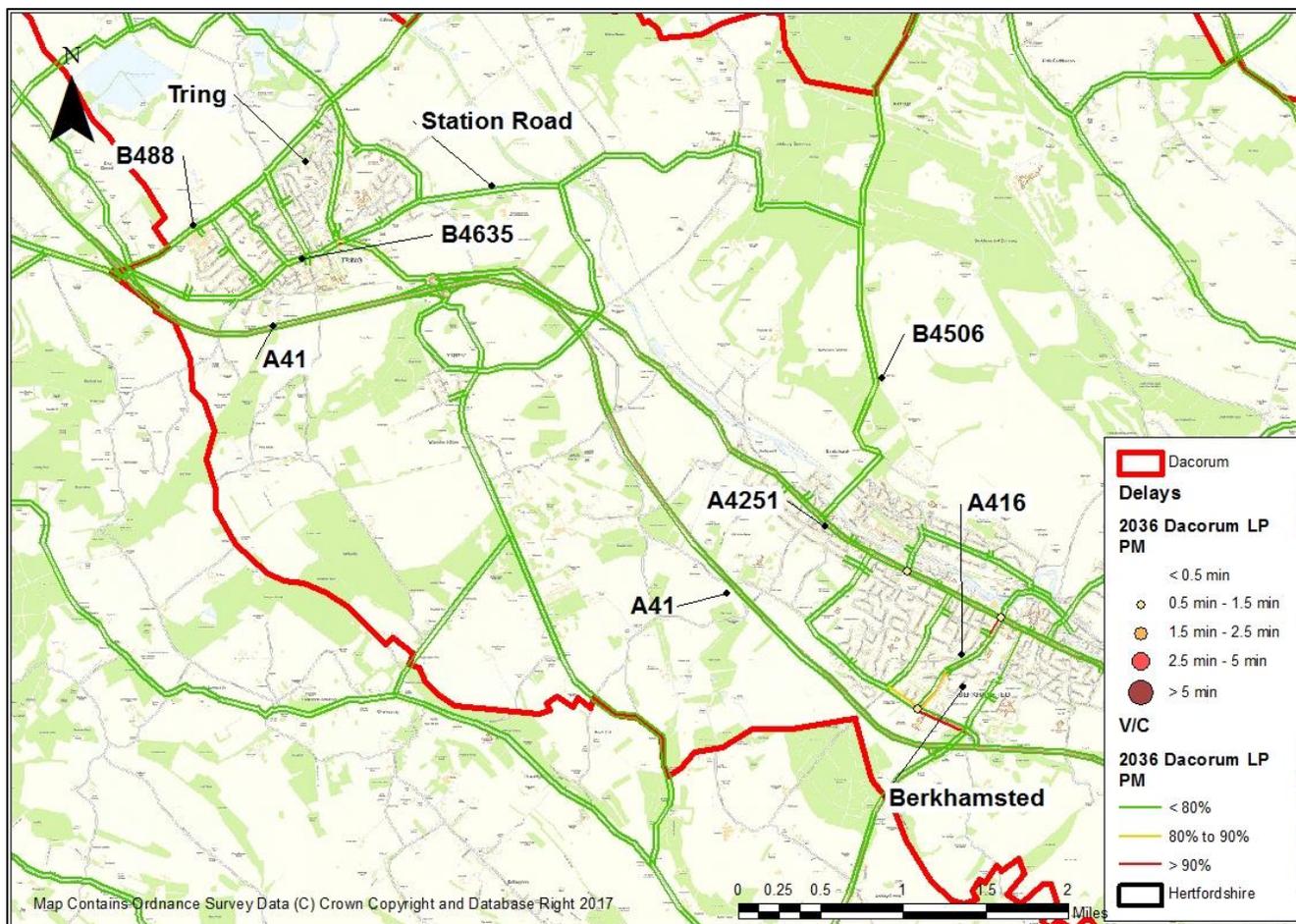


Figure 10: Delays and V/C in Tring and Berkhamsted area - PM peak, 2036 Dacorum Local Plan

Highway Network Scenario Comparison

4.20. This section details the flow and delay differences of the 2036 Dacorum Local Plan Scenario compared to the:

- 2014 Base Model; and
- 2031 Do Something scenario.

4.21. Link “equivalents” have been made where new schemes have been introduced in the forecast year scenarios. This ensures flow differences are realistic. Zoomed plots have been produced for Hemel Hempstead as this is where the majority of highways schemes are proposed.

4.22. Results concentrate on AM (8am – 9am) and PM (5pm – 6pm) peak periods. Small changes (+/- 25 in flow and +/- 30 seconds delay) are excluded to aid clarity on the figures.

- 4.23. Figure 11 and Figure 12 detail the flow and delay differences of the 2014 Base Model compared to the 2036 Dacorum Local Plan Scenario in the AM and PM peak periods. Compared to the 2014 Base, there is an increase in flows on the strategic routes of the M25, M1 and A41 around and through Dacorum. There is an increase in delays at M25 junction 20 (A41).
- 4.24. Routes into Hemel Hempstead from the north and south show increases in flows. There are increases in delays around Maylands Business Park which will be caused by the greater demand in this area in the forecast scenarios, however there are also new schemes in these areas in the 2036 Dacorum Local Plan scenario generating localised rerouting. The junctions showing the greatest increase in delays are Maylands Avenue / Maxted Road and Maylands Avenue / Swallowdale Lane. The flow differences appear to suggest that more traffic approaches these junctions from the northern side of Hemel Hempstead due to the new Maylands Business Park schemes which causes additional congestion and delays.
- 4.25. There are some reductions in flows in Hemel Hempstead which will be due to local rerouting and the impact of the new schemes providing alternative route choices.
- 4.26. The delay increases on the M1 and M25 motorways around Dacorum are due to lane merges coming under increasing pressure. These are merge points where slip roads enter carriageways and are forecast to experience delays in the forecast year scenarios due to the increased demand.
- 4.27. The impact of the new distributor road between the B440 Leighton Buzzard Road and the B487 Redbourn Road in north Hemel Hempstead can be clearly seen. The new road appears to offer an alternative east-west route across Dacorum and may be influencing traditional choices over a much wider area, such as the A414 through central Hemel Hempstead. The new distributor road also attracts more traffic to Redbourn Road / Redbourn bypass and M1 junction 9.
- 4.28. It can also be observed that trips to and from Berkhamsted and Tring use local routes to travel north/south as well as using the A41. There are some increases in delays in Berkhamsted around the A41 junction.

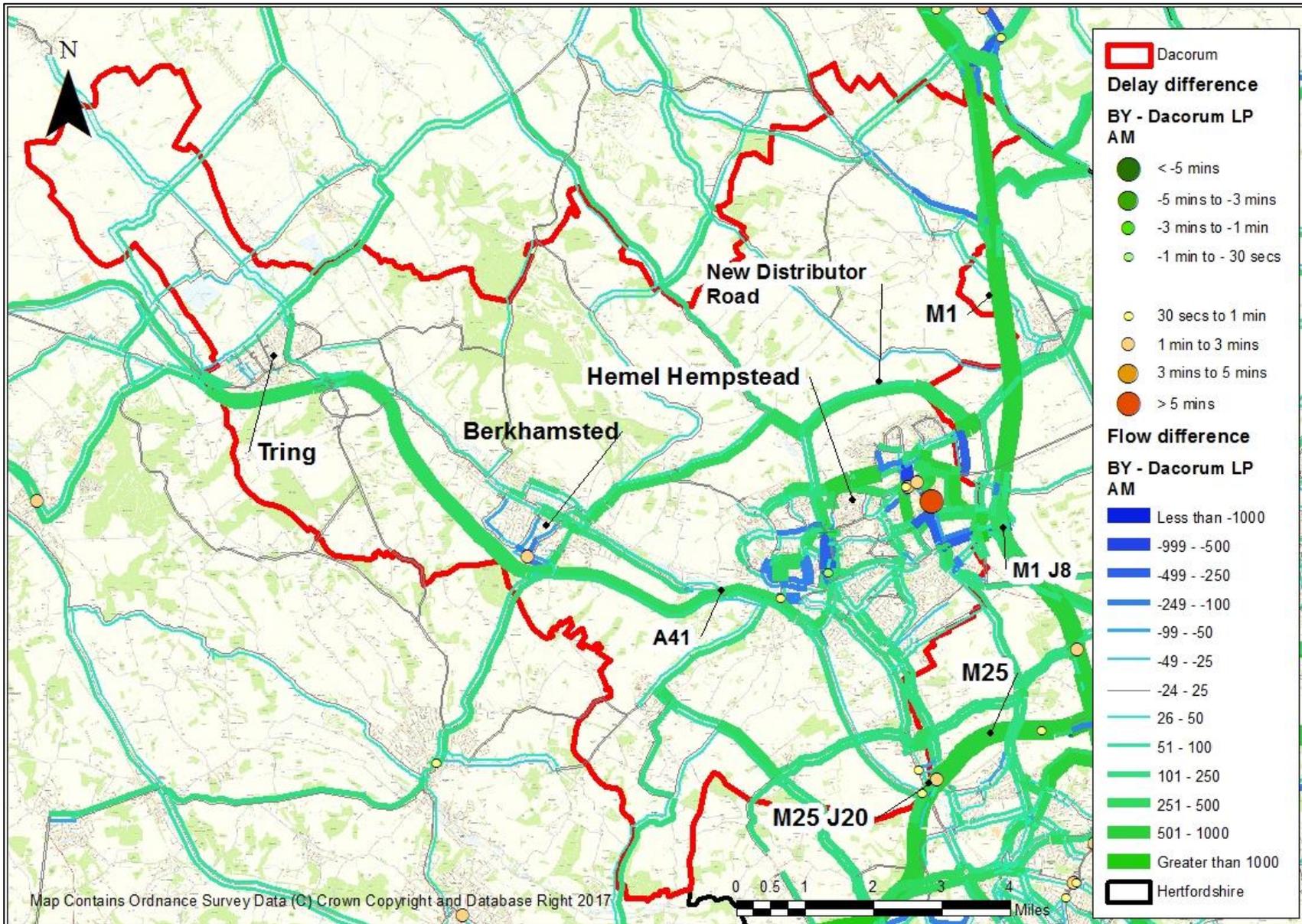


Figure 11: Difference in Delays and Flows in the AM peak - 2014 Base year compared to 2036 Dacorum Local Plan

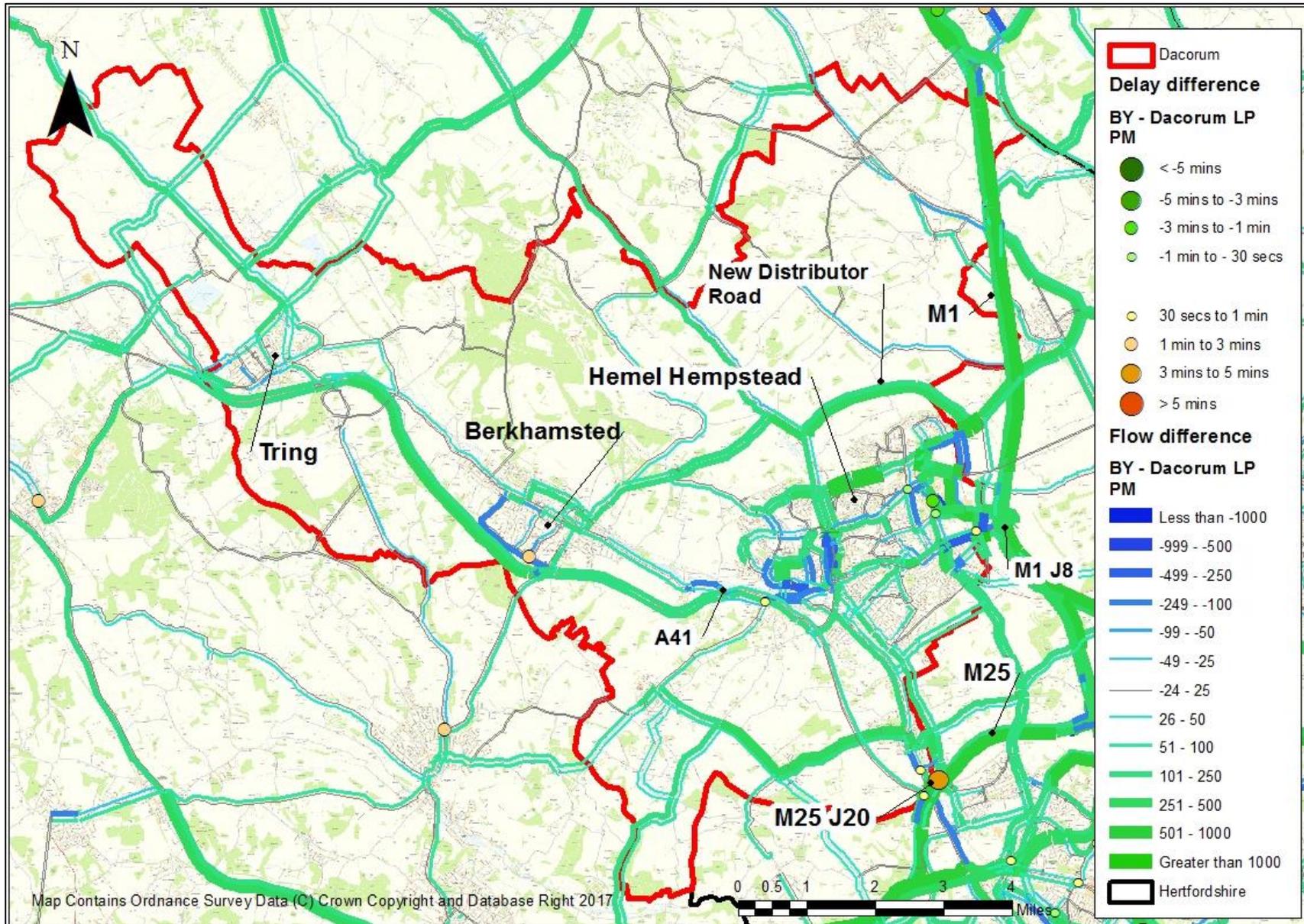


Figure 12: Difference in Delays and Flows in the PM peak - 2014 Base year compared to 2036 Dacorum Local Plan

- 4.29. Figure 13 and Figure 14 detail the flow and delay differences of the 2031 Do Something scenario compared to the 2036 Dacorum Local Plan Scenario in the AM and PM peak periods. The impact of the additional schemes included in the 2036 Dacorum Local Plan Scenario can be clearly seen. The new distributor road provides an alternative east-west route choice through and around Hemel Hempstead when combined with the upgrade to Green Lane and connection to junction 8 of the M1. The marginal flow reductions in Hemel Hempstead on the A4147, A414 and Queensway will be due to traffic using the new distributor road and other Maylands Business Park schemes implemented.
- 4.30. Some of the flows around M1 junction 8 may be subject to change. The new link road between the junction and Green Lane is not heavily used eastbound and this was due to localised delays at the eastern roundabout at M1 junction 8. Traffic found it easier to use Green Lane and the A414 which may not be realistic. The scenario used the latest signal timings from the Vectos Hemel Microsimulation model and these generated the rerouting shown.
- 4.31. Flows build from Berkhamsted towards the new distributor road and Green Lane. The new scheme at M1 junction 8 connecting Green Lane directly to the M1 junction also provides a new route choice compared to the 2031 Do Something scenario. There are marginal flow increases on the A41 between Tring and Berkhamsted.
- 4.32. There are some marginal flow differences on strategic routes such as the M1 and M25 between the 2031 Do Something and 2036 Dacorum Local Plan scenarios, however the percentage differences these represent are very small. This will mainly be due to localised rerouting between the model assignments.
- 4.33. The new distributor road also appears to reduce flows on other east-west routes further north in Dacorum with routes through Gaddesden Row, Ivinghoe and around Whipsnade Zoo experiencing a reduction in flows.
- 4.34. The proximity of the new developments in Tring and Berkhamsted to the railway network can also be recognised as these do not generate much additional congestion in these towns. There are some small increases in flows to/from the development locations in Tring and Berkhamsted, however the public transport and variable demand elements of the COMET modelling suite will be recognising that many journeys can be made by other modes from these developments.
- 4.35. It can be recognised that there is additional traffic on Potton End Hill from Berkhamsted towards Hemel Hempstead. This traffic is predominantly local traffic which has been attracted to the new distributor road across north Hemel Hempstead. There are some flows from the new Berkhamsted development, however these contribute a small number to the total increased flow.

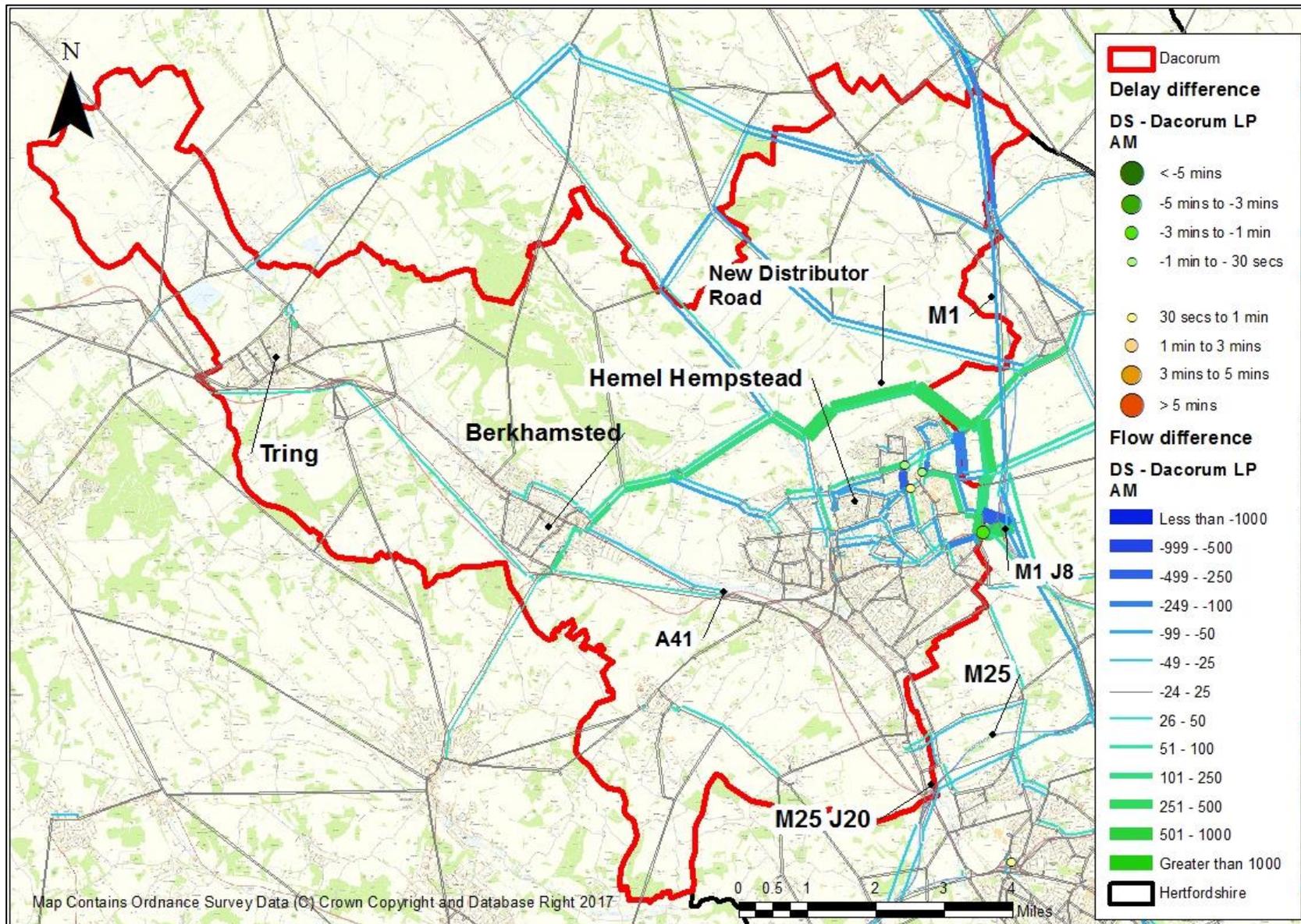


Figure 13: Difference in Delays and Flows in the AM peak – 2031 Do Something compared to 2036 Dacorum Local Plan

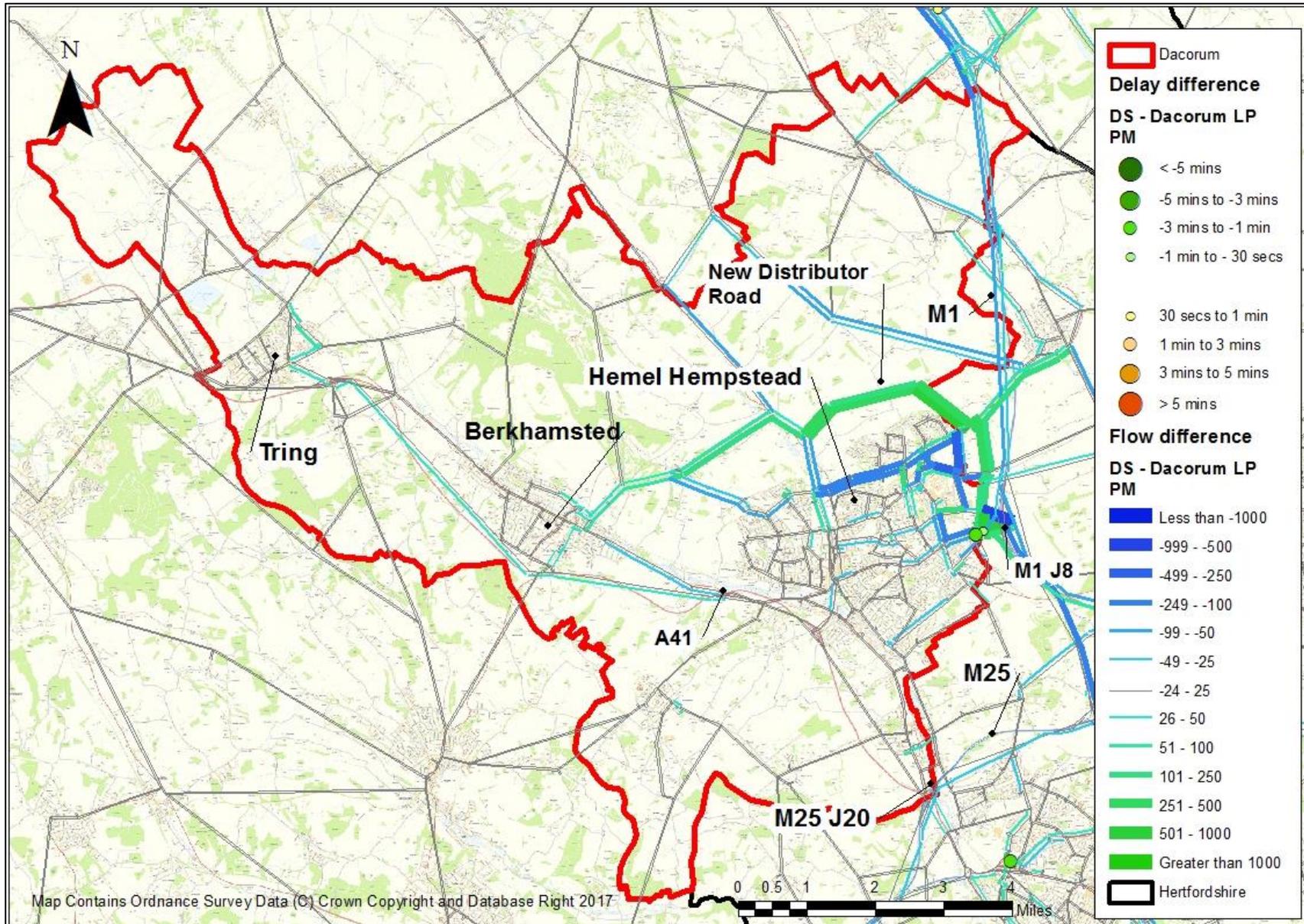


Figure 14: Difference in Delays and Flows in the PM peak – 2031 Do Something compared to 2036 Dacorum Local Plan

4.36. Figure 15 and Figure 16 (overleaf) detail the flow and delay differences of the 2014 Base Model compared to the 2036 Dacorum Local Plan Scenario around Hemel Hempstead in the AM and PM peak periods. The impact of the new distributor road between Leighton Buzzard Road and B487 in north Hemel can be clearly seen.

4.37. Some reductions will be due to the new link road and schemes in Hemel Hempstead. Schemes at M1 junction 8 reduce some flows on the A414, however this is also due to the upgrade of Green Lane and new link road. It can be observed that vehicles use Boundary Way more than Green Lane. This will be due to the access points into employment zones around Maylands Business Park. The increase in delays relates to the Maylands Avenue/Maxted Road junction in Maylands Business Park.

4.38. There are some changes in routing towards central Hemel Hempstead which appear to be localised re-routing.

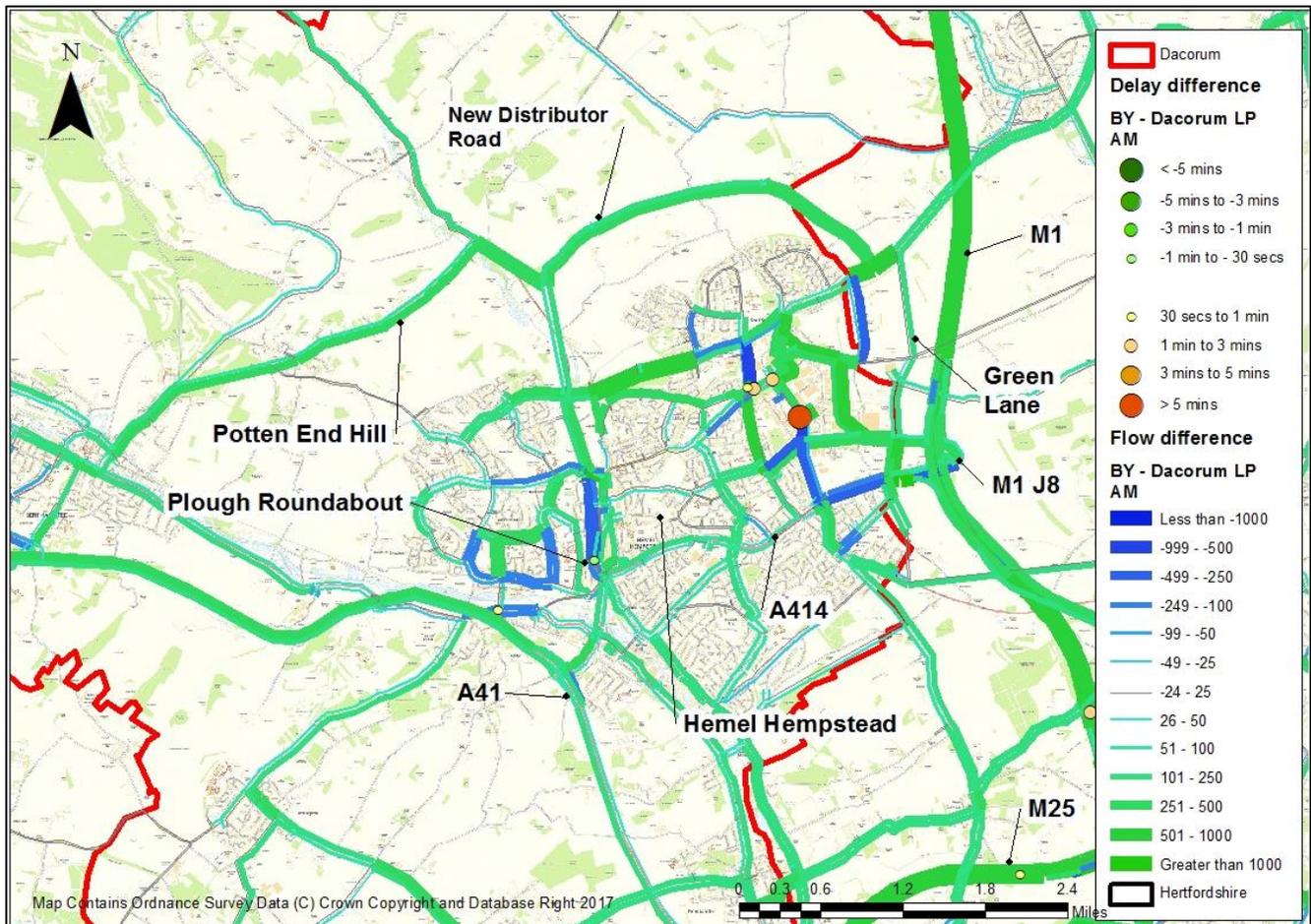


Figure 15: Difference in Delays and Flows in the AM peak - 2014 Base year compared to 2036 Dacorum Local Plan (Hemel Hempstead)

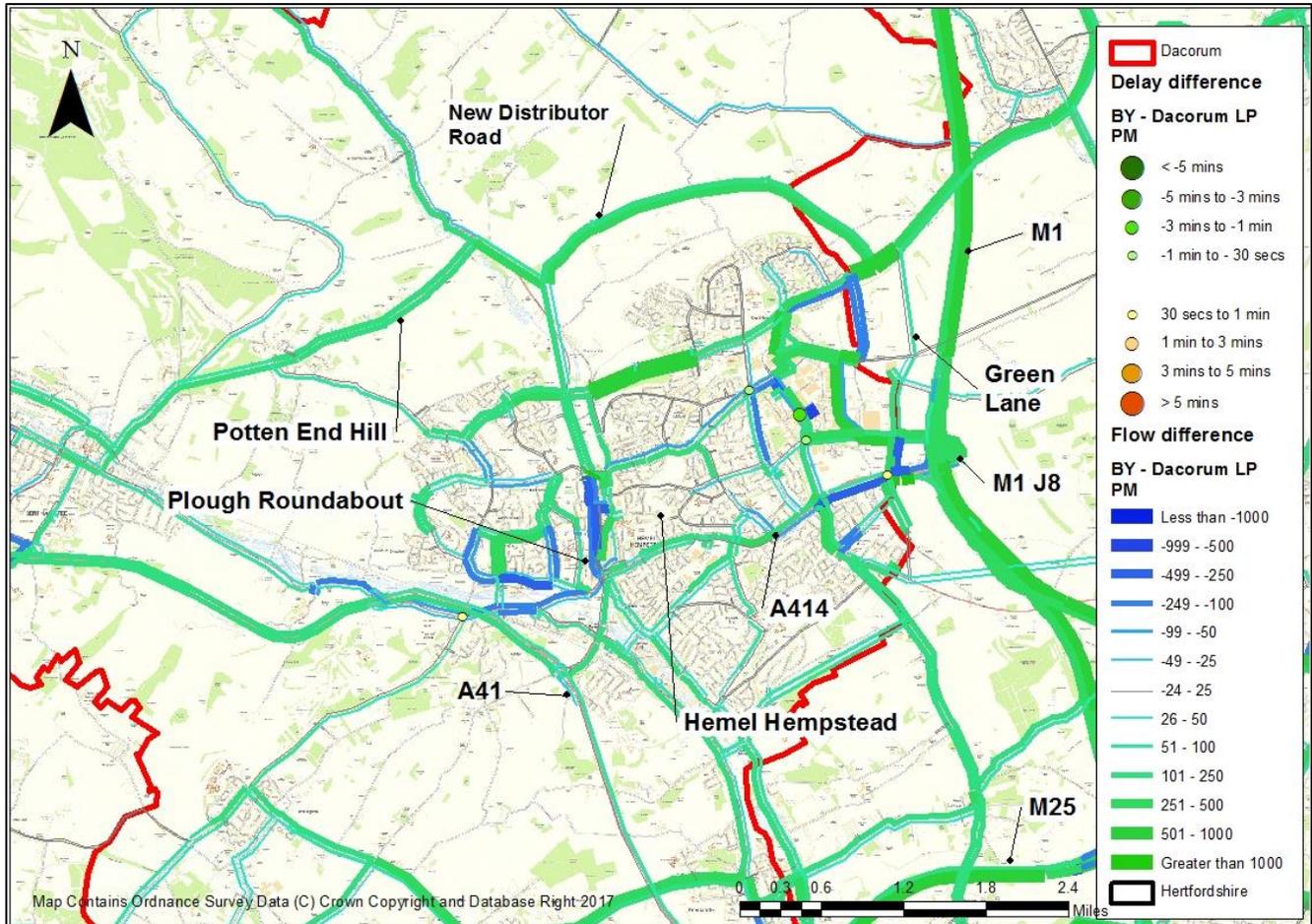


Figure 16: Difference in Delays and Flows in the PM peak - 2014 Base year compared to 2036 Dacorum Local Plan (Hemel Hempstead)

4.39. The PM peak displays very similar results to the AM peak, however there are some delay reductions at some junctions around Maylands Business Park. This may be due to delays at surrounding junctions and different approach routes to the junctions given the increased network coverage in the 2036 Dacorum Local Plan scenario. There are delay differences along the A414 through central Hemel Hempstead due to the new junction layouts in the 2036 Dacorum Local Plan scenario.

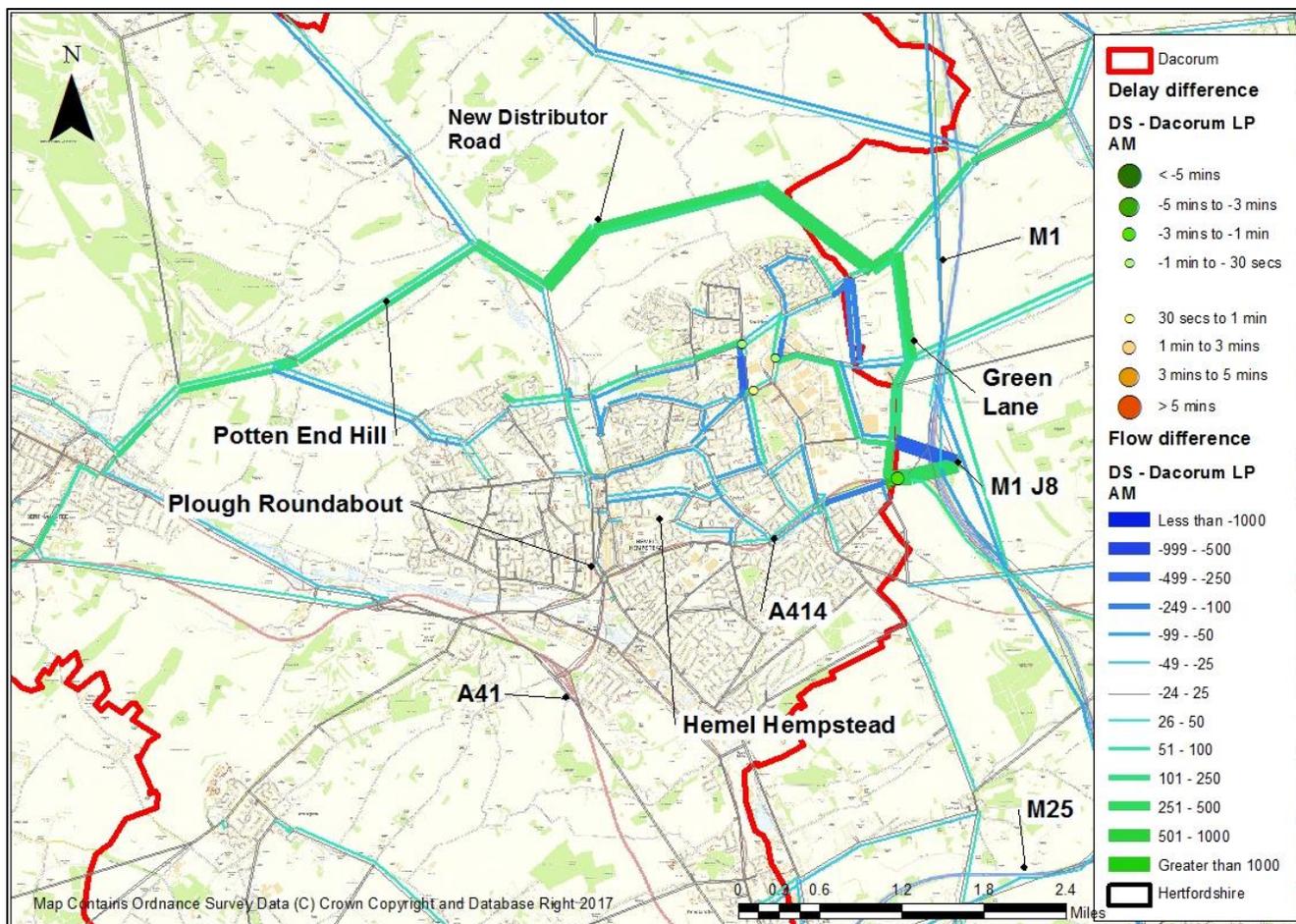


Figure 17: Difference in Delays and Flows in the AM peak – 2031 Do Something compared to 2036 Dacorum Local Plan (Hemel Hempstead)

- 4.40. Figure 17 (above) and Figure 18 (overleaf) detail the flow and delay differences of the 2031 Do Something scenario compared to the 2036 Dacorum Local Plan Scenario around Hemel Hempstead in the AM and PM peak periods. Again, the impact of the new distributor road between the B440 Leighton Buzzard Road and B487 Redbourn Road in north Hemel can be clearly seen. New routing of traffic via this route and Green Lane to M1 junction 8 can be clearly seen. Localised changes in central Hemel Hempstead will also be influenced by the new distributor road.
- 4.41. There is a reduction in delays at the Green Lane junction on the A414 but it should be noted this is now 2 staggered junctions in the 2036 Dacorum Local Plan scenario.
- 4.42. There is a reduction in flows on the new link road across to M1 junction 8 eastern roundabout as traffic uses Green Lane instead (upgraded to dual carriageway in the 2036 Dacorum Local Plan scenario). It is believed this is due to the small increase in journey time using this route as opposed to the revised Green Lane junction. There are some minor delays at the eastern roundabout and it only provides a quicker route for vehicles wishing to head southbound on the M1 from junction 8. There is also a strong linkage between the northbound off and on-slips at junction 8 and the Maylands Business Park area of Hemel Hempstead. These movements do not use the new eastern roundabout at junction 8.
- 4.43. Overall delays are very similar to the 2031 Do-Something scenario. The impact of the new distributor road on Redbourn Road is most pronounced in the PM peak when compared to the 2031 Do Something scenario.

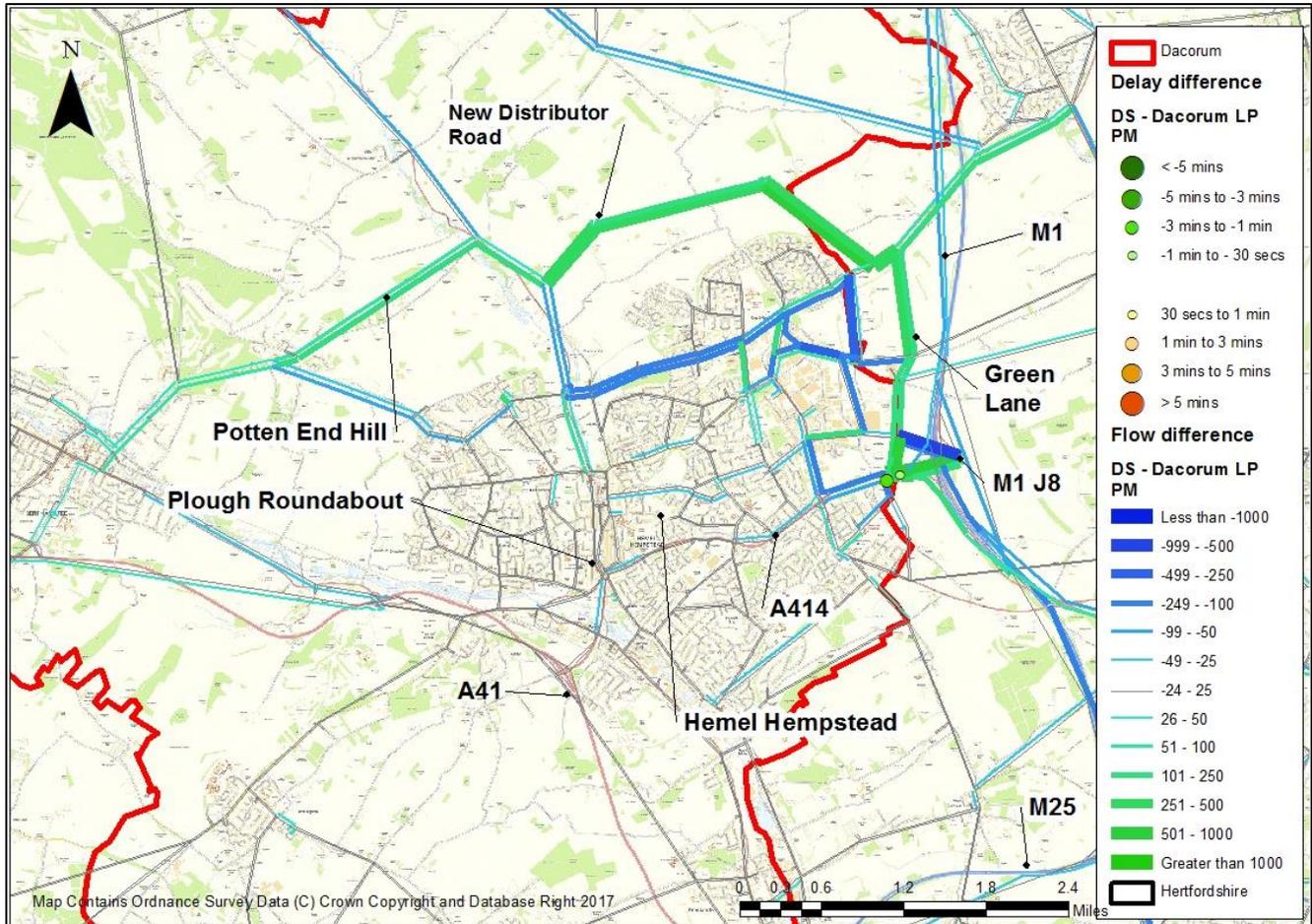


Figure 18: Difference in Delays and Flows in the PM peak – 2031 Do Something compared to 2036 Dacorum Local Plan (Hemel Hempstead)

Highway Network Journey Time Comparisons

- 4.44. Dacorum identified a number of journey time routes to be analysed in the 2036 Dacorum Local Plan scenario. The strategic nature of COMET should be considered when viewing these results as not all local roads / junctions are included in the model. As detailed in Section 3, COMET under-estimates journey times in densely populated urban areas and COMET has not been validated in urban areas across Dacorum in the 2014 Base Year model. Urban areas in Dacorum have not been subject to a speed limit review which would be applied if the model was enhanced further.
- 4.45. Due to the differences in highway network between scenarios, there will be different route choices which will impact delay, flows and rerouting options. All of these factors should be considered and local journeys would be better assessed using other microsimulation modelling packages.
- 4.46. The roads used in the journey times are detailed for information. Results are shown for the AM peak (0800 – 0900) and PM peak (1700 – 1800) periods. Results are purely indicative. Percentage differences from the 2036 Dacorum Local Plan Scenario compared to previous scenarios are provided as these provide the most consistent comparison.
- 4.47. Figure 19, Figure 20 and Figure 21 display the journey time routes assessed. General comments are made about the results seen whilst Table 2 displays the full journey time results. In considering the results you should note that a reduction in journey time is shown by a minus sign. 0% represents that the journey time has not changed. As highlighted, the impact of localised rerouting should be considered when viewing the results as the networks and congestion levels are very different between scenarios.

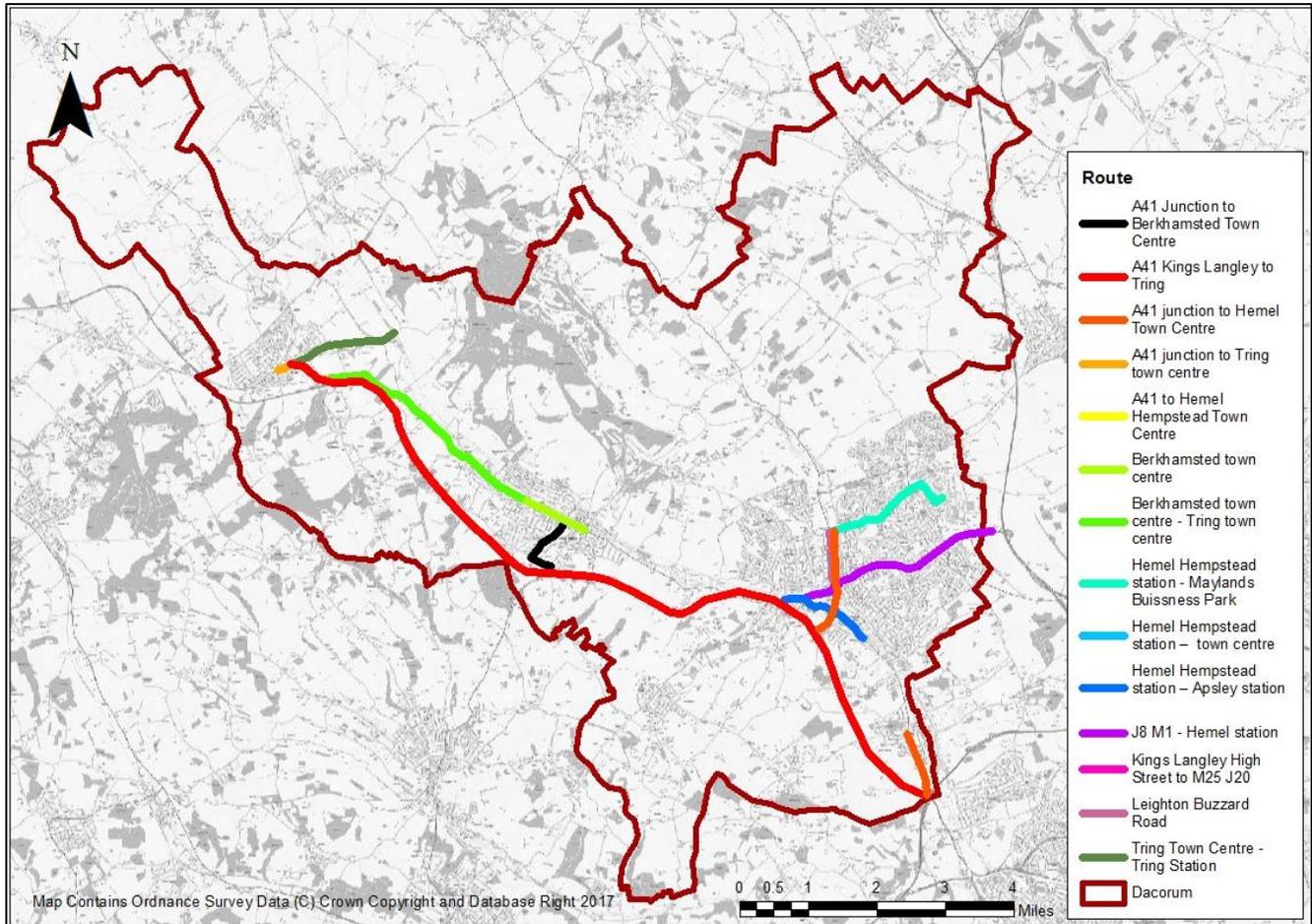


Figure 19: Journey Time Routes Assessed in Dacorum

4.48. In general, longer journey times through free flowing sections of the network do not experience significant changes in journey times. This is highlighted by the route between Kings Langley and Tring using the A41 which only experiences an increase in journey times of approximately 5% compared against the base model. These journey times do not take account of the increase in delays at junction 20 of the M25.

4.49. It should also be noted that journey times along the M25 and M1 surrounding Dacorum have not been assessed as part of this analysis. These routes are operating at near 100% capacity in the future year scenarios and it is estimated this could cause considerable rerouteing onto Dacorum’s highway network, particularly when incidents occur.

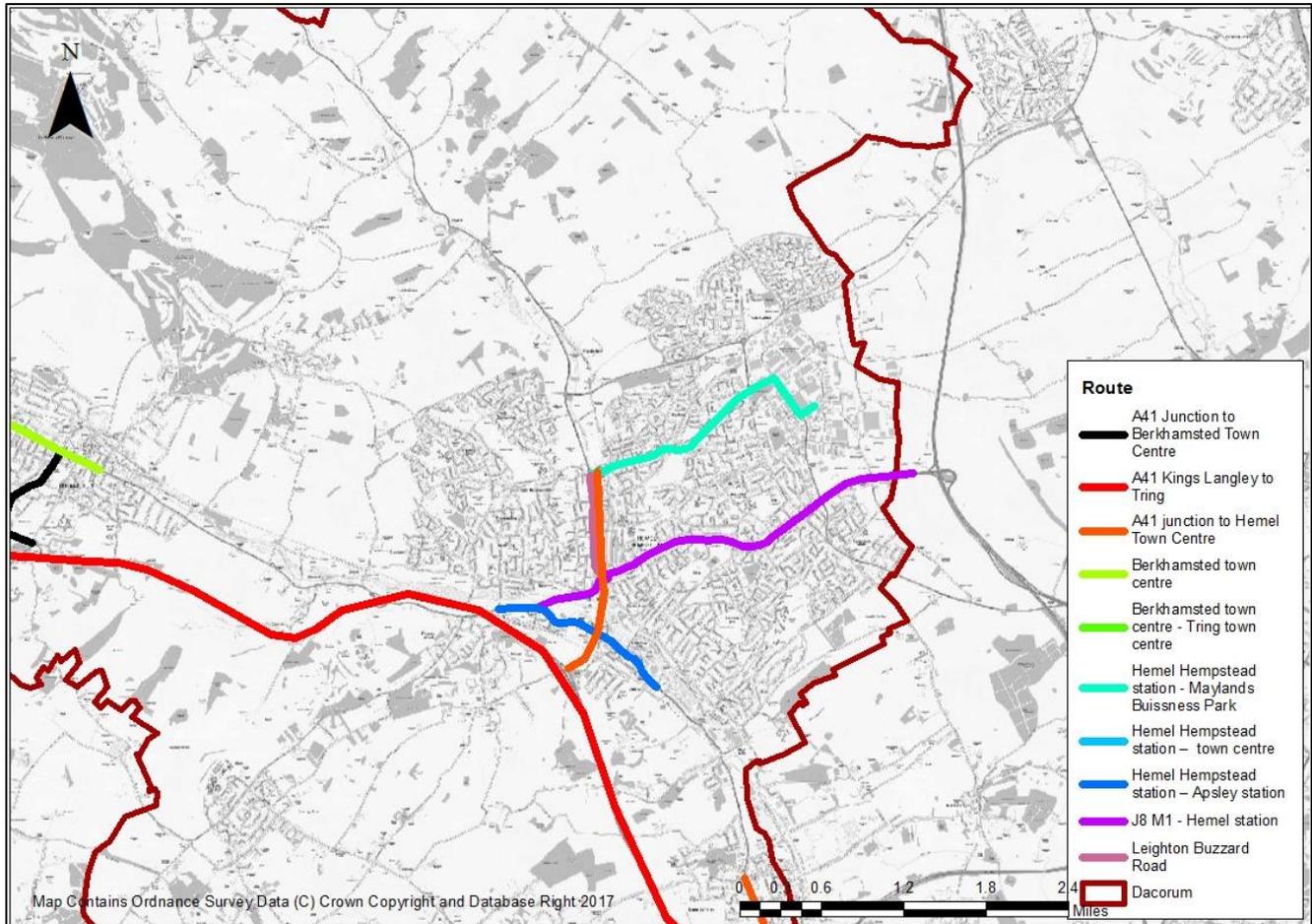


Figure 20: Journey Time Routes assessed in the Hemel Hempstead area

4.50. On average, there is a 10% increase in journey times within Hemel Hempstead when the 2036 Dacorum Local Plan Scenario is compared to the 2014 Base Year model. This is to be expected given the increased demand on the network. However, when the 2036 Dacorum Local Plan Scenario is compared to the 2031 Do Something scenario, it is noted there are journey time reductions around the town centre, especially in the AM peak. This will be due to the additional schemes in the 2036 Dacorum Local Plan scenario, particularly the new distributor road and capacity improvements around junction 8 of the M1 linked to the new signalised junctions which aid flows. Journeys between east Hemel Hempstead and the town centre experience journey time reductions.

4.51. As delays were observed around the Plough Roundabout in future year scenarios, the impact these roundabouts have on rerouting in the local area should also be considered.

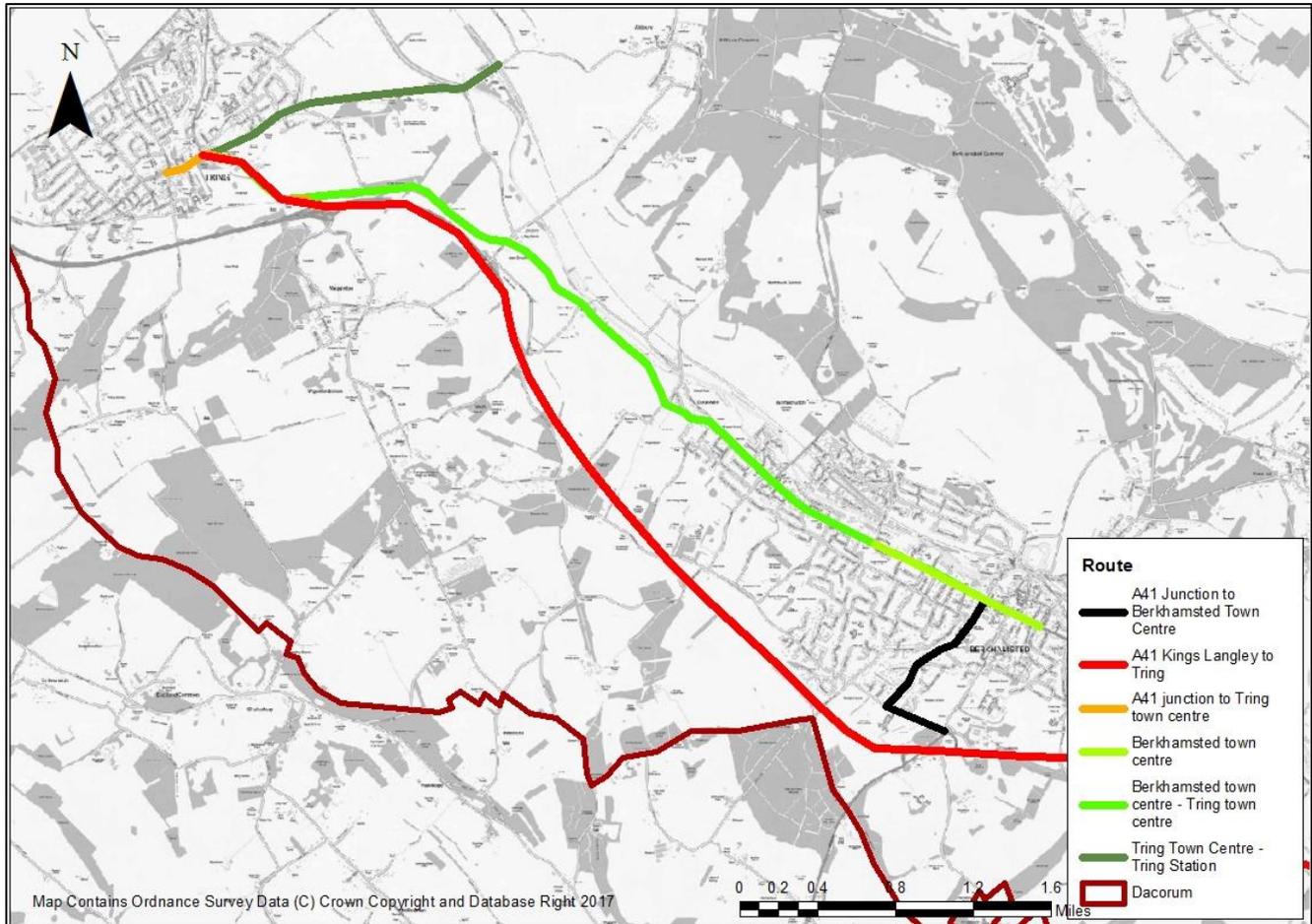


Figure 21: Journey Times Assessed in the Tring / Berkhamsted Area

4.52. Similar to Hemel Hempstead, journey times around the Berkhamsted and Tring areas are longer in the 2036 Dacorum Local Plan Scenario compared to the 2014 Base Year model. There are some considerable increases accessing the A41 from Berkhamsted, and smaller increases when travelling on local roads between the two towns. Delays around Tring are minimal in all scenarios although there is an increase in journey times around Berkhamsted. Changes in journey times between the 2036 Dacorum Local Plan Scenario and 2031 Do Something scenario are less pronounced in these areas compared to Hemel Hempstead. Even though developments are proposed in these areas, the impacts on the highway network appear negligible given the proximity of rail and bus services and the relative capacity of links in the model.

4.53. Table 2 displays the full journey time results.

Table 2: Detailed Journey Time Analysis – 2036 Dacorum Local Plan scenario compared to 2014 Base Year model and 2031 Do Something scenario

Route Description	Direction	Route Used	2036 Dacorum Local Plan AM Peak		2036 Dacorum Local Plan PM Peak	
			% Change to 2014 Base Year Model	% Change to 2031 Do Something	% Change to 2014 Base Year Model	% Change to 2031 Do Something
Hemel Hempstead station to Hemel Hempstead town centre	Northbound	A4251 A4146/ Leighton Buzzard Rd	9%	1%	-16%	-18%
Hemel Hempstead town centre to Hemel Hempstead station	Southbound	A4146/ Leighton Buzzard Rd A4251	7%	-10%	25%	-1%
Hemel Hempstead station to Hemel Hempstead town centre to Maylands Business Park	Northbound	A4251 A4146/ Leighton Buzzard Rd B487/Queensway	1%	-24%	7%	-2%
Maylands Business Park to Hemel Hempstead town centre to Hemel Hempstead station	Southbound	B487/Queensway A4146/ Leighton Buzzard Rd A4251	6%	-24%	31%	11%
Junction 8 M1 to Hemel Hempstead station	Eastbound	A4251 A4146 St Albans Rd	11%	-13%	13%	-2%
Hemel Hempstead station to Junction 8 M1	Westbound	St Albans Rd A4146 A4251	11%	0%	16%	4%
Hemel Hempstead station to Apsley station	Southbound	A4251	-2%	-3%	-2%	0%
Apsley station to Hemel Hempstead station	Northbound	A4251	10%	1%	108%	-4%
Tring town centre to Tring station	Eastbound	Station Rd	0%	0%	2%	2%
Tring station to Tring town centre	Westbound	Station Rd	0%	0%	18%	-4%
Tring town centre to Berkhamsted town centre	Southbound	A4251	7%	0%	24%	0%
Berkhamsted town centre - Tring town centre	Northbound	A4251	5%	-1%	13%	-2%

A41 junction to Hemel Hempstead town centre	Northbound	A41 Two Waters Rd	22%	0%	1%	-2%
Hemel Hempstead town centre to A41 junction	Southbound	Two Waters Rd A41	31%	-1%	25%	0%
A41 junction to Berkhamsted town centre;	Northbound	A416	62%	0%	66%	10%
Berkhamsted town centre to A41 junction	Southbound	A416	49%	-1%	21%	-4%
Tring town centre to A41 junction	Southbound	London Rd	1%	-4%	0%	0%
A41 junction to Tring town centre	Northbound	London Rd	3%	0%	28%	-3%
Tring to Kings Langley (does not include M25 J20)	Southbound	A41	3%	0%	2%	1%
Kings Langley to Tring (does not include M25 J20)	Northbound	A41	2%	0%	5%	0%
Leighton Buzzard Road (Queensway to Plough Roundabout)	Southbound	Leighton Buzzard Rd	42%	-1%	67%	2%
Leighton Buzzard Road (Plough Roundabout to Queensway)	Northbound	Leighton Buzzard Rd	22%	-3%	9%	1%
Berkhamsted town centre (Billet Lane to Swing Gate Lane)	Southbound	A4251	16%	0%	15%	0%
Berkhamsted town centre (Swing Gate Lane to Billet Lane)	Northbound	A4251	21%	0%	20%	0%
Kings Langley High Street to J20 M25	Southbound	A4251	29%	3%	59%	-5%
J20 M25 to Kings Langley High Street	Northbound	A4251	3%	0%	0%	0%

Highway Network Impact Summary

- 4.54. In summary, in the 2036 Dacorum Local Plan scenario, key strategic routes around and through Dacorum, specifically the M25 and M1, suffer from congestion and delays in 2036. Routes into and from Dacorum from neighbouring areas experience some congestion and delays.
- 4.55. Hemel Hempstead experiences the longest delays in Dacorum with access from the south appearing particularly congested. It can be identified that some delays are generated by the high demand for trips into certain employment zones in the AM peak. High link stress is also apparent around Maylands Business Park. The A414 corridor through central Hemel Hempstead experiences delays at the junctions and there are also delays at, and approaching, the Plough Roundabout in central Hemel Hempstead. As stated, the new distributor road through northern Hemel Hempstead will be reducing the delays and congestion in Hemel Hempstead as it provides an alternative route choice.
- 4.56. There are delays and congestion around Markyate in northern Dacorum and on the approaches to junction 9 with the M1 (noting these will not only be due to growth in Dacorum). Berkhamsted suffers some congestion and delays with routes between the town centre and the A41.
- 4.57. The main differences between 2036 Dacorum Local Plan Scenario and previous scenarios are:
- Traffic flows have steadily increased across Dacorum with the majority of increases seen on the strategic routes of the M1, M25 and A41 through/around the District;
 - Growth in Maylands Business Park appears to require all the associated complementary highways schemes;
 - The new link road across northern Hemel linked with the upgrade to Green Lane provides a new route to M1 junction 8 and leads to traffic flow reductions on other east west routes through Hemel including the A4147 link road, Queensway and the A414;
 - The new link attracts additional traffic from Berkhamstead along Water End Road and Potten End Hill; and
 - The A41 appears to operate within capacity however there are some delays leading to and from its junctions.
- 4.58. Journey time analysis has highlighted that the various schemes around Hemel Hempstead in the 2036 Dacorum Local Plan Scenario make an impact and provide congestion relief around the town. The impacts in other areas of the district are less pronounced.

5. 2036 Dacorum Local Plan Public Transport Assignment Results

- 5.1. This section details the results from the public transport assignment and compares impacts to previous scenarios. Results focus on the demand for bus services as these were the only changes made in the 2036 Dacorum Local Plan Scenario compared to the 2031 Do Something scenario.
- 5.2. As a caveat, it is important to note that the COMET model does not include congestion or capacity constraints for the public transport services – i.e. if a user wishes to use a bus to complete their journey it is assumed that the service would have capacity to meet their requirement and would not experience congestion. It should also be noted that no new bus services have been coded in serving the proposed new developments.

2036 Bus Demand Summary

- 5.3. This section details the demand on bus services from the 2036 Dacorum Local Plan scenario. The scenario only considered additional bus routes proposed in the Maylands Business Park area¹² when compared to the 2031 Do Something scenario. Flows are represented by lines with thicker lines highlighting greater demand along a route. Results are presented for an average AM peak hour (between 7am-10am) and PM peak hour (between 4pm-7pm).
- 5.4. Figure 22 highlights bus passenger demand in the AM peak. Passenger demand can be identified on the A41, A5183 and M1 through Dacorum, with many rural routes converging on the A41. Limited demand is apparent in rural areas of Dacorum, however demand for linkages between Dacorum and other urban areas including Watford, St Albans, Luton and Luton Airport can be seen.
- 5.5. There were no new routes serving the North Hemel development added to the 2036 Dacorum Local Plan scenario and instead increased demand is shown for existing routes to the nearby Grovehill and Woodhall Farm estates.

¹² As detailed in Figure 22 of “Maylands Growth Corridor Study - Scheme Concept 8 (Bus Service Provision) Option Report” issued in August 2016

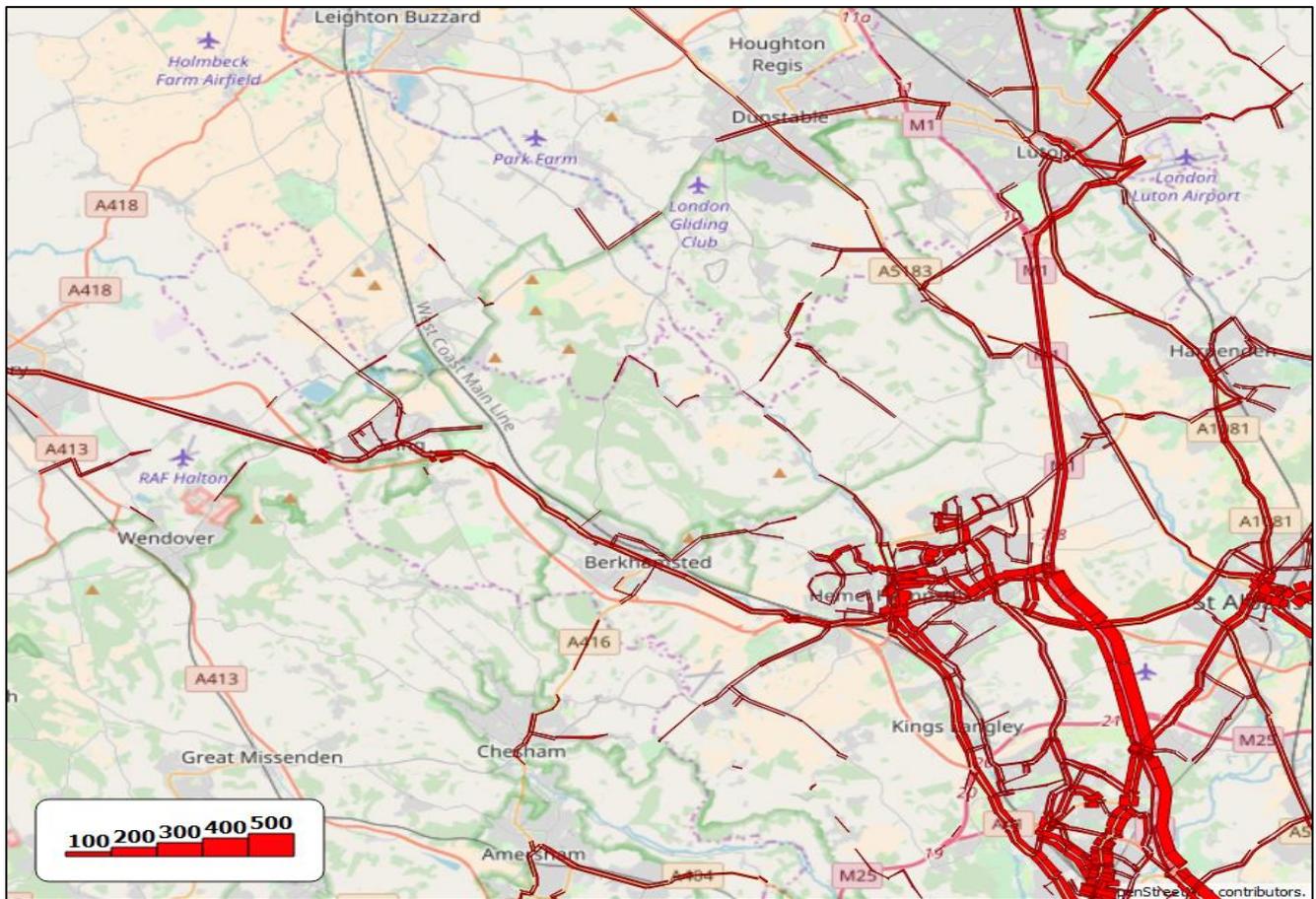


Figure 22: Dacorum Bus Passenger Demand - AM Peak 2036 Dacorum Local Plan Scenario

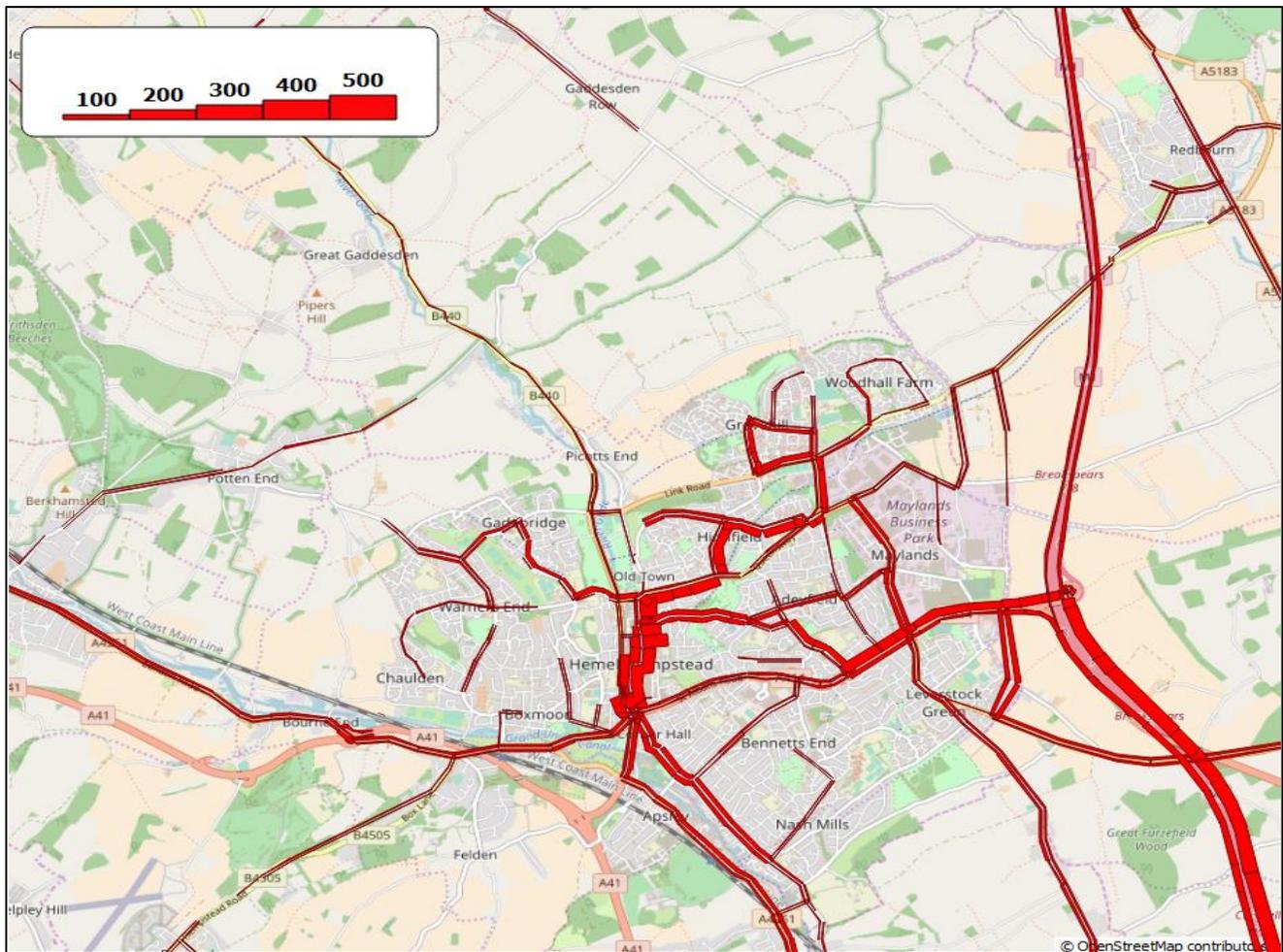


Figure 23: Hemel Hempstead Bus Passenger Demand - AM Peak 2036 Dacorum Local Plan Scenario

- 5.6. Focusing on Hemel Hempstead (Figure 23) a clear interaction between the town centre, Maylands Business Park and the M1 southbound can be clearly identified. There is a clear growth of demand on the M1 Southbound after the Hemel Hempstead junction. The routes around Maylands Business Park represent the new routes coded in to the model.
- 5.7. Bus demand is highest on Leighton Buzzard Road through central Hemel Hempstead and the eastern section of the A14 approaching M1 junction 8.

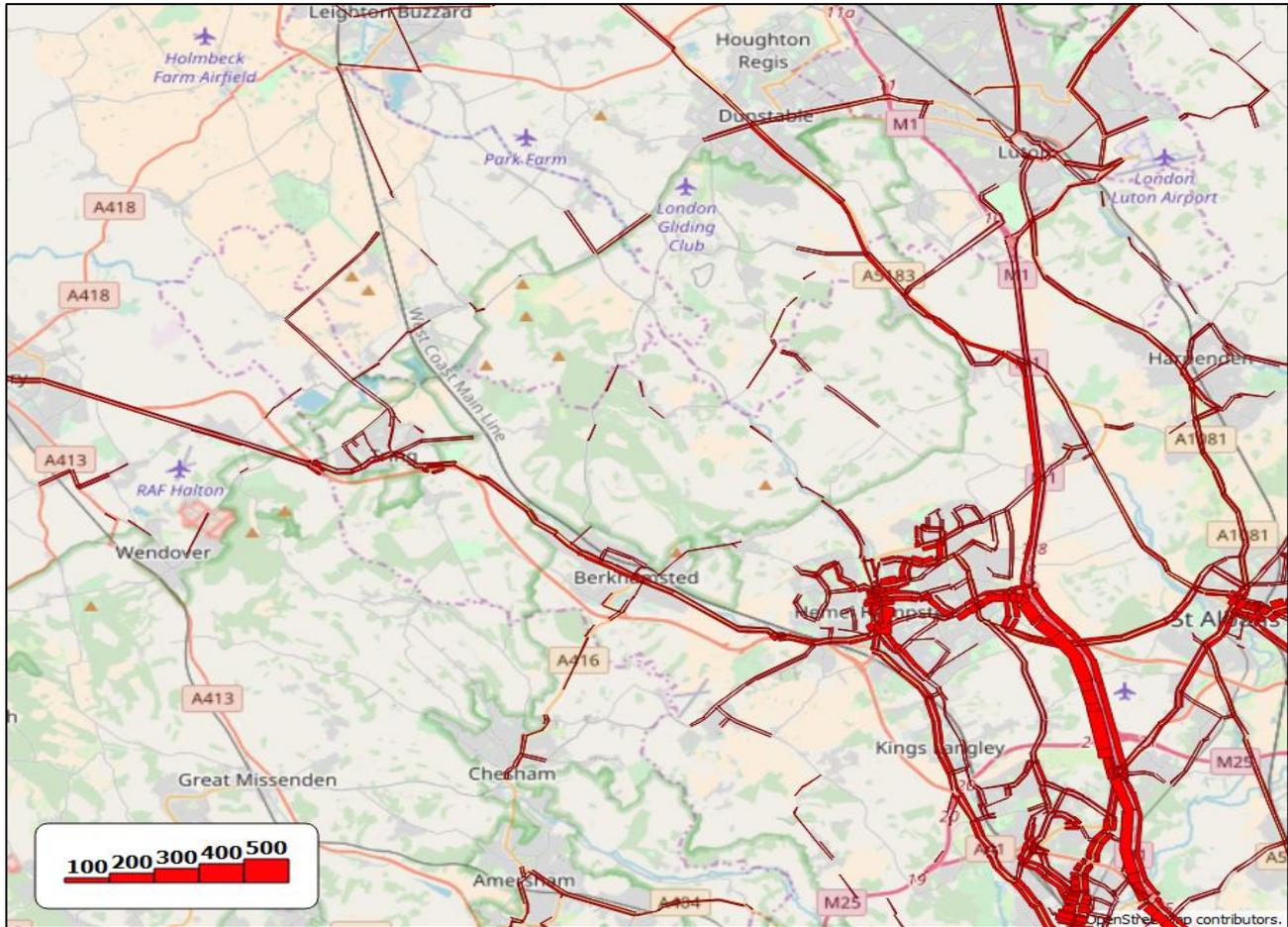


Figure 24: Dacorum Bus Passenger Demand - PM Peak 2036 Dacorum Local Plan Scenario

5.8. Bus passenger demand figures presented across Dacorum in the PM peak (Figure 24) mirror what was identified in the AM peak with bus passenger demand present on the A41, A5183 and M1 through Dacorum. Many rural routes link from the A41, however there is limited demand in rural areas of Dacorum. Demand for linkages to Watford, St Albans, Luton and Luton Airport can be clearly seen.

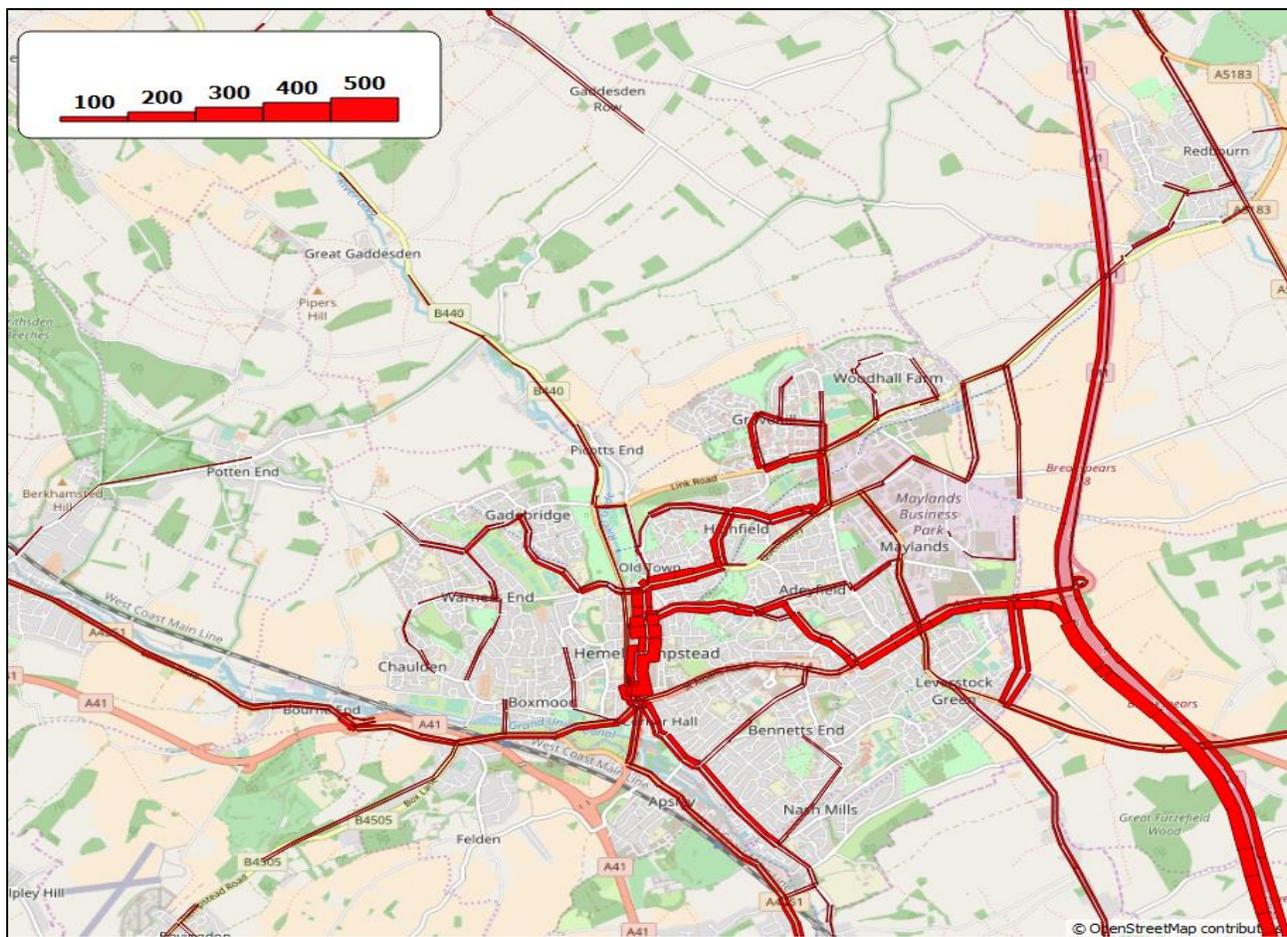


Figure 25: Hemel Hempstead Bus Passenger Demand - PM Peak 2036 Dacorum Local Plan Scenario

5.9. Figure 25 presents the bus passenger demand with a focus on Hemel Hempstead. A clear interaction between the town centre, Maylands Business Park and M1 northbound can be identified. Demand on the M1 northbound reduces after the M1 Hemel Hempstead junction. The routes around Maylands Business Park represent the new routes coded into the model. Similar to the AM peak, bus demand is highest on Leighton Buzzard Road through central Hemel Hempstead and the eastern section of the A414 from M1 junction 8.

Bus Demand Scenario Comparison

5.10. This section details the bus passenger demand differences of the 2036 Dacorum Local Plan Scenario compared to the:

- 2014 Base Model; and
- 2031 Do Something scenario

5.11. Bus passenger demand differences are represented by the thickness of lines with thicker lines highlighting greater demand along the route. Results are presented for AM peak (8am-9am) and PM peak (5pm-6pm) periods. Red represents an increase in demand, green a decrease.

5.12. Figure 26 highlights the bus passenger demand in the 2036 Dacorum Local Plan Scenario AM peak compared to the 2014 Base Year.

5.13. Figure 26 highlights there is a reduction in bus demand in the AM peak compared to the 2014 base year. This is linked to the forecasting assumption that personal incomes will rise faster than bus fares. This is a common theme in forecast year scenarios. As incomes rise, rail becomes relatively more attractive than bus, so some demand moves from bus to rail. Hence, reductions in more strategic bus demand to and from Luton/Luton Airport is observed. Bus demand is also linked to highway congestion which is much higher in the 2036 Dacorum Local Plan

scenario. This decrease in bus passenger demand is likely to be related to a rise in rail passenger flow on the Thameslink line. Please refer to the “*Hertfordshire COMET: Local Plan Do Minimum Forecasting Report*” issued in January 2017¹³ which provides further examples of this across Hertfordshire.

5.14. Localised increases in bus demand around Hemel Hempstead are linked to the new routes introduced in the 2036 Dacorum Local Plan scenario. There are some increases southbound from Piccotts End into Hemel.

5.15. Bus demand in rural Dacorum is low and does not change between scenarios.

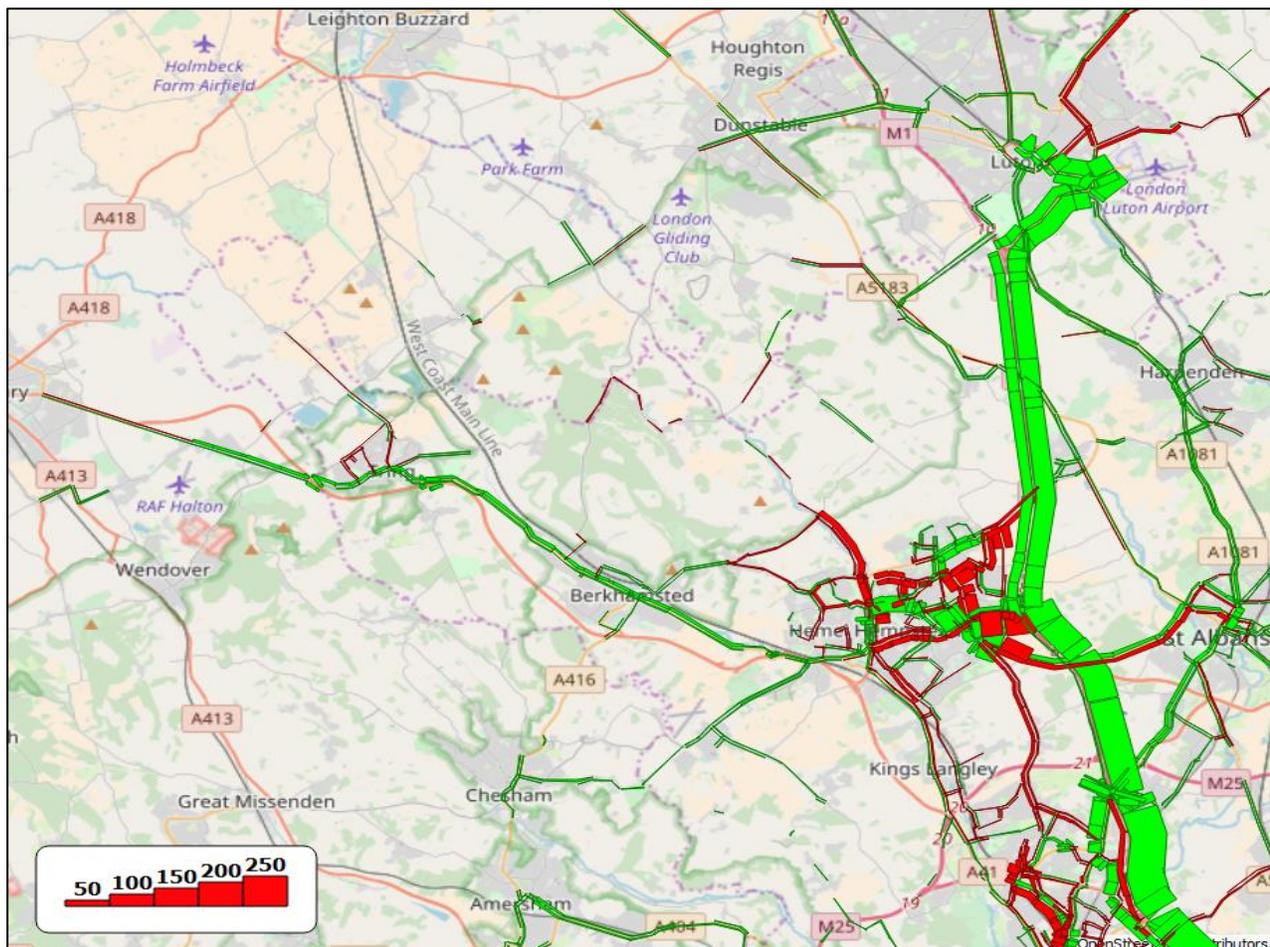


Figure 26: Bus Passenger Demand Differences AM Peak – 2036 Dacorum Local Plan compared to 2014 Base Year

5.16. Figure 27 displays bus passenger demand differences in the PM peak between the 2036 Dacorum Local Plan Scenario and the 2014 Base Year. Very similar results to those seen in the AM are observed. There is a reduction in demand compared to the 2014 base year linked to the forecasting assumption that incomes will rise faster than bus fares. Hence, reductions in more strategic bus demand to and from Luton Airport is observed.

5.17. Again, the localised increases in and around Hemel Hempstead are linked to the new routes introduced in the 2036 Dacorum Local Plan scenario. There are also increases northbound to Piccotts End from Hemel which will be linked to the extra demand created by the North Hemel development. Similar to the AM peak, bus demand in rural Dacorum is low and does not change between scenarios.

¹³ Issued by HCC to districts as the “*Hertfordshire COMET Local Plan Do Minimum Forecasting Report*” dated 16/01/2017

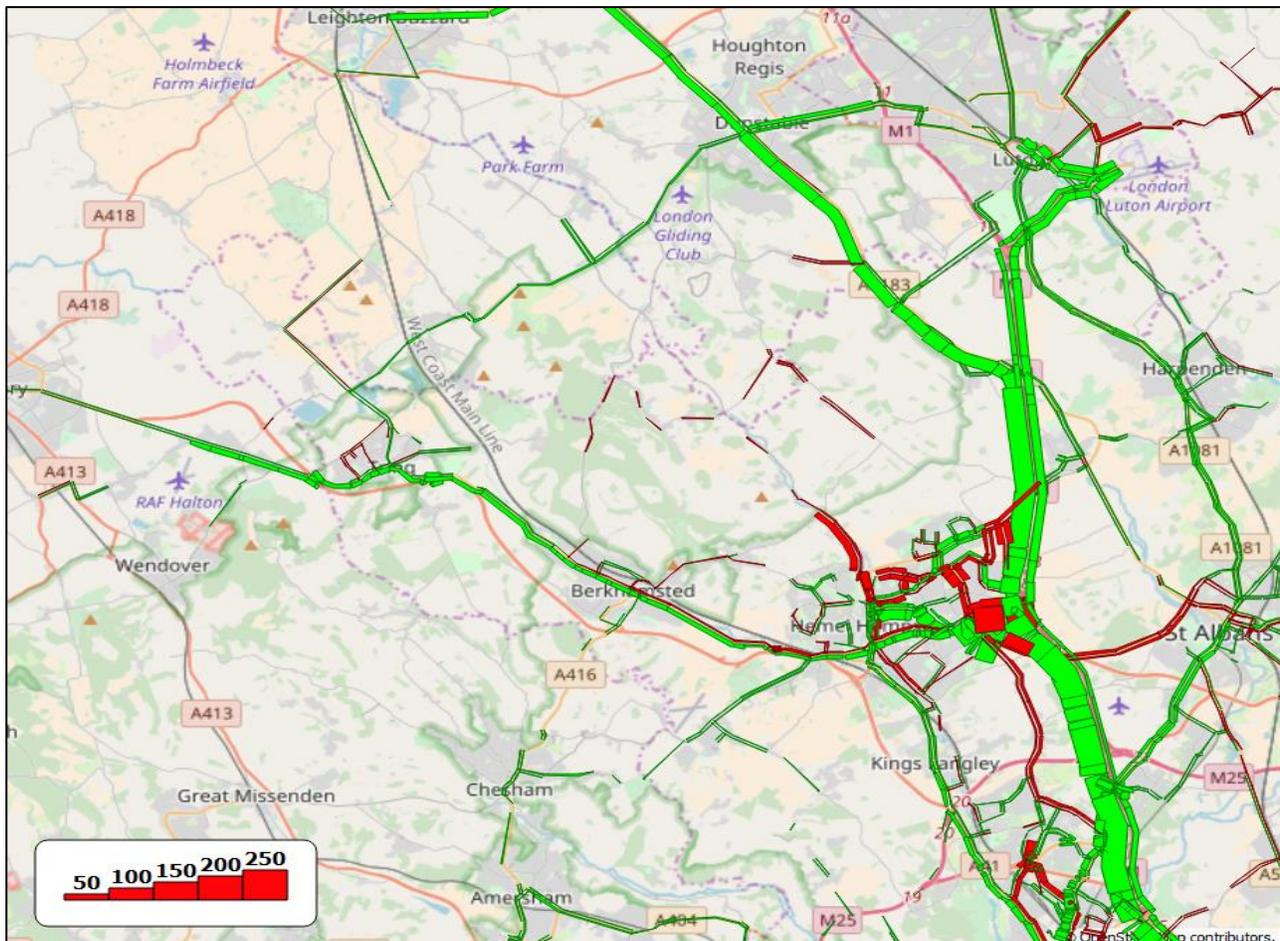


Figure 27: Bus Passenger Demand Differences PM Peak – 2036 Dacorum Local Plan compared to 2014 Base Year

- 5.18. Figure 28 and Figure 29 highlight the bus demand differences across Dacorum between the 2036 Dacorum Local Plan and the 2031 Do Something scenarios.
- 5.19. Figure 28 and Figure 29 highlight the localised changes in Hemel Hempstead between the scenarios. Impacts are constrained to the new routes added into the 2036 Dacorum Local Plan scenario. Key decreases are eastbound from Hemel Hempstead town centre towards Maylands Business Park and M1 junction 8. These reductions are linked to the improved conditions along the A414 corridor which may generate a mode switch to car travel. There are localised increases around Maylands Business Park and these represent the new routes added to the 2036 scenario where additional bus capacity has been added. Some of these locations also mirror locations where delays are experienced in the highway network so public transport mode choice becomes more attractive.
- 5.20. There are also localised increases southbound from Piccotts End into Hemel Hempstead and around Woodhall Farm and Grovehill estates. These will be linked to the additional demand created by the North Hemel development.
- 5.21. There are also small increases in demand around Tring and Berkhamsted which may be linked to the new development areas. Flows appear to link to the rail stations which would indicate there is increased demand for these journeys.
- 5.22. There are small reductions in bus demand between Hemel Hempstead and St Albans. This will be a knock on impact of the reduced congestion through central Hemel Hempstead generated by the new link road. This new route generates mode choice back to the private car as it will become more attractive for some local journeys.
- 5.23. Comparisons in the PM peak mirror those seen in the AM peak

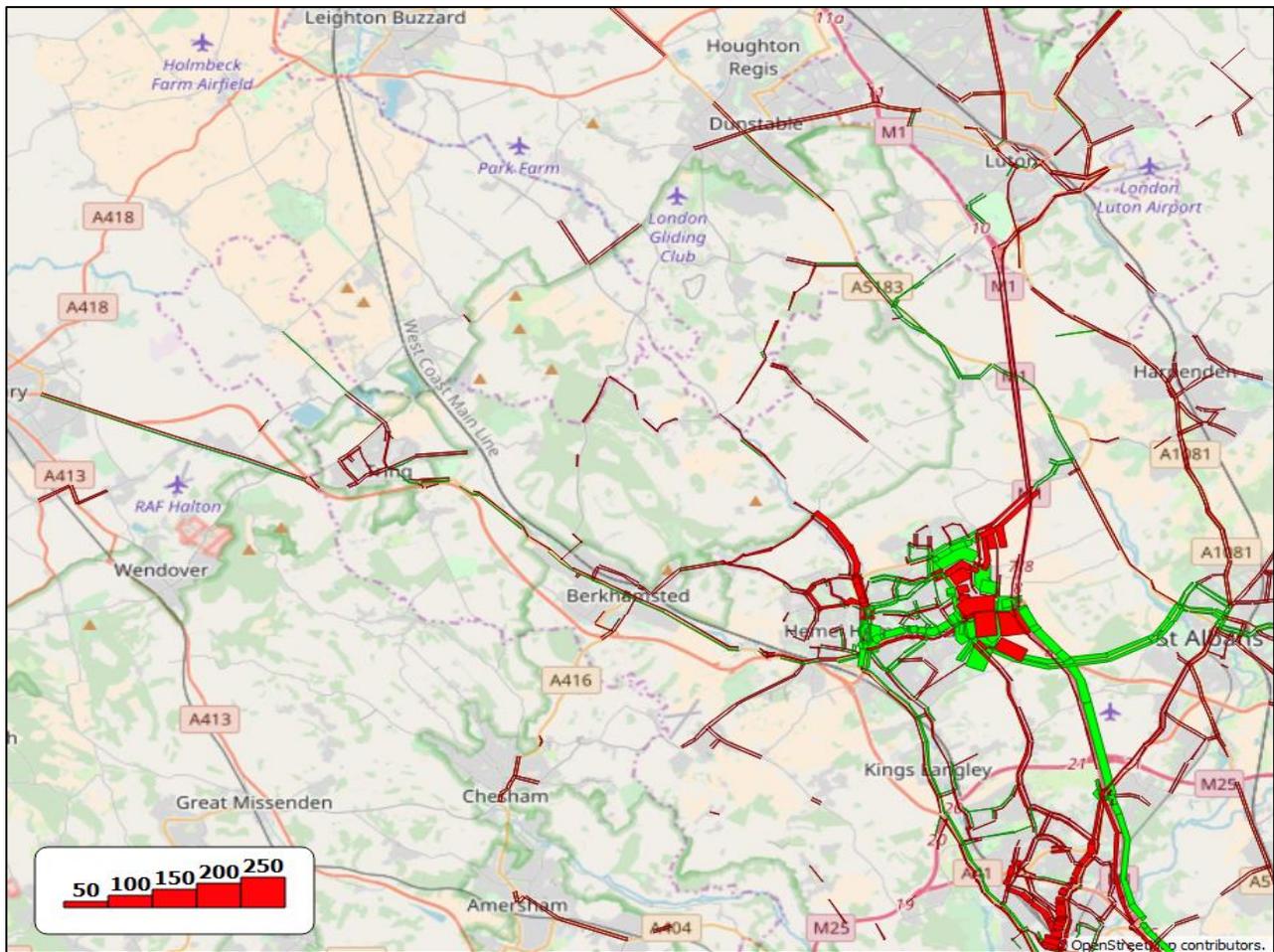


Figure 28: Bus Passenger Demand Differences AM Peak – 2036 Dacorum Local Plan compared to 2031 Do Something

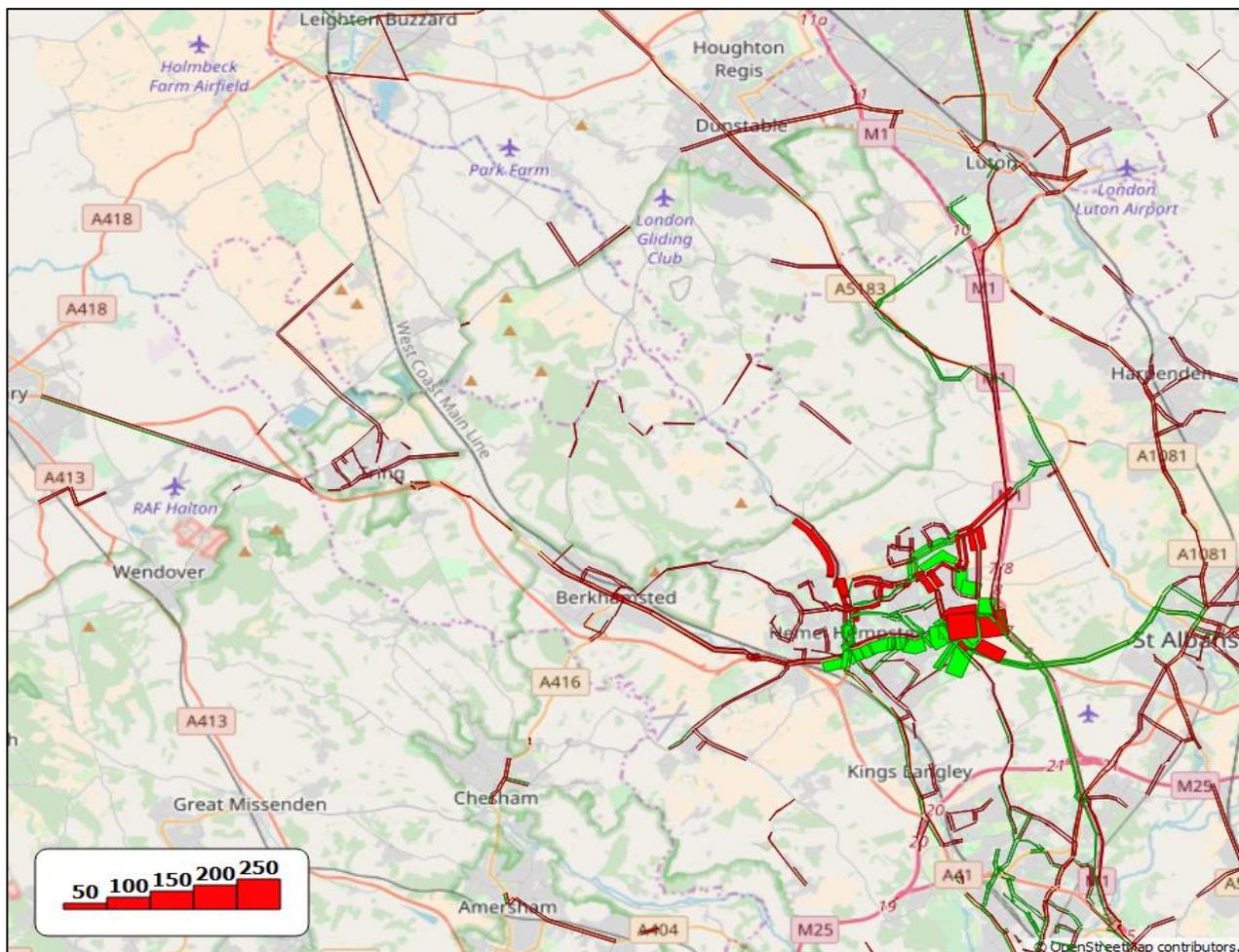


Figure 29: Bus Passenger Demand Differences PM Peak – 2036 Dacorum Local Plan compared to 2031 Do Something

Bus Demand Summary

5.24. The results from the public transport models have indicated that the additional bus services in Hemel Hempstead¹⁴ have a local impact. It is important any new developments are linked to bus services, however forecasting has indicated that the impact of bus services over time may be limited as users switch to alternative modes. The impact of new bus services would also be enhanced if they were linked to bus priority measures which would enable them to be less affected by traffic congestion.

¹⁴ As detailed in Figure 22 of “Maylands Growth Corridor Study - Scheme Concept 8 (Bus Service Provision) Option Report” issued in August 2016

6. High Level Assessment of Mitigation Measures

- 6.1. Using the 2036 Dacorum Local Plan Scenario as an evidence base, this section aims to quantify if a range of mitigation measures identified by Dacorum Borough Council could aid the movement of people and vehicles around Dacorum.
- 6.2. No reference to the engineering feasibility, economic viability or political support of schemes is made or assumed.

Hemel Hempstead Multi Modal Transport Strategy

6.3. Dacorum Borough Council has identified the need to undertake a multi modal transport strategy for Hemel Hempstead as a mitigation measure for dealing with the transport impacts of growth. As shown in Figure 30, there are delays around Hemel Hempstead Railway Station in the PM peak which limit access and may be generating rerouteing. In addition, there are a number of considerations which the Dacorum 2036 Local Plan scenario has highlighted which should be considered:

- There are delays around the town centre junctions which would emphasise that switching to alternative modes in these areas may be beneficial;
- The employment area of Maylands Business Park is remote from the town centre and the railway station. Are there sufficient links between these areas for people who wish to use public transport or walk/cycle between them?
- The topography of Hemel Hempstead generates issues as the difference in elevation from one side of the town to the other is great which could be a deterrent to making journeys on foot or by bike;
- The additional bus services serve Maylands Business Park but are they fully integrated to other services around the town?
- The reduction in congestion in central Hemel Hempstead and along the A414 generated by the additional distributor link road could encourage road space reallocation to public transport measures (e.g. bus/cycle lanes – as supported by the reduction in journey times along this route);
- Is the railway station fully integrated with other transport modes around the town? Are bus stops located within easy reach of the station and are there clearly marked pedestrian and cyclist routes to and from the station and the town centre?
- Is the town prioritised for vehicle or people movements? Are pedestrian/cyclist crossing points of the network convenient and prioritised where relevant; and
- Could alternative transport modes be investigated – i.e. light rail, park and ride or a bicycle hire scheme?



Figure 30: Delays and Congestion around Hemel Hempstead Railway Station in the 2036 Dacorum Local Plan scenario

New East of Tring Link Road

- 6.4. As highlighted in Figure 31, Tring experiences limited congestion compared to other areas of Dacorum in the 2036 scenario. There is an overall increase in traffic along the two main routes through Tring and to/from the M1, however, overall link stress in Tring is less than 80% for the large majority of links. There are some minor delays at the A41 junctions but these are not critical compared to other locations in the District.
- 6.5. Whilst the 2036 Dacorum Local Plan scenario does not indicate a link road is essential, localised junction modelling should be used to fully investigate options in this area. A new link road would amend route options and choice which could lead to alternative options for other transport modes and connectivity. A new link would provide more permeability around the town and potentially address the requirements of new residents and transport patterns. Further work should be undertaken to fully investigate how travel patterns could change and open new transport opportunities around Tring.
- 6.6. Given the development options around Tring, ensuring links to and from the railway station are optimised is key. These should include improved routes for pedestrians and cyclists which cannot be modelled in COMET.



Figure 31: Delays and Link Stress around Tring in the 2036 Dacorum Local Plan Scenario – PM peak

Bus Links to New Developments

- 6.7. As illustrated in Section 5, the additional bus services added into the 2036 Dacorum Local Plan Scenario generate additional bus demand around Hemel Hempstead. It should be ensured that any new development is supported by bus links which enable residents to reach the town centre, railway station and employment areas. If feasible, bus links should match the desire lines of users and become a realistic alternative travel choice to the private car – i.e. services should radiate across towns as well as serve the traditional town centre environments.
- 6.8. Previous work by AECOM has highlighted that residents of Hertfordshire have a strong connection with London. As the large majority of trips are made by rail into London, bus services to new developments should also cater for trips to and from the main railway stations in the district.
- 6.9. Section 7 highlights the routing of traffic from/to developments proposed. These highlight that patterns are varied, however there appear to be two key flows:
- From the south of Berkhamsted development from/to Hemel Hempstead and Maylands Business Park; and
 - North Hemel development from/to St Albans.
- These journeys should be catered for by amending existing bus routes or introducing new ones.
- 6.10. As highlighted previously, where schemes in the 2036 Dacorum Local Plan Scenario have relieved levels of congestion, consideration should be given to allocating road space to bus lanes. Bus priority measures will only serve to enhance the bus links and routes around Dacorum. As alternative growth scenarios are identified, consideration should be given to how bus services may link to new development locations.

Sustainable Transport Interchanges

- 6.11. Sustainable transport interchanges should be promoted in Dacorum. As highlighted in paragraph 6.3, convenience is key and assessment of the 2036 Dacorum Local Plan Scenario has highlighted that the railway stations in Hemel Hempstead and Tring are not located directly in the town centre and are away from the main employment areas in these towns. Bus stops serving these railway stations should be located as close as possible to the platforms to encourage a seamless interchange experience. If users are required to walk long distances, or cross many roads to interchange to another form of transport, the attractiveness of the journey decreases significantly.
- 6.12. Key attractors across Dacorum such as railway stations and employment sites should be easily accessible by both public transport and walking/cycling. Signage and route guidance information to and from destinations will also aid movement by different modes. Attractors should also be linked to the key residential areas across Dacorum if feasible (linked to paragraph 6.7).
- 6.13. Dacorum will work closely with Network Rail and the rail and bus operators in order to progress this workstream. Any future studies/projects should also consider the better integration of travel modes; for example. seamless ticketing and information technology to improve the user experience. This workstream should also complement any improvements at Hemel Railway Station (see paragraph 6.29).
- 6.14. Future work will also investigate the physical constraints at some transport hubs across Dacorum; for example the opportunities for creating an interchange at Apsley Station (or other improvements) are more limited given the smaller size of the station. Proposals should be investigated by using more localised modelling packages such as the Hemel Hempstead Paramics Microsimulation Model.

Improvements at M25 Junction 20

- 6.15. M25 junction 20 will become critical in forecast year scenarios. The modelling has indicated that delays of up to 5 minutes will occur for southbound traffic from the A41 in the AM peak and up to 8 minutes delay for circulating traffic on the roundabout in the PM peak trying to access the A41 northbound. These delays generate queues which impact other junctions around the roundabout. There are smaller delays experienced on the roundabout itself and at surrounding junctions in both peak periods. The A41 from Watford approaching the roundabout experiences queues and delays in both peak periods.
- 6.16. The slip roads into the junction from the M25 are over capacity, however the M25 itself is nearing saturation point in both directions in both peaks. This may influence route choices, especially when incidents occur on the M25 at peak times.
- 6.17. Options may include revised lane allocations, free flowing left turn slip roads bypassing the junction, or full signalisation of all arms to the roundabout, linked to nearby junctions. Any potential schemes at this junction need to be agreed with key stakeholders such as Highways England, Hertfordshire County Council and affected districts.

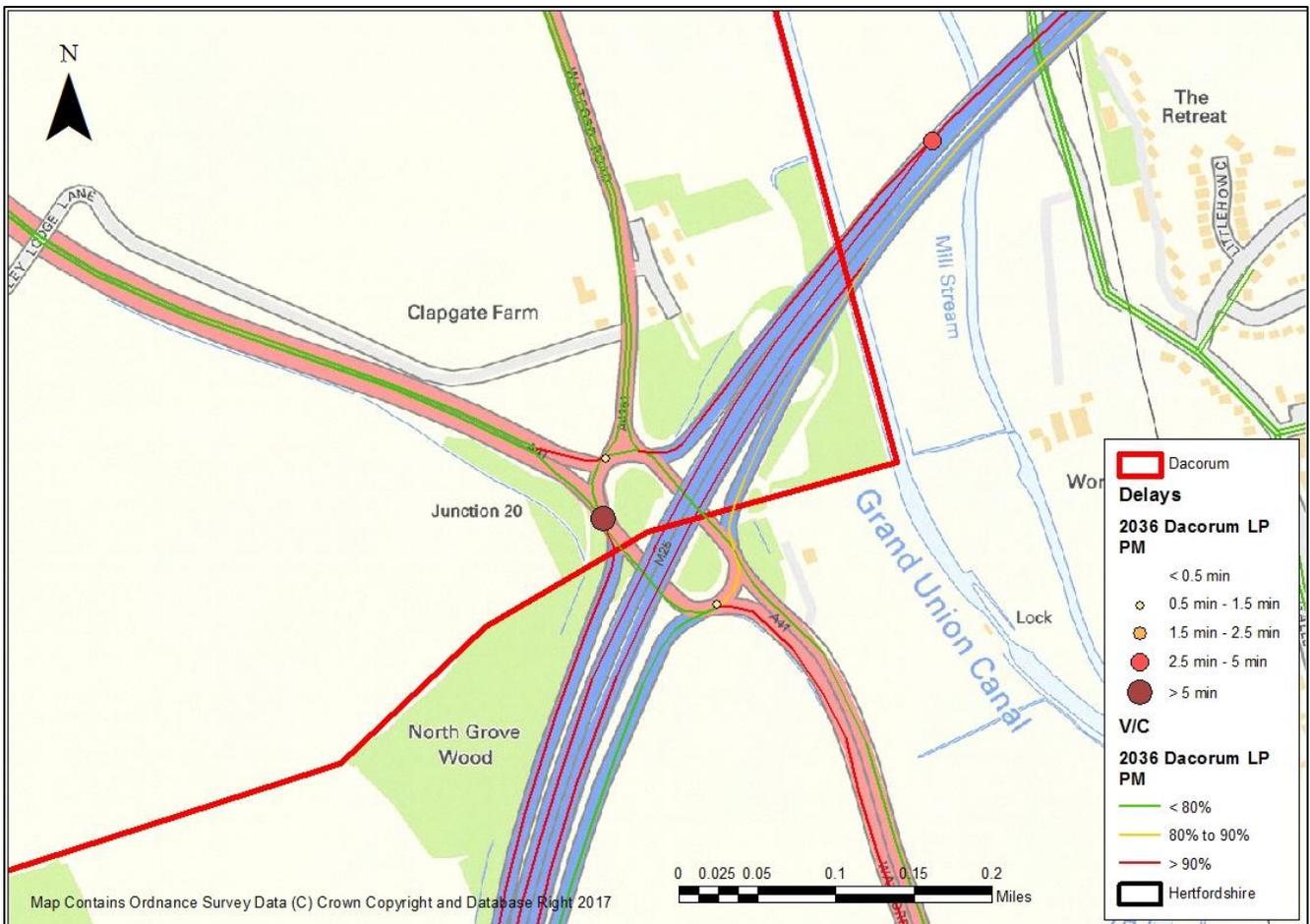


Figure 32: M25 Junction 20 Link Stress and Delays – PM peak Dacorum Local Plan Scenario

M1 Junction 8 Improvements

- 6.18. The improvements at M1 Junction 8, linked to the Green Lane staggered signalisation and upgrade of Green Lane north of the A414 appear to work well. It is acknowledged the additional link road from the eastern roundabout at junction 8 to its junction with Green Lane/Boundary Way represents the longer term aspirations for the junction.
- 6.19. The schemes at M1 junction 8 combined with the Green Lane amendments and the new distributor road provide an alternative route choice through Hemel Hempstead for traffic. Further sensitivity tests may be required to assess the impact of these schemes if they are introduced in stages.
- 6.20. The modelling has also indicated the new loop around to Green Lane/Boundary Way has a limited impact due to small cumulative delays at surrounding junctions and the eastern roundabout at junction 8 which is signalised. Signalising the Green Lane/Boundary Way junction and synchronising signals with those at the eastern roundabout at junction 8 may improve the attractiveness of this route.
- 6.21. The modelling has indicated capacity on M1 itself is limited which may exert pressure on the junction at peak times when incidents occur.
- 6.22. The revised layout at this junction should be further assessed using the Hemel Hempstead Paramics Microsimulation Model. This will fully quantify the impact of the amendments on the local road network.

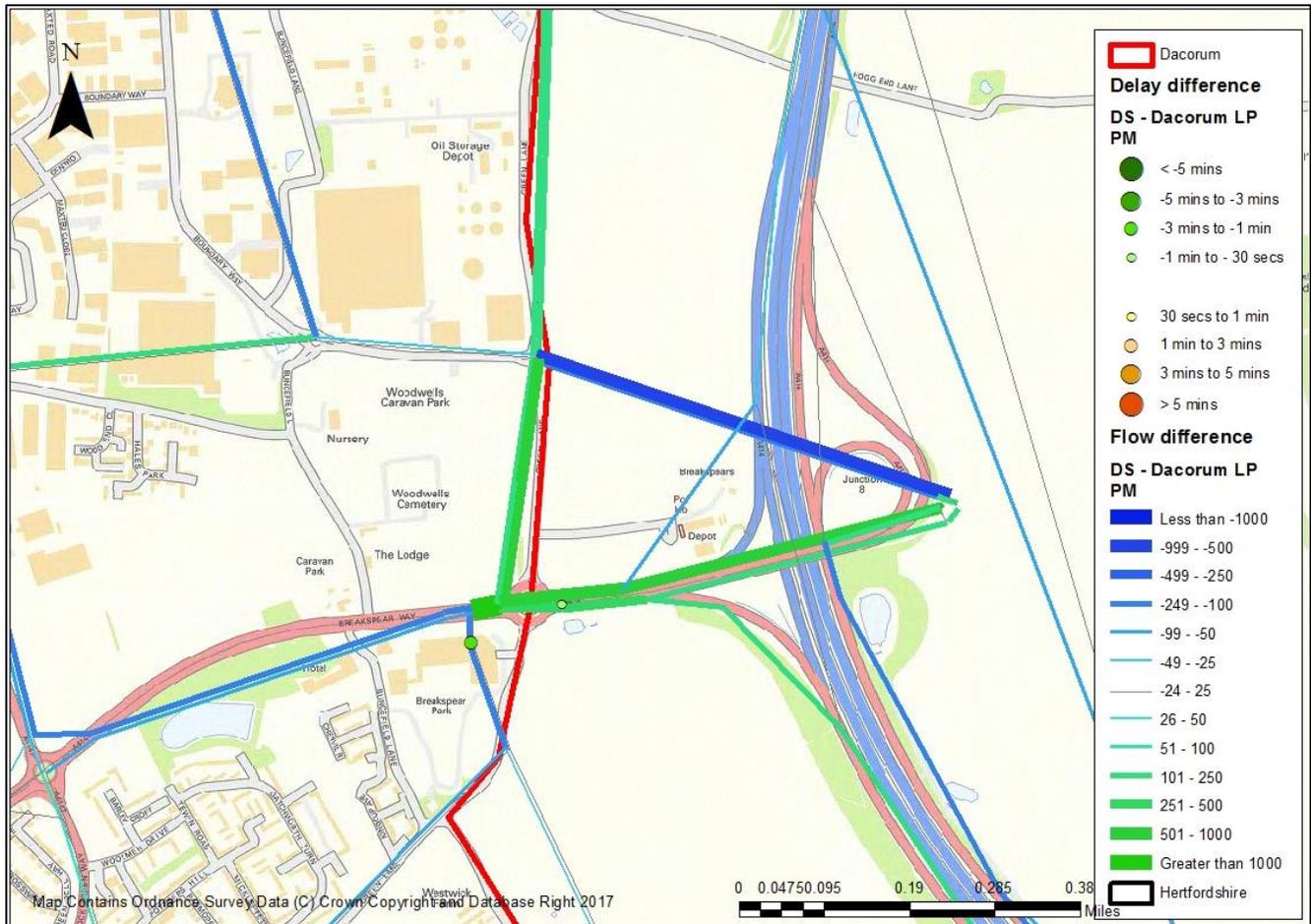


Figure 33: M1 Junction 8 Flow Difference Compared to 2031 Do Something Scenario – PM Peak

Two Waters Road/London Road Junction

6.23. Average delay at the junction in the AM peak is 1 minute, however delays of over 2 minutes are recorded for east/west movements across the junction. In the PM peak the average delay at the junction is 1.5 minutes, however delays of up to 5 minutes are recorded for traffic on London Road heading westbound across the junction. Figure 34 (overleaf) details the location of the junction.

6.24. There appears limited scope to improve the junction unless the traffic signals could be linked to surrounding junctions. The left turn movements could be converted to give-ways if sufficient carriageway space exists.

6.25. Possible schemes should be assessed using the Hemel Hempstead Paramics Microsimulation Model model or localised junction modelling.

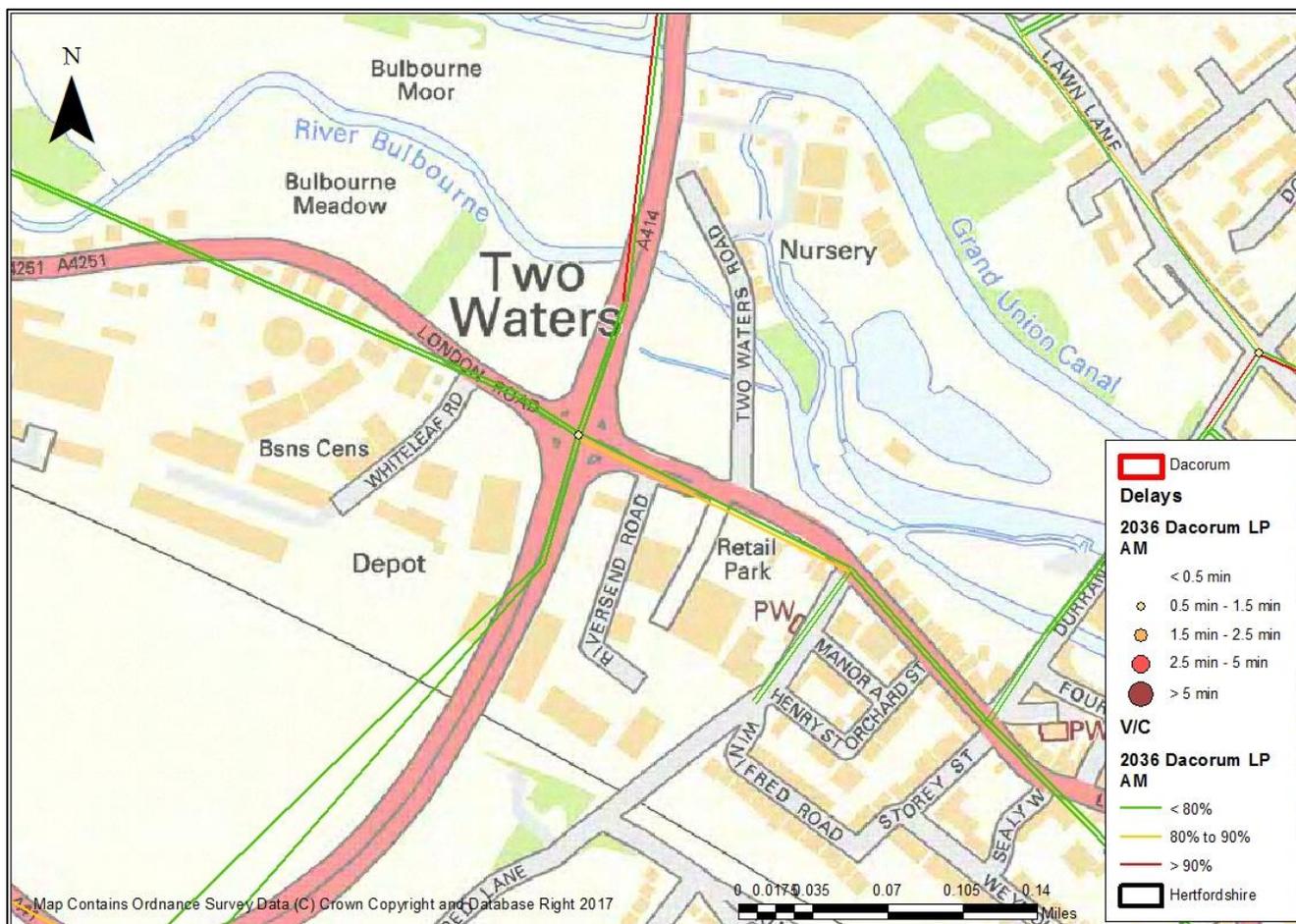


Figure 34: Two Waters Road / London Road junction Link Stress and Delays – AM Peak Dacorum Local Plan Scenario

Widening of Durrants Hill Bridge

6.26. The main area of congestion in this area is north of the bridge approaching Lawn Lane and St Albans Hill. The high link stress recorded here is mainly due to delays at the Lawn Lane junction rather than insufficient physical capacity on the road. The narrow width of the road does not make it a popular route choice, therefore flows are low. Figure 35 details the link stress and delays in the PM peak around Durrants Hill Bridge.

6.27. Congestion on Durrants Hill itself is minimal. Parallel routes north towards the A414 also appear relatively free flowing.

6.28. Possible schemes should be assessed using the Hemel Hempstead Paramics Microsimulation Model or localised junction modelling.

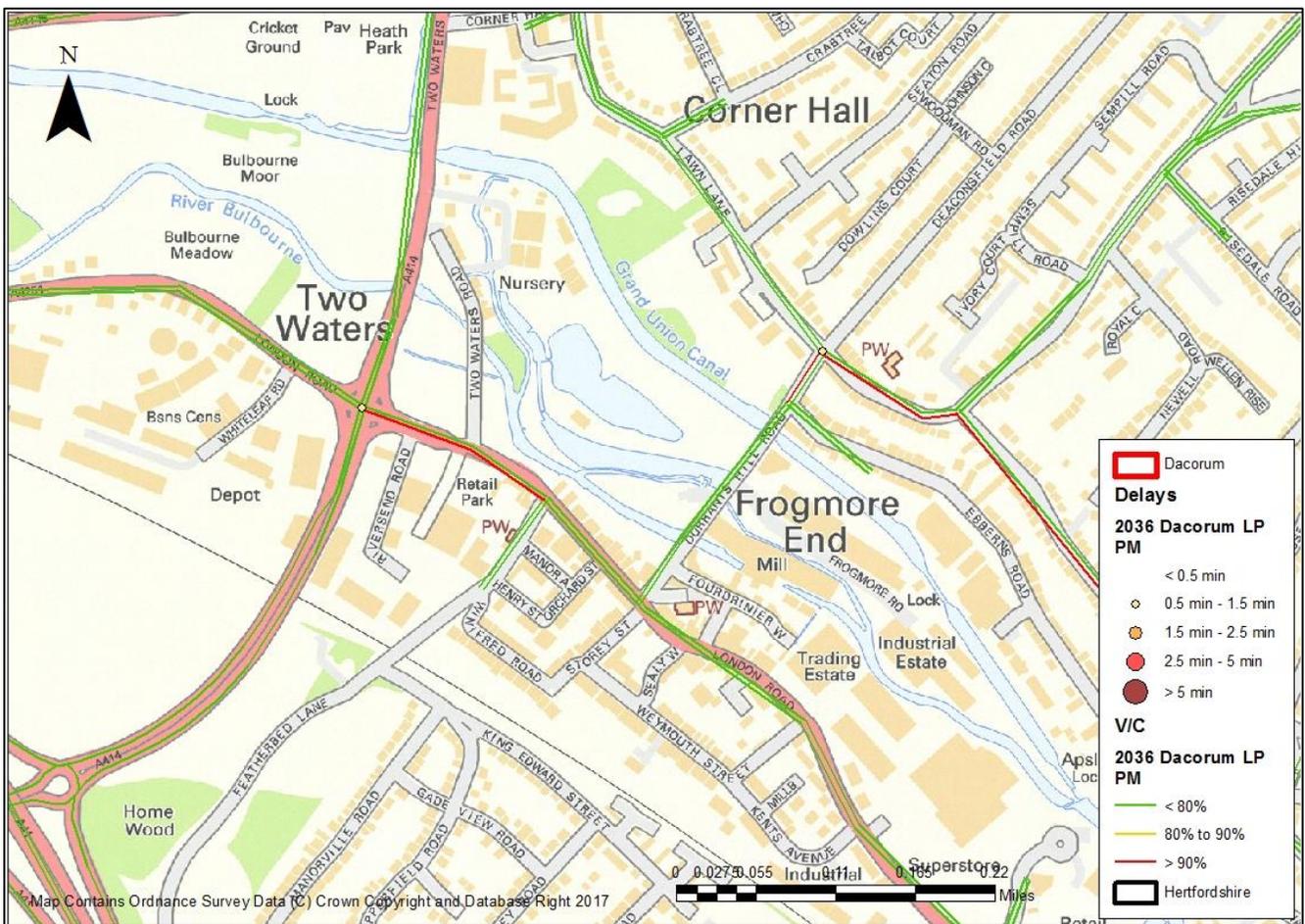


Figure 35: Durrants Hill Bridge Link Stress and Delays – PM Peak Dacorum Local Plan Scenario

New Access to Hemel Station

- 6.29. Considering alternative options for access to Hemel Station appears to be critical as capacity on links around the station is limited with high link stress levels recorded and delays at the roundabouts. These delays would cause traffic to queue around the area. Figure 36 details link stress and delays around the station area in the PM peak. It is acknowledged that access to the station is limited via the River Bulbourne.
- 6.30. If feasible, additional access points from routes to the south would help improve access to the station. Linking to previous mitigation measures, clearly defined and segregated walking and cycling routes to the station should also be investigated. Bus stops surrounding the station should be located in easy to reach and readily accessible locations.
- 6.31. Whilst ambitious, a scheme providing dedicated slip roads to and from the A41 would help remove traffic from the Hemel Hempstead town centre. Park and ride services to and from the station could also reduce the number of trips to the station and around the town centre.
- 6.32. Possible schemes should be assessed using the Hemel Hempstead Paramics Microsimulation Model or localised junction modelling.



Figure 36: Hemel Station Link Stress and Delays – PM Peak Dacorum Local Plan Scenario

East-West Link Road in the South Berkhamsted Development

6.33. Figure 37 illustrates congestion and delays around Berkhamsted in the 2036 Dacorum Local Plan AM scenario. It can be seen there are delays and congestion around the A416 / Shootersway junction and at the A416 Kings Road / A4251 High Street / Lower Kings Road cross roads. There are also minor delays at the A4251 Gossoms End / Billet Lane junction.

6.34. As the South Berkhamsted development would be located adjacent to the A41 south of the town, access points should be carefully considered in relation to the A416 / Shootersway junction and A41 junctions. An east-west link road may help alleviate congestion at the A416 / Shootersway junction if alternative route choices were available.

6.35. Whilst the 2036 Dacorum Local Plan scenario does not indicate a link road is essential, localised junction modelling should be used to fully investigate options in this area. A new link road would amend route options and choice which could lead to alternative options for other transport modes and connectivity. A new link would provide more permeability around the town and potentially address the requirements of new residents and transport patterns. Further work should be undertaken to fully investigate how travel patterns could change and open new transport opportunities around Berkhamsted.

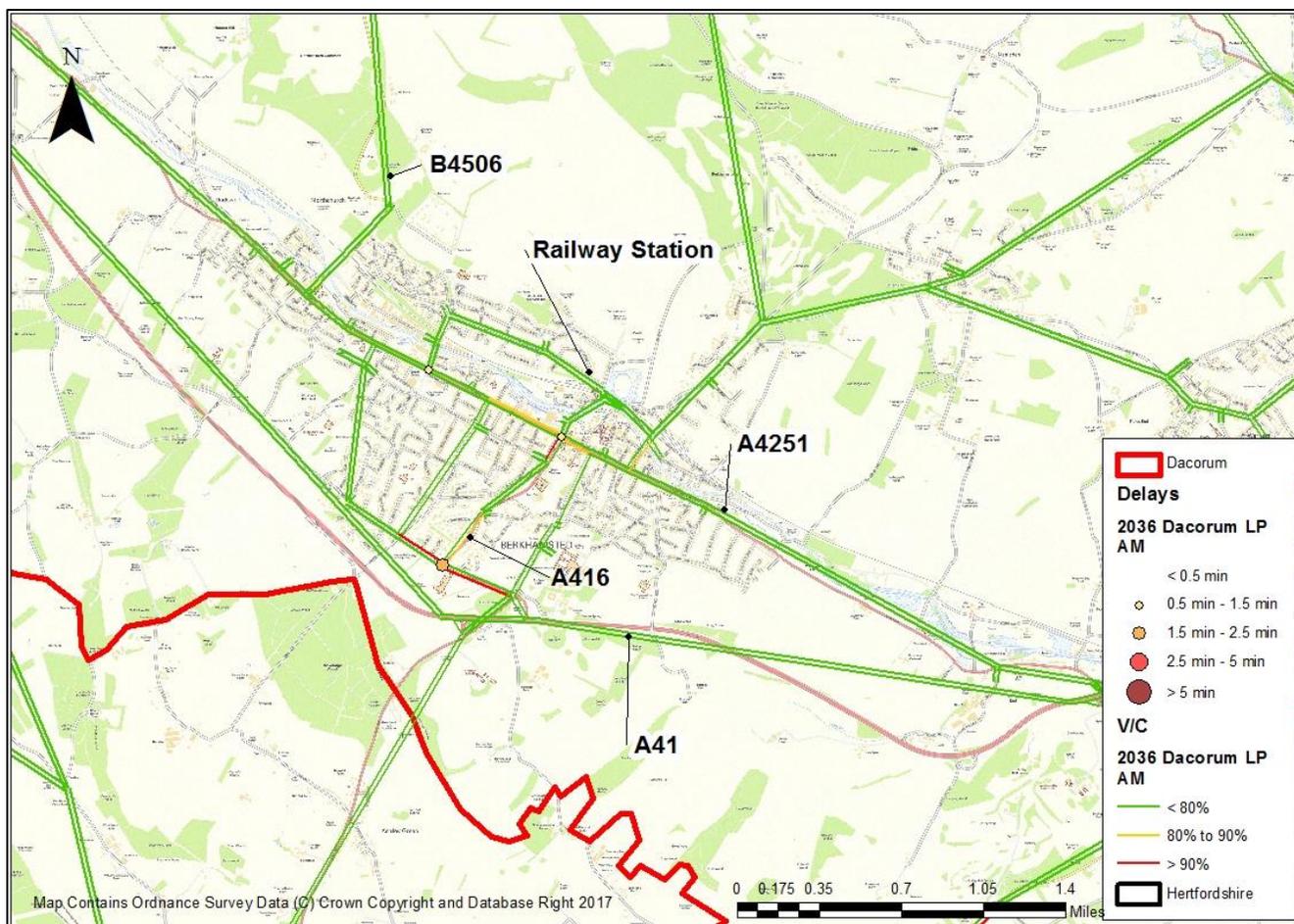


Figure 37: Berkhamsted Link Stress and Delays – PM Peak Dacorum Local Plan Scenario

Summary of Mitigation Measures

6.36. Overall, the 2036 Dacorum Local Plan Scenario has highlighted that a number of complementary mitigation measures should be studied further. The modelling has supported the consideration that most of these mitigation measures should focus on the Hemel Hempstead area of the district and its interaction with the M25 and M1 junctions.

7. Development Flow Analysis

- 7.1. This section identifies the routing of traffic from/to the three major development sites in Dacorum District in the 2036 Dacorum Local Plan Scenario. The full Variable Demand Model has been run in the 2036 Dacorum Local Plan Scenario which may impact the movements out of and into developments due to cost/time/demand changes during model assignment. The three development sites assessed are:
- Land South of Berkhamsted;
 - North Hemel Development; and
 - Tring Development.
- 7.2. It should be noted these three development sites only represent one scenario under consideration by Dacorum District Council and do not represent a defined, final scenario. The trip distribution from the developments is based on historic trip patterns from the 2014 Base Year model. It should also be noted that trip patterns in the PM peak are historically more varied than those in the AM peak. Whereas trips are often to a workplace in the AM peak, there is greater variation in the PM peak as travellers do not always return directly home, stopping on the way to go shopping, visit friends or undertake other activities.
- 7.3. Figures are provided across the wider COMET model area and Dacorum area specifically. AM outbound trip and PM inbound trips are mapped. The locations of developments are indicative as they represent the access points of the developments in the COMET model. More detailed access points and designs can be incorporated into future versions of the modelling if required.

Land South of Berkhamsted

7.4. Figure 38 highlight the routing of traffic originating from the Land South of Berkhamsted development in the AM peak. Flows from the sites extend across Hertfordshire; however the majority of movements are towards Watford, Hemel Hempstead, St Albans, Welwyn and Hatfield. There are also further movements outside of Hertfordshire towards the north London boroughs and Aylesbury/ Luton.

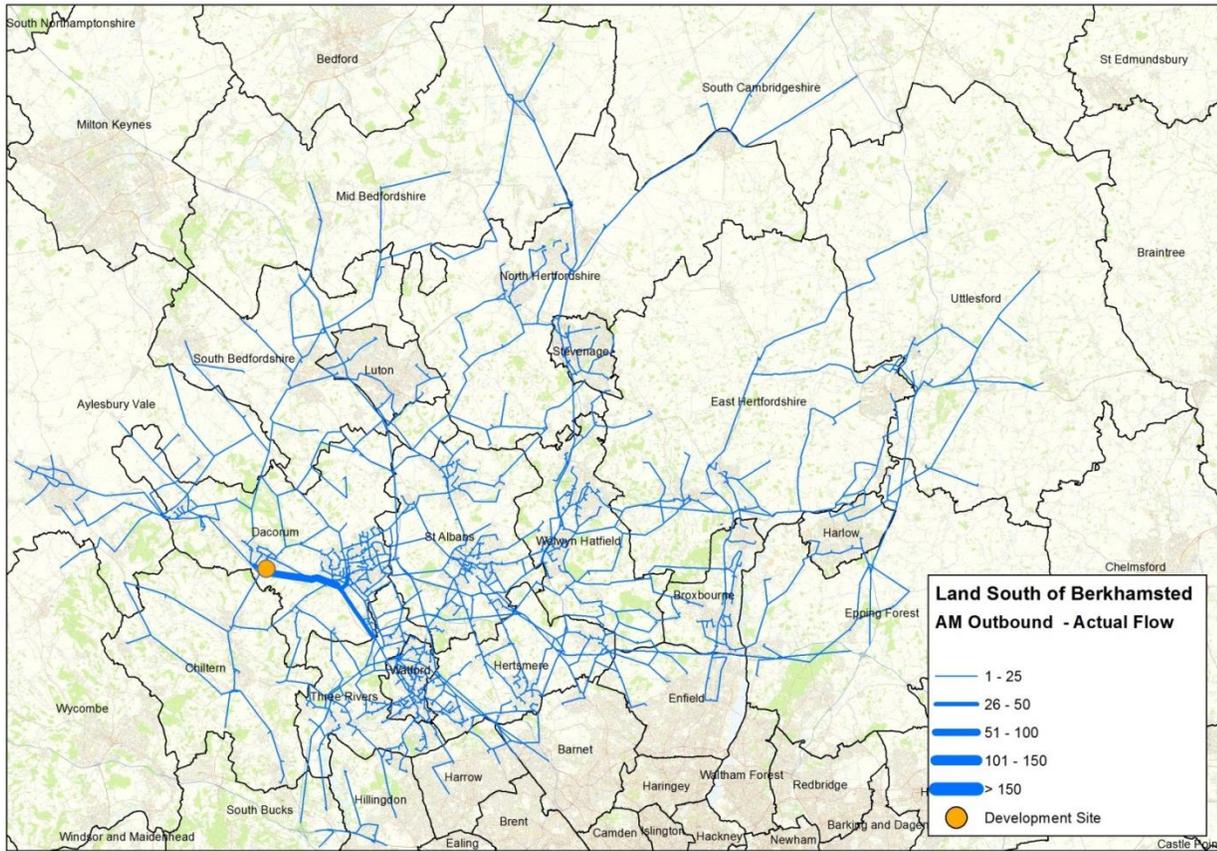


Figure 38: Development flow analysis - AM Outbound from Land South of Berkhamsted

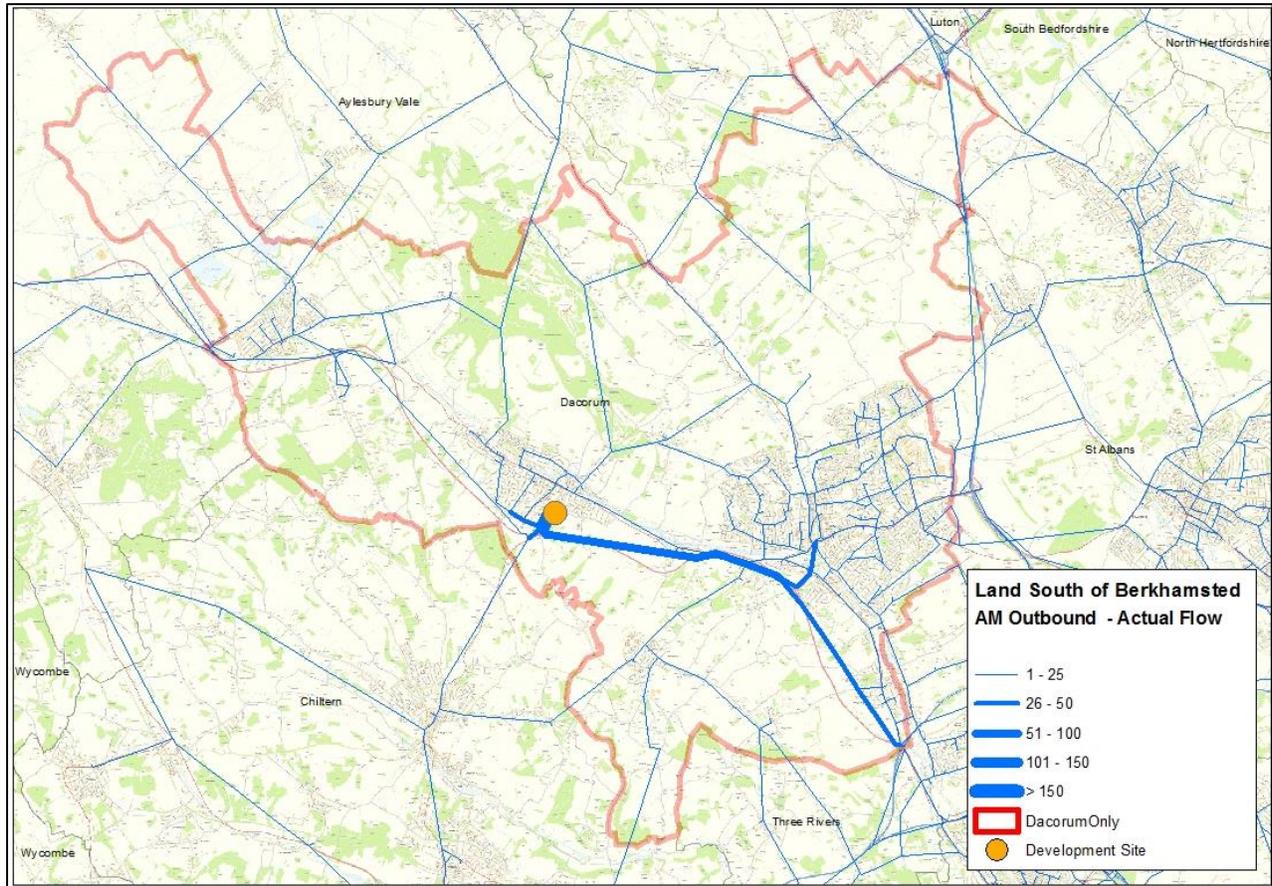


Figure 39: Development flow analysis - AM outbound from Land South of Berkhamsted (Dacorum Focus)

- 7.5. Focussing on the Dacorum area specifically in Figure 39, it can be identified that development trips mainly uses the A41 as a route to Hemel Hempstead or the M25, from there flows then disperse. Destinations further west in Dacorum or into the neighbouring counties of Buckinghamshire and Bedfordshire are minimal.
- 7.6. There is limited interaction with the new northern distributor road across north Hemel Hempstead. No vehicles use it in the AM peak, however some vehicles use it in the PM peak as shown in Figure 41.

7.7. In the PM peak, analysis of flows travelling into the South of Berkhamsted development highlights that flows to the site predominately originate from Hertfordshire, specifically, Watford, Hemel Hempstead and St Albans. Furthermore, flows also originate from North London Boroughs and Aylesbury. Figure 40 demonstrates that flows in the PM peak are more dispersed than the AM peak as journeys do not always directly return home.

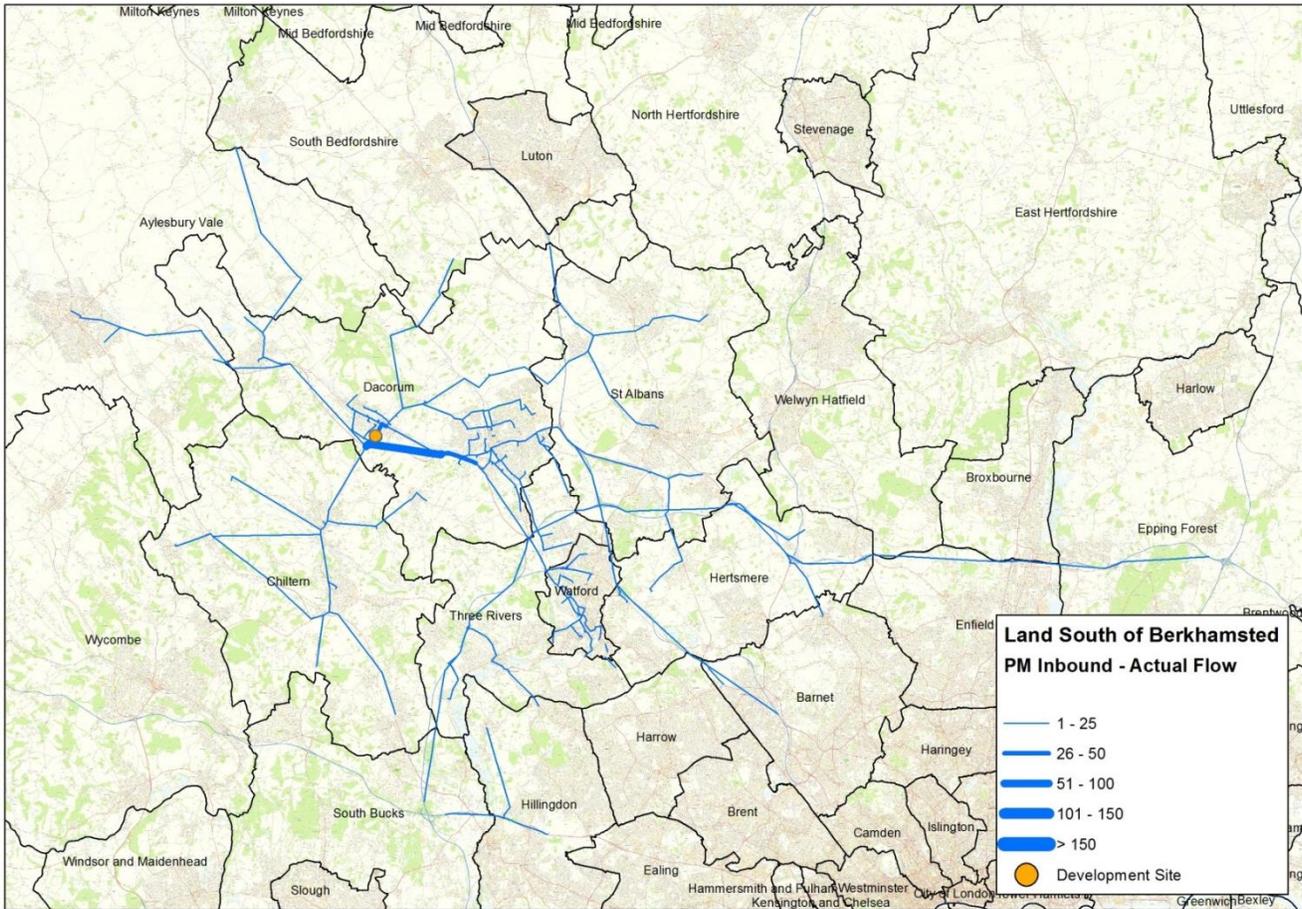


Figure 40: Development flow analysis – PM Inbound to Land South of Berkhamsted

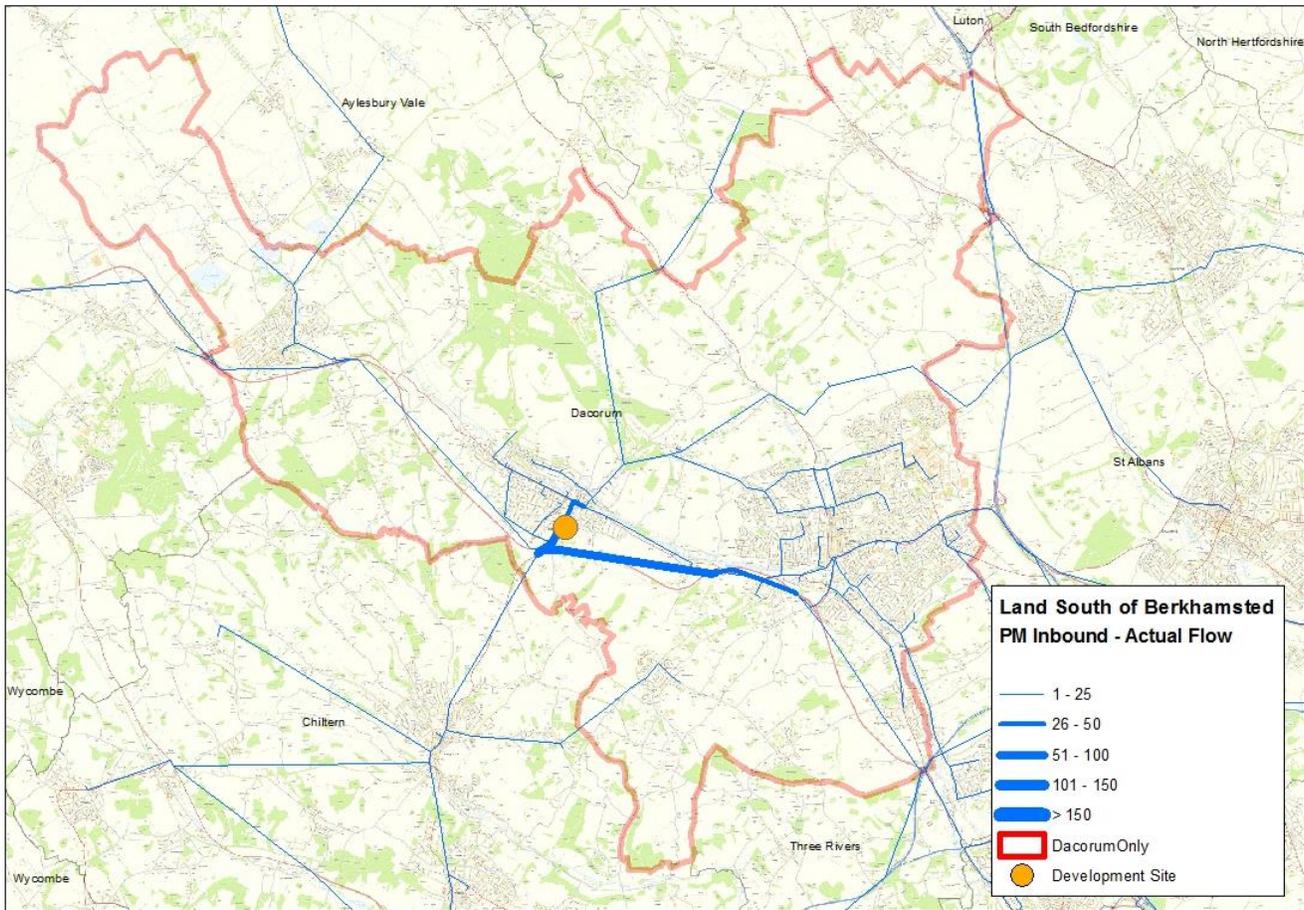


Figure 41: Development flow analysis - PM outbound form Land South of Berkhamsted. (Dacorum Area)

7.8. Figure 41 highlights that similarly to the AM flows (Figure 39) traffic predominately uses the A41 to access the development in the PM peak. The interaction with origins further west and north of the development is also limited, similar to the AM peak.

North Hemel Development

7.9. There are 3 access points into/out of the North Hemel Development in the 2036 Dacorum Local Plan Scenario. Flows from this site extend across Hertfordshire, however the majority of movements are towards Watford, Hemel Hempstead, St Albans, Welwyn, Hatfield and Stevenage. There are also movements towards the north London boroughs and Aylesbury Vale / Bedfordshire outside Hertfordshire. These movements appear greater than those seen in the other development areas. This is highlighted in Figure 42.

7.10. The larger radius of trips compared to other development areas represents the increased size of this development compared to the other development areas proposed.

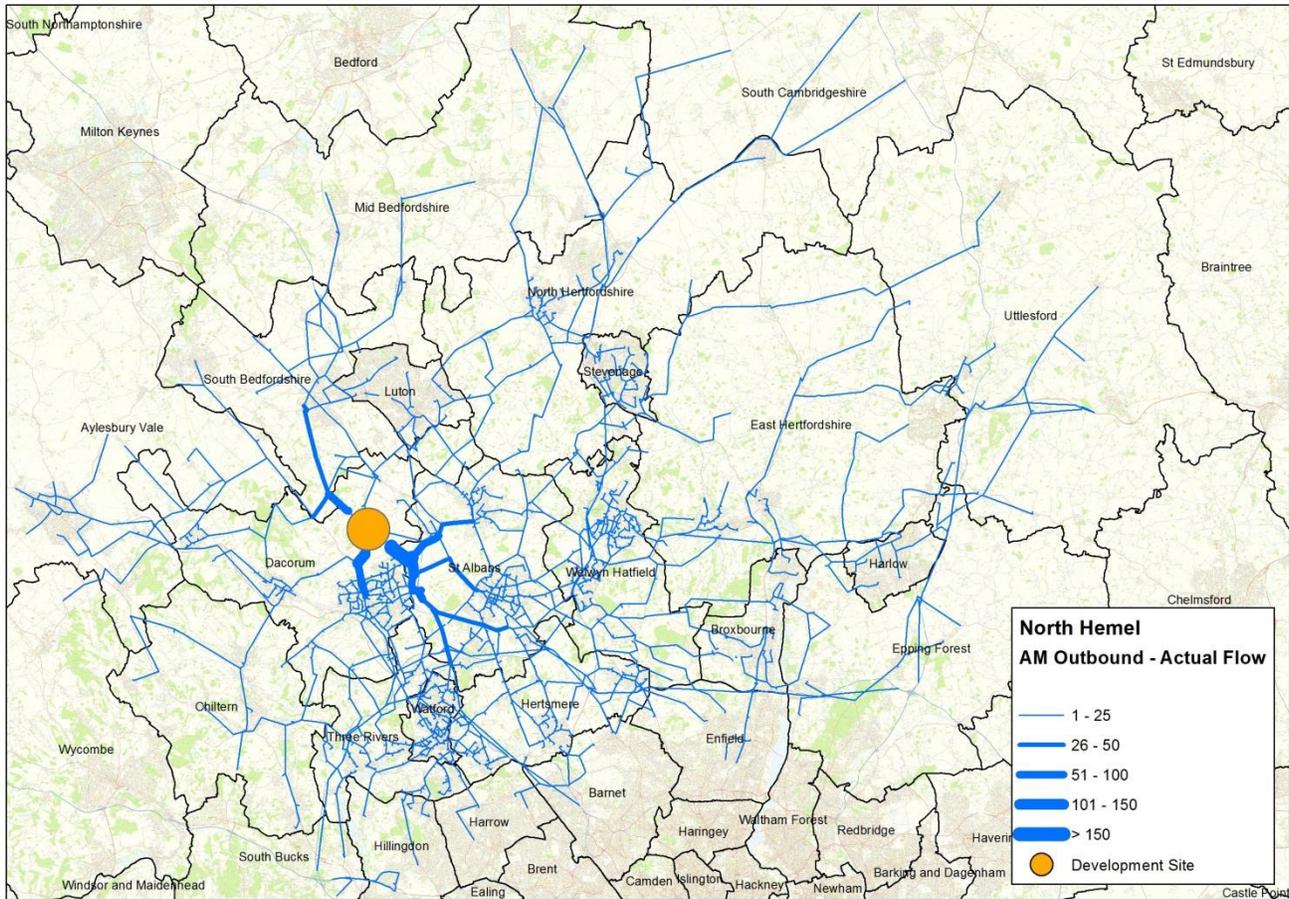


Figure 42: Development flow analysis - AM Outbound from North Hemel Development

7.11. As highlighted in Figure 43, traffic exiting the zone in the AM peak heads in three main directions through Dacorum:

- North out of Dacorum via Studham towards Dunstable and Luton to the north;
- South via Leighton Buzzard Road towards Hemel Hempstead town centre; and
- East towards the M1 southbound (via junction 8) or Redbourn Road and St Albans via the A414.

7.12. It should be noted that the design of roads surrounding this development was not examined during this model assessment. It may be that flows seen are not entirely appropriate for the existing infrastructure, for example on Punchbowl Lane east of Hemel Hempstead. Future iterations of the model may consider downgrading certain routes around the development to encourage traffic onto more strategic routes

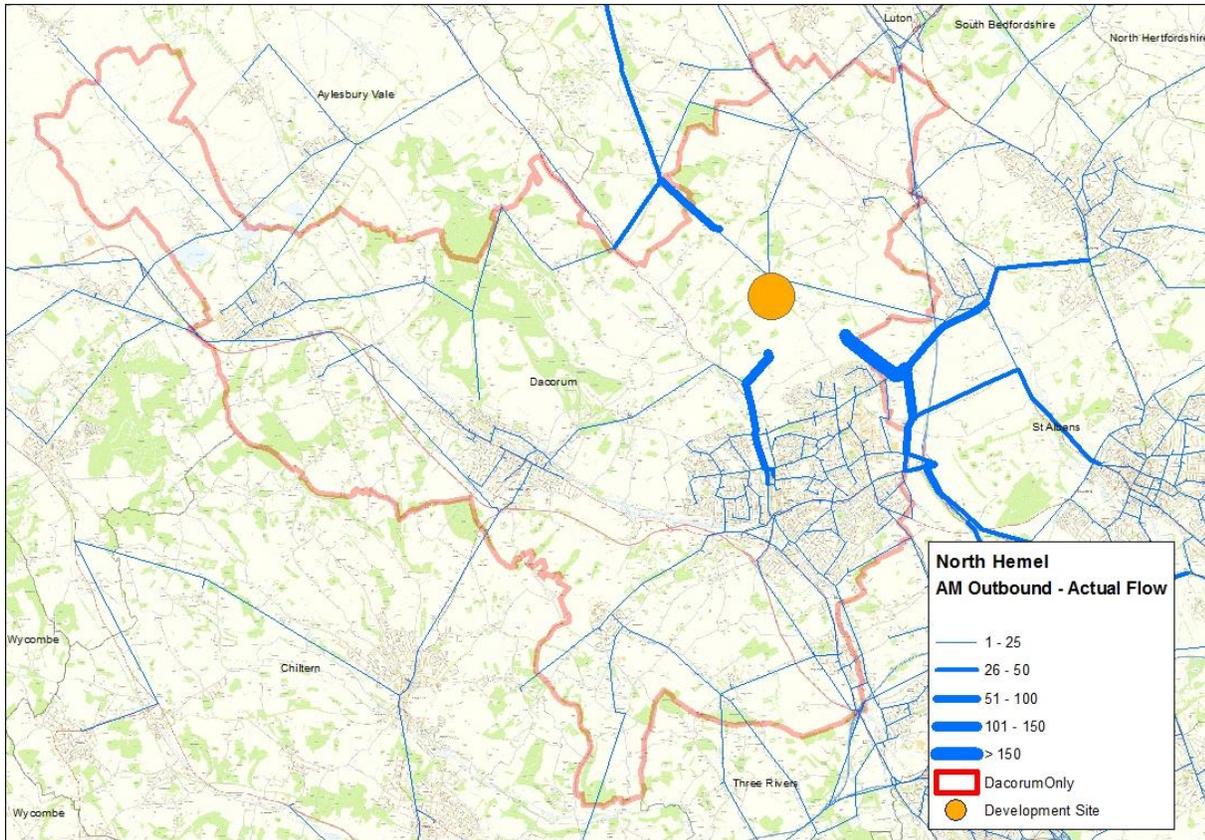


Figure 43: Development flow analysis - AM outbound from North Hemel Development (Dacorum Focus)

7.13. As highlighted in Figure 44, flows to this site originate from Watford, Hemel Hempstead and St Albans. There are also flows originating from north London boroughs and Aylesbury Vale/Bedfordshire outside Hertfordshire.

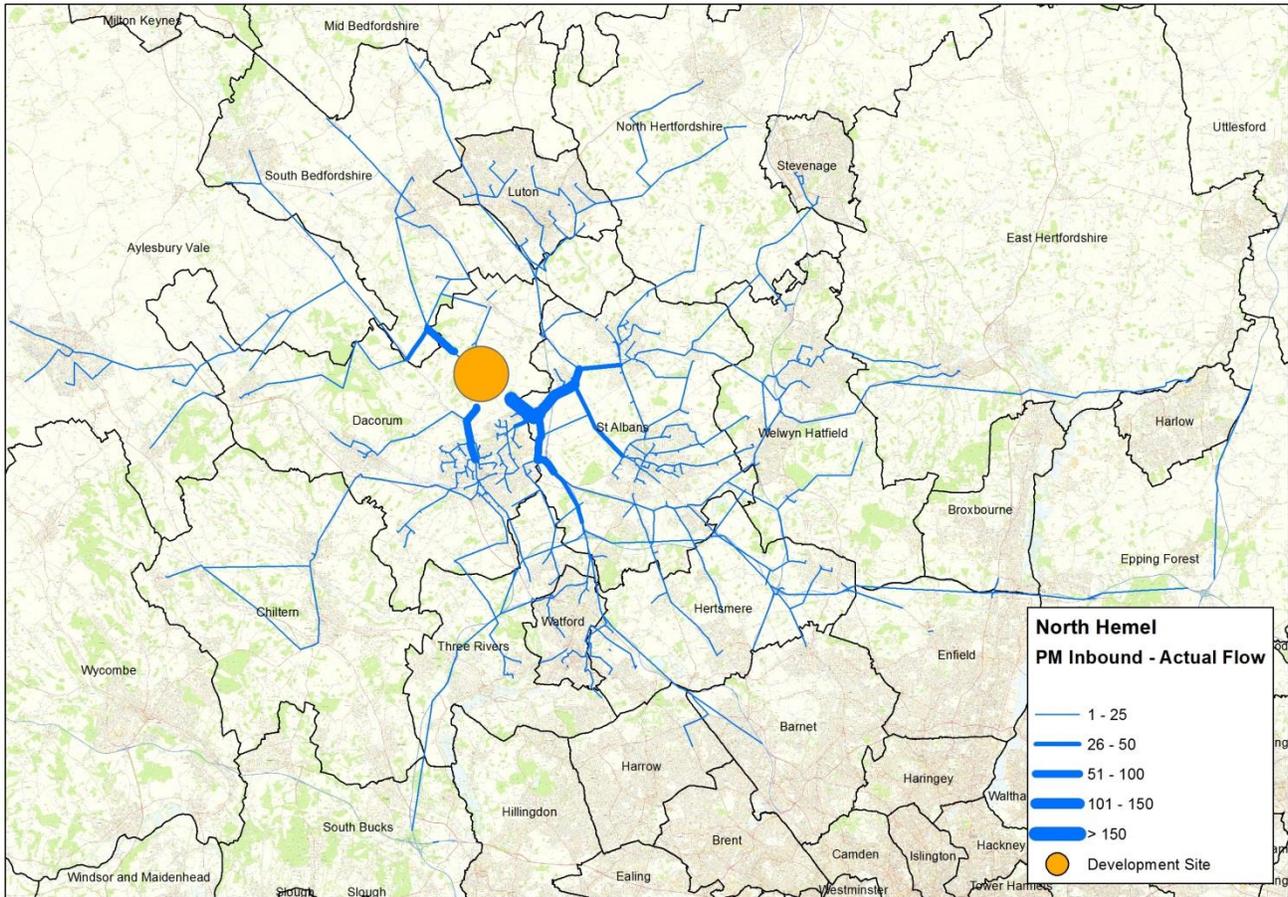


Figure 44: Development flow analysis – PM Inbound to North Hemel Development

7.14. Figure 45 highlights that similar to the AM peak, traffic travels to this zone via Studham to the north, central Hemel to the south or M1 junction 8/Redbourn Road to the east. The routing of traffic from St Albans can be clearly seen, most notably that the A5183-B487 route is preferable over the A4147 route. The additional infrastructure in the 2036 Dacorum Local Plan Scenario facilitates the movement of vehicles from the northbound M1 via junction 8, Green Lane and the new distributor road into the development. This will be reducing the impact on the A414 which could otherwise occur.

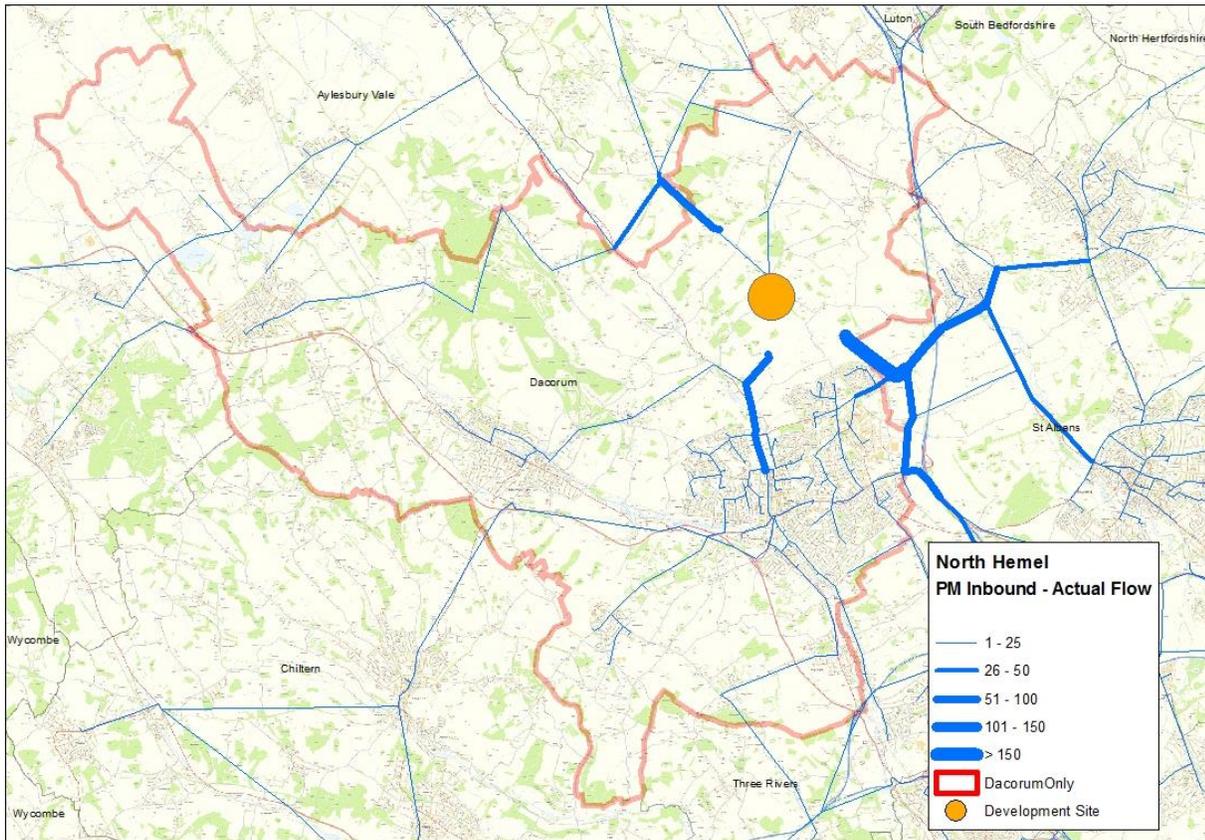


Figure 45: Development flow analysis – PM Inbound to North Hemel Development (Dacorum Focus)

Tring Development

7.15. Flows from this site extend across Hertfordshire as highlighted in Figure 46. The majority of movements are towards Watford, Hemel Hempstead, St Albans, Welwyn, Hatfield and Stevenage. There are also flows towards the north London boroughs and Aylesbury Vale/Bedfordshire outside Hertfordshire. Flows towards Eastern Hertfordshire destinations are minimal which is to be expected given the western location of this development area.

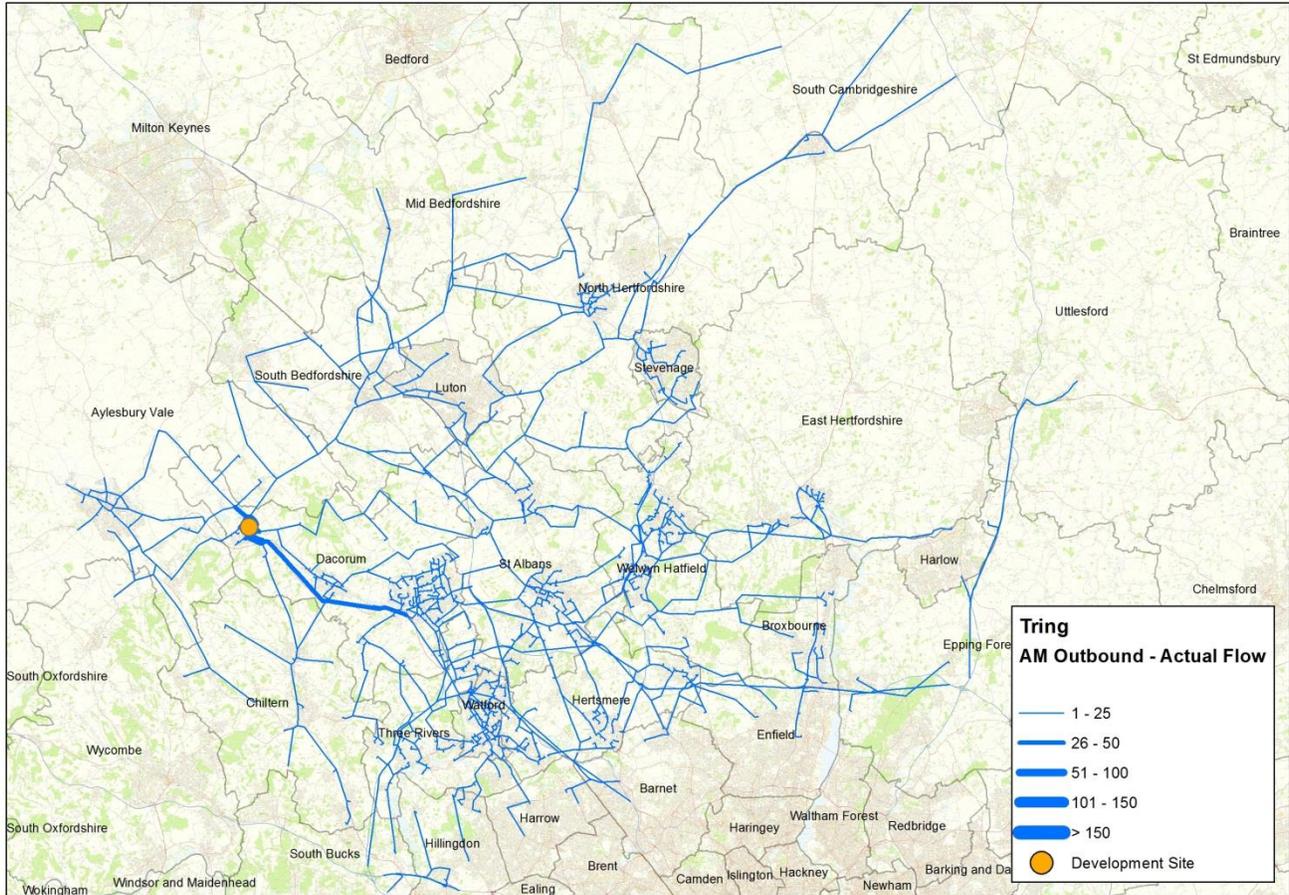


Figure 46: Development flow analysis - AM Outbound from Tring Development

7.16. It is also noted there is some interaction with Aylesbury, but limited interaction with other destinations further west. Whilst the A41 is a key route used to travel eastbound, it is also noted that a lot of cross country routes are used away from the traditional trunk roads and motorways.

7.17. Figure 47 highlights the strong interaction with the A41 and also suggests a number of local trips around the immediate area in Tring. The interaction with destinations in Hemel Hempstead can also be seen. There are also flows along the new northern distributor road across north Hemel Hempstead.

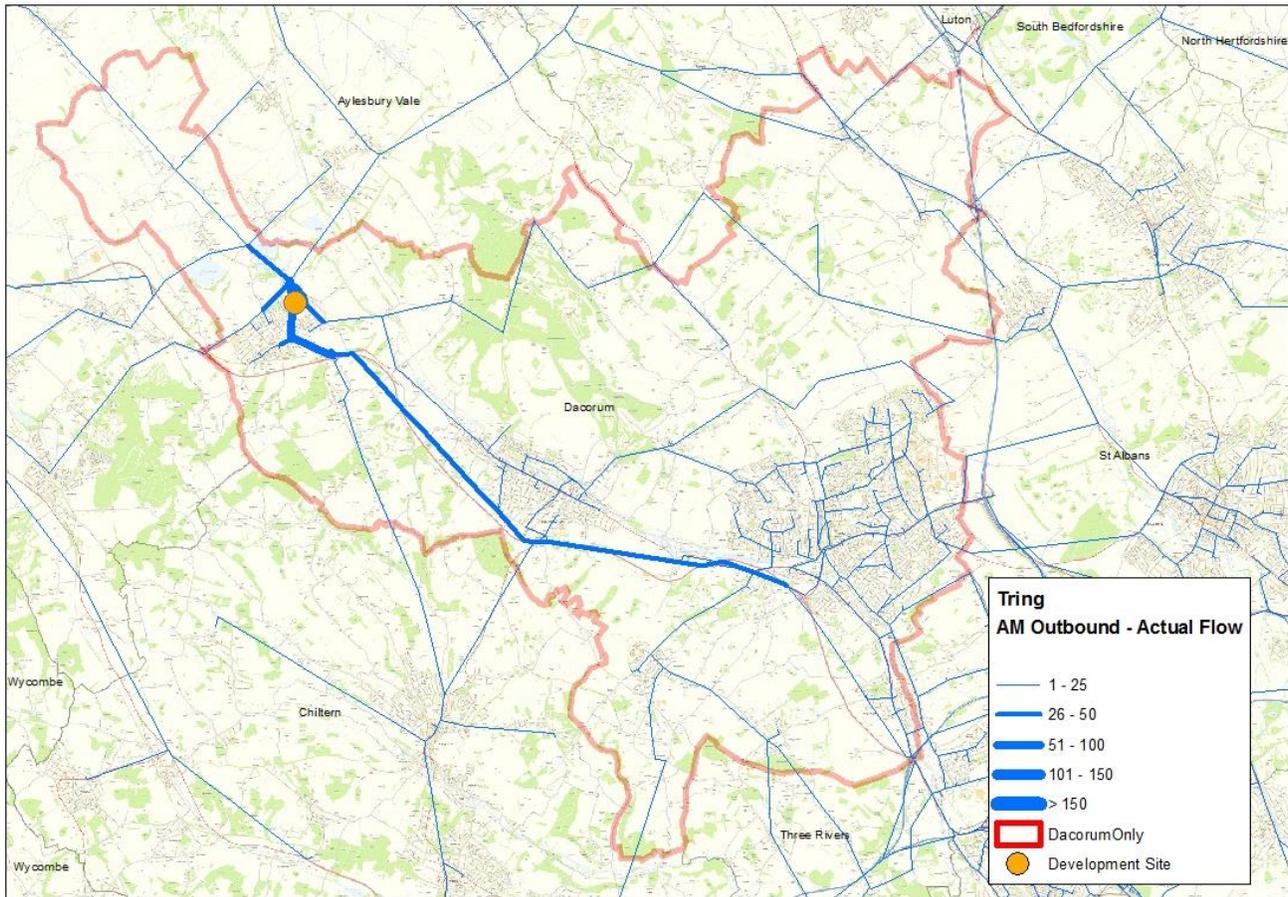


Figure 47: Development flow analysis - AM outbound from Tring Development (Dacorum Focus)

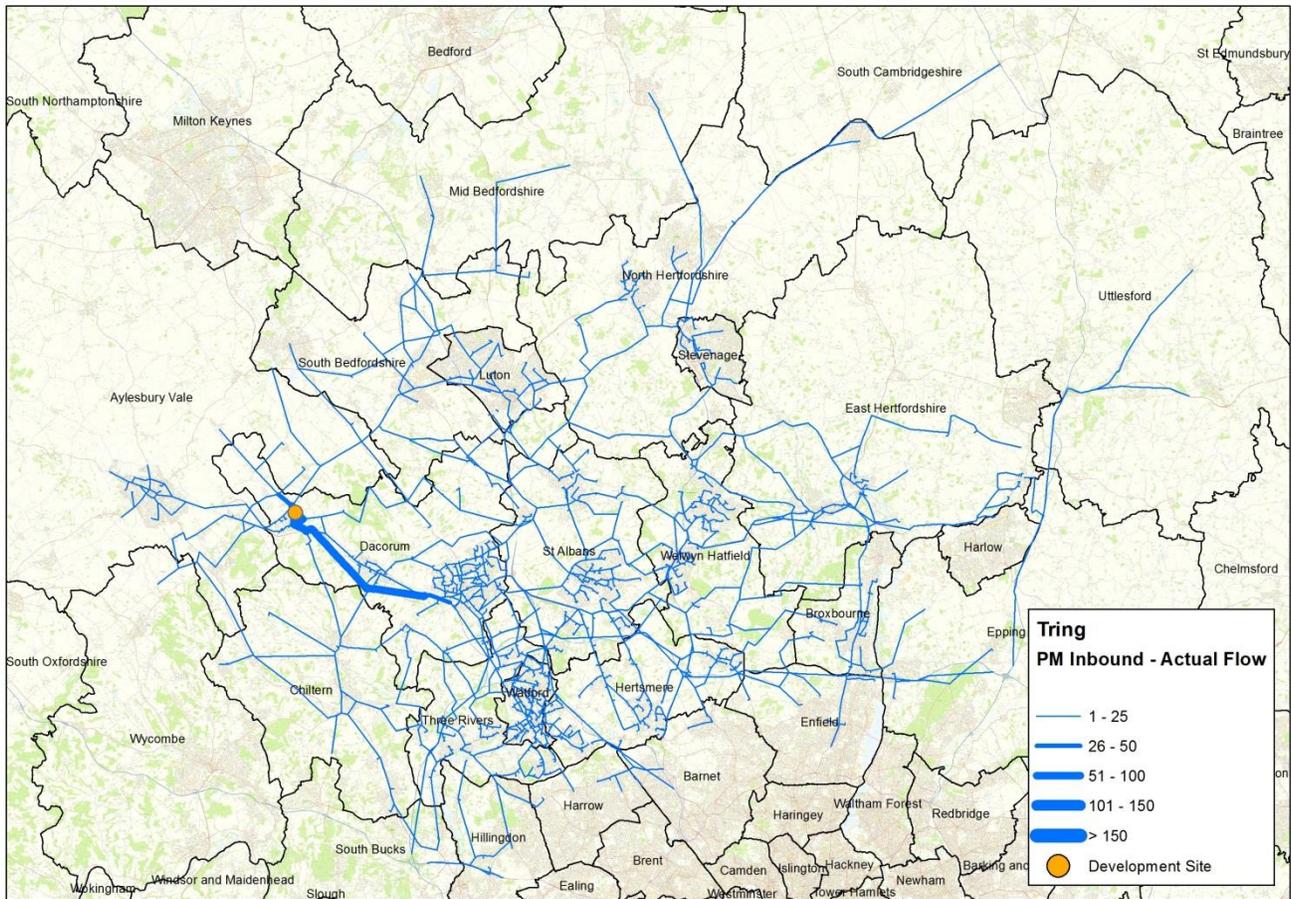


Figure 48: Development flow analysis – PM Inbound to Tring Development

7.18. Figure 48 highlights the trips to the Tring development in the PM peak. It can be observed that similar to AM outbound trips, there is a wide dispersion across Hertfordshire. Flows to this site originate from Watford, Hemel Hempstead, St Albans, Welwyn and Hatfield. There are also flows originating from north London boroughs and Aylesbury Vale/Bedfordshire outside Hertfordshire.

7.19. Figure 49 highlights the trips to the Tring development in the PM peak focusing on the Dacorum area. Similar to the AM results, the figure highlights the importance of the A41 for inbound trips through Dacorum. Strong links towards Hemel Hempstead and St Albans can also be seen.

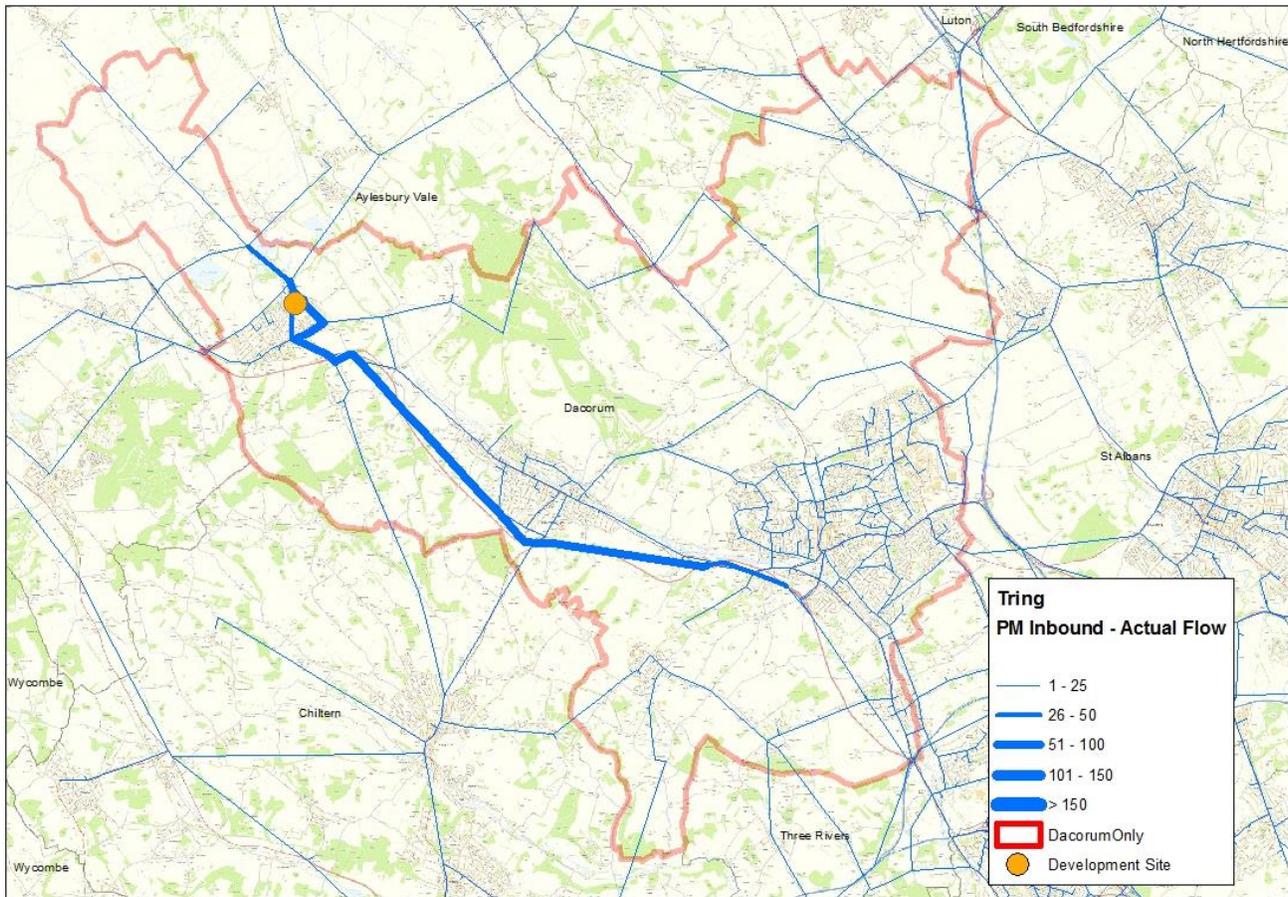


Figure 49: Development flow analysis – PM Inbound to Tring Development (Dacorum Focus)

8. Conclusions and Next Steps

- 8.1. The 2036 Dacorum Local Plan Scenario has indicated that Dacorum's highway network will suffer from delays and congestion in forecast year scenarios. Although it is acknowledged the scenario tested is one of many under consideration, the level of growth modelled highlights that major congestion issues will occur around the M25 motorway and in around Hemel Hempstead. The increased levels of congestion highlight that public transport and alternative transport modes should be promoted to help limit the impacts of the proposed growth.
- 8.2. Even though results are indicative at this stage as only Dacorum generates 2036 levels of demand, it is acknowledged that traffic conditions are aided by the various transport schemes proposed across the district and especially those proposed around M1 junction 8 and Maylands Business Park in Hemel Hempstead.
- 8.3. The flow of traffic around Hemel Hempstead and from / to Berkhamsted is also greatly impacted by the new distributor road through the North Hemel Development. This provides an alternative route to and from the M1 and relieves the reliance on the A414 through central Hemel Hempstead.
- 8.4. The 2036 Dacorum Local Plan Scenario has also highlighted how most of the schemes proposed are linked to the Maylands Business Park area in Hemel Hempstead and congestion issues around the Plough Roundabout, town centre and Hemel Railway Station in the town remain. There are opportunities to integrate transport services across Dacorum and ensure areas of housing, employment and retail are fully linked by all transport modes. The schemes implemented also present an opportunity to introduce other transport modes across the district or reallocate road space to bus priority or walking/cycling measures.
- 8.5. Outside of Hemel Hempstead, the A41 provides a key arterial route through the district and although traffic volumes increase along it, delays are minimal except at junctions which is to be expected. The main issue occurs at the M25/A41 junction where delays reach critical levels. The modelling highlights this junction will become one of the most critical along the highway network.
- 8.6. Dacorum's position in relation to the strategic M1 and M25 motorways should also be considered. The 2036 Dacorum Local Plan Scenario indicates these motorways will be approaching saturation point which may generate rerouting and delays on Dacorum's network, especially when incidents occur.
- 8.7. Bus demand in the 2036 Dacorum Local Plan Scenario highlights how bus services still appear feasible and required in the major urban area of Hemel Hempstead, however they have limited demand in other areas of the district. Ensuring bus services integrate with employment hubs and the railway stations is key.
- 8.8. As detailed in Section 3, the caveats associated with this scenario should be considered fully.
- 8.9. Next steps to aid Dacorum's Local Plan could involve:
 - Uplifting all housing and employment demand in all other HCC districts to 2036 levels in the COMET model to ascertain the extra impact on Dacorum's transport network;
 - Modelling alternative planning scenarios using COMET;
 - Using the outputs of this scenario to inform more localised modelling of schemes in Hemel Hempstead using the Hemel Hempstead Paramics Microsimulation Model or localised junction modelling software;
 - Progressing the mitigation schemes assessed in Section 6 using the 2036 Dacorum Local Plan Scenario as an evidence base;
 - Assessing the interventions put forward in the emerging South West Hertfordshire Growth and Transport Plan (some of which have already been captured); and
 - Using the upcoming enhanced version of COMET (due for completion later in 2018) to assess scheme and development options proposed across Dacorum.