TRANSPORT FOR LONDON

Havering Strategic Modelling Review using LoHAM

Havering Strategic Modelling Technical Note

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LIST OF ABBREVIATIONS

Abbreviation	Definition
C	Capped
HAM	Highway Assignment Model
IP	Inter Peak
LBH	London Borough of Havering
LoHAM	London Highway Assignment Model
SATURN	Simulation and Assignment of Traffic in Urban Road Networks
TEMpro	Trip End Model Presentation Program
TfL	Transport for London
TLRN	Transport for London Road Network
V/C	Volume / Capacity
UC	Uncapped

1 Introduction

This note provides a high-level analysis of the network performance and changes between the base year 2016 and forecast years 2026, 2041 capped and 2041 uncapped LoHAM (London Highway Assignment Model). Although LoHAM is a London-wide strategic model, the analysis focuses on traffic issues in and around the London Borough of Havering.

LoHAM is a detailed highway assignment model developed by TfL which represents traffic flows and congestion across the whole of the Greater London area and extending beyond the M25 boundary. LoHAM is used to provide the means for assessing strategic infrastructure and development impacts across London.

The LoHAM model employs the SATURN (Simulation and Assignment of Traffic to Urban Road Networks) modelling software package which allows detailed modelling of congestion in urban areas. SATURN is a suite of flexible network analysis programs developed at the Institute for Transport Studies, University of Leeds and distributed by Atkins Limited since 1982.

The base year models, developed for AM and PM peak hours and an average Inter Peak hour, are fully calibrated representations of traffic flows and conditions across the modelled area. The models are calibrated to 2016 count data and traffic movements and validated to exacting standards against a large number of observed journey times for routes across the network. The 2016 models serve as basis for the development of 2026 and 2041 uncapped and capped forecast years (Reference Case) models with trip growth controlled to LTS (London Transport Study) trip levels, taking account of changes between base and forecast zonal level trip ends and the inclusion of all committed and funded highway schemes.

The analysis of the strategic highway modelling presented here was undertaken by the Streets Analysis team within TfL City Planning on behalf of the London Borough of Havering. The overall objective was to provide information about the network-based plots which show distributions of traffic growth and the locations of major delays across Havering, in particular for the major A12 and A127 trunk roads and the A13 in the south of the borough.

This note describes the analysis of the base year 2016 and forecast years 2026, 2041 (capped and uncapped demand) for AM, Inter Peak and PM peak periods.

The M25 JN 25 and JN 28 proposed schemes are included in the modelling from 2026 onwards. The Lower Thames Crossing DCO scheme is not included in any of the modelling as it is not yet a fully confirmed scheme.

2 LoHAM Background: Demand Growth

2.1 Reference Case Demand matrices were developed using the CHAMP (Cube to HAM Process) process to apply, at zone level, changes in LTS 7.2 demand between the 2016 Base Year and the relevant Reference case years (2026, 2041 uncapped and 2041 capped). CHAMP is a calculation process which derives the incremental demand growth between the LTS base and forecast year. CHAMP then applies this incremental growth to the LoHAM base year to create a LoHAM forecast model. The LTS matrices included specific major developments but control of trip totals was applied to wider areas. The 2016 demand matrices were used to pivot from and corresponding to each of the periods.

LTS used the population, household and employment data from the London Plan: the hybrid borough-level projections for the GLA area, produced by the GLA. For the Annulus (the area between GLA boundaries and M25) and External (mostly outside the M25) areas, population, household and employment data was based on Department of Transport projections in TEMPRO 7.2.

In the 2031and 2041 trip matrices there is a large amount of origin growth located in Barking and Dagenham in the relatively small area, stretching across the northern Thames riverside corridor between Tower Hamlets, Newham and Barking and Dagenham. This growth pattern is closely aligned with the LTS population and employment growth forecasts for 2016-2041. From model runs it is apparent that there is too little network supply to support this level of development growth. The levels of delay escalate quickly in the 2031 and 2041 networks, with some feeder links showing over-capacity delays of around 1 hour (3600s). This level of delay is considered to be unrealistic, therefore an option of capping the trips in the vicinity of Barking and Dagenham with exceptionally high growth rates to 2026 levels has been used to produce an alternative set of 2031 and 2041 matrices. It is recommended that scenarios using these capped matrices be used to provide an alternative sensitivity test RC model, which can then be used as the reference case inputs for further studies on a project by project basis depending on how close the schemes under investigation are to Barking Riverside.

2.2 Matrices are defined in Passenger Car Units (PCU) and are equivalent to one car. The matrices are one-hour demand flow and formed the basis for the development of the Reference Case demand matrices for the following time periods:

- AM Peak (8:00-09:00)
- Inter Peak (10:00-16:00 average hour)
- PM Peak (17:00-18:00)

2.3 The model has six user classes factored to PCUs as follows:

1. Car (In Work Time) – PCU Factor 1
2. Car (Out of Work Time) – PCU Factor 1
3. Private Hire Vehicles (PHV) – PCU Factor 1
4. Taxi – PCU Factor 1
5. Light Goods Vehicles (LGV) – PCU Factor 1
6. Other Goods Vehicles (OGV) – PCU Factor 2.3

A PCU Factor of 2.3 is also applied to buses.

2.4 Table 1 below shows the total trip origins and destinations in Havering between 2016 and 2026 Reference Case year for AM peak, IP and PM peak periods. Growth in the totals of trip origins and destinations average between 2.6% and 7.6% by time period, with growth in the AM peak higher for trip origins (7.6%) and Inter Peak higher for trip destinations (5.2%) than in the two other peak periods. Table 2 below shows the total trip origins and destinations in Havering between 2016 and 2041 uncapped Reference Case year for AM peak, Inter Peak and PM peak. Growth in the totals of trip origins and destinations average between 4.4% and 6.9% by time period, with growth in the AM Peak higher for trip origins (6.7%) and Inter Peak higher for trip destinations (6.9%) than in the two peak periods. Table 3 below shows the total trip origins and destinations in Havering between 2016 and 2041 capped Reference Case year for AM, IP and PM. Growth in the totals of trip origins and destinations average between 3.9% and 6.7% by time period, with growth in the AM Peak higher for trip origins (6.5%) and Inter Peak higher for trip destinations (6.7%) than in the two peak periods.

Table 1: Origin/Destination in Havering 2016/2026

	Origin				Destination			
	2016	2026	Diff	%diff	2016	2026	Diff	%diff
AM	27,547	29,738	2191	7.6	25,792	27,017	1226	4.6
IP	22,421	23,409	988	4.3	21,695	22,873	1179	5.2
PM	27,408	28,133	725	2.6	27.761	28,905	1144	4.0

Table 2: Origin/ Destination in Havering 2016/2041 uncapped

	Origin				Destination			
	2016	2041 uncapped	Diff	%diff	2016	2041 uncapped	Diff	%diff
AM	27,547	29,478	1930	6.7	25,792	27,099	1308	4.9
IP	22,421	23,837	1416	6.1	21,695	23,251	1557	6.9
PM	27,408	28,642	1233	4.4	27,761	29,335	1574	5.5

Table 3: Origin/ Destination in Havering 2016/2041 capped

	Origin				Destination			
	2016	2041 capped	Diff	%diff	2016	2041 capped	Diff	%diff
AM	27,547	29,412	1865	6.5	25,792	26,902	1110	4.2
IP	22,421	23,719	1298	5.6	21,695	23,155	1460	6.7
PM	27,408	28,498	1090	3.9	27.761	29,254	1494	5.2

The heat maps show in Figures 2.1 to 2.12 show information on origin and destination trip-end growth for the base year against each of the reference case forecast years. The growth within the centre of Havering is relatively unchanged with the largest changes happening in the South of Havering, likely related to the high growth in the Barking Riverside development. Additionally, to the South-East of Havering, there is another growth hot-spot which is attributed to the M25 Dartford Crossing.

Figure 2.1 Trip End Changes by LoHAM zone: AM Peak Origins 2016 to 2026

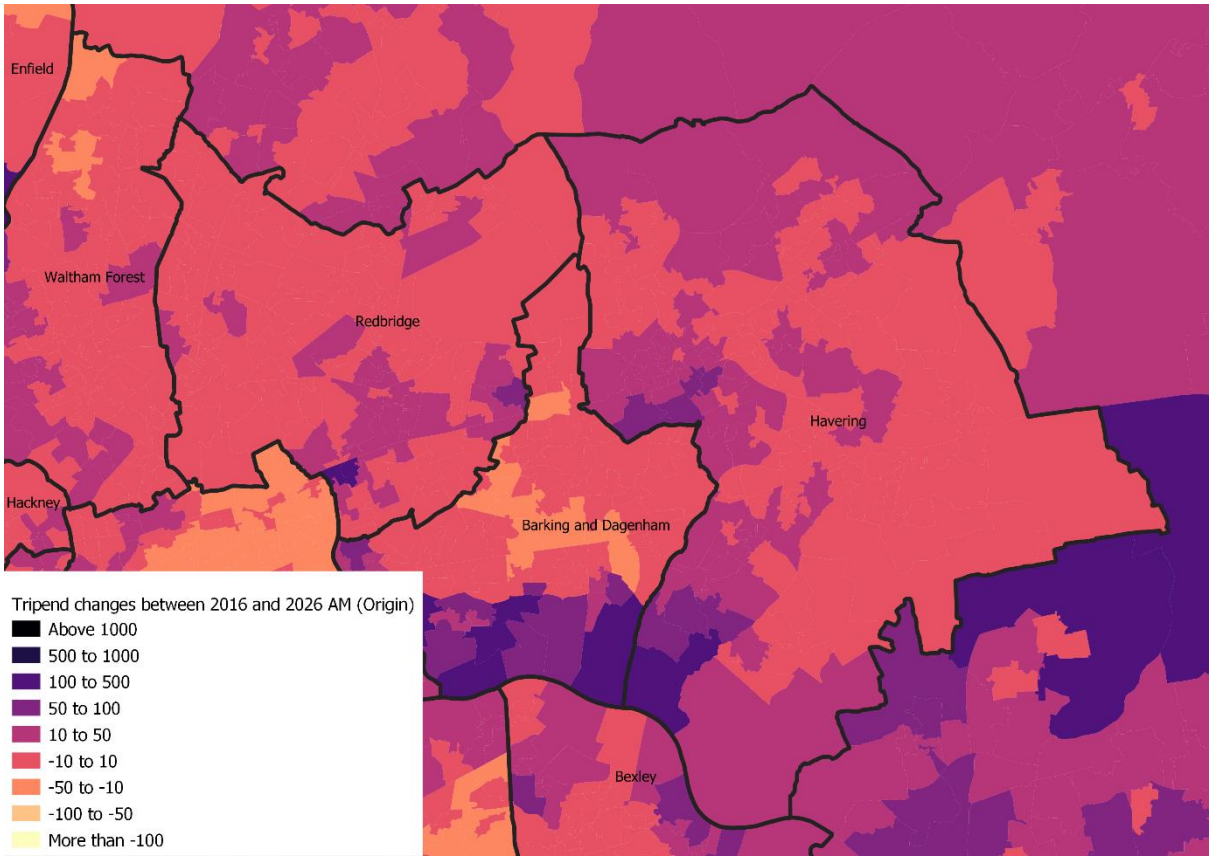


Figure 2.2 Trip End Changes by LoHAM zone: AM Peak Destination 2016 to 2026

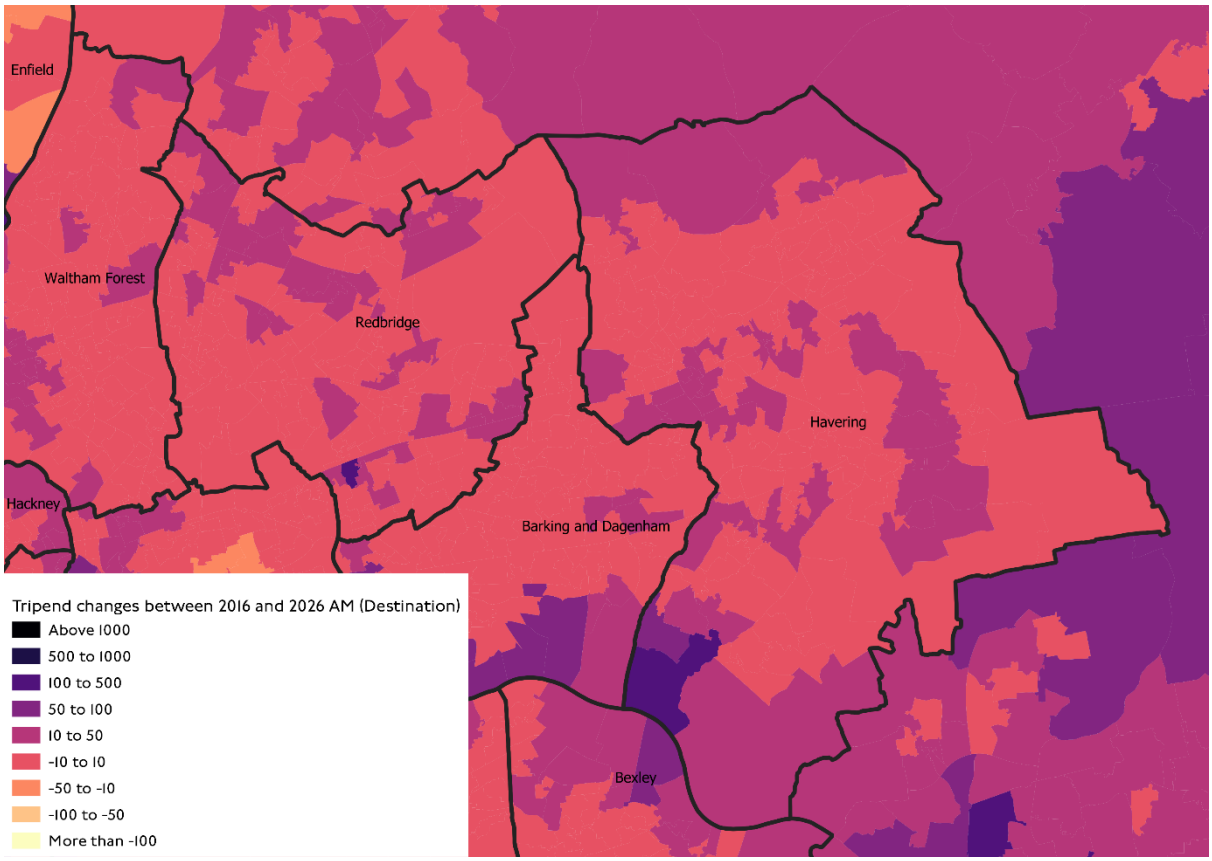


Figure 2.3 Trip End Changes by LoHAM zone: IP Origins 2016 to 2026

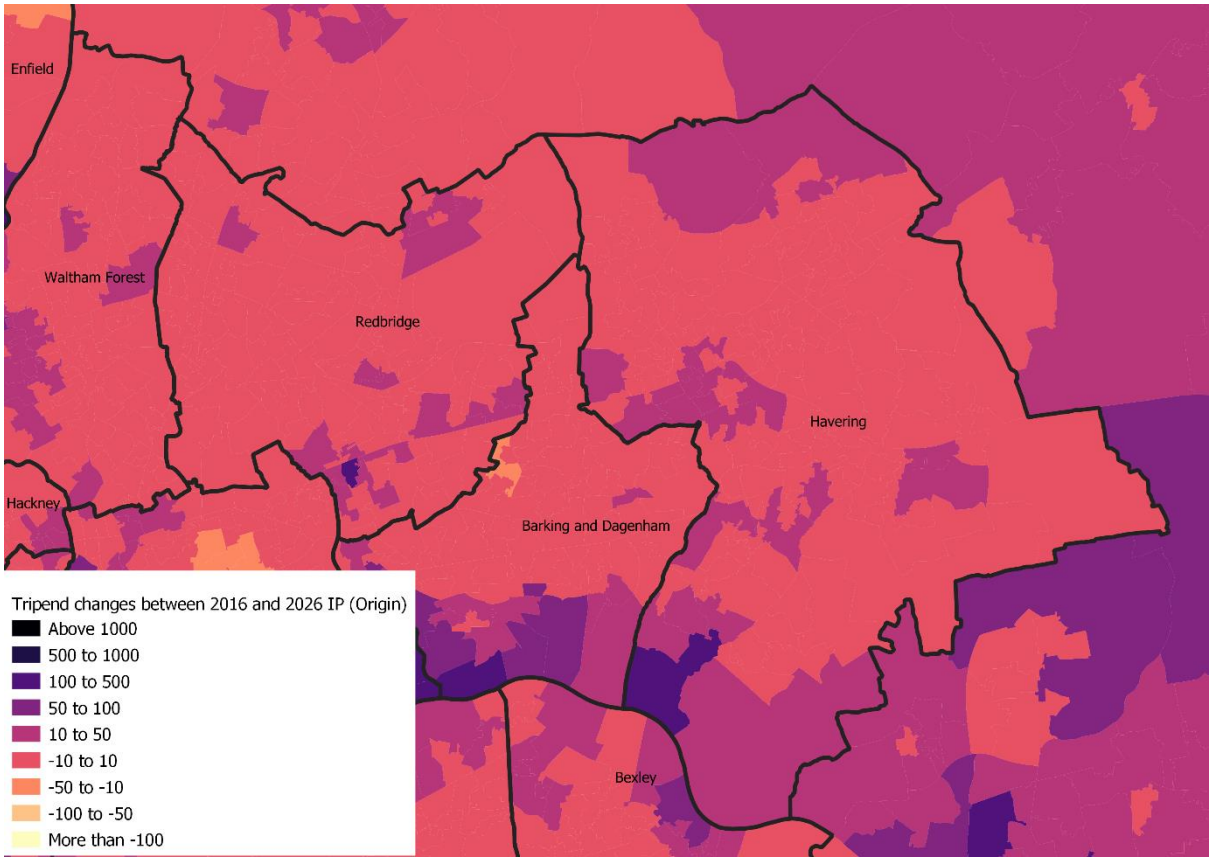


Figure 2.4 Trip End Changes by LoHAM zone: IP Destinations 2016 to 2026

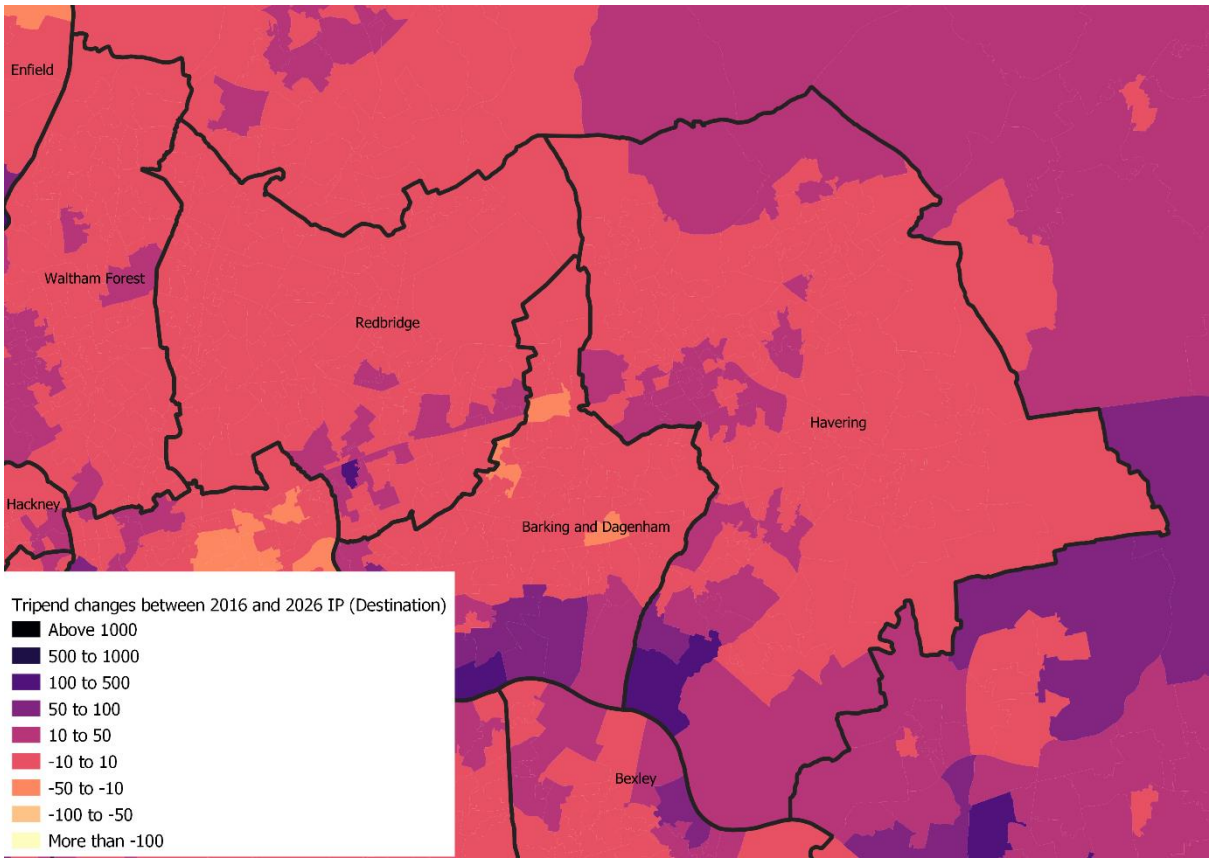


Figure 2.5 Trip End Changes by LoHAM zone: PM Peak Origins 2016 to 2026

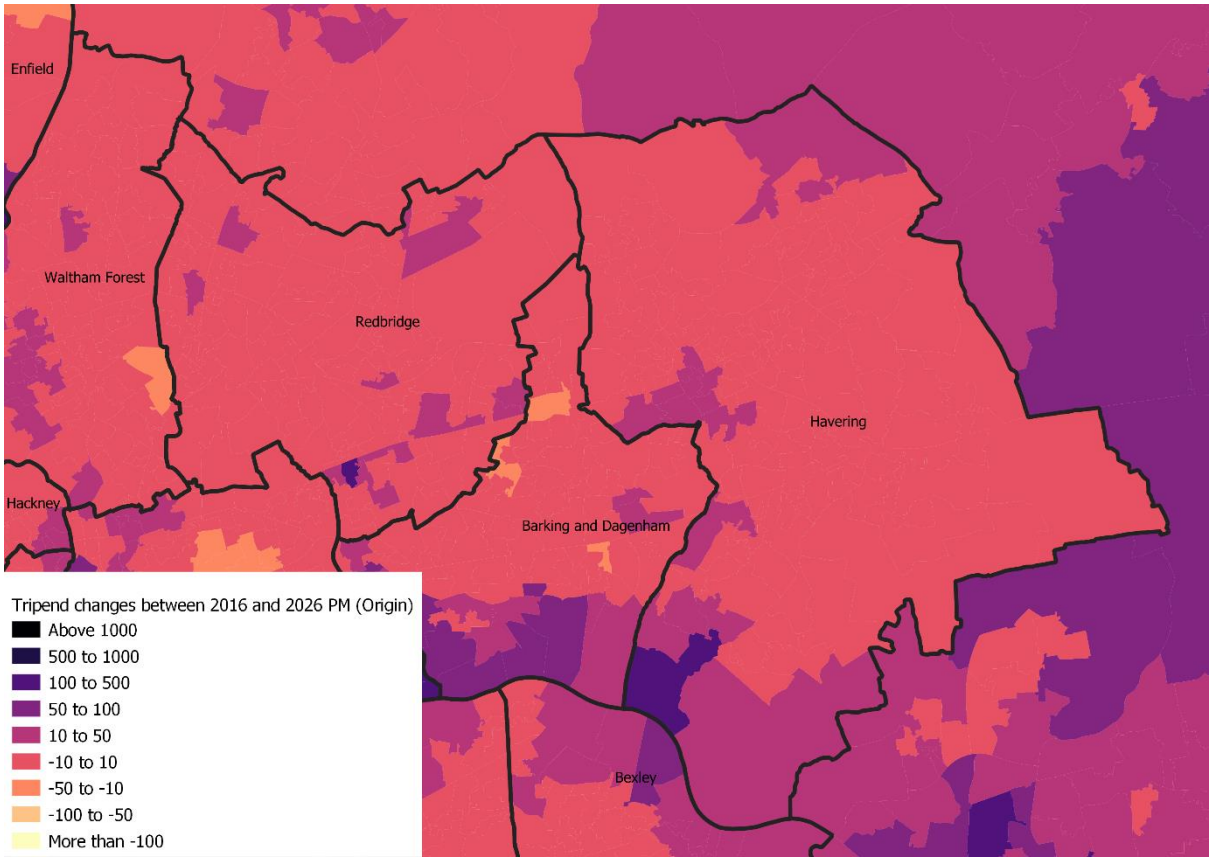


Figure 2.6 Trip End Changes by LoHAM zone: PM Peak Dest. 2016 to 2026

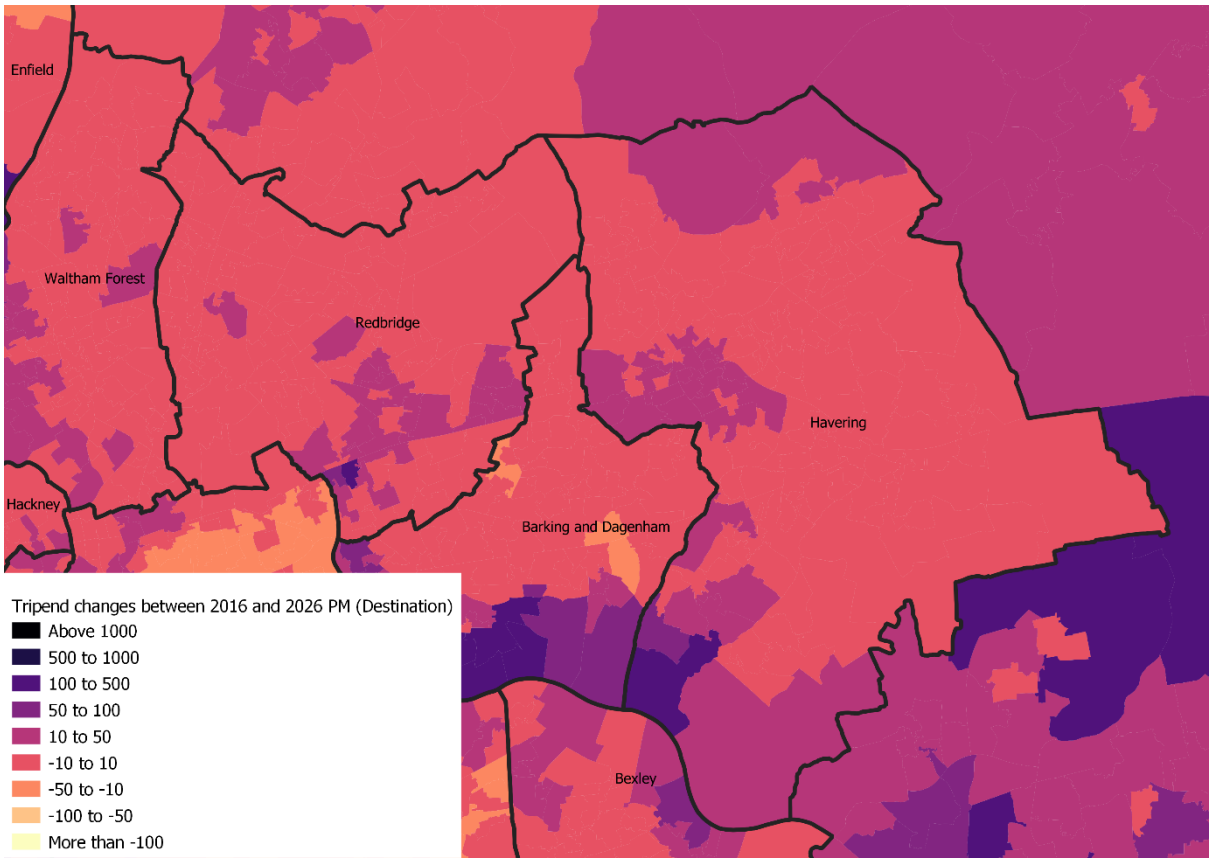


Figure 2.7 Trip End Changes by LoHAM zone: AM Peak Origins 2016 to 2041(UC)

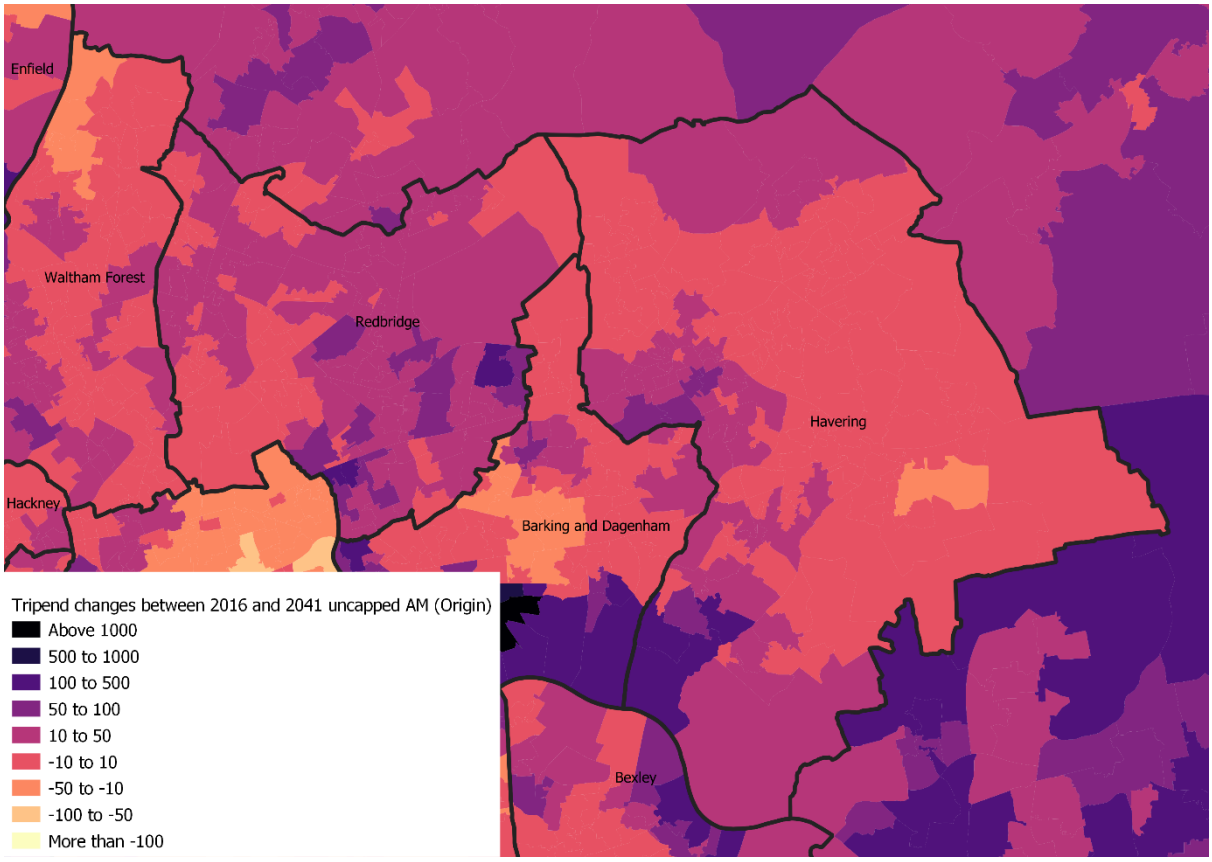


Figure 2.8 Trip End Changes by LoHAM zone: AM Peak Dest. 2016 to 2041 (UC)

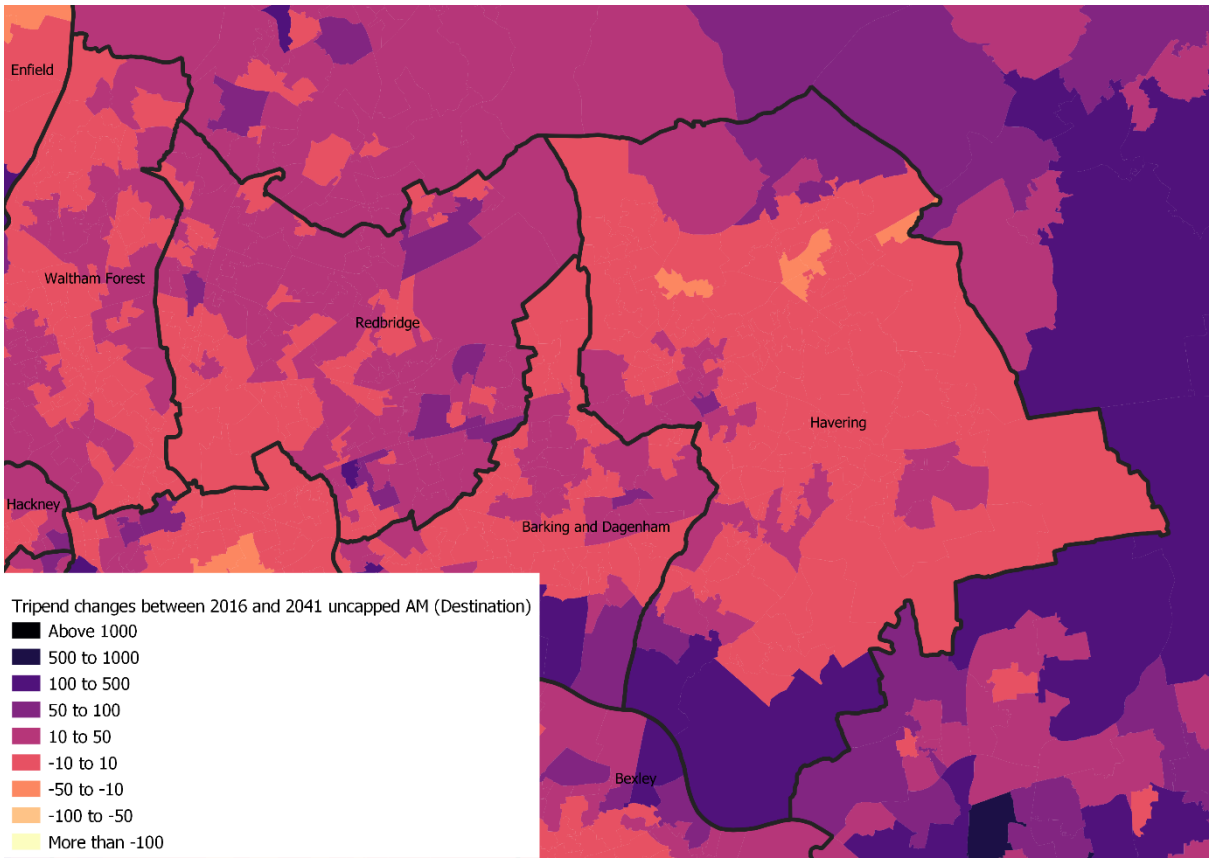


Figure 2.3 Trip End Changes by LoHAM zone: IP Origins 2016 to 2041 (UC)

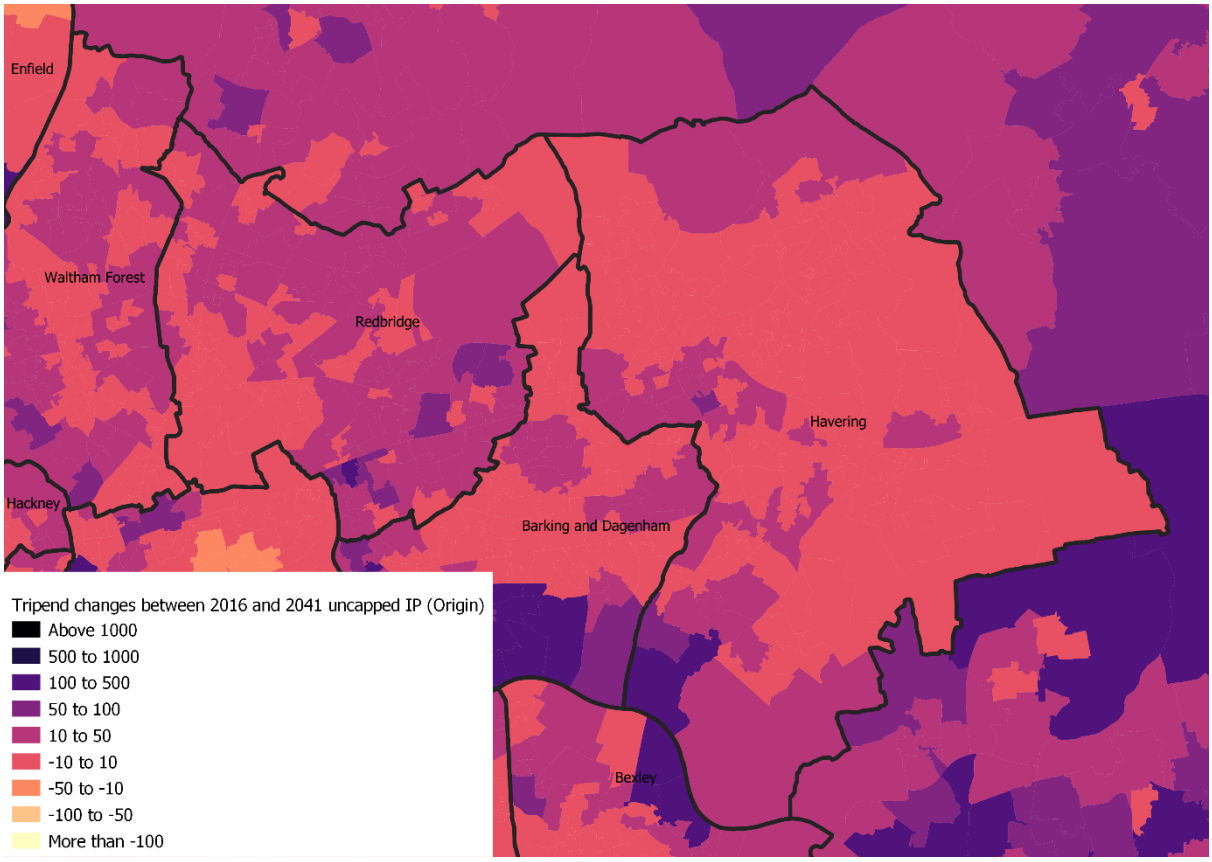


Figure 2.4 Trip End Changes by LoHAM zone: IP Dest. 2016 to 2041 (UC)

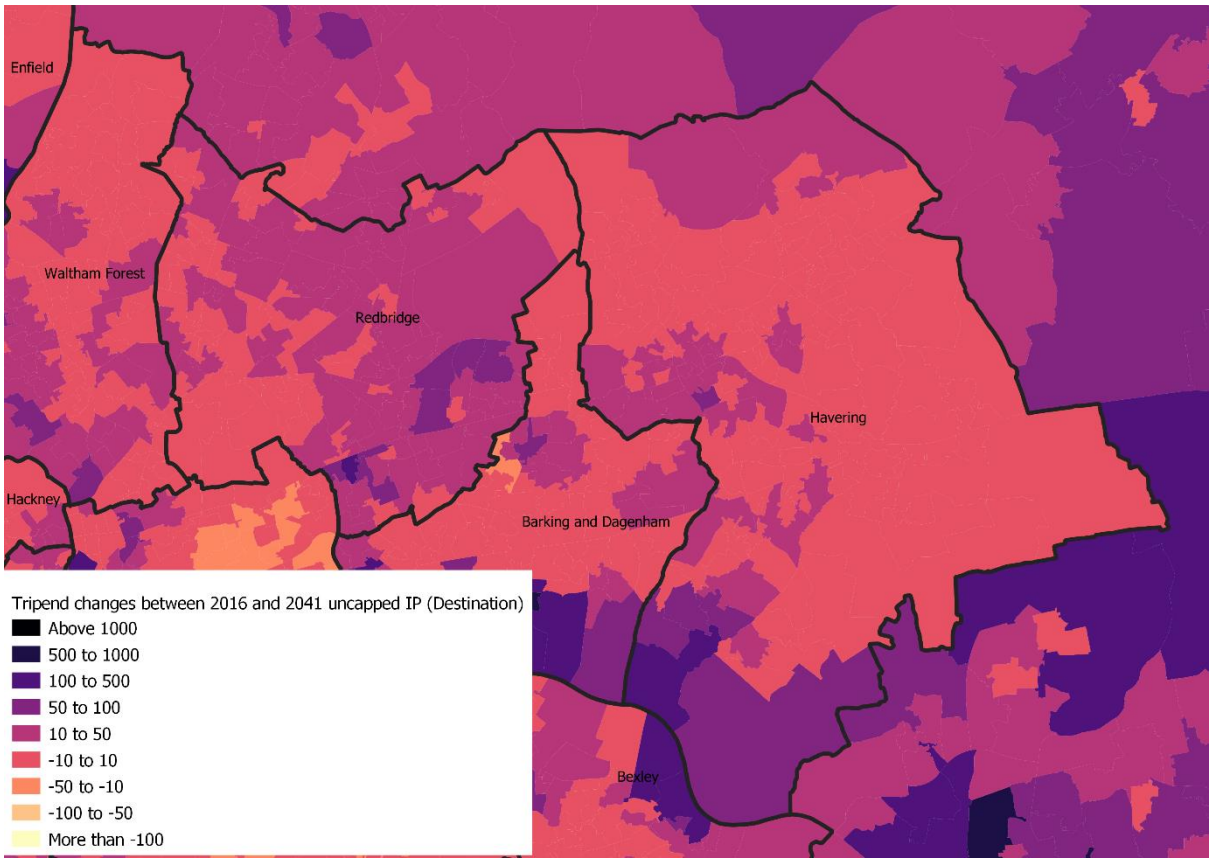


Figure 2.5 Trip End Changes by LoHAM zone: PM Peak Origins 2016 to 2041 (UC)

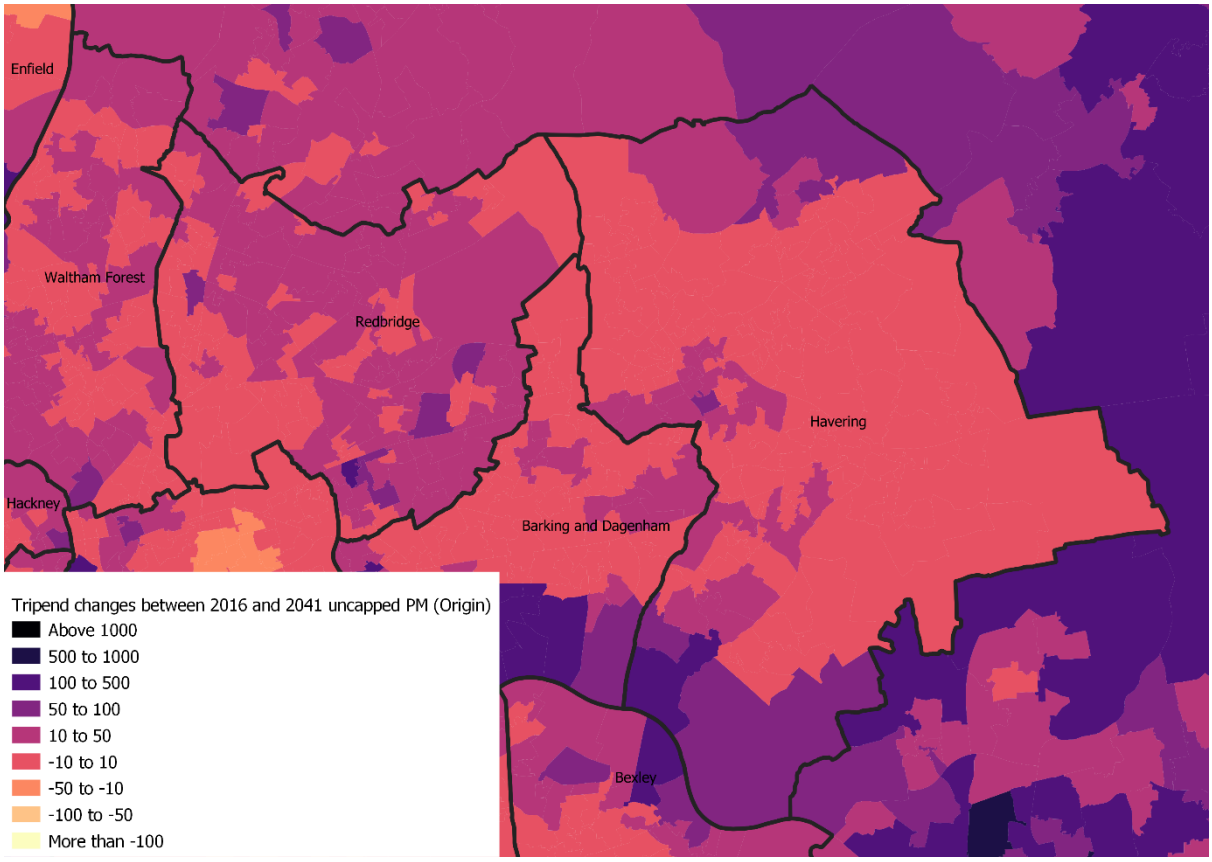


Figure 2.6 Trip End Changes by LoHAM zone: PM Peak Dest. 2016 to 2041 (UC)

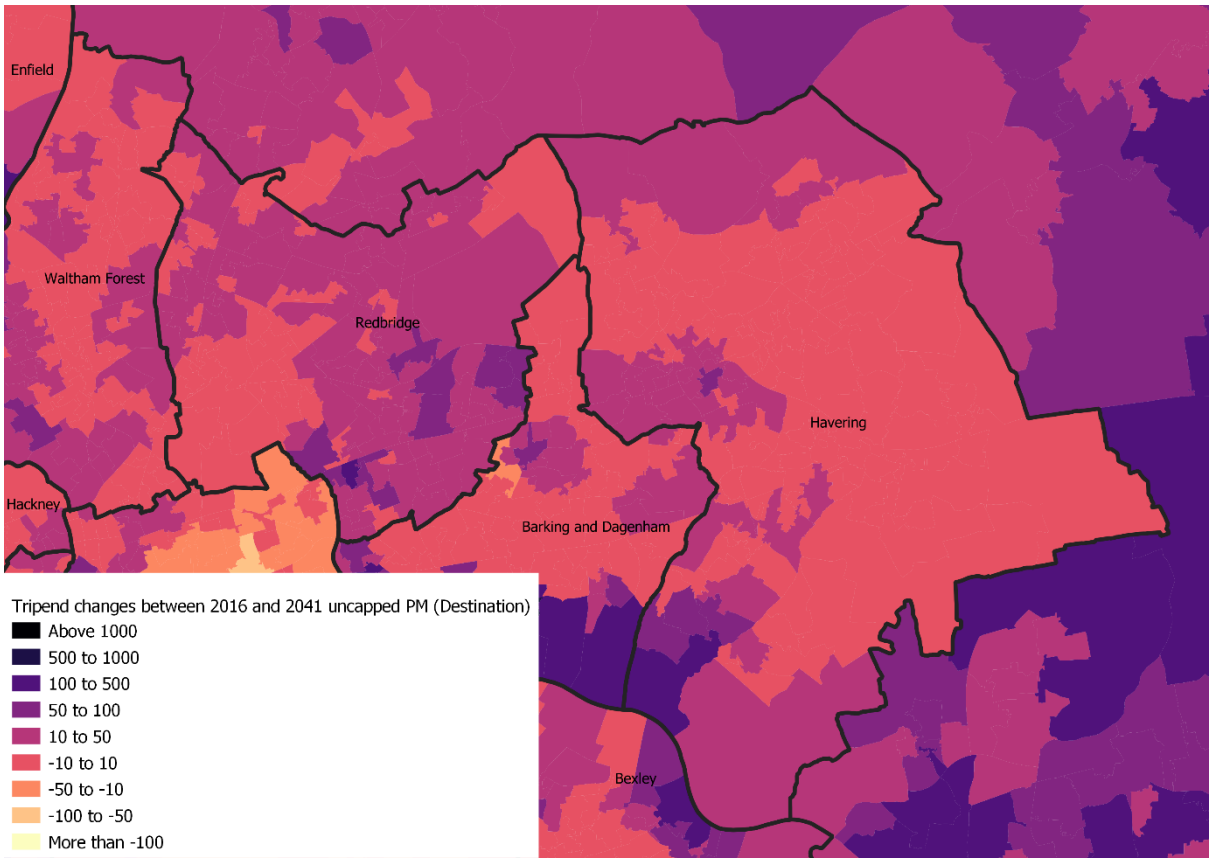


Figure 2.7 Trip End Changes by LoHAM zone: AM Peak Origins 2016 to 2041 (C)

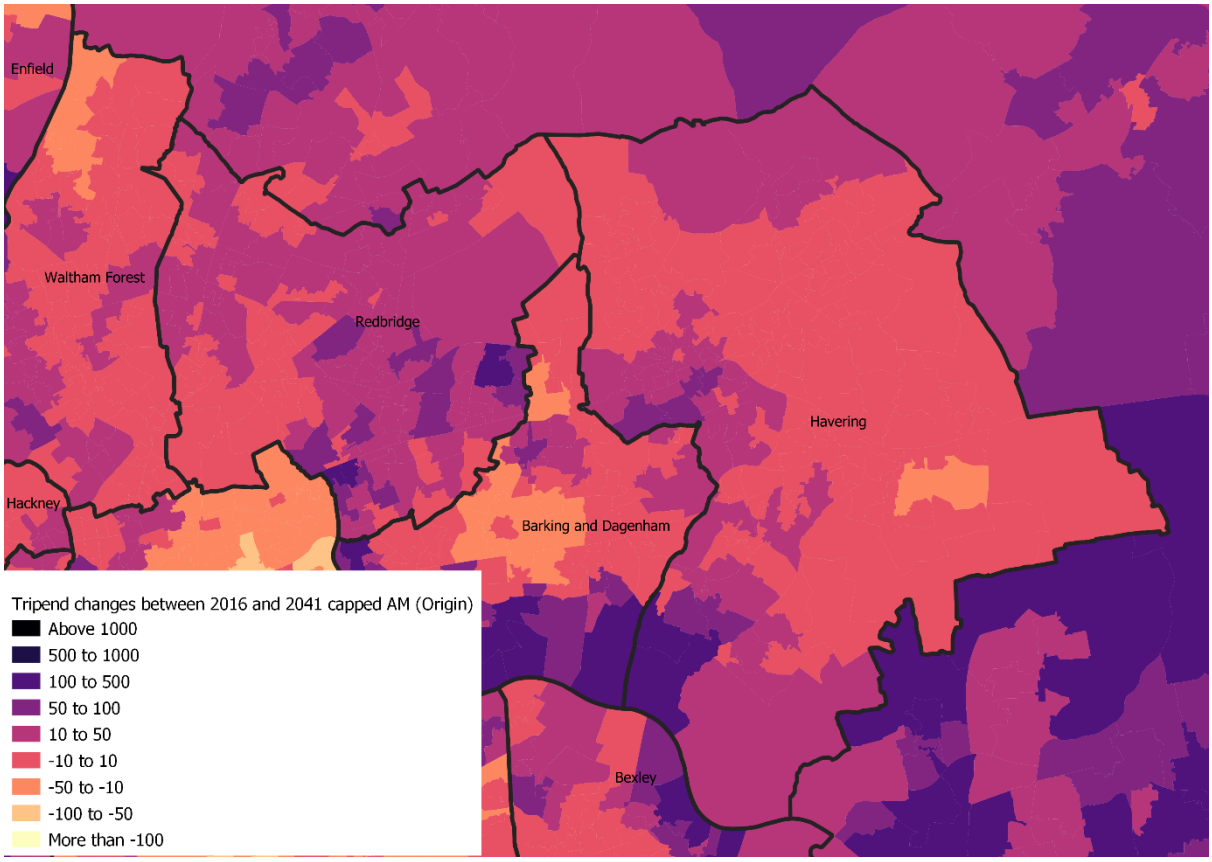


Figure 2.8 Trip End Changes by LoHAM zone: AM Peak Dest. 2016 to 2041 (C)

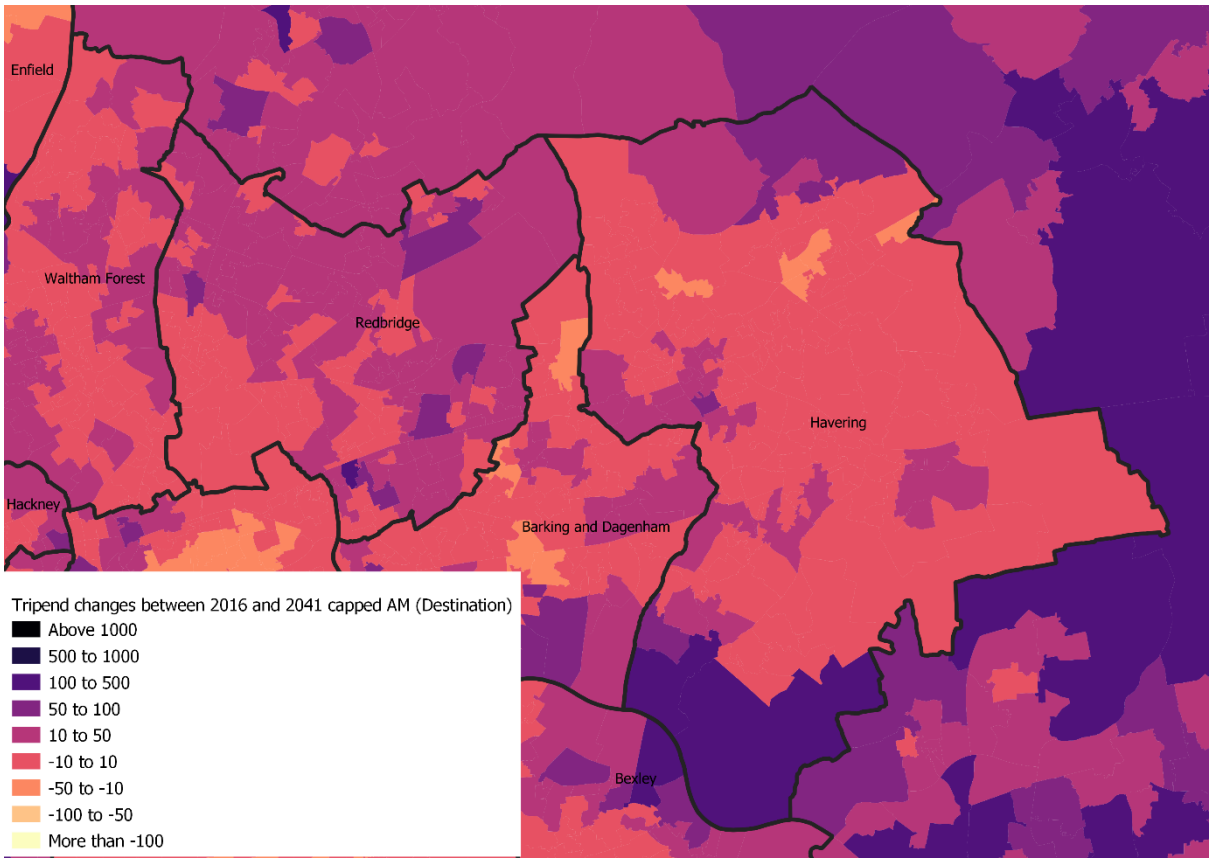


Figure 2.9 Trip End Changes by LoHAM zone: IP Origins 2016 to 2041 (C)

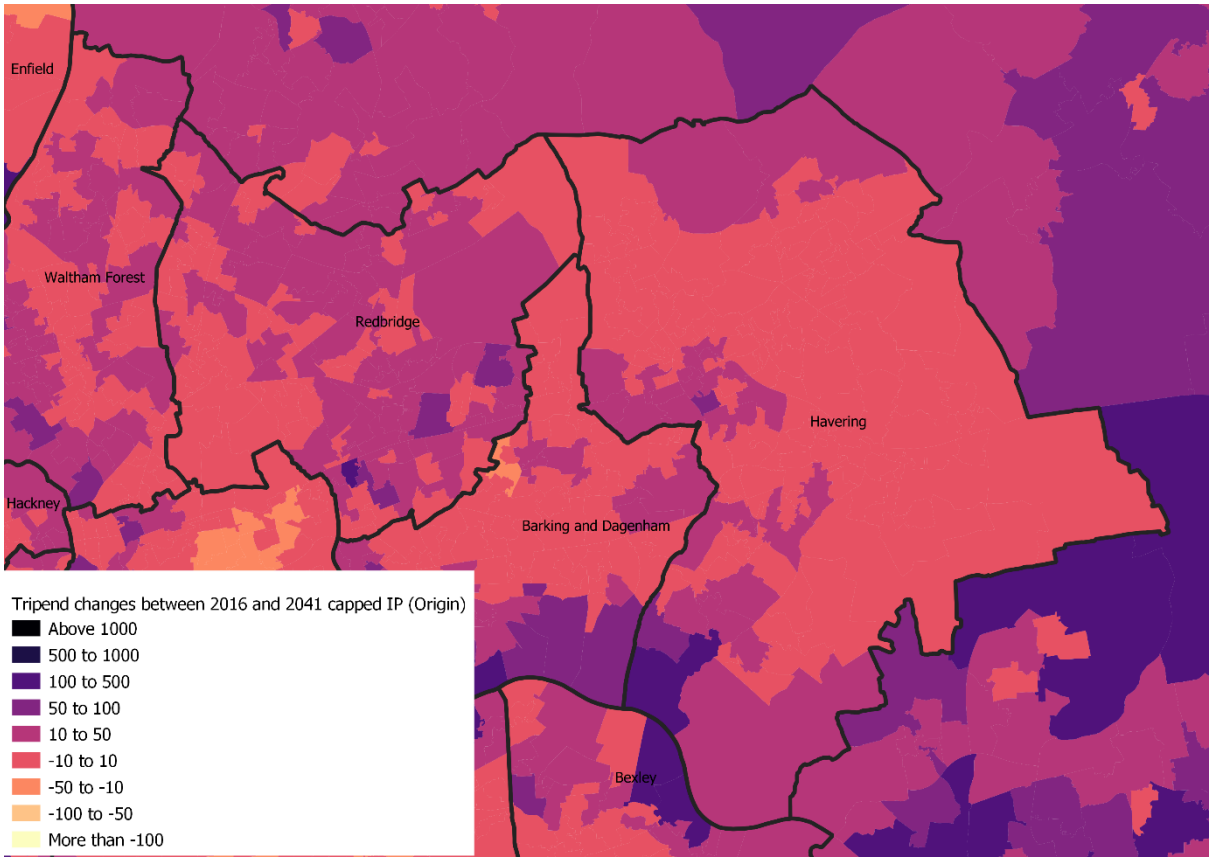


Figure 2.10 Trip End Changes by LoHAM zone: IP Dest. 2016 to 2041 (C)

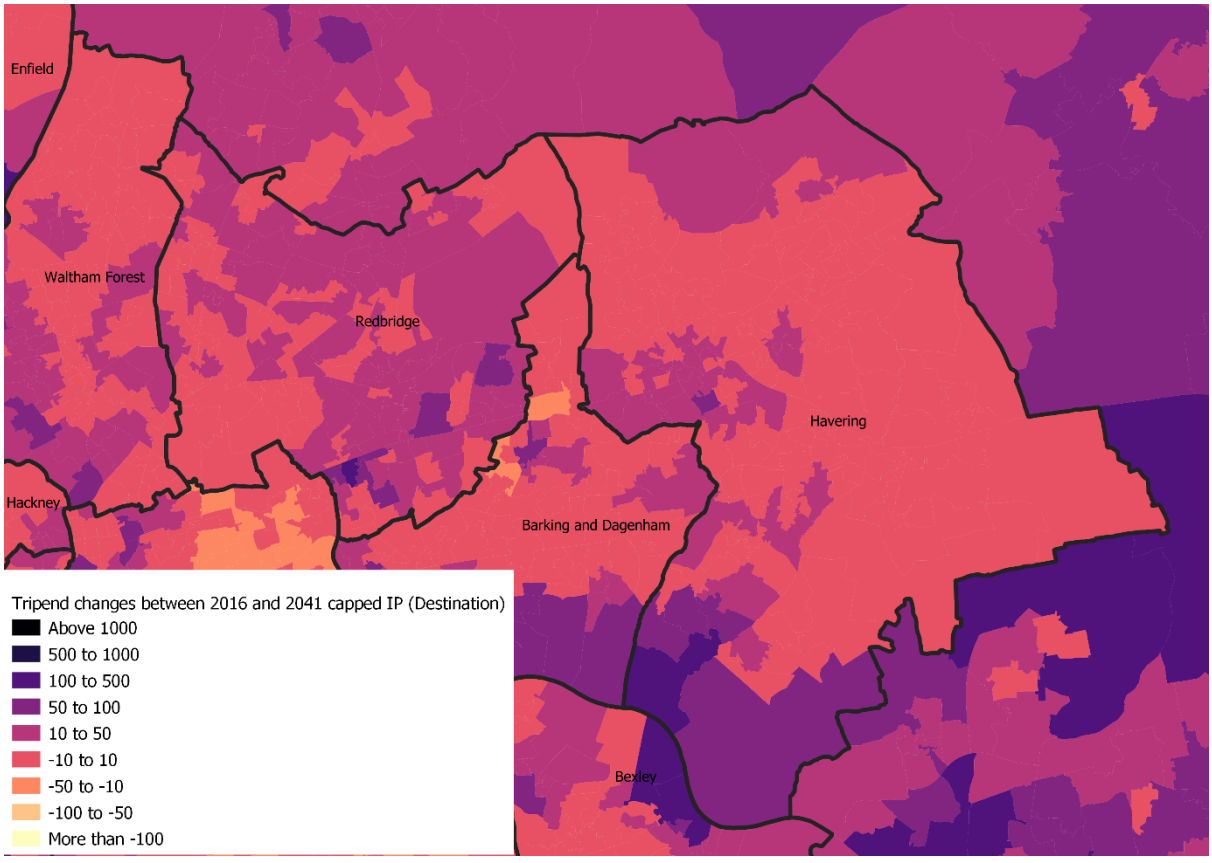


Figure 2.11 Trip End Changes by LoHAM zone: PM Peak Origins 2016 to 2041 (C)

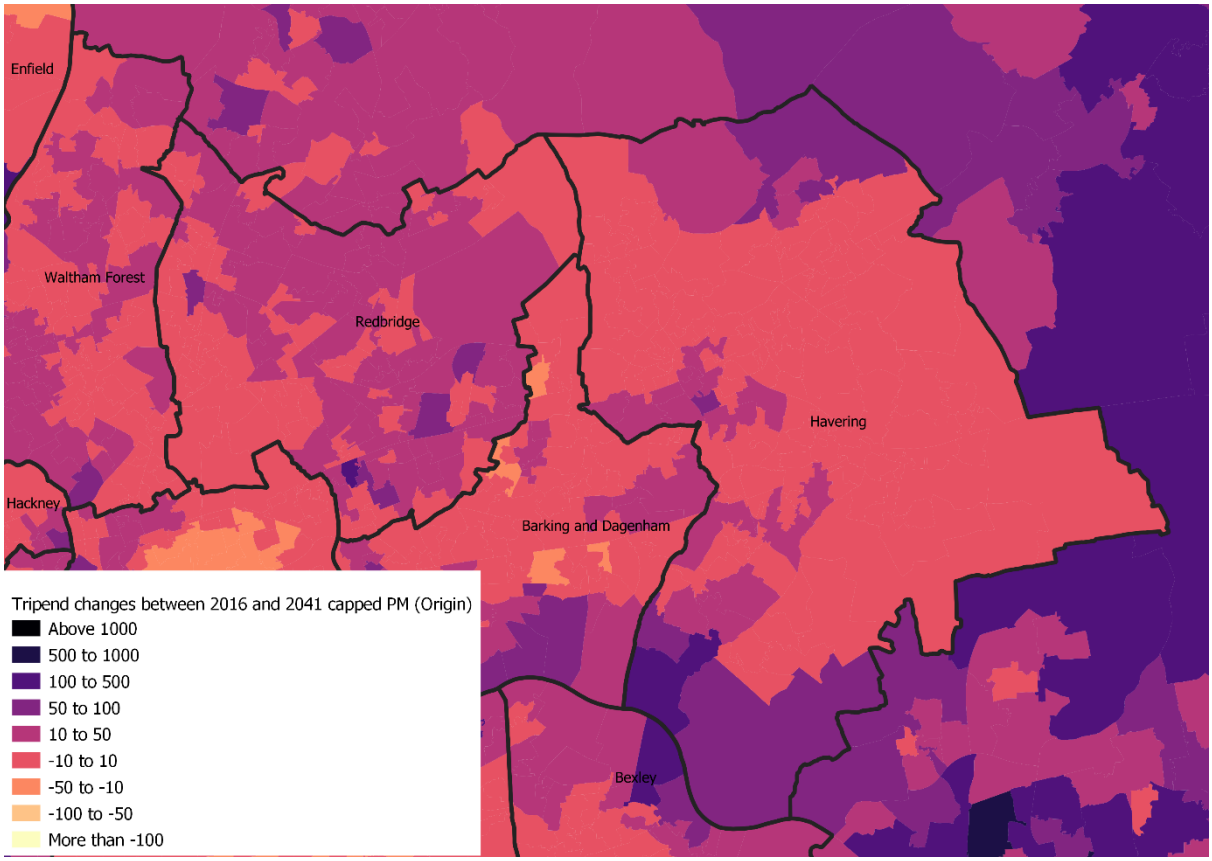
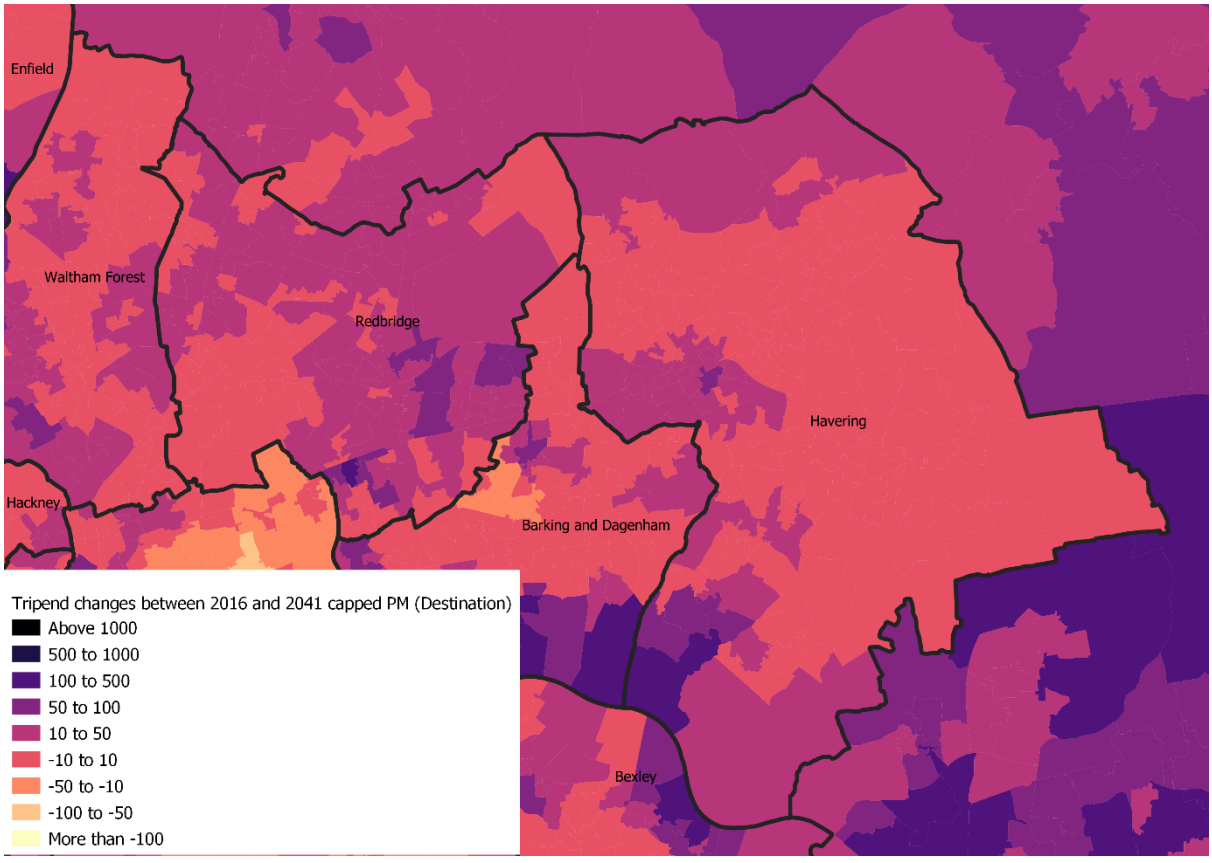


Figure 2.12 Trip End Changes by LoHAM zone: PM Peak Dest. 2016 to 2041 (C)



3 Traffic Flow Growth and Comparisons

Figure 3.1 to Figure 3.3 illustrate the change in actual flows (PCU/hour) for the AM, Inter peak and PM peak between the 2016 base year and reference case year 2026. Figures 3.4 to Figure 3.6 illustrate the change in actual flows (PCU/hour) for the AM, Inter peak and PM peak between the 2016 base year and reference case year 2041 uncapped. Figures 3.7 to 3.9 illustrate the change in actual flows (PCU/hour) for the AM, Inter peak and PM peak between the 2016 base year and reference case year 2041 capped.

The red bandwidths show an increase in traffic flows between the reference case year and the base year model, the blue bandwidths show a small or no change in traffic flows between the reference case year and the base year model and the green bandwidths show a decrease in traffic flows between the reference case year and the base year model.

The traffic growth is most evident in outer London, the M25 and principal outer London radial corridors. In all periods, there is a significant M25 growth of traffic that occurs between the junctions 27 to 30. The three principle roads in Havering are the A12, A127 and A13 all providing links from M25 towards central London. They all see increases in traffic flow across all time periods in 2026 but less so than compared to the 2041models. Junction 28 of the M25 Southbound sees a decrease in traffic travelling Eastbound on the A12 across all time periods and years. The increases in traffic flows in 2026 are typically between of typically between 4% and 10% across all time periods, A127/Hall Lane junction is seeing a 20% increase with traffic flowing towards the M25 in the 2026 differences across all time periods.

In the AM Peak 2041 uncapped differences, traffic on the A12 increases by 20% from Gallows Corner to the M25 J28, similarly it increases approximately 7% westbound. There is a 20% increase from Gallows Corner eastbound to Gubbins Lane, with a 15% increase westbound. Gallows Corner to Mawney Rd/A12 seeing a 2%-9% increase in traffic westbound, with a slight decrease between A12/North Street and Pettits Lane of 1%. The M25 between J27-J30 southbound see increases of approximately 15% and northbound only a 5% increase between J28 to J27 but a 15% increase between J30-J28 (increase between 300 and 1000 PCUs in absolute values).

The PM Peak 2041 uncapped differences follow a similar traffic flow pattern to the AM Peak. A127/Hall Lane has a 20% increase is traffic flow in both directions to/from the M25 J29. Southbouth on the A127 from Gallows Corner there is less than a 4% increase, and Northbound has a 2% increase. There is a decrease in traffic flow on the A13 eastbound of more than 5% to the M25 but nearly a 30% increase going westbound. Other main roads around Havering have a 2-10% increase overall in traffic flow.

For the AM peak 2041 capped differences, A12 traffic increases by 20% from Gallows Corner to M25 J28 (increase of more than 300 PCUs). There is an 8% increase in the westbound direction to Gubbins Lane/Gooshays Drive but a 15% increase westbound between Gubbins Lane to Gallows Corner. The A127/Hall Lane eastbound towards the M25 J29 see a 25% increase in traffic, westbound is less with a 15% increase. The M25

between J27-J30 in both directions see increases between 15-20%, with southbound seeing the greater increase in traffic (increase between 300 and 1000 PCUs). In Romford, the eastbound on the A1251 towards Thurloe Gardens see a 30% increase in traffic. Overall, the majority of roads in Havering see increases in both directions but these are less than 100 PCUs in absolute values. The A13 near Rainham Marshes eastbound towards M25 J30 sees an increase in traffic of 24% (more than 700 PCUs), westbound also sees increases of 9% (more than 400 PCUs). The A1306, a 45% increase eastbound towards the A13/M25 J30 (more than 400 PCUS), westbound towards Rainham sees only a 10% increase. Whilst these changes on the A13 do represent large percentage, some caution must be attached to their interpretation because of the location towards the edge of the simulation model and limited calibration in the area.

IP peak 2041 capped, nearly equal increase in traffic flows in both directions between Gallows Corner and M25 J28, between 10-17% (increase of more than 150 PCUs). The same trend continues from Gallows Corner to Mawney Rd/A12, with less than 10% increases in both directions. A127/Hall Lane, approximately 20% increase towards M25 J29 and a nearly 10% increase from J29 to westbound A127. The A127 to southbound Hall Lane an increase of 30% towards Upminster, while northbound on Hall Lane is an increase of only 5%. Increase of the M25 in both directions between 8 and 15% (increase between 500 and 1000 PCUs). The majority of non-major roads in Havering see increases in traffic, between 2 and 10%, but this translates to generally less than 100 PCUs in absolute terms.

In the PM peak 2041 capped differences, from Gallows Corner to Mawney Rd/A12, there is less an 10% increase in both directions. The same traffic flow pattern is seen from Gallows Corner to A127/Hall Lane, less than 10% increase in traffic flow in both directions. The A13 near Rainham Marshes sees nearly an inverse of traffic flows from the AM Peak, with a increase of 26% westbound (more than 800 PCUs) and less than 10% increase eastbound (more than 300 PCUs) towards the M25. The A1306 continues the same pattern as the AM Peak with an 35% increase in traffic eastbound towards the A13 (more than 300 PCUs). The A127/Hall Lane eastbound towards the M25 J29 see a 20% increase in traffic, westbound is less with a 15% increase. On the M25 J27 to J28 sees only a 4% increase in traffic southbound and 3% increase northbound (100-300 PCUs). J28 to J29 and J29 to J30 see greater increases of approximately 10% in both directions (400-650 PCUs).

Figure 3.1 2016 to 2026 AM Traffic Flow Changes

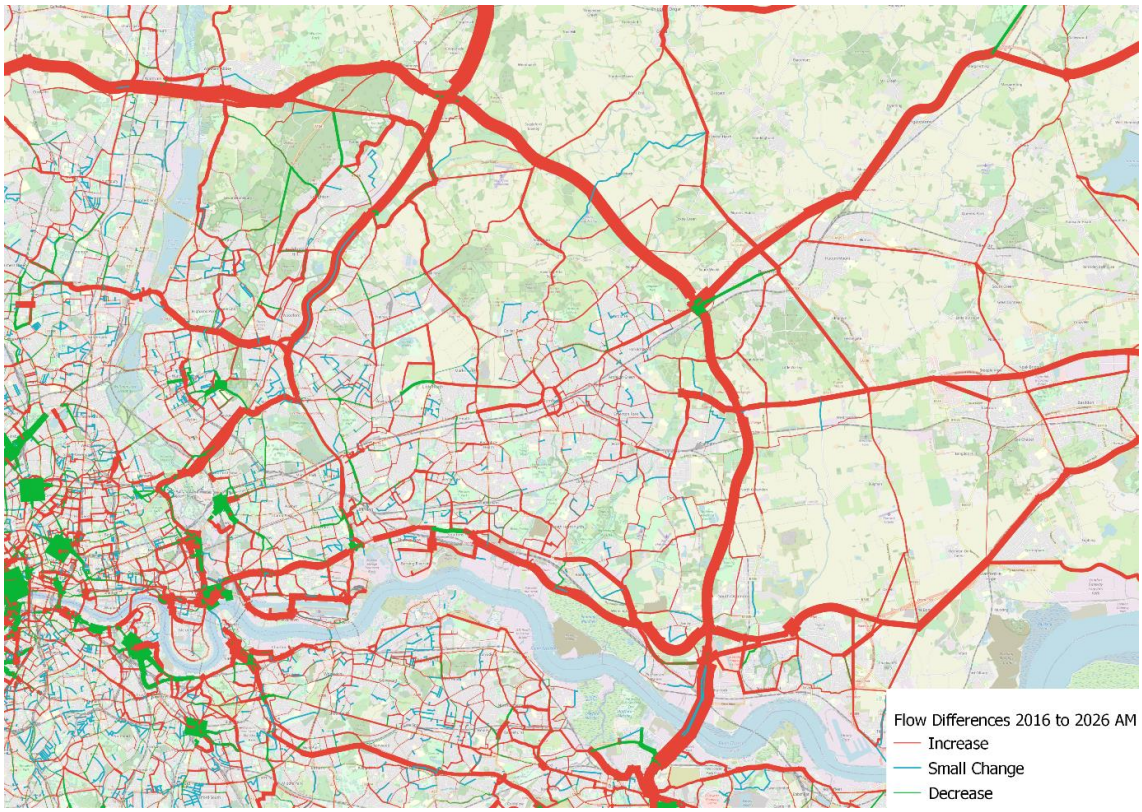


Figure 3.2 2016 to 2026 IP Traffic Flow Changes

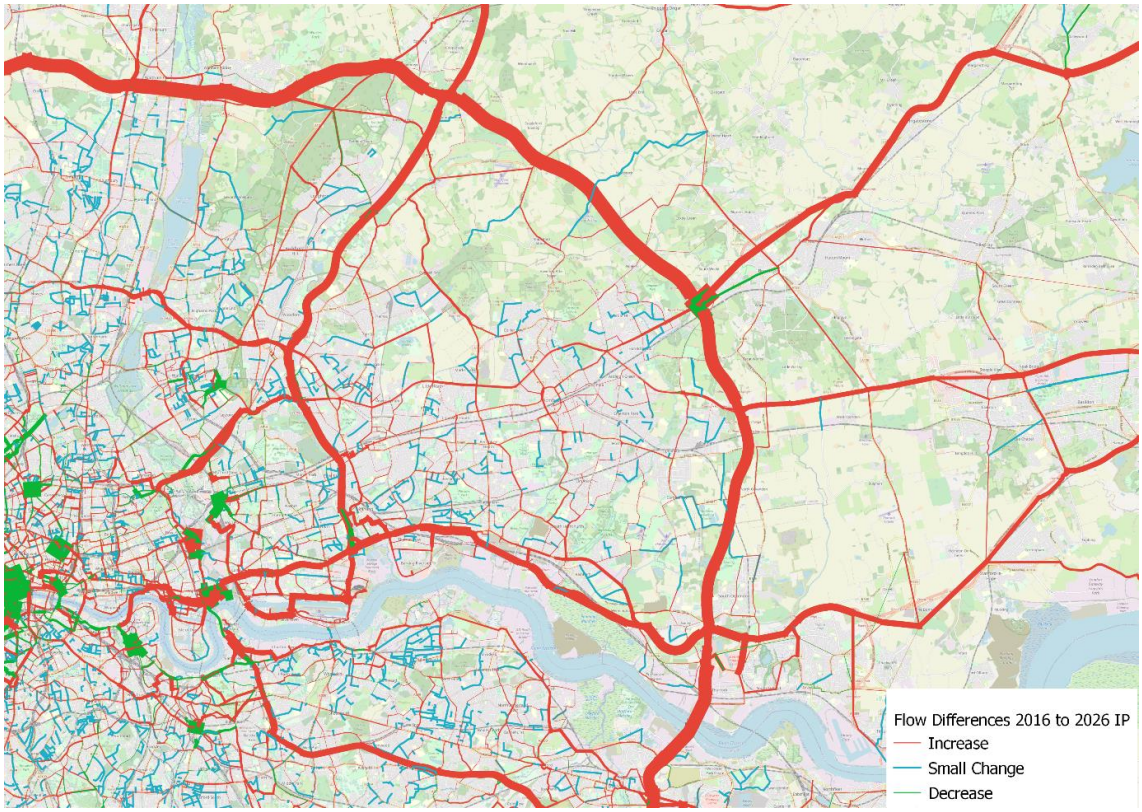


Figure 3.3 2016 to 2026 PM Traffic Flow Changes

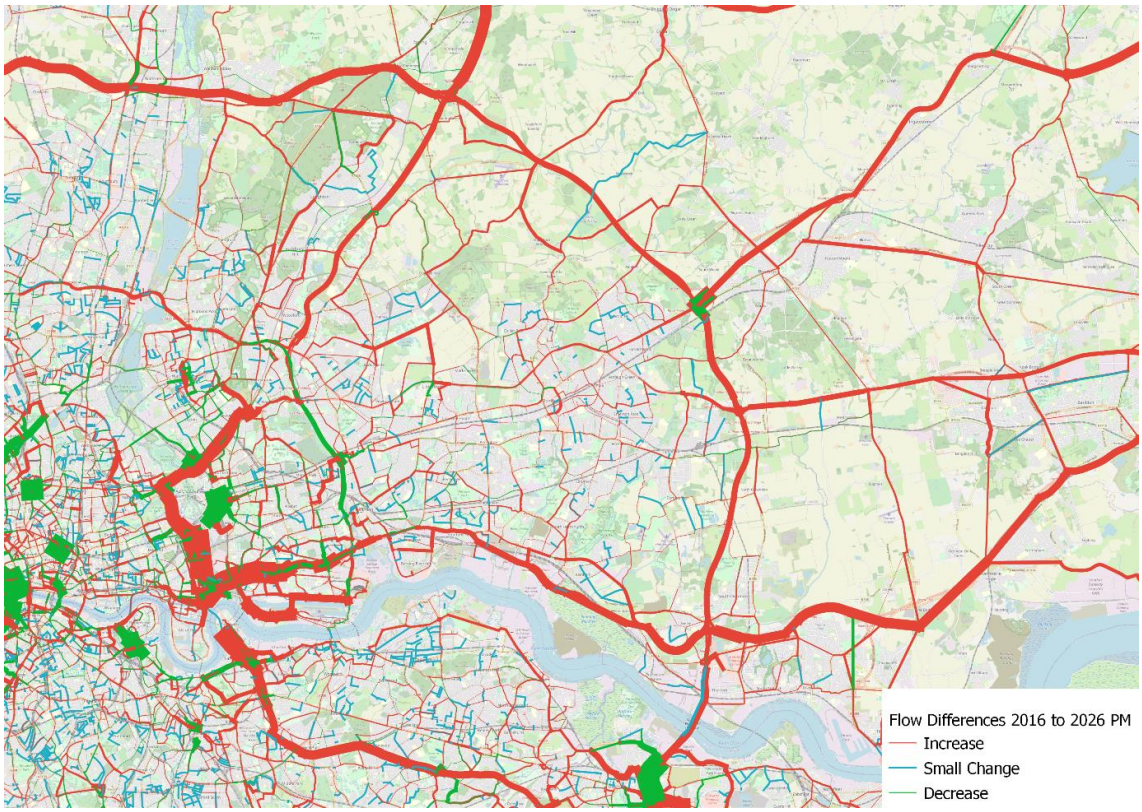


Figure 3.4 2016 to 2041 uncapped AM Traffic Flow Changes

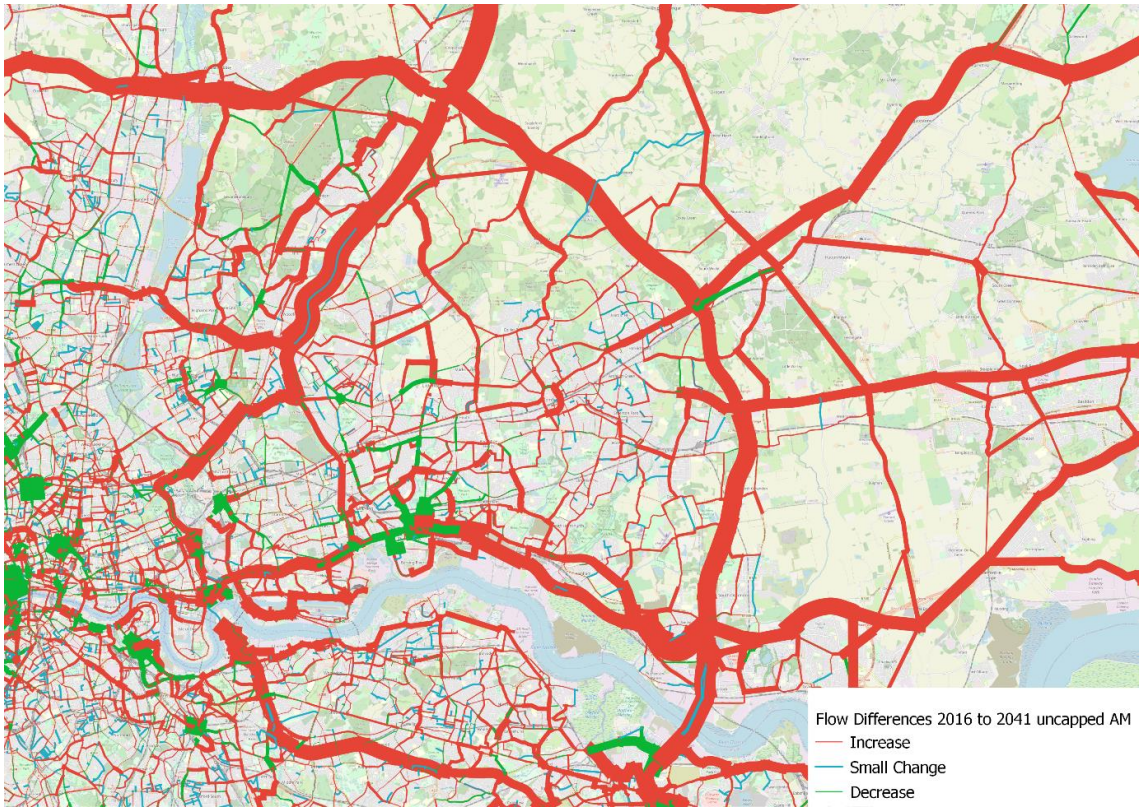


Figure 3.5 2016 to 2041 uncapped IP Traffic Flow Changes

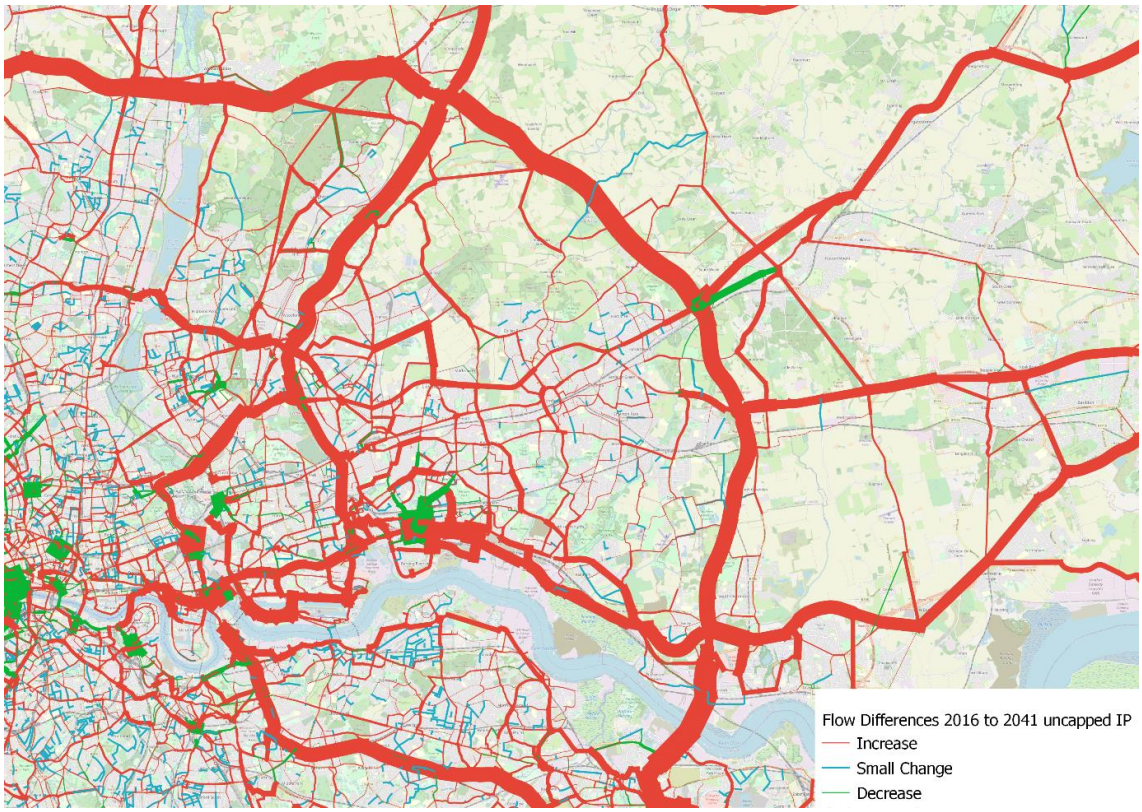


Figure 3.6 2016 to 2041 uncapped PM Traffic Flow Changes

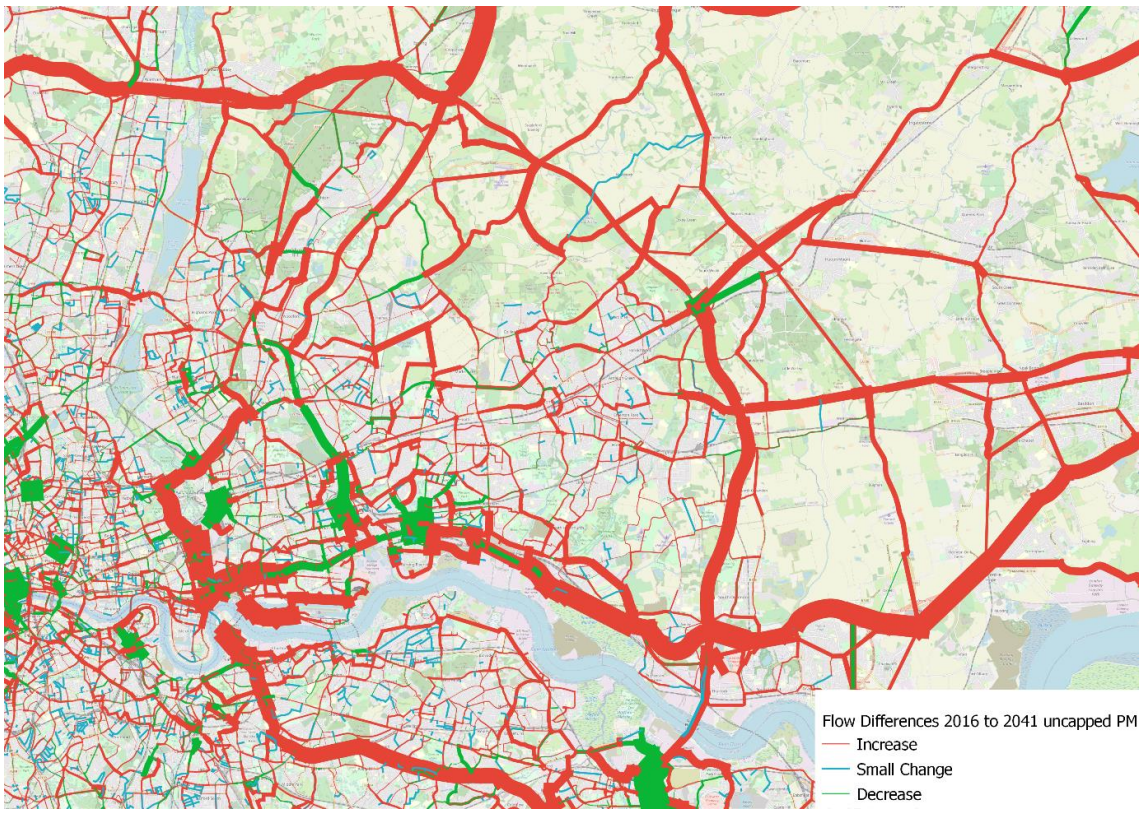


Figure 3.7 2016 to 2041 capped AM Traffic Flow Changes

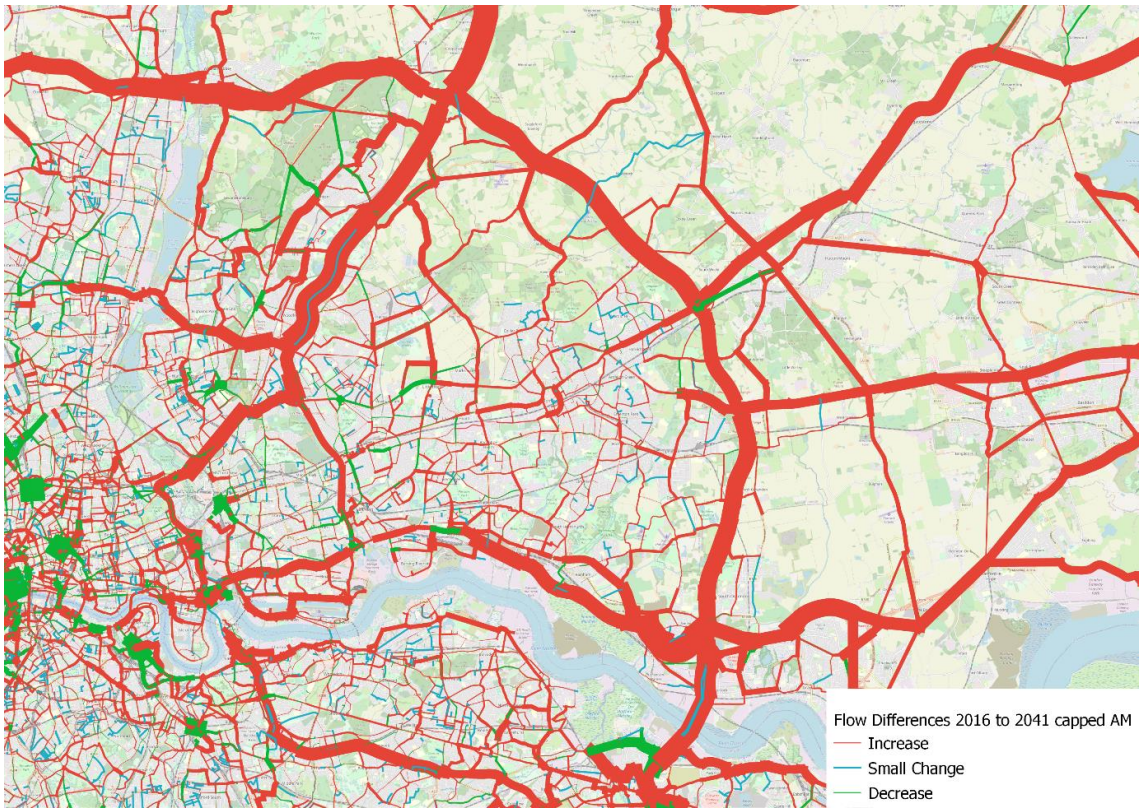


Figure 3.8 2016 to 2041 capped IP Traffic Flow Changes

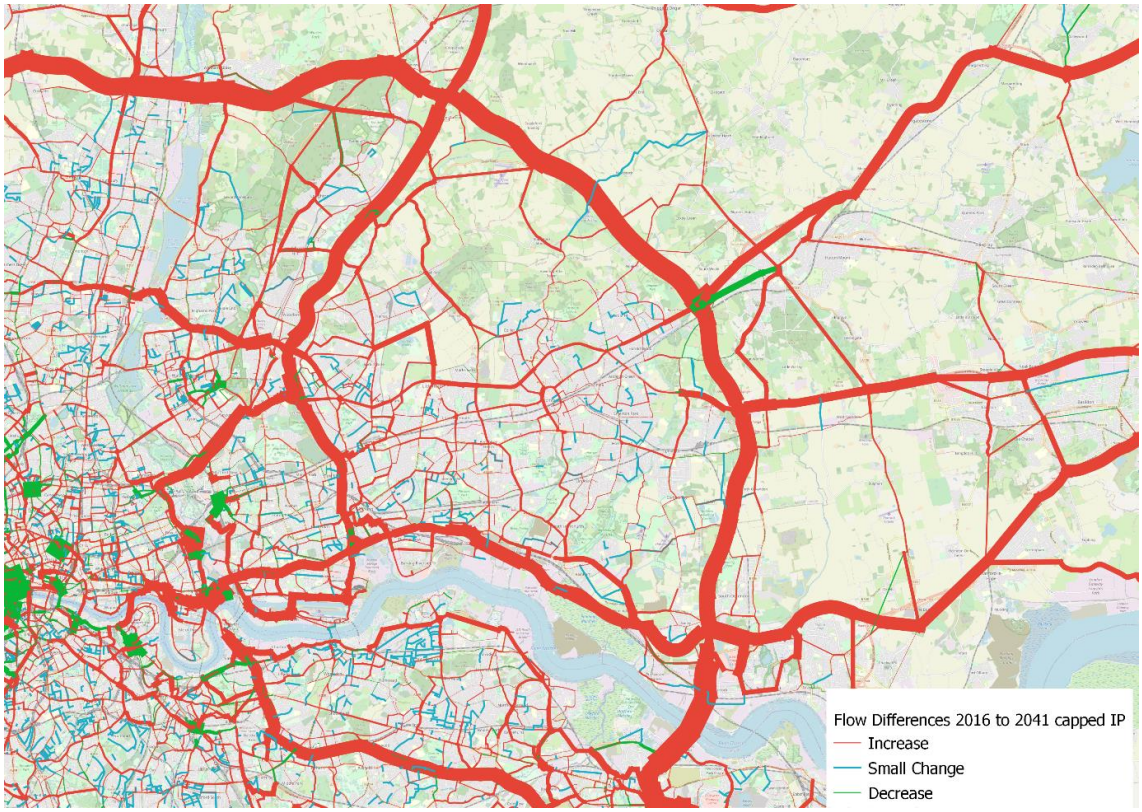
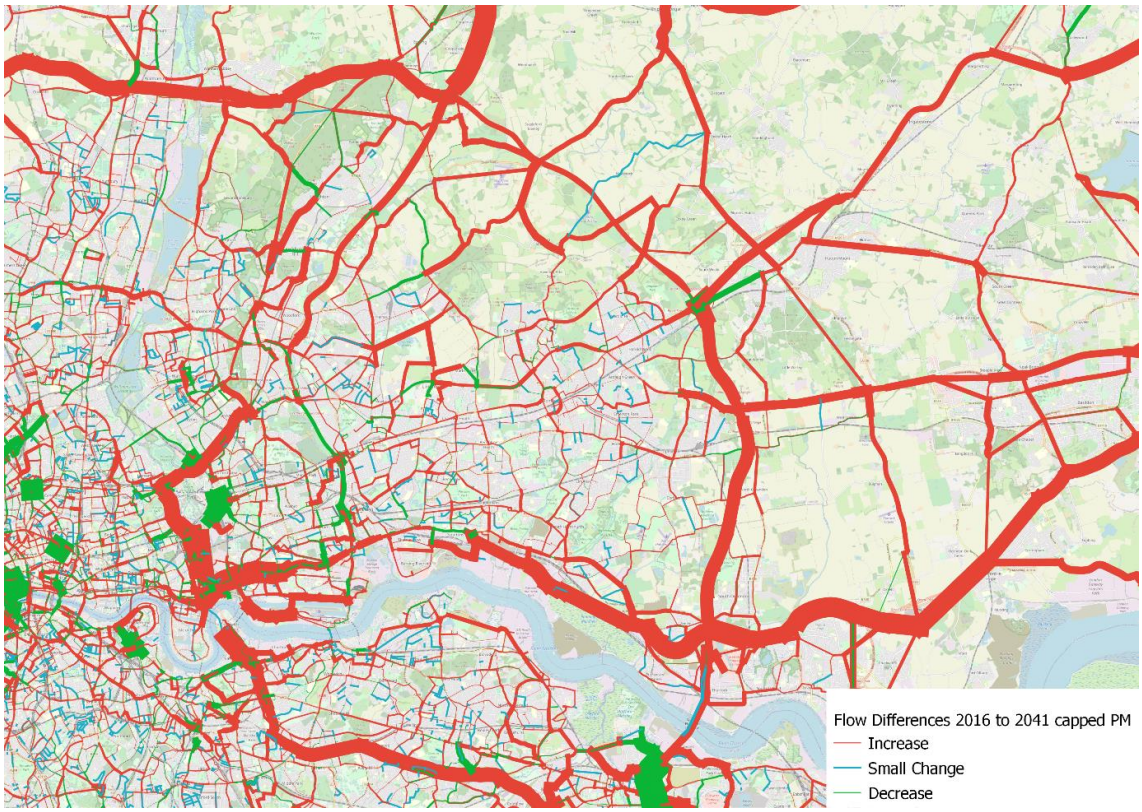


Figure 3.9 2016 to 2041 capped PM Traffic Flow Changes



4 Junction Delays

4.1 Junction delays, which are report below (in PCU hours -actual flow multiplied by average delay time per PCU for each simulated junction) provide a measure of total delay accumulated at the junction due to the individual delays, taking into account the total volume of traffic through the junction. The choice of PCU hours reflects more appropriately the greater importance of changes in delay where high volumes of traffic flows are affected, but does naturally emphasize delays on high capacity roads, particularly motorways.

Figures 4.1 to 4.3 show in graphical form the total changes in delay for the AM, IP and PM peak junction delays (in PCU hours) in LoHAM for the 2016 Base Year and 2026 Reference Year. Figure 4.4 to 4.6 show in graphical form the total changes in delay for the AM, IP and PM peak junction delays (in PCU hours) in LoHAM for the 2016 Base Year and 2041 uncapped Reference Year. Figure 4.7 to 4.9 show in graphical form the total changes in delay for the AM, IP and PM peak junction delays (in PCU hours) in LoHAM for the 2016 Base Year and 2041 capped Reference Year.

In these 'difference' plots, the cyan bandwidth discs show an increase in delays (PCU hours) between the base and reference case year and the pink discs show a reduction, the disc radius being proportional to the size of change. The delay differences shown relate to individual LoHAM nodes so a junction (or queue) may comprise a number of such nodes.

In the delay difference from 2016 to 2026, the only major site of delay impacting on Havering is at J28 of the M25 which is present in both the AM peak and PM peak differences. Across all time periods there are some delays South of the M25 Dartford Crossing.

In the delay difference plots for 2016 to 2041 uncapped, there are many more node delays, particularly directly in and surrounding the Barking Riverside development. In the AM peak the delay at J28 remains with additional delays at the Ardleigh Green/Squirrels Heath junction, as well as North of the M25 Dartford Crossing on the M25. The PM peak suffers from the same delays as the AM Peak but also has a large delay at Gallows Corner and more delays at J28, reflecting the increase in peak traffic flows in both directions utilising this junction. The IP peak has one additional delay North of the M25 J28 compared to the 2026 differences.

The 2041 capped plots show the same areas of increased delays as the uncapped plots, with Barking Riverside being the main area with differences, with a significant reduction in node delays in this area. However, the rest of the network delays remain.

Figure 4.1 2016 to 2026 AM PCU hours Delay Change

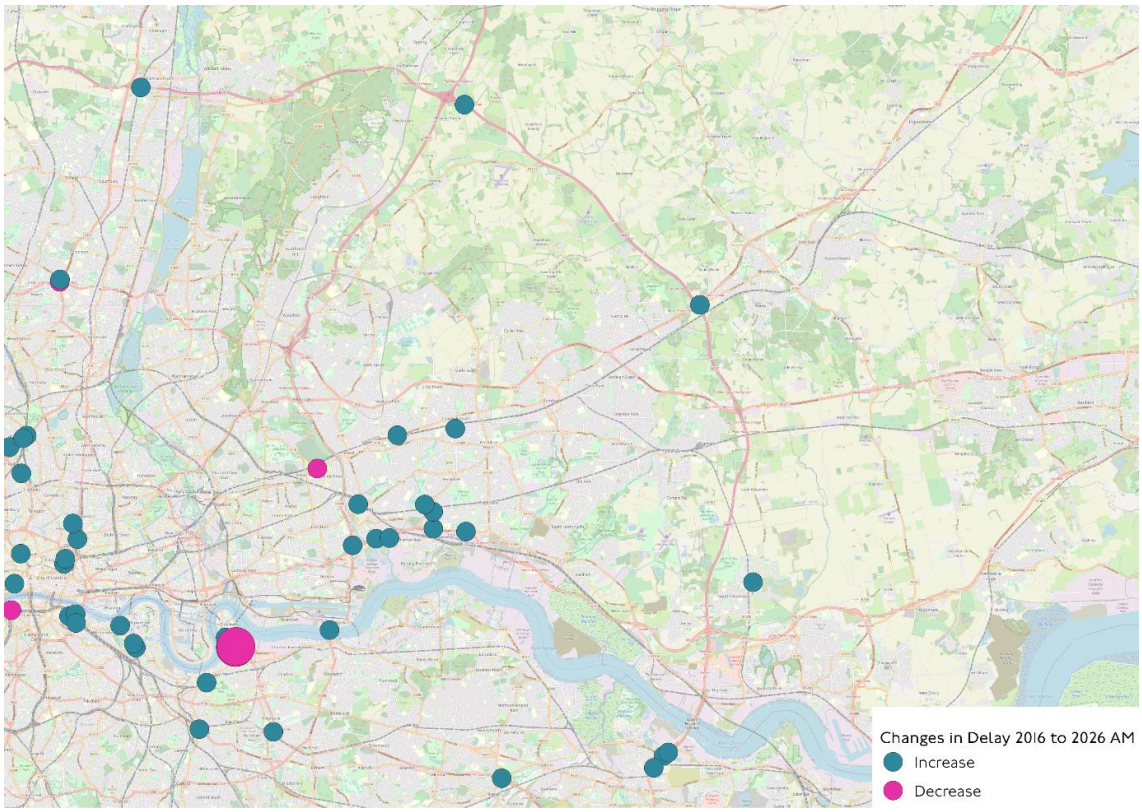


Figure 4.2 2016 to 2026 IP PCU hours Delay Change

Figure 4.3 2016 to 2026 PM PCU hours Delay Change

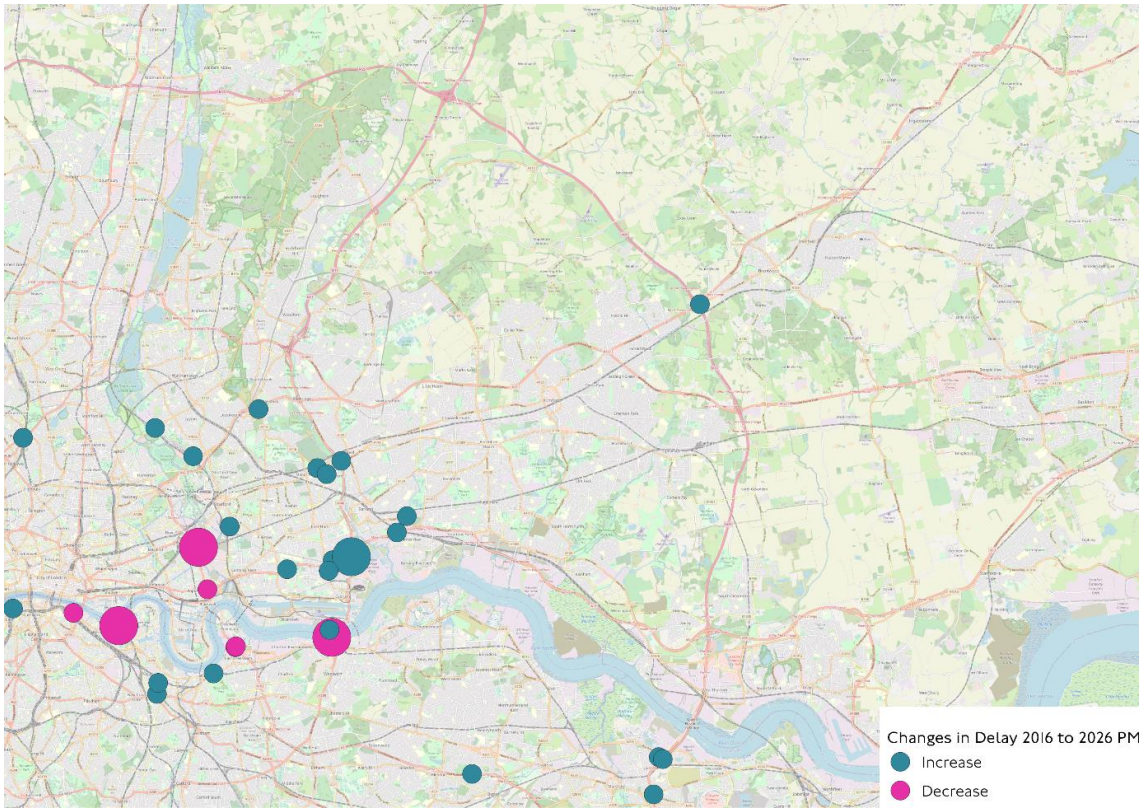


Figure 4.4 2016 to 2041 uncapped AM PCU hours Delay Change

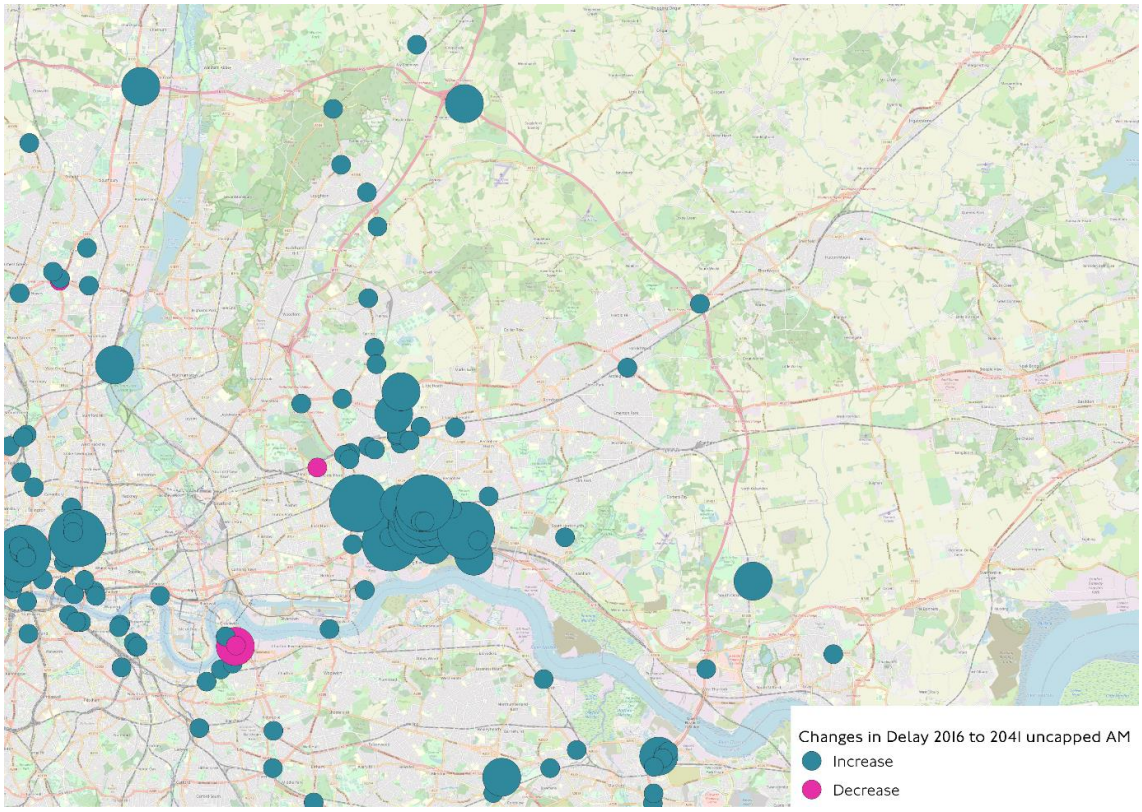


Figure 4.5 2016 to 2041 uncapped IP PCU hours Delay Change

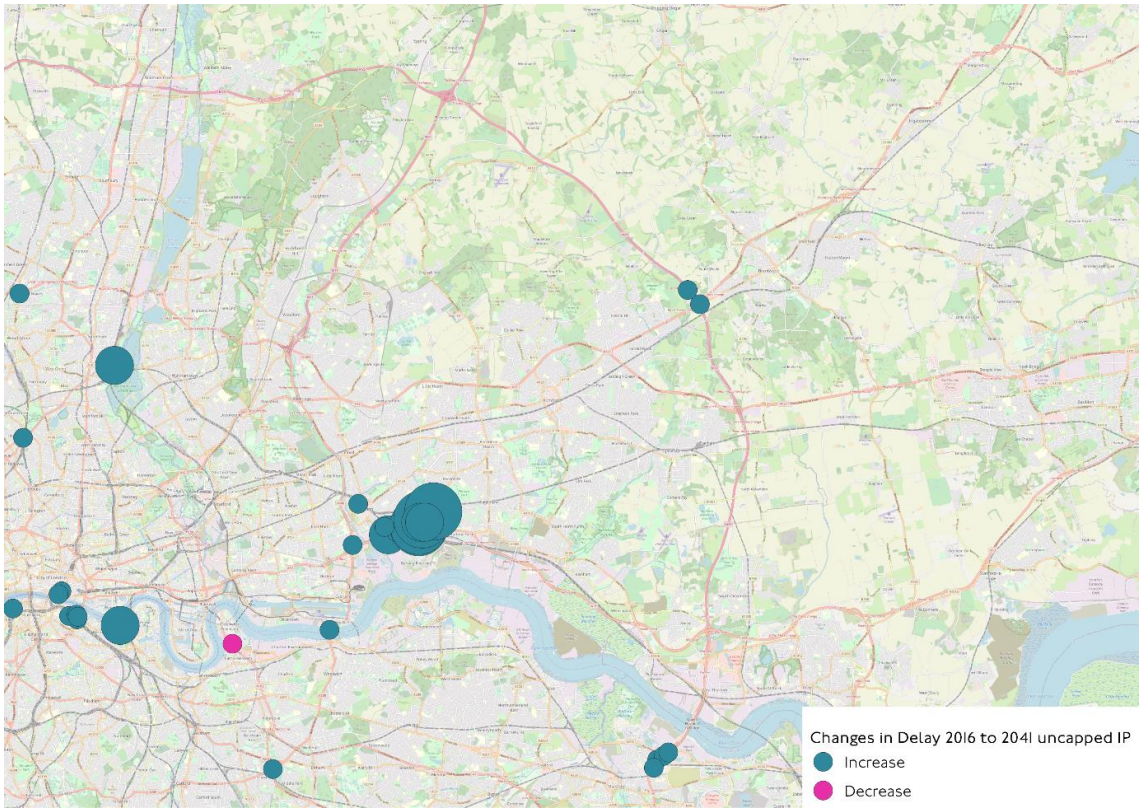


Figure 4.6 2016 to 2041 uncapped PM PCU hours Delay Change

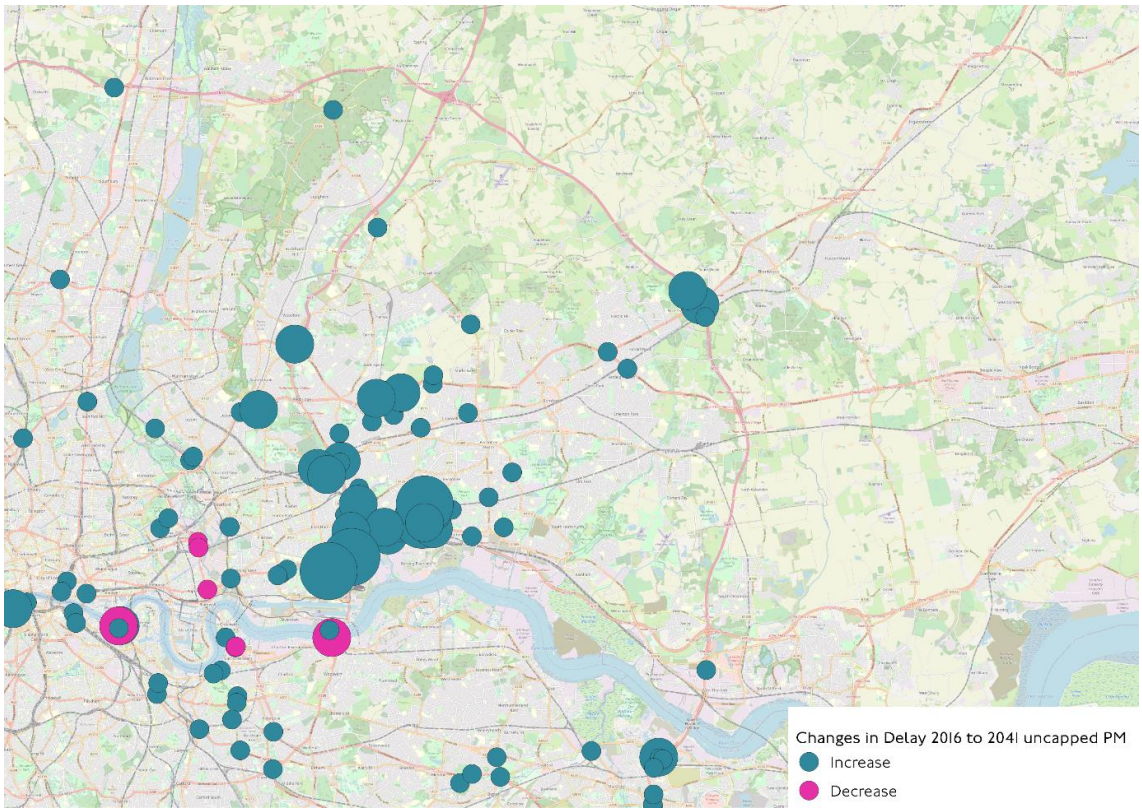


Figure 4.7 2016 to 2041 capped AM PCU hours Delay Change

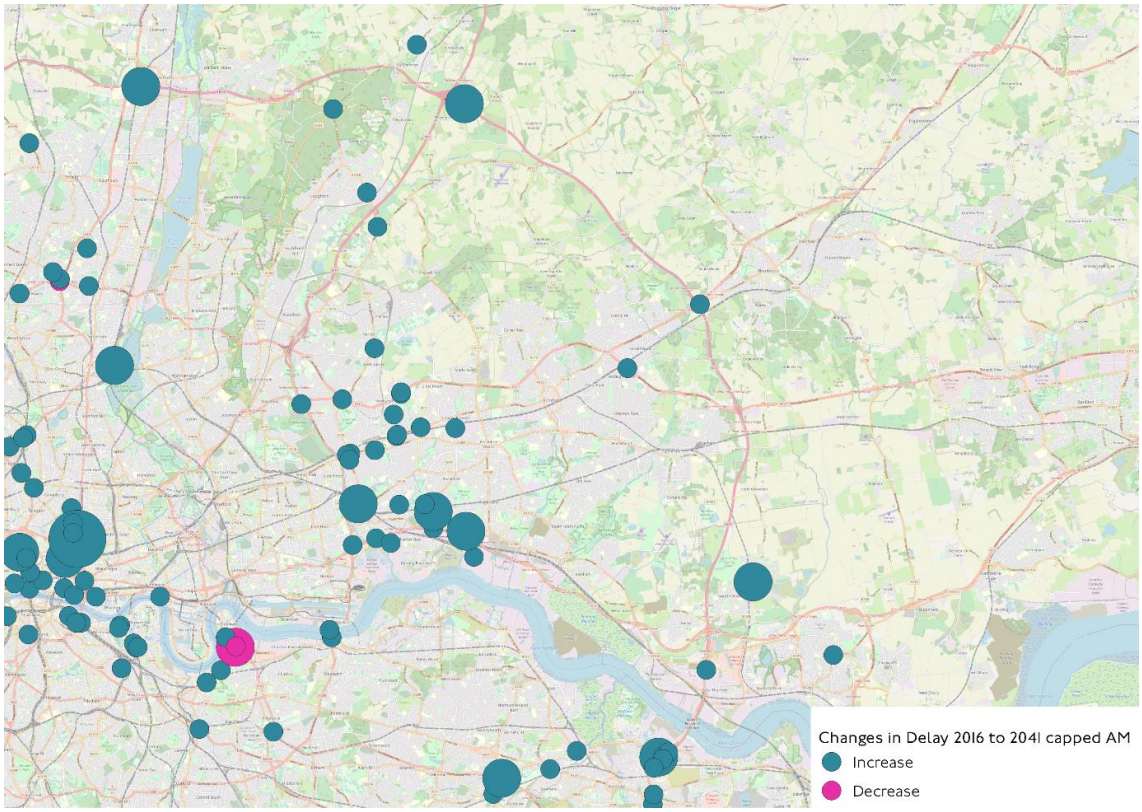


Figure 4.8 2016 to 2041 capped IP PCU hours Delay Change

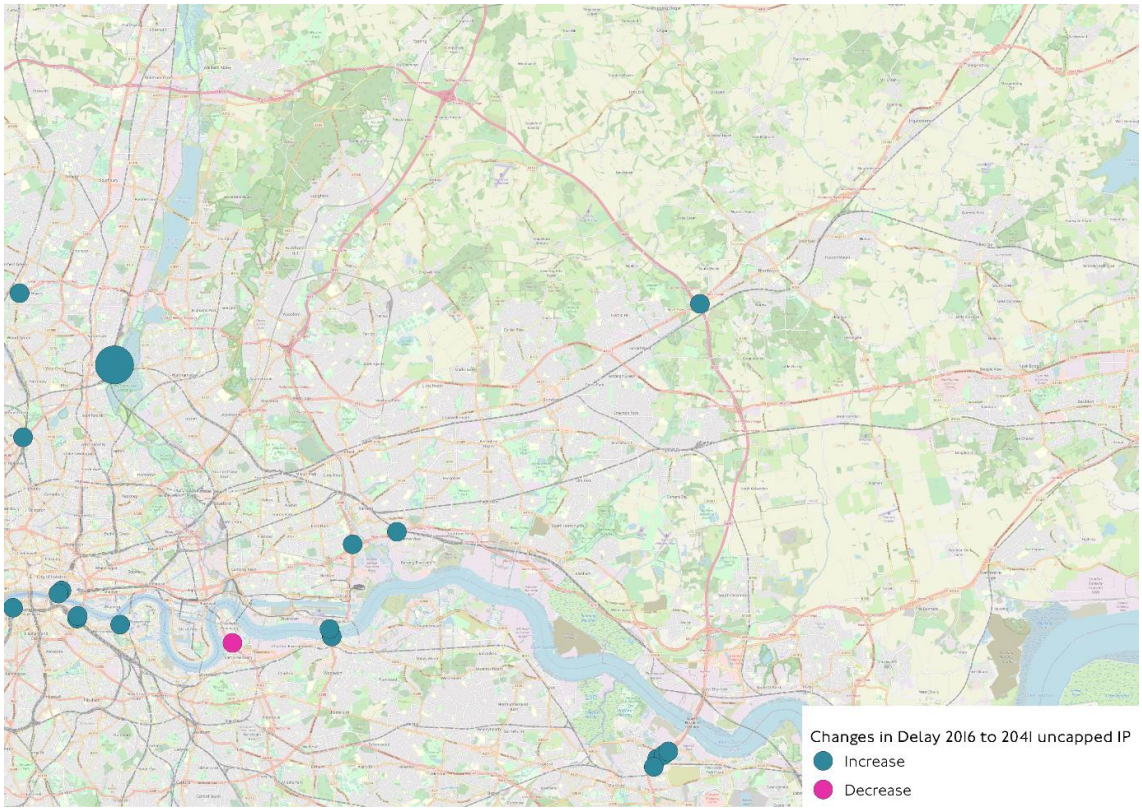
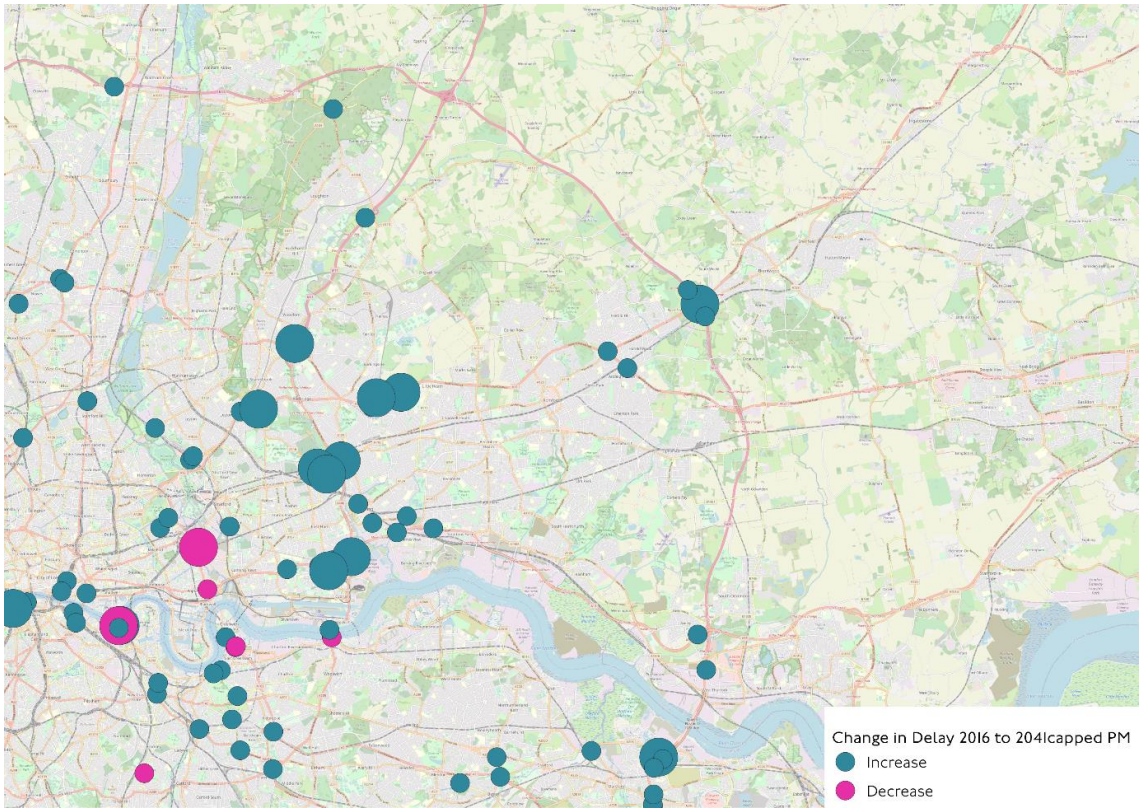


Figure 4.9 2016 to 2041 capped PM PCU hours Delay Change



5 Volume over Capacity Ratio (V/C)

5.1 The junction volume to capacity (V/C) ratio is a standard indicator to measure how close a junction or link is to theoretical capacity, under actual traffic flows.

The volume-to-capacity ratio can be calculated for an individual turning movement, a link, or for the junction as a whole. In SATURN simulation, it is dependent on a wide range of factors including type of junction, numbers of lanes, lane capacity, traffic signal staging and traffic levels, both opposing and 'on-link' volumes.

Figure 5.1 to Figure 5.4 illustrate the ratios of volume over capacity (V/C) for links in the AM peak for 2016 and 2026. Figures 5.5 to 5.8, and Figures 5.9 to 5.12 show the same information for the IP and the PM peak respectively.

The different coloured bandwidth illustrate the range for different percentages of V/C with light orange coloured bandwidths representing the links with a V/C between 85% and 90%, dark orange coloured indicating links with a V/C between 90% and 95% and red coloured bandwidths showing where link V/C exceeds 95%.

In 2026 AM and PM peaks, the V/C exceeds 95% at M25 J28, Gallows Corner, North of J28 on the M25, and the A12 west of the Mawney Rd junction.

2041 uncapped and capped PM peaks see the same areas of V/C exceeding 95% but additionally the A125 south of Romford and the A127 between Ardleigh Green and Wingleyte Lane also see increases in V/C. The AM and PM peaks in all reference years have a substantial number of highly congested links and some caution is urged when interpreting results.

The IP plots shows similar areas of congestion but to a much less extent.

Figure 5.1 2026 AM Link V/C

Figure 5.2 2041 uncapped AM Link V/C

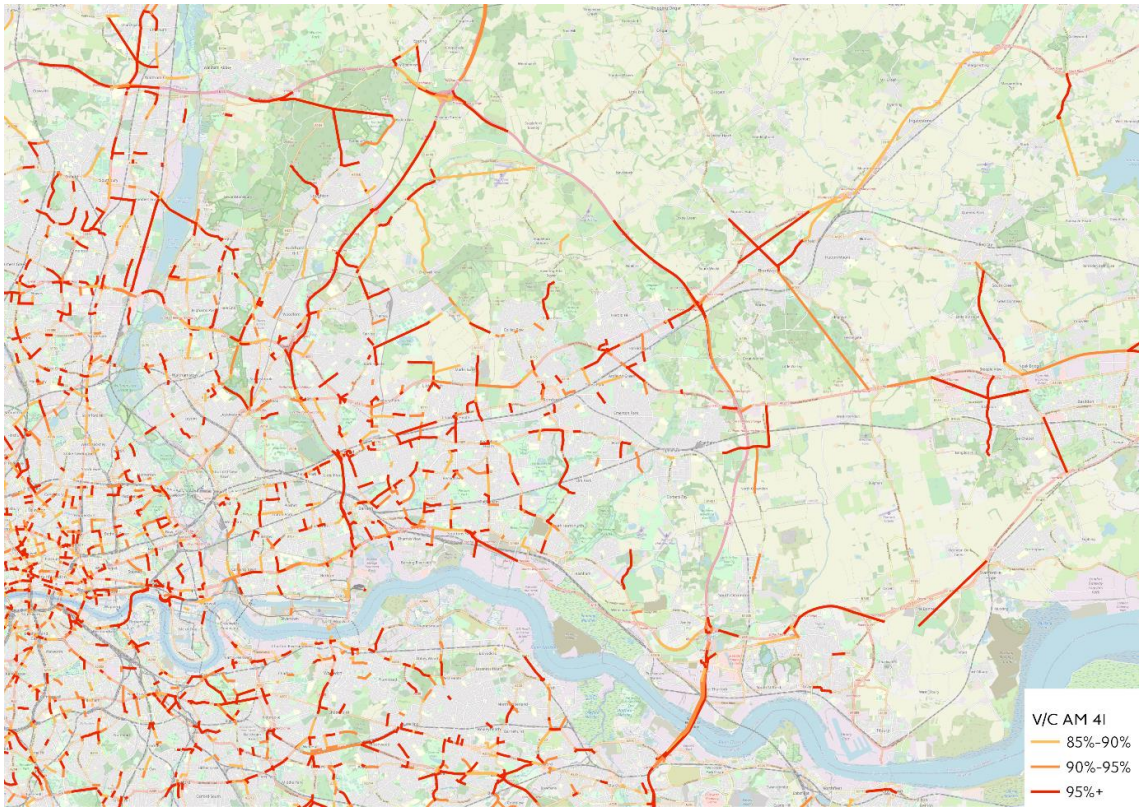


Figure 5.3 2041 capped AM Link V/C

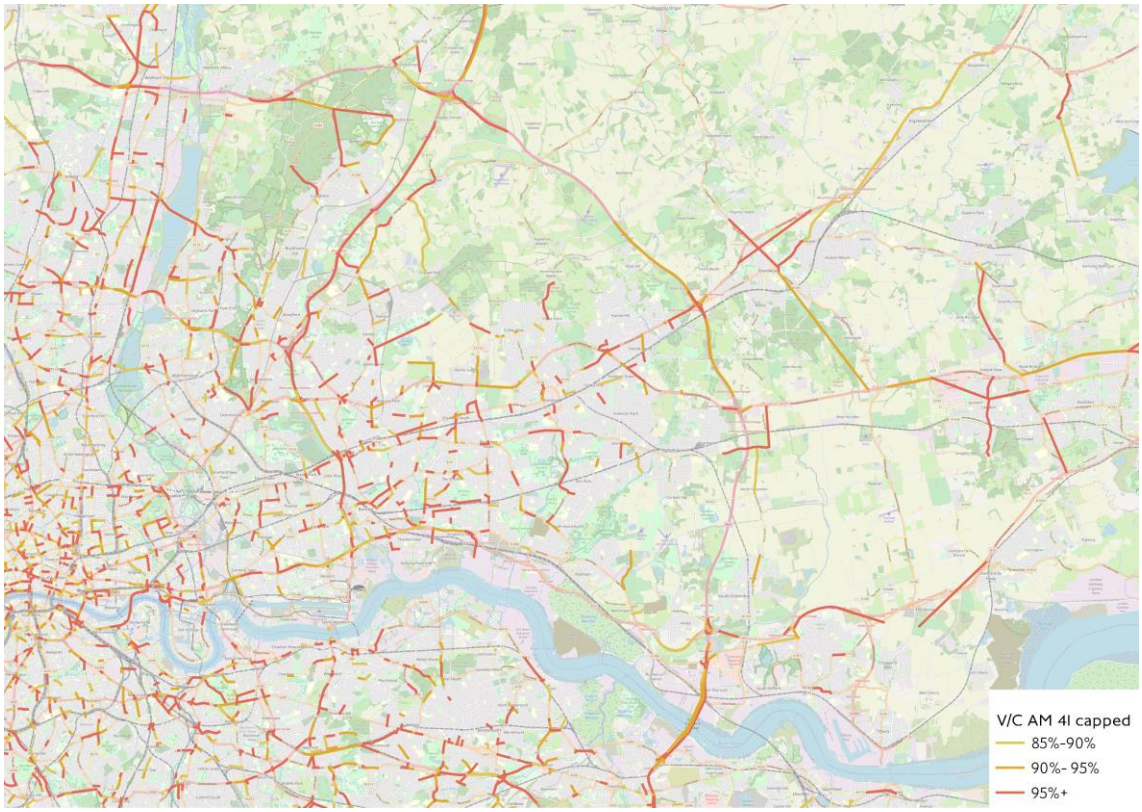


Figure 5.4 2016 IP Link V/C

Figure 5.5 2041 uncapped IP Link V/C

Figure 5.6 2041 capped IP Link V/C

Figure 5.7 2026 PM Link V/C

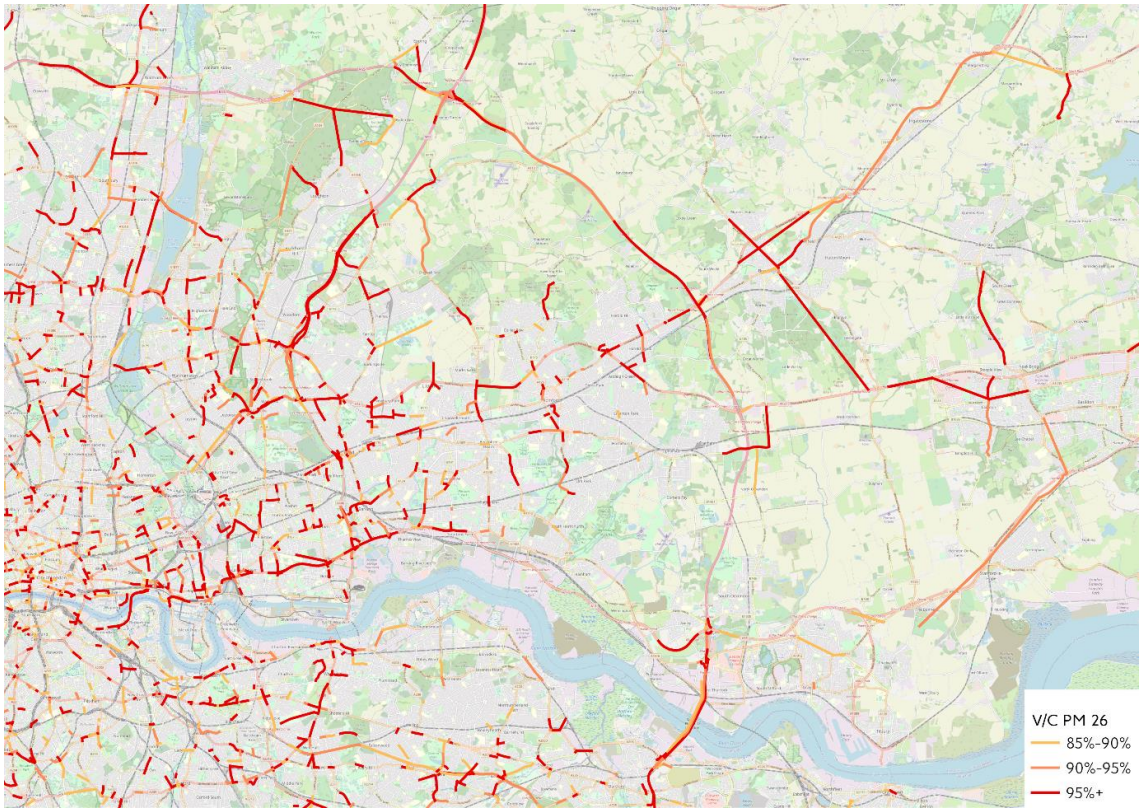


Figure 5.8 2041 uncapped PM Link V/C

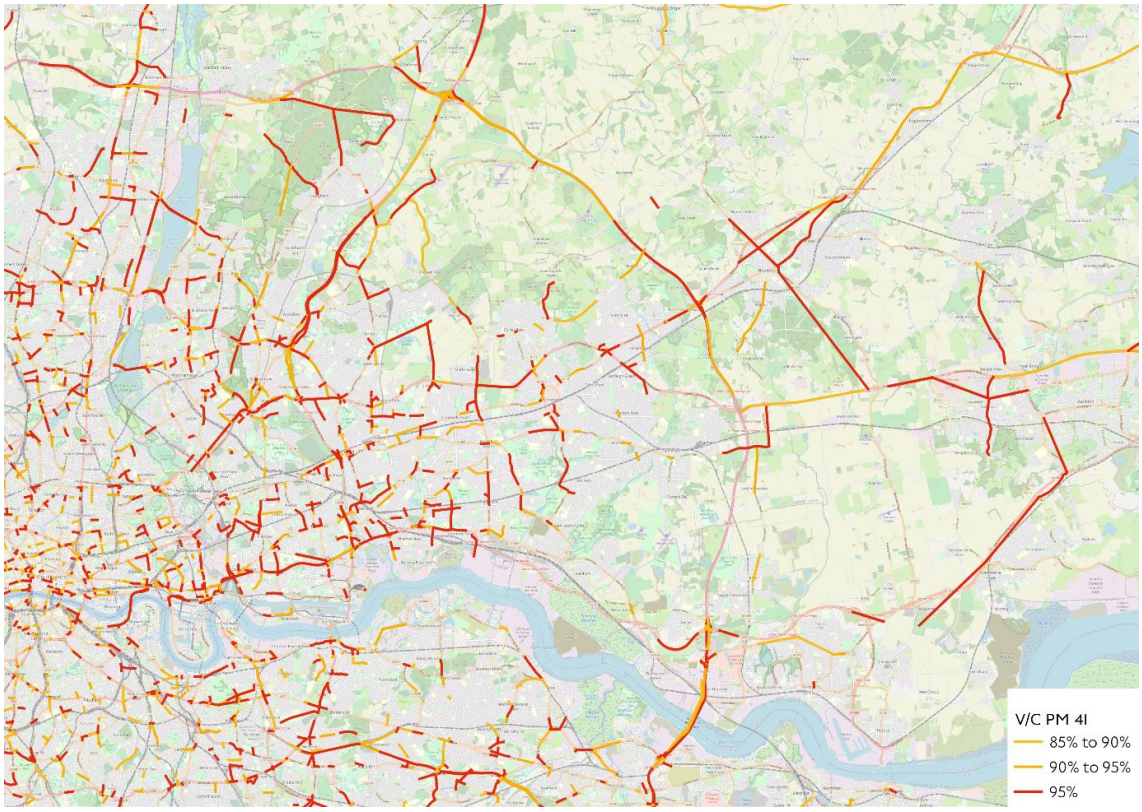
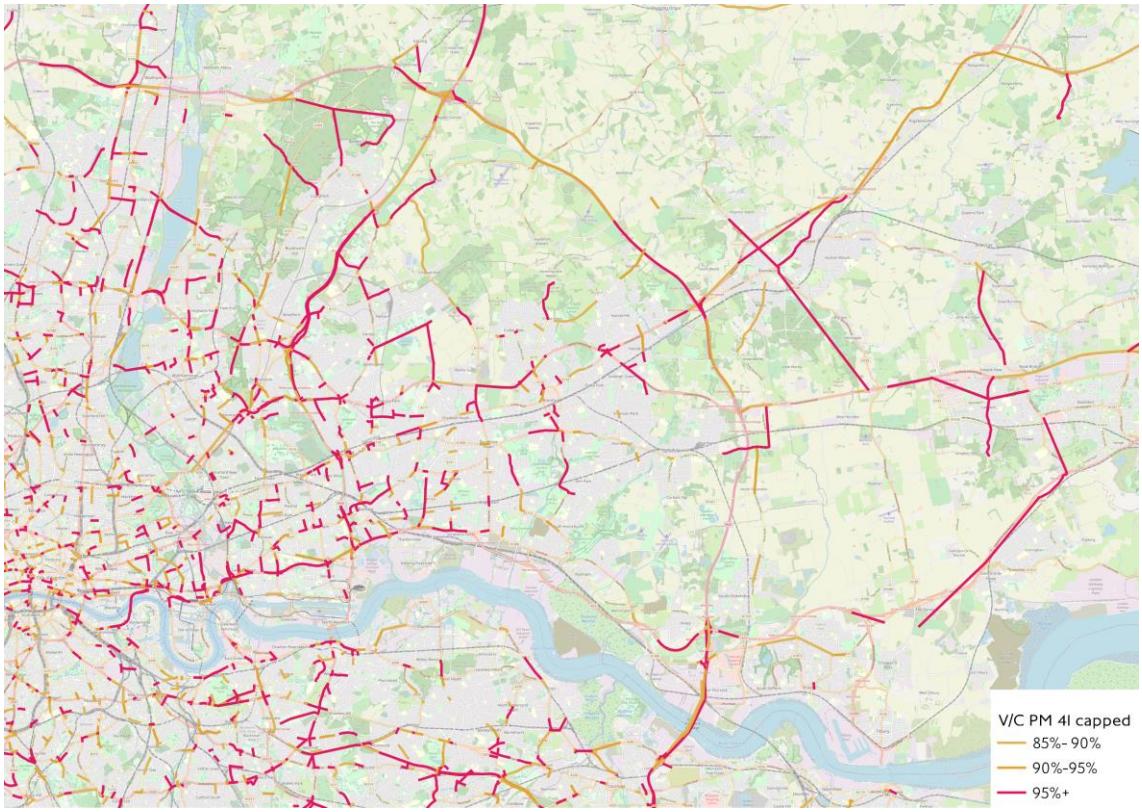


Figure 5.9 2041 capped PM Link V/C



6 Borough Statistics

6.1 Borough statistics were calculated for each time period and for the 2016 base and 2026, 2041 uncapped and 2041 capped forecast years. At the Havering borough level, figures for PCU kilometres, PCU hours and average speeds and queues provide a high-level view of changing network conditions over time and by time period.

Tables 4, 5 and 6 shows the calculated statistics in detail for Havering and neighbouring boroughs in total during the AM, IP and PM peaks respectively for the reference years 2026, 2041 uncapped and 2041 capped, with comparisons made to equivalent statistics for 2016 in each case.

In 2026, the reduction in speed is nearly the same in the AM and PM peaks, with a much lower reduction in the Inter Peak. However, in 2041 the PM peak has a 2.4% greater reduction than the AM Peak in the capped model and a 3.1% greater reduction than the AM peak in the uncapped model.

Figure 6.4 shows an increase in the total queues at the end of the 3 time period across Havering, indicating the increased congestion in the network, in the uncapped model some of this will be due to the Barking Riverside Development. The increases are quite significant in the uncapped model with an increase in queue in the AM of 141%, 399% in the Inter Peak and 285% in the PM Peak. The magnitudes of the increased queues in 2041 uncapped are approximately 1000 PCUs, 500 PCUs and 1800 PCUs in the AM, IP and PM time period respectively. The PM Peak in both 2041 capped and uncapped have over a 200% increase in PCUs.

Travel time nearly doubles from 2026 to 2041 capped and more than doubles for 2041 uncapped. While the Travel Time (PCU-hours) increased the most in 2041 uncapped, so did the travel distance (PCU-km), across all time periods.

Table 4: Statistics for London Borough of Havering and surrounding Boroughs (2016 and 2026)

		Travel Distance (PCU-km)			Travel Time (PCU-hours)			Average Speed (km/h)			Queue at End of Modelled Period (PCUs)		
Time Period	London Borough	2016	2026	% Change	2016	2026	% Change	2016	2026	% Change	2016	2026	% Change
AM	Barking and Dagenham	113,224	120,907	6.8%	6227	7910	27.0%	18.2	15.3	-15.9%	1523	2914	91.4%
	Bexley	198,119	210,511	6.3%	7707	9155	18.8%	25.7	23.0	-10.6%	593	1495	152.0%
	Havering	**354,859**	**385,658**	**8.7%**	**10,170**	**11,695**	**15.0%**	**34.9**	**33.0**	**-5.5%**	**774**	**1138**	**47.0%**
	Redbridge	230,939	239,950	3.9%	10,719	12,502	16.6%	21.5	19.2	-10.9%	2424	3903	61.0%
	Total	897,142	957,027	6.4%	34,823	41,262	19.4%	100.3	90.4	-10.7%	5314	9450	87.9%
IP	Barking and Dagenham	96,756	105,334	8.9%	3621	4228	16.8%	26.7	24.9	-6.8%	14	140	899.1%
	Bexley	157,809	168,304	6.7%	4963	5401	8.8%	31.8	31.2	-2.0%	20	26	28.8%
	Havering	**313,257**	**340,137**	**8.6%**	**7309**	**8110**	**11.0%**	**42.9**	**41.9**	**-2.1%**	**132**	**157**	**19.3%**
	Redbridge	194,696	207,409	6.5%	6116	6747	10.3%	31.8	30.7	-3.4%	61	106	73.6%
	Total	762,518	821,183	7.7%	22,009	24,486	11.7%	133.2	128.8	-3.6%	226	429	255.2%
PM	Barking and Dagenham	115,540	120,664	4.4%	5807	6922	19.2%	19.9	17.4	-12.4%	870	1855	113.3%
	Bexley	192,403	201,909	4.9%	7783	8902	14.4%	24.7	22.7	-8.3%	930	1650	77.5%
	Havering	**376,619**	**397,956**	**5.7%**	**10,676**	**11,930**	**11.8%**	**35.3**	**33.4**	**-5.4%**	**641**	**1183**	**84.6%**
	Redbridge	231,957	239,027	3.0%	10,619	11,951	12.5%	21.8	20.0	-8.4%	2224	3324	49.5%
	Total	916,519	959,556	4.5%	34,884	39,705	14.5%	101.7	93.5	-8.6%	4664	8012	81.2%

Table 5: Statistics for London Borough of Havering and surrounding Boroughs (2016 and 2041 uncapped)

		Travel Distance (PCU-km)			Travel Time (PCU-hours)			Average Speed (km/h)			Queue at End of Modelled Period (PCUs)		
Time Period	London Borough	2016	2041 uncapped	% Change	2016	2041	% Change	2016	2041 uncapped	% Change	2016	2041 uncapped	% Change
AM	Barking and Dagenham	113,224	124,489	9.9%	6227	11,560	85.7%	18.2	10.8	-40.8%	1523	6961	357.1%
	Bexley	198,119	221,727	11.9%	7707	10,812	40.3%	25.7	20.5	-20.2%	593	2805	372.6%
	Havering	**354,859**	**407,077**	**14.7%**	**10,170**	**13,224**	**30.0%**	**34.9**	**30.8**	**-11.8%**	**774**	**1863**	**140.7%**
	Redbridge	230,939	248,136	7.4%	10,719	14,696	37.1%	21.5	16.9	-21.6%	2424	6409	164.4%
	Total	897,142	1,001,430	11.0%	34,823	50,292	48.3%	100.3	78.9	-23.6%	5314	18,037	258.7%
IP	Barking and Dagenham	96,756	116,810	20.7%	3621	7109	96.3%	26.7	16.4	-38.5%	14	2171	15374.0%
	Bexley	157,809	181,232	14.8%	4963	6111	23.1%	31.8	29.7	-6.7%	20	137	592.6%
	Havering	**313,257**	**359,502**	**14.8%**	**7309**	**9267**	**26.8%**	**42.9**	**38.8**	**-9.5%**	**132**	**656**	**398.6%**
	Redbridge	194,696	226,863	16.5%	6116	8202	34.1%	31.8	27.7	-13.1%	61	400	555.6%
	Total	762,518	884,407	16.7%	22,009	30,688	45.1%	133.2	112.5	-17.0%	226	3364	4230.2%
PM	Barking and Dagenham	115,540	126,859	9.8%	5807	10,677	83.9%	19.9	11.9	-40.3%	870	5594	543.3%
	Bexley	192,403	213,040	10.7%	7783	10,378	33.3%	24.7	20.5	-17.0%	930	2748	195.5%
	Havering	**376,619**	**414,881**	**10.2%**	**10,676**	**13,826**	**29.5%**	**35.3**	**30.0**	**-14.9%**	**641**	**2453**	**283.0%**
	Redbridge	231,957	247,380	6.6%	10,619	14,634	37.8%	21.8	16.9	-22.6%	2224	5947	167.4%
	Total	916,519	1,002,159	9.3%	34,884	49,515	46.1%	101.7	79.3	-23.7%	4664	16,742	297.3%

Table 6: Statistics for London Borough of Havering and surrounding Boroughs (2016 and 2041 capped)

		Travel Distance (PCU-km)			Travel Time (PCU-hours)			Average Speed (km/h)			Queue at End of Modelled Period (PCUs)		
Time Period	London Borough	2016	2041 capped	% Change	2016	2041 capped	% Change	2016	2041 capped	% Change	2016	2041 capped	% Change
AM	Barking and Dagenham	113,224	124,628	10.1%	6227	8848	42.1%	18.2	14.1	-22.5%	1523	3771	147.6%
	Bexley	198,119	220,537	11.3%	7707	10,574	37.2%	25.7	20.9	-18.9%	593	2604	338.8%
	Havering	**354,859**	**403,389**	**13.7%**	**10,170**	**12,709**	**25.0%**	**34.9**	**31.7**	**-9.0%**	**774**	**1516**	**95.9%**
	Redbridge	230,939	247,446	7.1%	107,19	13,938	30.0%	21.5	17.8	-17.6%	2424	5340	120.3%
	Total	897,142	996,001	10.6%	34,823	46,069	33.6%	100.3	84.4	-17.0%	5314	13,231	175.6%
IP	Barking and Dagenham	96,756	109,007	12.7%	3621	4704	29.9%	26.7	23.2	-13.3%	14	303	2059.1%
	Bexley	157,809	179,400	13.7%	4963	5998	20.8%	31.8	29.9	-5.9%	20	102	415.0%
	Havering	**313,257**	**355,626**	**13.5%**	**7309**	**8898**	**21.8%**	**42.9**	**40.0**	**-6.8%**	**132**	**489**	**272.2%**
	Redbridge	194,696	221,940	14.0%	6116	7608	24.4%	31.8	29.2	-8.4%	61	162	166.1%
	Total	762,518	865,972	13.5%	22,009	27,208	24.2%	133.2	122.2	-8.6%	226	1057	728.1%
PM	Barking and Dagenham	115,540	123,740	7.1%	5807	7751	33.5%	19.9	16.0	-19.8%	870	2550	193.2%
	Bexley	192,403	212,407	10.4%	77,83	10,210	31.2%	24.7	20.8	-15.8%	930	2608	180.5%
	Havering	**376,619**	**413,881**	**9.9%**	**10,676**	**13,247**	**24.1%**	**35.3**	**31.2**	**-11.4%**	**641**	**1983**	**209.5%**
	Redbridge	231,957	246,277	6.2%	10,619	13,662	28.7%	21.8	18.0	-17.5%	2224	4941	122.2%
	Total	916,519	996,305	8.4%	34,884	44,870	29.4%	101.7	86.0	-16.1%	4664	12,082	176.4%

Figure 6.1 LB of Havering Travel Distance (PCU KM) for 2016, 2026, 2041 and 2041 Capped

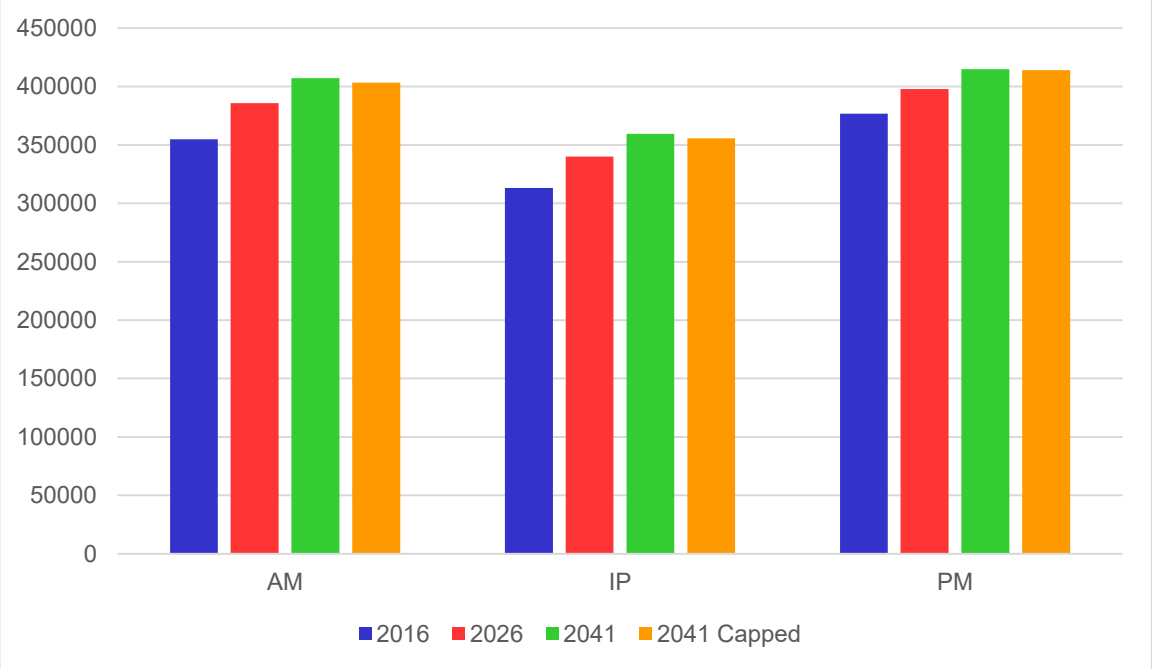


Figure 6.2 LB of Havering Travel Time (PCU hours) for 2016, 2026, 2041, 2041 Capped

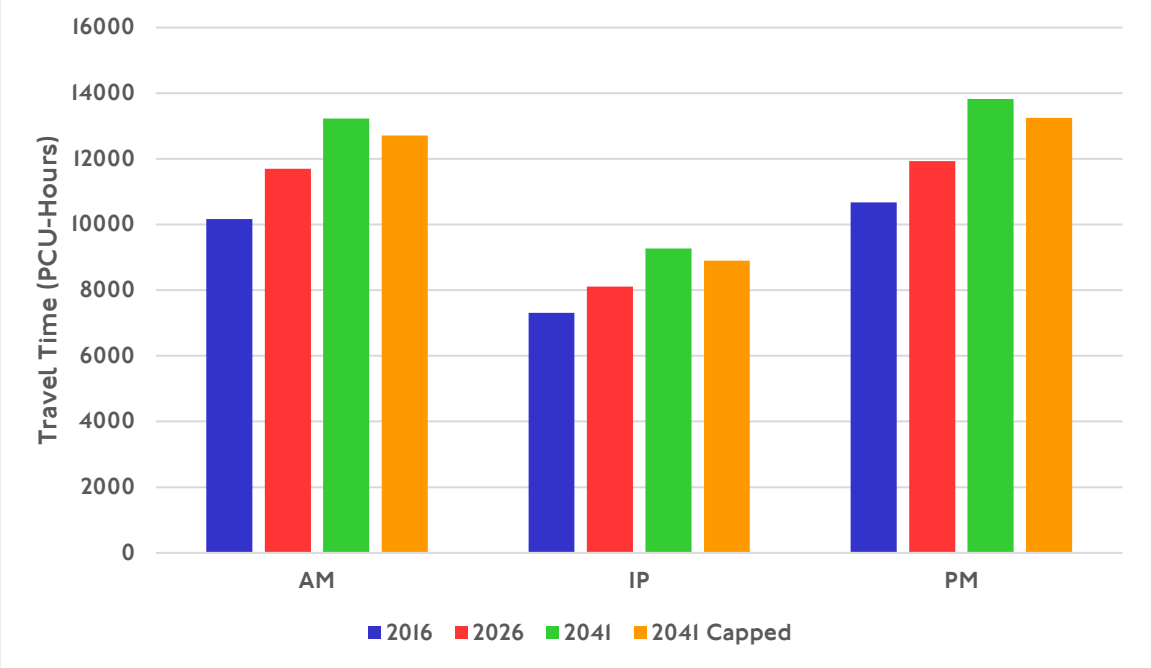


Figure 6.3 LB of Havering Average Speed (Km/Hr) for 2016, 2026, 2041 uncapped, 2041 capped

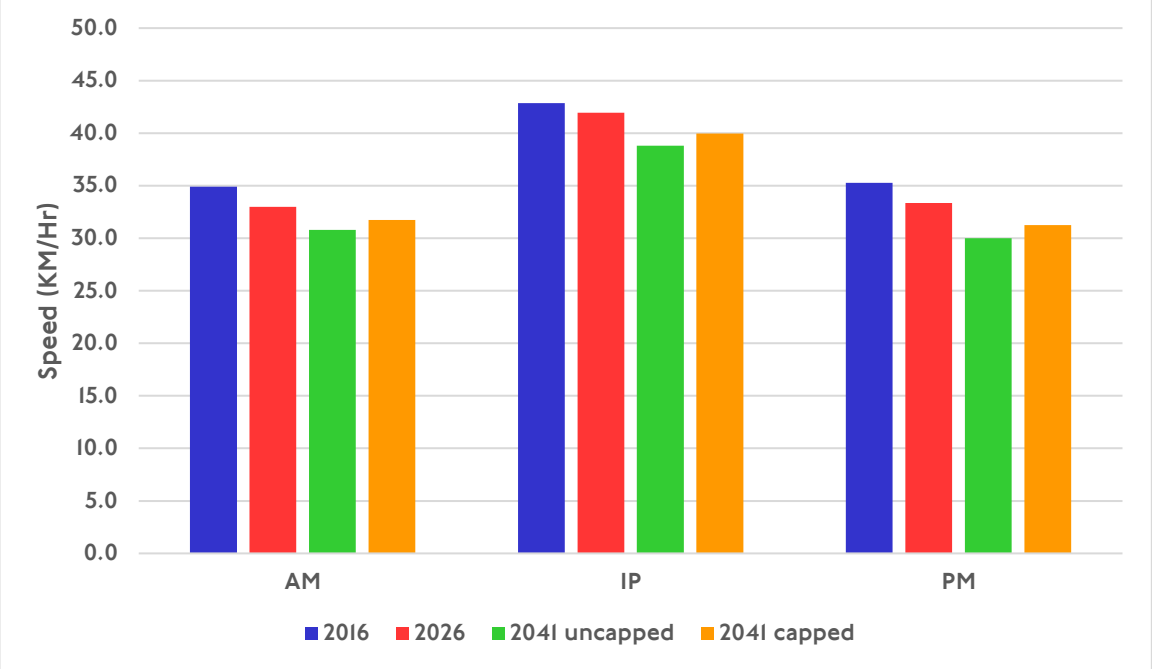
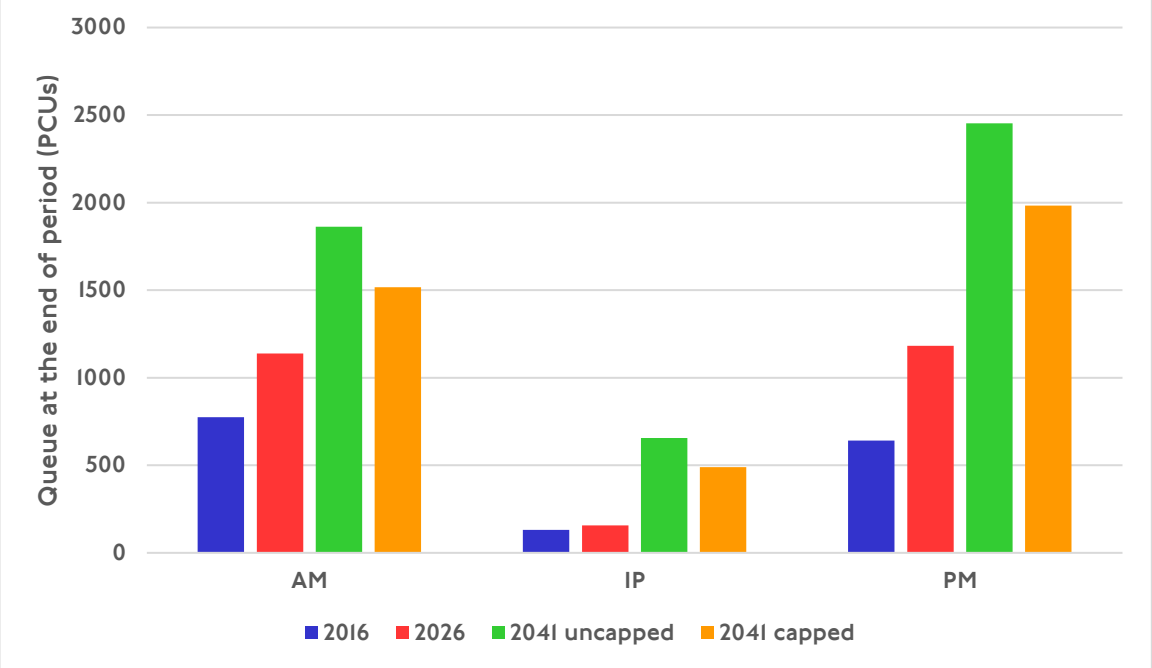


Figure 6.4 LB of Havering Queue at the end of Period (PCU) for 2016, 2026, 2041 uncapped, 2041 capped



7 Summary and Conclusion

The traffic growth is most evident along the M25, the main corridors in Havering and principal outer London radial corridors. In all periods, there is a significant M25 growth of traffic that occurs between the junctions 27 to 30. The three principle roads in Havering are the A12, A127 and A13 all providing links from M25 towards central London. They all see increases in traffic flow across all time periods in 2026 but less so than compared to the 2041models. The increases in traffic flows in 2026 are typically between of typically between 4% and 10% across all time periods.

For the AM peak 2041 capped differences, A12 traffic increases by 20% from Gallows Corner to M25 J28 (increase of more than 300 PCUs). There is an 8% increase in the westbound direction to Gubbins Lane/Gooshays Drive but a 15% increase westbound between Gubbins Lane to Gallows Corner. The A127/Hall Lane eastbound towards the M25 J29 see a 25% increase in traffic, westbound is less with a 15% increase. The M25 between J27-J30 in both directions see increases between 15-20%, with southbound seeing the greater increase in traffic (increase between 300 and 1000 PCUs). Overall, the majority of roads in Havering see increases in both directions but these are less than 100 PCUs in absolute values.

In the PM peak 2041 capped differences, from Gallows Corner to Mawney Rd/A12, there is less an 10% increase in both directions. The same traffic flow pattern is seen from Gallows Corner to A127/Hall Lane, less than 10% increase in traffic flow in both directions.

In the delay difference plots for 2016 to 2041 uncapped, there are many node delays, particularly directly in and surrounding the Barking Riverside development. In the AM peak the delay at J28 remains with additional delays at the Ardleigh Green/Squirrels Heath junction, as well as North of the M25 Dartford Crossing on the M25. The PM peak suffers from the same delays as the AM Peak but also has a large delay at Gallows Corner and more delays at J28, reflecting the increase in peak traffic flows in both directions utilising this junction.

There is a significant increase in the total queues at the end of the 3 time periods across Havering, indicating the increased congestion in the network, in the uncapped model some of this will be due to the Barking Riverside Development. The increases are quite significant in the uncapped model with an increase in queue in the AM of 141%, 399% in the IP and 285% in the PM Peak.

Travel time nearly doubles from 2026 to 2041 capped and more than doubles for 2041 uncapped. While the Travel Time (PCU-hours) increased the most in 2041 uncapped, so did the travel distance (PCU-km), across all time periods.

The overall results in the reference case include all committed schemes but may not fully reflect potential for additional development not committed at this time (such as the Lower Thames Crossing).

Havering Strategic Modelling Review using LoHAM

Havering Strategic Modelling Technical Note

December 2020

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