Three Rivers and Watford LDF

Executive Summary

Report

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1 Three Rivers and Watford LDF Modelling

Background and Study Objectives

1.1 The central part of the existing South West Herts SATURN Highway Model, taking in the town centre and the area west of the town towards Rickmansworth, has recently been updated to represent 2010 base year conditions to support the assessment and appraisal of the successful bid for Croxley Rail Link funding.

1.2 Three Rivers District Council and Watford Borough Council both agreed with Hertfordshire County Council to make use of the SATURN model to provide evidence to support the associated consultation on LDF documents.

1.3 A future year of 2026 has been taken to correspond with the Three Rivers LDF timetable. Given that the difference in flows to 2031 would be slight, the modelling results remain relevant to Watford who are working towards 2031.

1.4 Clearly, the LDF sites are not constrained to the central part of the highway model defined above and, as such, there was a need to incorporate this update into the wider SATURN model to allow the potential transport impacts of the combined strategies to be evaluated. The wider SATURN model includes much of the administrative area of Three Rivers District Council, all of the area of Watford Council and a small part of Hertsmere District Council (Bushey and Bushey Heath)

1.5 The report provides a stand-alone Executive Summary of the modelling work undertaken to update and utilise the highway model to assess the implications of future growth in development across Three Rivers and Watford to 2026. More detail on individual modelling tasks are included in three separate technical reports;

- Technical Note 1: Base 2010 Model
- Technical Note 2: Future Year Model Development
- Technical Note 3: 2026 LDF Sites

1.6 The remainder of this report provides a summary of the tasks undertaken and the conclusions derived at each stage of the study.

Base 2010 Model

1.7 As explained above, there was a need to incorporate the update of the highway model carried out to support the Croxley Rail Link (CRL) appraisal into the wider SATURN model to provide evidence of the potential transport impacts of the combined strategies of Three Rivers District Council and Watford Borough Council in support of their LDF site allocation consultation.

1.8 Any changes to modelled traffic flow to and from the updated central area have been reflected in the wider model, along with relatively minor changes to the representation of the highway in this central area to reflect in more detail the routes deemed likely to be affected by the CRL scheme.

1.9 Following this, the main update task related to the comparison of traffic flow forecasts within the updated model with latest count data. It was agreed that any

update of the model would make best use of available data and a request for new automatic count data was made with Herts Highway's data collection team. Data was received for a total of 18 sites across the wider model area.

1.10 Data was made available for a consistent week in each year between 2007 and 2011. Across all sites, no consistent pattern of growth through the five years available was identified and, as such, flows for 2010 have been used for flow calibration. This is consistent with data used for the update of the central area.

1.11 Initial model calibration against 2010 flows was poor, and identified a need to carry out additional flow calibration of the wider model area.

1.12 Where appropriate, calibration of modelled flows to link counts was dealt with manually, particularly to better reflect observed flows on the edge of the model area. However, this did not improve calibration sufficiently across the whole modelled area and it was also necessary to carry out a process known as matrix estimation in an attempt to improve the match against the 18 new count locations, in each direction.

1.13 The resulting matrices were re-assigned to the wider model network and resulting modelled flows again compared against the count locations. Flow comparisons are evaluated both in terms of absolute and percentage differences and a specific modelling comparator, the geh-statistic.

1.14 Overall, model flows compare well to observed count data in models of both the morning and evening peak hours. Reasonably accurate flow calibration is achieved for some 81% of comparisons in the AM peak and 83% in the PM peak.

1.15 There are, however, selected areas where calibration is not so good. It tends to underestimate AM peak flow in the base year on the A41 North Western Avenue in Garston and southbound on A411 Hempstead Road, immediately south of the Hunton Bridge gyratory. In the PM peak, again flow on the northern section of Hempstead Road is underestimated, as is flow on the High Road in Leavesden.

1.16 These discrepancies need to be kept in mind when interpreting model results in future years.

Conclusions

1.17 Having incorporated updates to the central area to the wider model area, the initial comparison of assigned flows to counts did not result in many matches and the need for a relatively minor update to the calibration was identified.

1.18 It should be noted that this model update exercise represents a calibration of model flow against already available count data only, and should not be regarded as a model upgrade, particularly given that no additional information has been gathered on origins and destinations of journeys within the model area.

1.19 However, it is believed that the resulting 2010 base model provides a suitable base point for the preparation of a transport evidence base to support the LDF consultation process.

Future Year Model Development

1.20 Following agreement of the 2010 Base Model, we then evaluated the level of traffic forecast to be generated by sites identified as committed developments in each of the Three Rivers and Watford areas and sought to identify any network improvements, some of which are also committed, that are likely to be required to support this committed growth. Except where committed infrastructure proposals are identified, such improvements to the network are constrained to relatively modest upgrades, which we believe can be delivered within existing highway boundaries.

1.21 A future year of 2026 has been taken to correspond with the Three Rivers LDF timetable. Given that the difference in flows to 2031 would be slight, the modelling results remain relevant to Watford who are working towards 2031.

Committed Developments

1.22 The table below lists the committed developments identified within the Three Rivers district and provides the development size, type and generated trip forecasts. Where available, trip forecasts have been taken directly from the individual development Transport Assessments (TAs). Where such information isn't available, residential trip rates are derived from those TAs that are available for similar developments, with rates extracted from the TRICS database for other land uses. The following generic rates are applied.

- Housing (per dwg): AM In=0.170, AM Out=0.410, PM In=0.380, PM out=0.230
- B2/B2 (per 100m^2): AM In=0.456, AM Out=0.094, PM In=0.044, PM out=0.339
- Office (per 100m^2): AM In=1.483, AM Out=0.172, PM In=0.139, PM out=1.235
- Retail (per 100m^2): AM In=9.311, AM Out=6.580, PM In=7.883, PM out=11.173
- Hotel (per bed): AM In=0.091, AM Out=0.113, PM In=0.097, PM out=0.084

TABLE 1.1 SUMMARY OF COMMITTED DEVELOPMENT – THREE RIVERS

Dev. Size	Development Type	Generated Trips			
		AM in	AM Out	PM In	PM Out
Abbots Langley					
33 units	Residential	6	13	12	7
Carpenders Park					
33 units	Residential (inc Rear of Kebbel House)	5	14	13	7
Chorleywood					
54 units	Residential	9	22	20	12

Croxley Green					
204 units	Residential (inc Old Merchant Taylors and Durrants)	35	83	76	47
Moor Park and Eastbury					
37 units	Residential	6	15	14	8
Kings Langley					
4 units	Residential	1	2	2	1
Rickmansworth					
110 units	Residential (inc 3a High St)	15	38	35	20
South Oxhey					
31 units	Residential	5	13	12	7
Leavesden					
425 units	Residential	72	173	160	96
Studio	Studio Tours	33	2	137	168
	Total Generated Trips	187	375	481	373

1.23 For Three Rivers, the predicted total of newly generated trips amounts to an additional 562 two-way trips in AM modelled period and 854 in the PM modelled period.

1.24 Similarly, the table below identifies the number of trips generated from the committed developments within the different wards around Watford.

1.25 For Watford, the total generated trips amount to an additional 2573 two-way trips in AM modelled period and 2329 in the PM modelled period.

TABLE 1.2 SUMMARY OF COMMITTED DEVELOPMENT - WATFORD

Dev. Size	Development Type	Generated Trips			
		AM in	AM Out	PM In	PM Out
Leggatts Ward					
225 units	Residential (inc Leggatts Campus)	30	76	69	29
Vicarage Ward					
74,000 sqm	Health Campus -Hospital	923	216	183	553

5,005 sqm	Health Campus -Restaurant	0	0	106	83
14,715 sqm	Health Campus - Hotel	53	65	64	37
18,780 sqm	Health Campus -Offices	281	34	28	234
504 units	Health Campus -Residential	41	117	107	54
48 units	Other Residential	8	20	18	11
Woodside Ward					
73 units	Residential	9	20	19	11
Callowland Ward					
65 units	Residential	11	26	25	15
Central Ward					
420 units	Residential	64	158	145	89
Holywell Ward					
119 units	Residential	20	48	44	26
Meriden Ward					
167 units	Residential	25	65	66	43
Nascot Ward					
332 units	Residential	53	122	108	72
Oxhey Ward					
136 units	Residential	14	33	31	19
Park Ward					
25 units	Residential	4	10	10	6
Stanborough Ward					
34 units	Residential	6	14	13	8
Tudor Ward					
9 units	Residential	2	4	3	2
	Total Generated Trips	1544	1028	1035	1294

1.26 These new trips are added to the base matrices for the AM and PM peaks to provide a 'Base + Committed' scenario.

1.27 Before assigning the 2026 matrices to the model, the following network improvements are assumed:

- Health Campus Link
  - Connecting Dalton Way to the Health Campus site via Wiggenhall Road
  - Left-in/left-out junction provided at Dalton Way (one-way operation)
  - New signalised junction with Wiggenhall Road: Layout shown in Appendix B
- Colonial Way Extension
  - Connecting Colonial Way from its junction with Imperial Way to St Albans Rd
  - All moves signalised junction with St Albans Lane
  - New rear entrance to Watford Junction Station car parks, forming a new signalised junction with Colonial Way Extension

1.28 Initial assignment of the 'Base+Committed' matrices identified a number of areas where stress on the network, in terms of queues and delays, are increased significantly over the 2010 base scenario. An assessment of each location has been carried out to make a judgement as to whether increased capacity could realistically be delivered to accommodate additional levels of traffic associated with the committed development. It seems reasonable to assume that developers of those committed schemes will be expected to contribute in some way to network improvements.

1.29 In some cases, improvements are delivered through optimisation of traffic signals. However, where increased physical capacity is required, solutions are constrained through a broad assessment of land availability, although it must be stressed that a more detailed assessment would be required if any of the schemes proposed were to be progressed. A summary of additional changes made to the network to accommodate committed development is provided below.

- Coding of additional capacity at the A412/A404 roundabout to the west of Rickmansworth Town Centre
- Provision of additional right turn lanes into and out of Glen Way and Grove Mill Lane at their junctions with A411 Hempstead Road

Potential Development

1.30 Sites identified for potential development, beyond those already committed, have similarly been identified for both Three Rivers and Watford. The following tables provide a summary of developments and the forecast numbers of generated trips. In Three Rivers future housing allocations are identified across seven wards. For Watford, potential development is focussed mainly at Watford Junction, the town centre and at Watford Business Park.

TABLE 1.3 SUMMARY OF POTENTIAL DEVELOPMENT – THREE RIVERS

Dev. Size	Development Type	Generated Trips			
		AM in	AM Out	PM In	PM Out
Abbots Langley					
75 units	Residential	13	30	31	17
Croxley Green					
145 units	Residential (inc Killingdown Farm, Former Croxley Green Station & South Tolpits Lane)	25	58	55	33
Langleybury					
310 units	Residential (inc Kings Langley & Langleybury House)	53	125	116	70
Leavesden					
80 units	Residential (inc Brickett Wood & Hill Farm Industrial Estate)	14	32	30	18
Rickmansworth					
263 units	Residential (inc Long Island Exchange & Stockers Farm Road)	45	107	99	59
16,000 sqm	B2/B8 Employment – Maple Cross	73	15	7	63
Sarratt					
10 units	Residential	2	4	4	2
South Oxhey					
473 units	Residential (inc Little Furze School, Land South of St Josephs, South Oxhey Town Centre Regeneration & Heysham Drive)	81	192	178	107
	Total Generated Trips	304	566	516	370

TABLE 1.4 SUMMARY OF POTENTIAL DEVELOPMENT - WATFORD

Dev. Size	Development Type	Generated Trips			
		AM in	AM Out	PM In	PM Out
Central					
1,200 units	Watford Junction Station - Residential	204	487	451	272
23,525 sqm	Watford Junction Station – Offices	344	40	32	287
300 bed	Watford Junction Station - Hotel	27	34	29	25
56,458 sqm	Town Centre (net increase)	71	11	277	393
96 units	Metropolitan Station Approach - Residential	16	39	36	22
Holywell					
3,716 sqm	Western Gateway – net increase in retail	346	245	293	415
	Total Generated Trips	1010	856	1117	1413

Traffic Growth and Matrix Sizes

1.31 Target traffic levels in 2026 are derived from the application of background growth rates to the 2010 base traffic flows. Following the addition of committed and potential development, background growth is adjusted to account for the 'gap' between identified development and the 2026 target levels.

1.32 The Tempro (v6.2) database has been interrogated to identify the expected growth in car driver trips between the years of 2010 and 2026. The average of origin and destination growth is used. Furthermore, there are differences in predicted growth between Watford and Three Rivers and, as such, growth rates for Hertfordshire is applied which is slightly below growth for Watford and a little above growth for Three Rivers. Given the coverage of model area, this seems reasonable. The growth rates applied are:

- AM Peak: 2010 to 2026 1.142
- PM Peak: 2010 to 2026 1.144

1.33 These growth rates define an upper limit of future year trips by 2026, most of which is accounted for by a combination of trips associated with committed (COM) and potential (POT) development sites. The following year provides a breakdown of future year matrix totals.

TABLE 1.5 FUTURE YEAR MATRIX TOTALS

Matrix Scenario	Breakdown				Total 2026
	2010	COM	POT	Growth	
AM Peak:					
Base + COM only	50925	3104	-	-	54029
Base + COM + residual growth	50925	3104	-	4125	58154
Base + COM + POT + res. growth	50925	3104	2742	1375	58146
PM Peak:					
Base + COM only	54829	3150	-	-	57979
Base + COM + residual growth	54829	3150	-	4771	62749
Base + COM + POT + res. growth	54829	3150	3428	1316	62723

Conclusions

1.34 Committed development sites in both the Three Rivers district and in Watford have been identified and associated forecasts of trip generation indicate that we expect to be adding some 3,104 extra 2-way trips to the model network in the AM peak, and a similar increase of 3,150 in the PM peak.

1.35 Committed development includes the Health Campus proposals and, as such, the network includes the new Health Campus link road from Dalton Way via a new signalised junction with Wiggenhall Road. In addition, it is assumed that Colonial Way Extension will be delivered by 2026.

1.36 Assigning demand associated with committed development to the updated network identified other locations where it appears feasible that capacity improvements could be implemented to help accommodate additional demand associated with committed development. These include optimisation of traffic signals at a number of junctions, physical changes to the network at junctions along Hempstead Road and additional capacity at the A412/A404 roundabout to the west of Rickmansworth Town Centre.

1.37 Overall, whilst there are few problems on the network with the network improvements identified, it is predicted that operation of the junction of Eastbury Road/Deacons Hill is likely to be cause for concern in future years, with increased delay also predicted on the approach to Rickmansworth in the morning peak and along Hempstead Road in the evening peak.

2026 LDF Sites

1.38 Once future year trip matrices have been established, and the level of future year networks changes required to help accommodate committed development has been identified, we then assess the additional impact of potential LDF sites.

1.39 The assessment specifically considered growth up to 2026, constrained by Tempro, under two scenarios.

- Base + Committed Development + Residual Growth to 2026
- Base + Committed and Potential Developments + Residual Growth to 2026 (LDF Scenario)

1.40 First a comparison was made of the 'Base+Committed+Growth' assignment against the 'Base+Committed' only results, to help illustrate those areas affected by additional demand growth beyond those sites where committed development has been identified. Second, we compared differences in 2026 model performance when a proportion of the future growth is allocated to directly to sites which have been identified as potential sites for further development through both Three Rivers' and Watford's ongoing LDF process.

1.41 For each scenario, we identified those sections of the network expected to operate above capacity by 2026 and how the patterns differs from the 'Base + Committed' only.

1.42 With 'Base+Committed+Growth', there is little control over where the growth occurs. The majority of routes show an increase in flow with the additional demand and the majority of the increase is shown on the motorways which, given growth is relatively unconstrained and that the strategic network is most heavily trafficked, is not a surprise.

1.43 Perhaps more interestingly, the changes in delay on the network are relatively low and suggest that the model adjusted to best accommodate committed development demand, can also largely accommodate further growth to 2026.

1.44 With future growth focussed on those areas identified in the LDF as having potential to deliver additional development (LDF Scenario), we see changes in the distribution of traffic across the network. In both peaks there is a reduction in flow on the M25 and M1 links implying that the growth is more self-contained within the study area when applied to potential allocations. We see increased demand for busy routes between Rickmansworth and Watford, but in the PM peak, where we have more trips associated with the potential sites, the impact is greater and also shown to extend beyond Rickmansworth along the A412 Uxbridge Road to the M25.

1.45 Comparing the LDF scenario against 'base+committed' only, we see pressures, in the AM peak, focussed on Watford, with network stress in West Watford and around the Bushey Arches gyratory. In the PM peak we predict changes in stress patterns around south-west Rickmansworth and increased stress at Watford Business Park and outbound on St Albans Road.

1.46 When trips associated with potential LDF sites are assessed independently, we can link increases in demand to some of the problem areas identified, seeing significant increases forecast for Ascot Road, Hempstead Road (as far as Langley

Road) and through the St Albans Road/Station Road junction in the AM peak. In the PM peak we also forecast greater increases along Hempstead Road, which are likely to be a cause of the problems at Courtlands Drive and Hunton Bridge.

1.47 The other problem areas of Eastbury Road/Deacons Hill, Bushey Arches and the western side of Rickmansworth are all areas of existing congestions, expected to worsen with growth to 2026.

Impact on the Strategic Road Network

1.48 Unconstrained growth to 2026 is predicted to add between 7-17% traffic to the motorway junctions within the study area, with M1 Junction 6 seeing the greatest increase. With growth constrained to LDF sites, we generally see a 2-3% reduction in the AM peak, and up to 4% in the PM peak.

1.49 However, it should be noted that while the motorway network is included in the highway model, these routes are not modelled in the same level of detail as the more central parts of the model area and queues and delay are not validated. We therefore have less confidence in the flows quoted for these outer 'buffer' parts of the model and recommend that it is the absolute changes in flow that should be considered, rather than the actual flows quoted.

Implications for Public Transport

1.50 Development related trips are generally spread across the network, and main radial routes into and out of the town, particularly from the north and west, are well served by existing bus services, linking Watford and Rickmansworth to surrounding towns. Also, the Croxley Rail Link proposals introduce new rail stations at both Ascot Road and at the Health Campus, which will provide additional public transport options to each of these key employment destinations.

1.51 Similarly, it can be implied that these model results represent a worst case given that no account is made of expected reductions in flow on local highways as a result of the Croxley Rail Link (CRL) scheme nor Abbey Line improvements. It is worth noting that for CRL alone, the supporting Transport Assessment indicates a predicted reduction of some 287 peak hour trips from the network following introduction of the scheme as drivers change mode from the car to rail. These reductions in flow offer moderate improvement in future year operational conditions at both the Rickmansworth Road/Ascot Road and Ascot Road/Whippendell Road junctions.

Future Mitigation

1.52 Growth in traffic on the network to 2026 will both add to pressures at locations where congestion is already a cause for concern, and introduce new concerns. The following table brings together the various proposals put forward, both to accommodate traffic associated with committed development proposals and beyond. For each solution, a scale of costs is also provided, although this must at this stage be taken as an indication only. Further detailed design and consideration of land costs would be needed to validate these costs.

TABLE 1.6 POTENTIAL FUTURE YEAR MITIGATION SUMMARY

Definition	Description	Funding / Cost
Major Schemes		
Health Campus Link	New link from development to Dalton Way via Wiggenhall Road	Developer led
Colonial Way Link	Extension of Colonial Way to St Albans Rd	Developer led
Croxley Rail Link	New rail link from Croxley to Watford Junction Station, inc new stations at Ascot Rd and Health Campus	Funding has been agreed by Government
Committed Developments		
Signal optimisation	Clarendon Road/ St Johns Road Hempstead Road/ Langley Way Exchange Road/ Market Street	Low cost
Capacity improvement	Increased circulatory capacity A412/A404 roundabout	<£1m
	RT lanes into/out of Glen Way and Grove Mill La at junctions with Hempstead Road	<£0.25
Additional Mitigation		
Bus re-routing	Re-route W30 service along Rickmansworth Rd rather than via Watford Met Station	Low cost
New bus services	New service between Watford Business Park and Rickmansworth	<£1m (subsidy?)
Signal optimisation	St Albans Road/ Sheepcot Lane	Low cost
Capacity improvement	M25 spur approach to Hunton Bridge rbt - widening approach/circulation or signalisation	~£1m
	Eastbury Road/ Deacons Hill – possible LT lane from Deacons Hill or major land-take	<£1m up to £5m+
	St Albans Rd/ Station Rd – possible 2-lanes northbound out of junction & review of parking	<£1m
	Bushey Arches – major scheme?	£10m+

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