

Technical note 2 - Spreadsheet model development, latest study position and next steps

31st January 2014

This technical note serves as a follow-up to the October 2013 note covering the base year junction capacity modelling. It documents the latest position of the Epping Local Plan Highway Impact Assessment, focussing on the development of a spreadsheet model to assist with forecast-year appraisal. It also outlines changes to the initial work brief, and next steps in the study.

This note has been produced as an interim document to inform Epping Forest District Council (EFDC) and Essex County Council (ECC) of study progress. It is envisaged that the contents, and that of the October 2013 technical note, will form part of a final report to be produced at the conclusion of the study.

Study progress to-date & changes to initial brief

Essex Highways were commissioned by EFDC and ECC in June 2013 to undertake a highways study to assess the likely impact of preferred Local Development Plan (LDP) options on surrounding key links and junctions within the district. Specific attention was given to the urban conurbations of Epping, Waltham Abbey, Chipping Ongar, North Weald and villages south of Harlow.

By October 2013, a base year appraisal had been undertaken – assessing the performance of the road network under current road conditions. This served as a foundation for subsequent forecast-year development impact appraisal. Further details can be found in the preceding technical note.

Since October 2013, a spreadsheet model has been in development which assigns future development traffic across the district, and forecasts future traffic flows at identified key junctions.

The original brief outlined an intention to model a 2026/2036 ‘do-something’ scenario with LDP development in the initial tranche of modelling. This ‘do-something’ scenario was later determined through discussions with EFDC to cover an assessment of 11,000 dwellings and 25 hectares of employment sites in Epping Forest district by 2036. Follow-up studies would then use the spreadsheet model to appraise the impact of various alternative development scenarios.

Whilst the initial brief considered a rigid spreadsheet model that could be adapted to model variable levels of development, a decision was made to spend additional time building a model with greater flexibility, inclusive of all possible LDP development sites

which could then be selected/de-selected at will. This would significantly speed up the appraisal of alternative development scenarios going forward.

Details of the spreadsheet model development can be found in the following section of this technical note.

Spreadsheet model development

- **Step One: Development Identification**

In August 2013, EFDC provided a list of committed housing developments with existing planning consent, and a list of potential residential and employment/retail LDP developments proposed for the period up to 2036. Tables 1 and 2 below provide a summary of the developments, whilst a detailed list is included in the appendices of this technical note.

Area	Housing (units)	Empl GFA (HA)
Buckhurst Hill	52	0
Chigwell	419	0
Epping	2,748	0.12
Harlow	7,837	1.6
Loughton	269	9.84
Lower Sheering	644	0
Nazeing	1,383	0.98
North Weald	2,260	8.2

Area	Housing (units)	Empl GFA (HA)
Ongar	4,935	16.43
Roydon	1,044	0
Sheering	674	0
Theydon Bois	1,266	0
Thornwood Common	400	1.14
Waltham Abbey	2,879	18.55
Total	26,810	56.86

Table 1: Proposed LDP developments in Epping Forest District

Area	Housing (units)
Buckhurst Hill	19
Chigwell	98
Epping	169
Harlow	0
Loughton	69
Lower Sheering	0
Nazeing	6
North Weald	48

Area	Housing (units)
Ongar	17
Roydon	0
Sheering	9
Theydon Bois	0
Thornwood Common	0
Waltham Abbey	134
Total	569

Table 2: Committed housing developments in Epping Forest District

It is understood that the list of potential LDP development sites identified in Epping Forest District is exhaustive for planned developments to the horizon dates. No other sites are currently envisaged or under consideration.

All the sites listed have been included in the spreadsheet model, although it is acknowledged that only a selection will be developed. In this respect, a modelled scenario containing all proposed LDP developments would not be realistic.

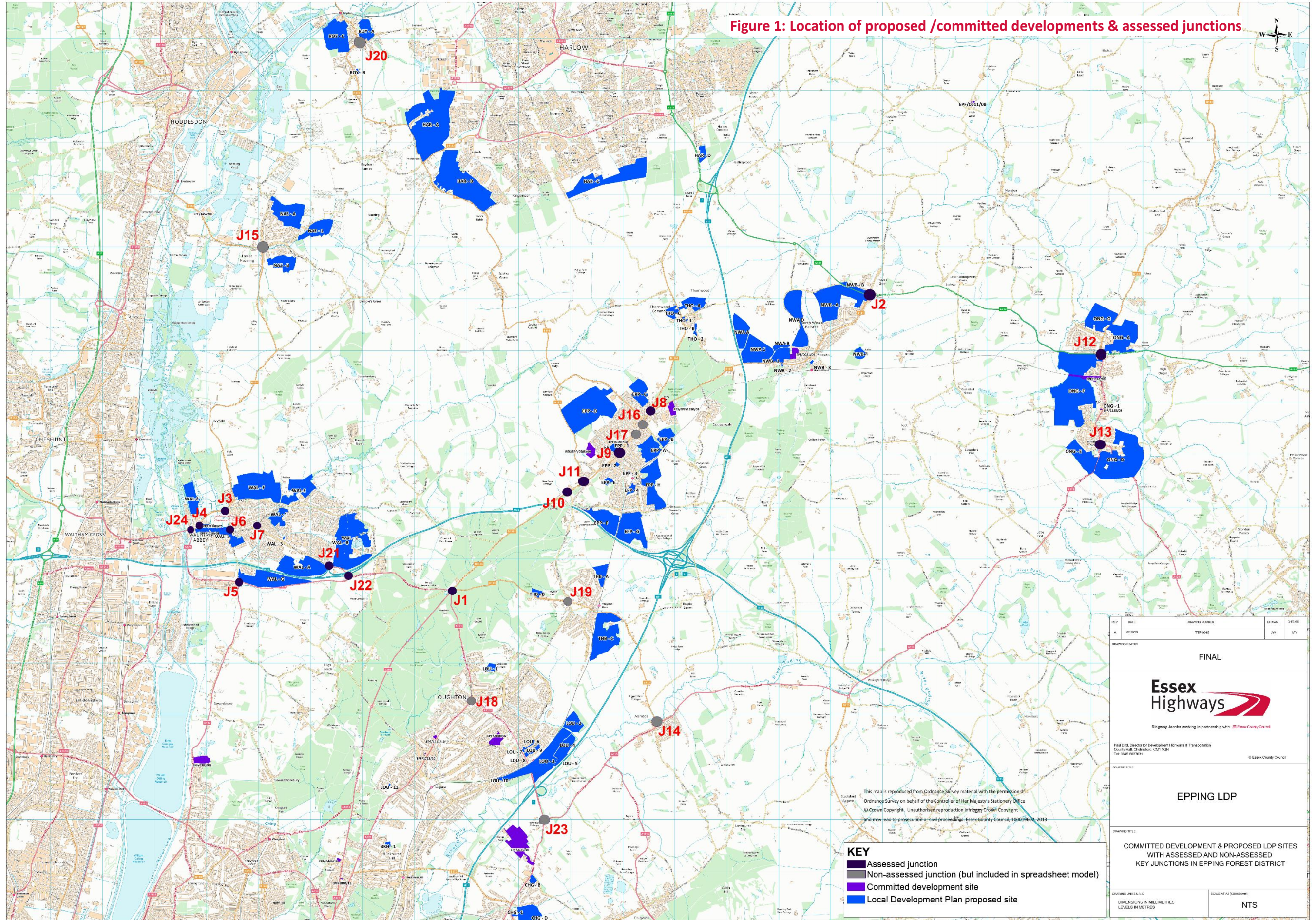
It has been agreed that all committed developments will be in place by the 2026 assessment year. For the purpose of determining trip generation (see Step Two), it has also been broadly assumed that 50% of any LDP development will have been completed by 2026, with the remainder completed by 2036.

Only sites larger than five housing units have been included in the model, whilst the Gross Floor Area (GFA) of developments represent the floor area of the potential building developments and not the overall plot sizes. As such, development trips have been calculated directly from the GFA values quoted.

The locations of the developments are shown in Figure 1, along with the location of key junctions in the district that are expected to be impacted by the associated growth in traffic. The junctions are also listed in Table 3 below. Those italicised in the table in grey are not included in the junction impact assessment, but have been included (along with the others) in the spreadsheet model.

Ref	Junction	Area
JC01	B1393 Epping Rd / B172 / A121 / A104 Epping New Rd (Wake Arms) (5-arm)	Epping
JC02	A414 High Rd / B181 High Rd (Talbot PH), North Weald (4-arm)	N Weald
JC03	B194 Abbeyview / Crooked Mile / Parklands, Waltham Abbey (5-arm)	W Abbey
JC04	B194 Abbeyview / B194 Highbridge St, Waltham Abbey (5-arm)	W Abbey
JC05	A112 Sewardstone Rd / A121 Meridian Way / Dowding Way, Waltham Abbey (4-arm)	W Abbey
JC06	Sun St / Sewardstone Rd / Monkwood Ave / Farm Hill Rd, Waltham Abbey (5-arm extended)	W Abbey
JC07	Farm Hill Rd / Honey Ln / Broomstick Hall Rd, Waltham Abbey (3-arm)	W Abbey
JC08	B1393 Thornwood Rd / B181 Epping Rd, Epping (3-arm)	Epping
JC09	B1393 High St / Station Rd / St John's Rd, Epping (4-arm extended junction)	Epping
JC10	B1393 High Rd / Theydon Rd, Epping (3-arm)	Epping
JC11	B182 Bury Ln / B1393 High Rd, Epping (3-arm)	Epping
JC12	A414 Chelmsford Rd / B184 High St / Fyfield Rd, Ongar (4-arm)	Ongar
JC13	A128 Brentwood Rd / A113 Coopers Hill, Marden Ash (4-arm)	Ongar
JC14	<i>A113 Ongar Rd / B172 Abridge Rd, Abridge (3-arm)</i>	<i>Loughton</i>
JC15	<i>B194 Nazeing Rd / North St / St Leonards Rd, Lower Nazeing (4-arm)</i>	<i>Nazeing</i>
JC16	<i>B1393 Palmers Hill / Stonnards Hill / B1393 High St / B181 Lindsey St, Epping (4 arm)</i>	<i>Epping</i>
JC17	<i>B1393 High St / Hemnall St, Epping (3 arm)</i>	<i>Epping</i>
JC18	<i>A121 Church Hill / A1168 Rectory Lane, Loughton (4-arm double mini)</i>	<i>Loughton</i>
JC19	Piercing Hill / B172 Coppice Row, Theydon Bois (4-arm)	Epping
JC20	<i>B181 High St / B181 Epping Rd / Harlow Rd, Roydon (3-arm)</i>	<i>Roydon</i>
JC21	M25 J28 / A121 north roundabout, Waltham Abbey	W Abbey
JC22	M25 J28 / A121 south roundabout, Waltham Abbey	W Abbey
JC23	<i>A113 High Rd / A1168 Chigwell Ln / A113 Abridge Rd, Loughton (Rolls Park Cnr)</i>	<i>Loughton</i>
JC24	A121 Station Rd / B194 Highbridge St / A121 Meridian Way, Waltham Abbey	Loughton

Table 3: Impacted junctions in Epping Forest District



- **Step Two: Trip Generation**

Trips associated with the proposed developments were determined using the TRICS 2013 (b) database (v.6.12.1). The calculated rates are shown below:

Housing trip rates (per 100m ²)	No. of Surveys	08:00 to 09:00		17:00 to 18:00	
		ARR	DEP	ARR	DEP
Houses Privately Owned - Average	42	0.156	0.419	0.396	0.232
Houses Privately Owned - 85th percentile		0.243	0.491	0.556	0.222
Houses Rented - Average	11	0.132	0.243	0.294	0.182
Houses Rented - 85th percentile		0.186	0.309	0.46	0.246
Flats Privately Owned - Average	18	0.027	0.139	0.23	0.106
Flats Privately Owned - 85th percentile		0.15	0.3	0.333	0.25
Flats Rented - Average	18	0.071	0.103	0.104	0.09
Flats Rented - 85th percentile		0.2	0.1	0.214	0.071
Mixed Private Housing - Average	14	0.123	0.37	0.313	0.199
Mixed Private Housing - 85th percentile		0.214	0.364	0.361	0.197
Mixed Housing for Rent - Average	7	0.079	0.253	0.287	0.177
Mixed Housing for Rent - 85th percentile		0.175	0.425	0.441	0.237
Mixed Private & Non-Private Housing - Average	20	0.103	0.304	0.292	0.146
Mixed Private & Non-Private Housing - 85th percentile		0.246	0.386	0.59	0.128

Table 4: Housing development trip rates (per 100m²)

Retail / Employment trip rates (per 100m ²)	No. of Surveys	08:00 to 09:00		17:00 to 18:00	
		ARR	DEP	ARR	DEP
Retail - Food superstore - Average	12	2.352	1.607	4.614	4.874
Retail - Food superstore - 85th percentile		3.940	2.320	8.529	6.882
Retail - Shopping Centre / Local Shops - Average	20	4.276	4.064	5.036	5.171
Retail - Shopping Centre / Local Shops - 85th percentile		8.154	8.000	9.076	7.756
Employment - Office - Average	41	1.696	0.194	0.145	1.413
Employment - Office - 85th percentile		3.034	0.207	0.267	2.600
Employment - Warehousing - Average	10	0.076	0.048	0.032	0.082
Employment - Warehousing - 85th percentile		0.417	0.333	0.333	0.333
Employment - Industrial Units - Average	20	0.438	0.080	0.049	0.360
Employment - Industrial Units - 85th percentile		0.842	0.211	0.114	1.143
Employment - Industrial Estate - Average	32	0.495	0.242	0.126	0.418
Employment - Industrial Estate - 85th percentile		0.921	0.873	0.561	0.673
Employment - Business Park - Average	22	1.383	0.273	0.188	1.132
Employment - Business Park - 85th percentile		2.162	0.243	0.191	1.842

Table 5: Retail / Employment development trip rates (per 100m²)

The following assumptions have been made in the calculation and application of trips rates in the model:

- Whilst separate trip rates were identified for ‘edge of town’ and suburban areas. The geographic locations of individual sites found in the two categories in the TRICS database, were considered to be very similar. Therefore, a mix of the two trip rate categories was used.
- 85th percentile trip rates were considered more representative for employment sites in Ongar, Thornwood, North Weald and Nazeing, where public transport in the more rural areas was considered to be less accessible. Average trip rates were used for more urban sites in Epping, Waltham Abbey, Harlow and Loughton.
- Housing-type splits were determined for each town in the district using 2011 Census data. These were as follows:

	Epping	Harlow	Ongar	North Weald	Waltham Abbey	Epping Forest Av
% Houses =	79%	75%	86%	84%	68%	78%
% Flats =	21%	25%	14%	16%	32%	22%
% Private =	70%	57%	80%	74%	69%	73%
% Rented =	30%	43%	20%	26%	31%	27%

Table 6: Housing-type splits in Epping Forest District – taken from 2011 Census

Developments not located in the main towns in the district were assigned a housing-type split derived from the average of all the towns.

- Given the small size of the proposed retail foodstore site(s) in Loughton, site selection in TRICS was limited to foodstores without petrol stations.

All trip generation assumptions were agreed with EFDC at the time, and prior to construction of the model.

- **Step Three: Trip Distribution**

2001 Census Journey to Work (JTW) data was used to guide the distribution of development trips across the spreadsheet model.

In order to utilise this data, a model zone system was defined based on the Census JTW output areas and boundaries. It was then possible to aggregate the JTW data to fit within the zone definitions of the spreadsheet model. 96 zones were subsequently identified. Of these, 80 were located in the district and 16 were located externally – see Figures 2 & 3 below.

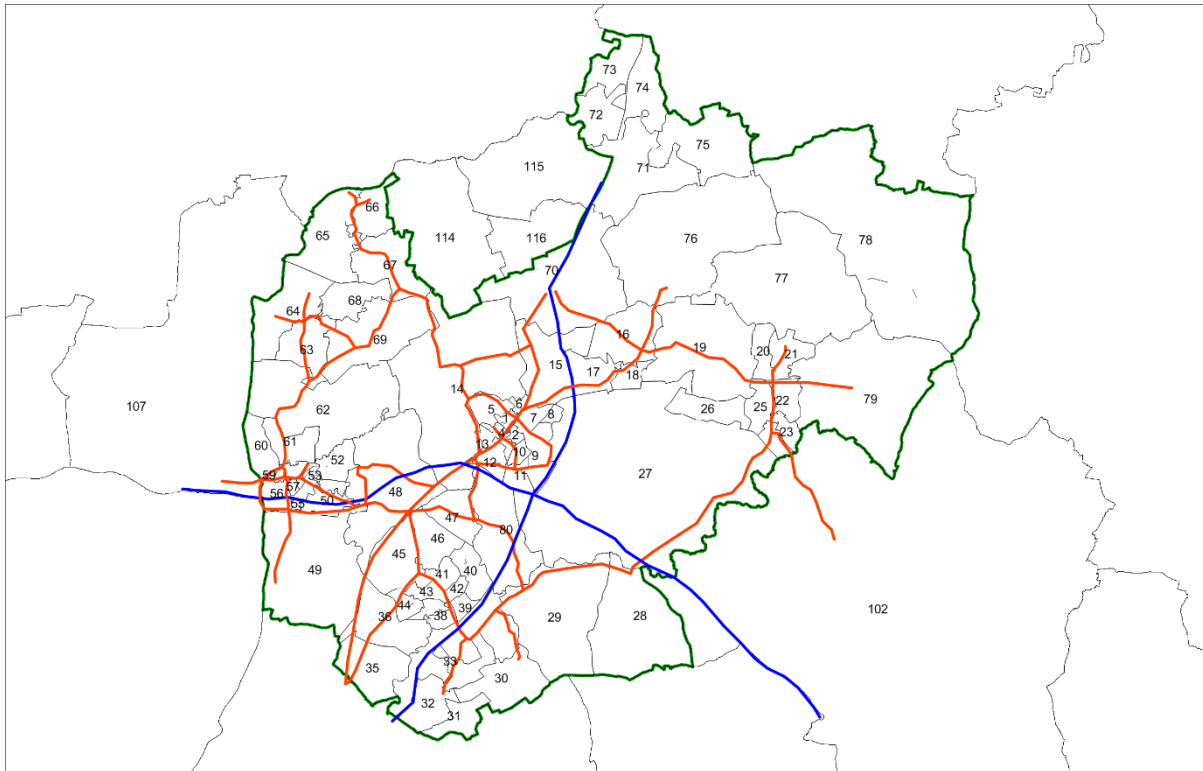


Figure 2: Zone system determined for Epping Forest District (boundary in green). Key routes (orange) and motorways (blue) also shown

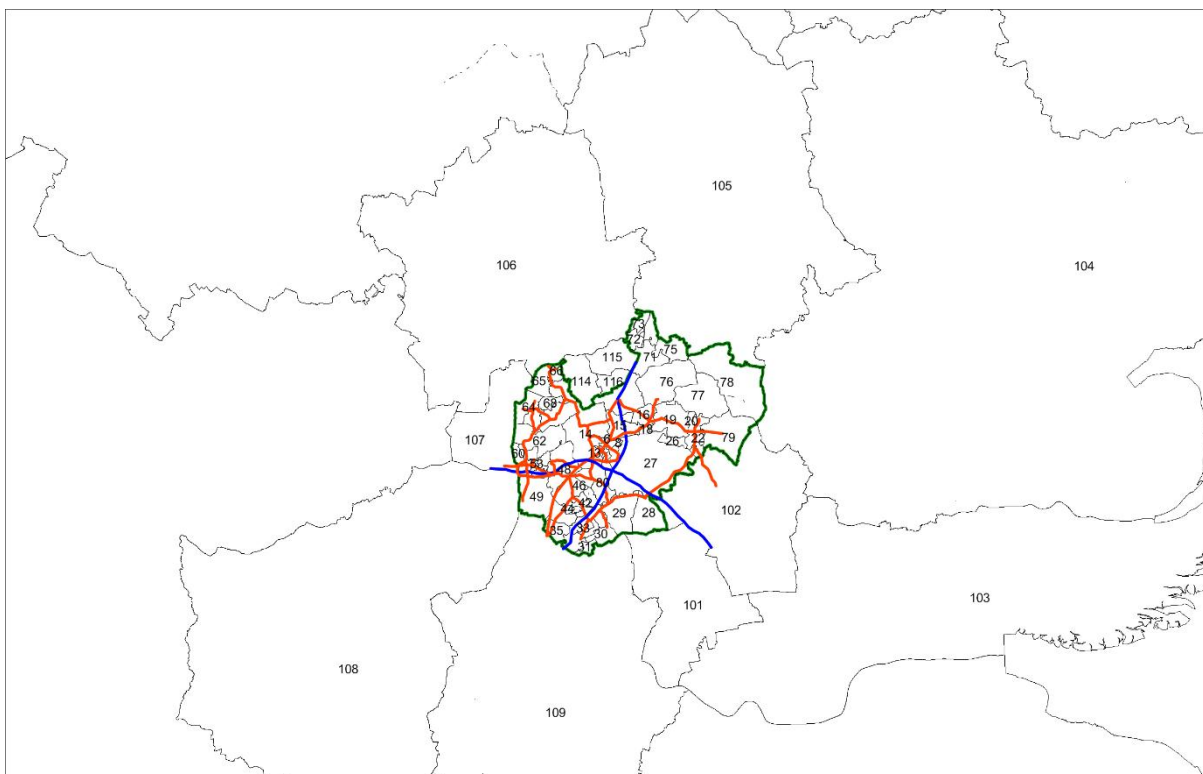


Figure 3: Zone system determined for areas outside of Epping Forest District (boundary in green). Key routes (orange) and motorways (blue) also shown

A 96 x 96 matrix of Census JTW trips was subsequently derived and was used as a basis for the creation of sectorised distribution matrices for each of the three main towns - Epping, Ongar and Waltham Abbey, and for the wider district.

The Epping sectorised distribution matrix, as an example, contained 13 internal sectors overlapping the 13 zones comprising the urban area of Epping. In addition, 5 external sectors were identified, each comprising an aggregate of zones determined by their location and proximity to one of the town's identified five entry-exit points on the road network.

Epping		
Number of internal sectors	13	
Number of external sectors	5	
	Entry/exit point (road):	Direction:
External Sector 1	B181 Lindsey Street	North
External Sector 2	B1393 High Road	North-East
External Sector 3	B181 Epping Road	East
External Sector 4	Theydon Road	South
External Sector 5	B1393 High Road	South-West

Table 7: Sectoring in Epping

Bespoke sectorised matrices were also created for Waltham Abbey and Ongar, with the aggregation of external zones being unique to the location of entry-exit points to each town.

A further sectorised matrix was also created for the wider Epping Forest District. This treated Epping, Waltham Abbey and Ongar as individual sectors, whilst aggregating remaining zones based on matching route choice through the modelled junctions. It was also necessary to ensure that sectors did not encompass more than one modelled junction approach to ensure that all trips between sectors could be captured as turning movements at relevant junctions.

Each sectorised distribution matrix was then converted into production and attraction matrices by determining the proportion of journeys travelling to (attraction) and from (production) each sector.

For each proposed committed or LDP development within a particular town or district sector, the relevant production and attraction proportions were applied to the trip generation values of each development in order to determine the trip distribution.

For the PM peak modelling, it was assumed that the AM peak production and attraction distributions would be reversed.

- **Step Four: Trip Assignment**

The creation of separate sector matrices for Epping, Waltham Abbey, Ongar and the wider district enabled the creation of three town centre models and a wider district model – all linked to one another. This helped reduce the complexity of the manual trip assignment process. Screenshots of the models can be found in the appendices of this technical note.

For each town/district model, internal development trips were manually assigned through each applicable junction based on a judgement of likely route choice between model sectors.

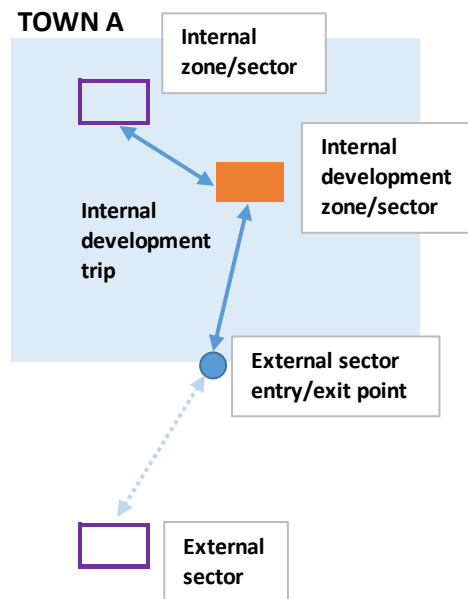


Figure 4: Assignment of internal development trips within a particular town model

Then for each town model, the number of external (wider district or other town) LDP/committed development trips with in-town origins and destinations were identified and assigned an entry-exit point matching a representative town model external sector.

The town model external sectors were subsequently treated as internal development zones/sectors, with external development trips manually assigned through the town centre junctions using a representative internal-external sector JTW distribution.

External (wider district or other town) LDP/committed development through-trips were then determined for each town model based on the manual assignment of trips through the wider district model. Through-trip entry and exit points were again matched to representative town model external sectors, and trips manually assigned through the town centre junctions between external sector pairs.

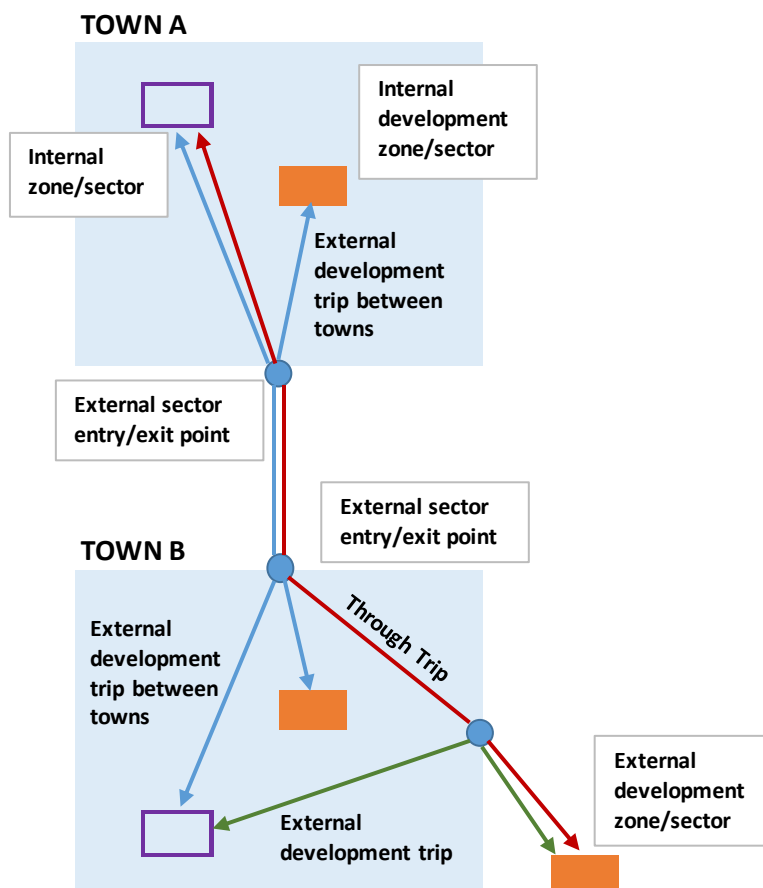


Figure 5: Assignment of external development trips and through-trips within town models

• Step Five: Forecast Year Growth

Fuel and income factors presented in the The Department for Transport’s WebTAG unit 3.15.2 were applied to both background and development traffic flows to account for economic growth. This was on the assertion that development trips from the TRICS database would also be the subject of fuel price and income changes over time.

	Income adjustment factor	Fuel adjustment factor	Combined Factor
2013	1.065	1.018	
2026	1.107	1.032	
2036	1.146	1.032	
2013-2026	1.039	1.014	1.054
2013-2036	1.076	1.014	1.091

Table 8: Fuel & income factors applied to forecast year traffic flows

Since development scenario predictions for the district were shown to exceed development quotas stated in TEMPRO for Epping Forest, it was considered that no further growth need to

be applied to trips internally produced or attracted beyond the trips calculated for the LDP scenarios.

As the spreadsheet model was not constructed using trip-end matrices, it was not possible to isolate the external background trips routing through the district on which to apply a regional growth factor. While the existing through trips were captured by the base traffic counts, the growth of through trips needed to be added. Forecast-year outputs from the Harlow Stansted Gateway Traffic Model (HSGTM) were thus used to determine the distribution and volume of growth in external traffic with the potential to route through Epping Forest District.

The spreadsheet model has been constructed so that 2026/2036 development scenario trips can be added to current 2013 junction count data. Factors attributed to economic growth (fuel and income) can also be applied to junction turning movements separately, along with regional through trips taken from the HSGTM.

Spreadsheet model functionality

- The spreadsheet model contains all committed and proposed LDP developments as of August 2013, allowing the user to turn on/off individual developments in order to model the impact of all possible development scenarios.
- Housing trips are modelled separately from employment/retail trips, allowing either to be toggled on/off for each development site.
- The spreadsheet model can also separate development traffic from background traffic in order to isolate the impact of development traffic on the road network.
- The model can be toggled between 2026 and 2036 assessment years.
- The model has been built using a fixed manual assignment process and therefore does not model variable network conditions and stochastic (non-predetermined) route assignment.
- The base model has been built from traffic count data collected at junctions and not from an origin-destination matrix. Whilst development trips have been distributed via a Census JTW matrix, it is not possible to determine the origins and destinations (and subsequent route choice) of background traffic flows through the model.

Next steps & study timescales

- Spreadsheet model to be checked and finalised.
- A 2026 and 2036 forecast year scenario with background traffic-only to be modelled and junction capacity outputs reviewed.
- EFDC to confirm six development scenarios to be modelled.

(There is also the potential to use the spreadsheet model to determine the location and/or scale of development required to minimise the impact of development flows on the road network and thus reduce the amount of mitigation measures required).

- Development scenarios to be modelled and junction capacity outputs reviewed and reported.
- With reference to junction capacity findings, mitigation measures to be discussed with EFDC. It is anticipated that the Epping Town Centre Study will run concurrently alongside the spreadsheet modelling, and that options such as an Epping relief road and/or junction signalisation will be considered in relation to the development impact.
- Final report to be submitted.

The deadline for completion of the study has been set at the end of May, in time for the Public Consultation on the draft Local Plan in July. Specific timescales associated with interim study milestones will be determined following confirmation of the development scenario modelling and agreement on a proposal of work for the Epping Town Centre Study.

Appendices

1) Full Table of Committed Developments

Site/App Ref	Site Name & Location	Settlement:	Easting	Northing	JTW Census zone to represent site	Model Sector	Total 2013-2036 Site Yield
EPF/0585/09	St John's School, Tower Road, Epping, CM16 5EN	Epping	545397	202114	13	E13	149
EPF/0383/09	Limes/White Lodge, Sewardstone Road, London, E4 7SA	Waltham Abbey	537784	196136	49	D16	118
EPF/2100/06 (part 1)	Epping Forest College, Border's Lane, Loughton, IG10 3SA	Loughton	543688	196439	43	D11	40
EPF/2278/10	Grange Farm, High Road, Chigwell, IG7 6DP (Now known as Chigwell Grange)	Chigwell	543764	194732	31	D9	45
EPF/0081/09 (part 1)	Former Parade Ground, Merlin Way, North Weald, CM16 6HT	North Weald Bassett	549298	205180	17	D4	26
EPF/0081/09 (part 2)	Former Parade Ground, Merlin Way, North Weald, CM16 6HT	North Weald Bassett	549298	205180	17	D4	22
RES/EPF/1350/08	St Margaret's Hospital & Ivylands, The Plain, Epping, CM16 6TN (Now known as Kings Wood Park)	Epping	547051	202930	7	E7	12
EPF/0409/11	Bald Hind, Hainault Road, Chigwell, IG7 5DW	Chigwell	544209	192305	31	D9	14
EPF/0446/10	BPI Poly Site, Brook Road, Buckhurst Hill, IG9 5TU	Buckhurst Hill	540622	194207	35	D10	14
EPF/2100/06 (part 2)	Epping Forest College, Border's Lane, Loughton, IG10 3SA	Loughton	543688	196439	43	D11	12
EPF/1413/10	Land rear of Diggins Court & Vanryne House, High Road, Loughton, IG10 1RB	Loughton	542457	196612	44	D12	12
EPF/0320/10	113 & 115 Grange Crescent, Chigwell, IG7 5JD	Chigwell	544981	192399	31	D9	12
EPF/0475/11	109 & 111 Manor Road, Chigwell, IG7 5PS	Chigwell	544318	192267	31	D9	11
EPF/1118/08	20 Sun Street, Waltham Abbey, EN9 1EE	Waltham Abbey	538258	200584	59	W59	9
EPF/0976/09	Land at The Maltings, Waterside Place, Sheering Lower Road, Sheering, CM21 9RF	Sheering	549071	214935	73	D22	9
EPF/0149/10	208 - 212 High Street, Epping, CM16 4AQ	Epping	546086	202209	2	E2	8
EPF/1325/10	114,116 & 118 Manor Road, Chigwell, IG7 5PW	Chigwell	544118	192232	31	D9	8
EPF/1403/10	28 Sun Street, Waltham Abbey, EN9 1EE	Waltham Abbey	538306	200586	59	W59	7
EPF/0011/08	High Laver Hall Farm, Matching Road, High Laver, Ongar, CM5 0DU	Moreton, Bobbingworth and the Lavers	553448	211017	76	D22	7
EPF/1452/08	1 The Mead, Nazeing, EN10 6SS	Nazeing	537922	206636	64	D18	6
EPF/1145/08 (part 1)	Land at Station Approach, High Street, Ongar, CM5 9BN	Ongar	555211	203912	25	O25	5
EPF/1723/10	Rear car park of 184-186 High Road, Loughton, IG10 1DN	Loughton	542221	196234	44	D12	5
EPF/1153/09	Rear of 103 High Street, Chipping Ongar, CM5 9DX	Ongar	555218	202870	22	O22	5
EPF/1840/11	49 Epping New Road Buckhurst Hill Essex IG9 5JT	Buckhurst Hill	542352	207238	35	D10	5
EPF/1228/11	114,116,118 Manor Road Chigwell Essex IG7 5PW	Chigwell	544118	192232	31	D9	8

2) Full Table of Proposed LDP Developments

Site/App Ref	Site Name & Location	Settlement:	Easting	Northing	JTW zone to represent site	Model Sector	Site Size (Ha):	Total 2013-2036 Site Yield	Additional Land Use	Floorspace (GFA) m ²
BKH - 1	Powell Road	Buckhurst Hill	541466	194645	35	D10	1.2	40		-
BKH - 2	Station Way	Buckhurst Hill	541524	192952	35	D10	0.17	12		-
CHG - 1	Hainault Road (Small)	Chigwell	543877	193153	32	D9	0.4	10		-
CHG - B	Vicarage Lane	Chigwell	544269	193845	33	D9	1.8	54		-
CHG - D	Hainault Road (Large)	Chigwell	544140	193149	32	D9	14.8	355		-
EPP - 1	St. John's Road	Epping	545862	202114	4	E4	1.47	35	Employment - Office	1,200
EPP - 2	Nicholl Road	Epping	545895	201804	3	E3	0.04	12		-
EPP - 3	Centre Drive	Epping	546119	201679	3	E3	0.2	6		-
EPP - 4	Bower Terrace	Epping	546132	201306	10	E10	2	55		-
EPP - A	Stonards Hill (S)	Epping	546535	202104	9	E9	14.5	300		-
EPP - B	Stonards Hill (N)	Epping	546807	202362	7	E7	7.8	230		-
EPP - C	Thornwood Road	Epping	546381	203035	6	E6	12	350		-
EPP - D	B181 Lindsey Street / B182 Bury Lane	Epping	545224	202813	5	E5	53	750		-
EPP - E	Theydon Place / Madells	Epping	545722	201543	12	E12	2	60		-
EPP - F	Ivy Chimneys Road	Epping	545668	200786	12	E12	17	350		-
EPP - G	Brook Road	Epping	546166	200611	11	E11	26	250		-
EPP - H	Bower Hill	Epping	546572	201452	10	E10	23	350		-
HAR - A	B181 Epping Road / B1133 Water Lane	Harlow	542327	208310	67	D19	36	900		-
HAR - B	B181 Epping Road / Parsloe Road	Harlow	543000	207157	67	D19	59	1100		-
HAR - C	Rye Hill Road	Harlow	545802	207348	70	D21	33	987		-
HAR - D	A414 North of M11 J7	Harlow	547543	207777	70	D21	4	0	Employment - Office	16,000
HAR - E	B183 Sheering Road	Harlow	549325	212222	72	D22	140	4850		-
LOU - 1	Clay's Lane	Loughton	543497	197918	46	D13	2.59	78		-
LOU - 10	Oakwood Hill	Loughton	543646	195778	38	D11	0.55	0	Employment - Industrial Estate	2,200
LOU - 11	Albion Hill	Loughton	541227	195108	36	D10	0.29	10		-
LOU - 2	Langston Road (North)	Loughton	545060	196847	40	D11	9.06	0	Employment - Industrial Estate	30,200
LOU - 3	Langston Road / Oakwood Hill	Loughton	544264	196006	39	D11	33.51	0	Employment - Industrial Estate	20,000
LOU - 4	Langston Road (NE)	Loughton	544921	196508	40	D11	6.24	0	Employment - Industrial Estate	32,000
LOU - 5	Langston Road (East)	Loughton	544801	196244	39	D11	3.87	0	Employment - Industrial Estate	7,700
LOU - 6	Vere Road	Loughton	544189	196409	39	D11	0.97	41		-
LOU - 7	Chigwell Lane / The Broadway	Loughton	544092	196318	39	D11	0.24	19	Retail - Shopping Centre / Local Shops	1,500
LOU - 8	Chigwell Lane	Loughton	544140	196224	39	D11	0.52	41	Retail - Food superstore	3,800
LOU - 9	Torrington Drive	Loughton	544324	196307	39	D11	1.28	80	Retail - Shopping Centre / Local Shops	1,000
LSH - A	Station Road / Sheering Lower Road	Lower Sheering	549056	215200	73	D22	0	14		-
LSH - B	Sawbridgeworth Road / Back Lane	Lower Sheering	549056	215200	73	D22	22	630		-
NAZ - 1	Hoe Lane	Nazeing	540039	206387	68	D19	13.5	400		-
NAZ - A	Peck's Hill / Palmers Grove	Nazeing	539578	206605	64	D18	23	690		-
NAZ - B	Hyde Mead	Nazeing	539362	205761	63	D17	12	293	Employment - Industrial Estate	9,800
NWA - A	North Weald Airfield A	North Weald Airfield	548269	204518	17	D4	14	0		-
NWA - B	North Weald Airfield B	North Weald Airfield	549041	204108	17	D4	3	0		-
NWA - C	North Weald Airfield C	North Weald Airfield	548447	203919	17	D4	23	0	Employment - Warehousing	82,000

NWA - D	North Weald Airfield D	North Weald Airfield	549441	204233	17	D4	24	1107		-
NWB - 1	B181 Epping Road (North)	North Weald Bassett	548957	203881	17	D4	8	0		-
NWB - 2	B181 Epping Road (South)	North Weald Bassett	549002	203764	17	D4	0	0		-
NWB - 3	Station Road	North Weald Bassett	549635	203826	18	D4	0	0		-
NWB - A	Vicarage Lane West	North Weald Bassett	549971	205090	16	D3	35	1050		-
NWB - B	Vicarage Lane East	North Weald Bassett	550438	205106	16	D3	4	103		-
NWB - 4	Land SW of Blakes Golf Club	North Weald Bassett	550566	203967	18	D4	4	0		-
ONG - 1	High Street	Ongar	555190	202873	22	O22	1	5		-
ONG - A	B184 Fyfield Road (NE Ongar)	Ongar	555627	204340	21	O21	26.6	635	Employment - Office	21,300
ONG - D	A128 Brentwood Road / Stondon Road	Ongar	555521	201900	23	O23	54.2	1344	Employment - Industrial Estate	45,000
ONG - E	Stanford Rivers Road	Ongar	554852	201933	24	O24	17.6	432	Employment - Industrial Estate	14,000
ONG - F	A414 Epping Road (West Ongar)	Ongar	554779	203325	25	O25	84.2	2015	Employment - Industrial Estate	67,000
ONG - G	B184 Fyfield Road (NW Ongar)	Ongar	555194	204504	21	O21	20.7	504	Employment - Office	17,000
ROY - A	B181 High Street / Harlow Road	Roydon	540995	210040	66	D20	9	289		-
ROY - B	B181 Epping Road (South Roydon)	Roydon	540885	209353	66	D20	0	5		-
ROY - C	B181 Epping Road (NW Roydon)	Roydon	540550	209905	65	D19	25	750		-
SHE - A	B183 The Street (West Sheering)	Sheering	550237	213880	74	D22	3	71		-
SHE - B	B183 The Street (North Sheering)	Sheering	550730	214191	74	D22	14	420		-
SHE - C	B183 The Street (South Sheering)	Sheering	550587	213710	74	D22	6	183		-
THB - A	Forest Drive	Theydon Bois	545564	199738	80	D29	6.6	198		-
THB - B	B172 Coppice Row	Theydon Bois	544362	199289	47	D14	2.3	68		-
THB - C	B172 Abridge Road	Theydon Bois	545592	198864	80	D29	36	1000		-
THO - 1	B1393 High Road / Weald Hall Lane	Thornwood	547154	204635	15	D2	0.97	20		-
THO - 2	Woodside	Thornwood	547405	204337	15	D2	0.4	5		-
THO - A	Weald Hall Lane (NE Thornwood)	Thornwood	547393	204846	15	D2	8.8	231	Employment - Industrial Estate	11,400
THO - B	Woodside / Duck Lane	Thornwood	547390	204434	15	D2	0.6	19		-
THO - C	B1393 High Road (NW Thornwood)	Thornwood	546976	204723	15	D2	4.18	125		-
WAL - 3	Mason Close	Waltham Abbey	539510	200380	53	W53	0	10		-
WAL - 4	Broomstick Hall Road	Waltham Abbey	539364	200819	53	W53	7	220		-
WAL - A	Honey Lane / M25	Waltham Abbey	540126	199863	50	W50	12.96	0	Employment - Industrial Estate	20,000
WAL - B	Old Shire Lane / Upshire Road	Waltham Abbey	540507	200112	51	W51	19	500		-
WAL - C	Honey Lane / Woodgreen Road	Waltham Abbey	540840	200565	51	W51	45	950	Employment - Industrial Estate	54,500
WAL - E	Paternoster Hill / Pick Hill	Waltham Abbey	539911	201278	52	W52	10	384		-
WAL - F	Parklands	Waltham Abbey	538995	201287	61	W61	42	600		-
WAL - G	Dowding Way	Waltham Abbey	539138	199593	55	W55	26	0	Employment - Warehousing	104,000
WAL - 1	Highbridge Street / Quaker Lane	Waltham Abbey	538167	200547	59	W59	14	15	Employment - Office	7,000
WAL - 2	Powdermill Way	Waltham Abbey	537744	200988	60	W60	11	200		-

3) Epping Spreadsheet Model screenshot

(outputs shown as an example)

AM Peak 2026 Future Base, and Development
 Values in PCUs
 Arm A is Green, other arms are Blue - clockwise B,C,D.

Percentage change in approach arm traffic flow
 Greater than 40% increase
 Between 20% and 40% increase
 Less than 20% increase

Existing (2013) capacity of junction approach arm
 (Where modelled)
 At/Over Capacity
 Approaching Capacity
 Within Capacity

External Zone sectoring:

- EX1 14, 63-29
- EX2 15, 70-75, 101, 103,105,106,110,112-116
- EX3 16-26, 76-79, 102, 104
- EX4 27-29, 40, 47, 80, 109
- EX5 30-39, 41-46, 48-62, 107, 108, 111

Forecast Year 2026

Base Traffic OFF

Future Base ON

Development ON

Epping Development Toggle OFF

Ref:	Site:	Zone:	Housing	Employment
EPP - 1	St. John's Road	E4	OFF	OFF
EPP - 2	Nicholl Road	E3	OFF	OFF
EPP - 3	Centre Drive	E3	OFF	OFF
EPP - 4	Bower Terrace	E10	OFF	OFF
EPP - A	Stonards Hill (S)	E9	OFF	OFF
EPP - B	Stonards Hill (N)	E7	ON	OFF
EPP - C	Thornwood Road	E6	ON	OFF
EPP - D	B181 Lindsey Street / B182 Bury Lane	E5	ON	OFF
EPP - E	Theydon Place / Madells	E12	OFF	OFF
EPP - F	Ivy Chimneys Road	E12	ON	OFF
EPP - G	Brook Road	E11	OFF	OFF
EPP - H	Bowers Hill	E10	ON	OFF
EPP/0585/09	St John's School, Tower Road, Epping, ChE13	E13	ON	OFF
RES/EPP/13	St Margaret's Hospital & Ivylands, The Pl:E8	E8	ON	OFF

Junc:	10
A A	0
A B	126
A C	937
B A	183
B B	0
B C	142
C A	696
C B	62
C C	0

F&I Fact	1.05
Junc:	10
A A	0
A B	133
A C	987
B A	193
B B	0
B C	150
C A	733
C B	65
C C	0

% Dev:	100
Junc:	10
A A	0
A B	83
A C	270
B A	17
B B	0
B C	28
C A	62
C B	11
C C	0

Junc:	11
A A	0
A B	66
A C	364
B A	36
B B	0
B C	711
C A	184
C B	759
C C	0

Junc:	11
A A	0
A B	70
A C	384
B A	38
B B	0
B C	749
C A	194
C B	800
C C	0

Junc:	11
A A	0
A B	51
A C	58
B A	3
B B	0
B C	260
C A	20
C B	60
C C	0

Junc:	9
A A	0
A B	35
A C	60
A D	65
B A	90
B B	0
B C	89
B D	544
C A	61
C B	205
C C	0
C D	111
D A	110
D B	542
D C	195
D D	0

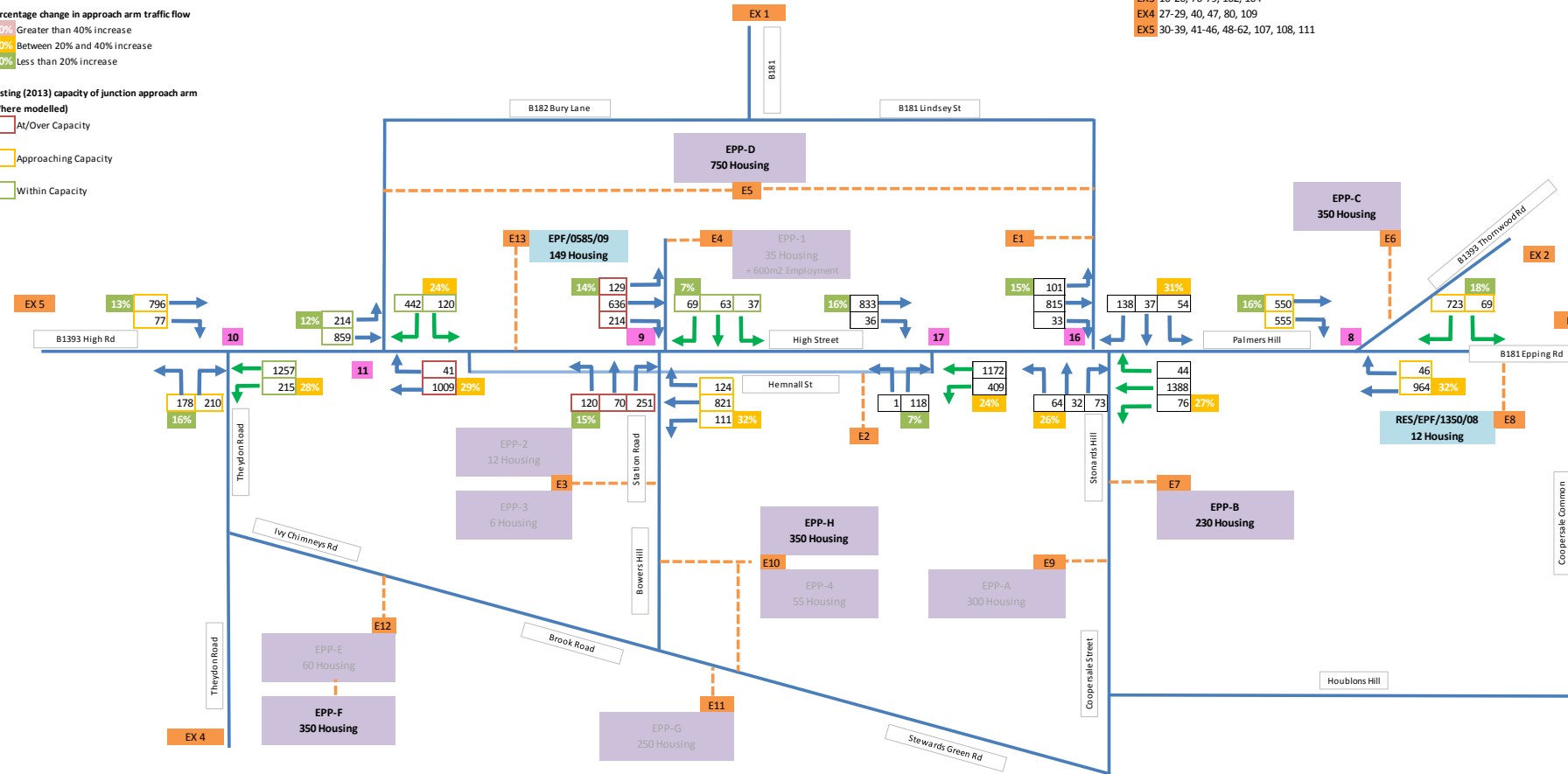
Junc:	9
A A	0
A B	37
A C	63
A D	68
B A	95
B B	0
B C	94
B D	573
C A	64
C B	216
C C	0
C D	117
D A	116
D B	571
D C	205
D D	0

Junc:	9
A A	0
A B	1
A C	0
A D	1
B A	30
B B	0
B C	17
B D	248
C A	6
C B	35
C C	0
C D	3
D A	14
D B	64
D C	8
D D	0

Junc:	17
A A	0
A B	376
A C	829
B A	111
B B	0
B C	1
C A	696
C B	34
C C	0

Junc:	17
A A	0
A B	396
A C	874
B A	117
B B	0
B C	1
C A	733
C B	36
C C	0

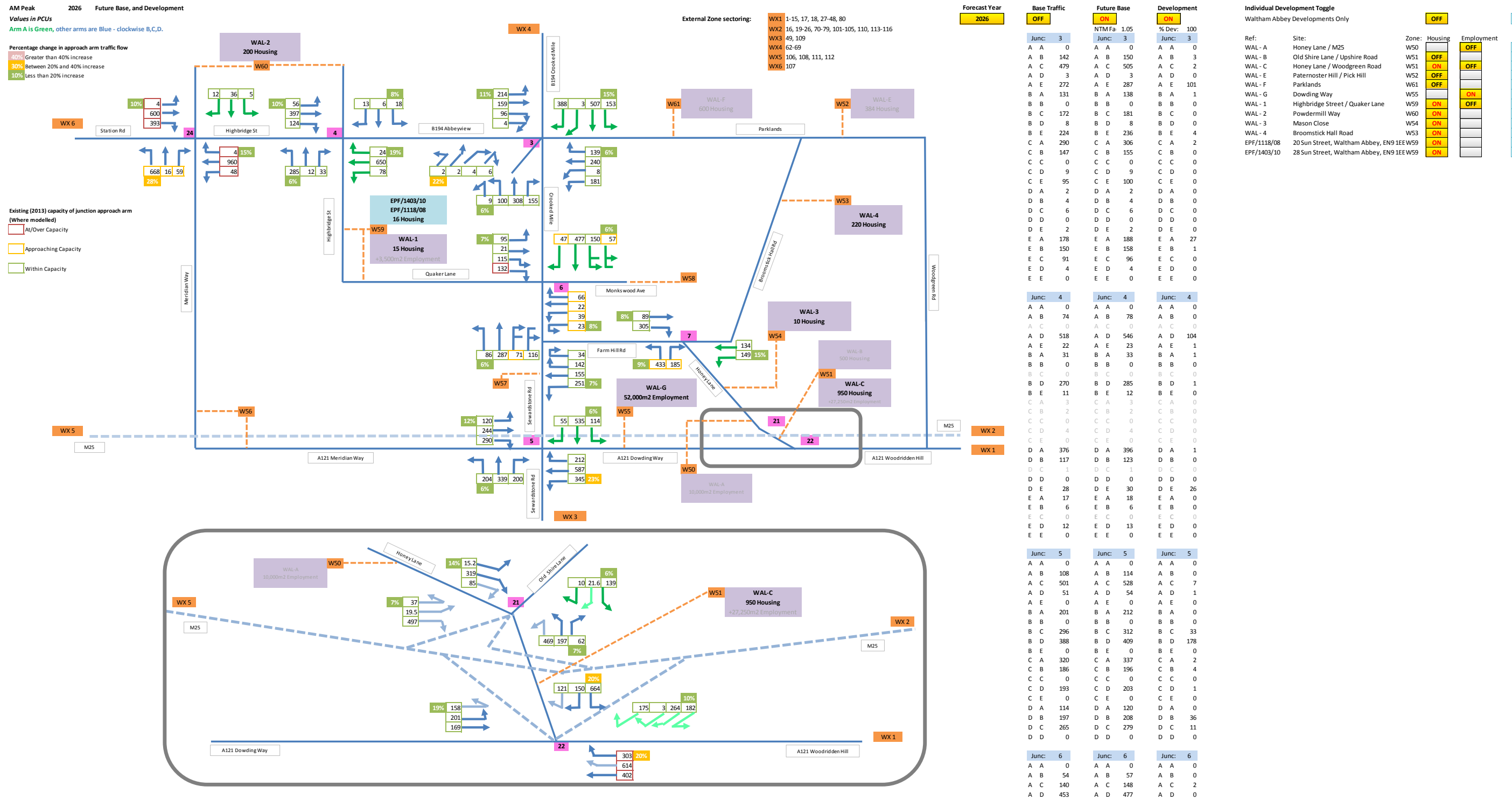
Junc:	17
A A	0
A B	13
A C	298
B A	1
B B	0
B C	0
C A	99
C B	0
C C	0



Epping Forest Local Plan Highway Impact Assessment



4) Waltham Abbey Spreadsheet Model screenshot (outputs shown as an example)



5) Ongar Spreadsheet Model screenshot

(outputs shown as an example)

AM Peak 2026 Future Base, and Development

Values in PCUs

Arm A is Green, other arms are Blue - clockwise B,C,D.

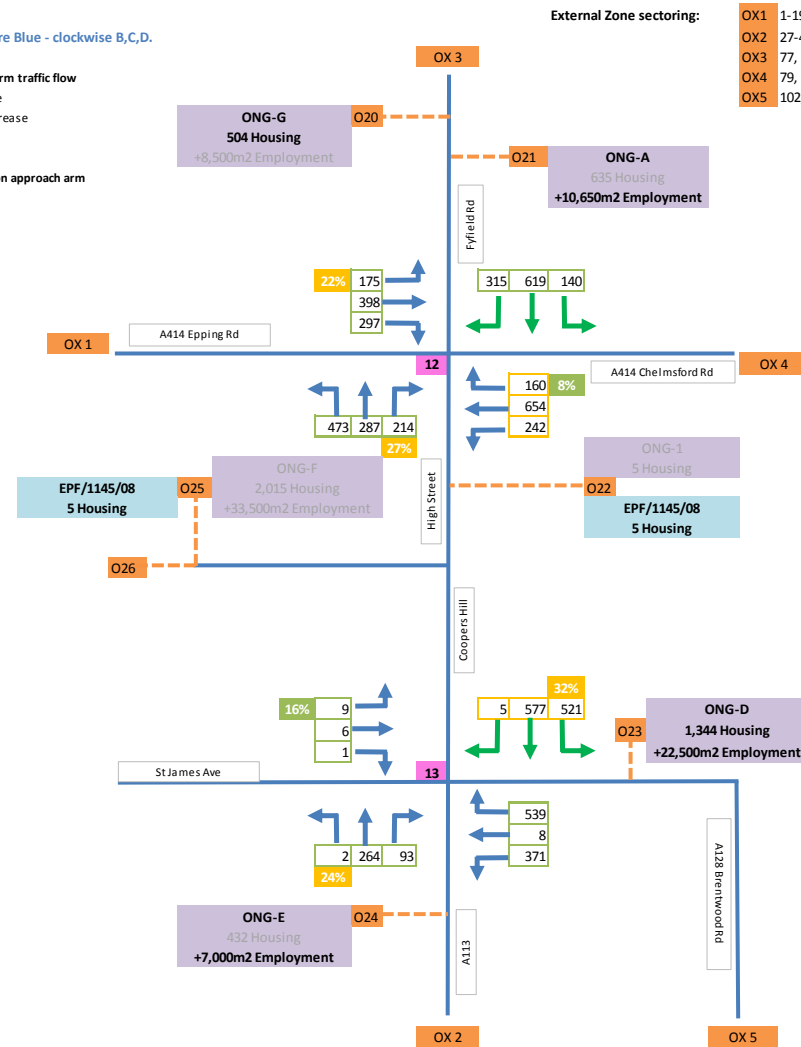
Percentage change in approach arm traffic flow

- 40% Greater than 40% increase
- 30% Between 20% and 40% increase
- 10% Less than 20% increase

Existing (2013) capacity of junction approach arm

(Where modelled)

- At/Over Capacity
- Approaching Capacity
- Within Capacity



- External Zone sectoring:
- OX1 1-19, 45-76, 106-108, 111, 112, 114-116
 - OX2 27-44, 80, 101, 109
 - OX3 77, 78, 105
 - OX4 79, 104, 113
 - OX5 102, 103, 110

Forecast Year 2026

Base Traffic OFF

Junc: 12	
A A	0
A B	105
A C	367
A D	135
B A	148
B B	0
B C	222
B D	599
C A	256
C B	163
C C	0
C D	289
D A	114
D B	363
D C	201
D D	0

Future Base ON

Junc: 12	
A A	0
A B	111
A C	387
A D	142
B A	156
B B	0
B C	234
B D	631
C A	270
C B	172
C C	0
C D	305
D A	120
D B	383
D C	212
D D	0

Development ON

Junc: 12	
A A	0
A B	29
A C	233
A D	172
B A	4
B B	0
B C	8
B D	23
C A	17
C B	42
C C	0
C D	168
D A	55
D B	16
D C	85
D D	0

Base Traffic OFF

Junc: 13	
A A	0
A B	327
A C	421
A D	5
B A	326
B B	0
B C	156
B D	8
C A	217
C B	54
C C	0
C D	2
D A	9
D B	6
D C	1
D D	0

Future Base ON

Junc: 13	
A A	0
A B	345
A C	444
A D	5
B A	344
B B	0
B C	164
B D	8
C A	229
C B	57
C C	0
C D	2
D A	9
D B	6
D C	1
D D	0

Development ON

Junc: 13	
A A	0
A B	176
A C	134
A D	0
B A	195
B B	0
B C	206
B D	0
C A	35
C B	36
C C	0
C D	0
D A	0
D B	0
D C	0
D D	0

Individual Development Toggle

Ongar Developments Only

Ref:	Site:	Zone:	Housing	Employment
ONG - A	B184 Fyfield Road (NE Ongar)	O21	OFF	ON
ONG - D	A128 Brentwood Road / Stondon R	O23	ON	ON
ONG - E	Stanford Rivers Road	O24	OFF	ON
ONG - F	A414 Epping Road (West Ongar)	O25	OFF	OFF
ONG - G	B184 Fyfield Road (NW Ongar)	O20	ON	OFF
ONG - 1	High Street	O22	OFF	
EPF/1145/	Land at Station Approach, High Stre	O25	ON	
EPF/1153/	Rear of 103 High Street, Chipping	CO22	ON	

