

# TECHNICAL NOTE

**Job Name:** Brentwood Local Plan – Transport Modelling  
**Job No:** 28085  
**Note No:** 28085-BLPTM-TN01 v2  
**Date:** 05/06/2018  
**Prepared By:** David Cope  
**Subject:** Junction Modelling - Review of Junctions Modelled and Data

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## 1. Introduction

Peter Brett Associates LLP (PBA) have been undertaking transport modelling work for Brentwood Borough Council (BBC) since 2013 to support the development of a transport evidence base for the BBC Local Plan. As part of this work, several junction models were developed which were used to assess impact of the Local Plan.

The previous models were developed in 2012 and as part of this updated study a review of the junctions identified previously, has been undertaken, along with a review of the traffic data used. The purpose of the review is to show that the junctions to be modelled are adequate and that any data used is suitable for the modelling of the Local Plan.

The previous modelling work looked at four development options within the borough and has been used to inform the development of a preferred option, which is now the subject of this new study.

For all junctions, the following peak periods have been used for the assessment and the same periods will be maintained in the study update:

- AM Peak: 08:00 to 09:00
- PM Peak: 17:00 to 18:00

## DOCUMENT ISSUE RECORD

Technical Note No	Rev	Date	Prepared	Checked	Reviewed (Discipline Lead)	Approved (Project Director)
20180426 Junction Modelling Review	-	27.04.18	DC	PG	PG	RP
20180426 Junction Modelling Review	2	22.05.18	BH	DC	PG	RP
20180426 Junction Modelling Review	3	05.06.18	DC	PG	PG	

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### 2. Review of Junctions Modelled

As part of the previous work, a total of 23 junctions were modelled. This included junctions on the Essex highway network, but at that time excluded the M25 junctions 28 and 29.

Further discussions are ongoing with Highways England to understand the availability of data and existing models for the two M25 junctions, to inform the study and are therefore omitted from this review. There is an existing VISSIM model for junction 28, which would seem to meet the requirements for testing at this junction.

The previous work undertaken has been used to inform the selection of the junctions to be modelled within the new study, along with TrafficMaster speed plots for the AM and PM peaks, provided by Essex County Council.

The first step has been to review the outputs from the previous study. The outputs from the previous modelling work was reported in 'Brentwood Local Plan – Development Options – Highway Modelling', Peter Brett Associates, February 2018. Following a review of this work, several junctions were shown to work well within capacity within the development option that most closely replicated the preferred option.

The junctions that have been removed from the new study are shown in Table 1, along with the highest RFC (Ratio of flow to capacity).

Table 1: Omitted Junctions from New Study

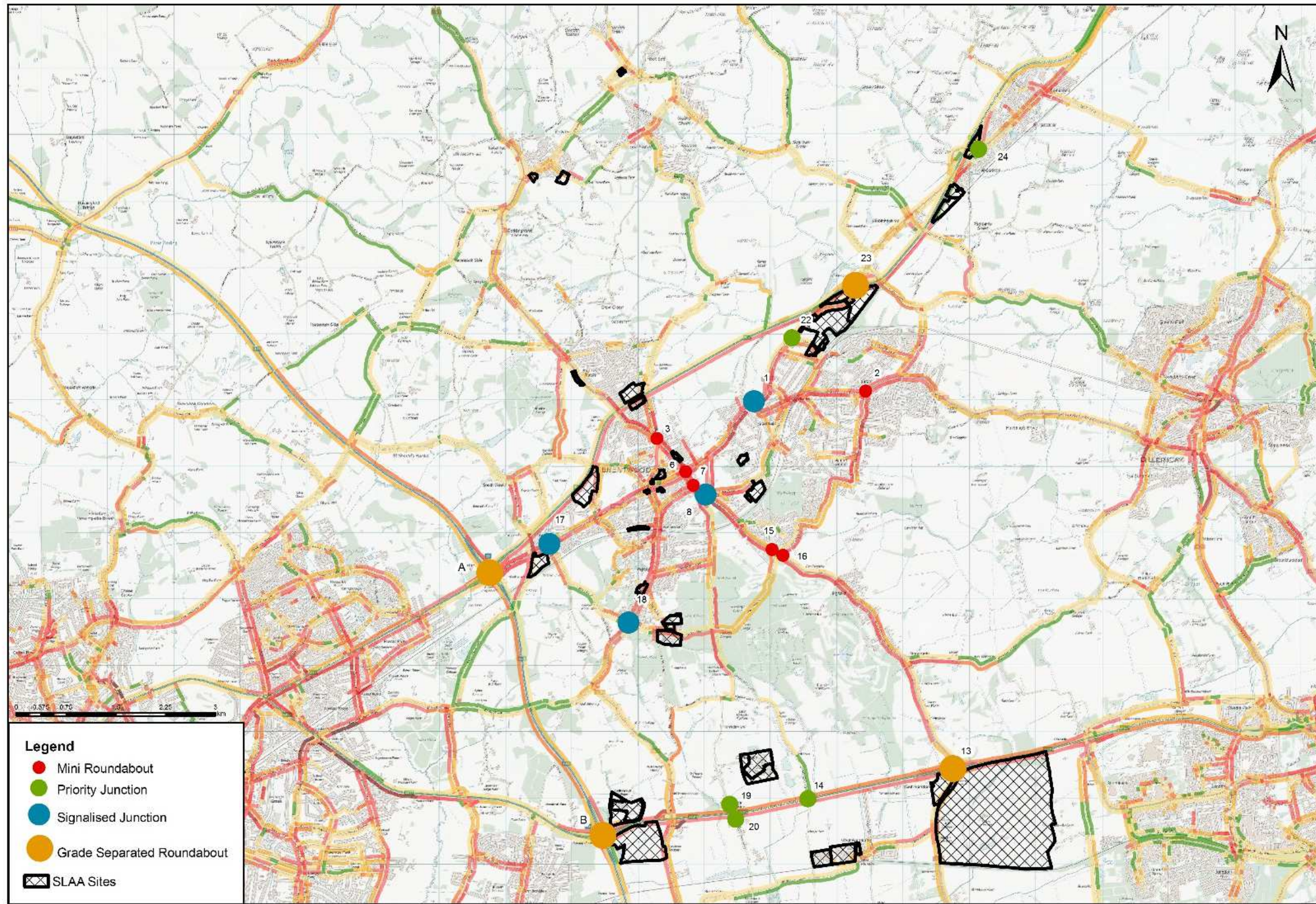
Junction ID	Location	AM Peak Highest RFC	PM Peak Lowest RFC
4	A128 Ongar Road/ Western	0.65	0.71
5	A128 Ongar Road/William Hunter	0.49	0.42
9	B185 Kings Road/B186 Queens	0.76	0.84
11	Weald Road/Western Road	0.49	0.69
12	Western Road/William Hunter Way	0.57	0.61
21	A127 Westbound/Thorndon	0.64	0.49

The next step has been to review the remaining junctions against the TrafficMaster plots and the location of the development within the preferred option.

The junctions that have been identified to require junction modelling are shown on Figure 1, overlaid onto the TrafficMaster Plots.

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Figure 1: Junction Locations for Assessment – AM Peak

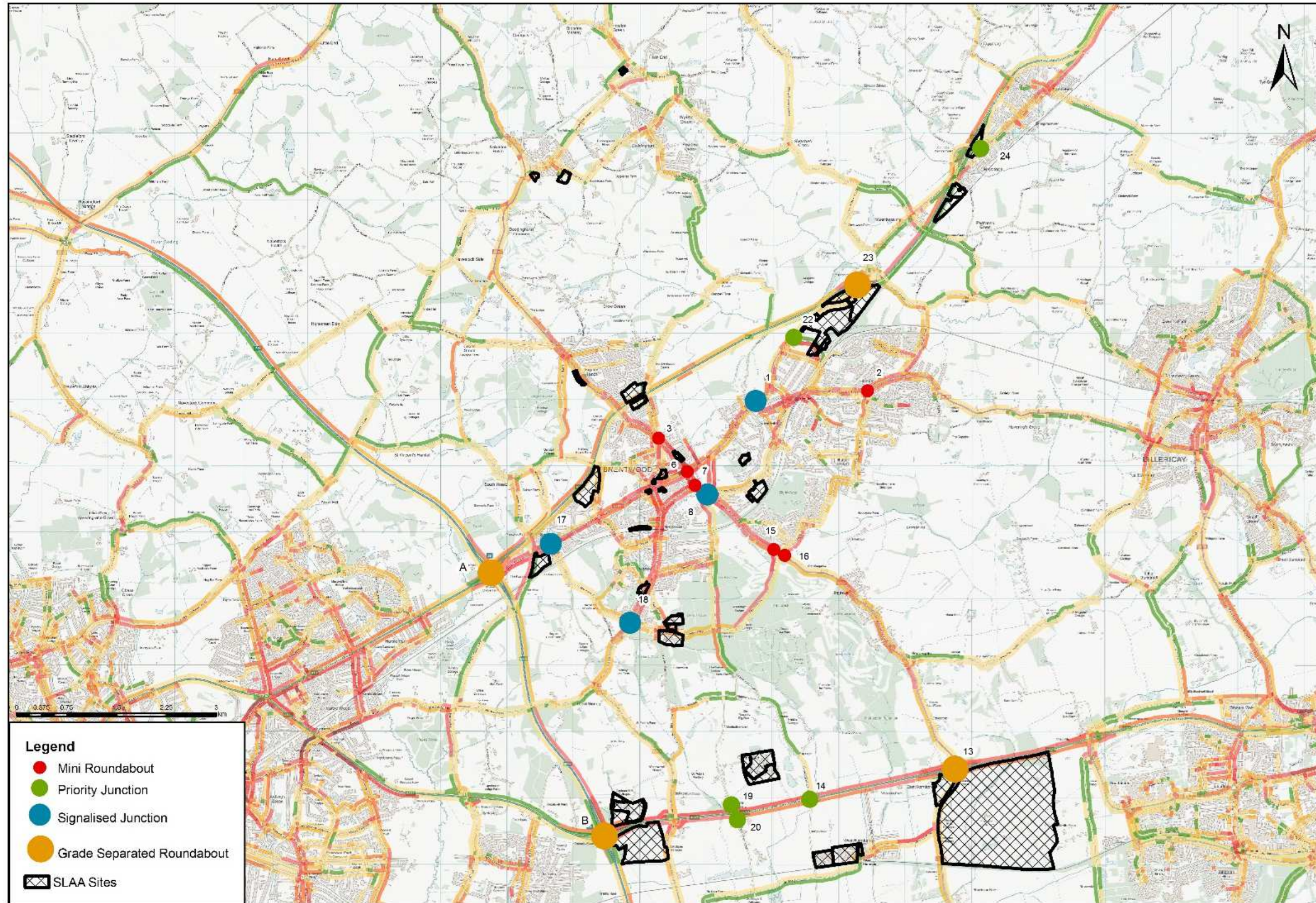


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Figure 2: Junction Locations for Assessment – PM Peak



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Following review of the location of the development sites and the TrafficMaster plots, two new junctions have been identified. The full list of junctions now to be modelled are included within Table 2. It should be noted that the junction ID's used within the original study have been maintained. The three new junctions are numbered 23, 24 and 27 in the table.

Appendix E summarises details regarding the original year, any change between the base year and 2017 if appropriate, the profile used for the assessments and the factors used for growth or a reduction in flow where applicable.

Table 2: Junctions to be Modelled

Junction ID	Junction	Junction Type	Modelling Software
1	A1023 Chelmsford Road / A129 Hutton Road / A1023 Shenfield Road	Signalised Junction	LinSig
2	A129 Rayleigh Road / Hanging Hill Lane	Mini Roundabout	Junctions 9
3	A128 Ongar Road / Doddinghurst Road	Mini Roundabout	Junctions 9
6	A128 Ongar Road / A1023 Shenfield Road / A128 Ingrave Road / A1023 High Street	Double Mini Roundabout	Junctions 9
7	A128 Ingrave Road / B186 Queens Road	Mini Roundabout	Junctions 9
8	A128 Ingrave Road / Middleton Hall Lane / Seven Arches Road	Signalised Junction	LinSig
10	A1023 High Street/ B185 Kings Street	Signalised Junction	LinSig
13	A127 / A128 Brentwood Road / A128 Tilbury Road	Roundabout	Junctions 9
14	A127 / Childerditch Lane	Priority Junction	Junctions 9
15	A128 Ingrave Road / The Avenue	Double Mini Roundabout	Junctions 9
16	A128 Brentwood Road /Running Waters	Double Mini Roundabout	Junctions 9
17	A1023 Brook Street /Mascalls Lane	Signalised Junction	LinSig
18	B186 Warley Hill / Eagle Way / B186 Warley Road / Mascalls Lane	Signalised Junction	LinSig
19	B186 Warley Street / A127 eastbound	Priority Junction	Junctions 9
20	B186 Warley Street / A127 westbound	Priority Junction	Junctions 9
22	A1023 Chelmsford Road / Alexander Lane	Priority Junction	Junctions 9
23	A12 Junction 12	Roundabout	Junctions 9

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24	Roman Road / A12 Slip	Priority Junction (Staggered)	Junctions 9
27	A128 Tilbury Road/Station Road	Priority Junction	Junctions 9

### 3. Data Review

A review of the traffic data used within the previous models has been undertaken. In order to do this more up to date traffic data has been used to confirm the suitability of the 2012 data or to provide new data to be used within the updated modelling.

The previous assessments used traffic count data surveyed in 2012. It is noted that within DMRB Volume 12, Section 1, Part 1 states “[w]here trip information used in a traffic appraisal relies largely upon observations taken more than about 6 years ago it will be necessary to ensure that this information is still valid...”. As a result, a pragmatic approach was taken to produce new junction flows where applicable.

#### TEMPro Growth

Table 3 below outlines the TEMPro growth rates used depending on if the junction analysis showed a decrease in flow when compared to newer data or where no comparison data was available. The junctions where this has been applied to are summarised within the following sections. Most recent data is available for 2017 for a number of junctions, therefore this has been used as the new base year. One more recent count is available for 2014, hence a factor is provided for 2014 to 2017.

Table 3: TEMPro Growth Rates

Base Year	Future Year	Area	AM	PM
2012	2017	Brentwood	1.074	1.071
2014			1.043	1.041

#### Recent Traffic Surveys

At some junctions, more recent 2017 traffic survey data was made available either directly provided from Essex County Council or obtained from local Transport Assessments. Table 4 outlines the attributes of the 2017 data sources and which junctions will utilise this most up to date traffic counts for use in the junction assessments.

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Table 4: 2017 Data Sources

Junction ID	Date of survey	Location	Source	Junction Type
6	Thursday 2 <sup>nd</sup> March 2017	Wilson's Corner, Brentwood	Essex County Council	Double Mini-Roundabout
8	Tuesday May 23 <sup>rd</sup> 2017	Ingrave Road/Middleton Hall Lane/Seven Arches Road	Brentwood Preparatory School, Transport Assessment, Waterman Ltd	Signalised Junction
13	Wednesday 1 <sup>st</sup> March 2017	A128 Halfway House, West Horndon	Essex County Council	Grade Separated Junction
24	Thursday 6 <sup>th</sup> July 2017	A12 Junction 12	Residential Development, Ingatestone, Transport Assessment, WSP	Grade Separated Junction
27	2017 (no date given in TA)	A128 Tilbury Road/Station Road	East Horndon Industrial Park, Supplementary Transport Report, Redwood Partnership	Priority Junction

### Additional Analysis

Additional analysis has been undertaken to identify the suitability of the counts for use in the base junction models. The following section summarises the analysis undertaken for the junctions within Brentwood Town Centre and those in the outer areas. Further detailed information summarising the calculations can be found within Appendices A to D. In the absence of time-series ATC data, which would identify trends, we have looked at each junction on a case by case basis, using comparison data that is available in close proximity to the junction.

Appendix E provides a full summary of each junction, its original survey year, the proportion of change for each peak and what matrix profile is to be used for the assessment.

ECC has provided PBA with 11 counts of which 7 were identified to be suitable for the analysis. Through the examination of traffic counts and junction turning flows it was identified that there was no clear pattern in traffic growth in the region. As such and in some cases TEMPro growth was applied to junctions that were identified to have no direct comparison data available, or the junction count showed no specific trend. TEMPro growth from the



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respective base year to 2017 has been applied to both peaks depending on the outcome of the analysis.

The following sections summarise the methodologies used for each junction, split between geographical areas.

### Brentwood Town Centre

Table 5 below summarises the junctions located within Brentwood Town Centre that are to be modelled, the summary also includes the factor which is to be applied to the junctions based on the analysis undertaken if a newer comparable junction or ATC flows were available to produce a relevant factor. At locations where flows were identified to significantly differ between a comparable site or if no comparable site was available TEMPro growth has been applied.

Appendix A provides further detail on the analysis undertaken.

Table 5: Brentwood Town Centre Junctions Assessments – Derivation of 2017 Base Year data

Junction ID	Location	Source	Junction Type	Junction used for analysis	Factor Applied
3	A128 Ongar Road / Doddinghurst Road	Essex County Council	Mini Roundabout	Junction 6	AM and PM 2012 flows by 3%
7	A128 Ingrave Road / B186 Queens Road	Essex County Council	Mini Roundabout	Junction 6	AM 2012 flows by 3% PM 2012 flows by 10%
10	A1023 High Street/ B185 Kings Street	Essex County Council	Priority Junction	-	TEMPro growth for both peaks of 7% (2012 to 2017).
15	A128 Ingrave Road / The Avenue	Essex County Council	Double Mini Roundabout (linked with J16)	-	AM 2012 flows by -11 and PM growth of 3%
16	A128 Brentwood Road /Running Waters	Essex County Council	Double Mini Roundabout (linked with J16)	-	AM 2012 flows by -11 and PM growth of 3%

Through the analysis undertaken at junction 6 where a more recent turning count from 2017 was available it was concluded that there was an average increase in flow of approximately 3% for both peak periods for arm A (junction 3), 3% for the AM peak and 10% for the PM peak for arm C (junction 7).

Additional analysis at junction 8, where 2017 turning count information was also made available identified that traffic flows decreased by 11% in the AM peak when compared with 2012 turning movements, the PM peak showed a slight increase of 3%. As such junctions 15 and 16 will have these factors applied.

A summary of this analysis is shown in Appendix B of this report.



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### Brentwood Outer Area

Tables 6 to 8 summarise the junctions outside of Brentwood Town Centre that will have junction assessments undertaken.

Table 6 shows the group of junctions to the east of Brentwood, through analysis of the comparison of 2012, 2014 and 2017 junction turning counts taken at junction 6 it was identified that during the AM peak Arm A, A1023, Shenfield Road witnessed an increase of approximately 2%, whilst the PM peak flows remained flat. As a result, the junctions to the east, (junctions 1 and 2 ) will have their respective AM peak flow factored by 2%, whilst the PM peak will have no growth applied. For junctions 22 and 24 where no direct comparable data was available both have been factored from 2014 to 2017 using TEMPro growth for their respective peak periods.

Further detail on the calculations can be found in Appendix A.

Table 6: East of Brentwood Town Centre Junction Assessments

Junction ID	Location	Source	Junction Type	Junction used for analysis	Factored
1	A1023 Chelmsford Road / A129 Hutton Road / A1023 Shenfield Road	Essex County Council	Signalised Junction	Junction 6	AM 2012 flows by 2% PM 0% growth.
2	A129 Rayleigh Road / Hanging Hill Lane	Essex County Council	Mini Roundabout	Junction 6	AM 2012 flows by 2% PM 0% growth.
22	A1023 Chelmsford Road / Alexander Lane	Essex County Council	Priority Junction	Junction 6	AM and PM flows by 2014 TEMPro growth of 4% (2014 to 2017)
23	A12/B1002/Roman Road	Mountnessing Scrapyard Transport Assessment,	Grade Separated Junction	-	AM and PM flows by 2014 TEMPro growth of 4% (2014 to 2017)

Table 7 below shows details for both junctions 17 and 18 but with the lack of any comparison data it was concluded that these assessments will continue to use the 2012 turning flows, growed up by TemPro to 2017.

Further detail on the analysis for these junctions can be found within Appendix E.

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Table 7: West of Brentwood Town Centre Junctions Assessments

Junction ID	Location	Source	Junction Type	Junction used for analysis	Factored
17	A1023 Brook Street /Mascalls Lane	Essex County Council	Signalised Junction	-	TEMPro Growth For Both Peaks of 7% (2012 to 2017)
18	B186 Warley Hill / Eagle Way / B186 Warley Road / Mascalls Lane	Essex County Council	Signalised Junction	-	TEMPro Growth of For Both Peaks 7% (2012 to 2017)

Lastly, shown in Table 8 are the junctions focussed on the A127 corridor. Where available Highways England ATC counts were compared to enable a comparison between 2012 and 2016 ATC flow data on the A127 and between the relevant arm at junction 14. The analysis showed a decrease in flows for both directions along the A127 as such the data at junction 14 has been factored down accordingly, both junctions 19 and 20 had no direct comparable data available and as such have used TEMPro growth from 2014 to 2017 to factor the original flows.

Appendix D provides further detail on the assessment undertaken.

Table 8: South Brentwood Town Centre Junction Assessments

Junction ID	Location	Source	Junction Type	Junction used for analysis	Factored
14	A127 / Childerditch Lane	Essex County Council	Priority Junction	Junction 14 and A127 ATC	AM 2012 flows by -5 and PM of -2%
19	B186 Warley Street / A127 eastbound	Essex County Council	Priority Junction	Junction 14 and A127 ATC	TEMPro Growth for Both Peaks of 4% (2014 to 2017)
20	B186 Warley Street / A127 westbound	Essex County Council	Priority Junction	Junction 14 and A127 ATC	TEMPro Growth of 4% (2014 to 2017)

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### 4. Assessment Matrix Input Type for Junction Models

Junctions 9 and LinSig require different matrix inputs to accurately model different types of junctions. As such modelling undertaken within Junctions 9 will use direct matrix input, inserting the matrices in four 15-minute profiles, except for junctions 23 and 27 where only hourly data was available.

Where junctions are required to use LinSig, such as junctions 1, 8, 10, 17 and 18 flat matrices will be used, this is because LinSig does not allow for direct matrices to be used within the junction modelling software.

Table 9 shows what Demand Matrix Profile was used for each junction in the assessment.

Table 9: Junction Input Matrix Profiles

Junction Number	Matrix Profile	Junction Number	Matrix Profile
1	Flat	16	Direct
2	Direct	17	Flat
3	Direct	18	Flat
6	Direct	19	Direct
7	Direct	20	Direct
8	Flat	22	Direct
10	Flat	23	Flat
13	Direct	24	Direct
14	Direct	27	Flat
15	Direct		

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### 5. Conclusions

A review of available data suggests that there has been little growth in traffic between 2012 and 2017 – up to a maximum of 10%. Where the data suggests that there has been some growth we have applied factors based on this evidence. Where data suggests some reduction a flat growth or a decrease in growth has been applied. Where no comparative data was available we have applied the associated TEMPro growth to ensure a robust assessment. This method is considered appropriate to the needs of this study.

Newer data from 2017 was made available for junctions 6, 8, 13, 24 and 27 and as such the flow data at these junctions have not been factored and deemed appropriate for use.

Within Brentwood Town Centre, junctions 3 and 7 have had growth applied as a result of comparison with more recent traffic surveys, whilst junction 10 has had 2012 to 2017 TEMPro growth applied and junctions 15 and 16 have been reduced by 11% in the AM peak but had an increase of 3% in the PM peak, as a result of the analysis undertaken at junction 8.

In the Brentwood Outer Area, junctions 1 and 2 have had growth based on more recent junction survey data applied for the AM and PM peak, with the PM peak showing no change in flows. Junctions 22 and 23 have had 2014 to 2017 TEMPro growth applied to both peak periods.

The other junctions to the west and south of Brentwood, junctions 17, 18, 19 and 20 have had TEMPro growth applied to both peak periods, with the exception of junction 14 which has had a decrease in flow of 5% and 2% for the AM and PM peak periods respectively.

Where appropriate depending on the modelling software used or if the data isn't available, the junction analysis will use either a flat or direct matrix profile to model the performance of the junction.

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## Appendix A – Junction 6 Turning Flow Analysis

AM - 2012 FLOWS					
	A	B	C	D	From
A	0	208	373	64	645
B	300	0	303	266	869
C	291	300	0	111	702
D	76	183	93	0	352
To	667	691	769	441	2568

PM - 2012 FLOWS					
	A	B	C	D	From
A	0	264	329	80	673
B	390	0	151	208	749
C	362	357	0	79	798
D	80	189	65	0	334
To	832	810	545	367	2554

AM - 2017 FLOWS					
	A	B	C	D	From
A	0	243	371	62	676
B	284	0	281	215	780
C	338	353	2	89	782
D	59	187	79	0	325
To	681	783	733	366	2563

PM - 2017 FLOWS					
	A	B	C	D	From
A	0	259	365	56	680
B	392	0	195	170	757
C	412	362	0	75	851
D	64	181	57	0	303
To	868	802	619	302	2591

AM % Difference					
	A	B	C	D	From
A	0 %	17%	-1%	-3%	5%
B	-5%	0 %	-7%	-19%	-10%
C	16%	18%	0%	-20%	11%
D	-22%	2%	-15%	0%	-8%
To	2%	13%	-5%	-17%	-0.2%

PM % Difference					
	A	B	C	D	From
A	0 %	-2%	11%	-30%	1%
B	1%	0 %	29%	-18%	1%
C	14%	1%	0 %	-5%	7%
D	-20%	-4%	-12%	0 %	-9%
To	4%	-1%	14%	-18%	1%

AM Abs. Difference					
	A	B	C	D	From
A	0	35	-2	-2	31
B	-16	0	-22	-51	-89
C	47	53	2	-22	80
D	-17	4	-14	0	-27
To	14	92	-36	-75	-5

PM Abs. Difference					
	A	B	C	D	From
A	0	-5	36	-24	7
B	2	0	44	-38	8
C	50	5	0	-4	53
D	-16	-8	-8	0	-31
To	36	-8	74	-65	37



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## Appendix B – Junction 8 Turning Flow Analysis

AM - 2012 FLOWS					
	A	B	C	D	From
A	0	232	263	139	634
B	100	0	17	485	602
C	262	24	0	218	504
D	110	349	86	0	545
To	472	605	366	842	2285

PM - 2012 FLOWS					
	A	B	C	D	From
A	0	161	165	77	403
B	76	0	16	446	538
C	209	29	0	128	366
D	149	589	57	0	795
To	434	779	238	651	2102

AM - 2017 FLOWS					
	A	B	C	D	From
A	0	138	251	151	540
B	77	0	28	480	585
C	267	41	0	6	314
D	178	312	77	0	567
To	522	491	356	637	2006

PM - 2017 FLOWS					
	A	B	C	D	From
A	0	205	203	90	498
B	80	0	26	418	524
C	207	44	0	2	253
D	126	604	91	0	821
To	413	853	320	510	2096

AM % Difference					
	A	B	C	D	From
A	0%	-41%	-5%	9%	-15%
B	-23%	0%	65%	-1%	-3%
C	2%	71%	0%	-97%	-38%
D	62%	-11%	-10%	0%	4%
To	11%	-19%	-3%	-24%	-12%

PM % Difference					
	A	B	C	D	From
A	0%	27%	23%	17%	24%
B	5%	0%	63%	-6%	-3%
C	-1%	52%	0%	-98%	-31%
D	-15%	3%	60%	0%	3%
To	-5%	9%	34%	-22%	0%

AM Abs. Difference					
	A	B	C	D	From
A	0	-94	-12	12	-94
B	-23	0	11	-5	-17
C	5	17	0	-212	-190
D	68	-37	-9	0	22
To	50	-114	-10	-205	-279

PM Abs. Difference					
	A	B	C	D	From
A	0	44	38	13	95
B	4	0	10	-28	-14
C	-2	15	0	-126	-113
D	-23	15	34	0	26
To	-21	74	82	-141	-6



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# Appendix B – Junction 14 Turning Flow Analysis

### A127 ATC /Junction 14 Turning Count Analysis

AM – 2012 FLOWS						PM – 2012 FLOWS					
	A	B	C	D	From		A	B	C	D	From
A	0	80	0	0	80	A	0	123	0	0	123
B	0	0	24	2934	2958	B	0	0	10	2894	2904
C	0	0	0	34	34	C	0	0	0	22	22
D	19	2895	0	0	2914	D	33	2731	0	0	2764
To	19	2975	24	2968	5986	To	33	2854	10	2916	5813

Peak Period	A127 EB	2012 JC Flows	2015 ATC	Difference	Proportional
08:00 to 09:00	D to B	2895	2744	-151	-5%
17:00 to 18:00	D to B	2731	2654	-77	-3%

Peak Period	A127 WB	2012 JC Flows	2015 ATC	Difference	Proportional
08:00 to 09:00	B to D	2934	2773	-161	-5%
17:00 to 18:00	B to D	2894	2881	-13	-0.4%

### A127 ATC Analysis

A127 EB	2012	2015	Absolute Change	Percentage Change
08:00 to 09:00	2837	2744	-93	-3%
17:00 to 18:00	2857	2654	-203	-8%

A127 WB	2012	2015	Absolute Change	Percentage Change
08:00 to 09:00	2992	2773	-219	-8%
17:00 to 18:00	2813	2881	68	2%



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# Appendix C – Junction 17 Turning Flow Analysis

AM – 2012 FLOWS						PM – 2012 FLOWS					
	A	B	C	D	From		A	B	C	D	From
A	0	147	34	54	235	A	0	66	35	49	150
B	13	0	76	585	674	B	9	0	70	765	844
C	32	23	0	292	347	C	23	22	0	271	316
D	63	790	304	0	1157	D	34	715	235	0	984
To	108	960	414	931	2413	To	66	803	340	1085	2294

### A128 ATC/Junction 17 Turning Flow Analysis

A128 EB	2012	2016	Absolute Change	Percentage Change
08:00 to 09:00	674	885	211	24%
17:00 to 18:00	844	628	-216	-34%

A128 WB	2012	2016	Absolute Change	Percentage Change
08:00 to 09:00	960	558	-402	-72%
17:00 to 18:00	803	741	-62	-8%





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## Appendix D – Junction 13 Turning Flow Analysis

AM - 2012 BASE FLOWS					
	A	B	C	D	From
A	0	412	328	134	874
B	502	0	351	0	853
C	338	264	0	205	807
D	85	0	183	0	268
To	925	676	862	339	2802

PM - 2012 BASE FLOWS					
	A	B	C	D	From
A	0	397	279	67	743
B	464	0	394	0	858
C	405	424	0	140	969
D	110	0	314	0	424
To	979	821	987	207	2994

AM - 2017 BASE FLOWS					
	A	B	C	D	From
A	0	349	362	77	788
B	462	0	384	0	846
C	336	249	0	302	887
D	67	0	221	0	288
To	865	598	967	379	2809

PM - 2017 BASE FLOWS					
	A	B	C	D	From
A	0	342	323	70	735
B	436	0	287	0	723
C	392	451	0	167	1010
D	90	0	316	0	406
To	918	793	926	237	2874

AM % Difference					
	A	B	C	D	From
A	0%	-15%	10%	-43%	-10%
B	-8%	0%	9%	0%	-1%
C	-1%	-6%	0%	47%	10%
D	-21%	0%	21%	0%	7%
To	-6%	-12%	12%	12%	0%

PM % Difference					
	A	B	C	D	From
A	0%	-14%	16%	4%	-1%
B	-6%	0%	-27%	0%	-16%
C	-3%	6%	0%	19%	4%
D	-18%	0%	1%	0%	-4%
To	-6%	-3%	-6%	14%	-4%

AM Abs. Difference					
	A	B	C	D	From
A	0	-63	34	-57	-86
B	-40	0	33	0	-7
C	-2	-15	0	97	80
D	-18	0	38	0	20
To	-60	-78	105	40	7

PM Abs. Difference					
	A	B	C	D	From
A	0	-55	44	3	-8
B	-28	0	-107	0	-135
C	-13	27	0	27	41
D	-20	0	2	0	-18
To	-61	-28	-61	30	-120



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# Appendix E – Junction Assessment Summary

JUNCTION ID	JUNCTION	JUNCTION TYPE	MODELLING SOFTWARE	NUMBER OF ARMS	Survey Year	NOTES	AM Change	PM Change	Profile
1	A1023 Chelmsford Road / A129 Hutton Road / A1023 Shenfield Road	Signalised Junction	LINSIG	3	2012	J6 FACTORS	2%	0%	Flat
2	A129 Rayleigh Road / Hanging Hill Lane	Mini Roundabout	JUNCTIONS 9	3	2012	J6 FACTORS	2%	0%	Direct
3	A128 Ongar Road / Doddington Road	Mini Roundabout	JUNCTIONS 9	3	2012	J6 FACTORS	3%	3%	Direct
6	A128 Ongar Road / A1023 Shenfield Road / A128 Ingrave Road / A1023 High Street	Double Mini Roundabout	JUNCTIONS 9	4	2017	NEW COUNT	N/A	N/A	Direct
7	A128 Ingrave Road / B186 Queens Road	Mini Roundabout	JUNCTIONS 9	3	2012	J6 FACTORS	3%	10%	Direct
8	A128 Ingrave Road / Middleton Hall Lane / Seven Arches Road	Signalised Junction	LINSIG	4	2017	TRAFFIC FLOWS EXTRACTED FROM WATERMAN TA AUGUST 2017	N/A	N/A	Flat
10	Weald Road/A1023 High Street/Kings Road	Signalised Junction	LINSIG	4	2012	TEMPro	0.07	0.07	Flat
13	A127 / A128 Brentwood Road / A128 Tilbury Road	Grade Separated Roundabout	JUNCTIONS 9	4	2017	NEW COUNT	N/A	N/A	Direct

## TECHNICAL NOTE

14	A127 / Childer ditch Lane	Priority Junction	JUNCTIONS 9	4	2012	A127 ATC FACTORS	-5%	-2%	Direct
15	A128 Ingrave Road / The Avenue	Double Mini Roundabout (linked with J16)	JUNCTIONS 9	3	2012	J8 FACTORS	-11%	3%	Direct
16	A128 Brentwood Road / Running Waters	Double Mini Roundabout (linked with J15)	JUNCTIONS 9	3	2012	J8 FACTORS	-11%	3%	Direct
17	A1023 Brook Street / Mascalls Lane	Signalised Junction	LINSIG	4	2012	TEMPPro	0.07	0.07	Flat
18	B186 Warley Hill / Eagle Way / B186 Warley Road / Mascalls Lane	Signalised Junction	LINSIG	4	2012	TEMPPro	0.07	0.07	Flat
19	B186 Warley Street / A127 eastbound	Priority Junction	JUNCTIONS 9	3	2014	TEMPPro	0.07	0.07	Direct
20	B186 Warley Street / A127 westbound	Priority Junction	JUNCTIONS 9	3	2014	TEMPPro	0.07	0.07	Direct
22	A1023 Chelmsford Road / Alexander Lane	Priority Junction	JUNCTIONS 9	3	2014	TEMPPro	0.04	0.04	Direct
23	A12 Junction 12	Grade Separated Roundabout	JUNCTIONS 9	6	2014	TEMPPro	0.04	0.04	Flat
24	Roman Road / A12 Slip	Priority Junction (Staggered)	JUNCTIONS 9	4	2017	NEW COUNT	N/A	N/A	Direct
27	A128 Tilbury Road / Station Road	Priority	JUNCTIONS 9	3	2017	TRAFFIC FLOWS EXTRACTED FROM APPENDIX E OF SPD REDWOOD PARTERSHIP EAST HORNDON IND PARK JAN 18	N/A	N/A	Flat