
AXA REAL ESTATE INVESTMENT MANAGERS UK LTD

WESTWOOD

HIGH LEVEL JUNCTION ASSESSMENT – MODAL SPLIT SENSITIVITY TESTING – TECHNICAL NOTE

11 JULY 2014

PROJECT: 286897A-HHC

1 INTRODUCTION

- 1.1 Parsons Brinckerhoff (PB) has previously prepared two technical notes (Trip Generation Technical Note and High Level Junction Assessment Technical Note) outlining the steps undertaken to derive trip numbers for the proposed development and a review of the proposed junction improvement scheme at M5 Junction 27 with the proposed development taken into account.
- 1.2 Additional comments have been received from Devon County Council (DCC) regarding the proposed modal split assumed for the previous technical notes. Whilst PB believes that the previous assumptions are achievable in the long term, further sensitivity testing has been undertaken to show an increased reliance on private cars.
- 1.3 The purpose of this technical note is:
 - To provide confidence to the highway authorities that the impact of the proposed development is manageable and appropriate mitigation measures could be applied.
- 1.4 These notes are not the final assessment of traffic impacts at Westwood and are to be used to inform the Local Plan allocation process. A full Transport Assessment will be undertaken, as well as continued liaison with the Highways Agency (HA) and DCC, as part of any subsequent planning application.

2 METHODOLOGY

- 2.1 The previous technical notes detailed the process by which a distribution matrix was derived for the development peak hour and the peak hours tested within the DCC LINSIG model for the HA Pinch Point funding scheme.
- 2.2 A modal split of trips of 70% by car, 20% by rail and 10% by bus was used. In addition a review of the data for the retail activities identified that the spread of trips throughout the week did not reflect the weekend peak nature of the development (Section 10 High Level Junction Assessment Technical Note).
- 2.3 Therefore to facilitate a robust sensitivity assessment several options have been applied to the DCC LINSIG model. All options have a modal split of 90% by car, 5% by rail and 5% by bus. The options tested are as follows:
 - Weekday AM Peak (08:00-09:00) Non Retail Adjusted;
 - Weekday PM Peak (17:00-18:00) Non Retail Adjusted;
 - Summer Saturday Peak (13:00-14:00) Non Retail Adjusted;
 - Other Saturday Peak (13:00-14:00) Non Retail Adjusted;
 - Weekday AM Peak (08:00-09:00) Retail Adjusted;
 - Weekday PM Peak (17:00-18:00) Retail Adjusted;
 - Summer Saturday Peak (13:00-14:00) Retail Adjusted;
 - Other Saturday Peak (13:00-14:00) Retail Adjusted;

3 DAILY TRIP GENERATION

3.1 The same assumptions have been applied to the raw data to generate daily trip generation numbers, with additional factors used for adjusting the spread of retail trips across the week. The total two way trip generation for the whole development, for typical week day and weekend in August in Year 3, is shown in below in Tables 1 and 2. These figures are based on each zone being a standalone development with no reduction in trips, save for the modal split.

	Two Way (vehicles)			
	Mon-Thu	Fri	Sat	Sun
Westwood Reef	647	557	1,823	1,823
Westwood Boardwalk	362	753	744	744
Westwood Sports Village	1,605	1,410	1,194	1,182
Westwood Artisan Village	1,536	3,694	3,642	3,642
Westwood Garden	652	571	482	477
Westwood Square	10,206	8,998	7,671	7,597
Westwood Resort	730	1,386	1,370	1,370
Westwood @ J27	767	767	767	767
Westwood Connect	1,292	1,292	1,292	1,292
Retirement Village	456	456	456	456
Total	18,253	19,884	19,441	19,350

Table 1 – Total Daily Trip Generation (Non Retail Adjusted), Two Way (August Year 3)

	Two Way (vehicles)			
	Mon-Thu	Fri	Sat	Sun
Westwood Reef	647	557	1,823	1,823
Westwood Boardwalk	362	753	744	744
Westwood Sports Village	1,295	1,410	1,758	1,758
Westwood Artisan Village	1,536	3,694	3,642	3,642
Westwood Garden	523	571	715	715
Westwood Square	8,290	8,998	11,144	11,144
Westwood Resort	730	1,386	1,370	1,370
Westwood @ J27	767	767	767	767
Westwood Connect	1,292	1,292	1,292	1,292
Retirement Village	456	456	456	456
Total	15,898	19,884	23,710	23,710

Table 2 – Total Daily Trip Generation (Retail Adjusted), Two Way (August Year 3)

4 DISCOUNTING AND DISTRIBUTION OF DAILY TRIP GENERATION

4.1 The same assumptions have been applied to the raw data to take into account linked trips, pas by trips and temporal and spatial distribution, with additional factors used for adjusting the spread of retail trips across the week.

5 LINSIG PEAK HOUR MATRICES

5.1 Based on the methodology in the previous sections and technical notes the development distribution matrices (PCUs) for various peak hours outlined in Section 2.3 were determined. These are shown in Tables 3 to 10 below:

		Weekday AM Peak (08:00-09:00) Non Retail Adjusted				
		Destination				
		M5 South	A38	M5 North	A361	Total
Origin	M5 South	0	49	106	105	260
	A38	109	0	0	0	109
	M5 North	252	0	0	0	252
	A361	242	0	0	0	242
	Total	604	49	106	105	864

Table 3 – Weekday AM Peak (Non Retail Adjusted) Trip Matrix

		Weekday PM Peak (17:00-18:00) Non Retail Adjusted				
		Destination				
		M5 South	A38	M5 North	A361	Total
Origin	M5 South	0	125	290	278	693
	A38	84	0	0	0	84
	M5 North	202	0	0	0	202
	A361	199	0	0	0	199
	Total	485	125	290	278	1178

Table 4 – Weekday PM Peak (Non Retail Adjusted) Trip Matrix

		Summer Saturday Peak (13:00-14:00) Non Retail Adjusted				
		Destination				
		M5 South	A38	M5 North	A361	Total
Origin	M5 South	0	106	223	212	541
	A38	117	0	0	0	117
	M5 North	248	0	0	0	248
	A361	237	0	0	0	237
	Total	602	106	223	212	1143

Table 5 – Summer Saturday Peak (Non Retail Adjusted) Trip Matrix

		Other Saturday Peak (13:00-14:00) Non Retail Adjusted				
		Destination				
		M5 South	A38	M5 North	A361	Total
Origin	M5 South	0	94	195	186	475
	A38	111	0	0	0	111
	M5 North	230	0	0	0	230
	A361	219	0	0	0	219
	Total	560	94	195	186	1035

Table 6 – Other Saturday Peak (Non Retail Adjusted) Trip Matrix

		Weekday AM Peak (08:00-09:00) Retail Adjusted				
		Destination				
		M5 South	A38	M5 North	A361	Total
Origin	M5 South	0	45	91	89	225
	A38	100	0	0	0	100
	M5 North	222	0	0	0	222
	A361	211	0	0	0	211
	Total	533	45	91	89	757

Table 7 – Weekday AM Peak (Retail Adjusted) Trip Matrix

		Weekday PM Peak (17:00-18:00) Retail Adjusted				
		Destination				
		M5 South	A38	M5 North	A361	Total
Origin	M5 South	0	115	255	242	613
	A38	75	0	0	0	75
	M5 North	172	0	0	0	172
	A361	168	0	0	0	168
	Total	416	115	255	242	1029

Table 8 – Weekday PM Peak (Retail Adjusted) Trip Matrix

		Summer Saturday Peak (13:00-14:00) Retail Adjusted				
		Destination				
		M5 South	A38	M5 North	A361	Total
Origin	M5 South	0	123	279	269	672
	A38	137	0	0	0	137
	M5 North	313	0	0	0	313
	A361	303	0	0	0	303
	Total	754	123	279	269	1426

Table 9 – Summer Saturday Peak (Retail Adjusted) Trip Matrix

		Other Saturday Peak (13:00-14:00) Retail Adjusted				
		Destination				
		M5 South	A38	M5 North	A361	Total
Origin	M5 South	0	110	246	238	593
	A38	128	0	0	0	128
	M5 North	289	0	0	0	289
	A361	279	0	0	0	279
	Total	696	110	246	238	1290

Table 10 – Other Saturday Peak (Retail Adjusted) Trip Matrix

6 HIGH LEVEL JUNCTION ASSESSMENT – MODAL SPLIT SENSITIVITY TESTING

- 6.1 The peak hour matrices in Section 5 were applied to the DCC LINSIG model to determine the impact of the proposed development on the Pinch Point scheme. Tables 11 and 12 show the LINSIG results for the various peak hours tested.
- 6.2 The results show that all arms, with the exception of the M5 N/B off slips, operate above capacity for at least one of the peak hours tested. However the results, showing a maximum of 9% over capacity for the worst case, indicate that the junction could operate within capacity if additional measures are implemented as part of the development.

M5 Junction 27	Weekday AM Peak (08:00 – 09:00)			Weekday PM Peak (17:00-18:00)			Saturday Summer Peak (13:00-14:00)			Saturday (rest) (13:00-14:00)		
	Queue (PCU)	Delay (Secs)	DOS (%)	Queue (PCU)	Delay (Secs)	DOS (%)	Queue (PCU)	Delay (Secs)	DOS (%)	Queue (PCU)	Delay (Secs)	DOS (%)
HA Pinch Point Scheme and Development (Non Retail Adjusted)												
M5 (S/B Off) Lane 1	26.7	141.1	102.3	14.7	39.2	81.8	11.2	28.2	67.2	7.1	24.3	48.8
M5 (S/B Off) Lane 2	6.7	37.4	57.7	7.3	27.2	52.2	19.7	45.1	89.7	3.8	21.2	29.1
M5 (S/B Off) Lane 3	0.0	0.0	0.0	0.0	0.0	0.0	0.3	17.7	2.4	0.2	18.4	2.2
A38 Lane 1	9.7	17.9	80.8	12.7	23.9	88.9	22.4	74.4	98.3	2.1	4.0	50.9
A38 Lane 2	3.1	6.8	70.7	4.4	5.6	68.9	20.0	20.5	89.2	0.2	1.8	24.9
M5 (N/B Off) Lane 1	11.9	27.0	68.4	13.3	32.3	75.3	12.1	35.4	74.5	6.0	24.0	43.1
M5 (N/B Off) Lane 2	11.9	27.0	68.4	13.2	32.2	75.1	12.1	35.4	74.5	6.0	23.9	42.9
A361 Lane 1	81.4	73.0	100.8	75.6	102.1	103.1	35.4	67.4	100.0	4.0	5.2	63.9
A361 Lane 2	8.8	6.9	78.3	0.5	3.1	51.1	0.6	3.2	52.7	0.1	1.7	20.9

Table 11 – Junction 27 LINSIG Results – HA Pinch Point Scheme and Development (Non Retail Adjusted)

M5 Junction 27	Weekday AM Peak (08:00 – 09:00)			Weekday PM Peak (17:00-18:00)			Saturday Summer Peak (13:00-14:00)			Saturday (rest) (13:00-14:00)		
	Queue (PCU)	Delay (Secs)	DOS (%)	Queue (PCU)	Delay (Secs)	DOS (%)	Queue (PCU)	Delay (Secs)	DOS (%)	Queue (PCU)	Delay (Secs)	DOS (%)
HA Pinch Point Scheme and Development (Retail Adjusted)												
M5 (S/B Off) Lane 1	18.1	86.0	95.8	13.6	38.5	79.5	14.2	33.8	78.0	9.1	28.4	60.1
M5 (S/B Off) Lane 2	6.6	37.3	57.5	7.6	28.4	53.8	23.3	59.4	94.6	4.3	23.1	32.9
M5 (S/B Off) Lane 3	0.0	28.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.7	0.1
A38 Lane 1	9.3	17.3	79.2	10.4	18.5	84.9	59.5	181.2	107.4	2.6	4.6	57.5
A38 Lane 2	2.8	6.3	68.4	3.8	4.8	64.2	32.4	56.5	98.6	0.2	1.9	28.7
M5 (N/B Off) Lane 1	11.3	26.4	66.5	12.4	29.7	71.3	10.4	22.7	61.0	6.2	21.9	43.5
M5 (N/B Off) Lane 2	11.3	26.4	66.5	12.3	29.6	71.2	10.4	22.6	60.9	6.2	21.9	43.5
A361 Lane 1	35.8	54.5	99.0	31.5	45.5	97.7	101.6	191.8	109.0	5.3	7.0	70.0
A361 Lane 2	7.3	5.8	75.1	0.5	2.9	49.5	0.6	3.6	55.1	0.1	1.8	22.0

Table 12 – Junction 27 LINSIG Results – HA Pinch Point Scheme and Development (Retail Adjusted)

7 POTENTIAL MITIGATION MEASURES

- 7.1 The results of the modal split sensitivity tests indicates that the proposed HA Pinch Point scheme at M5 Junction 27 would not accommodate the proposed development at Westwood on certain arms for the peak hours tested. However the quantum of the results indicates that mitigation measures could be implemented to ensure that the junction operates to the satisfaction of the highway authorities. It is anticipated that any mitigation measures needed would be of a scale that is deliverable within the Local Plan period.
- 7.2 As identified in the previous technical note there are several mitigation measures that could be assessed as part of a full Transport Assessment for the scheme. These could include but not be limited to:
- Increasing the modal split towards sustainable means of transport;
 - Full signalisation of the junction;
 - Introduction of segregated left turn lane on M5 southbound off slip;
 - Optimisation of signal timings with proposed development access;
 - Optimisation of lane markings and signage;
 - Lengthening of slip roads within M5 corridor.
- 7.3 As part of the assessment process we will liaise with the HA and DCC over the capacity criteria required at the junction and agree a mitigation scheme that is appropriate and deliverable.

8 CONCLUSIONS AND RECOMMENDATIONS

- 8.1 This technical note provides further sensitivity testing of the impact that the development at Westwood could have on M5 Junction 27. It is intended to support the Local Plan Allocation process and it is not intended as a full Transport Assessment, which would be submitted as part of any future planning application.
- 8.2 The background calculations related to the methodology will be available to the HA and DCC as part of the continued liaison throughout the assessment process.
- 8.3 The modal split sensitivity tests have shown that development would have an impact on the junction and that some arms would operate over capacity during certain peak hours.
- 8.4 Regardless of the modal split applied during any assessment, mitigation measures are likely to be requested as part of any development to ensure that a level of capacity is maintained at the junction. The level of capacity and the measures required to achieve this will be agreed with the HA and DCC during the assessment process.
- 8.5 Further refinement of the development flows will be undertaken during the assessment process to ensure that the proposed scheme includes the best estimate of trips generated. This will include:
- Reviewing the estimated spread of retail trips throughout the week, based on data sourced from similar developments (where appropriate);
 - Reviewing the estimated spread of employment trips throughout the week, based on data sourced from similar developments (where appropriate);
 - Reviewing the car occupancy estimates, based on data sourced from similar development (where appropriate);
 - Sensitivity tests to relate the visitor number estimates to TRICS or traffic count data for similar developments (where appropriate);
- 8.6 As part of the assessment a review of the impact of the development on the local road network would be undertaken, as necessary, and ensure that the scheme provides appropriate provision for access and on site facilities.