To	OPDC	**Technical Note**	
Cc	TfL		
From	Steer		
Date	29 August 2018		
Project	Old Oak Strategic Modelling	Project No.	23255401

Transport appraisal support to Old Oak North HIF bid

How do existing users of the local highway dis-benefit from the addition of increased traffic associated with the development potential released by the housing infrastructure scheme?

Approach

Use existing 2038 strategic modelling results:

- Base Minus – no development (i.e. non-dependent development trips)
- OOC – with development (i.e. with dependent development trips)

A key assumption is that all development is dependent on the HIF scheme.

Area of influence

The analysis is focussed on the network area that is shown to be affected by the new development. A difference plot with and without development shows that the area of influence can be generally defined as follows.

Figure 1: Area of influence
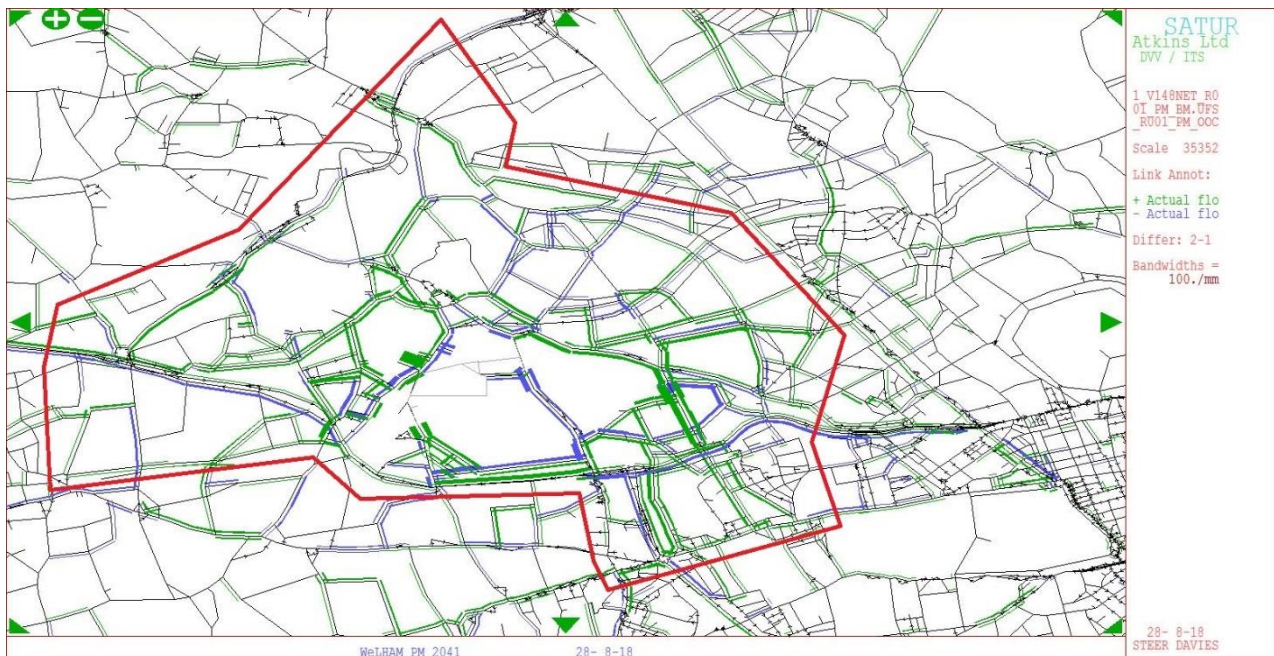
Assignment outputs

Travel time, distance and speed information is then extracted for each network link within the area of influence. A total of 1,723 links are included in the analysis.

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The results for each of the AM and PM peak, separately by model user class, are presented in the following tables.

Table 1: Network statistics – AM peak

Type	Network Statistics	Base Minus	OOC	% Change from BM
Car (in work)	Free Flow Time (PCU Hours)	481.0	479.7	0%
	Total Travel Time (PCU Hours)	942.5	991.2	5%
	Total Travel Distance (PCU Kms)	17,274.5	17,128.7	-1%
	Average Speed (kph)	18.3	17.3	-6%
	Total Delay (PCU Hours)	461.5	511.5	11%
	Level of Delay (mins/km)	1.6	1.8	12%
	Over Capacity Queue (PCU Hours)	185.9	227.6	22%
Car (out of work)	Free Flow Time (PCU Hours)	3,298.0	3,260.5	-1%
	Total Travel Time (PCU Hours)	6,647.7	6,837.0	3%
	Total Travel Distance (PCU Kms)	118,026.0	115,912.0	-2%
	Average Speed (kph)	17.8	17.0	-5%
	Total Delay (PCU Hours)	3,349.8	3,576.5	7%
	Level of Delay (mins/km)	1.7	1.9	9%
	Over Capacity Queue (PCU Hours)	1,405.9	1,614.2	15%
Taxis	Free Flow Time (PCU Hours)	91.9	90.2	-2%
	Total Travel Time (PCU Hours)	166.5	169.4	2%
	Total Travel Distance (PCU Kms)	3,003.7	2,932.8	-2%
	Average Speed (kph)	18.0	17.3	-4%
	Total Delay (PCU Hours)	74.6	79.2	6%
	Level of Delay (mins/km)	1.5	1.6	9%
	Over Capacity Queue (PCU Hours)	13.8	17.8	30%
LGVs	Free Flow Time (PCU Hours)	1,061.4	1,136.5	7%
	Total Travel Time (PCU Hours)	2,074.6	2,328.2	12%
	Total Travel Distance (PCU Kms)	38,605.5	40,980.9	6%
	Average Speed (kph)	18.6	17.6	-5%
	Total Delay (PCU Hours)	1,013.2	1,191.8	18%
	Level of Delay (mins/km)	1.6	1.7	11%
	Over Capacity Queue (PCU Hours)	387.5	492.0	27%
HGVs	Free Flow Time (PCU Hours)	530.0	557.9	5%
	Total Travel Time (PCU Hours)	1,076.2	1,181.2	10%
	Total Travel Distance (PCU Kms)	20,362.0	21,236.4	4%
	Average Speed (kph)	18.9	18.0	-5%
	Total Delay (PCU Hours)	546.2	623.4	14%
	Level of Delay (mins/km)	1.6	1.8	9%
	Over Capacity Queue (PCU Hours)	237.9	287.6	21%
All Ucs (excl fixed)	**Free Flow Time (PCU Hours)**	**5,462.2**	**5,524.7**	**1%**
	Total Travel Time (PCU Hours)	**10,907.4**	**11,507.0**	**5%**
	Total Travel Distance (PCU Kms)	**197,271.7**	**198,190.8**	**0%**
	Average Speed (kph)	**18.1**	**17.2**	**-5%**
	Total Delay (PCU Hours)	**5,445.2**	**5,982.3**	**10%**
	Level of Delay (mins/km)	**1.7**	**1.8**	**9%**
	Over Capacity Queue (PCU Hours)	**2,231.0**	**2,639.2**	**18%**

In the AM peak, average speeds are predicted to reduce slightly, by less than 1 kph. Across all user classes the additional demand associated with dependent development has little effect on total distance travelled and total travel time is forecast to increase by 5%. Total delay is forecast to increase by 10%.

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Table 2: Network statistics – PM peak

Type	Network Statistics	Base Minus	OOC	% Change from BM
Car (in work)	Free Flow Time (PCU Hours)	539.2	525.9	-2%
	Total Travel Time (PCU Hours)	1,044.1	1,098.4	5%
	Total Travel Distance (PCU Kms)	19,156.4	18,692.7	-2%
	Average Speed (kph)	18.3	17.0	-7%
	Total Delay (PCU Hours)	504.8	572.6	13%
	Level of Delay (mins/km)	1.6	1.8	16%
	Over Capacity Queue (PCU Hours)	220.9	283.2	28%
Car (out of work)	Free Flow Time (PCU Hours)	3,592.8	3,528.8	-2%
	Total Travel Time (PCU Hours)	7,231.2	7,498.1	4%
	Total Travel Distance (PCU Kms)	129,739.0	127,191.0	-2%
	Average Speed (kph)	17.9	17.0	-5%
	Total Delay (PCU Hours)	3,638.4	3,969.3	9%
	Level of Delay (mins/km)	1.7	1.9	11%
	Over Capacity Queue (PCU Hours)	1,718.8	2,008.5	17%
Taxis	Free Flow Time (PCU Hours)	143.7	140.8	-2%
	Total Travel Time (PCU Hours)	242.7	245.5	1%
	Total Travel Distance (PCU Kms)	4,802.1	4,673.8	-3%
	Average Speed (kph)	19.8	19.0	-4%
	Total Delay (PCU Hours)	99.1	104.7	6%
	Level of Delay (mins/km)	1.2	1.3	9%
	Over Capacity Queue (PCU Hours)	18.6	22.4	21%
LGVs	Free Flow Time (PCU Hours)	934.0	1,004.9	8%
	Total Travel Time (PCU Hours)	1,853.0	2,106.2	14%
	Total Travel Distance (PCU Kms)	34,140.1	36,387.6	7%
	Average Speed (kph)	18.4	17.3	-6%
	Total Delay (PCU Hours)	918.9	1,101.3	20%
	Level of Delay (mins/km)	1.6	1.8	12%
	Over Capacity Queue (PCU Hours)	434.3	544.5	25%
HGVs	Free Flow Time (PCU Hours)	265.9	282.1	6%
	Total Travel Time (PCU Hours)	548.3	617.0	13%
	Total Travel Distance (PCU Kms)	9,963.5	10,471.4	5%
	Average Speed (kph)	18.2	17.0	-7%
	Total Delay (PCU Hours)	282.5	334.9	19%
	Level of Delay (mins/km)	1.7	1.9	13%
	Over Capacity Queue (PCU Hours)	141.6	175.9	24%
All Ucs (excl fixed)	**Free Flow Time (PCU Hours)**	**5,475.6**	**5,482.5**	**0%**
	Total Travel Time (PCU Hours)	**10,919.3**	**11,565.2**	**6%**
	Total Travel Distance (PCU Kms)	**197,801.2**	**197,416.5**	**0%**
	Average Speed (kph)	**18.1**	**17.1**	**-6%**
	Total Delay (PCU Hours)	**5,443.7**	**6,082.7**	**12%**
	Level of Delay (mins/km)	**1.7**	**1.8**	**12%**
	Over Capacity Queue (PCU Hours)	**2,534.2**	**3,034.6**	**20%**

In the PM peak, average speeds are predicted to reduce slightly, by around 1 kph. Across all user classes the additional demand associated with dependent development has little effect on total distance travelled and total travel time is forecast to increase by 6%. Total delay is forecast to increase by 12%.

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Quantifying delays

An estimate of the monetary value of the increase in total travel delay can be made by applying the value of time associated with each modelled user class. The following perceived values of time (£ per hour, 2010 values) have been taken from Table A1.3.1 of the WebTAG data book, May 2018.

- Car – in work time   £14.86/hour
- Car – out of work time   £9.95/hour
- Taxi – driver   £10.89/hour
- LGV – driver & passenger   £10.24/hour
- HGV – driver & passenger   £12.06/hour

The following table presents a calculation of the likely cost of increased delay based on AM and PM peak hour conditions. Peak hour to peak period factors have been derived from expansion factors used by TfL and included in Appendix A. The road category 'Inner' has been taken to represent conditions around Old Oak. The following factors are derived:

- AM peak to AM peak period   2.886
- PM peak to PM peak period   2.990
- (AM+PM periods) to 12-hour   1.926

If it is assumed that off-peak changes in conditions are not significant then the combination of AM and PM peak period delays can be used as a proxy for the day. Daily values are then multiplied by 5 days and by 52 weeks to give equivalent annual values.

Table 3: Estimated costs of increased network delay

		factor	Car – in work	Car – out of work	Taxi	LGV	HGV
AM peak hour	PCU hours	-	50.0	226.7	4.6	178.6	77.2
AM peak period	PCU hours	2.886	144.3	654.1	13.1	515.4	222.8
PM peak hour	PCU hours	-	67.7	330.8	5.6	182.4	52.4
PM peak period	PCU hours	2.990	202.5	989.1	16.8	545.3	156.7
12-hour period	PCU hours	1.926	668	3165	58	2043	731
Annual	PCU hours	260	173688	822923	15010	531178	190015
Value of time	£ per hour (2010)	-	14.86	9.95	10.89	10.24	12.06
Annual cost	£, 2010 values	-	2,580,999	8,188,086	163,459	5,439,262	2,291,578

This gives a total annual cost of additional delay on the network (2010 values) of £18.663m.

In line with Tag Unit A2.2 Appraisal of Induced Investment Impacts, this cost can be offset against the land value uplift likely to arise from the scheme.

Comment

It is noted, however, that the above results provide a direct comparison of with development conditions against conditions without the proposals. As such, all network users are included in the calculations not just existing users and the results are likely to be higher than if calculated through TUBA.

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Furthermore, the existing 2038 modelling on which the analysis is based includes all Local Plan Period development across the development corporation area and represents significantly higher development related traffic than associated with Wave 1 and Wave 2 of the Old Oak North programme included in the HIF Economic Case.

Wave 1 and Wave 2 includes a gross increase in 9,848 units compared to a total of 20,172 units in the Local Plan Period model, plus the model includes significant levels of employment/retail/leisure activity. Given the analysis outlined above is based on increases in PCU hour delays between the with and without development scenarios, it is reasonable to assume that modelling lower levels of development would result in reduced increases in delay. Although the relationship is unlikely to be completely linear, if the modelling had included less than half the level of residential development we might expect a similar reduction in the costs of additional delay on the network.

Other elements of the assessment which make this a conservative assessment of the dis-benefits of the scheme

- Park Road will carry buses linking to the Old Oak Common station (HS2, Elizabeth Line, West Coast Mainline), and is also connected to the new walk link connected to Willesden Junction Station, which will provide improved accessibility for all public transport users.
- There is significant development across the whole of the OPDC area, not all of which is dependent on the HIF link, but the existing model runs contain all development demand in the development corporation area.

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Appendix A – Hourly expansion factors

Table 1 – Hourly Expansion Factors by Road Category

Factors	Central	Inner	Outer	Inbound Radial	Outbound Radial	Orbital	Not orbital or radial	BPRN	TLRN
From 24 hr to 00:00 to 01:00 flow	0.0269	0.0232	0.0137	0.0191	0.0197	0.0223	0.0194	0.0174	0.0219
From 24 hr to 01:00 to 02:00 flow	0.0178	0.0148	0.0080	0.0122	0.0126	0.0140	0.0122	0.0109	0.0139
From 24 hr to 02:00 to 03:00 flow	0.0133	0.0106	0.0055	0.0087	0.0090	0.0101	0.0091	0.0078	0.0101
From 24 hr to 03:00 to 04:00 flow	0.0120	0.0091	0.0050	0.0076	0.0078	0.0092	0.0082	0.0067	0.0092
From 24 hr to 04:00 to 05:00 flow	0.0146	0.0112	0.0077	0.0097	0.0098	0.0120	0.0107	0.0083	0.0121
From 24 hr to 05:00 to 06:00 flow	0.0215	0.0182	0.0162	0.0176	0.0163	0.0197	0.0188	0.0148	0.0202
From 24 hr to 06:00 to 07:00 flow	0.0435	0.0399	0.0403	0.0399	0.0351	0.0445	0.0415	0.0344	0.0446
From 24 hr to 07:00 to 08:00 flow	0.0528	0.0546	0.0621	0.0620	0.0531	0.0566	0.0573	0.0566	0.0574
From 24 hr to 08:00 to 09:00 flow	0.0534	0.0569	0.0625	0.0645	0.0572	0.0548	0.0590	0.0625	0.0560
From 24 hr to 09:00 to 10:00 flow	0.0534	0.0527	0.0565	0.0562	0.0527	0.0530	0.0564	0.0574	0.0531
From 24 hr to 10:00 to 11:00 flow	0.0524	0.0501	0.0525	0.0513	0.0505	0.0516	0.0532	0.0532	0.0513
From 24 hr to 11:00 to 12:00 flow	0.0514	0.0509	0.0531	0.0515	0.0521	0.0518	0.0523	0.0537	0.0511
From 24 hr to 12:00 to 13:00 flow	0.0502	0.0522	0.0546	0.0532	0.0539	0.0516	0.0526	0.0548	0.0515
From 24 hr to 13:00 to 14:00 flow	0.0505	0.0526	0.0557	0.0537	0.0545	0.0526	0.0528	0.0550	0.0523
From 24 hr to 14:00 to 15:00 flow	0.0511	0.0531	0.0576	0.0541	0.0556	0.0542	0.0541	0.0564	0.0534
From 24 hr to 15:00 to 16:00 flow	0.0521	0.0557	0.0601	0.0562	0.0588	0.0558	0.0559	0.0598	0.0547
From 24 hr to 16:00 to 17:00 flow	0.0529	0.0565	0.0637	0.0575	0.0612	0.0583	0.0574	0.0614	0.0569
From 24 hr to 17:00 to 18:00 flow	0.0537	0.0587	0.0664	0.0600	0.0643	0.0598	0.0589	0.0637	0.0586
From 24 hr to 18:00 to 19:00 flow	0.0552	0.0603	0.0637	0.0603	0.0644	0.0575	0.0605	0.0629	0.0586
From 24 hr to 19:00 to 20:00 flow	0.0523	0.0563	0.0581	0.0554	0.0585	0.0542	0.0562	0.0566	0.0553
From 24 hr to 20:00 to 21:00 flow	0.0456	0.0481	0.0460	0.0457	0.0474	0.0466	0.0459	0.0456	0.0468
From 24 hr to 21:00 to 22:00 flow	0.0428	0.0421	0.0364	0.0395	0.0400	0.0401	0.0400	0.0383	0.0407
From 24 hr to 22:00 to 23:00 flow	0.0420	0.0383	0.0311	0.0347	0.0357	0.0374	0.0368	0.0338	0.0377
From 24 hr to 23:00 to 00:00 flow	0.0387	0.0339	0.0236	0.0295	0.0300	0.0326	0.0309	0.0279	0.0327
From 12 hrs to 16 hrs	1.2929	1.2849	1.2551	1.2653	1.2668	1.2818	1.2739	1.2506	1.2860
From 16 hrs to 18 hrs	1.0992	1.0858	1.0615	1.0746	1.0764	1.0831	1.0792	1.0708	1.0836
From 18 hrs to 24 hrs	1.1187	1.0955	1.0594	1.0809	1.0812	1.0955	1.0849	1.0706	1.0956
From 24 hrs to 12 hrs	0.6290	0.6543	0.7084	0.6804	0.6783	0.6575	0.6704	0.6975	0.6550

Source: HAM Matrix Development Report (31/07/14, SKM)

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