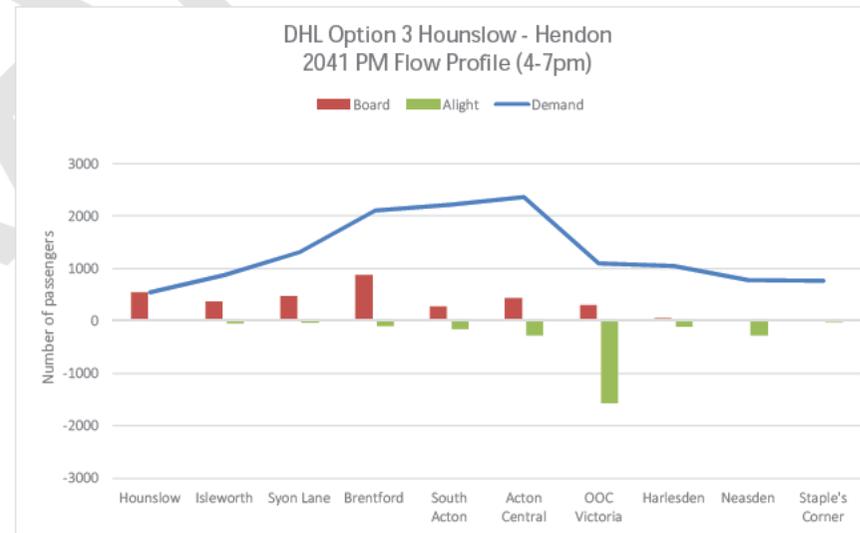
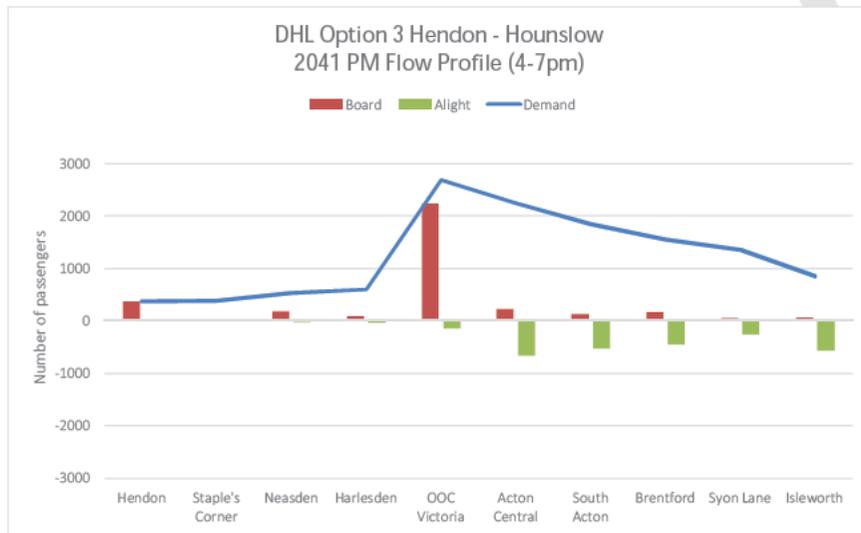
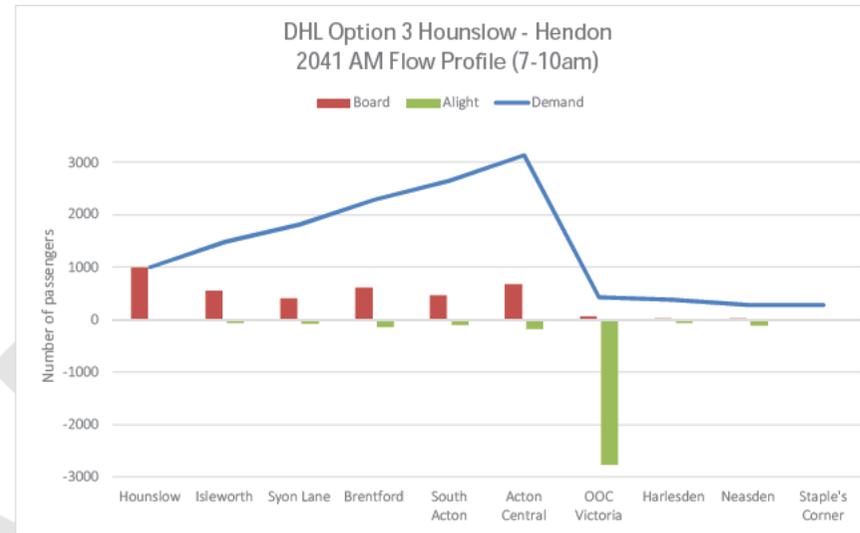
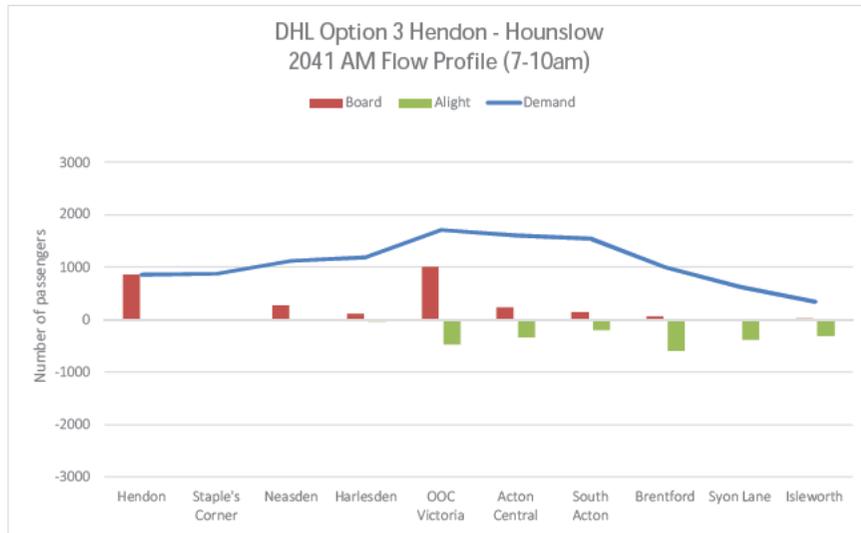
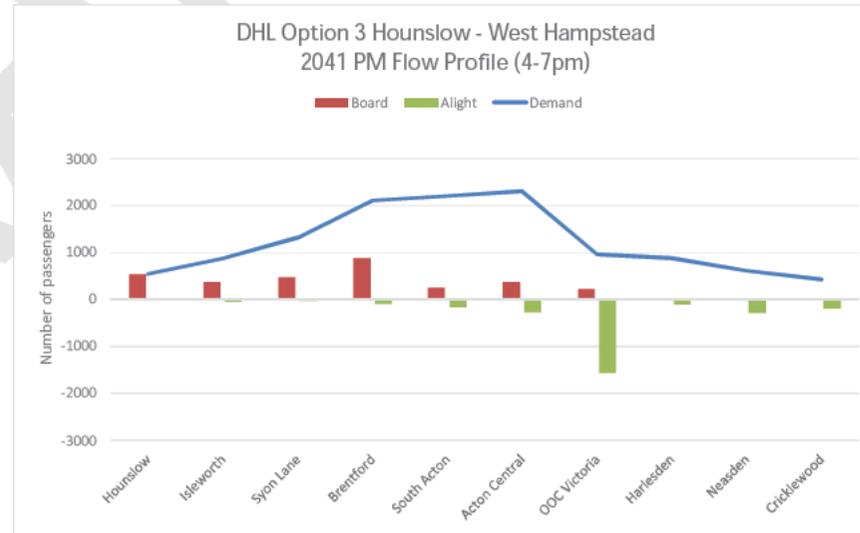
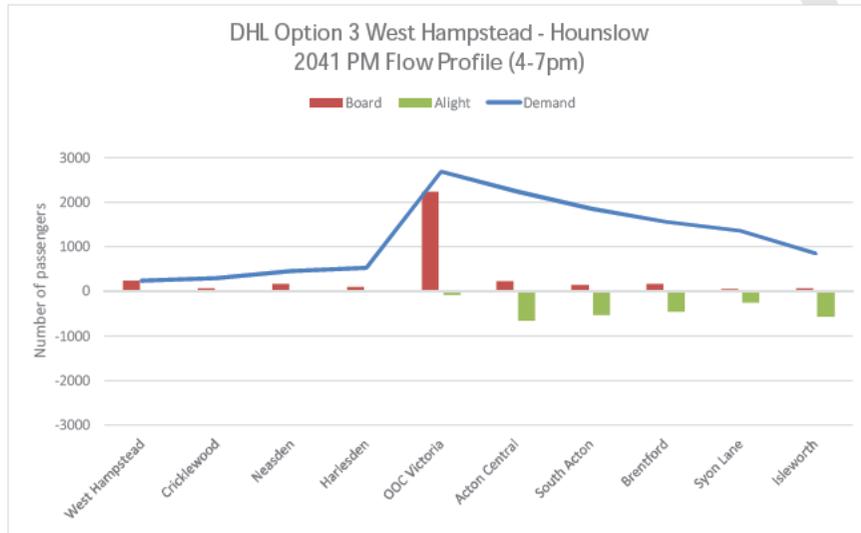
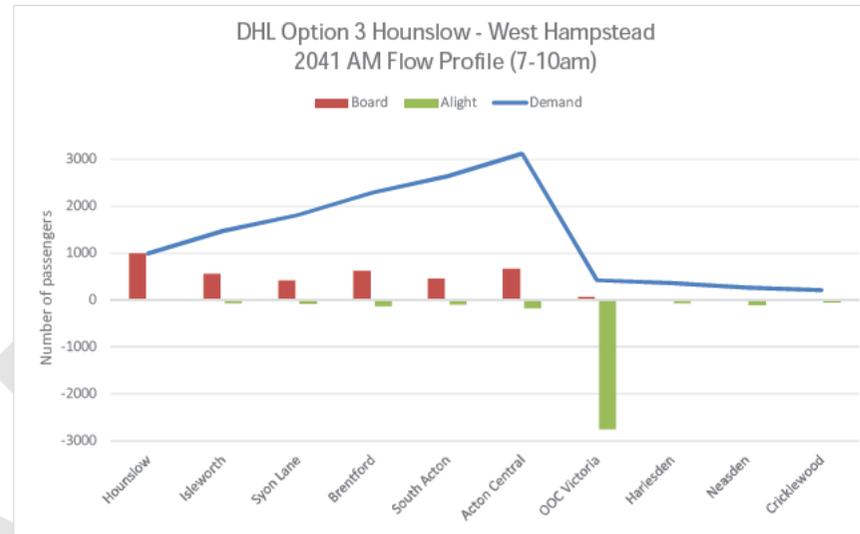
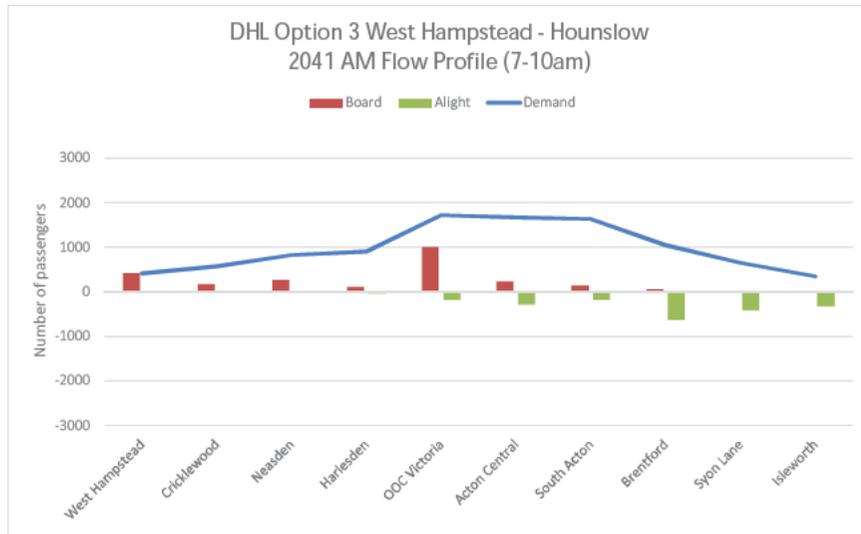


Option 3

Direction	From	To	NAME	LONGNAME	AM			PM		
					Demand	Board	Alight	Demand	Board	Alight
Southbound	Hendon	Staple's Corner	DH001D	HENDON-HOUNSLOW	855	855	0	373	373	0
	Staple's Corner	Neasden	DH001D	HENDON-HOUNSLOW	870	15	0	384	11	0
	Neasden	Harlesden	DH001D	HENDON-HOUNSLOW	1118	264	-15	533	174	-25
	Harlesden	OOO Victoria	DH001D	HENDON-HOUNSLOW	1188	111	-41	597	91	-27
	OOO Victoria	Acton Central	DH001D	HENDON-HOUNSLOW	1710	998	-476	2682	2231	-146
	Acton Central	South Acton	DH001D	HENDON-HOUNSLOW	1602	222	-329	2240	223	-665
	South Acton	Brentford	DH001D	HENDON-HOUNSLOW	1542	142	-203	1840	129	-529
	Brentford	Syon Lane	DH001D	HENDON-HOUNSLOW	998	51	-595	1549	156	-447
	Syon Lane	Isleworth	DH001D	HENDON-HOUNSLOW	624	13	-387	1351	53	-251
	Isleworth	Hounslow	DH001D	HENDON-HOUNSLOW	342	25	-307	848	62	-565
Northbound	Hounslow	Isleworth	DH002U	HOUNSLOW-HENDON	996	996	0	546	546	0
	Isleworth	Syon Lane	DH002U	HOUNSLOW-HENDON	1479	551	-68	870	373	-49
	Syon Lane	Brentford	DH002U	HOUNSLOW-HENDON	1809	407	-77	1311	468	-28
	Brentford	South Acton	DH002U	HOUNSLOW-HENDON	2284	613	-138	2096	880	-95
	South Acton	Acton Central	DH002U	HOUNSLOW-HENDON	2645	461	-100	2207	269	-158
	Acton Central	OOO Victoria	DH002U	HOUNSLOW-HENDON	3127	664	-182	2357	427	-278
	OOO Victoria	Harlesden	DH002U	HOUNSLOW-HENDON	425	62	-2765	1092	301	-1566
	Harlesden	Neasden	DH002U	HOUNSLOW-HENDON	376	19	-67	1040	59	-110
	Neasden	Staple's Corner	DH002U	HOUNSLOW-HENDON	282	16	-110	778	22	-285
	Staple's Corner	Hendon	DH002U	HOUNSLOW-HENDON	273	0	-9	762	0	-16

Direction	From	To	NAME	LONGNAME	AM			PM		
					Demand	Board	Alight	Demand	Board	Alight
Southbound	West Hampstead	Cricklewood	DH003D	WESTHAMPSTEAD-HOUNSLOW	410	410	0	234	234	0
	Cricklewood	Neasden	DH003D	WESTHAMPSTEAD-HOUNSLOW	575	168	-3	296	65	-4
	Neasden	Harlesden	DH003D	WESTHAMPSTEAD-HOUNSLOW	826	264	-13	449	174	-20
	Harlesden	OOC Victoria	DH003D	WESTHAMPSTEAD-HOUNSLOW	901	111	-37	527	91	-13
	OOC Victoria	Acton Central	DH003D	WESTHAMPSTEAD-HOUNSLOW	1722	997	-176	2683	2230	-74
	Acton Central	South Acton	DH003D	WESTHAMPSTEAD-HOUNSLOW	1664	222	-279	2250	223	-656
	South Acton	Brentford	DH003D	WESTHAMPSTEAD-HOUNSLOW	1633	142	-173	1855	129	-523
	Brentford	Syon Lane	DH003D	WESTHAMPSTEAD-HOUNSLOW	1049	52	-636	1561	157	-452
	Syon Lane	Isleworth	DH003D	WESTHAMPSTEAD-HOUNSLOW	651	13	-410	1360	53	-254
	Isleworth	Hounslow	DH003D	WESTHAMPSTEAD-HOUNSLOW	347	25	-329	847	62	-574
Northbound	Hounslow	Isleworth	DH004U	HOUNSLOW-WESTHAMPSTEAD	989	989	0	545	545	0
	Isleworth	Syon Lane	DH004U	HOUNSLOW-WESTHAMPSTEAD	1472	551	-68	875	378	-49
	Syon Lane	Brentford	DH004U	HOUNSLOW-WESTHAMPSTEAD	1804	409	-76	1318	471	-27
	Brentford	South Acton	DH004U	HOUNSLOW-WESTHAMPSTEAD	2285	617	-136	2110	887	-95
	South Acton	Acton Central	DH004U	HOUNSLOW-WESTHAMPSTEAD	2640	453	-98	2204	249	-156
	Acton Central	OOC Victoria	DH004U	HOUNSLOW-WESTHAMPSTEAD	3118	657	-180	2309	381	-276
	OOC Victoria	Harlesden	DH004U	HOUNSLOW-WESTHAMPSTEAD	425	64	-2757	970	222	-1560
	Harlesden	Neasden	DH004U	HOUNSLOW-WESTHAMPSTEAD	362	5	-67	888	29	-111
	Neasden	Cricklewood	DH004U	HOUNSLOW-WESTHAMPSTEAD	262	12	-112	612	8	-284
	Cricklewood	West Hampstead	DH004U	HOUNSLOW-WESTHAMPSTEAD	209	3	-56	429	1	-183

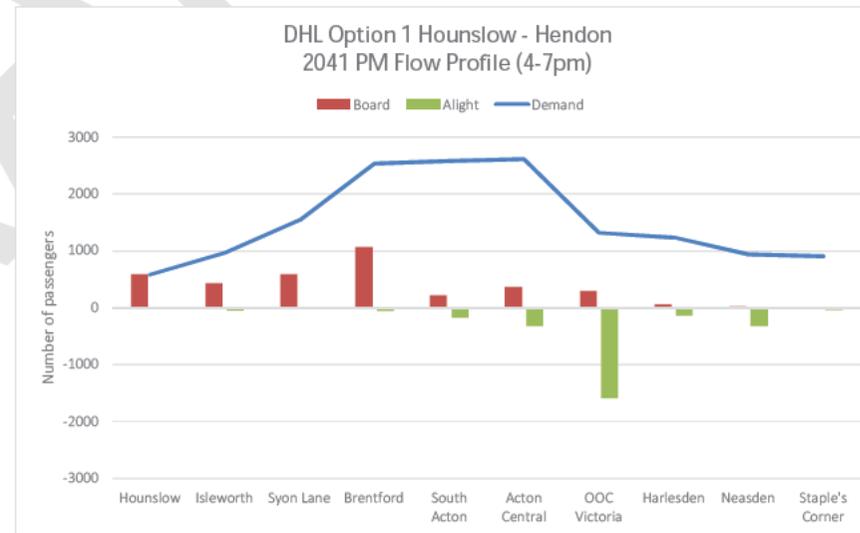
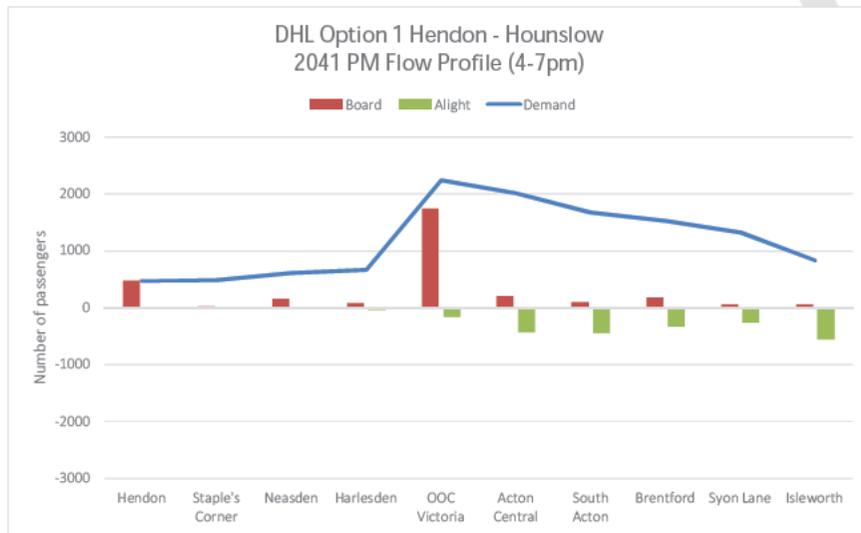
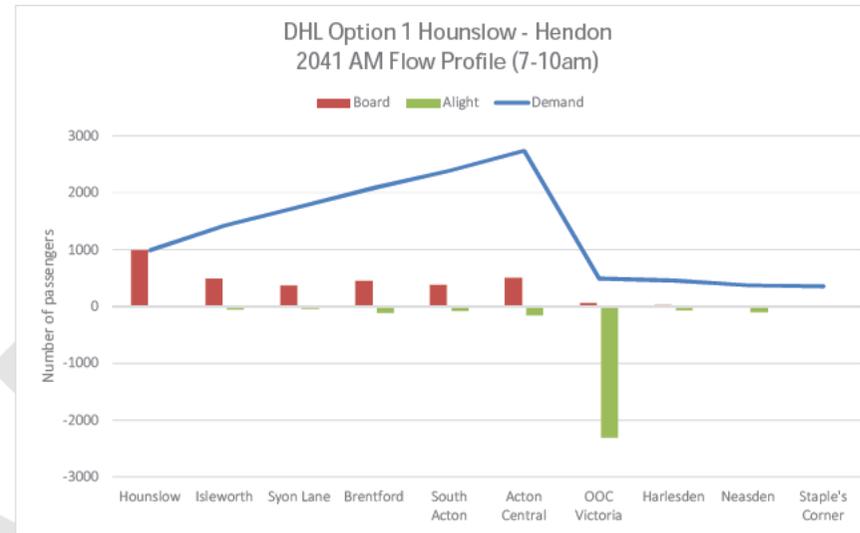
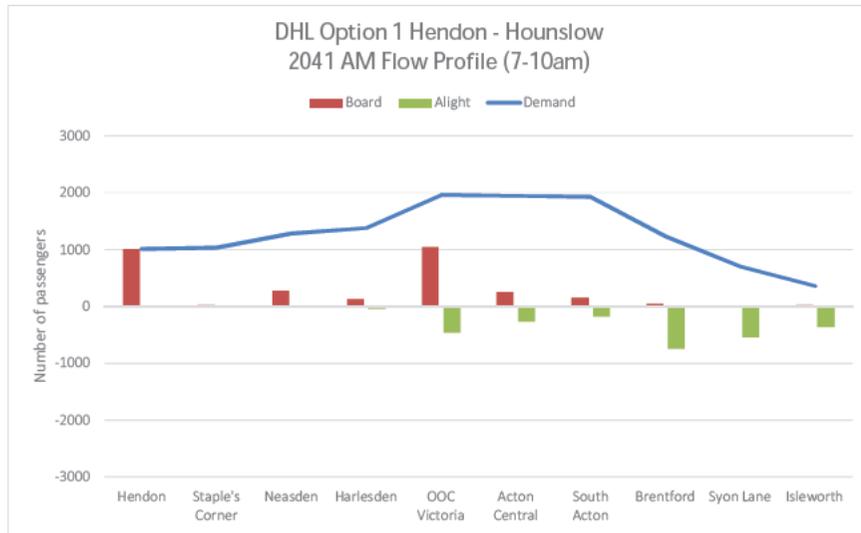




**Baseline: 2041 Maximum Growth Scenario without Crossrail 2**

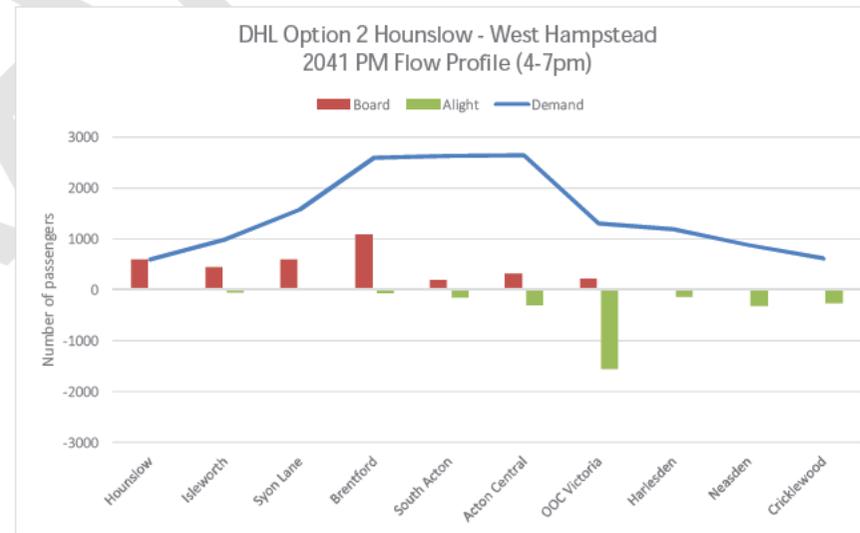
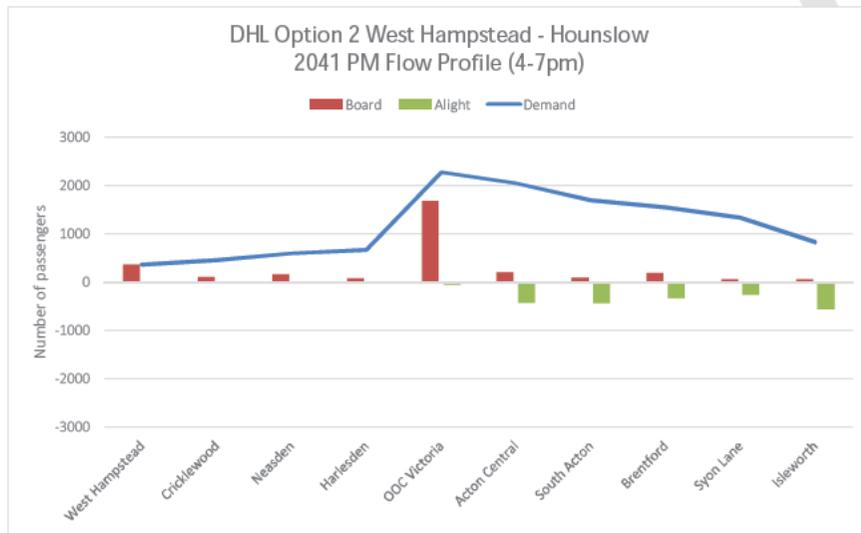
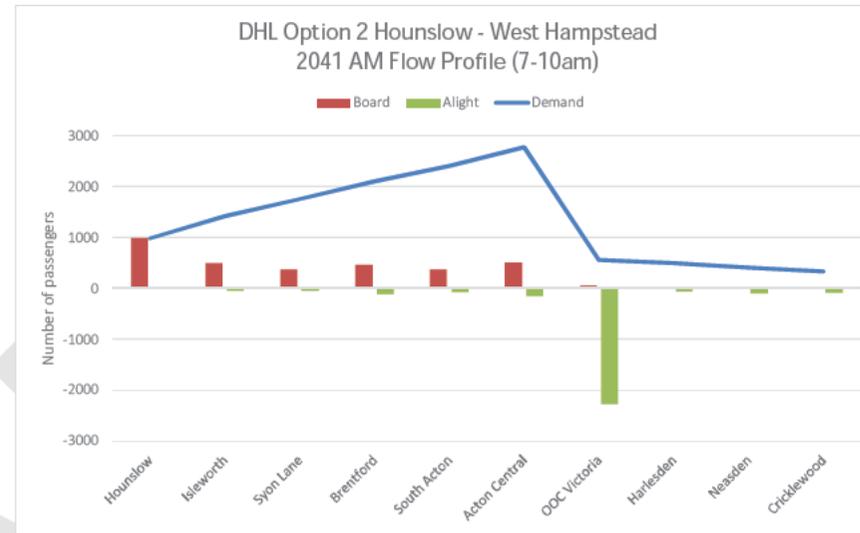
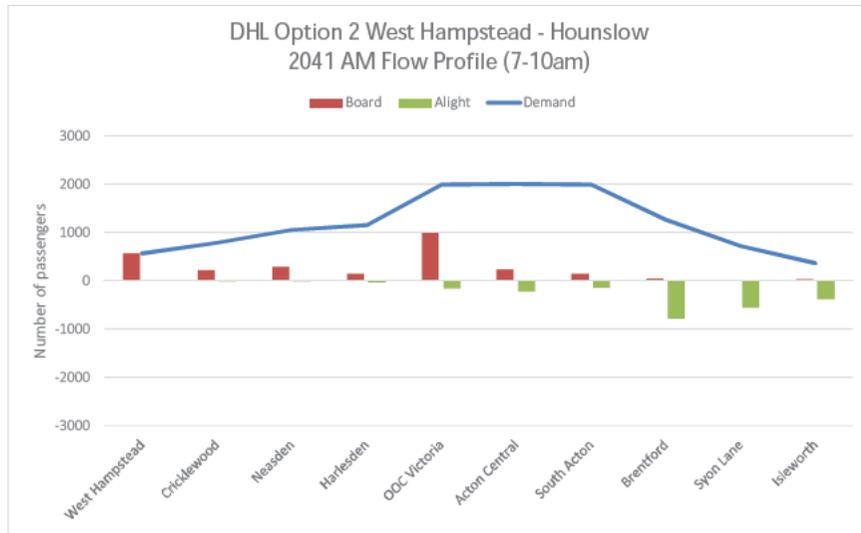
**Option 1**

Direction	From	To	NAME	LONGNAME	AM			PM		
					Demand	Board	Alight	Demand	Board	Alight
Southbound	Hendon	Staple's Corner	DH001D	HENDON-HOUNSLOW	1011	1011	0	471	471	0
	Staple's Corner	Neasden	DH001D	HENDON-HOUNSLOW	1032	21	0	488	17	0
	Neasden	Harlesden	DH001D	HENDON-HOUNSLOW	1286	269	-15	613	152	-27
	Harlesden	OOO Victoria	DH001D	HENDON-HOUNSLOW	1379	132	-38	663	80	-30
	OOO Victoria	Acton Central	DH001D	HENDON-HOUNSLOW	1960	1044	-463	2242	1737	-157
	Acton Central	South Acton	DH001D	HENDON-HOUNSLOW	1945	255	-269	2017	202	-428
	South Acton	Brentford	DH001D	HENDON-HOUNSLOW	1926	154	-174	1672	98	-442
	Brentford	Syon Lane	DH001D	HENDON-HOUNSLOW	1230	46	-741	1528	184	-329
	Syon Lane	Isleworth	DH001D	HENDON-HOUNSLOW	698	13	-545	1323	56	-262
Isleworth	Hounslow	DH001D	HENDON-HOUNSLOW	359	23	-362	829	59	-553	
Northbound	Hounslow	Isleworth	DH002U	HOUNSLOW-HENDON	989	989	0	585	585	0
	Isleworth	Syon Lane	DH002U	HOUNSLOW-HENDON	1422	486	-54	967	431	-49
	Syon Lane	Brentford	DH002U	HOUNSLOW-HENDON	1751	369	-39	1541	591	-16
	Brentford	South Acton	DH002U	HOUNSLOW-HENDON	2088	444	-108	2535	1057	-64
	South Acton	Acton Central	DH002U	HOUNSLOW-HENDON	2388	378	-78	2576	209	-168
	Acton Central	OOO Victoria	DH002U	HOUNSLOW-HENDON	2734	500	-153	2611	355	-320
	OOO Victoria	Harlesden	DH002U	HOUNSLOW-HENDON	492	66	-2308	1319	299	-1591
	Harlesden	Neasden	DH002U	HOUNSLOW-HENDON	454	24	-62	1235	55	-139
	Neasden	Staple's Corner	DH002U	HOUNSLOW-HENDON	372	19	-101	938	22	-319
	Staple's Corner	Hendon	DH002U	HOUNSLOW-HENDON	357	0	-15	907	0	-31



Option 2

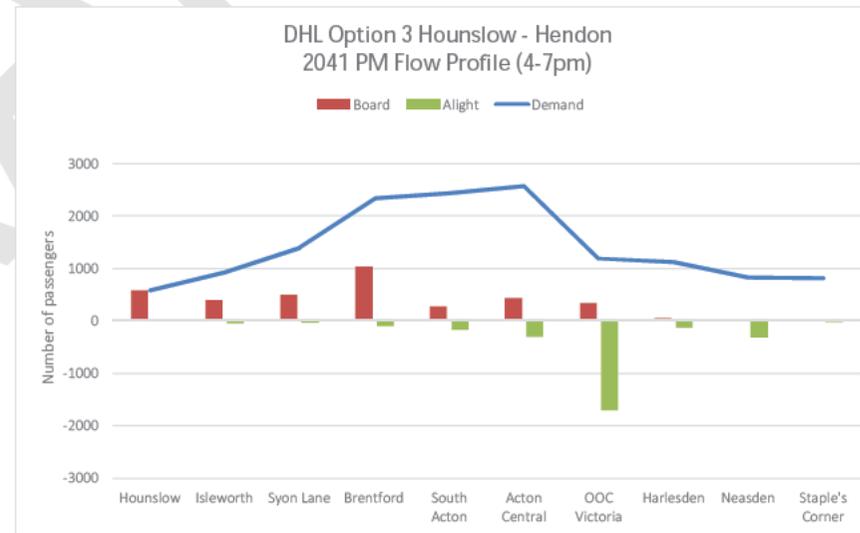
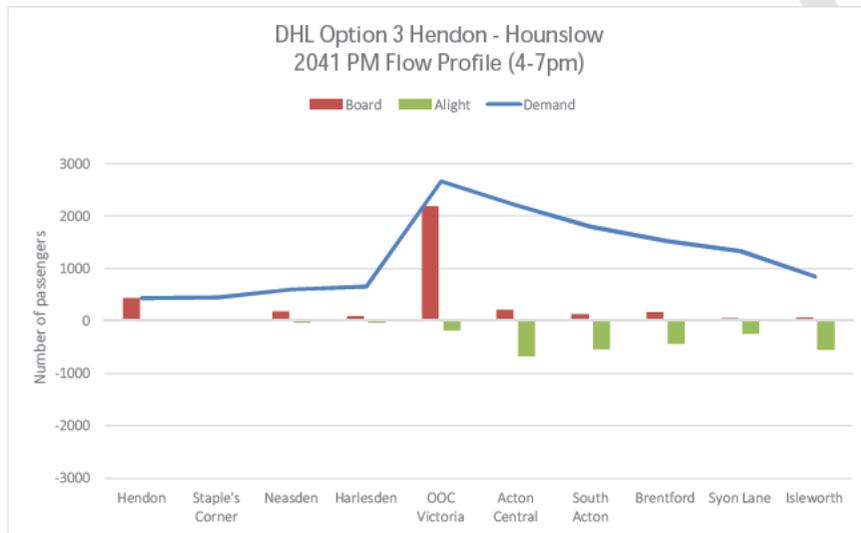
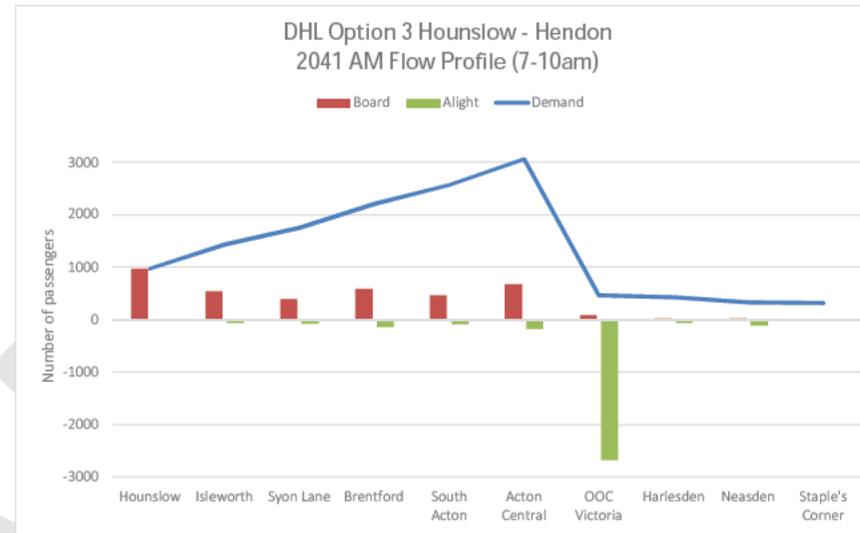
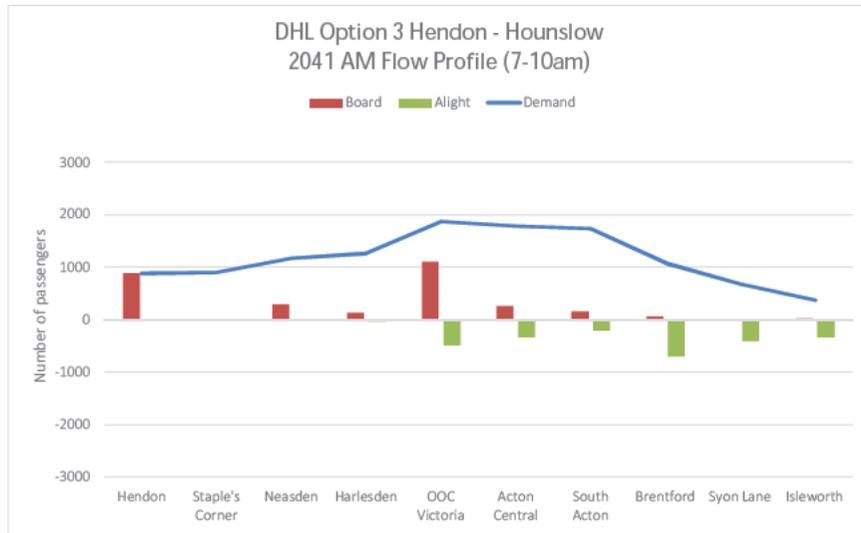
Direction	From	To	NAME	LONGNAME	AM			PM		
					Demand	Board	Alight	Demand	Board	Alight
Southbound	West Hampstead	Cricklewood	DH003D	WESTHAMPSTEAD-HOUNSLOW	563	563	0	356	356	0
	Cricklewood	Neasden	DH003D	WESTHAMPSTEAD-HOUNSLOW	783	224	-3	451	99	-4
	Neasden	Harlesden	DH003D	WESTHAMPSTEAD-HOUNSLOW	1054	283	-12	592	163	-22
	Harlesden	OOC Victoria	DH003D	WESTHAMPSTEAD-HOUNSLOW	1152	135	-36	660	82	-14
	OOC Victoria	Acton Central	DH003D	WESTHAMPSTEAD-HOUNSLOW	1989	988	-151	2272	1671	-59
	Acton Central	South Acton	DH003D	WESTHAMPSTEAD-HOUNSLOW	2003	237	-223	2042	197	-427
	South Acton	Brentford	DH003D	WESTHAMPSTEAD-HOUNSLOW	1995	136	-144	1693	91	-440
	Brentford	Syon Lane	DH003D	WESTHAMPSTEAD-HOUNSLOW	1262	46	-779	1542	185	-336
	Syon Lane	Isleworth	DH003D	WESTHAMPSTEAD-HOUNSLOW	718	13	-557	1333	56	-265
	Isleworth	Hounslow	DH003D	WESTHAMPSTEAD-HOUNSLOW	362	23	-380	828	59	-564
Northbound	Hounslow	Isleworth	DH004U	HOUNSLOW-WESTHAMPSTEAD	988	988	0	594	594	0
	Isleworth	Syon Lane	DH004U	HOUNSLOW-WESTHAMPSTEAD	1426	492	-54	989	444	-49
	Syon Lane	Brentford	DH004U	HOUNSLOW-WESTHAMPSTEAD	1761	375	-39	1573	600	-16
	Brentford	South Acton	DH004U	HOUNSLOW-WESTHAMPSTEAD	2109	456	-108	2595	1086	-64
	South Acton	Acton Central	DH004U	HOUNSLOW-WESTHAMPSTEAD	2412	374	-71	2634	192	-153
	Acton Central	OOC Victoria	DH004U	HOUNSLOW-WESTHAMPSTEAD	2777	511	-145	2650	316	-300
	OOC Victoria	Harlesden	DH004U	HOUNSLOW-WESTHAMPSTEAD	558	57	-2277	1303	212	-1560
	Harlesden	Neasden	DH004U	HOUNSLOW-WESTHAMPSTEAD	501	5	-62	1190	26	-138
	Neasden	Cricklewood	DH004U	HOUNSLOW-WESTHAMPSTEAD	412	12	-102	879	7	-318
	Cricklewood	West Hampstead	DH004U	HOUNSLOW-WESTHAMPSTEAD	332	3	-82	617	1	-263

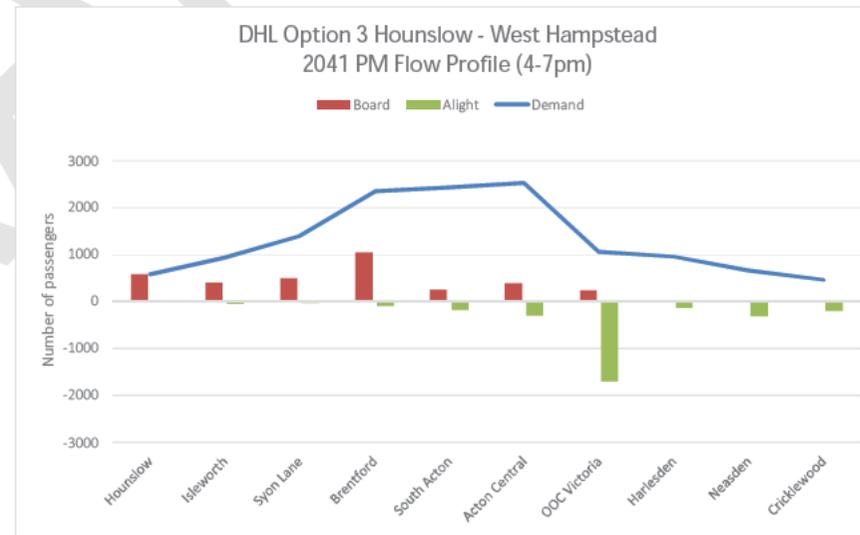
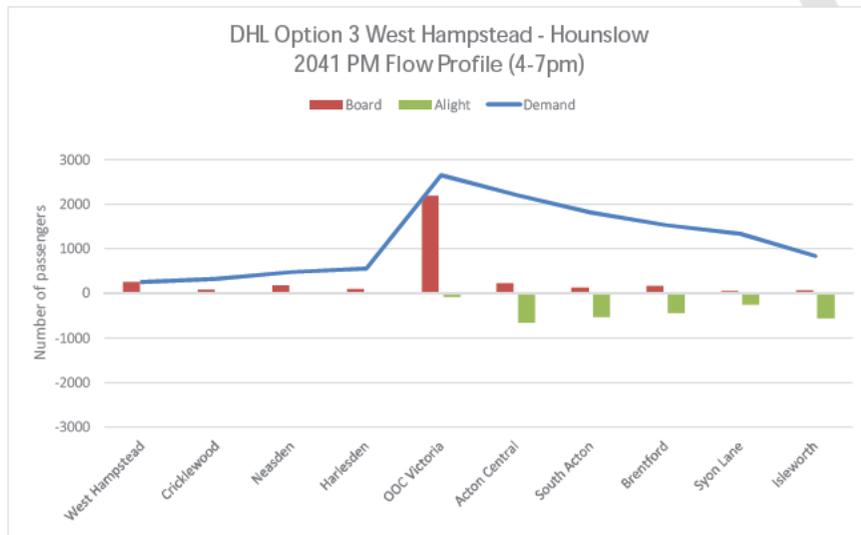
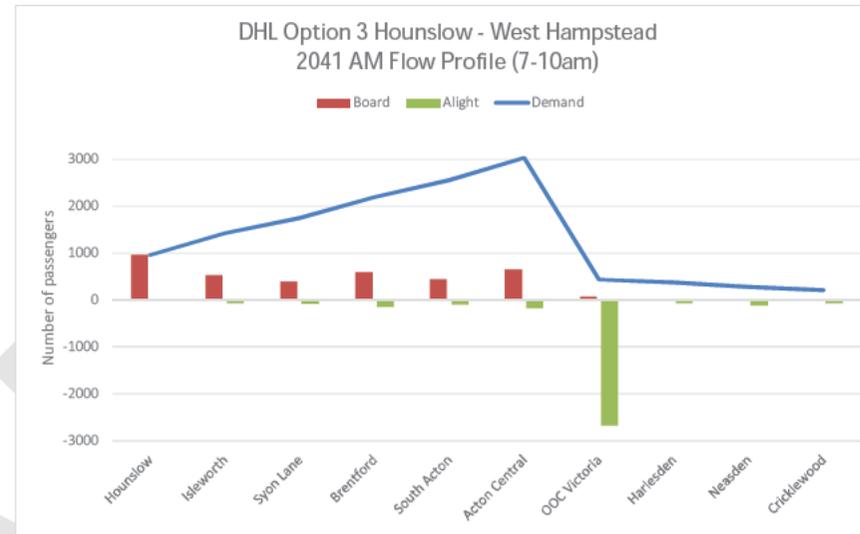
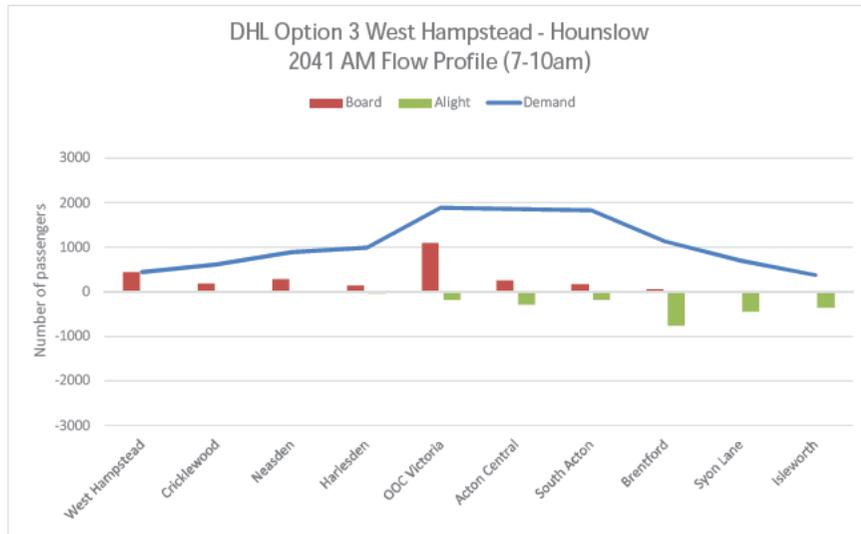


Option 3

Direction	From	To	NAME	LONGNAME	AM			PM		
					Demand	Board	Alight	Demand	Board	Alight
Southbound	Hendon	Staple's Corner	DH001D	HENDON-HOUNSLOW	883	883	0	431	431	0
	Staple's Corner	Neasden	DH001D	HENDON-HOUNSLOW	899	16	0	443	12	0
	Neasden	Harlesden	DH001D	HENDON-HOUNSLOW	1171	287	-15	594	179	-27
	Harlesden	OOO Victoria	DH001D	HENDON-HOUNSLOW	1263	133	-40	653	91	-32
	OOO Victoria	Acton Central	DH001D	HENDON-HOUNSLOW	1869	1099	-492	2658	2184	-179
	Acton Central	South Acton	DH001D	HENDON-HOUNSLOW	1784	250	-336	2203	217	-672
	South Acton	Brentford	DH001D	HENDON-HOUNSLOW	1733	159	-210	1796	124	-532
	Brentford	Syon Lane	DH001D	HENDON-HOUNSLOW	1076	52	-708	1523	164	-436
	Syon Lane	Isleworth	DH001D	HENDON-HOUNSLOW	676	13	-413	1330	52	-245
	Isleworth	Hounslow	DH001D	HENDON-HOUNSLOW	369	25	-331	839	62	-553
Northbound	Hounslow	Isleworth	DH002U	HOUNSLOW-HENDON	969	969	0	581	581	0
	Isleworth	Syon Lane	DH002U	HOUNSLOW-HENDON	1434	532	-67	927	395	-49
	Syon Lane	Brentford	DH002U	HOUNSLOW-HENDON	1753	393	-75	1391	492	-28
	Brentford	South Acton	DH002U	HOUNSLOW-HENDON	2200	589	-141	2329	1036	-98
	South Acton	Acton Central	DH002U	HOUNSLOW-HENDON	2564	459	-95	2434	278	-172
	Acton Central	OOO Victoria	DH002U	HOUNSLOW-HENDON	3055	665	-174	2567	438	-305
	OOO Victoria	Harlesden	DH002U	HOUNSLOW-HENDON	462	80	-2673	1186	327	-1707
	Harlesden	Neasden	DH002U	HOUNSLOW-HENDON	420	23	-66	1114	58	-130
	Neasden	Staple's Corner	DH002U	HOUNSLOW-HENDON	326	18	-112	825	22	-310
	Staple's Corner	Hendon	DH002U	HOUNSLOW-HENDON	316	0	-10	808	0	-18

Direction	From	To	NAME	LONGNAME	AM			PM		
					Demand	Board	Alight	Demand	Board	Alight
Southbound	West Hampstead	Cricklewood	DH003D	WESTHAMPSTEAD-HOUNSLOW	440	440	0	249	249	0
	Cricklewood	Neasden	DH003D	WESTHAMPSTEAD-HOUNSLOW	614	177	-3	321	76	-4
	Neasden	Harlesden	DH003D	WESTHAMPSTEAD-HOUNSLOW	889	287	-12	478	179	-22
	Harlesden	OOC Victoria	DH003D	WESTHAMPSTEAD-HOUNSLOW	984	132	-38	553	91	-15
	OOC Victoria	Acton Central	DH003D	WESTHAMPSTEAD-HOUNSLOW	1887	1093	-189	2653	2184	-84
	Acton Central	South Acton	DH003D	WESTHAMPSTEAD-HOUNSLOW	1850	249	-286	2210	217	-660
	South Acton	Brentford	DH003D	WESTHAMPSTEAD-HOUNSLOW	1829	159	-180	1809	124	-525
	Brentford	Syon Lane	DH003D	WESTHAMPSTEAD-HOUNSLOW	1125	52	-756	1534	165	-440
	Syon Lane	Isleworth	DH003D	WESTHAMPSTEAD-HOUNSLOW	702	13	-436	1338	52	-248
	Isleworth	Hounslow	DH003D	WESTHAMPSTEAD-HOUNSLOW	374	25	-353	838	62	-562
Northbound	Hounslow	Isleworth	DH004U	HOUNSLOW-WESTHAMPSTEAD	961	961	0	581	581	0
	Isleworth	Syon Lane	DH004U	HOUNSLOW-WESTHAMPSTEAD	1425	531	-67	933	401	-49
	Syon Lane	Brentford	DH004U	HOUNSLOW-WESTHAMPSTEAD	1745	394	-74	1400	495	-28
	Brentford	South Acton	DH004U	HOUNSLOW-WESTHAMPSTEAD	2198	592	-140	2348	1046	-98
	South Acton	Acton Central	DH004U	HOUNSLOW-WESTHAMPSTEAD	2554	450	-93	2436	258	-170
	Acton Central	OOC Victoria	DH004U	HOUNSLOW-WESTHAMPSTEAD	3034	653	-173	2524	391	-303
	OOC Victoria	Harlesden	DH004U	HOUNSLOW-WESTHAMPSTEAD	437	71	-2668	1064	241	-1701
	Harlesden	Neasden	DH004U	HOUNSLOW-WESTHAMPSTEAD	377	5	-66	962	29	-131
	Neasden	Cricklewood	DH004U	HOUNSLOW-WESTHAMPSTEAD	275	12	-114	660	7	-310
	Cricklewood	West Hampstead	DH004U	HOUNSLOW-WESTHAMPSTEAD	215	3	-64	465	1	-196





# Appendix B

DEMAND ANALYSIS. PREFERRED OPTION

DRAFT

## APPENDIX B-1

### **GLOBAL STATISTICS**

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This section presents key model statistics at a global level for each AM Peak and PM Peak scenario modelled, as well as differences in the model statistics between the preferred option scenario and its associated baseline scenario.

**Baseline: Standard LTS-PT 2041 Reference Case (A141rc01a)**

Mode	Peak	Description	2041 TfL Ref Case	Dudding Hill Preferred Option	Difference
		Scenario	A141rc01a	A141DH07a	A141DH07a-A141rc01a
Rail	AM	Passenger Kms	61,984,155	62,033,637	49,482
		Uncrowded Passenger Hrs	57,719,229	57,789,782	70,553
		Crowded Passenger Hrs	77,959,930	78,023,714	63,783
		Passenger Boardings	1,937,480	1,946,854	9,374
	PM	Passenger Kms	63,991,947	64,049,804	57,857
		Uncrowded Passenger Hrs	57,473,633	57,570,553	96,920
		Crowded Passenger Hrs	73,205,216	73,306,027	100,811
		Passenger Boardings	1,996,416	2,005,744	9,327
LUL	AM	Passenger Kms	16,267,356	16,207,276	-60,080
		Uncrowded Passenger Hrs	29,182,762	29,067,435	-115,327
		Crowded Passenger Hrs	43,191,304	42,944,197	-247,107
		Passenger Boardings	2,272,048	2,265,807	-6,241
	PM	Passenger Kms	16,552,743	16,491,977	-60,766
		Uncrowded Passenger Hrs	30,074,167	29,957,067	-117,100
		Crowded Passenger Hrs	41,269,408	41,031,203	-238,205
		Passenger Boardings	2,416,620	2,410,510	-6,110
Bus	AM	Passenger Kms	6,749,006	6,726,693	-22,313
		Uncrowded Passenger Hrs	26,478,568	26,383,592	-94,976
		Crowded Passenger Hrs	30,735,987	30,602,227	-133,759
		Passenger Boardings	1,852,325	1,847,392	-4,932
	PM	Passenger Kms	8,199,665	8,175,750	-23,915
		Uncrowded Passenger Hrs	30,291,568	30,192,596	-98,973
		Crowded Passenger Hrs	36,796,301	36,625,703	-170,598
		Passenger Boardings	2,177,500	2,172,396	-5,104
DLR	AM	Passenger Kms	632,655	632,476	-179
		Uncrowded Passenger Hrs	1,538,078	1,537,703	-375
		Crowded Passenger Hrs	1,899,277	1,898,590	-686
		Passenger Boardings	147,849	147,822	-27
	PM	Passenger Kms	701,112	700,954	-158
		Uncrowded Passenger Hrs	1,695,600	1,695,266	-334
		Crowded Passenger Hrs	2,080,741	2,080,125	-616
		Passenger Boardings	162,406	162,381	-25
Tram	AM	Passenger Kms	162,639	162,632	-7
		Uncrowded Passenger Hrs	430,015	429,997	-19
		Crowded Passenger Hrs	614,341	614,319	-22
		Passenger Boardings	35,061	35,061	0
	PM	Passenger Kms	189,577	189,572	-5
		Uncrowded Passenger Hrs	486,745	486,732	-13
		Crowded Passenger Hrs	756,547	756,508	-39
		Passenger Boardings	38,543	38,543	0
All PT	AM	Passenger Kms	85,795,810	85,762,713	-33,096
		Uncrowded Passenger Hrs	115,348,652	115,208,508	-140,143
		Crowded Passenger Hrs	154,400,839	154,083,047	-317,792
		Passenger Boardings	6,244,762	6,242,936	-1,827
	PM	Passenger Kms	89,635,043	89,608,056	-26,986
		Uncrowded Passenger Hrs	120,021,714	119,902,213	-119,500
		Crowded Passenger Hrs	154,108,212	153,799,566	-308,646
		Passenger Boardings	6,791,486	6,789,573	-1,913

**Baseline: 2041 Maximum Growth Scenario without Crossrail 2**

Mode	Peak	Description	2041 TfL Max Growth	Dudding Hill Preferred Option	Difference
		Scenario	A141rc20a	A141DH08a	A141DH08a-A141rc20a
Rail	AM	Passenger Kms	63,543,061	63,593,894	50,833
		Uncrowded Passenger Hrs	59,261,438	59,348,851	87,413
		Crowded Passenger Hrs	80,539,375	80,605,804	66,429
		Passenger Boardings	2,009,641	2,019,080	9,439
	PM	Passenger Kms	65,808,704	65,869,871	61,166
		Uncrowded Passenger Hrs	59,357,651	59,457,575	99,924
		Crowded Passenger Hrs	76,530,731	76,628,358	97,627
		Passenger Boardings	2,077,290	2,087,085	9,795
LUL	AM	Passenger Kms	16,651,343	16,588,978	-62,364
		Uncrowded Passenger Hrs	29,861,747	29,742,203	-119,544
		Crowded Passenger Hrs	44,507,659	44,251,287	-256,372
		Passenger Boardings	2,334,658	2,328,209	-6,449
	PM	Passenger Kms	17,064,166	16,999,450	-64,716
		Uncrowded Passenger Hrs	30,975,294	30,851,079	-124,216
		Crowded Passenger Hrs	43,170,281	42,911,511	-258,770
		Passenger Boardings	2,493,211	2,486,653	-6,558
Bus	AM	Passenger Kms	7,020,708	6,997,781	-22,927
		Uncrowded Passenger Hrs	27,493,659	27,396,754	-96,905
		Crowded Passenger Hrs	32,489,132	32,309,474	-179,657
		Passenger Boardings	1,927,422	1,922,445	-4,977
	PM	Passenger Kms	8,516,962	8,492,219	-24,743
		Uncrowded Passenger Hrs	31,405,075	31,302,740	-102,335
		Crowded Passenger Hrs	39,115,825	38,926,214	-189,611
		Passenger Boardings	2,263,218	2,257,977	-5,240
DLR	AM	Passenger Kms	772,475	772,331	-144
		Uncrowded Passenger Hrs	1,873,801	1,873,467	-334
		Crowded Passenger Hrs	2,543,780	2,543,076	-703
		Passenger Boardings	178,172	178,149	-23
	PM	Passenger Kms	853,060	852,919	-140
		Uncrowded Passenger Hrs	2,054,730	2,054,430	-300
		Crowded Passenger Hrs	2,754,186	2,753,533	-653
		Passenger Boardings	195,390	195,367	-23
Tram	AM	Passenger Kms	165,161	165,151	-10
		Uncrowded Passenger Hrs	436,538	436,511	-27
		Crowded Passenger Hrs	625,596	625,543	-53
		Passenger Boardings	35,692	35,691	-1
	PM	Passenger Kms	193,122	193,111	-11
		Uncrowded Passenger Hrs	496,620	496,591	-29
		Crowded Passenger Hrs	781,050	780,958	-92
		Passenger Boardings	39,250	39,249	-1
All PT	AM	Passenger Kms	88,152,748	88,118,135	-34,613
		Uncrowded Passenger Hrs	118,927,182	118,797,784	-129,397
		Crowded Passenger Hrs	160,705,541	160,335,185	-370,356
		Passenger Boardings	6,485,584	6,483,574	-2,010
	PM	Passenger Kms	92,436,014	92,407,570	-28,444
		Uncrowded Passenger Hrs	124,289,369	124,162,414	-126,955
		Crowded Passenger Hrs	162,352,074	162,000,575	-351,499
		Passenger Boardings	7,068,359	7,066,331	-2,028

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## APPENDIX B-2

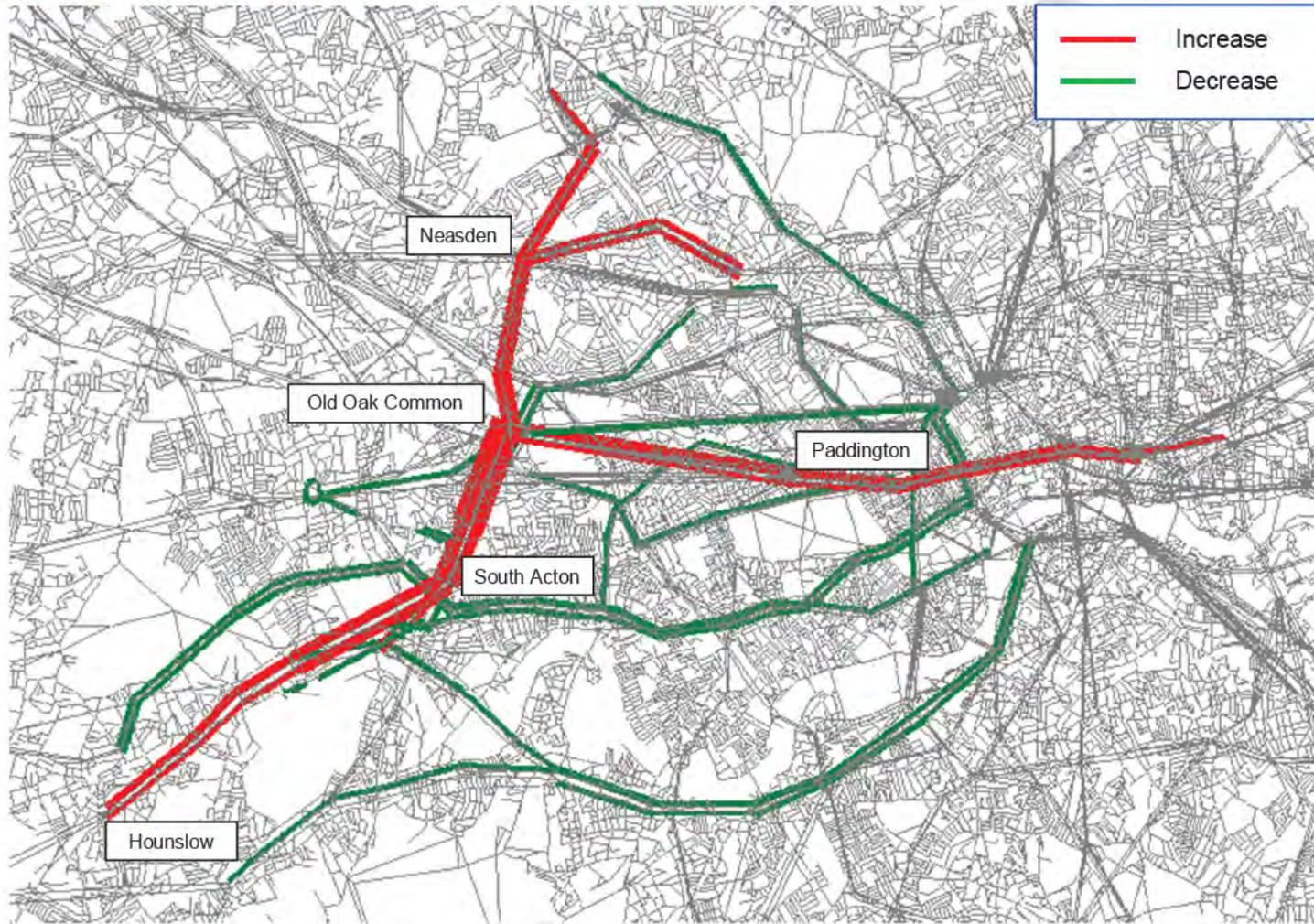
### **FLOW DIFFERENCE PLOTS**

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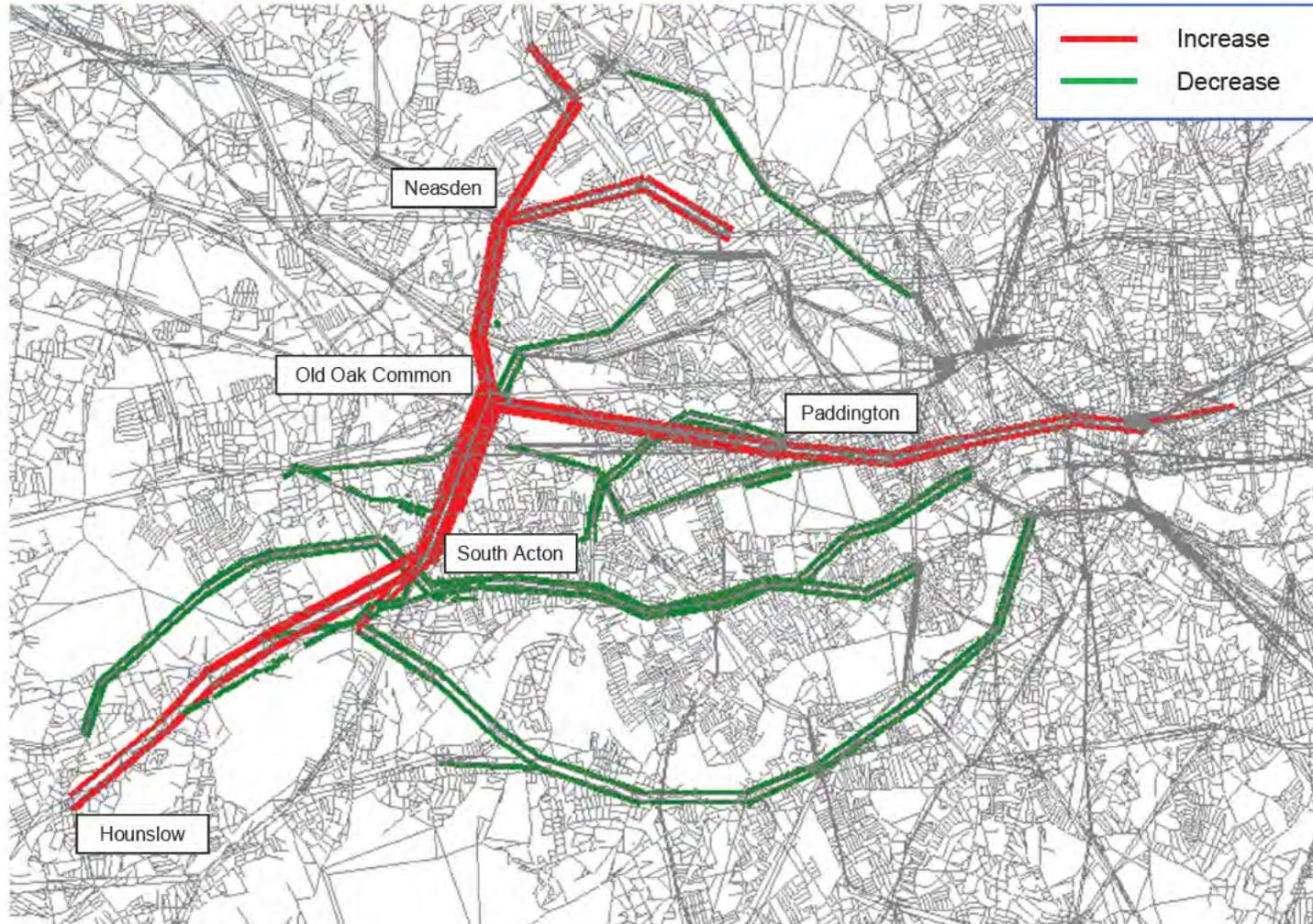
This section displays public transport network plots showing differences in demand on the public transport network in the AM and PM between the preferred option scenario and its associated baseline scenario.

Baseline: Standard LTS-PT 2041 Reference Case (A141rc01a)

Passenger flow difference Preferred Option minus Reference Case, AM

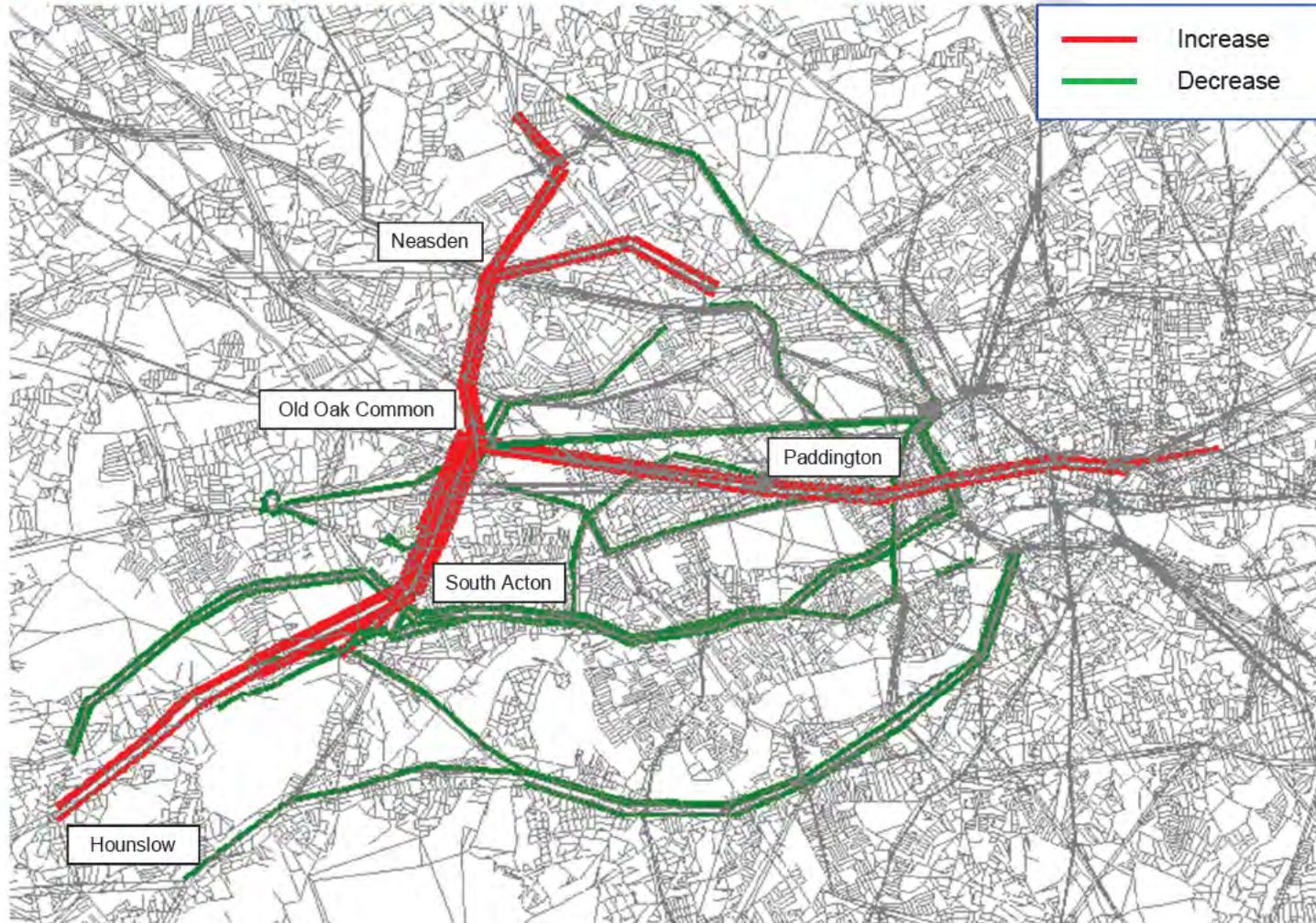


Passenger flow difference Preferred Option minus Reference Case, PM

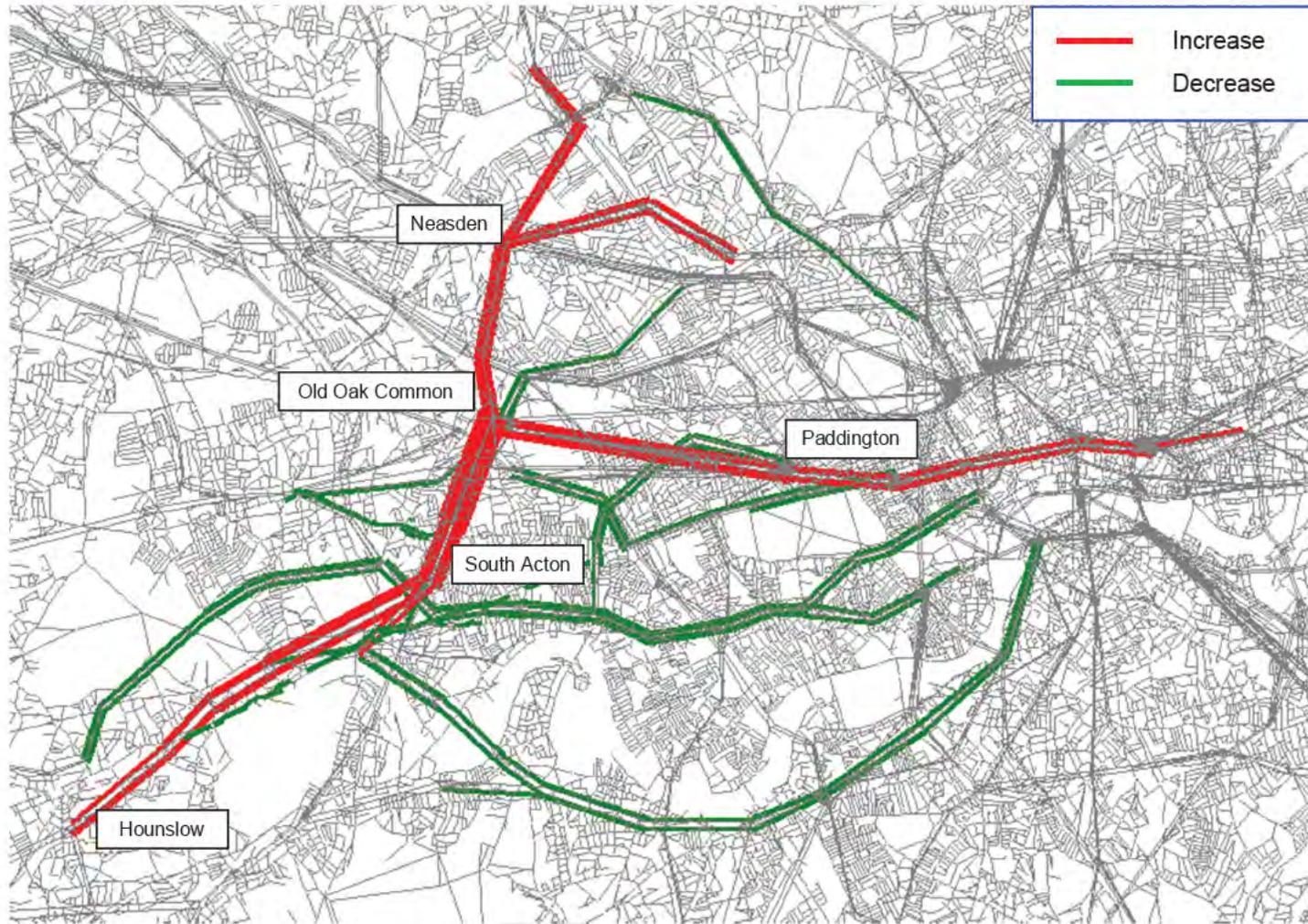


Baseline: 2041 Maximum Growth Scenario without Crossrail 2

Passenger flow difference Preferred Option minus Maximum Growth Scenario, AM



Passenger flow difference Preferred Option minus Maximum Growth Scenario, PM



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APPENDIX B-3

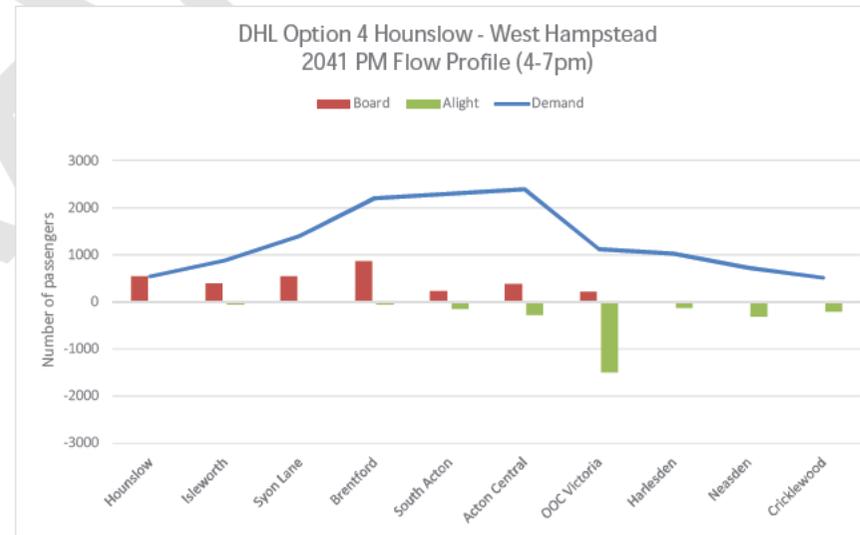
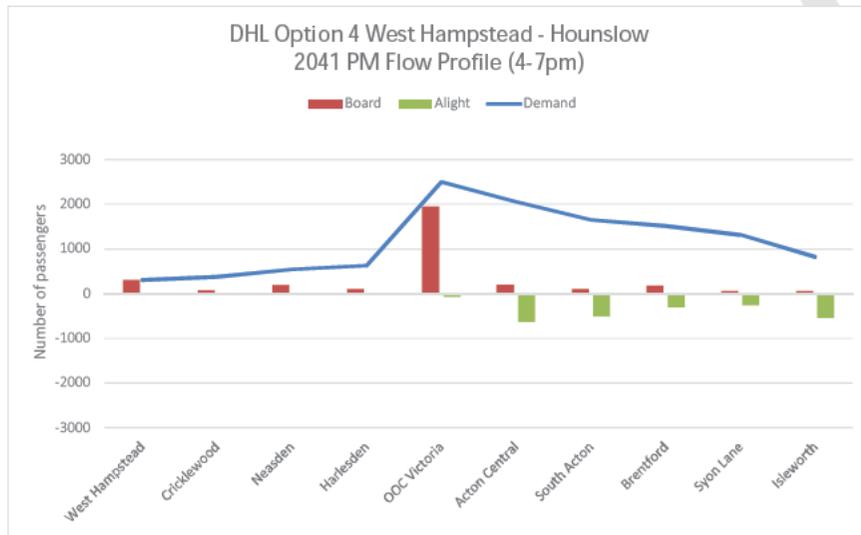
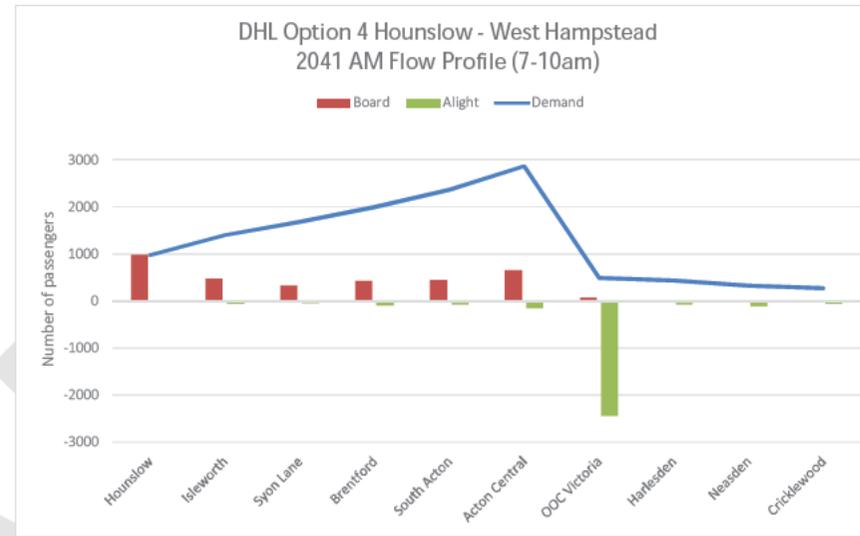
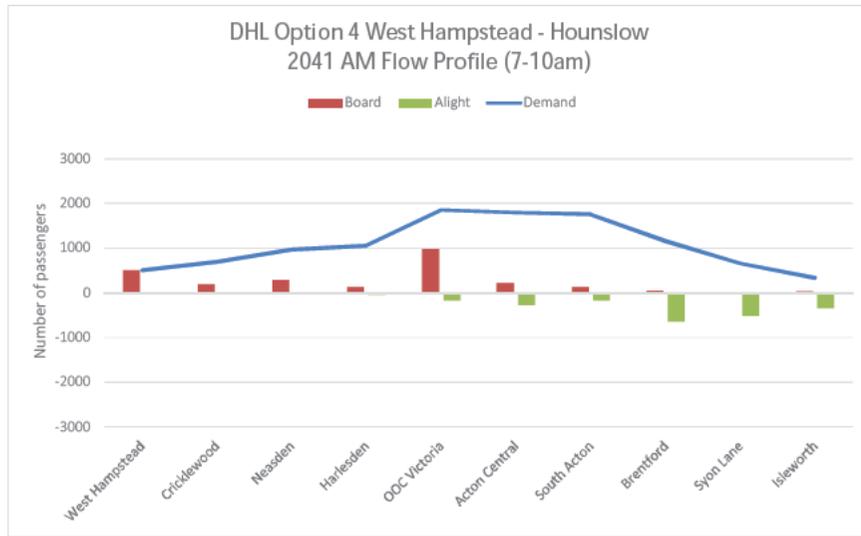
**WLO LINE LOADING, BOARDINGS AND  
ALIGHTINGS**

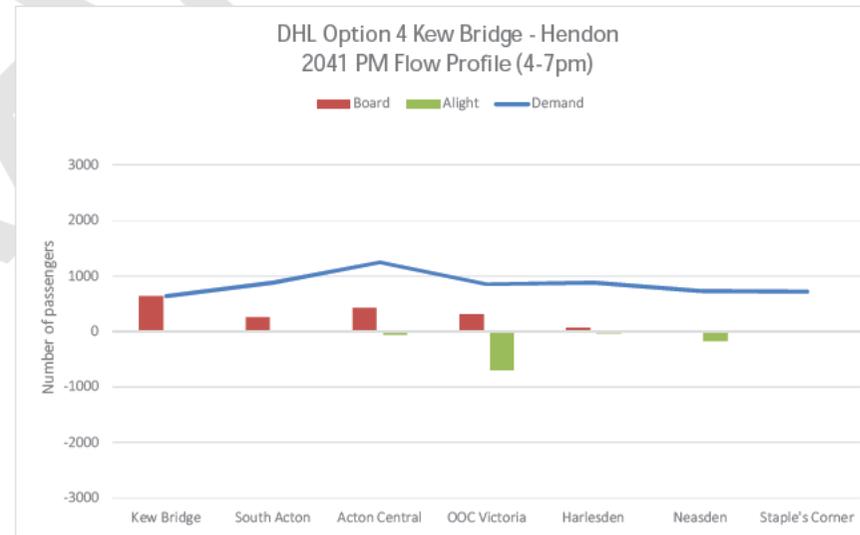
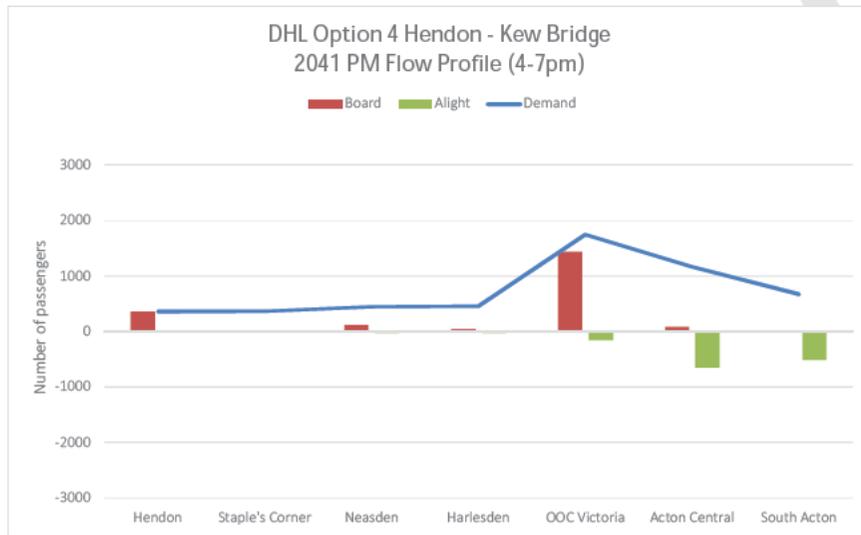
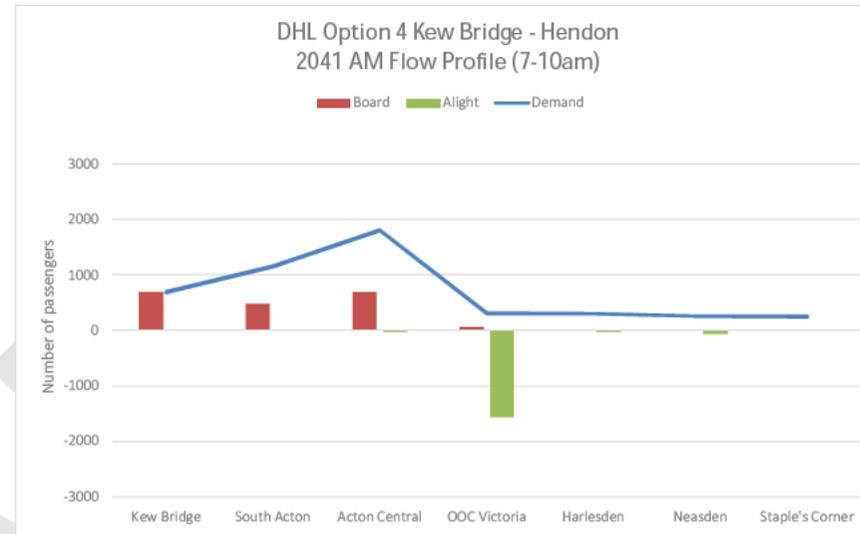
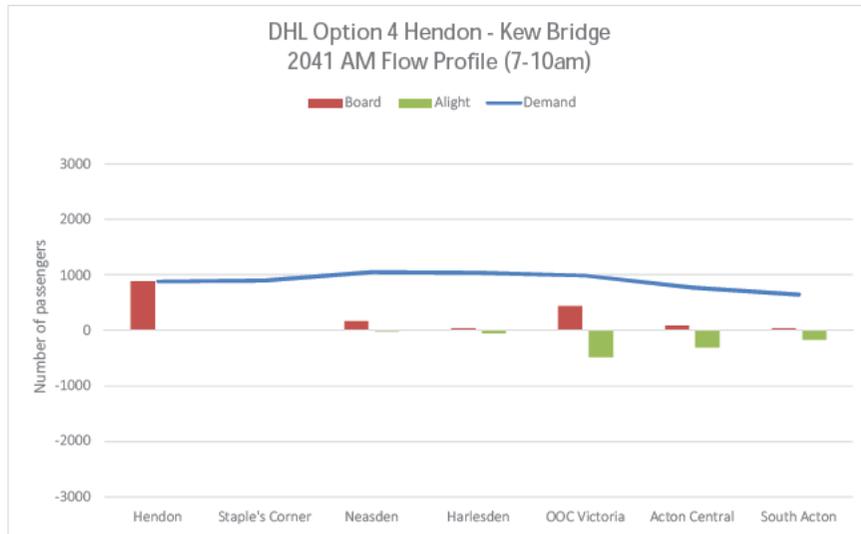
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**Baseline: Standard LTS-PT 2041 Reference Case (A141rc01a)**

Direction	From	To	NAME	LONGNAME	AM			PM		
					Demand	Board	Alight	Demand	Board	Alight
Southbound	West Hampstead	Cricklewood	DH003D	WESTHAMPSTEAD-HOUNSLOW	502	502	0	299	299	0
	Cricklewood	Neasden	DH003D	WESTHAMPSTEAD-HOUNSLOW	686	188	-3	371	75	-4
	Neasden	Harlesden	DH003D	WESTHAMPSTEAD-HOUNSLOW	960	288	-14	538	188	-21
	Harlesden	OOC Victoria	DH003D	WESTHAMPSTEAD-HOUNSLOW	1052	130	-39	622	97	-13
	OOC Victoria	Acton Central	DH003D	WESTHAMPSTEAD-HOUNSLOW	1849	975	-178	2494	1946	-74
	Acton Central	South Acton	DH003D	WESTHAMPSTEAD-HOUNSLOW	1791	217	-275	2052	197	-638
	South Acton	Brentford	DH003D	WESTHAMPSTEAD-HOUNSLOW	1753	130	-169	1647	97	-502
	Brentford	Syon Lane	DH003D	WESTHAMPSTEAD-HOUNSLOW	1150	45	-648	1515	176	-308
	Syon Lane	Isleworth	DH003D	WESTHAMPSTEAD-HOUNSLOW	652	13	-511	1314	57	-258
	Isleworth	Hounslow	DH003D	WESTHAMPSTEAD-HOUNSLOW	333	23	-342	820	59	-553
Northbound	Hounslow	Isleworth	DH004U	HOUNSLOW-WESTHAMPSTEAD	976	976	0	538	538	0
	Isleworth	Syon Lane	DH004U	HOUNSLOW-WESTHAMPSTEAD	1396	474	-54	882	393	-49
	Syon Lane	Brentford	DH004U	HOUNSLOW-WESTHAMPSTEAD	1679	323	-40	1404	538	-16
	Brentford	South Acton	DH004U	HOUNSLOW-WESTHAMPSTEAD	1998	423	-104	2199	858	-63
	South Acton	Acton Central	DH004U	HOUNSLOW-WESTHAMPSTEAD	2366	443	-76	2290	236	-145
	Acton Central	OOC Victoria	DH004U	HOUNSLOW-WESTHAMPSTEAD	2863	650	-153	2394	375	-271
	OOC Victoria	Harlesden	DH004U	HOUNSLOW-WESTHAMPSTEAD	493	64	-2434	1116	222	-1500
	Harlesden	Neasden	DH004U	HOUNSLOW-WESTHAMPSTEAD	429	5	-69	1022	30	-124
	Neasden	Cricklewood	DH004U	HOUNSLOW-WESTHAMPSTEAD	329	12	-112	722	9	-309
	Cricklewood	West Hampstead	DH004U	HOUNSLOW-WESTHAMPSTEAD	269	3	-63	515	1	-208

Direction	From	To	NAME	LONGNAME	AM			PM		
					Demand	Board	Alight	Demand	Board	Alight
Southbound	Hendon	Staple's Corner	DH005D	HENDON-KEWBRIDGE	883	883	0	356	356	0
	Staple's Corner	Neasden	DH005D	HENDON-KEWBRIDGE	896	14	0	365	9	0
	Neasden	Harlesden	DH005D	HENDON-KEWBRIDGE	1047	173	-22	446	109	-28
	Harlesden	OOC Victoria	DH005D	HENDON-KEWBRIDGE	1039	39	-48	455	39	-29
	OOC Victoria	Acton Central	DH005D	HENDON-KEWBRIDGE	987	434	-486	1745	1440	-151
	Acton Central	South Acton	DH005D	HENDON-KEWBRIDGE	768	84	-304	1166	77	-656
	South Acton	Kew Bridge	DH005D	HENDON-KEWBRIDGE	642	40	-166	673	20	-513
Northbound	Kew Bridge	South Acton	DH006U	KEWBRIDGE-HENDON	686	686	0	641	641	0
	South Acton	Acton Central	DH006U	KEWBRIDGE-HENDON	1155	482	-13	879	257	-19
	Acton Central	OOC Victoria	DH006U	KEWBRIDGE-HENDON	1806	685	-35	1247	429	-61
	OOC Victoria	Harlesden	DH006U	KEWBRIDGE-HENDON	306	63	-1563	853	309	-703
	Harlesden	Neasden	DH006U	KEWBRIDGE-HENDON	301	19	-24	879	63	-36
	Neasden	Staple's Corner	DH006U	KEWBRIDGE-HENDON	254	17	-64	732	26	-174
	Staple's Corner	Hendon	DH006U	KEWBRIDGE-HENDON	248	0	-6	720	0	-13

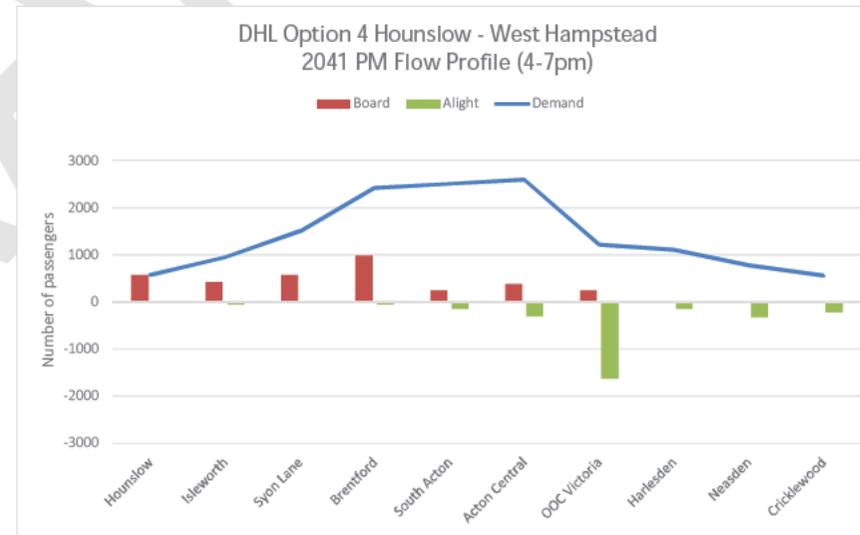
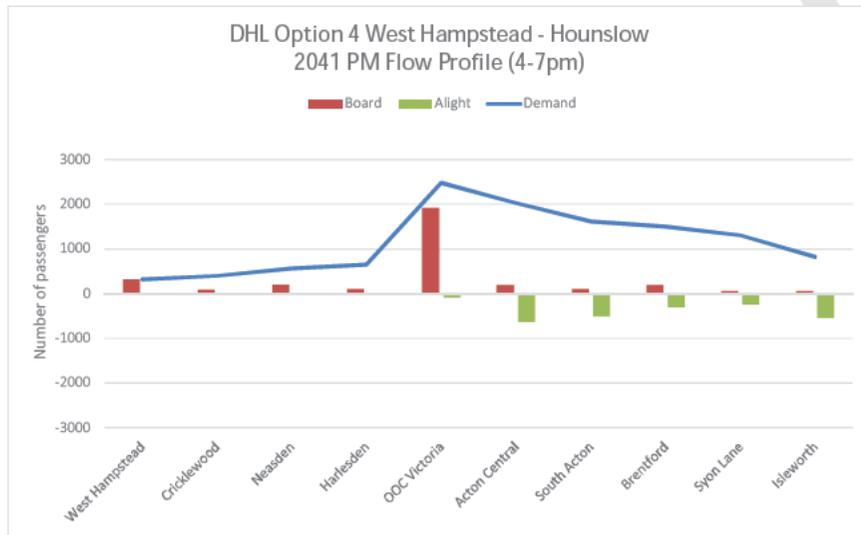
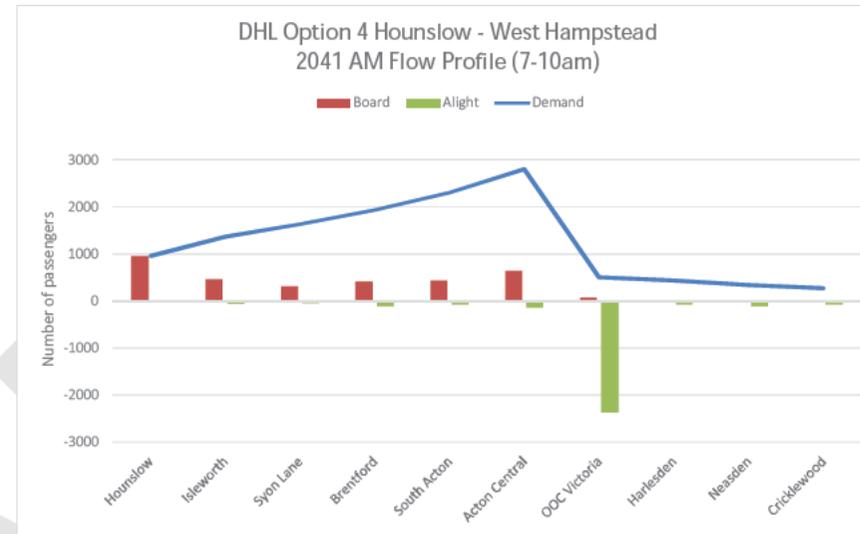
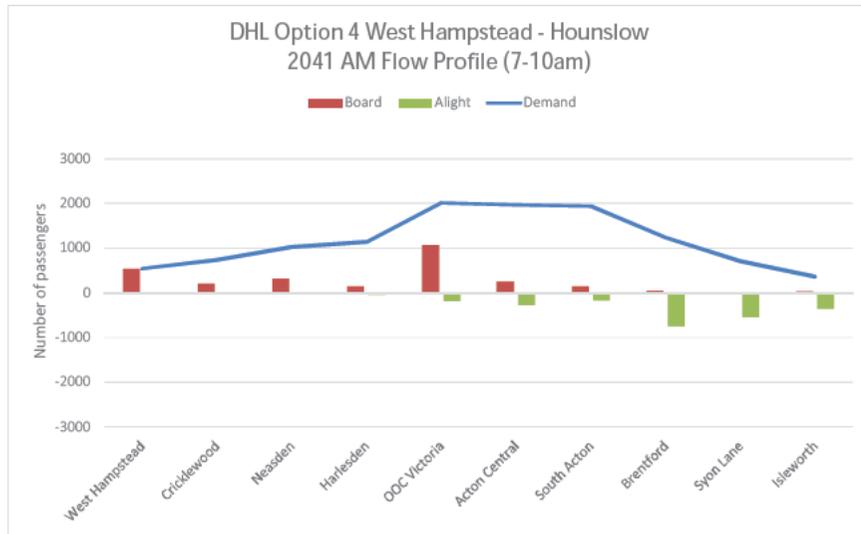


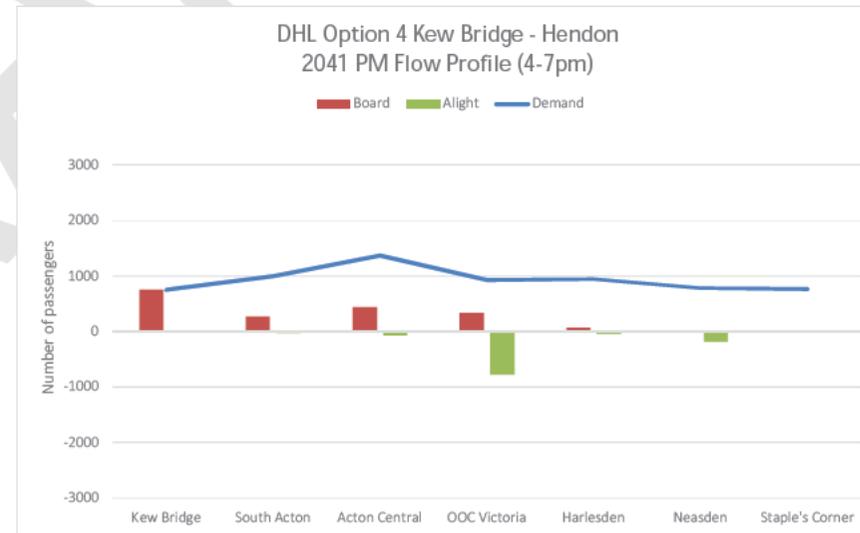
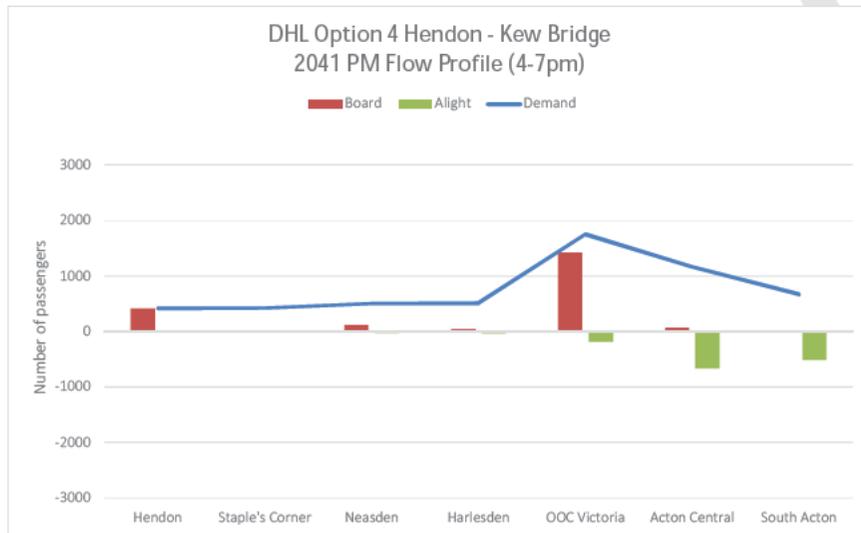
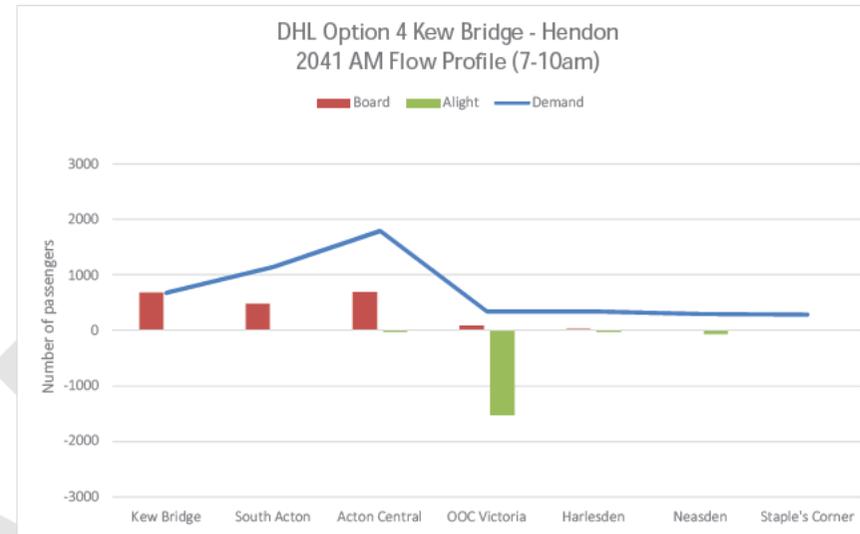
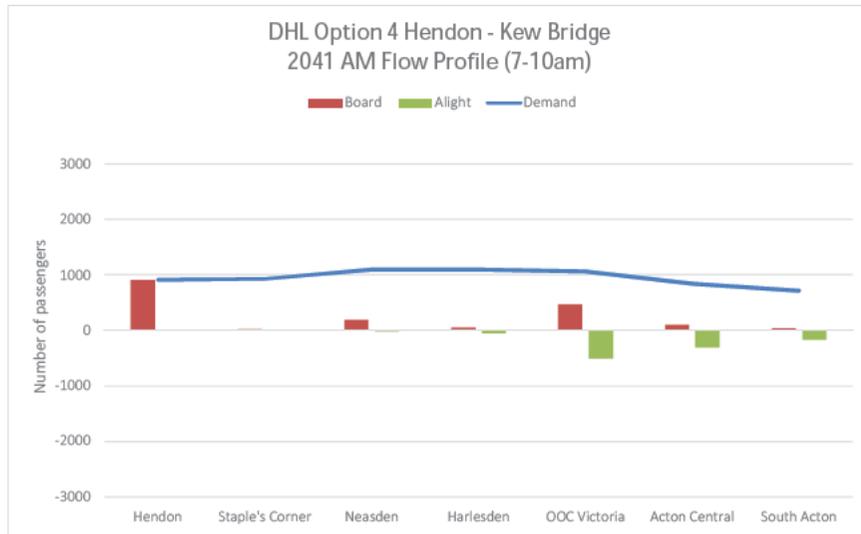


**Baseline: 2041 Maximum Growth Scenario without Crossrail 2**

Direction	From	To	NAME	LONGNAME	AM			PM		
					Demand	Board	Alight	Demand	Board	Alight
Southbound	West Hampstead	Cricklewood	DH003D	WESTHAMPSTEAD-HOUNSLOW	537	537	0	312	312	0
	Cricklewood	Neasden	DH003D	WESTHAMPSTEAD-HOUNSLOW	732	199	-3	395	87	-4
	Neasden	Harlesden	DH003D	WESTHAMPSTEAD-HOUNSLOW	1026	308	-14	565	193	-22
	Harlesden	OOC Victoria	DH003D	WESTHAMPSTEAD-HOUNSLOW	1138	151	-39	646	96	-16
	OOC Victoria	Acton Central	DH003D	WESTHAMPSTEAD-HOUNSLOW	2007	1061	-191	2475	1914	-85
	Acton Central	South Acton	DH003D	WESTHAMPSTEAD-HOUNSLOW	1965	239	-281	2026	192	-641
	South Acton	Brentford	DH003D	WESTHAMPSTEAD-HOUNSLOW	1933	143	-174	1615	93	-504
	Brentford	Syon Lane	DH003D	WESTHAMPSTEAD-HOUNSLOW	1233	46	-746	1497	185	-303
	Syon Lane	Isleworth	DH003D	WESTHAMPSTEAD-HOUNSLOW	702	13	-543	1303	56	-251
	Isleworth	Hounslow	DH003D	WESTHAMPSTEAD-HOUNSLOW	358	23	-367	818	59	-543
Northbound	Hounslow	Isleworth	DH004U	HOUNSLOW-WESTHAMPSTEAD	957	957	0	576	576	0
	Isleworth	Syon Lane	DH004U	HOUNSLOW-WESTHAMPSTEAD	1362	458	-54	949	422	-49
	Syon Lane	Brentford	DH004U	HOUNSLOW-WESTHAMPSTEAD	1633	311	-39	1501	568	-16
	Brentford	South Acton	DH004U	HOUNSLOW-WESTHAMPSTEAD	1933	409	-108	2422	985	-64
	South Acton	Acton Central	DH004U	HOUNSLOW-WESTHAMPSTEAD	2302	440	-72	2508	243	-157
	Acton Central	OOC Victoria	DH004U	HOUNSLOW-WESTHAMPSTEAD	2801	645	-146	2595	384	-297
	OOC Victoria	Harlesden	DH004U	HOUNSLOW-WESTHAMPSTEAD	504	71	-2368	1215	241	-1622
	Harlesden	Neasden	DH004U	HOUNSLOW-WESTHAMPSTEAD	442	6	-67	1101	30	-144
	Neasden	Cricklewood	DH004U	HOUNSLOW-WESTHAMPSTEAD	341	13	-113	778	9	-332
	Cricklewood	West Hampstead	DH004U	HOUNSLOW-WESTHAMPSTEAD	273	3	-71	556	1	-222

Direction	From	To	NAME	LONGNAME	AM			PM		
					Demand	Board	Alight	Demand	Board	Alight
Southbound	Hendon	Staple's Corner	DH005D	HENDON-KEWBRIDGE	913	913	0	414	414	0
	Staple's Corner	Neasden	DH005D	HENDON-KEWBRIDGE	928	15	0	423	9	0
	Neasden	Harlesden	DH005D	HENDON-KEWBRIDGE	1092	187	-22	505	112	-30
	Harlesden	OOC Victoria	DH005D	HENDON-KEWBRIDGE	1093	47	-47	510	39	-35
	OOC Victoria	Acton Central	DH005D	HENDON-KEWBRIDGE	1059	469	-503	1751	1426	-184
	Acton Central	South Acton	DH005D	HENDON-KEWBRIDGE	842	93	-310	1165	75	-661
	South Acton	Kew Bridge	DH005D	HENDON-KEWBRIDGE	714	44	-173	671	20	-513
Northbound	Kew Bridge	South Acton	DH006U	KEWBRIDGE-HENDON	675	675	0	749	749	0
	South Acton	Acton Central	DH006U	KEWBRIDGE-HENDON	1140	477	-12	996	268	-21
	Acton Central	OOC Victoria	DH006U	KEWBRIDGE-HENDON	1791	684	-33	1369	442	-69
	OOC Victoria	Harlesden	DH006U	KEWBRIDGE-HENDON	341	81	-1531	926	335	-778
	Harlesden	Neasden	DH006U	KEWBRIDGE-HENDON	341	24	-24	945	62	-43
	Neasden	Staple's Corner	DH006U	KEWBRIDGE-HENDON	295	19	-66	782	26	-190
	Staple's Corner	Hendon	DH006U	KEWBRIDGE-HENDON	288	0	-6	768	0	-14





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*Network Strategy & Capacity Planning– Capability  
and Capacity Analysis  
Hounslow - Old Oak Common Timetable Study  
Report*

Arthur Velavs

**Network Strategy & Capacity Planning– Capability and Capacity Analysis**

**Hounslow - Old Oak Common Timetable Study Report**

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<b>Project Manager – Capability and Capacity Analysis (Document Owner)</b>	
Jill Stone	Date 20/03/2017
<b>Senior Development Manager – Network Strategy &amp; Planning (London South East)</b>	

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Reviewers			
Version	Date	Reviewer(s)	Review Notes
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0.6	09/01/2017	Nick Brand	Version following SDM meeting.
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Ref.	Document Name	Date
001	Hounslow – Old Oak Common Timetable Study Remit	07/2016
002	Brentford Community Stadium Exhibition (website)	-
003	Southern Rail Access to Heathrow Feasibility Study	12/2015
004	2018 Train Planning Rules v1	10/2016
005	Bplan (NR website)	10/2017

Stakeholders	
Name	Company
Jill Stone – Senior Development Manager	Network Rail – Network Strategy & Planning
Mark Frost – Head of Traffic & Transport	Hounslow Borough Council

<b>Abbreviations</b>	
<b>Acronym</b>	<b>Meaning</b>
CP5	Control Period 5
CP6	Control Period 6
GWML	Great Western Main Line
GRIP	Guide to Rail Investment Process
HS2	High Speed 2
IRT	Indicative Running Time
ITSS	Indicative Train Service Specification
ITT	Indicative Timetable
LOROL	London Overground Operations Limited
NIM	National Infrastructure Model (NIM)
NLL	North London Line
SOAR	Sale Of Access Rights
SRAtH	Southern Rail Access to Heathrow
SRT	Sectional Running Time
TfL	Transport for London
tph	Trains per hour
TPRs	Timetable Planning Rules
TPS	Timetable Planning System
WTT	Working Timetable

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## 1. Introduction

### 1.1. Background

The Old Oak Common area in West London is due to undergo a transformational change over the coming decades, which will be triggered by the construction of one of the largest railway hubs in the country. The High Speed Two (HS2) project is proposing to construct the new station which would link HS2 to both the Great Western Main Line and Crossrail. On the back of this, Transport for London (TfL) is proposing to construct two new London Overground stations, allowing access from the Old Oak Common hub to the North London Line (NLL) and West London Line (WLL).

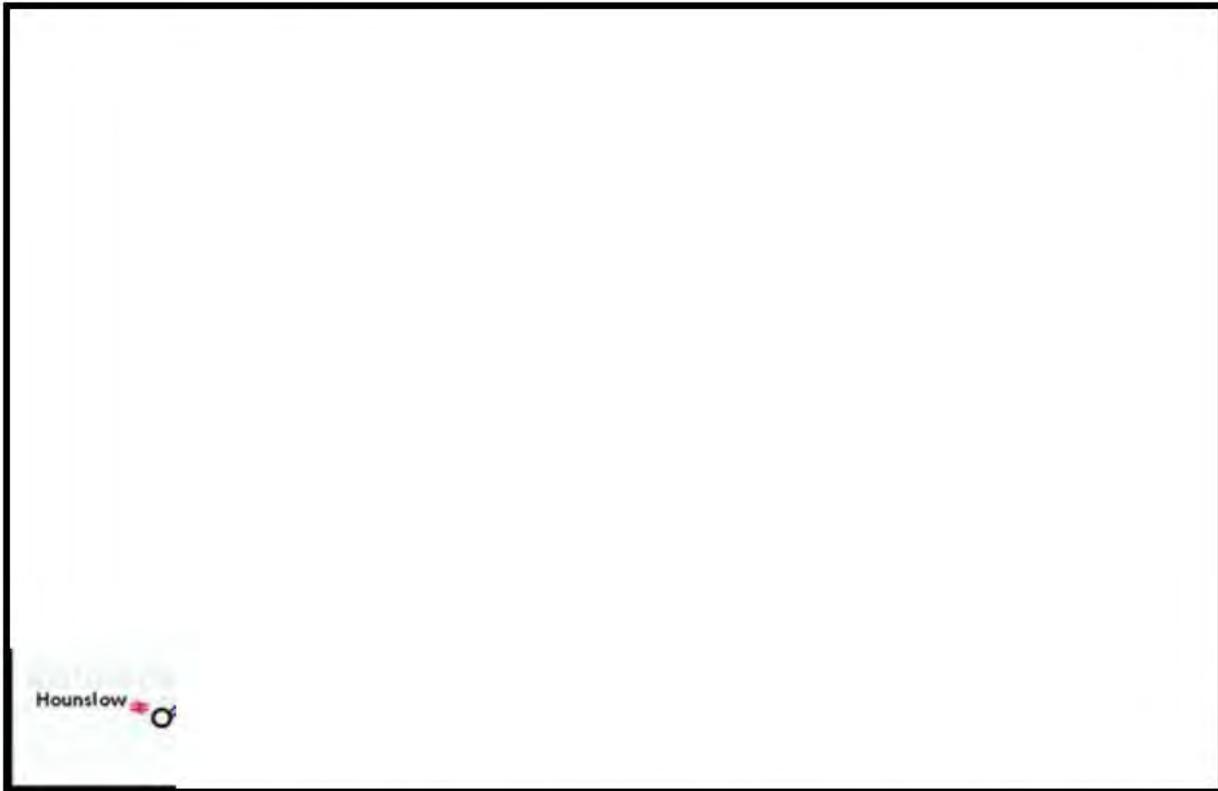
Situated only a few miles to the south west of Old Oak Common, Hounslow is well located to take advantage of this development. Hounslow Borough Council proposes a direct rail link between Hounslow and the projected NLL Old Oak Common station. The Council is also proposing a new railway station at Lionel Road to serve Brentford Football Ground.

The Council aspire to achieve four trains per hour (tph) between Hounslow and the proposed NLL Old Oak Common station, calling at existing stations and the new Lionel Road station.

### 1.2. Aims & Objectives

Though rail infrastructure exists between South Acton and Brentford in the form of Kew branch, it is solely used by freight services. The Capability & Capacity Analysis Team examined the suitability of using enhanced infrastructure between Hounslow and the proposed NLL Old Oak Common station to run passenger shuttle services. The aim of this study is identify the feasibility of providing four shuttle paths per hour in each direction between Hounslow and the NLL Old Oak Common station. Should this be unachievable, Capability & Capacity Analysis will advise on the changes necessary to allow implementation of the shuttle services. Capability & Capacity Analysis will further advise on the compatibility of the project with the existing network and wider service aspirations.

**1.3. Geographic Scope**



**Figure 1: Diagram illustrating the route between Hounslow and Willesden Junction (proposed location for NNL Old Oak Common station), including the proposed location of the new Lionel Road station**

The Hounslow – Old Oak Common Timetable Assessment study has examined the section of track between Hounslow and Willesden High Level Junction, including the Hounslow Line (SW230), Kew branch (SW240/EA1330) and the North London Line (EA1310).

The study further examined interaction between the Hounslow Line (SW230) and the Main Line (SW210) to establish the best location of turnback for shuttle services.

## 2. Assumptions & Methodology

### 2.1. Assumptions

#### Time period assumptions

The high peak hour is defined as trains arriving at London Waterloo between 08:00 and 08:59.

#### Train service assumptions

The baseline train service assumptions should be the end of the Control Period 6 (CP6) train service assumptions on the Windsor Lines and North London Line which are listed as the core service assumptions below.

The Wessex Route Study also outlines an alternative use of the Windsor Lines which should be tested as sensitivity. This is also outlined below.

#### *Windsor Lines – core service assumptions*

- High peak hour - 8tph stopping passenger trains in both directions between London Waterloo and beyond Feltham
  - 8tph consisting of the current 4tph that operate over the Hounslow Loop plus an additional 2tph provided in CP5 and 2tph provided in CP6
  - As a turnback is now no longer being provided at Hounslow by any current projects (Feltham Re-signalling or Wessex Capacity Programme) it is assumed that all additional services will operate to destinations beyond Feltham, for instance Windsor & Eton Riverside.
  - For the purposes of this study infrastructure beyond Feltham should not be modelled
- Off-peak – 6tph passenger trains in both directions between London Waterloo and beyond Feltham
  - 6tph consisting of the current 4tph that operate over the Hounslow Loop plus an additional 2tph that will be provided in CP5/ CP6 (off-peak service requirement to be agreed through the franchise)
  - 2tph freight paths to be assumed in addition to the 6tph passenger services
  - As a turnback is now no longer being provided at Hounslow by any current projects (Feltham Re-signalling or Wessex Capacity Programme) it is assumed that all additional services will operate to destinations beyond Feltham, for instance Windsor & Eton Riverside.
  - For the purposes of this study infrastructure beyond Feltham should not be modelled

#### *Windsor Lines – sensitivity*

The Wessex Route Study outlined an option to run semi-fast Windsor Line services via the Hounslow Loop in the high peak hour (assumed to be services from Reading) to achieve comparable journey times to those offered by services via Richmond.

It is assumed that this will result in passengers from Feltham and beyond spreading out across Hounslow Loop and Richmond services thereby freeing up train passenger capacity on services via Richmond.

Assumptions are as follows:

- High peak hour - 8tph passenger trains in both directions between London Waterloo and beyond Feltham
  - 8tph consisting of 6tph stopping services and 2tph semi-fast services
  - 2tph semi-fast services to stop at Hounslow and Brentford only

*North London Line– core service assumptions*

Peak – 5tph passenger trains in both directions between Stratford and Richmond

1tph freight service (origin – destination as per today’s WTT)

Off-peak – 4tph passenger trains in both directions between Stratford and Richmond

2-3tph freight services (origin – destination as per today’s WTT)

Infrastructure assumptions in all scenarios

Assume infrastructure as per the end of CP5 with the following exceptions:

- Assume Old Kew Junction is doubled;
- Assume Kew branch is electrified;
- Assume a new station at Old Oak Common Lane as per TfL’s GRIP 3 drawings (attached in Appendix A);
- Assume provision of a turnback in the Old Oak Common Lane station area.

Rolling Stock assumptions

Assume the following in terms of rolling stock:

- Assume the NLL services and the additional services to meet London Borough of Hounslow’s aspirations are operated as Class 378 London Overground 5-car units (as per those operated by LOROL)
- Assume that current services that operate over the Hounslow Loop are as follows:
  - London Waterloo to London Waterloo services are 10-car Class 707 units
  - Weybridge to London Waterloo services are 10-car Class 707 units
  - Reading to London Waterloo services (sensitivity option only) are 10-car Class 458 units

## **2.2. Methodology**

### **2.2.1. Infrastructure Model Set-up**

Sectional Running Time (SRT) is the official time it takes for a train to travel between two locations on the rail network. As the Kew branch is currently used by freight services only, there are no passenger SRTs connecting the SW230 (Hounslow line) and EA1310 (NLL) routes. Furthermore, the study assumes a number of proposed infrastructure upgrades which have no SRTs associated with them. In order to estimate these missing SRTs, the existing National Infrastructure Model (NIM) was updated in RailSys to derive the Indicative Running Times (IRTs) to be used as a substitute for SRTs.

A two-platform Lionel Road station has been added between Old Kew Junction and Kew East Junction. The location for this station was estimated based on the Brentford Community Stadium exhibition brochure and Google Maps. A two platform NLL Old Oak Common Station has been added between Acton Wells Junction and Willesden Junction High Level. The location for this station has been estimated based on the diagrams provided by Transport for London (TfL).

In order to illustrate the timetable for analysis, the same infrastructure upgrades have been made for the national model in the Train Planning System (TPS).

### **2.2.2. IRT calculation**

The new RailSys infrastructure model was used to generate IRTs for Class 378 services travelling between Hounslow and the proposed NLL Old Oak Common station.

### **2.2.3. Timetable Assessment**

A Timetable Planning System (TPS) project was created based on the Principal 2017 Production timetable. As there was no information available on the CP5/CP6 Hounslow Loop uplift, the timetable was examined to establish the potential time slots for additional services specified in the Indicative Train Service Specification (ITSS) for the South-Western Franchise. The decision was made to fit the additional franchise services around the existing Hounslow Loop services and the new shuttle services delivered as part of this study.

### **2.2.4. Infrastructure Assessment**

Infrastructure was examined to establish whether it is possible to run 4tph or 2tph shuttle services between Hounslow and NLL Old Oak Common.

### **2.2.5. Recommendations**

Based on the infrastructure analysis, recommendations were made for the best possible locations for turnback of the shuttle services. Further recommendations were made to improve the feasibility of delivery of the shuttle services and reduce performance risk.

### 3. Project Findings

#### 3.1. IRT calculation results

The following tables summarise the IRTs derived for Class 378 shuttle services running between Hounslow and NLL Old Oak Common stations:

Depart	Arrive	Stop type	IRT
Hounslow	Isleworth	stop to stop	2.5
Isleworth	Syon Lane	stop to stop	1.5
Syon Lane	Brentford	stop to stop	1.5
Brentford	Old Kew Junction	stop to pass	1
Old Kew Junction	Lionel Road	pass to stop	1.5
Lionel Road	Kew East Junction	stop to pass	0.5
Kew East Junction	South Acton Junction	pass to pass	1.5
South Acton Junction	South Acton	pass to stop	0.5
South Acton	Acton Central	stop to stop	1.5
Acton Central	Old Oak Common NLL	stop to stop	2.5
Total Journey Time (excluding dwell)			14.5

Table 1: Class 378 IRTs for services travelling from Hounslow to Old Oak Common NLL

Depart	Arrive	Stop type	IRT
Old Oak Common NLL	Acton Central	stop to stop	3
Acton Central	South Acton	stop to stop	1.5
South Acton	South Acton Junction	stop to pass	0.5
South Acton Junction	Kew East Junction	pass to pass	0.5
Kew East Junction	Lionel Road	pass to stop	1.5
Lionel Road	Old Kew Junction	stop to pass	1
Old Kew Junction	Brentford	pass to stop	2
Brentford	Syon Lane	stop to stop	1.5
Syon Lane	Isleworth	stop to stop	1.5
Isleworth	Hounslow	stop to stop	2
Total Journey Time (excluding dwell)			15

Table 2: Class 378 IRTs for services travelling from Old Oak Common NLL to Hounslow

To ensure validity, the derived IRTs have been compared to the SRTs of similar services currently operating along SW230 (Hounslow line) and EA1310 (NLL) routes. No significant differences were found.

## 3.2. Timetable Assessment

### 3.2.1. Additional assumptions

The timetable was assessed to establish current capacity usage along the Hounslow – Old Oak Common NLL service path. Timetable Planning Rules (TPRs) were used to examine whether it is possible to compliantly plan the additional shuttle services as well as the CP6 uplift (increase from 18 to 20tph on the Windsor Lines, with 8tph on the Hounslow Loop). The prominent TPRs are headway, junction margin and turnround values.

A number of assumptions were made in relation to the new infrastructure. As there were no values for turnround times either at Hounslow or Old Oak Common NLL, the turnround time was assumed to be 4 minutes. The 4 minute turnround time was based on the “Minimum Turnround – Passenger Stock” table found in the Wessex section of the TPRs.

The minimum dwell time for Lionel Road was assumed to be the default 30 seconds, based on the minimum dwell of other non-major stations along the SW230 route (i.e. Syon Lane and Isleworth).

All shuttle services turning round at Hounslow and exiting Platform 2 in the Up direction conflict with Down Services entering Platform 2. To ensure compliance, the standard junction margin of 3 minutes was assumed for this move.

### 3.2.2. Peak hour definition

The high peak hour is defined as trains arriving at London Waterloo between 08:00 and 08:59. The average journey time between Hounslow and London Waterloo is approximately 40 minutes. In order for a service to arrive to London Waterloo between 08:00 – 08:59, this service needs to depart Hounslow between 07:20 – 08:20. This time frame was assumed to be the peak hour at Hounslow.

### 3.3. Infrastructure assessment

#### 3.3.1. Initial Assessment

Following the assessment of infrastructure along the Hounslow – Old Oak Common NLL route, Old Kew Junction was determined to be the most constraining point along the route. The doubling of Old Kew junction removed the single line conflict between Down and Up services travelling along the Kew branch. However, the crossing move between Up Hounslow services and Down Kew shuttle services remained a significant constraint. As a result, Old Kew Junction was used to determine the pattern of the Old Oak Common NLL – Hounslow shuttle services.

The second constraining point on Hounslow – Old Oak Common NLL route was determined to be South Acton Junction. Particularly, the issue was the crossing move between Down NLL services accessing Down Kew line and Up NLL services travelling to Richmond.

Since the two most constraining moves between Hounslow and Old Oak Common NLL were in the Down direction, this highlighted the Down Old Oak Common NLL – Hounslow route as a priority for developing the shuttle service pattern. The pattern was based around the Down crossing move at Old Kew Junction.

Extending the shuttle services beyond Hounslow would allow turnaround on the SW210 route (i.e. Feltham or Whitton/Twickenham), but would also result in additional crossing moves between the SW230 (Hounslow line) and SW210 (Feltham/Twickenham line) routes. This would reduce the possibility of delivering the shuttle services. Therefore, the study initially concentrated on turning the shuttle services at Hounslow only, later examining the opportunities of turning the shuttle services around at Feltham, Whitton or Twickenham.

#### 3.3.2. Viability of peak services

##### 3.3.2.1. Journey Description

Shuttle services arrive into Platform 2, and after turning around for 4 minutes, they depart by crossing over to the Up Hounslow line at the North end of Hounslow. The resulting services arrive and depart Hounslow roughly 15 minutes apart within the peak hour. However, the arrival and departure timings in the shoulder peak hours differ from the peak hour due to the irregularity of the timetable in the morning hours.

The new Lionel Road station proves to be an advantage when timetabling in the areas of Old Kew Junction and South Acton Junction. It allows the shuttle services to extend dwell in the platform while waiting for an opportunity to make a compliant crossing at either junction. This is especially beneficial for NLL section of the route, as it allows shuttle services to arrive and depart the EA1310 (NLL) while avoiding conflicts at South Action Junction.

In order to turn trains around at Old Oak Common, a siding is necessary north of the station. The siding would be used to turn back shuttle services off the NLL while avoiding conflicts with other services. The preferred location of the sidings is north of the Old Oak Common NLL station, as this would potentially allow repurposing of the existing unused South West Sidings. However, this would require infrastructure changes to join the southern end of South West Sidings to the South West Line and, more importantly, would require infrastructure alternations to the North London Line itself

just north of the new Old Oak Common station to provide crossovers to access the South West Line from the station. The feasibility of this infrastructure is unknown and would need to be investigated.

Accessing the sidings is also difficult in some hours due to the number of freight movements on the North London Line. Finding four paths each way to access and egress the sidings will be challenging in hours with a high number of freight trains.

If minimum dwell at each station is included, the journey time between Old Oak Common NLL station and Hounslow is 25 minutes. Taking into account the 4 minute turnround time, an average return journey of the shuttle service would take just under 1 hour. This implies that at least 4 train units are necessary to run a 4tph shuttle service.

### 3.3.2.2. Journey Limitations

In order to fit four peak Hounslow – Old Oak Common paths into the assumed CP6 timetable, it is necessary to use minimum TPRs; junction margins and headways.

This enables four paths in the peak hours, with the 25 minute journey time described in the previous section. However, turning back shuttle services at Hounslow, with the addition of the CP6 uplift services, results in a 92% occupation of Platform 2. Such high occupation would not be accepted by the Sale Of Access Rights (SOAR) panel. Therefore, an additional platform or siding would be required at Hounslow to support the service proposition and to avoid the high occupation rate at Platform 2.

Additionally, the fact that all peak shuttle services have to be planned on minimum TPR values, headways and junction margins is a performance risk, which has the potential of causing significant secondary delay issues throughout the Wessex area. It means that if the shuttle service is delayed even slightly, it will affect other services travelling on the Hounslow line. This is a major problem, as these services have to join the highly congested SW210 (Feltham/Twickenham line) at particular times to avoid causing conflicts. The Hounslow Loop has a number of critical junctions, including Feltham Junction, Old Kew Junction and Barnes Junction. These junctions are very sensitive to changes due to congestion in the Hounslow Loop and Waterloo areas. Adding shuttle services as well as the CP6 uplift services to the Hounslow Loop, even when fully compliant, may result in breaking these junctions in the peak hours.

An additional platform or siding at Hounslow could enable the use of longer turnround times than the minimum of 4 minutes. However, in addition to an increase in journey time and the need for at least one additional unit (which would need to be accommodated on the network), this would also help mitigate delay for Hounslow – Old Oak Common journeys. It would not alleviate secondary delay spreading across the network due to the use of minimum junction margins.

Reducing the frequency of the Hounslow – OOC services to two trains per hour in the peak would still require the use of minimum junction margins, with the associated risk of spreading delay. However, it would enable more space in the timetable in the hour to potentially recover from any delays. More detailed performance analysis would be required to determine how such a timetable would build up delay and recover.

Lastly, the timings of existing services in the Hounslow area differ between the peak and shoulder

peak hours. Dwell times and arrival times at Hounslow station are different between the hours. As a result, an hourly consistent pattern cannot be achieved at Hounslow. Each hour needs to be adjusted to take into account the irregularities of the morning timetable. Such a timetable may be difficult to market.

### 3.3.3. Viability of off-peak services

During the off-peak timetable the problems occur at the NLL end of the route. The crossing move at Old Kew Junction and occupation of Hounslow Platform 2 are less of an issue in the off-peak, because there are less services travelling along the Hounslow Loop. On the contrary, the main constraints to delivering the shuttle services are now located along the NLL, particularly in the area of Acton Wells Junction.

The off-peak timetable around Old Oak Common NLL station is highly irregular. The freight paths around Acton Wells Junction vary considerably between off-peak hours. For example, in today's timetable between 12:00 – 13:00 there are 5 freight services travelling Up the North London Line and 1 freight service travelling Down the Kew branch. In contrast, between 14:00 – 15:00 there are 3 freight services travelling Up the North London Line but 2 freight services travelling Down the Kew branch.

As a result, it is not possible to accommodate 4tph between Hounslow – Old Oak Common NLL during the off-peak time period between 12:00 – 13:00. The maximum number of shuttle services that can be achieved between Hounslow and the proposed Old Oak Common NLL station is 3tph. This is primarily due to the freight services using Acton Wells Junction to access Acton Main Line and the sidings. Furthermore, existing freight services that travel along the Kew branch, take up additional paths that could otherwise be used by shuttle services.

As the off-peak timetable is irregular, each off-peak hour varies in the maximum number of shuttle services possible and the times at which the services can be accommodated. This means achieving a symmetrical (clockface) standard hour timetable for shuttle services across all off-peak hours is impossible; to make the timetable work, each hour would need to be individually tailored. An irregular timetable creates operational complexity and is difficult to market.

It is important to note that the situation in the off-peak period is likely to deteriorate due to the future growth in demand for freight (especially as this service would not commence until at least 2026). The current freight forecasts for the NLL expect significant growth in freight services in the area of Acton Wells Junction. With more freight services using Acton Wells Junction, even fewer paths will be available for the shuttle services.

### 3.3.4. Windsor Lines –sensitivities analysis

The main difference between the core services assumption and the sensitivities option is that 2 out of 8 trains per hour are now semi-fast services that stop at Hounslow and Brentford only. This implies that the semi-fast services will travel faster between Brentford and Hounslow than the stopping services.

Because the semi-fast services stop at Hounslow, they will operate like other stopping services on

approach to the station. Semi-fast services will be subject to the same slow headway and platform re-occupation margins at Hounslow as the stopping services. Furthermore, all existing services (including semi-fast services) also stop at Feltham. As a result, semi-fast services will interact with the Hounslow – Feltham section just like all other stopping services.

With the addition of the shuttle services and the CP6 uplift services, the Hounslow – Feltham section becomes very congested. As there are more stopping services on the Hounslow Loop, the semi-fast services are likely to be pathed out to fit in with the stopping services. In this case, the sensitivities option of having 2 semi-fast services is unlikely to have any significant impact on the timetable. However, it will have an impact on the journey times of the semi-fast services which may impact the viability of the Wessex Route Study option.

### **3.3.5. Feltham Turnround**

Extending the shuttle services to Feltham results in a number of new constraints, as the shuttle services now additionally interact with Hounslow Junction and Feltham Junction.

All current services stop at Feltham station. According to the TPRs, a Down shuttle service from Hounslow would require a 7 minute break in the SW210 line services to reach Feltham. Such large intervals are rare in the peak period timetable. The available intervals rarely align with other conditions necessary to run a full shuttle services as far as Feltham Junction. The situation is worsened by existing services with extended dwell at Hounslow Platform 2.

Due to heavy traffic along the SW210 lines in the peak hour, a bay platform is necessary at Feltham. The bay platform would be used to offload the passengers and turnround the shuttle services.

Following examination of the current peak timetable, this study concluded that after extending shuttle services to Feltham it is only possible to turnround 1 shuttle service per hour in the peak period. This would require a bay platform at Feltham.

### **3.3.6. Whitton/Twickenham Turnround**

Extending the shuttle services to Whitton or Twickenham results in a number of new constraints, as the services now additionally interact with Hounslow Junction, Whitton Junction and Twickenham Junction.

Currently, turnround of shuttle services at Whitton is impossible. The existing infrastructure prevents running of compliant shuttle services from Whitton back to Hounslow after the service turns round.

Twickenham offers several turnround options in the form of an extra platform and multiple crossings. However, Twickenham is more congested than Whitton due to the SW245 route joining from Strawberry Hill.

Existing infrastructure at Twickenham allows turnround of services in either Platform 2 or Platform 3. However, due to additional services joining via the SW245 route, along with services on the SW210 route, both platforms are highly occupied during the peak hour. Several services have extended

dwell at Platform 3. As a result, a bay platform is needed to offload and turn services around at Twickenham.

It is not possible to turnround any shuttle services at Twickenham in the peak hour. Extending the shuttle services beyond Hounslow introduces too many constraints along the route, which prevent the shuttle service from operating. For example, several Up SW210 services are semi-fast; they skip Whitton and continue on to Twickenham. Semi-fast services limit the number of shuttle services achievable on the SW210 route due to speed differentials. Furthermore, the additional Platform 3 is mostly occupied by Up services from the SW245 route, preventing the use of it for turnround of shuttle services.

### **3.3.7. Southern Rail Access to Heathrow interaction**

The Southern Rail Access to Heathrow (SRAtH) Feasibility Study developed a range of indicative train service specifications (ITSS) which aim to serve London Heathrow from a number of locations in the UK south. The London Waterloo – Heathrow ITSS proposes that it is possible to achieve 2tph stopping services via Richmond and 2tph stopping services via Hounslow. The Feasibility Study does not provide any timings for these proposed services.

SRAtH has no impact on the Hounslow – Old Oak Common shuttle services in the context of this study. When implemented, SRAtH services will be part of the CP6 uplift and are therefore already accounted for in this study.

It is important to note that in this study the CP6 specification fits around the Hounslow – Old Oak Common shuttle services. If the timings of SRAtH services happen to be different from the CP6 paths identified in this study, there may be substantial impacts on the findings.

### **3.3.8. Level Crossings**

The proposed Hounslow – Old Oak Common services would run over three existing level crossings: Wood Lane on the Hounslow Loop and Bollo Lane (Kew Branch) and Churchfield Road on the North London Line.

A level crossing risk assessment would need to be undertaken on these crossings to understand what mitigations might be required to enable an increase in train service.

## 4. Recommendations

Although it is technically possible to accommodate 4tph shuttle services between Hounslow and Old Oak Common in the peak hour, this poses an unacceptable performance risk with Hounslow Platform 2 being occupied for the majority of the hour. This would therefore require a new platform or siding on the south side of Hounslow

It is difficult to address the performance risk to the Wessex network caused by the necessary use of minimum TPRS (junction margins, headways etc). Grade separation of Old Kew Junction would be highly beneficial, as it is the main constraint along the shuttle service route. A grade separation at South Acton Junction would also alleviate the issue of planning on minimum junction margins. However, even the significant investment to alleviate the constraining junctions would not mitigate the risk arising from running on minimum headways.

The main constraint that prevents running shuttle services in the off-peak hours is the movement of freight at Acton Wells Junction. This constraint could be resolved by constructing a direct connection from the South West Line to Acton Main Line, effectively separating these freight services from the NLL.

This study recommends Hounslow as the best location for the shuttle service turnback. Extending shuttle services past Hounslow to turnround at Feltham, Whitton or Twickenham results in additional constraints, which prevent delivery of the shuttle services.

In order to turnaround trains at Old Oak Common, a siding is necessary north of the station. The siding would be used to turn back shuttle services off the NLL while avoiding conflicts with other services. The preferred location of the sidings is north of the Old Oak Common NLL station, as this would potentially allow repurposing of the existing unused South West Sidings. However, this would require infrastructure changes to join the southern end of South West Sidings to the South West Line and, more importantly, would require infrastructure alternations to the North London Line itself just north of the new Old Oak Common station to provide crossovers to access the South West Line from the station. The feasibility of this infrastructure is unknown and would need to be investigated.

This study also notes the potential benefit of a timetable recast of the Inner Wessex area. The current timetable features many irregularities between the hours, such as hourly services with different dwell times at Hounslow. A recast of the timetable would potentially allow standardisation of hours, allowing for an even hourly pattern of the shuttle services. Though this would still carry the aforementioned performance risk, due to the volume of services and their interaction on the Hounslow Loop.

## 5. Conclusion

Though it is possible to achieve 4tph in the peak, this requires a new platform or siding at Hounslow and carries significant performance risk of spreading delay across the network, resulting from the necessary minimum TPRs (junction margins, headways etc). Reduction of the service frequency to 2tph in the peak would still require the use of minimum junction margins, with the associated risk of spreading delay. However, it would enable more space in the timetable in the hour to potentially recover from any delays. More detailed performance analysis would be required to determine how such a timetable would build up delay and recover.

It is difficult to address the performance risk to the Wessex network caused by the necessary use of minimum TPRS (junction margins, headways etc). Grade separation of Old Kew Junction would be highly beneficial, as it is the main constraint along the shuttle service route. A grade separation at South Acton Junction would also alleviate the issue of planning on minimum junction margins. However, even the significant investment to alleviate the constraining junctions would not mitigate the risk arising from running on minimum headways.

The major constraint in the off-peak timetable is the movement of freight services at Acton Wells Junction. The off-peak timetable is highly irregular, with some hours of the off-peak timetable may accommodate 2-4tph shuttle services whereas others may not (based on today's level of freight services). This situation is likely to worsen over time due to the forecast freight growth on the route. The main constraint that prevents running shuttle services in some hours is the movement of freight at Acton Wells Junction. This constraint could be resolved by constructing a direct connection from the South West Line to Acton Main Line, effectively separating these freight services from the NLL.

The irregularities in the peak Hounslow Loop timetable and the off-peak North London Line freight paths mean it would be almost impossible to achieve a consistent pattern of Hounslow – OOC services, with each hour needing to be adjusted to take into account the wider service structure. Such a timetable may be difficult to market.

The Windsor Line sensitivities option proposed by the Wessex Route Study makes little difference in regards to running shuttle services from Old Oak Common to Hounslow. However, semi-fast services will potentially perform like stopping services in the areas where semi-fast services interact with the shuttle services. This would increase the journey times of these semi-fast services, potentially affecting the viability of the Route Study option.

It is recommended that the new shuttles services turn round at Hounslow, at the Wessex end, and a siding north of OOC station at the North London Line end. The siding would be used to turn back shuttle services off the NLL while avoiding conflicts with other services. However, this would require infrastructure changes to join the southern end of South West Sidings to the South West Line and, more importantly, would require infrastructure alternations to the North London Line itself just north of the new Old Oak Common station to provide crossovers to access the South West Line from the station. The feasibility of this infrastructure is unknown and would need to be investigated.

Accessing the sidings is also difficult in some hours due to the number of freight movements on the North London Line. Finding four paths each way to access and egress the sidings will be

challenging in hours with a high number of freight trains.

This study found that the CP6 uplift services fit between the existing services and the proposed Hounslow – Old Oak Common shuttle services. If the actual CP6 timetable results in different pathing assumptions, the proposed shuttle service routes will potentially become invalidated. Therefore, in order to fully establish whether the shuttle services are feasible, more precise information on the CP6 timetable would be required. Until this is known, any timetable developed for the Hounslow shuttles will carry this risk.

# MAYOR OF LONDON

**Cllr Muhammed Butt**

Leader of Brent Council  
& Chairman of West London Alliance  
West London Alliance (WLA)  
Perceval House  
14-16 Uxbridge Road  
London W5 2HL

**Our ref:** MGLA080617-4883

**Your ref:** 46912

**Date:** 21<sup>st</sup> July 2017

Dear Muhammed

Thank you for your letter of 7<sup>th</sup> June regarding the Dudding Hill Line. I apologise for the delay in responding to you.

The draft Mayor's Transport Strategy (MTS) sets out our commitment to improving connectivity to support good growth, unlocking development sites for new housing and jobs, encouraging mode shift away from the car, and improving air quality. It also specifically sets out an ambition to improve orbital public transport connectivity while tackling the issue of freeing up freight lines for passenger services.

The proposed Dudding Hill scheme fits well with these priorities and, I agree with you, merits further consideration. Proposal 83 of the draft MTS states that the Mayor, through Transport for London (TfL) and relevant boroughs, will examine the feasibility of delivering a new London Overground rail link between Hounslow and Old Oak and assess options for an extension towards Cricklewood.

TfL is currently supporting your consultants with their initial feasibility study, which will consider various options and costs. I understand there are several alternative options for route alignment and service provision. Each of these will need to be given thorough consideration within the context of wider sub-regional transport priorities and the Mayor's Homes for Londoners programme in unlocking development sites.

If the feasibility study shows promise, we can give the scheme further consideration, including whether to include it in the final MTS following public consultation. We will need further work to assess the level of housing and employment the proposal could support as well as exploring the level of contribution any new development could provide. This would need to be supported through the respective boroughs' Local Plans and the joint West London SHLAA. We will also need to consider how local funding sources, like borough Community Infrastructure Levy (CIL), and incremental business rates, might contribute. I gather the feasibility study is due to be completed in time to inform your response to the consultation on the draft strategy.

As I am sure you can imagine, the demands on funding are significant, so a robust business case and funding proposal will be required if it is to compete with other schemes. TfL can support you on this work. Please bear in mind that there is a long list of schemes currently being worked on across London and only limited resource and finance to do this.

I look forward to discussing this with you further as well as your wider west London Vision for Growth when I meet with you and your colleagues at the WLA Leaders' meeting on the 26 July.

Yours sincerely,

A handwritten signature in black ink that reads "Valerie". The signature is written in a cursive, flowing style.

**Valerie Shawcross CBE**  
Deputy Mayor for Transport



## West London Economic Prosperity Board

8 June 2016

<b>Title</b>	<b>West London Vision for Growth: Action Plan</b>
<b>Report of</b>	Luke Ward, Interim Head of Growth, Employment and Skills, West London Alliance
<b>Status</b>	Public
<b>Urgent</b>	No
<b>Key</b>	No
<b>Enclosures</b>	Appendix 1 – West London Vision for Growth Appendix 2 – Vision for Growth Action Plan
<b>Officer Contact Details</b>	Luke Ward, Interim Head of Growth, Employment and Skills, E: <a href="mailto:wardlu@ealing.gov.uk">wardlu@ealing.gov.uk</a> , T: 07738 802 929

### Summary

This paper sets out an action plan for delivering the West London Vision for Growth, which was requested by the Economic Prosperity Board at its meeting on 17 February 2016 and has subsequently been developed by Growth Directors with input from Chief Executives. If approved by the WLEPB this action plan will proceed to delivery, with different strands of activity within it e.g. Work and Health or Business Rates devolution, reporting back to the WLEPB individually, and an Annual Report covering overall progress once per year in the future.

### Recommendations

The Board is requested to:

1. Review the West London Vision for Growth Action Plan as set out in Appendix 2 and make comments and amendments
2. Approve the Action Plan set out in Appendix 2 and delegate authority to the West London Growth Director to incorporate any comments and amendments as referred to in 1. above

**3. Agree for the Action Plan to be published on the West London Alliance website and for the Board to receive a regular annual report setting out progress delivering it.**

## **1. WHY THIS REPORT IS NEEDED**

- 1.1 The purpose of this paper is to set out an action plan for delivering the West London Vision for Growth, which was requested by the West London Economic Prosperity Board (WLEPB) on 17 February 2016. A broad framework for this action plan was agreed at the Leaders and Chief Executives Board on 22 March 2016, and subsequently discussed and steered by Growth Directors on 21 April 2016 and chief executives on 3 May 2016.
- 1.2 Delivery of the Vision for Growth has to date focused on a number of priority areas, including Employment and Skills, the Post-16 Education and Training Review, and Welfare Reforms. With the Economic Prosperity Board established now is an opportune time for the sub-region to turn its attention to other elements of the vision that are essential components of economic growth, including business and productivity growth, housing, business rates devolution, infrastructure and inward investment, in addition to employment and skills.

## **2. PRINCIPLES FOR DRIVING GROWTH SUB-REGIONALLY**

- 2.1 Given the work that is already happening at both the borough level and pan-London levels (e.g. Skills Devolution, elements of housing) a set of principles for identifying priority areas of work for the West London area have already been identified by Leaders. These are:
- **Subsidiarity:** Sub-regional activity occurs where it either wouldn't otherwise happen or would be less efficient if undertaken at the national, regional or borough levels.
  - **Additionality:** Activity occurs and is prioritised where action produces the greatest economic impact for the least resources.
  - **Accountability:** Sub-regional activity has clearly defined objectives and outputs, is resourced, and has clear ownership.
- 2.2 Activity undertaken at the sub-regional level should also be deliverable, evidence-based, and focus on agreed outcomes.

## **3. ACTION PLAN**

- 3.1 The summary table that Leaders and Chief Executives discussed on 22 March has been significantly developed and refined with input from West London Growth Directors to produce the action plan in Appendix 2, which is divided

into four distinct categories against which different strands of work have been allocated:

1. Housing
2. Employment, Skills and Productivity
3. Infrastructure
4. A Competitive Economy

3.2 For each of these groups activity is divided into short, medium and longer-term opportunities that set strategic goals alongside shorter-term, deliverable outputs. The content of the action plan was discussed by Chief Executives on 3 May 2016 and by Growth Directors on 21 April 2016. The action plan also reflects the outcome of a prioritisation exercise that was undertaken by Growth Directors at the request of Chief Executives identifying the activities in the plan that they consider to be of highest priority.

#### **4. DELIVERING THE ACTION PLAN**

4.1 Should the WLEPB approve this action plan then, subject to comments, it will progress to delivery stage, with detailed plans embedded into the wider WLA work programme and those of WLA member authorities.

4.2 Consideration also needs to be given to how the action plan that Leaders have requested will be implemented, for example:

1. Director / borough-level leadership of different activities within the action plan
2. Resources necessary to deliver activity beyond the core WLA team, e.g. within boroughs and other partners and through external/devolved funding or secondments
3. Project budgets to deliver for example research projects relating to Business Rates devolution or Area Review.

4.3 Resourcing considerations are set out in more detail in section 8.2 of this report (below) and in section 8 of Appendix 2.

#### **4. REASONS FOR RECOMMENDATIONS**

4.1 At its meeting on 17 February 2016 the WLEPB requested the West London Growth Directors develop an action plan for delivering the Vision for Growth to return to its meeting on 8 June 2016. This action plan reflects that request.

#### **5. ALTERNATIVE OPTIONS CONSIDERED AND NOT RECOMMENDED**

5.1 The Vision for Growth was agreed by West London Leaders in late 2014, and to date there has been more emphasis on some parts of it than others, with focus predominantly on the delivery of a number of skills and employment programmes such as the Area Review of Further Education and the Work and

Health programme, and less on wider agendas of relevance to sub-regional growth such as Business Rates Devolution, housing, or infrastructure.

## **6. POST DECISION IMPLEMENTATION**

6.1 If approved by the WLEPB and subject to its comments this action plan will be published on the WLA website and proceed to delivery stage. Activity outlined within the action plan will be embedded across WLA work areas and those of WLA member authorities along with appropriate programme support and resource to ensure delivery.

6.2 Progress against delivering the action plan will be reported to the WLEPB on an annual basis, with decisions relating to individual priorities or strands of work (e.g. Work and Health or Business Rates Devolution) returning to the Board as required.

## **7. IMPLICATIONS OF DECISION**

### **7.1 Corporate Priorities and Performance**

7.1.1 This report relates directly to the delivery of the West London Vision for Growth, which has been agreed by the members of the West London Alliance.

### **7.2 Resources (Finance & Value for Money, Procurement, Staffing, IT, Property, Sustainability)**

7.3 WLEPB are asked to note Section eight of appendix two setting out resourcing requirements associated with this action plan. It is anticipated that a significant element of work will happen within existing resources; however some additional resource will be required to deliver the overall programme, for instance in relation to policy agendas such as Area Review, Business Rates Devolution, or Infrastructure.

7.4 Where a specific requirement for additional resource is identified to fund a particular activity or project contained within the Vision for Growth action plan then this requirement will be brought back to a future Board for consideration on a case-by-case basis.

### **7.5 Social Value**

7.5.1 This action plan supports the delivery of the objectives set out in the Vision for Growth, including the objective to support low-paid people in work and those without work to find it.

### **7.6 Legal and Constitutional References**

7.7 The Board has its own functions and procedure rules as set out in the Constitutions of the relevant local authorities. These include representing the participating local authorities in discussions and negotiations with regional and

national bodies and central government on matters relating to economic prosperity for the benefit of the local government areas of the participating authorities, and representing the participating local authorities in discussion and negotiations in relation to pan-London matters relating to economic prosperity.

## **7.8 Risk Management**

7.8.1 There is a risk that by not engaging with the full range of levers that have an impact on the overall economic success of an area the sub-region will not achieve the level of economic outcomes in terms of jobs, investment, or housing that might otherwise be the case over the medium and long term.

## **7.9 Equalities and Diversity**

7.9.1 The Vision for Growth recognises the need to ensure that people from all backgrounds are able to benefit from growth. Individual programmes within the Vision will have equality impact assessments undertaken on a case by case basis.

## **7.10 Consultation and Engagement**

7.10.1 WLEPB considered an outline Vision for Growth action plan and requested more developed version on 17 February 2016. Growth Directors subsequently discussed and informed a draft action plan at their meeting on 21 April 2016. Chief Executives discussed a more developed draft action plan on 3 May 2016. Growth Directors prioritised elements of the action plan over the first part of April 2016.

## **5.8 Insight**

5.8.1 The content of the Vision for Growth Action Plan draws on the evidence base for the West London Economy that was commissioned from Peter Brett Associates in 2015.

## **8. BACKGROUND PAPERS**

8.1 None

### Passenger service for the Dudding Hill line: brief for feasibility study

#### Introduction

The West London Alliance is currently investigating ways of accommodating the additional demand resulting from the growth of population and employment in the area and across London as a whole.

One such option is to restore services utilising the Dudding Hill Line. This is an existing railway line in north-west London running from Acton to Cricklewood. The line itself has had no scheduled passenger service for over a century, no stations, no electrification, and a 30 miles per hour (48 km/h) speed limit with semaphore signalling, and is lightly used by freight and very occasional passenger charter trains. It is roughly 4 miles (6.4 km) long. On the face of it, this looks to meet a strategic need.

#### Purpose of the brief

The West London Alliance wishes to procure consultants in order to carry out a feasibility study into the case for running a new passenger service between Barnet, Brent, Ealing and Hounslow serving locations such as Cricklewood, Neasden, Harlesden, Acton Central, Old Oak Common, Brentford and Hounslow.

The aim of the proposed feasibility study is to investigate the practicalities and timings of this, as well as identifying the strength of the strategic, economic, commercial and financial case for such a new service.

Consultants should take as given the following which will be made available:

1. West London Transport Infrastructure Constraints: Evidence (February 2017, Regeneris Consulting Ltd.). The analysis in Section 5 of this report indicates material demand for movements along the equivalent A406 corridor. A significant proportion of these trips are currently undertaken by bus. It provides evidence of highway delays (e.g. Figure 3.12) as well as predicted future overcrowding (shown in Figure 3.21). The report helps demonstrate the strategic narrative for better orbital public transport connections, particularly between growth areas. The annex to this brief also shows mapped data on the proposed service mapped against changes in population, the index of multiple deprivation and London Plan opportunity areas to illustrate the available analysis with which a strategic case can potentially be shown
2. The initial feasibility study for LB Hounslow into a passenger link between Hounslow and Willesden which is available here:  
<https://hounslow.box.com/s/f42tpb1dvegwvvsy6qqdtyrnxtfssiei>
3. Subsequent analysis of the feasibility of timetabling more trains across Acton Wells Junction on the North London line and along the Hounslow Loop by both Network

## Rail and WSP | PB

4. Lionel Road proposed railway station: Transport Business Case – Technical Report for London Borough of Hounslow
5. Latest plans for development of Old Oak Common and Park Royal including potential transport interventions.
6. Various other ad hoc pieces of work undertaken for *Infrastructure Plan 2050* ([https://www.london.gov.uk/sites/default/files/Transport%20Supporting%20Paper 3.pdf](https://www.london.gov.uk/sites/default/files/Transport%20Supporting%20Paper%203.pdf)), etc.

Background information and specific requirements are provided in the following sections.

## Strategic optioneering

The task is to test at a high-level whether the Dudding Hill line is the indeed the best possible way to support growth in this part of London. The consultants are asked to construct and consider a long-list of potential options to meet the transport challenges from west London's growth. Each option should be prioritised semi-qualitatively using criteria such as capital cost, operating cost, wider economic impacts, level of demand, transport benefits, likely value for money, fit with strategy, revenue impact, likelihood of third party funding, practical feasibility and programme impacts, although this list is open to discussion. This long-list of alternative options could include:

- make better use of existing heavy rail infrastructure, such as the Dudding Hill line
- examining other possible heavy rail alignments
- possible light rail, tram-train or tram options
- new Underground railway
- bus rapid transit
- road schemes
- any others that the consultant believes are reasonable or which a literature search uncovers

## Appraisal of the preferred high-level scheme

The West London Alliance believes that a passenger service using the Dudding Hill and Kew curve line between West Hampstead, Cricklewood, Old Oak Common, Brentford and Hounslow would score well in the optioneering analysis above. If this proves to be the case, there are a number of sub-options for such a proposed service which we wish to test. The scope could consist of:

- A 3 or 4-car diesel operated service at a frequency of 4 even interval trains per hour all day, every day with the following calling points:
  - Hounslow (existing station and platforms)
  - Isleworth (existing station and platforms)
  - Syon Lane (existing station and platforms)
  - Brentford (existing station and platforms)
  - Lionel Road (potential new station and platforms to meet all usual standards)
  - South Acton (existing station and platforms)
  - Acton Central (existing station and platforms)
  - Old Oak Common Victoria Road (potential new station and platforms to meet all usual standards with out of station (on-street) interchange with other proposed Old Oak Common stations as proposed in TfL consultations <https://consultations.tfl.gov.uk/london-overground/old-oak-common/> )
  - Harlesden (potential new station and platforms with out of station (on-street) interchange with Bakerloo line and London Overground station)
  - Neasden (potential new station and platforms with out of station interchange

with Jubilee line station)

- Cricklewood (new platforms on Hendon lines adjacent to existing station)
- West Hampstead (new platform(s) on Hendon lines adjacent to existing station)

Transport for London (TfL) estimate the following approximate journey times for the service which imply a fleet size of seven to eight, including a spare unit for maintenance. The consultant is asked to review this analysis.

Station		cumulative distance (miles)	cumulative time (mins)
West Hampstead	D	11.68	0
Cricklewood	A		2
Cricklewood	D	10.48	2.5
Neasden	A		4.5
Neasden	D	8.86	5
Harlesden	A		7.5
Harlesden	D	7.5	8
Old Oak Common Victoria Road	A		15
Old Oak Common Victoria Road	D	6.71	15.5
Acton Central	A		18.5
Acton Central	D	5.5	19
South Acton	A		22
South Acton	D	4.81	22.5
Brentford	A		25.5
Brentford	D	2.85	26
Syon Lane	A		29
Syon Lane	D	2.08	29.5
Isleworth	A		36.5
Isleworth	D	1.38	37
Hounslow	A	0	39
Reversal		n/a	At least 4 minutes



This 11.68 mile route is shown in the map above.

Infrastructure requirements for such a passenger service could include:

- Re-signalling of the Dudding Hill line
- Turn-back at Hounslow with associated connections and signalling
- Turn-back at West Hampstead with associated connections and signalling if necessary
- Additional platforms and associated station facilities
- Depot and stabling for a diesel fleet
- Potential doubling of Old Kew Junction (currently single track connection with the South Western line to Waterloo)
- Possible re-alignment (and possible four-tracking) of Acton Wells Junction
- Possible mitigations at level crossings given the impact on down-time and road traffic
- Mitigations if required for current freight services. The Dudding Hill Line is at

present used for freight services, with roughly 90 paths scheduled per weekday and approximately 30 of these used in both directions (not each).

### Other options

The consultants are asked to appraisal qualitatively and provide a narrative of the advantages and disadvantages of some other potential options raised already by stakeholders which are:

- 1) An 11.7 mile route to Hendon or Mill Hill rather than West Hampstead as shown in the map below with a possible intermediate call at the new Brent Cross Cricklewood station if feasible and appropriate



- 2) An electric train option for the West Hampstead to Hounslow route
- 3) The possibilities for a higher frequency service of 6-10 trains per hour train service

for the West Hampstead to Hounslow route, be it delivered from the outset or incrementally over time including programme, costs and benefits involved in scaling up the proposed service to this level over time

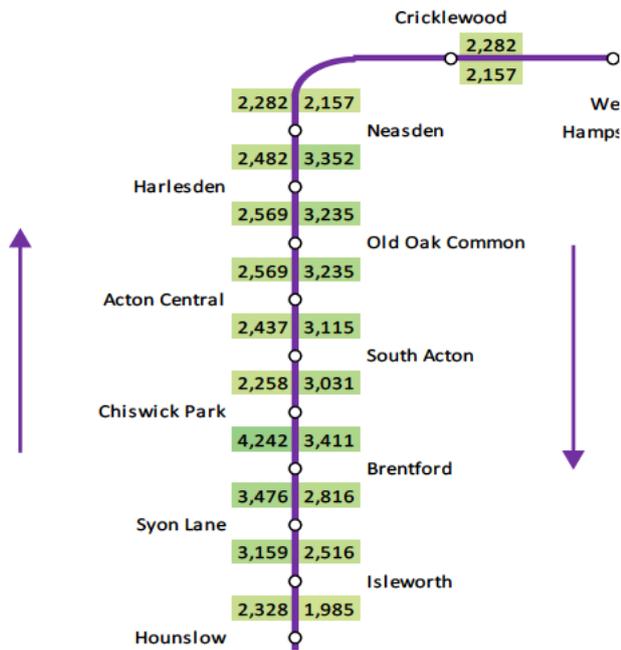
- 4) An option for the West Hampstead to Hounslow route with an additional spur to the Wembley Park or Wembley Stadium area

### **Analysis required**

The analysis required is an outline feasibility study (GRIP 1 equivalent) on the provision of service options as set out above

- 1) Reviewing existing regeneration proposals and material from the boroughs and TfL/GLA which may lead to an indication of the likely levels of growth and additional rail demand in the study area and an assessment of the additional housing capability from such a new service based on the change in PTALs or other acceptable method of calculation
- 2) Liaise with the concerned boroughs, West London Alliance, TfL/GLA to get a fuller understanding of the aspirations and options and constraints
- 3) Using Railplan establish a likely demand forecast for each option set out in the brief

(**NB.** For information, previous work in 2014 to inform the GLA Infrastructure Plan 2050 by Halcrow on behalf of TfL showed a peak three hour number of journeys of roundly 3,000 passengers in anti-clockwise / southbound and 2500 clockwise / northbound in 2031 using standard London Plan forecasts. This is shown in the graphic below. There are also demand estimates in the work by WSP for LB Hounslow for the southern half of the route, which are also roundly that number for passengers travelling over the Kew curve against which an explicit comparison should be made. However, the underlying assumptions will be different at least in detail from a current reference case.)



- 4) Establish the potential for interworking with freight services on existing routes and establish additional rail infrastructure that may be required to establish suitable services for each of the identified options. This should include:
  - a. consideration of the need for upgraded or grade-separated junctions, passing loops
  - b. impact of the additional stations and/or additional platforms, etc.
  - c. location of possible depots and stabling. For the diesel option, account should be taken of the fact that Willesden depot is losing its diesel capability shortly, so maintenance and refuelling will necessarily be undertaken elsewhere. Chiltern Railways has such a facility at Wembley, but this is unlikely to have much or any spare space, and paths to/from it may be tricky. Dedicated sidings may therefore be required, at least for a fuelling point with facilities for cleaning and valeting.
  - d. Review compatibility of other possible foreseen service developments and impact of other schemes within the geographic area upon this scheme (e.g. Southern access to Heathrow)
  
- 5) Establish the rail timetable feasibility with particular reference to
  - a. Compatibility with south western services between Old Kew Junction and Hounslow, and mitigations to ensure this if any for which there is analysis in hand by Network Rail and WSP for LB Hounslow
  - b. Interworking with other passenger and freight services through Acton Wells for which there is timetable analysis in hand by Network Rail and WSP for LB Hounslow. In the event that this shows conflicts that are not readily solved,

the tasks becomes one of identifying possible operational or infrastructure mitigations to achieve a four trains per hour frequency

- c. Interworking with freight services along the Dudding Hill line and Hendon lines given the need to interwork with the NLL and Hounslow loop services
  - d. Impact on level crossing down times
- 6) Review of capital and operating costs provided by TfL, and their use to complete the economic part of the standard five case business case model.
- a. Outline and present the strategic case
  - b. Outline and present the financial case
  - c. Outline and present the economic case, including passenger and environmental benefits
  - d. Outline and present the management case including a potential outline programme and the main engineering, fleet, public relations and other challenges to solve
  - e. Outline and present the commercial case including options for procuring a train service

## **Outputs**

We anticipate the five case business case documentation that results would be about 15-20 pages in length and suitable for use with stakeholders and funders. The final output of the work should include provision for a presentation(s) to Borough leaders etc, a final report and outline business case and [50] copies of a colour brochure which can be used for publicity purposes.

## **Work stages & deliverables**

The project should be delivered in the following stages.

### **1. Project inception and familiarisation**

This stage will include:

- Gaining familiarity with the proposed services and the potential routes and constraints.
- An inception meeting with the interested boroughs, the West London Alliance and TfL , where the context can be explained in more detail as needed to ensure a full understanding of the project.
- site visits if necessary

- Identification of the information necessary for execution of the study.

## 2 **Planning, cost estimates and business case assessment**

The consultant will need to:

- Attend a workshop to discuss the means by which the work will be taken forward for further analysis.
- Impact assessment on other key stakeholders, along with potential mitigation measures to be investigated.
- Consider the feasibility of the proposed service and any mitigations required, and make any adjustments necessary in consultation with the client
- Produce basic plans for each new platform and any additional stations
- List options for stabling and fleet maintenance
- Review TfL's itemised capital and operating costs for each option (to  $\pm 25\%$ )
- Provide indicative construction schedules for each option, highlighting aspects on the critical path, risk and opportunities
- Set out in writing the key assumptions
- Hold progress meetings with the client and provide weekly email updates

## 3 **Final report, presentation and colour brochures**

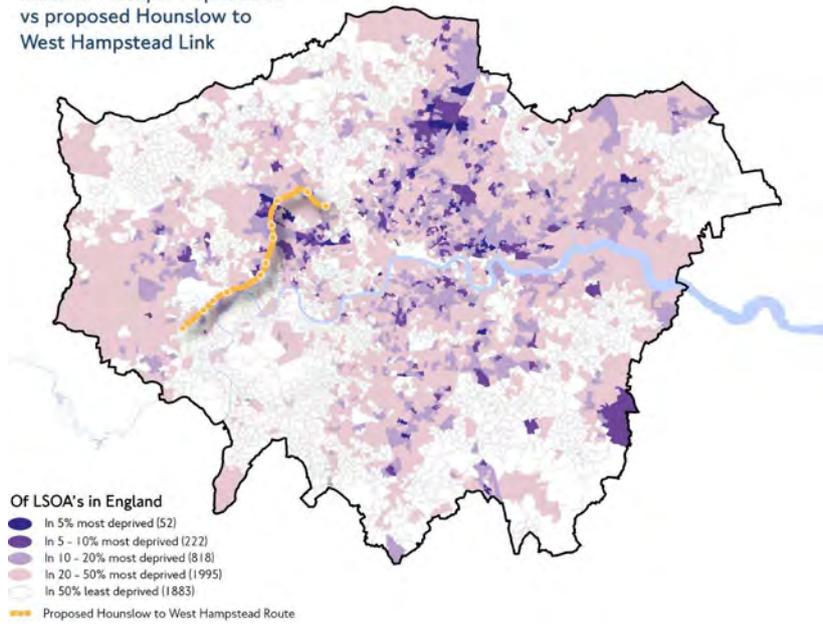
In this final stage, the consultant will:

- Attend a meeting with the client to present preliminary recommendations and collect any feedback
- Make minor adjustments necessary to accommodate this feedback
- Produce a final report which contains full detail.
- Prepare a presentation and allow for several presentation meetings for interested boroughs, West London Alliance and TfL/GLA
- Prepare [50] copies of a colour brochure for use in publicity and presentational / promotional activities

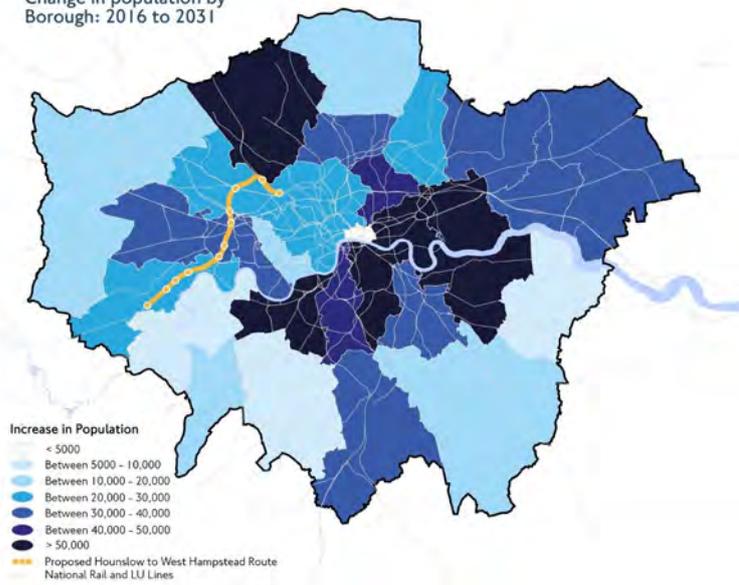
**Deadline for the Final outputs is late May 2017**

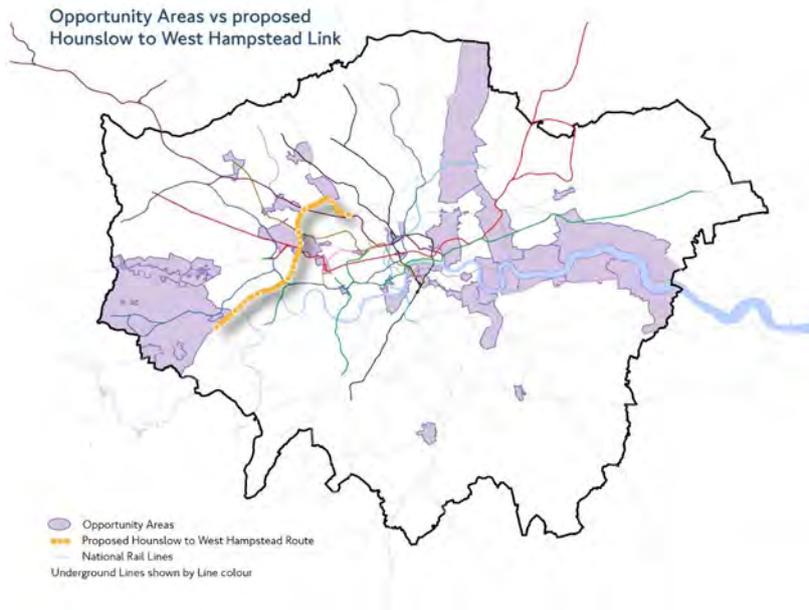
**Annex: Background data**

Index of Multiple Deprivation  
vs proposed Hounslow to  
West Hampstead Link



Change in population by  
Borough: 2016 to 2031

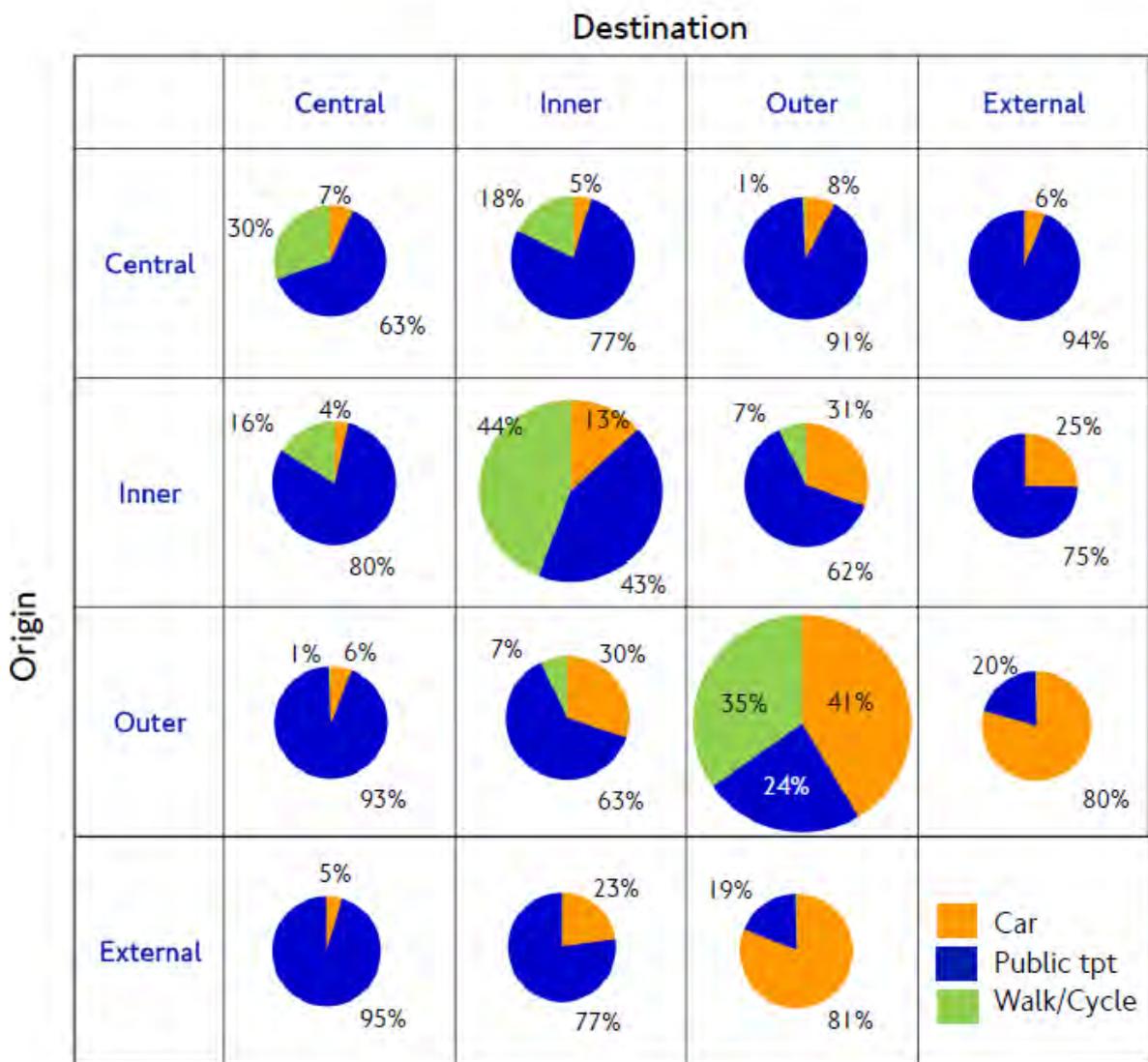




Analysis shows that the majority of journeys in London - 70% - will be made within or between inner and outer London.

	C	I	O	X
C	3%	4%	2%	2%
I	5%	21%	5%	1%
O	3%	5%	39%	3%
X	2%	1%	3%	

Around 30% of journeys between inner and outer London and 41% of journeys within outer London will be made by car.



Emerging policy is therefore identifying the need to reduce car use in inner and outer London by changing the relative appeal of the car compared to other modes in terms of price, time or convenience.

# West London transport Infrastructure Constraints: Evidence Base

Jon Bunney, Systra



# Presentation Structure

1. Project Scope
2. Stakeholder Consultees
3. Policy Context
4. Key Trends and Projections
5. Growth Area Connectivity
6. Demand for Orbital Transport
7. Impact of Committed Investment
8. Key Sub-regional Transport Constraints
9. Developing Possible Schemes

## Overall study aims

*Quantify the current and future costs to the economy associated with inadequate transport infrastructure focusing on road and rail, and identify those specific sub-regional transport infrastructure schemes that are most likely to yield the greatest return on investment and economic benefit to the WLA sub-region as a whole*

## Our approach

1. Collation of available data sources from existing literature, previous transport studies, transport model outputs, and other survey data
2. Consultations with stakeholders
3. Identification of Transport Infrastructure Constraints and their associated cost to the sub-regional economy
4. Identification, appraisal and prioritisation of schemes

## Stakeholders

- Mark Frost, LB Hounslow:
- Alan Tilly, LB Hillingdon
- Bob Casteljin, LB Hillingdon
- Hanif Islam, LB Harrow
- Chris Cole, LB Ealing
- Rachel Best, LB Brent
- Nick Boyle, LB H&F
- Nick Lynch, LB Barnet
- Paul Callender, LB Barnet
- Paul Bowker, LB Barnet
- Clare Woodcock, OPDC
  
- Anthony McNamara, WestTrans
- Theo Panayi, Heathrow Airport
  
- Georgina Barretta, TfL Area Lead
- Stefan Trinder, TfL Modelling & Appraisal
- Mark Honey, TfL Modelling & Appraisal
- Nick Blades, TfL (Hangar Lane)
- Shamal Ratnayaka, TfL (Heathrow Surface Access)
- Christopher Mills, TfL Transport Planning Manager (Heathrow Surface Access)
  
- Chief Planning Officers Group, West London Growth Directors Board

- Economic Policies – key issues

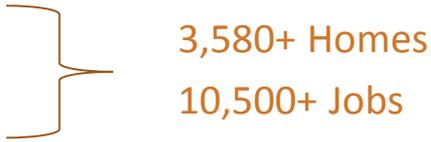
- London Plan identifies eleven Opportunity Areas within West London

- Cricklewood / Brent Cross (10,000 Homes, 20,000 Jobs)
- Collindale / Burnt Oak (12,500 Homes, 2,000 Jobs)
- Harrow & Wealdstone (2,800 Homes, 3,000 Jobs)
- Wembley (11,500 Homes, 11,000 Jobs)
- Park Royal (1,500 Homes, 10,000 Jobs)
- Old Oak Common (24,000 Homes, 55,000 Jobs)
- Kensal Canalside (3,500 Homes, 2,000 Jobs)
- White City (6,000 Homes, 10,000 Jobs)
- Earls Court (7,500 Homes, 9,500 Jobs)
- Southall (6,000 Homes, 3,000 Jobs)
- Heathrow (6,500 Homes, 12,000 Jobs)



- Two further areas (one designated an Intensification Area, the other a Strategic Outer London Development Centre) have both residential and employment growth targets

- The Golden Mile (LB Hounslow) (1,580 Homes, 10,000 Jobs)
- Mill Hill East Intensification Area (2,000 Homes, 500 Jobs)
- New Southgate (unconfirmed)



- In addition there are separate Housing Zones:

- Alperton (3,200 Homes)
- Hayes (2,500 Homes)
- Hounslow (3,500 Homes)
- Feltham (3,500 Homes)



- Transport Policies – key issues

- The Borough Local Implementation Plans present a consistent message on the:



- Challenge of congestion across the strategic highway network



- Specific issue of orbital connectivity

- West London Sub-regional Transport Plan identifies the:



- Continued dominance of car as a primary share of trips originating in the sub-region



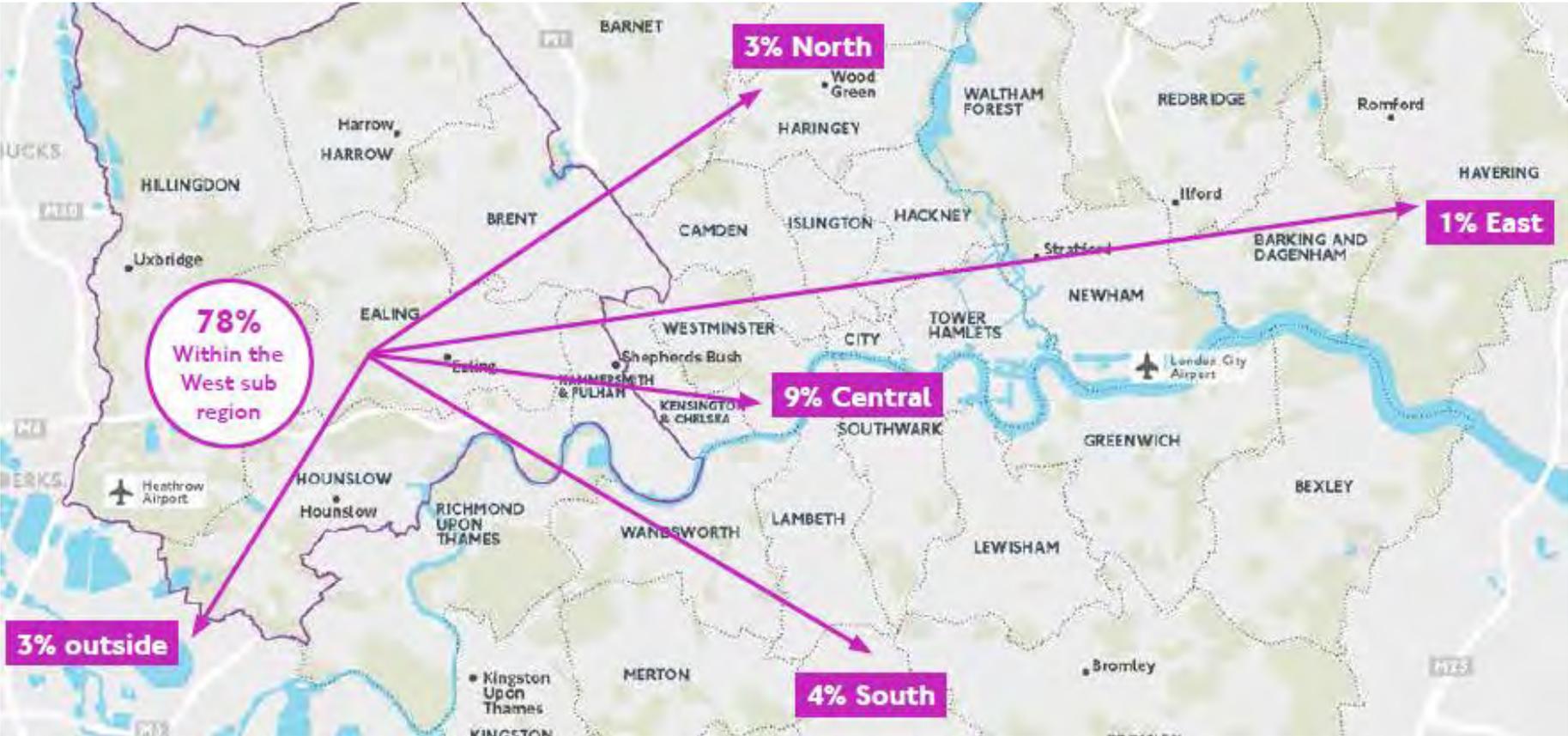
- Role of Crossrail, and subsequently HS2, in enhancing rail capacity and the requirement to maximise the subsequent opportunities that arise



- Challenge of delivering sustainable access to London's airports, particularly Heathrow

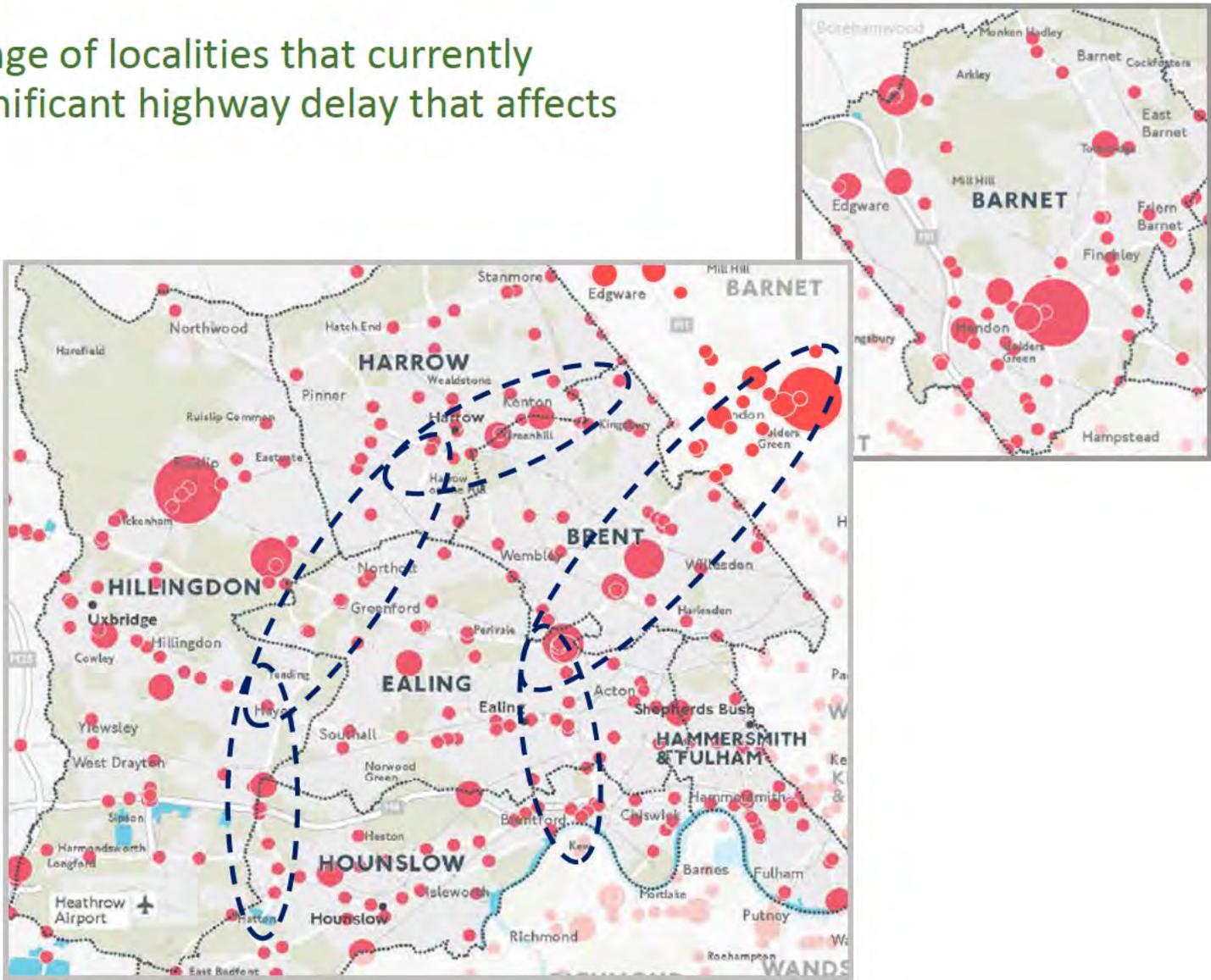
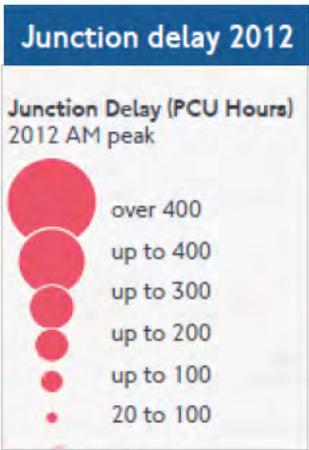
# Key Trends and Projections

- 78% of trips originating in the sub-region have a destination in the sub-region
- 63% of the sub-regions residents work within West London
- Internal sub-regional accessibility and movement clearly an important issue



# Key Trends and Projections

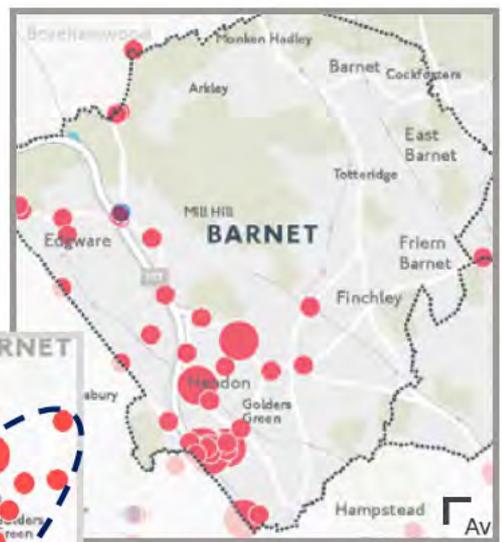
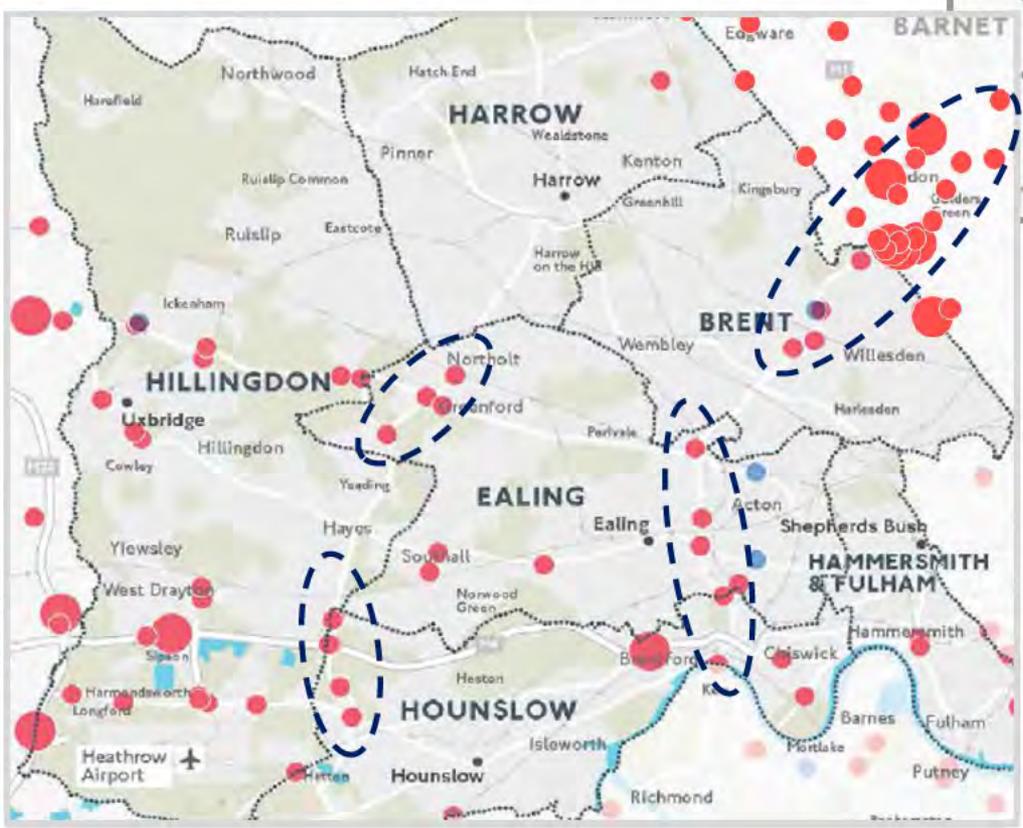
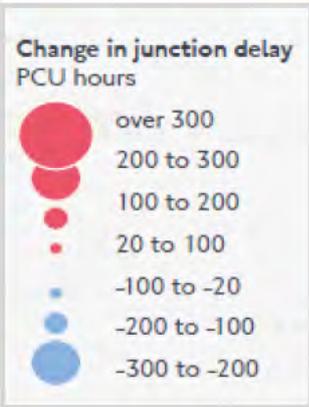
- There are a range of localities that currently experience significant highway delay that affects orbital travel



# Key Trends and Projections

- Some of these localities are also projected to experience further deterioration in journey time delays to 2031

**Change in junction delay 2011 – 2031 (AM peak)**

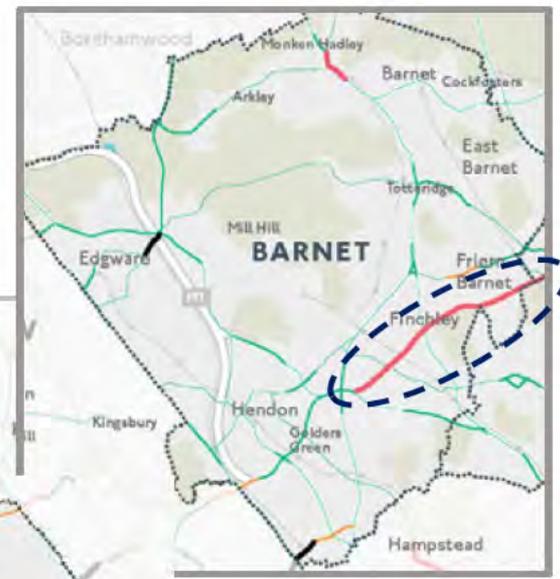
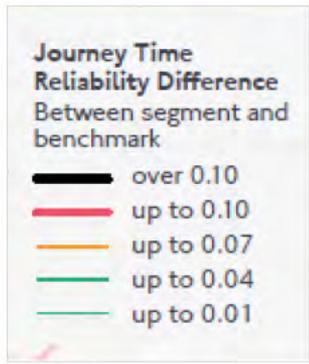


Average car speed expected to decrease by 3% by 2031

# Key Trends and Projections

- Furthermore, some of these localities also experience significant issues in terms of journey time reliability affecting orbital travel

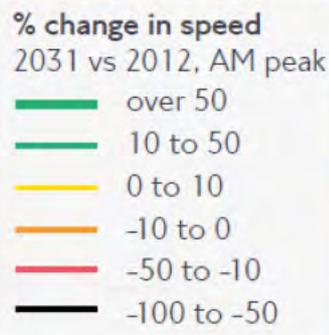
## Highway journey time reliability 2013



# Key Trends and Projections

- Buses currently provide important orbital public transport connectivity but are forecast to be subject to significant additional delays by 2031

**Change in bus delay 2012 – 2031 (AM peak)**

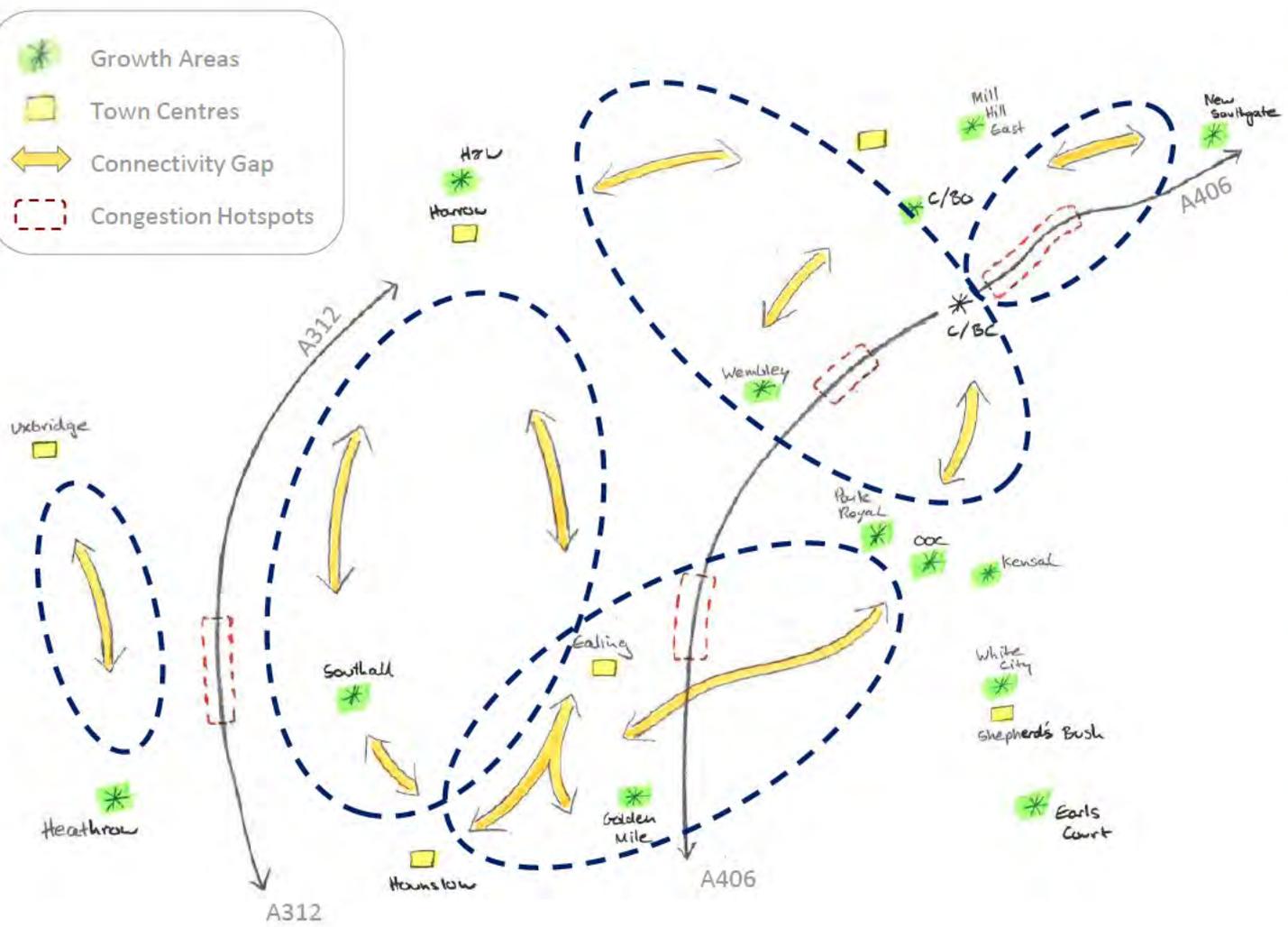






# Growth Area Connectivity

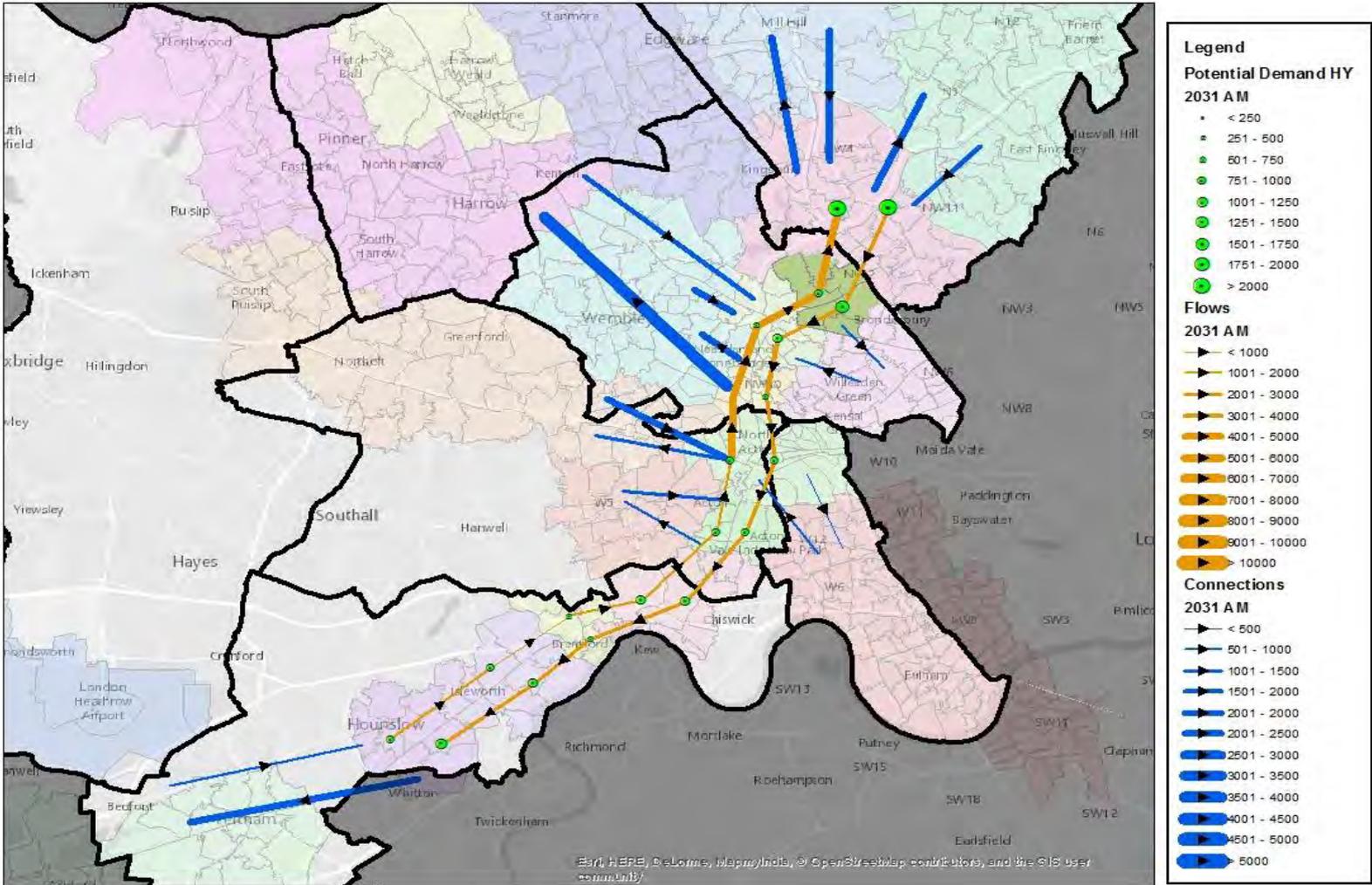
- Connectivity Gaps and Congestion Hotspots between Growth Areas and Town Centres



- Growth Areas**
- C/BO – Colindale / Burnt Oak
  - C/BC – Cricklewood / Brent Cross
  - H&W – Harrow & Wealdstone
  - OOC – Old Oak Common
  - Kensal – Kensal Canalside
  - New Southgate
  - Mill Hill East
  - Park Royal
  - White City
  - Earls Court
  - Wembley
  - Golden Mile
  - Southall
  - Heathrow

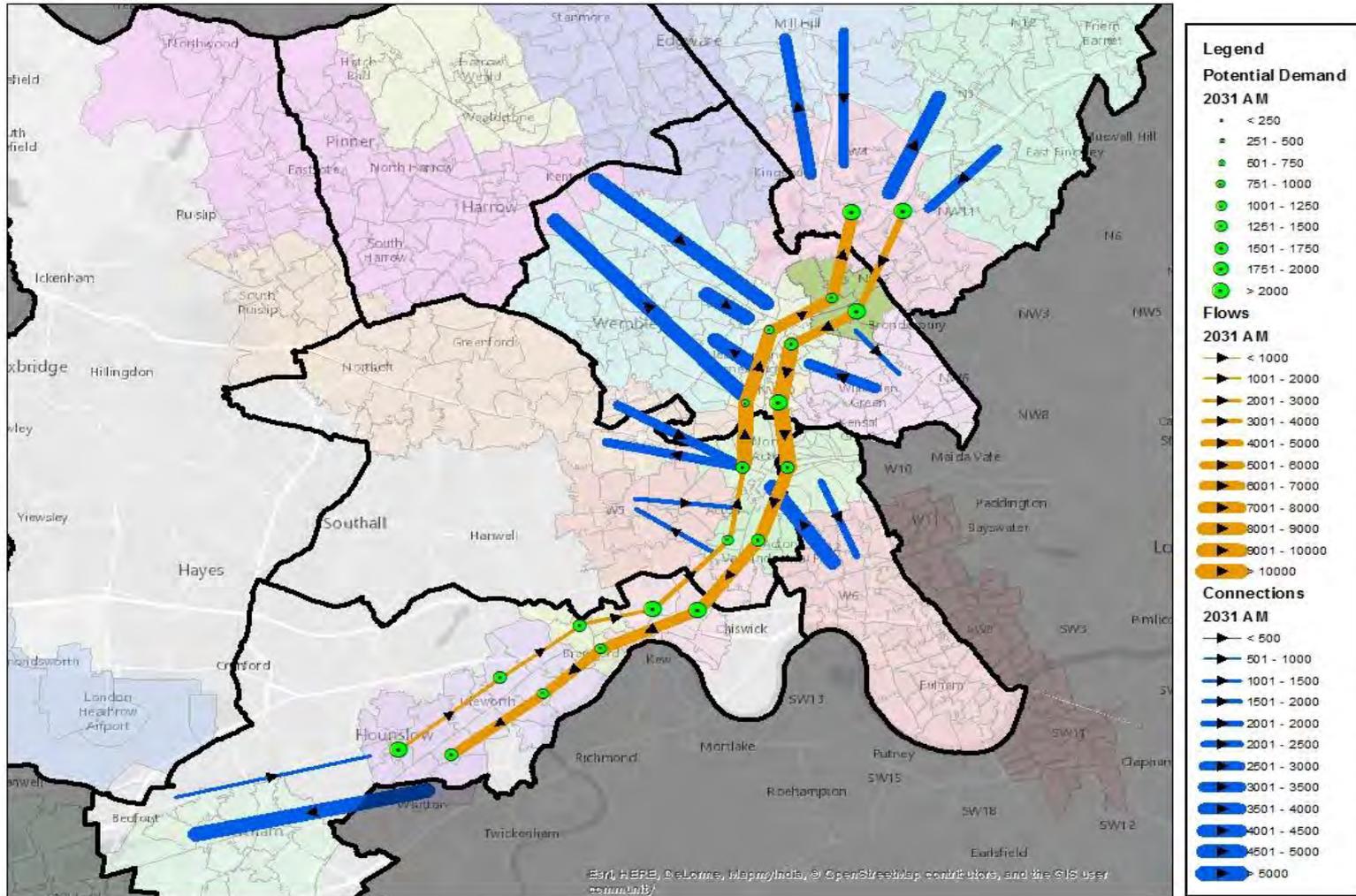
# Demand for Orbital Transport

- Projected future demand for orbital travel (A406 corridor, 2031) by road



# Demand for Orbital Transport

- Projected future demand for orbital travel (A406 corridor, 2031) by public transport



# Committed TfL Investment

## TfL Business Plan: 2016/17 to 2021/22

### Rail and Underground

- Crossrail (trains and enabling work)
- Modernisation of the Circle, District, Hammersmith & City and Metropolitan lines
- Modernisation of the Central and Bakerloo (new trains and signalling)
- Jubilee line capacity enhancement

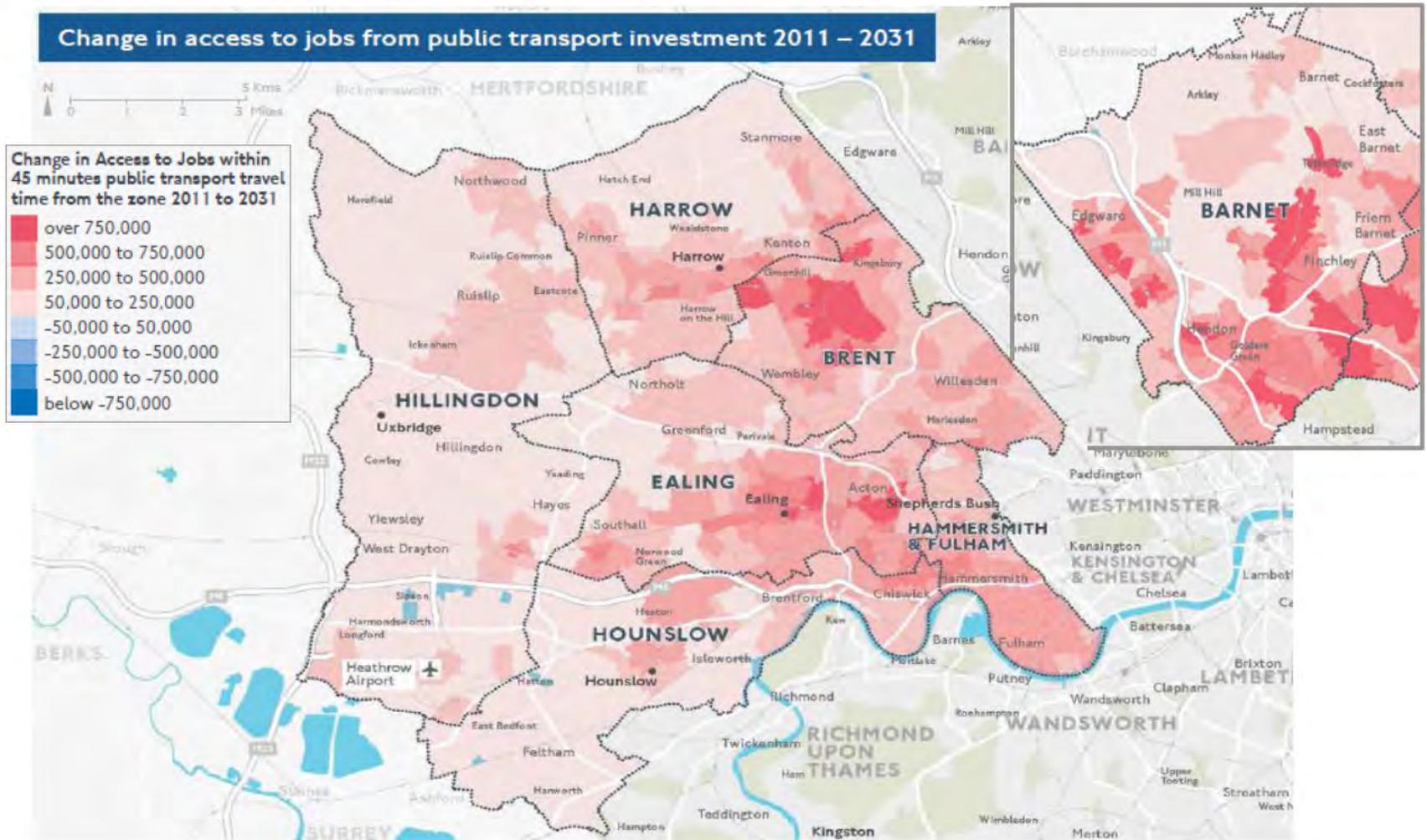
### Highways

- Healthy Streets - walking, cycling and public transport, more sustainable freight and servicing, plus initiatives to improve air quality
- Use new and improved strategic management, technology and communication to address problems on our roads
- Introduce bus priority measures in areas where emissions and service delays are greatest, and where bus use is highest
- Introduce an action plan to reduce freight's impact on safety and air quality

**Limited specific investment for West London Strategic Transport Network**

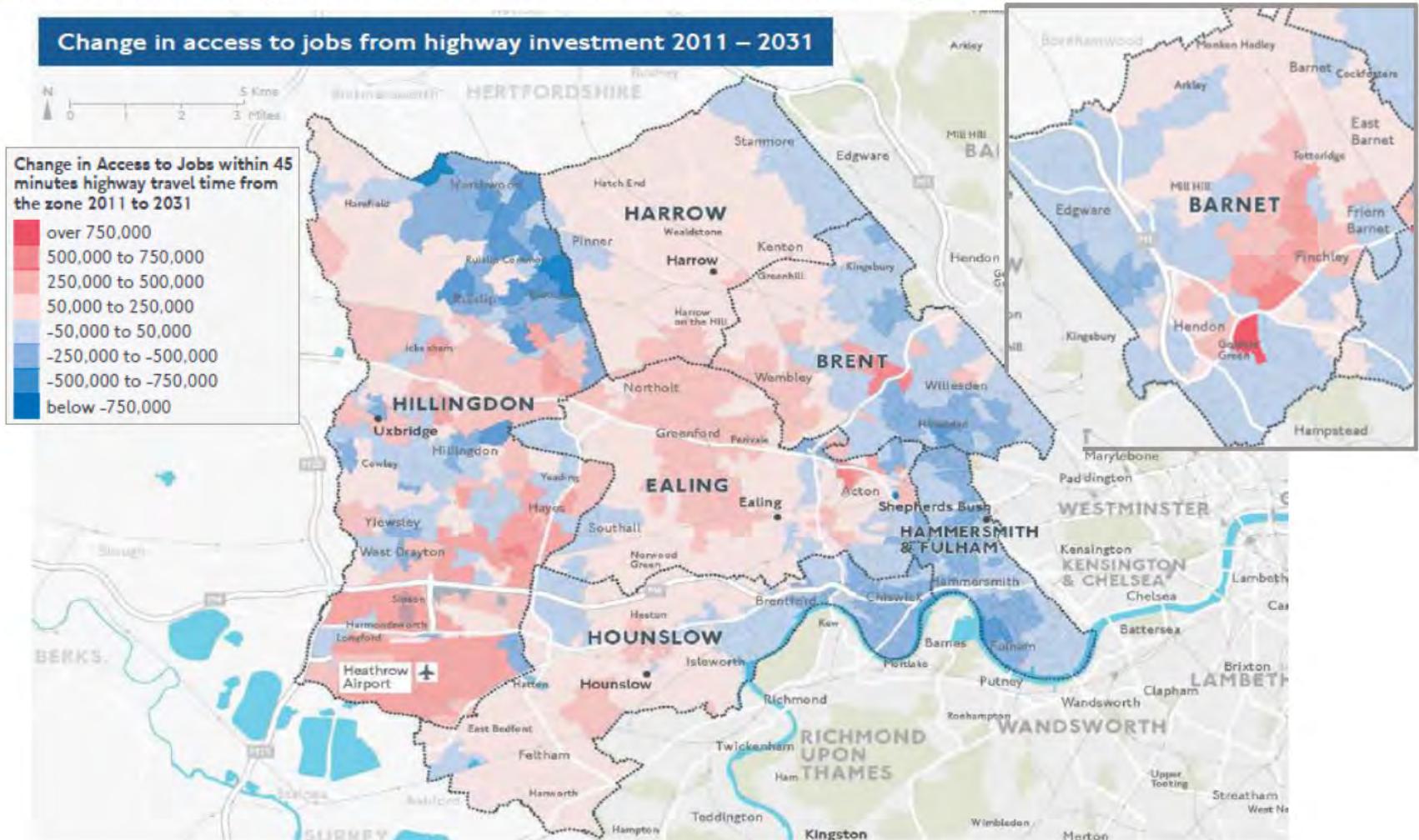
# Committed TfL Investment

- Impact of TfL committed public transport investment: general improvements due to Crossrail and Tube upgrades; however, generally on radial accessibility only



# Committed TfL Investment

- Impact of TfL committed highway investment: increased congestion offsets limited highway investment for much of the sub-region



# Key Orbital Transport Constraints

Three categories of sub-regional orbital transport constraints have been identified

## 1. Highway Congestion

- The A406 and A312 have been identified as key orbital highway routes
- Both are subject to congestion during peak periods, not only in terms of absolute delays but also the unreliability of journey times (a key issue for business travel)
- Specific localities identified include:
  - A406 junctions with A1/A41/M1/A5
  - A406 around Brent Park
  - A406 Hangar Lane (A40)
  - A406 between A40 and A4020 (Uxbridge Road)
  - A312 between M4 and Hayes Road

## 2. Lack of Orbital Rail Connections

- Comparative analysis of public transport and road journey times demonstrates the impact that limited orbital rail provision has upon the ability to travel by public transport
- Whilst there are orbital bus services, these are projected to become subject to similar levels of congestion as other highway movements
- Specific corridors with an absence of orbital rail provision include:
  - A406 corridor, in particular from Barnet to Brent / Harrow / Hounslow
  - A312 corridor, connecting Harrow to Southall / Ealing / Hounslow

# Key Orbital Transport Constraints

## 3. Lack of Orbital Connectivity between Growth Areas

- Connections between the identified Growth Areas (e.g. OPDC and Heathrow), and with the major Town Centres, will be a key issue in facilitating economic growth across the sub-region
- Even allowing for the spatial distribution of the sites across the sub-region (with peripheral sites inevitably less inter-connected) there are a range of constraints between some Growth Areas
- Key issues include connections to and from:
  - the four Growth Areas within Barnet
  - Harrow & Wealdstone
  - Southall
- In addition, there are also limitations in the orbital connections to Heathrow from other Growth Areas and Town Centres across the sub-region

# Developing Schemes

Strategic Transport Network	Type of Enhancement	Details
Highway Network Enhancements	<ul style="list-style-type: none"> <li>Expand junction capacity</li> </ul>	<ul style="list-style-type: none"> <li>Signalisation</li> <li>Additional approach lanes/expanded junction</li> <li>Grade separation</li> </ul>
	<ul style="list-style-type: none"> <li>Expand link capacity</li> </ul>	<ul style="list-style-type: none"> <li>Lane capacity</li> </ul>
	<ul style="list-style-type: none"> <li>Provide new capacity</li> </ul>	<ul style="list-style-type: none"> <li>New highway links</li> </ul>
	<ul style="list-style-type: none"> <li>Intelligent transport systems</li> </ul>	<ul style="list-style-type: none"> <li>Managed highway corridors</li> </ul>
Bus Network Enhancements	<ul style="list-style-type: none"> <li>Increased service capacity</li> </ul>	<ul style="list-style-type: none"> <li>Higher frequency services</li> <li>Larger vehicles</li> </ul>
	<ul style="list-style-type: none"> <li>New service provision</li> </ul>	<ul style="list-style-type: none"> <li>New routes</li> </ul>
	<ul style="list-style-type: none"> <li>Bus priority measures</li> </ul>	<ul style="list-style-type: none"> <li>Priority at junctions (physical, technological)</li> <li>Bus lanes</li> </ul>
Rail Network Enhancements	<ul style="list-style-type: none"> <li>Increased service capacity</li> </ul>	<ul style="list-style-type: none"> <li>Higher frequency services / new service patterns / signal enhancements</li> <li>Longer trains / higher capacity trains</li> </ul>
	<ul style="list-style-type: none"> <li>New heavy rail links</li> </ul>	<ul style="list-style-type: none"> <li>Passenger services on freight routes</li> <li>Rail spurs / junctions</li> <li>Rail links</li> </ul>
	<ul style="list-style-type: none"> <li>Light transit schemes</li> </ul>	<ul style="list-style-type: none"> <li>Light rail / trams / bus-based transit</li> </ul>



## West London Economic Prosperity Board

21 March 2017

<b>Title</b>	<b>Orbital Rail in West London</b>
<b>Report of</b>	Amar Dave (LB Brent)
<b>Status</b>	Public
<b>Urgent</b>	No
<b>Enclosures</b>	Appendix 1: Specification for a feasibility study into Orbital Rail around West London
<b>Officer Contact Details</b>	Luke Ward, Head of Growth, Employment and Skills, West London Alliance, wardlu@ealing.gov.uk

### Summary

Leaders have previously identified orbital transport infrastructure as an area of shared interest subject to more detailed analysis to identify which schemes would have the greatest economic benefit to West London boroughs, with a view to incorporating into Local Planning frameworks and the forthcoming Mayor's Transport Strategy (MTS) and London Plan. Growth Directors have as a result commissioned consultants to undertake some technical modelling to identify the demand for improved orbital transport options (both road and rail) as well as the specific schemes would most effectively boost growth and reduce the economic cost of congestion in the future.

One scheme that has emerged from this analysis is the Dudding Hill Rail Line, a freight line connecting Barnet to Hounslow via Wembley and the Old Oak Park Royal Development Corporation (OPDC) area. This scheme appears to be viable according to initial analysis undertaken by TfL and would also align closely with the emerging priorities in the London Plan and Mayor's Transport Strategy, namely that it would:

- connect areas of high jobs and housing growth;
- improve orbital journey times;
- reduce congestion on the road network; and
- improve environmental quality.

The next stage is to undertake a more detailed initial feasibility study in to the workings of the Dudding Hill Line and to agree that, subject to the findings of that study, the line is identified as a shared priority for West London boroughs. The feasibility study will need to be completed by June 2017 in order to inform the content of the MTS and London Plan.

## Recommendations

The Board is requested to:

1. **Agree that the Dudding Hill rail line is identified as a shared priority for boroughs represented on the West London Economic Prosperity Board based on the information collated to date by officers and TfL, and the advice of West London Growth Directors. This would be open to review at a future date as further data becomes available.**
2. **Agree for officers to commission the next stage feasibility study, to be completed by June 2017, in order to inform the content of the forthcoming Mayor's Transport Strategy and London Plan, as well as borough local plans.**
3. **Agree to/engage with the Deputy Mayor for Transport and the Deputy Mayor for Planning and Regeneration, in order to incorporate Dudding Hill into the MTS and London Plan.**
4. **Instruct officers to develop a longer-term road map and project plan that will set out how the Line will be taken to completion by the mid-2020s.**

### 1. WHY THIS REPORT IS NEEDED

- 1.1 Leaders have previously identified orbital transport infrastructure as an area of shared interest subject to more detailed analysis to identify which schemes would have the greatest economic benefit to West London boroughs.
- 1.2 One scheme that has emerged from this analysis is the Dudding Hill Rail Line, a freight line connecting Barnet to Hounslow via Wembley and the OPDC area. Modelling by TfL shows a strong level of passenger demand for this line.
- 1.3 The next stage of this work is to undertake a more detailed feasibility study in to the workings of the Dudding Hill Line and to agree that, subject to the findings of that study, it is identified as a shared priority for West London boroughs. The feasibility study will need to be completed by June 2017 in order to inform the content of the Mayor's Transport Strategy and London Plan.

### 2. STRATEGIC NARRATIVE FOR IMPROVED ORBITAL TRANSPORT

- 2.1 The West London Vision for Growth contains a focus on transport infrastructure, with an emphasis on orbital connectivity. The historical focus on radial connections (e.g. transport into and out of central London) is becoming increasingly difficult to justify as Londoners increasingly will live and work in outer-London in the future, and as congestion becomes a more significant constraint on economic growth.
- 2.2 The West London Vision for Growth paints a cross-cutting narrative for economic growth that includes jobs, skills and employment, housing, inward investment and the tax system, as well as infrastructure - both transport and digital. The idea is that everything local government does at the sub-regional level supports economic growth, removes barriers to growth, and supports

individual businesses and residents from all backgrounds to succeed and thrive.

2.3 Each of these themes makes an important contribution to our overall story for growth. Each theme supports, and is supported by, the others.

2.4 Orbital transport schemes such as the Dudding Hill Line should therefore be understood as critical pieces of sub-regional and London-wide infrastructure that:

- **Connect regeneration areas and “growth zones”** across outer-London including Brent Cross, Wembley, the OPDC area and the Golden Mile in Hounslow. It also makes growth areas in Central London and Heathrow Airport more accessible to the growing number of West Londoners who do not have access to a car and rely on high quality, well connected public transport.
- **Improve journey times around West London**, for instance allowing travellers to get from Barnet to the OPDC area in only 15 minutes and to Brentford in Hounslow in only 25 minutes. It would also be expected to have a positive impact on journey times by car as it would reduce congestion on the roads.
- **Improve air and environmental quality** by reducing the number of cars on the road. This would likely be the case even if Diesel rolling stock were used but would need to be confirmed through more detailed feasibility work.
- **Reduce pressure on public transport and road infrastructure in central and inner London** by supporting more distributed growth in London, including outer London.

### 3. BACKGROUND

3.1 This report relates specifically to the rail component of orbital connectivity in West London, in particular the “Dudding Hill” freight rail line that has been identified by Regeneris. This Line has been identified as being of particular interest because:

- It connects all the main growth areas in West London – Brent Cross, Wembley, the OPDC area, and into the Hounslow schemes. It also provides much greater rail accessibility to Heathrow and central London via the forthcoming Old Oak Common HS2/ Crossrail and Great West Mainline interchange station that will be built at Old Oak.
- It is twin track along its whole length
- Modelling by TfL shows significant passenger demand, enough to make the scheme viable.
- It has historically been a passenger Line, although is now used largely for freight (12 trains per day plus very occasional charter trains)

3.2 Stations are being considered at:

- Brent Cross OR Cricklewood
- Neasden (possibly with a spur to Wembley)
- Harlsden

- Old Oak area (connecting to HS2)
- Acton Central
- Down to Hounslow (connecting to the separate Brentford-Southall line).

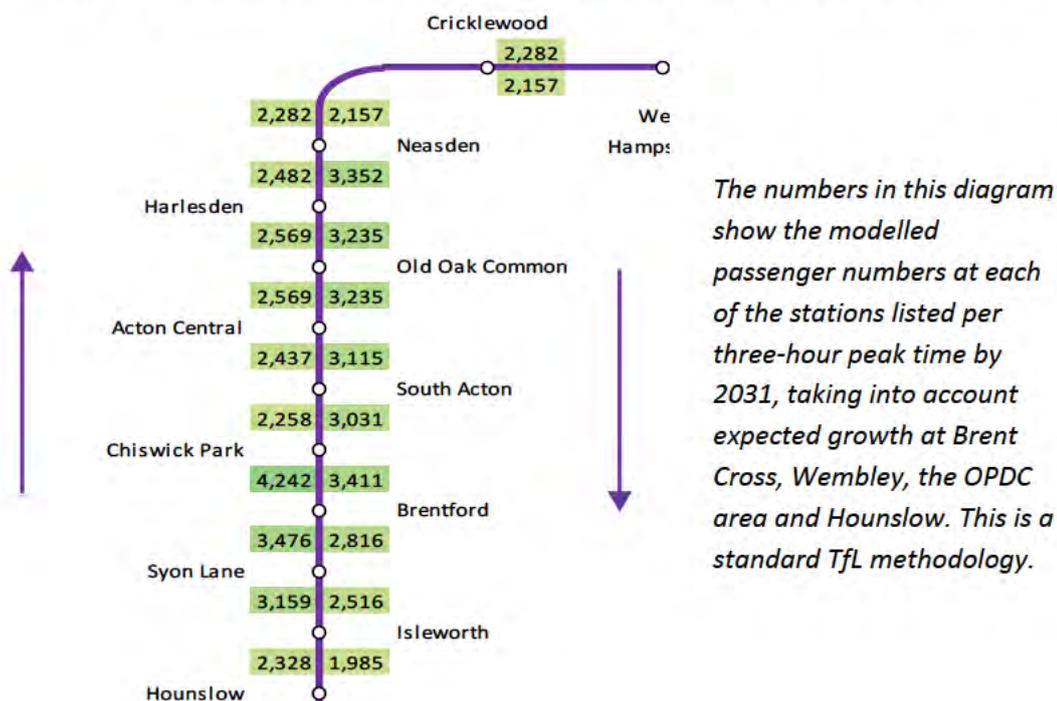
3.3 Previous modelling by TfL of passenger demand along the Dudding Hill Line shows c.2,000-3,000+ passengers each way by 2031 during peak hours, which would enable a 4 TPH service each way (one train every 15 minutes)

3.4 A Dudding Hill passenger service would also have a high degree of strategic fit with the emerging priorities that are expected to be contained within the forthcoming MTS e.g. connecting growth areas and town centres, removing cars from the road, and reducing travel times.

**Fig 1. Dudding Hill Line route (Source: TfL)**



**Fig2. Passenger demand modelling on the Dudding Hill Line 2031 (Source: TfL)**



3.5 The Dudding Hill line was referenced in the previous Mayor's Infrastructure Plan 2050 as a "longer term aspiration" (by 2041). Given this, the work undertaken to date, and the current timing relating to the draft MTS, **a key objective for this work is to bring this timetable forward by 15-20 years and to integrate it into the wider story of regeneration and growth in West London** that includes the OPDC area, Brent Cross, The Golden Mile and Wembley, as well as Heathrow.

#### 4. CURRENT POSITIONS OF BOROUGHES

4.1 Transport officers from the four affected boroughs, OPDC and TfL met on 1 February and 28 February 2017 to understand the scheme and to develop a sensible, evidence-based set of recommendations for Leaders and Directors. **It was agreed by the group, based on the best information and data currently available, that further work to assess the feasibility of the scheme in more detail was appropriate. The group also endorsed the recommendations set out in this report.**

4.2 It is important to note that, alongside the overall story for West London associated with the Dudding Hill Line, individual boroughs and OPDC also have local requirements and objectives which can all be addressed through the next stage of analysis. These are set out below (in alphabetical order).

- **BARNET:** would like to take a view about whether the line should have a station at either the new Brent Cross Thameslink Station (and on to Hendon and national rail services) or at Cricklewood (and then into the London Overground via West Hampstead).

- **BRENT:** would like the option of a spur between Neasden Junction and Wembley Stadium to be considered, as this is a priority for the borough. Also need to understand where any depot would be located for the Dudding Hill rolling stock.
- **EALING:** Supportive in principle but no official position yet. The Borough has asked for the viability of a station at Harlsden to be incorporated into the scheme concept as well as an investigation to the impact of the level crossings at Acton Central and South Acton.
- **HAMMERSMITH AND FULHAM:** Supportive in principle but wants to understand how work on orbital connectivity can benefit residents and businesses in Hammersmith and Fulham.
- **HARROW:** Supportive in principle but also keen to understand how work on orbital connectivity can benefit Harrow businesses and residents.
- **HOUNSLOW:** Noted the need to ensure that any focus on Dudding Hill north of OPDC did not damage the viability of established work on rail priorities on the Hounslow side. Also wants to ensure that any work on the wider Dudding Hill line makes use of existing detailed studies commissioned in Hounslow previously.
- **OPDC:** OPDC is interested in the ability of this scheme to enhance rail accessibility to Old Oak and Park Royal. OPDC would like to better understand the detail of the proposal and how it can be achieved within the constraints of the changes already planned for the Old Oak and Park Royal area, including the delivery of homes and jobs, and the impact it would have on other potential future rail enhancements to Old Oak and Park Royal.
- **TfL:** Have been supportive of this work to date and offered in-kind support in the form of advice, guidance, and technical input as reasonably required by the WLA.
- LBs Harrow, H&F and Hillingdon are not directly affected by the Dudding Hill Line's route but have been invited to engage should they wish to do so.

4.3 Boroughs have also highlighted a number of **shared issues and questions** that can be addressed through the next phase of feasibility work, should leaders chose to proceed:

- The impact of a passenger service on Dudding Hill on **freight** movement on the line and displacement to the road network.
- The net **environmental impact** of running a 4 TPH Diesel service on the line, offset by the reduction in car usage.
- Timing and phasing of the service in relation to the wider network, particularly at **Acton Wells**.

## 5. OBJECTIVE OF THIS WORK

5.1 The objective of work on the Dudding Hill line in the short-medium term is to:

- Bring it forward from being an “aspirational long-term scheme” as set out in the GLA's 2050 Infrastructure Plan to one that is delivered on the ground in the 2020s as part of a wider narrative relating to connecting strategic growth areas, Heathrow, and the wider country.

- Agree at the West London Level that Dudding Hill is (or isn't) a scheme of shared priority based on the information currently available and subject to future review.
- Deliver the more detailed feasibility study that is described in Appendix One of this report, in collaboration with TfL, by June 2017 before the end of the expected MTS consultation
- Secure agreement from the GLA and TfL via Deputy Mayors to incorporate Dudding Hill into the London Plan and MTS.

## **6. IMMEDIATE NEXT STEPS**

- 6.1 Should the WLEPB approve the recommendations set out within this paper then officers will proceed to commission the feasibility study set out in Appendix One, as well as engage with officers in the LGA and TfL, as well as DfT and DCLG to lobby to have the scheme included within the forthcoming Mayor's Transport Strategy and London Plan.
- 6.2 Officers within West London boroughs will also begin the process of embedding the scheme into local planning frameworks, including Local Plans.

## **7. REASONS FOR RECOMMENDATIONS**

- 7.1 Long term projections of the London population and economy show that transport infrastructure is likely to become an increasing constraint on growth. We also know that with a falling rate of car ownership in outer London that the role of high quality transport infrastructure that connects the places that people live and work is crucial. The recommendations set out in this report address these issues and will put West London in a good position to grow well into the future

## **8. ALTERNATIVE OPTIONS CONSIDERED AND NOT RECOMMENDED**

- 8.1 It is understood that orbital rail schemes will always operate alongside road (bus and car) and other rail (Tube, national rail etc) transport options as part of a holistic and multi-faceted approach to supporting west Londoners to get around the sub-region. Leaders previously requested that a package of road schemes be developed to improve orbital connectivity. These road schemes are being developed alongside the Dudding Hill rail option and will be brought back to the WLEPB at a future date

## **9. POST DECISION IMPLEMENTATION**

- 9.1 Should this item be agreed by the WLEPB then Growth Directors, with support from West London transport planners, will commission the delivery of a more detailed feasibility study on the Dudding Hill Rail Line. The line will also be incorporated into the local planning frameworks of the boroughs affected by the line.
- 9.2 In addition, TfL and the GLA will be engaged with to secure the inclusion of the Dudding Hill rail line in to the forthcoming Mayor's Transport Strategy and the London Plan.
- 9.3 Furthermore, officers will develop a longer-term "road map" that will set out how the Dudding Hill line will be brought to reality by the 2020s. This road map will be incorporated into the medium and longer-term planning activity of individual West London Boroughs and of the WLA.

## **10 IMPLICATIONS OF DECISION**

### **10.1 Corporate Priorities and Performance**

- 10.1.1 The West London Vision for Growth highlights improved orbital transport infrastructure as a priority for the sub-region.

### **10.2 Resources (Finance & Value for Money, Procurement, Staffing, IT, Property, Sustainability)**

- 10.2.1 This review has the potential for economic benefit to the whole WLA area. Recommendations b and d have a cost, the funding of which is below delegated limits and will be agreed by Growth Directors subject to members agreeing these recommendations.

### **10.3 Social Value**

- 10.3.1 The proposal set out here support improved health and wellbeing outcomes for people and businesses in West London by enabling them to move around more quickly and cheaply than is often the case, and be improving the quality of the environment.

### **10.4 Legal and Constitutional References**

- 10.4.1 This work falls within the following sections of the WLEPB's Functions and Procedure Rules:
- Representing the participating local authorities in discussions and negotiations with regional bodies, national bodies and central government on matters relating to economic prosperity for the benefit of the local government areas of the participating authorities.
  - Representing the participating authorities in connection with the Greater London Authority, London Councils and the London Enterprise Panel, for the benefit of the local government areas of the participating authorities, in matters relating to the economic prosperity agenda

- Representing the participating local authorities in discussions and negotiations in relation to pan-London matters relating to economic prosperity.

10.4.2 The Joint Committee's role and purpose on behalf of the Participating Boroughs relates to ensuring appropriate, effective and formal governance is in place for the purposes of delivering the West London Vision for Growth and advancing Participating Boroughs' aspirations for greater economic prosperity in West London, including promoting "the Economic Prosperity Agenda", in partnership with employers, representatives from regional and central government, and education and skills providers.

10.4.3 The purpose of the Joint Committee will be collaboration and mutual co-operation and the fact that some functions will be discharged jointly by way of the Joint Committee does not prohibit any of the Participating Boroughs from promoting economic wellbeing in their own areas independently from the Joint Committee. The Joint Committee is not a self-standing legal entity but is part of its constituent authorities. Any legal commitment entered into pursuant of a decision of the Joint Committee must be made by all of the Participating Boroughs.

## **10.5 Risk Management**

10.5.1 The risk of not taking early action to improve joined up, high quality across West London is that growth across West London boroughs is lower than might otherwise have been the case, resulting in few jobs, a smaller tax base, and lower levels of investment than would otherwise be the case.

## **10.6 Equalities and Diversity**

10.6.1 This work currently has no equality or diversity implications. If brought to fruition however the Dudding Hill Line would connect many of the sub-region's most deprived communities with employment opportunities and growth areas across London, and allow them to access jobs and employment opportunities in these areas at a lower cost and more quickly than would often be possible by other forms of public transport or private car. A full EIA would be undertaken should this work progress to the stage of development that would require this.

## **10.7 Consultation and Engagement**

10.7.1 This work does not currently affect the public. All West London boroughs, plus the GLA, TfL and the Old Oak Command and Park Royal Development Corporation, as well as the business community have all been heavily involved in the development of the proposals to date. The public and businesses will be consulted as appropriate as this work progresses.

## **10.8 Insight**

10.8.1 The proposals set out in this report build upon the findings of the "West London Infrastructure Constraints" project that was commissioned by Growth

Directors in November 2016. It also builds on extensive work undertaken by individual boroughs into orbital and rail connectivity solutions.



## West London Economic Prosperity Board

21 March 2017

<b>Title</b>	<b>Orbital Transport Insight Findings</b>
<b>Report of</b>	Amar Dave (LB Brent)
<b>Wards</b>	All
<b>Status</b>	Public
<b>Urgent</b>	No
<b>Enclosures</b>	Appendix A: West London Transport Infrastructure Constraints: Evidence Base
<b>Officer Contact Details</b>	Luke Ward, Head of Growth, Employment and Skills, West London Alliance, E: <a href="mailto:wardlu@ealing.gov.uk">wardlu@ealing.gov.uk</a> , T: 07738 802929

### Summary

Leaders have previously identified orbital transport infrastructure as an area of shared interest subject to more detailed analysis.

West London Growth Directors have as a result commissioned consultants Regeneris and JMP/SYSTRA to undertake some technical analysis to identify the current and future demand for improved orbital transport (both road and rail), the economic costs of inadequate orbital infrastructure, and to highlight the specific sorts of scheme that would most effectively boost growth and reduce the costs of congestion in the future.

This item will involve a presentation from the consultants setting out the key findings of their work and suggested areas of focus for West London boroughs.

### Recommendations

The Board is asked to:

- 1) Note the presentation commissioned by growth directors setting out the main findings from the orbital infrastructure analysis undertaken on behalf of the Board.
- 2) Comment on the main findings set out in the presentation and identify any areas of particular interest for future attention.
- 3) Note that this item has informed the content of the following agenda item on orbital rail transport around West London

## **1. WHY THIS REPORT IS NEEDED**

- 1.1 At its meeting on 21 September 2016 the WLEPB requested further analysis to inform its work in relation to orbital transport in West London.

## **2. REASONS FOR RECOMMENDATIONS**

- 2.1 Long term projections of the London population and economy show that inadequate transport infrastructure is likely to become an increasing constraint on economic growth. The recommendations in this report will support an evidence-based and joined up West London strategic response that will address this constraint and ensure the economic competitiveness of West London boroughs in the future.

## **3. ALTERNATIVE OPTIONS CONSIDERED AND NOT RECOMMENDED**

- 3.1 n/a

## **4. POST DECISION IMPLEMENTATION**

- 4.1 Comments by the WLEPB will be incorporated into the report by consultants prior to its finalisation.

## **5. IMPLICATIONS OF DECISION**

### **5.1 Corporate Priorities and Performance**

- 5.1.1 The West London Vision for Growth highlights improved orbital transport infrastructure as a shared priority for the sub-region.

### **5.2 Resources (Finance & Value for Money, Procurement, Staffing, IT, Property, Sustainability)**

- 5.2.1 Work to date has been funded from existing resources. No additional resources are sought at this point. Decisions about funding of further work in the future will be made on a case by case basis.

### **5.3 Social Value**

- 5.3.1 n/a

### **5.4 Legal and Constitutional References**

- 5.4.1 The Joint Committee's role and purpose on behalf of the Participating Boroughs relates to ensuring appropriate, effective and formal governance is in place for the purposes of delivering the West London Vision for Growth and advancing Participating Boroughs' aspirations for greater economic prosperity

in West London, including promoting “the Economic Prosperity Agenda”, in partnership with employers, representatives from regional and central government, and education and skills providers. The purpose of the Joint Committee will be collaboration and mutual co-operation and the fact that some functions will be discharged jointly by way of the Joint Committee does not prohibit any of the Participating Boroughs from promoting economic wellbeing in their own areas independently from the Joint Committee. The Joint Committee is not a self-standing legal entity but is part of its constituent authorities.

## **5.5 Risk Management**

5.5.1 This report will support the WLEPB to make decisions based on the best possible evidence about how people move around west London both now and in the future.

## **5.6 Equalities and Diversity**

5.6.1 This study applies to people from all backgrounds across West London. In due course it is hoped that it will inform projects which will have a positive equalities impact.

## **5.7 Consultation and Engagement**

5.7.1 N/a

## **5.8 Insight**

5.8.1 The presentation accompanying this cover report sets out the findings of the orbital transport infrastructure analysis commissioned by Growth Directors.

## **6. BACKGROUND PAPERS**

6.1 None



**regeneris**

ECONOMICS · RESEARCH · ANALYSIS

West London Transport  
Infrastructure Constraints.  
Evidence and Outcomes

An Executive Summary  
Report by Regeneris  
Consulting and Systra

**SYSTRA**

West London Alliance

West London Transport Infrastructure Constraints:  
Evidence and Outcomes

May 2017

Regeneris Consulting Ltd  
[www.regeneris.co.uk](http://www.regeneris.co.uk)

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DRAFT

# 1. Executive Summary

## Project Overview

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- 1.1 The West London Alliance (WLA) has commissioned Regeneris and Systra to carry out the West London Transport Infrastructure Constraints study. The focus of the research is to quantify the economic costs of inadequate orbital road and rail infrastructure in the sub-region, with a view to identifying those specific infrastructure interventions and investments at the scheme level that would yield the greatest return to the economy if they were introduced.
- 1.2 The scope of the study focuses upon strategic orbital transport corridors but also provides due consideration to parts of the radial network where they connect to the orbital corridors to provide sub-regional connectivity. The types of infrastructure which are within scope includes strategic orbital road and rail connections between growth areas across West London.
- 1.3 The study has been carried out in two stages. **Part One** identifies the costs of constraints to the sub-regional economy based on a review of exiting literature and transport studies. The outputs from this part of the study are summarised within the **Evidence Report**.
- 1.4 **Part Two** of our research utilises the evidence base from Part 1 to identify a long-list of potential scheme interventions that could address the identified major infrastructure constraints across the sub-region. Each potential intervention has then been appraised and prioritised so as to provide a short-list of scheme interventions that are considered most likely to support the future growth of the West London sub-region. The outputs from this part of the study are summarised within the **Outcomes Report**.

## Part One: Evidence Base

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- 1.5 The Part One Evidence Report provides a detailed analysis of the current policy context, key trends and projections, as well as current orbital connectivity, including between the set of 14 designated 'growth areas' and major sub-regional town centres.

### Connectivity Gaps

- 1.6 Figure 1.1 presents a summary of the identified 'connectivity gaps' and 'congestion hotspots' between the 'growth areas' and town centres.
- 1.7 The gap analysis identified five separate areas with strategic orbital connectivity issues:
  - Connections across Barnet
  - Connections from Barnet 'growth areas' to Harrow and Brent 'growth areas'
  - Connections from Harrow to Ealing and Hounslow
  - Connections from OPDC and Ealing to Hounslow
  - Connections from Hillingdon to Heathrow
- 1.8 The evidence base also demonstrated a clear projected demand for orbital travel, in particularly around the A406 corridor for not simply road travel but also public transport. There are significant potential flows between Barnet, Brent and Ealing, as well as Hounslow.



## Summary of Evidence Base

- 1.14 The baseline analysis provides the evidence of a range of significant constraints affecting orbital travel across West London. More significantly, a number of these constraints affect connectivity to, from and between 'growth areas' within the sub-region, in particular with their links to Major Sub-regional Town Centres. These transport constraints will restrict the movement of people and goods between these areas impacting upon the scale of housing, employment and business (GDP) growth that can be achieved. This provides a strong evidence base for the requirement for mitigating measures.

## Part Two: Scheme Outcomes

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- 1.15 The Part One Evidence Base demonstrates the current and future constraints on orbital travel across the sub-region and the requirement for infrastructure investment to provide new transport connectivity. Part Two of the study examines the potential options for these new schemes.

### Scheme Option Development

- 1.16 An initial 'long list' has been developed of scheme options that could offer some potential to resolve the identified connectivity constraints. These schemes fall into three broad types of measures: Orbital Rail; Orbital Road; and Orbital Bus Rapid Transit.

#### Orbital Rail

- 1.17 The Evidence Base identified a range of strategic orbital connections for which there is currently limited, or no, rail provision. The development of schemes to address these connectivity gaps is challenging within a built-up environment where land availability restricts the opportunities to construct new rail lines. An initial assessment was, therefore, undertaken to identify freight lines and disused lines that could potentially be (re)instated for passenger rail services. Where opportunities for new rail services and lines were identified, these were also included within the long-list as well. In total, 16 potential rail schemes were identified to take forward into the appraisal process (see Table 1.1).

#### Orbital Road Schemes

- 1.18 The Evidence Base for the study demonstrated a range of capacity constraints and congestion hotspots across the two main orbital road corridors of the A406 and A312/A4006. A number of these areas suffer not only from the scale of delays, but also the degree to which the delays can vary from day-to-day, creating uncertainty for strategic orbital road trips. The future modelling indicates that this situation is likely to deteriorate significantly for some parts of the network.
- 1.19 An initial assessment was undertaken to examine specific areas where investment in highway infrastructure could generate positive benefits for orbital road travel. This process identified seven conceptual highway schemes to take forward into the appraisal process (see Table 1.1).

#### Orbital Bus Rapid Transit Schemes

- 1.20 Whilst the primary focus of the study is on road and rail, due to the restrictions in the ability to deliver new rail-based public transport solutions there is considered to be merit in considering bus-based solutions, as long as they are substantive in nature and can be deemed to contribute on a sub-regional level. A range of bus-rapid transit schemes have, therefore, been considered that offer direct, high speed, connections, either through segregated or prioritised provision. This process identified five conceptual bus rapid transit schemes to take forward for appraisal (see Table 1.1).

## Scheme Appraisal

### Overarching Appraisal Criteria

1.21 A set of objective appraisal criteria was established to determine how well individual scheme measures would perform against the key objectives of the study to enhance sub-regional orbital transport connectivity and support growth across West London. The following five objective appraisal criteria have been applied to each scheme on the long-list of potential measures:

- 1) **Economic impact:** is the scheme likely to have a positive impact upon the sub-regional economy, either through reducing journey times, congestion or improving reliability?
- 2) **Orbital connectivity:** does the scheme enhance orbital connections across the West London Sub-region?
- 3) **Growth Area Connectivity:** does the scheme enhance connectivity between Growth Areas or with Major Town Centres?
- 4) **Physical deliverability:** can the scheme be delivered easily in physical terms e.g. is land available?
- 5) **Value for Money:** what is the cost of the scheme likely to be in relation to the scale of the potential impacts?

### Appraisal Summary

1.22 Table 1.1 provides an overarching summary of the scoring for each individual scheme, along with their inter-dependencies and potential complementary nature.

		Dependant	Complementary	Economic	Orbital Connectivity	Growth Area Connectivity	Physical Deliverability	Value for Money
R1	Denham/West Ruislip – Uxbridge High Street	No	R2	+1	+1	0	-1	-2
R2	Uxbridge Vine Street – West Drayton	No	R1	+2	+2	+2	-3	-1
R3	West Drayton – Colnbrook - Staines	No	R2	+1	+2	0	-1	-1
R4	Ruislip Gardens - Ickenham	No	No	+1	+1	0	0	-1
R5	Greenford – West Ealing	No	No	0	+2	0	+2	+1
R6	Southall – Brentford Goods	No	No	+1	+1	+2	+2	+1
R6a	Southall – Brentford Goods – Brentford / Hounslow	(R6)	(R6)	+2	+3	+3	-2	0
R7	Edgware – Mill Hill East	No	No	+1	+2	+2	-3	-1
R8	Finsbury Park – Highgate – Alexandra Palace	No	No	+2	+1	0	0	0
R9	Neasden Junction - Neasden South Junction	R10	R10, R12, R13	+1	+1	+1	+1	+1

		Dependant	Complementary	Economic	Orbital Connectivity	Growth Area Connectivity	Physical Deliverability	Value for Money
R10	Dudding Hill Line	No	R9, R12, R13, R15	+3	+3	+3	0	+2
R11	Acton Canal Wharf Junction	R10	R10, R12, R15	+1	+1	0	0	-1
R12	Acton East Junction	No	R9, R10, R11	+1	+1	+1	+1	+1
R13	Junction Road Junction to Carlton Road Junction	R14	R14	+1	+1	+1	+2	+1
R14	Harringay Junction – Harringay Park Junction	R13	R13	+1	+1	+1	+2	+1
R15	South Action to Kew East Junction / Old Kew Junction Chord	No	R9, R10	+1	+1	+2	+2	+2
R16	Heathrow Southern Rail Access	No	No	+3	+1	+1	-1	0
H1	A406 – New Southgate – Colney Hatch	No	Other A406	+1	+1	+1	-1	0
H2	A406 – Brent Cross (A5 to A1)	No	Other A406	+2	+1	+2	-1	+1
H3	A406 – Brent Park	No	Other A406	+1	+1	+2	-1	+1
H4	A406 – Hangar Lane Junction	No	Other A406	+2	+1	+2	-1	+1
H5	A406 – Hangar Lane (A40) to Uxbridge Road (A4020)	No	Other A406	+1	+1	+2	-1	0
H6	A406 – M4 Junction	No	Other A406	+1	+1	+1	-1	0
H7	A312 – M4 to Hayes Road	No	No	+2	+1	+2	-1	+1
BRT1	A312 – Heathrow to Harrow	No	BRT2	+1	+1	+1	0	+1
BRT2	A4006 – Harrow to Cricklewood/Brent Cross	No	BRT1	+1	+1	+1	-1	0
BRT3	A408/A437/ A4020 – Heathrow to Uxbridge	No	No	+1	+1	+1	0	+1
BRT4	A410/A41 – Harrow & Wealdstone to Edgware	No	BRT5	+1	+1	+1	-1	0
BRT5	A5109 – Edgware to East Barnet	No	BRT4	+1	+1	0	-1	0

### Initial Ranking of Schemes

- 1.23 An initial ranking of schemes identified two schemes that would be extremely challenging to deliver without substantial tunnelling (R2: Uxbridge Vine Street – West Drayton, and R7: Edgware – Mill Hill East). These were therefore discounted.
- 1.24 In addition, a further 11 schemes were considered to have a low ranking indicating they were unlikely to offer sufficient value for money when considered against the specific objectives of this study. This included rail schemes R1, R3, R4, R8, and R11; highway schemes H1, H5, and H6; and bus rapid transit schemes BRT2, BRT4, and BRT5.

## Scheme Packages

### Packaging of Schemes

- 1.25 The remaining 16 schemes on the 'long-list' were all ranked either medium or high and are considered to have potential to deliver benefits to the West London Sub-region in terms of enhanced orbital connectivity, in particular between growth areas and town centres.
- 1.26 Some of these schemes are conditional upon other schemes (or each other) or are complementary. Others provide the opportunity to re-schedule rail services to provide additional connectivity. The individual scheme measures were, therefore, grouped into nine coherent packages of measures for further appraisal (see Table 1.2).

### Package Appraisal

- 1.27 The outcomes from the package appraisal process are summarised within Table 1.2.

Package	Economic	Orbital Connectivity	Growth Area Connectivity	Physical Deliverability	Value for Money	Prioritisation Level	
P1	Ruislip (Chiltern Line) to Ealing Rail	0	+2	0	+2	+1	L4
P2	Southall to The Golden Mile Rail	+1	+2	+2	+1	+1	L2
P3	Dudding Hill Rail Line	+3	+3	+3	0	+2	L1
P4	New Southgate to Cricklewood Rail	+1	+1	+1	+1	+2	L3
P5	OPDC to The Golden Mile / Hounslow Rail	+1	+1	+2	+2	+2	L2
P6	Southern Rail Access to Heathrow	+3	+1	+1	-1	0	L3
P7	A406 Road Schemes	+2	+1	+2	-1	+1	L2/L3
P8	Heathrow to Southall / Harrow - Road and Rapid Transit	+2	+1	+2	-1	+1	L2/L3
P9	Heathrow to Uxbridge Rapid Transit	+1	+1	+1	0	+1	L4

- 1.28 The Dudding Hill Line package of measures is considered to perform strongly against the appraisal criteria. The scheme offers a range of potential rail service operations that would provide additional sub-regional connectivity. Notably it would also complement two of the other rail packages, P3 and P5, offering the potential for rail connections from New Southgate, across the heart of the West London Sub-region, through to Hounslow and Feltham.

**Regeneris Consulting Ltd**

Manchester Office

4th Floor Faulkner House

Faulkner Street, Manchester M1 4DY

0161 234 9910

[manchester@regeneris.co.uk](mailto:manchester@regeneris.co.uk)

London Office

3rd Floor, 65 St. John's Street.

London EC1M 4AN

0207 336 6188

[london@regeneris.co.uk](mailto:london@regeneris.co.uk)

[www.regeneris.co.uk](http://www.regeneris.co.uk)



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ECONOMICS · RESEARCH · ANALYSIS

West London Transport  
Infrastructure Constraints.  
Outcomes

A Draft Report by  
Regeneris Consulting and  
Systra

**SYSTRA**

West London Alliance

West London Transport Infrastructure Constraints:  
Outcomes

March 2017

Regeneris Consulting Ltd  
[www.regeneris.co.uk](http://www.regeneris.co.uk)

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# 1. Introduction

## Overview

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- 1.1 The West London Alliance (WLA) has commissioned Regeneris and Systra to carry out the West London Transport Infrastructure Constraints study. The focus of the research is to quantify the economic costs of inadequate orbital road and rail infrastructure in the sub-region, with a view to identifying those specific infrastructure interventions and investments at the scheme level that would yield the greatest return to the economy if they were introduced.
- 1.2 The types of infrastructure which are within scope includes strategic orbital road and rail connections between growth areas across West London.
- 1.3 The West London Alliance (WLA) is a sub-regional partnership of seven West London councils which includes Barnet, Brent, Ealing, Hammersmith and Fulham, Harrow, Hillingdon, and Hounslow. The West London Vision for Growth is a key strategy document prepared by WLA which sets out an aspiration to deliver an ambitious growth programme across the area. The programme is overseen by leaders of six participating boroughs (not including LB Hillingdon) who work together through the West London Economic Prosperity Board (WLEB).
- 1.4 The WLA is undertaking a programme of research which can be used to develop their evidence base and support lobbying activity at a sub-regional level. This study aligns with the development of a new London Plan by the newly elected Mayor of London and the related development of new Local Plans across WLA member boroughs, and will also complement the development of the Mayors Transport Strategy.
- 1.5 The study is being carried out in two stages. **Part One** identifies the costs of constraints to the sub-regional economy based on a review of exiting literature and transport studies. This part of the study has been completed and has been summarised within the Evidence Report.
- 1.6 This report covers **Part Two** of our research that utilises the evidence base from Part 1 to identify a long-list of potential scheme interventions to address the identified major infrastructure constraints across the sub-region. Each potential intervention is appraised and prioritised so as to provide a short-list of scheme interventions that are considered most likely to support the future growth of the West London sub-region.

## Report Structure

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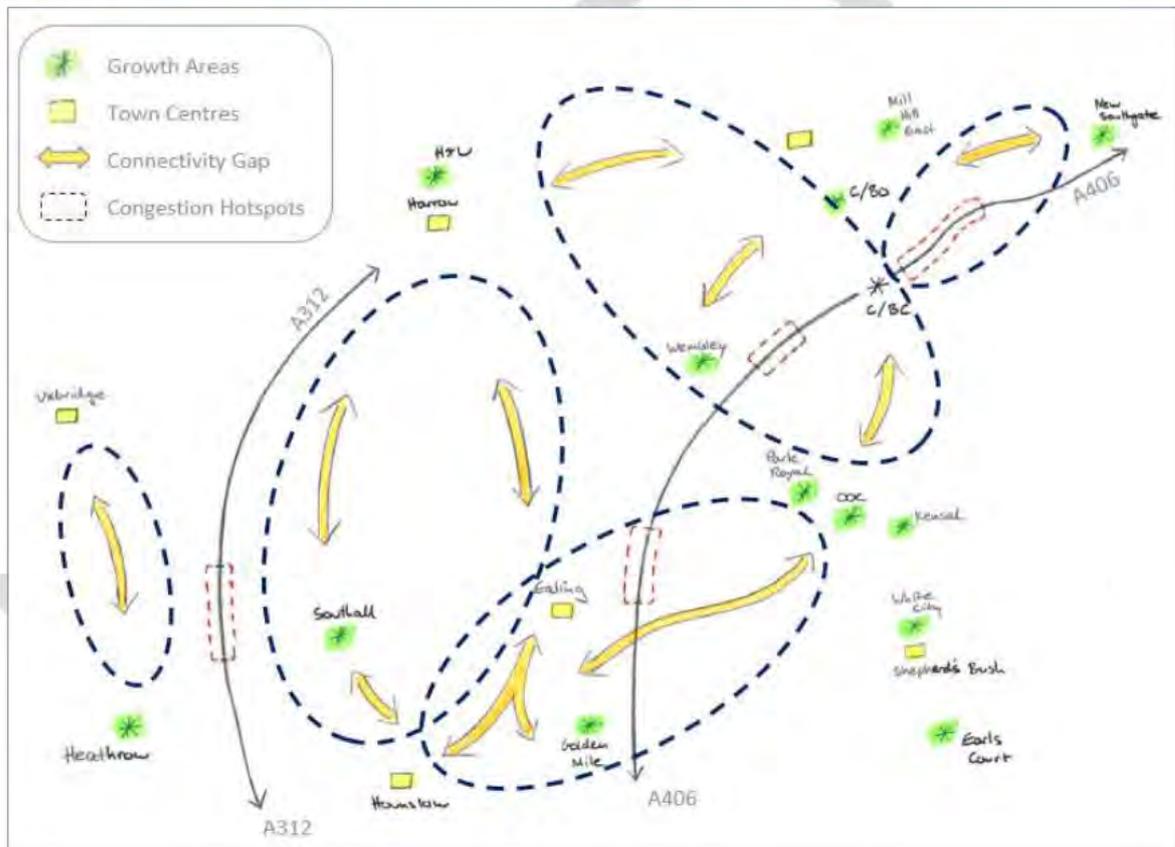
- 1.7 The remainder of this report is set out under the following headings:
  - Evidence of the impact of transport constraints on sub-regional economy
  - Scheme Option Development
  - Scheme Option Appraisal
  - Prioritisation of Scheme Options
  - Summary and Conclusions

## 2. Overview of Evidence Base

### Introduction

- 2.1 The scope of the study focuses upon strategic orbital transport corridors but also provides due consideration to parts of the radial network where they connect to the orbital corridors to provide sub-regional connectivity.
- 2.2 The Part One Evidence Report provides a detailed analysis of the current policy context, key trends and projections, as well as current orbital connectivity, including between the set of 14 designated 'growth areas' and major sub-regional town centres.
- 2.3 Figure 2.1 presents a summary of the identified 'connectivity gaps' and 'congestion hotspots' between the 'growth areas' and town centres.

Figure 2.1 Connectivity Gaps and Congestion Hotspots between Growth Areas and Town Centres



- 2.4 The gap analysis identifies five separate areas with orbital connectivity issues:
  - Connections across Barnet
  - Connections from Barnet 'growth areas' to Harrow and Brent 'growth areas'
  - Connections from Harrow to Ealing and Hounslow
  - Connections from OPDC and Ealing to Hounslow
  - Connections from Hillingdon to Heathrow

- 2.5 The evidence base also demonstrates a clear projected demand for orbital travel, in particularly around the A406 corridor for not simply road travel but also public transport. There are significant potential flows between Barnet, Brent and Ealing, as well as Hounslow.
- 2.6 Whilst Transport for London's 5-year business plan will deliver significant public transport enhancements, not least through Crossrail and Underground upgrades, these primarily focus on radial movements into and out from Central London, with limited improvement to orbital provision.

## Conclusions

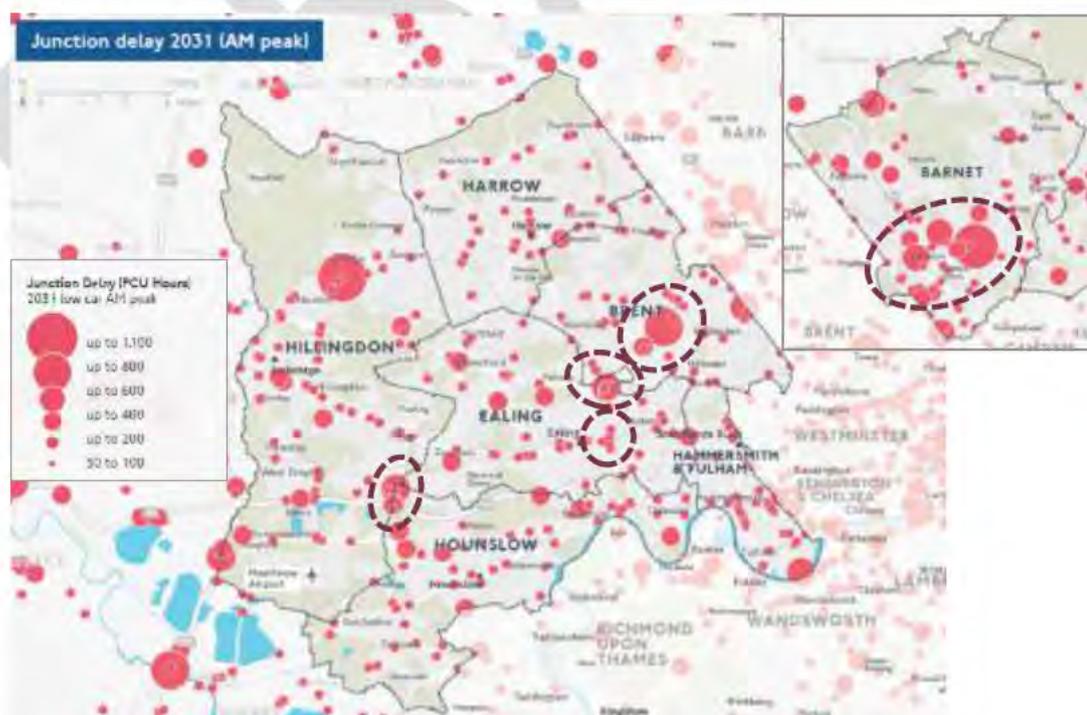
### Key Infrastructure Constraints

- 2.7 Three categories of sub-regional orbital transport constraints have been identified

#### Highway Congestion

- 2.8 The A406 and A312 have been identified as key orbital highway routes. Both are subject to congestion during peak periods, not only in terms of absolute delays but also the unreliability of journey times (a key issue for business travel).
- 2.9 Specific localities identified include:
  - A406 junctions with A1/A41/M1/A5
  - A406 around Brent Park
  - A406 Hangar Lane (A40)
  - A406 between A40 and A4020 (Uxbridge Road)
  - A312 between M4 and Hayes Road

Figure 2.2 Forecast Highway Network Junction Delay (2031)



Source: TfL West London Sub-regional Transport Plan (2016 Update)