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Comments from Ricardo-AEA

The methodology for estimating approach, initial climb and climb-out times is given in Appendix H (of the Environmental Statement for Implementation of Full Runway Alternation on Easterlies) in paragraphs 2.73 to 2.82. For the present assessment, new Noise and Track-Keeping (NTK) data was available and was analysed in the same way as described in Appendix H. The resulting times are very similar to those used in the 2008/9 work. Summary results are:

Approach times (seconds):

Wake Vortex Category	Approach Phase 1 (seconds)	Approach Phase 2 (seconds)
Heavy	74	160
Light	74	163
Medium	75	165
Small	74	163
Upper	75	165

Initial climb and climb-out times (seconds):

Aircraft Type	Initial Climb To 1000 ft	Initial Climb To 1500 ft	Climb-Out From 1000 ft	Climb-Out From 1500 ft
319	30	45	72	57
320	32	48	79	63
321	34	49	79	64
332	39	54	87	71
351	32	45	76	63
358	32	45	76	63
359	32	45	76	63
35X	32	45	76	63
388	38	61	94	71
772	34	48	84	70
778	32	45	76	63
779	32	45	76	63
77W	29	40	65	53
788	30	44	71	57
789	30	44	71	57
7XX	32	45	76	63
7ZZ	32	45	76	63
E90	31	46	59	44
E95	36	51	67	53
N19	30	45	72	57
N20	32	48	79	63
N21	34	49	79	64

Approach times were adjusted for a 3.2° glide slope in 2030 and 3.5° glide slope in 2040. It was assumed that horizontal speed is the same as for a 3° glide slope, so the time in each phase is adjusted by a factor of

$\cos 3.2° / \cos 3° = 0.9998$

for 2030 and

$\cos 3.5° / \cos 3° = 0.9995$

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for 2040. The main effect of the steeper glide slope is in the spatial configuration of the emissions.

Average take-off roll and landing-roll times are the same as in the 2008/9 work. Tables of averages are given in Tables A2.4 and A2.5 of Appendix H.

Hold times are assumed to be managed under Collaborative Decision Making (CDM) to be 4.5 minutes for each runway in 2030 and 2040 and in 2R and 3R cases. (Assumed queue length of 3 aircraft with 1.5 minute spacing between aircraft.)

For 2R (baseline) cases, taxi-in and taxi-out times were based on an analysis of Electronic Flight Progress Strip (EFPS) data for the 2013 calendar year. EFPS data appears to be more accurate than the Airport Playback Tool (APT) data used in the 2008/9 assessment, and also has higher coverage and better availability. EFPS data also appears to give higher times in mode, by roughly 10% for taxi-in and taxi-out. The raw 2013 data contained movement-by-movement times for 97% of departures and 97% of arrivals. These were averaged into tables of times by runway end and apron, given in the following table. The taxi-in times below include landing roll, so for each movement the landing roll time (which depends on other factors such as aircraft size) is subtracted.

Taxi-in and taxi-out times for 2R (seconds):

Runway	Apron	Land + Taxi In	Taxi Out
09L	B (South)	517	961
09L	F	506	801
09L	G	495	789
09L	H	351	728
09L	T2A2	396	938
09L	T2A4	396	938
09L	T2A5	396	938
09L	T2B2	398	917
09L	T4T	928	895
09L	T4V	803	781
09L	T5A2	538	545
09L	T5A4	499	484
09L	T5B2	645	542
09L	T5C2	585	759
09L	T5D2	520	881
09L	T5E2	606	371
09R	B (South)	352	504
09R	F	424	573
09R	G	586	654
09R	H	665	692
09R	T2A2	550	931
09R	T2A4	550	931
09R	T2A5	550	931
09R	T2B2	553	856
09R	T4T	358	619
09R	T4V	398	625
09R	T5A2	667	456
09R	T5A4	693	541
09R	T5B2	768	515

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Runway	Apron	Land + Taxi In	Taxi Out
09R	T5C2	705	586
09R	T5D2	629	586
09R	T5E2	523	561
27L	B (South)	312	478
27L	F	333	606
27L	G	425	707
27L	H	472	741
27L	T2A2	665	643
27L	T2A4	665	643
27L	T2A5	665	643
27L	T2B2	647	537
27L	T4T	449	548
27L	T4V	481	456
27L	T5A2	468	711
27L	T5A4	530	814
27L	T5B2	519	803
27L	T5C2	510	790
27L	T5D2	451	744
27L	T5E2	324	560
27R	B (South)	464	673
27R	F	387	819
27R	G	400	776
27R	H	326	576
27R	T2A2	470	578
27R	T2A4	470	578
27R	T2A5	470	578
27R	T2B2	494	508
27R	T4T	778	550
27R	T4V	815	431
27R	T5A2	491	762
27R	T5A4	445	730
27R	T5B2	518	842
27R	T5C2	497	832
27R	T5D2	436	763
27R	T5E2	427	636

For 3R (development) cases, taxi-in and taxi-out times were based on TAAM modelling data provided by NATS. Because the TAAM modelling was only available for one mode of operation, it was necessary to derive additional times by deriving effective speeds for taxi-in and taxi-out, and applying these to the distances for each taxi route. The derived times are given in the following table. The taxi-in times below include landing roll, so for each movement the landing-roll time (which depends on other factors such as aircraft size) is subtracted.

Taxi-in and taxi-out times for 3R (seconds):

Runway	Apron	Landing roll + Taxi In	Taxi Out
09L	2B	1568	1134
09L	2C	1638	1190
09L	2D	1713	1251
09L	2F	1916	1340
09L	2G	1764	1291

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Runway	Apron	Landing roll + Taxi In	Taxi Out
09L	4A	1685	1228
09L	4B	1753	1282
09L	4C	1769	1295
09L	2A	1383	986
09L	5B	1053	722
09L	5C	1122	777
09L	5D	1191	833
09L	5E	1246	877
09L	5F	1316	933
09L	5A	875	580
09L	6A	384	441
09L	6B	544	435
09L	6C	390	661
09C	2B	290	740
09C	2C	228	796
09C	2D	203	857
09C	2F	405	946
09C	2G	253	897
09C	4A	611	1013
09C	4B	770	1067
09C	4C	524	1080
09C	2A	475	592
09C	5B	809	328
09C	5C	735	383
09C	5D	663	438
09C	5E	608	483
09C	5F	544	539
09C	5A	992	365
09C	6A	1298	610
09C	6B	1140	313
09C	6C	1293	306
09R	2B	281	721
09R	2C	208	770
09R	2D	221	829
09R	2F	258	858
09R	2G	171	788
09R	4A	247	629
09R	4B	407	683
09R	4C	161	696
09R	2A	465	575
09R	5B	795	306
09R	5C	723	365
09R	5D	657	422
09R	5E	601	467
09R	5F	531	519
09R	5A	956	363
09R	6A	1447	756
09R	6B	1288	629
09R	6C	1441	751
27R	2B	1218	1416
27R	2C	1288	1472
27R	2D	1364	1533
27R	2F	1566	1622

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Runway	Apron	Landing roll + Taxi In	Taxi Out
27R	2G	1414	1573
27R	4A	1335	1510
27R	4B	1403	1564
27R	4C	1419	1577
27R	2A	1033	1268
27R	5B	703	1004
27R	5C	772	1059
27R	5D	841	1115
27R	5E	897	1159
27R	5F	967	1215
27R	5A	525	862
27R	6A	352	470
27R	6B	343	717
27R	6C	497	475
27C	2B	700	400
27C	2C	770	350
27C	2D	846	292
27C	2F	1048	381
27C	2G	888	332
27C	4A	1144	618
27C	4B	1212	745
27C	4C	1229	549
27C	2A	515	547
27C	5B	185	814
27C	5C	254	756
27C	5D	323	698
27C	5E	378	654
27C	5F	448	603
27C	5A	334	961
27C	6A	410	1206
27C	6B	224	1079
27C	6C	215	1202
27L	2B	675	391
27L	2C	736	332
27L	2D	810	269
27L	2F	846	259
27L	2G	759	229
27L	4A	570	357
27L	4B	638	485
27L	4C	654	288
27L	2A	492	538
27L	5B	208	802
27L	5C	230	744
27L	5D	301	691
27L	5E	357	591
27L	5F	423	150
27L	5A	370	930
27L	6A	860	1323
27L	6B	701	1196
27L	6C	855	1319

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As noted in the AQ technical appendix, for each LTO cycle, narrow-bodied aircraft APUs were assumed to operate for 20 minutes, whilst wide-bodied aircraft APUs were assumed to operate for 40 minutes.