Heathrow Expansion

Updated scheme design - Attachment 5-1 Addendum 2 (Noise)
Development Strategy submitted to the Airports Commission
by Runway Innovations Ltd and Heathrow Hub Ltd

July 2014

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1 INTRODUCTION

Heathrow Hub Ltd and Runway Innovations Ltd (HH/RIL) are pleased to provide this further submission prepared in response to the Airports Commission's noise clarification questions submitted in June 2014.

This Addendum 2 includes and consolidates the following information in response to:

- Clarification queries received from the Airports Commission on 13th June 2014 (Appendix 1);
- Changes to the proposed flight paths; and
- Provision of updated noise contour figures.

The following sections provide further details and the rationale behind the changes to the flight paths and resulting noise contours.

2 RESPONSE TO CLARIFICATION QUESTIONS

2.1 Clarification question: HUB-NOISE-N-004

Is the promoter able to share any further detail regarding the implication of the future noise contours presented (e.g. absolute numbers of people affected and change in the number of people exposed to aviation noise, and similar information for local amenities)?

2.1.1 *HHL/RIL Response*

Calculations on contour areas have been carried out using 2011 Census data. The calculated number of people affected and change in number affected are present in the Table 2.1 below. Calculations have also been carried out for additional modelled scenarios of 60% and 90% next generation aircraft.

Table 2.1 Affected population and % change (using existing flight paths[1])

Contour	Baseline[2] – Population within Contour	40% next gen		60% next gen		90% next gen	
		Population within Contour	% Change in Population	Population within Contour	% Change in Population	Population within Contour	% Change in Population
54dB $L_{Aeq,16h}$	207,089	235,534	14%	233,653	13%	211,743	2%
57dB $L_{Aeq,16h}$	119,432	125,761	5%	117,422	-2%	102,886	-14%
60dB $L_{Aeq,16h}$	58,559	77,945	33%	73,730	26%	66,405	13%
63dB $L_{Aeq,16h}$	34,767	41,652	20%	40,088	15%	38,306	10%

[1] the May 2014 submission assumed existing flight paths extrapolated to include the proposed extended runway
[2] Baseline year for noise contours is taken to be 2012

Contour	Baseline[2] – Popula-tion within Contour	40% next gen		60% next gen		90% next gen	
		Populati on within Contour	% Change in Population	Populatio n within Contour	% Change in Populati on	Populati on within Contour	% Change in Populati on
66dB $L_{Aeq,16h}$	14,956	23,601	58%	22,565	51%	20,604	38%
69dB $L_{Aeq,16h}$	3,486	7,959	128%	6,984	100%	5,247	51%
72dB $L_{Aeq,16h}$	739	2,601	252%	2,298	211%	1,972	167%

As can be expected, the increased air traffic movement (ATM) will lead to a corresponding change in the noise climate particularly at locations close to the airport under the 40% new generation fleet mix scenario. Where properties come within the 69dB contour and above, they will be eligible for compensation. However, it is expected that the fleet mix will continue to change as airlines upgrade their fleets to introduce next generation aircraft and retire older, Chapter 4, aircraft. We have therefore modelled a further two fleet mix options (60% and 90%) to account for this change in fleet mix over time – please see Figures 1.23 and 1.24 which are included in this submission. Table 2.1 above shows how the number of people which come within the 54dB contours and above is inversely proportional to the increase in new generation aircraft within the fleet mix.

It is also worth noting that the above table masks the subtleties of the changes within particular areas. Sections 1.9.1.1 to 1.9.1.5 in Chapter 1: Noise in the Stage 2 Submission Attachment 5-1 report consider the likely changes in particular areas to the east and west of the airport; that analysis is based on a 40% next generation fleet mix and can be extrapolated to consider the changes to the fleet mix over time.

The analysis within that chapter is based on the existing flights paths and angles of descent and climb-out. It is understood that these are in the process of being finalised in cooperation with NATS to optimise the airspace design and approach and departure flight paths; we expect to re-model our noise contours once those are fixed and the corresponding contours and population exposed tables may change as a result.

2.2 Clarification question: HUB-NOISE-N-006

With regard to the information presented in Table 1.7, 1.8 and 1.9, can the absolute values from which the calculation has been derived be provided?

2.2.1 *HHL/RIL Response*

Absolute noise levels with regards to the change in noise levels presented in Table 1.7, 1.8, and 1.9 in Chapter 1: Noise of the Stage 2 Submission Attachment 5-1 report are reproduced and updated below. Please note a typo has been identified in Table 1.7 which originally stated -7dB as the change in noise level and has been updated to correctly show -4dB.

Table 1.7: *Predicted Change in LAeq,16h Noise Level at Surrounding Habitations*[3]

Reference	Location	Baseline Noise Level $L_{Aeq,16h}$ dB	Future Noise Level $L_{Aeq,16h}$ dB	Change in $L_{Aeq,16h}$ dB
1	West Drayton	44	46	2
2	Ealing	53	49	-4
3	Hounslow	61	65	4
4	Slough	50	53	3
5	Staines-upon-Thames	48	49	2
6	Southall	42	39	-3
7	Richmond	50	54	4
8	Twickenham	50	52	2
9	Windsor	58	60	1
10	Sunbury-on-Thames	46	45	-1
11	Hayes	41	41	0
12	Langley	47	49	2
13	Brentford	51	57	6
14	Feltham	54	52	-2
15	Ashford	46	47	2

As stated in Chapter 1: Noise of the Stage 2 Submission, Attachment 5-1 report, the average change in noise level for all habitations assessed is an increase in LAeq,16h of approximately 1dB which is not considered to be perceptible to the human ear. Areas such as Richmond and Brentford which experience significant changes are already below the 57dB LAeq,16h contour which is accepted as the level above which disturbance is more likely to be experienced.

Table 1.8: *Predicted Change in LAeq,8h Noise Level at Surrounding Habitations*[4]

Reference	Location	Baseline Noise Level $L_{Aeq,8h}$ dB	Future Noise Level $L_{Aeq,8h}$ dB	Change in $L_{Aeq,8h}$ dB
1	West Drayton	35	37	2
2	Ealing	41	37	-4
3	Hounslow	58	55	-3
4	Slough	39	42	3
5	Staines-upon-Thames	40	42	2
6	Southall	32	31	-1
7	Richmond	47	45	-2
8	Twickenham	44	43	-1
9	Windsor	50	49	-1
10	Sunbury-on-Thames	34	37	3
11	Hayes	32	32	0
12	Langley	36	39	3
13	Brentford	48	48	0
14	Feltham	41	44	3
15	Ashford	36	39	3

Predicted changes for some locations are at the upper limit of where they may be noticeable to the human ear; however the analysis currently being undertaken with NATS to optimise flight paths may reduce this effect.

[3] Table reproduced and updated from Chapter 1: Noise in Stage 2 Submission Attachment 5-1 report
[4] Table reproduced from Chapter 1: Noise in Stage 2 Submission Attachment 5-1 report

Table 1.9: *Predicted Change in LDEN Noise Level at Surrounding Habitations*[5]

Reference	Location	Baseline Noise Level L_{DEN} dB	Future Noise Level L_{DEN} dB	Change in L_{DEN} dB
1	West Drayton	49	49	0
2	Ealing	58	55	-3
3	Hounslow	67	68	1
4	Slough	56	56	0
5	Staines-upon-Thames	54	53	-1
6	Southall	47	45	-2
7	Richmond	57	58	1
8	Twickenham	56	55	-1
9	Windsor	63	64	1
10	Sunbury-on-Thames	51	48	-3
11	Hayes	46	44	-2
12	Langley	52	52	0
13	Brentford	58	60	2
14	Feltham	60	56	-4
15	Ashford	51	50	-1

The average change in noise levels for habitations is assessed as a reduction in L_{DEN} of approximately 1dB with the highest increase predicted to be 2dB.

2.3 Clarification question: HUB-NOISE-N-009

The detailed table of "CAA Future Daytime Movements" indicates during daytime 159 aircraft movements by the Fokker 70/100 aircraft, whereas only 11 aircraft movements by this aircraft occurred in 2011, and a growth in such movements is not expected as the aircraft is out of production and does not reflect Heathrow demand profile; Can the promoter confirm whether the table is correct, and whether the noise contour modelling assumed this volume of ATM?

2.3.1 *HHL/RIL Response*

An error occurred in the transposition of aircraft movements into the report. The correct aircraft movements are presented in the tables below.

[5] Table reproduced from Chapter 1: Noise in Stage 2 Submission Attachment 5-1 report

CAA Future Daytime Movements

Aircraft	27L Departures			27R2 Departures			09R Departures			09L Departures				Approaches			
	CPT/SAM	MID	DVR	WOB	BPK	CPT	DVR	MID/SAM	CPT	BUZ	BPK	CPT	DVR	27L	27R2	09L	09R
737800	0.10	0.24	0.26	0.02	0.44	0.05	0.06	0.10	0.01	0.01	0.13	0.01	0.03	0.49	0.78	0.23	0.15
B747-8	10.09	4.40	7.22	23.44	17.07	15.21	1.47	2.10	4.48	6.04	5.42	2.03	0.67	23.11	36.97	11.04	6.90
B772G	0.01	0.05	0.82	0.01	0.44	0.01	0.19	0.02	0.00	0.00	0.14	0.00	0.08	0.45	0.71	0.21	0.13
B772P	0.00	0.02	0.37	0.01	0.20	0.00	0.08	0.01	0.00	0.00	0.06	0.00	0.04	0.20	0.32	0.10	0.06
B772R	0.01	0.09	1.45	0.03	0.79	0.02	0.33	0.03	0.00	0.01	0.24	0.00	0.15	0.79	1.27	0.38	0.24
777300	7.81	4.01	5.79	18.94	7.74	12.29	1.29	1.75	3.61	4.83	2.39	1.63	0.58	17.46	27.93	8.34	5.22
EA320C	0.89	2.47	2.91	2.75	4.90	0.01	0.67	1.02	0.01	0.83	1.45	0.00	0.30	5.72	9.15	2.73	1.71
EA320V	1.01	2.78	3.28	3.10	5.53	0.01	0.75	1.15	0.01	0.93	1.63	0.00	0.34	6.45	10.32	3.08	1.93
EA321C	1.14	3.47	3.66	5.49	6.32	0.01	0.84	1.39	0.01	1.64	1.86	0.00	0.38	8.09	12.95	3.87	2.42
EA321V	1.46	4.41	4.65	6.99	8.04	0.02	1.07	1.78	0.01	2.09	2.36	0.01	0.49	10.30	16.48	4.92	3.08
EA33	0.04	0.12	0.13	0.00	0.22	0.00	0.03	0.05	0.00	0.00	0.06	0.00	0.01	0.23	0.36	0.11	0.07
EA38GP	4.40	5.25	13.71	9.16	31.35	5.96	2.96	2.02	1.77	2.41	9.70	0.80	1.34	20.25	32.40	9.68	6.05
FK10	0.09	0.17	0.28	0.20	0.29	0.08	0.07	0.07	0.02	0.06	0.08	0.01	0.03	0.45	0.72	0.21	0.13
A3190NEO	0.86	2.36	2.64	7.94	4.39	0.02	0.60	0.98	0.01	2.37	1.29	0.01	0.27	7.06	11.30	3.38	2.11
A320NEO	2.66	8.10	8.78	9.01	15.25	0.03	2.03	3.25	0.02	2.70	4.49	0.01	0.92	17.91	28.65	8.56	5.35
B737-700	2.66	8.10	8.78	9.01	15.25	0.03	2.03	3.25	0.02	2.70	4.49	0.01	0.92	17.91	28.65	8.56	5.35
A321NEO	2.26	7.25	8.28	12.71	13.58	0.03	1.92	2.87	0.02	3.80	3.99	0.01	0.87	17.57	28.11	8.39	5.25
B737-900 MAX	2.26	7.25	8.28	12.71	13.58	0.03	1.92	2.87	0.02	3.80	3.99	0.01	0.87	17.57	28.11	8.39	5.25
B787-8	13.48	21.69	27.63	39.59	42.86	15.23	6.32	8.67	3.89	11.64	12.73	1.76	2.86	60.84	97.36	29.08	18.19
A350-800	0.85	0.57	0.96	2.00	1.58	1.30	0.21	0.24	0.38	0.51	0.49	0.17	0.09	2.17	3.47	1.04	0.65
B787-9	0.85	0.57	0.96	2.00	1.58	1.30	0.21	0.24	0.38	0.51	0.49	0.17	0.09	2.17	3.47	1.04	0.65
A350-900	2.05	2.83	3.77	2.53	5.68	2.46	0.86	1.14	0.65	0.69	1.70	0.30	0.39	7.21	11.53	3.44	2.15
A350-1000	2.05	2.83	3.77	2.53	5.68	2.46	0.86	1.14	0.65	0.69	1.70	0.30	0.39	7.21	11.53	3.44	2.15
B787-10	4.10	5.65	7.54	5.05	11.36	4.93	1.71	2.29	1.31	1.39	3.39	0.59	0.78	14.42	23.06	6.89	4.31
EA38R	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

CAA Future Night-time Movements

Aircraft	27L Departures			27R2 Departures			09R Departures			09L Departures				Approaches					
	CPT/SAM	MID	DVR	WOB	BPK	CPT	DVR	MID/SAM	CPT	BUZ	BPK	CPT	DVR	27L	27R	27R2	09L	09L2	09R
737800	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B747-8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B772G	0.00	0.00	0.00	0.73	1.75	0.24	0.00	0.00	0.00	0.20	0.08	0.03	0.21	3.18	2.27	1.81	0.43	0.35	0.60
B772P	0.00	0.00	0.00	0.09	0.22	0.03	0.00	0.00	0.00	0.02	0.01	0.00	0.03	0.40	0.28	0.23	0.05	0.04	0.08
B772R	0.00	0.00	0.00	0.55	1.31	0.18	0.00	0.00	0.00	0.15	0.06	0.02	0.16	2.38	1.70	1.36	0.32	0.26	0.45
777300	0.00	0.00	0.00	0.46	1.09	0.15	0.00	0.00	0.00	0.12	0.05	0.02	0.13	1.98	1.42	1.13	0.27	0.22	0.38
EA320C	0.52	0.55	1.45	2.18	5.17	0.72	0.19	0.26	0.03	0.58	0.25	0.08	0.62	1.01	0.00	2.02	0.00	0.38	0.19
EA320V	0.52	0.55	1.45	2.18	5.17	0.72	0.19	0.26	0.03	0.58	0.25	0.08	0.62	1.01	0.00	2.02	0.00	0.38	0.19
EA321C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EA321V	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EA33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EA38GP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FK10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
A3190NEO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
A320NEO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B737-700	0.69	0.73	1.94	2.90	6.90	0.95	0.26	0.35	0.03	0.78	0.33	0.11	0.83	1.34	0.00	2.69	0.00	0.51	0.26
A321NEO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B737-900 MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B787-8	0.00	0.00	0.00	0.46	1.09	0.15	0.00	0.00	0.00	0.12	0.05	0.02	0.13	1.98	1.42	1.13	0.27	0.22	0.38
A350-800	0.00	0.00	0.00	0.46	1.09	0.15	0.00	0.00	0.00	0.12	0.05	0.02	0.13	1.98	1.42	1.13	0.27	0.22	0.38
B787-9	0.00	0.00	0.00	0.36	0.85	0.12	0.00	0.00	0.00	0.10	0.04	0.01	0.10	1.54	1.10	0.88	0.21	0.17	0.29
A350-900	0.00	0.00	0.00	0.36	0.85	0.12	0.00	0.00	0.00	0.10	0.04	0.01	0.10	1.54	1.10	0.88	0.21	0.17	0.29
A350-1000	0.00	0.00	0.00	0.20	0.48	0.07	0.00	0.00	0.00	0.05	0.02	0.01	0.06	0.88	0.63	0.50	0.12	0.10	0.17
B787-10	0.00	0.00	0.00	0.20	0.48	0.07	0.00	0.00	0.00	0.05	0.02	0.01	0.06	0.88	0.63	0.50	0.12	0.10	0.17

Proposed Development Future Daytime Movements (40% Next Gen)

Aircraft	09R Departures			09L Departures				27L Departures			27R2 Departures			Approaches				
	DVR	MID/SAM	CPT	BUZ	BPK	CPT	DVR	CPT/SAM	MID	DVR	WOB	BPK	CPT	27L	27R	27R2	09L2	09R
737800	0.04	0.15	0.07	0.11	0.01	0.00	0.02	0.00	0.00	0.52	0.81	0.14	0.12	0.28	0.31	0.02	0.45	0.05
B747-8	1.91	6.88	1.62	2.31	4.92	0.99	0.89	0.33	0.11	24.39	38.22	6.78	11.73	5.11	8.40	23.81	17.34	15.45
B772G	0.04	0.13	0.21	0.02	0.00	0.00	0.02	0.00	0.01	0.47	0.74	0.13	0.01	0.06	0.95	0.01	0.45	0.01
B772P	0.02	0.06	0.09	0.01	0.00	0.00	0.01	0.00	0.01	0.21	0.33	0.06	0.00	0.03	0.43	0.01	0.20	0.00
B772R	0.07	0.24	0.36	0.03	0.01	0.00	0.04	0.00	0.02	0.84	1.31	0.23	0.01	0.10	1.69	0.03	0.80	0.02
777300	1.44	5.20	1.42	1.92	3.96	0.79	0.39	0.27	0.10	18.43	28.88	5.12	9.08	4.66	6.73	19.25	7.86	12.48
EA320C	0.47	1.70	0.73	1.12	0.01	0.14	0.24	0.00	0.05	6.04	9.46	1.68	1.04	2.87	3.38	2.79	4.98	0.01
EA320V	0.53	1.92	0.82	1.27	0.01	0.15	0.27	0.00	0.06	6.81	10.67	1.89	1.17	3.24	3.81	3.15	5.62	0.01
EA321C	0.67	2.41	0.93	1.53	0.01	0.27	0.30	0.00	0.06	8.54	13.39	2.37	1.33	4.03	4.25	5.58	6.42	0.01
EA321V	0.85	3.07	1.18	1.95	0.01	0.34	0.39	0.00	0.08	10.87	17.04	3.02	1.69	5.13	5.41	7.10	8.17	0.02
EA33	0.02	0.07	0.03	0.05	0.00	0.00	0.01	0.00	0.00	0.24	0.38	0.07	0.05	0.14	0.15	0.00	0.22	0.00
EA38GP	1.67	6.03	3.24	2.22	1.94	0.39	1.59	0.13	0.22	21.38	33.50	5.94	5.11	6.10	15.94	9.30	31.85	6.05
FK10	0.04	0.13	0.07	0.08	0.02	0.01	0.01	0.00	0.00	0.47	0.74	0.13	0.10	0.20	0.33	0.21	0.29	0.08
A3190NEO	0.58	2.10	0.66	1.07	0.01	0.39	0.21	0.00	0.04	7.46	11.69	2.07	1.00	2.74	3.07	8.07	4.46	0.02
A320NEO	1.48	5.33	2.22	3.57	0.02	0.44	0.73	0.00	0.15	18.90	29.62	5.25	3.09	9.42	10.21	9.15	15.50	0.03
B737-700	1.48	5.33	2.22	3.57	0.02	0.44	0.73	0.00	0.15	18.90	29.62	5.25	3.09	9.42	10.21	9.15	15.50	0.03
A321NEO	1.45	5.23	2.10	3.15	0.02	0.62	0.65	0.00	0.14	18.54	29.06	5.15	2.63	8.43	9.63	12.91	13.80	0.03
B737-900 MAX	1.45	5.23	2.10	3.15	0.02	0.62	0.65	0.00	0.14	18.54	29.06	5.15	2.63	8.43	9.63	12.91	13.80	0.03
B787-8	5.03	18.12	6.94	9.52	4.27	1.90	2.08	0.29	0.47	64.23	100.66	17.84	15.68	25.22	32.13	40.23	43.55	15.48
A350-800	0.18	0.65	0.23	0.26	0.42	0.08	0.08	0.03	0.02	2.29	3.59	0.64	0.99	0.67	1.11	2.03	1.60	1.32
B787-9	0.18	0.65	0.23	0.26	0.42	0.08	0.08	0.03	0.02	2.29	3.59	0.64	0.99	0.67	1.11	2.03	1.60	1.32
A350-900	0.60	2.15	0.94	1.26	0.72	0.11	0.28	0.05	0.06	7.61	11.92	2.11	2.38	3.29	4.38	2.57	5.77	2.50
A350-1000	0.60	2.15	0.94	1.26	0.72	0.11	0.28	0.05	0.06	7.61	11.92	2.11	2.38	3.29	4.38	2.57	5.77	2.50
B787-10	1.19	4.29	1.88	2.51	1.44	0.23	0.55	0.10	0.13	15.22	23.84	4.23	4.77	6.58	8.77	5.14	11.54	5.01
EA38R	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Proposed Development Future Night-time Movements (40% Next Gen)

Aircraft	09R Departures			09L Departures				27L Departures			27R2 Departures			Approaches				
	DVR	MID/SAM	CPT	BUZ	BPK	CPT	DVR	CPT/SAM	MID	DVR	WOB	BPK	CPT	27L	27R	27R2	09L2	09R
737800	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.00	0.02	0.00	0.02	0.03	0.00	0.00	0.01
B747-8	0.06	0.09	0.19	0.00	0.00	0.00	0.00	0.99	0.43	0.71	0.84	0.62	0.55	1.10	1.41	0.00	0.00	0.31
B772G	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.02	0.00	0.02	0.03	2.16	0.00	0.01
B772P	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.01	0.00	0.01	0.01	0.27	0.00	0.00
B772R	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.14	0.00	0.03	0.00	0.04	0.05	1.62	0.00	0.01
777300	0.05	0.07	0.15	0.00	0.00	0.00	0.00	0.77	0.39	0.57	0.68	0.28	0.44	0.83	1.07	1.35	0.00	0.23
EA320C	0.03	0.04	0.00	0.00	0.00	0.00	0.00	0.09	0.24	0.29	0.10	0.18	0.00	0.27	0.35	0.90	0.00	0.08
EA320V	0.03	0.05	0.00	0.00	0.00	0.00	0.00	0.10	0.27	0.32	0.11	0.20	0.00	0.31	0.39	0.90	0.00	0.09
EA321C	0.04	0.06	0.00	0.00	0.00	0.00	0.00	0.11	0.34	0.36	0.20	0.23	0.00	0.39	0.49	0.00	0.00	0.11
EA321V	0.05	0.08	0.00	0.00	0.00	0.00	0.00	0.14	0.43	0.46	0.25	0.29	0.00	0.49	0.63	0.00	0.00	0.14
EA33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.00	0.01	0.01	0.00	0.00	0.00
EA38GP	0.13	0.09	0.07	0.00	0.00	0.00	0.00	0.43	0.52	1.35	0.33	1.13	0.21	0.96	1.24	0.00	0.00	0.27
FK10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.01	0.01	0.00	0.02	0.03	0.00	0.00	0.01
A3190NEO	0.03	0.04	0.00	0.00	0.00	0.00	0.00	0.08	0.23	0.26	0.29	0.16	0.00	0.34	0.43	0.00	0.00	0.09
A320NEO	0.09	0.14	0.00	0.00	0.00	0.00	0.00	0.26	0.80	0.86	0.32	0.55	0.00	0.85	1.09	0.00	0.00	0.24
B737-700	0.09	0.14	0.00	0.00	0.00	0.00	0.00	0.26	0.80	0.86	0.32	0.55	0.00	0.85	1.09	1.20	0.00	0.24
A321NEO	0.08	0.12	0.00	0.00	0.00	0.00	0.00	0.22	0.71	0.81	0.46	0.49	0.00	0.84	1.07	0.00	0.00	0.24
B737-900 MAX	0.08	0.12	0.00	0.00	0.00	0.00	0.00	0.22	0.71	0.81	0.46	0.49	0.00	0.84	1.07	0.00	0.00	0.24
B787-8	0.27	0.37	0.17	0.00	0.00	0.00	0.00	1.32	2.13	2.71	1.43	1.55	0.55	2.90	3.72	1.35	0.00	0.82
A350-800	0.01	0.01	0.02	0.00	0.00	0.00	0.00	0.08	0.06	0.09	0.07	0.06	0.05	0.10	0.13	1.35	0.00	0.03
B787-9	0.01	0.01	0.02	0.00	0.00	0.00	0.00	0.08	0.06	0.09	0.07	0.06	0.05	0.10	0.13	1.05	0.00	0.03
A350-900	0.04	0.05	0.03	0.00	0.00	0.00	0.00	0.20	0.28	0.37	0.09	0.20	0.09	0.34	0.44	1.05	0.00	0.10
A350-1000	0.04	0.05	0.03	0.00	0.00	0.00	0.00	0.20	0.28	0.37	0.09	0.20	0.09	0.34	0.44	0.60	0.00	0.10
B787-10	0.07	0.10	0.06	0.00	0.00	0.00	0.00	0.40	0.56	0.74	0.18	0.41	0.18	0.69	0.88	0.60	0.00	0.19
EA38R	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.60	0.00	0.00

Proposed Development Future Daytime Movements (60% Next Gen)

	09R Departures			09L Departures				27L Departures			27R2 Departures			Approaches				
Aircraft	DVR	MID/SAM	CPT	BUZ	BPK	CPT	DVR	CPT/SAM	MID	DVR	WOB	BPK	CPT	27L	27R	27R2	09L2	09R
777300	0.77	1.04	0.47	0.20	0.26	0.03	0.05	1.75	2.71	3.60	4.38	5.35	1.54	6.91	10.83	1.92	0.54	1.95
EA319C	1.33	1.79	0.81	0.34	0.45	0.05	0.09	3.02	4.67	6.22	7.56	9.24	2.65	11.92	18.68	3.31	0.93	3.36
EA319V	1.33	1.79	0.81	0.34	0.45	0.05	0.09	3.02	4.67	6.22	7.56	9.24	2.65	11.92	18.68	3.31	0.93	3.36
EA320C	3.27	4.41	1.98	0.85	1.10	0.13	0.22	7.44	11.52	15.32	18.62	22.76	6.53	29.38	46.03	8.16	2.30	8.29
EA320V	3.27	4.41	1.98	0.85	1.10	0.13	0.22	7.44	11.52	15.32	18.62	22.76	6.53	29.38	46.03	8.16	2.30	8.29
EA321C	1.24	1.67	0.75	0.32	0.42	0.05	0.08	2.82	4.36	5.80	7.05	8.62	2.47	11.13	17.44	3.09	0.87	3.14
EA321V	1.24	1.67	0.75	0.32	0.42	0.05	0.08	2.82	4.36	5.80	7.05	8.62	2.47	11.13	17.44	3.09	0.87	3.14
A319NEO	1.77	2.40	1.08	0.46	0.60	0.07	0.12	4.04	6.25	8.32	10.11	12.36	3.55	15.95	24.99	4.43	1.25	4.50
A320NEO	4.72	6.38	2.87	1.23	1.59	0.19	0.32	10.75	16.64	22.13	26.90	32.88	9.44	42.44	66.50	11.79	3.33	11.97
A321NEO	0.93	1.26	0.57	0.24	0.31	0.04	0.06	2.12	3.28	4.37	5.31	6.49	1.86	8.38	13.13	2.33	0.66	2.36
A350-900	0.61	0.83	0.37	0.16	0.21	0.02	0.04	1.39	2.16	2.87	3.49	4.26	1.22	5.50	8.62	1.53	0.43	1.55
B787-8	2.67	3.60	1.62	0.69	0.90	0.11	0.18	6.07	9.39	12.49	15.19	18.56	5.33	23.96	37.54	6.65	1.88	6.76
B787-9	0.84	1.14	0.51	0.22	0.28	0.03	0.06	1.92	2.98	3.96	4.81	5.88	1.69	7.59	11.90	2.11	0.59	2.14
B777-900	2.32	3.13	1.41	0.60	0.78	0.09	0.16	5.27	8.16	10.85	13.20	16.13	4.63	20.81	32.62	5.78	1.63	5.87
A380-800	2.00	2.69	1.21	0.52	0.67	0.08	0.13	4.54	7.03	9.35	11.37	13.89	3.99	17.93	28.10	4.98	1.41	5.06
B777NG	2.95	3.98	1.79	0.76	0.99	0.12	0.20	6.70	10.38	13.80	16.78	20.51	5.89	26.47	41.48	7.35	2.07	7.47

Proposed Development Future Daytime Movements (90% Next Gen)

Aircraft	09R Departures			09L Departures				27L Departures			27R2 Departures			Approaches				
	DVR	MID/SAM	CPT	BUZ	BPK	CPT	DVR	CPT/SAM	MID	DVR	WOB	BPK	CPT	27L	27R	27R2	09L2	09R
777300	0.06	0.08	0.04	0.02	0.02	0.00	0.00	0.13	0.21	0.27	0.33	0.41	0.12	0.52	0.82	0.15	0.04	0.15
EA319C	0.10	0.14	0.06	0.03	0.03	0.00	0.01	0.23	0.35	0.47	0.57	0.70	0.20	0.90	1.42	0.25	0.07	0.25
EA319V	0.10	0.14	0.06	0.03	0.03	0.00	0.01	0.23	0.35	0.47	0.57	0.70	0.20	0.90	1.42	0.25	0.07	0.25
EA320C	0.25	0.33	0.15	0.06	0.08	0.01	0.02	0.56	0.87	1.16	1.41	1.72	0.49	2.23	3.49	0.62	0.17	0.63
EA320V	0.25	0.33	0.15	0.06	0.08	0.01	0.02	0.56	0.87	1.16	1.41	1.72	0.49	2.23	3.49	0.62	0.17	0.63
EA321C	1.24	1.67	0.75	0.32	0.42	0.05	0.08	2.82	4.36	5.80	7.05	8.62	2.47	11.13	17.44	3.09	0.87	3.14
EA321V	1.24	1.67	0.75	0.32	0.42	0.05	0.08	2.82	4.36	5.80	7.05	8.62	2.47	11.13	17.44	3.09	0.87	3.14
A319NEO	4.23	5.71	2.57	1.10	1.42	0.17	0.28	9.62	14.89	19.81	24.08	29.43	8.45	37.99	59.53	10.55	2.98	10.72
A320NEO	10.77	14.54	6.53	2.80	3.62	0.44	0.72	24.49	37.93	50.44	61.33	74.95	21.52	96.74	151.59	26.87	7.58	27.29
A321NEO	0.93	1.26	0.57	0.24	0.31	0.04	0.06	2.12	3.28	4.37	5.31	6.49	1.86	8.38	13.13	2.33	0.66	2.36
A350-900	0.61	0.83	0.37	0.16	0.21	0.02	0.04	1.39	2.16	2.87	3.49	4.26	1.22	5.50	8.62	1.53	0.43	1.55
B787-8	2.67	3.60	1.62	0.69	0.90	0.11	0.18	6.07	9.39	12.49	15.19	18.56	5.33	23.96	37.54	6.65	1.88	6.76
B787-9	0.84	1.14	0.51	0.22	0.28	0.03	0.06	1.92	2.98	3.96	4.81	5.88	1.69	7.59	11.90	2.11	0.59	2.14
B777-900	2.32	3.13	1.41	0.60	0.78	0.09	0.16	5.27	8.16	10.85	13.20	16.13	4.63	20.81	32.62	5.78	1.63	5.87
A380-800	2.00	2.69	1.21	0.52	0.67	0.08	0.13	4.54	7.03	9.35	11.37	13.89	3.99	17.93	28.10	4.98	1.41	5.06
B777NG	3.66	4.94	2.22	0.95	1.23	0.15	0.25	8.32	12.88	17.13	20.83	25.46	7.31	32.86	51.49	9.13	2.57	9.27

3 CHANGES TO FLIGHT PATHS

3.1 Proposed changes to flight paths

The Airports Commission (AC), in partnership with the National Air Traffic Services (NATS), has proposed some changes to the existing flight paths in an effort to minimise the effects of noise on the local population[6]. These, together with additional modifications made by the HHL/RIL team, were modelled to predict the likely noise levels associated with the expanded airport operations and can be made available if required. However, for the greater clarify and with the finalisation of the flight paths that the CAA is modelling as part of the appraisal process, this final and agreed set of flight paths have been modelled and the resulting noise contours are included in this Addendum 2 submission. The predicted noise levels have been calculated using the same fleet mixes of 40%, 60% and 90% next generation aircraft in line with the request by the AC and for greater ease of comparison with the noise contours provided in response to clarification question: HUB-NOISE-N-004 above.

These are attached as Figures 1.26, 1.30 and 1.31. The change in population affected is set out in Table 3.2 below.

Table 3.2 Affected population and % change with AC flight paths using INM baseline

Contour	Baseline Population	40% next gen AC flight paths		60% next gen AC flight paths		90% next gen AC flight paths	
		Population	% Change	Population	% Change	Population	% Change
54dB $L_{Aeq,16h}$	207,089	242,437	20%	234,564	14%	180,447	-4%
57dB $L_{Aeq,16h}$	119,432	106,723	-11%	97,218	-19%	92,949	-28%
60dB $L_{Aeq,16h}$	58,559	69,363	18%	67,436	15%	74,284	15%
63dB $L_{Aeq,16h}$	34,767	43,081	24%	41,513	19%	41,380	11%
66dB $L_{Aeq,16h}$	14,956	23,258	56%	22,360	50%	19,148	38%
69dB $L_{Aeq,16h}$	3,486	8,229	136%	7,073	103%	5,232	52%
72dB $L_{Aeq,16h}$	739	2,560	247%	2,257	206%	1,940	162%

To provide further detail on $L_{Aeq,16h}$ noise predictions, key location points around Heathrow have been selected to provide an indication of the change in predicted $L_{Aeq,16h}$ noise level at habitations around the airport. Results of noise level predictions at habitations are presented in Table 3.3 and the resultant changes in noise level from the baseline scenario are presented in Table 3.4. It should be noted that Maidenhead has been added to the list of habitations due to the new flight paths proximity to the habitation.

[6] Sent to HHL/RIL on 27th June 2014

Table 3.2 Predicted Noise Levels at Surrounding Habitations with AC Flight Paths

Reference	Location	Baseline Noise Level $L_{Aeq,16h}$ dB	40% Next Gen Future Noise Level $L_{Aeq,16h}$ dB	60% Next Gen Future Noise Level $L_{Aeq,16h}$ dB	90% Next Gen Future Noise Level $L_{Aeq,16h}$ dB
1	West Drayton	44	47	46	45
2	Ealing	53	50	49	48
3	Hounslow	61	64	64	63
4	Slough	50	51	50	49
5	Staines-upon-Thames	48	50	49	48
6	Southall	42	40	40	39
7	Richmond	50	54	53	53
8	Twickenham	50	52	51	51
9	Windsor	58	60	60	58
10	Sunbury-on-Thames	46	46	45	44
11	Hayes	41	41	40	40
12	Langley	47	49	49	48
13	Brentford	51	56	56	56
14	Feltham	54	52	52	51
15	Ashford	46	47	46	45
16	Maidenhead	42	51	50	49

Table 3.3 Change in Predicted Noise Levels at Surrounding Habitations with AC Flight Paths

Reference	Location	40% Next Gen Change in Noise Level $L_{Aeq,16h}$ dB	60% Next Gen Change in Noise Level $L_{Aeq,16h}$ dB	90% Next Gen Change in Noise Level $L_{Aeq,16h}$ dB
1	West Drayton	3	2	1
2	Ealing	-3	-4	-5
3	Hounslow	3	3	2
4	Slough	1	0	-1
5	Staines-upon-Thames	2	1	0
6	Southall	-2	-2	-3
7	Richmond	4	3	3
8	Twickenham	2	1	1
9	Windsor	2	2	0
10	Sunbury-on-Thames	0	-1	-2
11	Hayes	0	-1	-1
12	Langley	2	2	1
13	Brentford	5	5	5
14	Feltham	-2	-2	-3
15	Ashford	1	0	-1
16	Maidenhead	9	8	7

The most notable change in noise level is predicted to occur at Maidenhead due to the new departure flight paths associated with the extended runway passing in close proximity to the habitation; however, it should be noted that predicted noise levels at all habitations with the exception of Hounslow and Windsor are below the 57dB $L_{Aeq,16h}$ noise level which is considered to represent the onset of community annoyance.

The average change in noise level for all the habitations assessed is an increase in $L_{Aeq,16h}$ of approximately 2dB for 40% next generation aircraft, 1dB for 60% next generation aircraft, and no change for 90% next generation aircraft. Further studies may allow for departure tracks and aircraft that cause significant increases in noise levels at habitations to be identified. By

assigning noisy aircraft on quieter routes, a balance of noise level changes may be achieved to ensure that no habitation experiences a noticeable change in $L_{Aeq,16h}$ noise levels.

3.2 Offset, curved and angled approaches

The provision of respite from exposure to aircraft noise is a critical element to any proposal for expansion of Heathrow Airport. This is made possible in HHL/RIL's extended runway proposal through the use of alternating runway operations (as outlined in Chapter 1: Noise in the Stage 2 Submission Attachment 5-1 report). In addition to this, a series of alternative Standard Terminal Arrival Routes (STAR) was proposed including curved, angled and offset approaches. These were modelled and presented in Figures 1.16 – 1.22 in the May submission. These were presented as potential routes to be optimised and agreed with NATS in due course and served to illustrate the respite options available.

In the interim period, and with the changes to the flight paths as proposed by the AC, we have sought to refine the STAR routes and present a curved approach which seeks to avoid populated areas as far as possible. This is presented in Figure 1.35. This has been prepared using a 40% next generation fleet mix only; it is anticipated that any changes to the fleet mix in the future will lead to corresponding changes to the extent of the noise contours.

The new 'curved' approach paths can provide respite to communities that were previously affected by approach aircraft noise through alternating the approach paths. This allows respite from aircraft approach noise in areas of west London such as Barnes, Putney, and Fulham. This is achieved through arrivals to the northern runway approaching from the north and arrivals to the southern runway approaching from the south before joining the final approach approximately 5km from the runway threshold.

Although these new approach paths may expose new areas of west London to aircraft noise, this exposure will be for limited periods of time and a limited number of days per week. It should be noted that the scheme aims to stop early morning approaches taking place before 06:00. Consequently, there will be no new communities exposed to approach noise during the early morning period which is considered to be the most sensitive period of the day.

4 ADDITIONAL INFORMATION

4.1 Further analysis of baseline noise levels

The noise contours provided in our May 2014 submission were prepared using the Integrated Noise Model (INM) software. As this differs from the software package ANCON, which will be used by the AC and its partner the Civil Aviation Authority (CAA) to undertake the appraisal of the HHL/RIL proposal, a validation exercise was undertaken to calibrate the baseline data so as to be representative of existing conditions. This validation led to a correction factor being applied to the Sound Exposure Level (SEL) noise contours for key individual aircraft which are considered to be significant in terms of number of movements or noise output. Once the SEL contours were comparable in the INM and ANCON models average noise contours were produced. It was found that the INM model output was under-predicting noise levels over a 16-hour daytime period. An adjustment of +2dB was therefore made to the baseline contours to provide a suitably representative output to ANCON. However, under-predictions in approach noise were still apparent despite the correction. The under-prediction of aircraft approach noise for the baseline scenario is likely to result in over-predictions when calculating the population exposed to aircraft noise in the analysis of future noise scenarios as noise predictions with the future aircraft fleet show better correlation with future noise contours modelled by the CAA using ANCON.

These baseline contours were shown on Figures 1.6 – 1.8 submitted in Chapter 1: Noise of the Stage 2 Submission Attachment 5-1 report. They were also used in the calculation of change in population likely to be affected by aircraft noise due to the HHL/RIL proposed extension, providing a worst case scenario in terms of the increase in the number of people affected by changes in noise.

The main difference between the INM baseline (with modified aircraft profiles) and the CAA baseline was in the prediction of approach noise. In comparison to the CAA 2012 baseline noise contours, the INM baseline under-predicted on approaches, in particular at low noise contours (54dB and 57dB) and less so at contours of 60dB and greater. This is in contrast to the INM future predicted noise levels which, in comparison with the CAA ANCON noise predictions, under-predicted at 54dB, were comparable at 57dB and 60dB, and over-predicted at noise levels of 63dB and greater.

The key factor in the noise modelling process is the relative difference between the INM modelled results rather than absolute comparisons with the ANCON results. For analysis purposes, only the results of the INM modelling have been used to assess changes in the air noise environment. However, analysis of aircraft fleet using ANCON is likely to indicate that changes in noise on approach paths over west London are likely to be lower than those presented at noise levels of 57dB and greater due to discrepancies between INM and ANCON noise outputs. Consequently, the results of changes in population that are presented in this submission are likely to be higher at 54dB and 57dB than results of analysis using ANCON may show.

Changes in population affected by the future operational scenario using the CAA's ANCON noise contours are presented in Table 4.1. The change in population affected shows, as discussed, reductions in population affected under the 54dB and 57dB $L_{Aeq,16h}$ noise contours, a similar change in population affected at 60dB $L_{Aeq,16h}$, and increases in population affected at noise levels of 63dB $L_{Aeq,16h}$ and higher.

Table 4.1 Affected population and % change with AC flight paths using ANCON baseline

Contour	Baseline Population	40% next gen AC flight paths		60% next gen AC flight paths		90% next gen AC flight paths	
		Population	% Change	Population	% Change	Population	% Change
54dB LAeq,16h	348,306	242,437	-30%	234,564	-33%	180,447	-48%
57dB LAeq,16h	131,275	106,723	-19%	97,218	-26%	92,949	-29%
60dB LAeq,16h	66,786	69,363	4%	67,436	1%	74,284	11%
63dB LAeq,16h	30,876	43,081	40%	41,513	34%	41,380	34%
66dB LAeq,16h	9,909	23,258	135%	22,360	126%	19,148	93%
69dB LAeq,16h	2,355	8,229	249%	7,073	200%	5,232	122%
72dB LAeq,16h	451	2,560	468%	2,257	401%	1,940	330%

It should be noted that the change in noise levels at unique habitation locations are unable to be produced for the ANCON baseline contours as detailed grid calculations are not available for these predictions.

Table 4.2 Total affected population and % change with AC flight paths using ANCON baseline

Contour	Baseline Population	40% next gen AC flight paths		60% next gen AC flight paths		90% next gen AC flight paths	
		Population	% Change	Population	% Change	Population	% Change
54dB LAeq,16h	589,958	495,651	-16%	472,421	-20%	415,380	-30%
57dB LAeq,16h	241,652	253,214	5%	237,857	-2%	234,933	-3%
60dB LAeq,16h	110,377	146,491	33%	140,639	27%	141,984	29%
63dB LAeq,16h	43,591	77,128	77%	73,203	68%	67,700	55%
66dB LAeq,16h	12,715	34,047	168%	31,690	149%	26,320	107%
69dB LAeq,16h	2,806	10,789	284%	9,330	233%	7,172	156%
72dB LAeq,16h	451	2560	468%	2257	400%	1940	330%

Table 4.2 above shows the total affected population and the percentage change that will experience a reduction in noise, with 30% fewer people being exposed to aircraft noise greater than $L_{Aeq,16h}$ of 54dB.

4.2 Displaced threshold on southern runway

An additional mitigation option for the reduction of approach noise is the displacement of the landing threshold on the southern runway. Runway 27L is approximately 3,600m long allowing the landing threshold to be reduced by 600m and still maintaining 3,000m for safe landing. This is shown in Figure 1.25 and the associated reduction in population affected is set out in Table 4.1 below.

Table 4.3 Affected population change with displaced threshold on 27L

Contour	Baseline Population	40% next gen (original flight paths)		40% next gen 600m displaced 27L approach threshold	
		Population	% Change	Population	% Change
54dB LAeq,16h	207,089	235,534	14%	233,241	13%
57dB LAeq,16h	119,432	125,761	5%	124,996	5%
60dB LAeq,16h	58,559	77,945	33%	76,641	31%
63dB LAeq,16h	34,767	41,652	20%	42,546	22%
66dB LAeq,16h	14,956	23,601	58%	21,702	45%
69dB LAeq,16h	3,486	7,959	128%	7,633	119%
72dB LAeq,16h	739	2,601	252%	2,566	247%

5 RESPONSE TO COMMISSION'S QUERIES ON NOISE

Our response to the Commission's clarification queries, issued by email on 13th June 2014 is attached at Appendix 1.

1 NOISE CONTOURS

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LEGEND

Future Noise Contours

- 54dB
- 57dB
- 60dB
- 63dB
- 66dB
- 69dB
- 72dB

Revision Details	By / Check	Check Date	Suffix

Purpose of Issue: FINAL

Client: RUNWAY INNOVATIONS LIMITED

Project Title: SUBMISSION TO THE AIRPORTS COMMISSION - SHORTLISTED OPTIONS

Drawing Title: HUB 60 NEXT GEN

Drawn	Checked	Approved	Date
BB	ER	ER	14/07/2014

URS Internal Project No.: 47067372

Scale @ A3: 1:125,000

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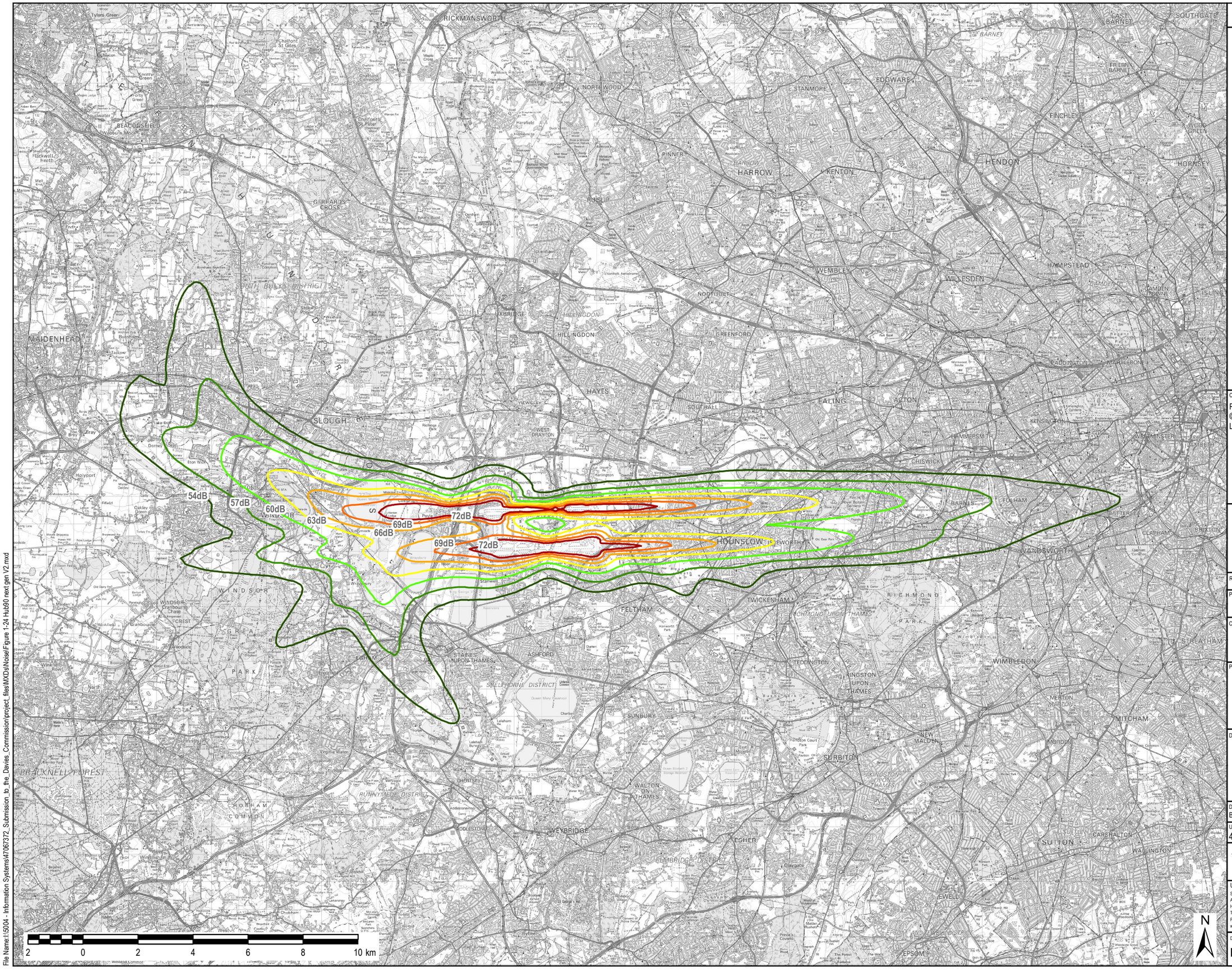
Drawing Number: FIGURE 1.23

Rev: 1

File Name:I:\5004 - Information Systems\47067372_Submission_to_the_Davies_Commission\project_files\MXDs\Noise\Figure 1-23 Hub60 next gen V2.mxd



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LEGEND

Future Noise Contours

- 54dB
- 57dB
- 60dB
- 63dB
- 66dB
- 69dB
- 72dB

Revision Details	By / Check	Check Date	Suffix

Purpose of Issue: FINAL

Client: RUNWAY INNOVATIONS LIMITED

Project Title: SUBMISSION TO THE AIRPORTS COMMISSION - SHORTLISTED OPTIONS

Drawing Title: HUB 90 NEXT GEN

Drawn	Checked	Approved	Date
BB	ER	ER	11/07/2014

URS Internal Project No.: 47067372

Scale @ A3: 1:125,000

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Drawing Number: **FIGURE 1.24**

Rev: 1

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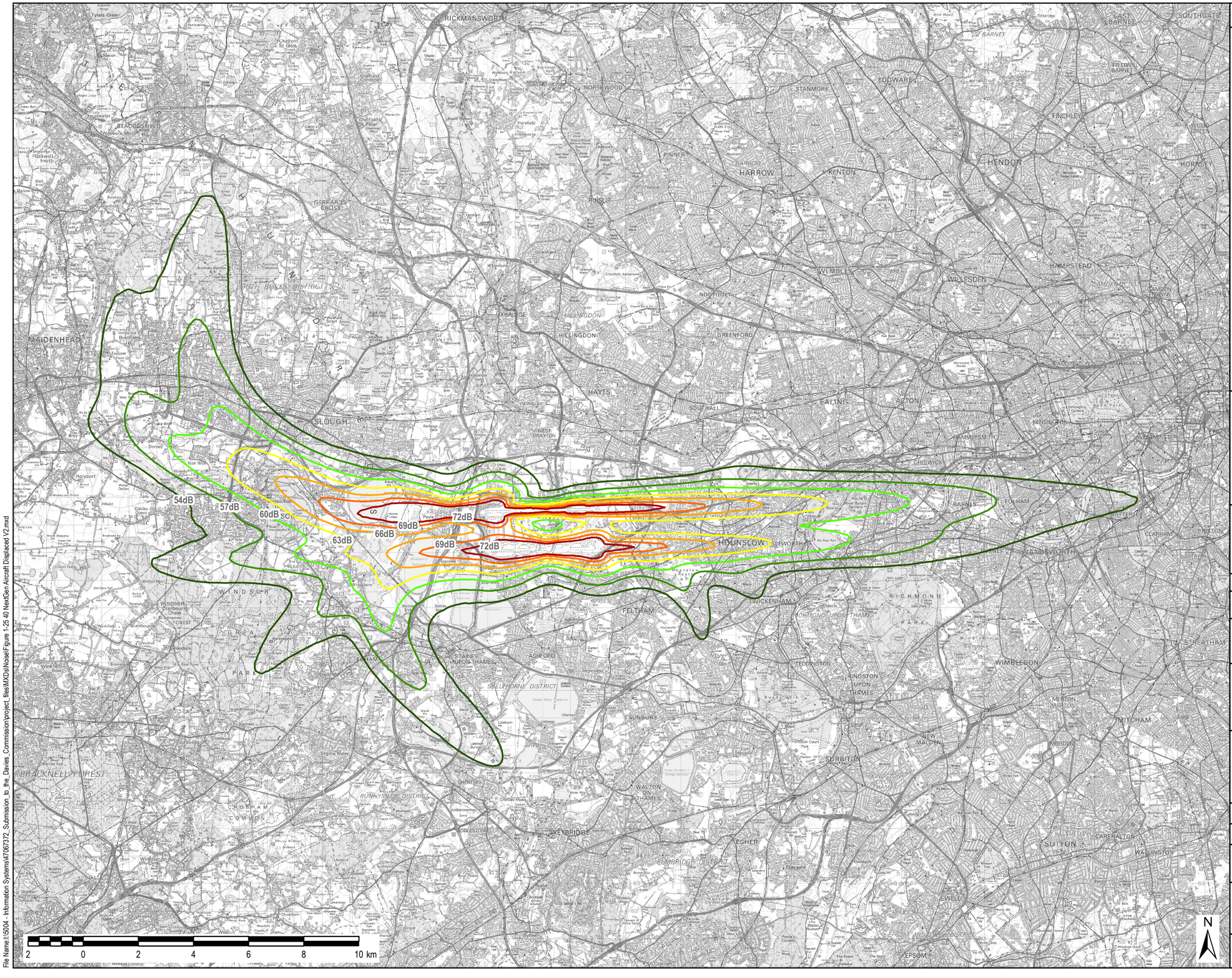

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LEGEND

Future Noise Contours

- 54dB
- 57dB
- 60dB
- 63dB
- 66dB
- 69dB
- 72dB

Revision Details	By / Check	Check Date	Suffix

Purpose of Issue: FINAL

Client: RUNWAY INNOVATIONS LIMITED

Project Title: SUBMISSION TO THE AIRPORTS COMMISSION - SHORTLISTED OPTIONS

Drawing Title: 40% NEXT GENERATION AIRCRAFT WITH 600M DISPLACED LANDINGS ON RUNWAY 27L

Drawn	Checked	Approved	Date
BB	ER	ER	08/07/2014

URS Internal Project No.	Scale @ A3
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Drawing Number: **FIGURE 1.25**

Rev: 1

File Name:I:\5004 - Information Systems\47067372_Submission_to_the_Davies_Commission\project_files\MXDs\Noise\Figure 1-25 40 NextGen Aircraft Displaced V2.mxd

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LEGEND

Future Noise Contours

- 54dB
- 57dB
- 60dB
- 63dB
- 66dB
- 69dB
- 72dB

Revision Details	By / Check	Check Date	Suffix

Purpose of Issue: FINAL

Client: RUNWAY INNOVATIONS LIMITED

Project Title: SUBMISSION TO THE AIRPORTS COMMISSION - SHORTLISTED OPTIONS

Drawing Title: 40% NEXT GENERATION AIRCRAFT WITH AC FLIGHT PATHS

Drawn	Checked	Approved	Date
BB	ER	ER	11/07/2014

URS Internal Project No.: 47067372

Scale @ A3: 1:125,000

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Drawing Number: FIGURE 1.26

Rev: 1

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2 0 2 4 6 8 10 km

File Name:I:\5004 - Information Systems\47067372_Submission_to_the_Davies_Commission\project_files\MXDs\Noise\Figure 1-26 40 Next Gen Aircraft Flightpaths V2.mxd

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LEGEND

Future Noise Contours

- 54dB
- 57dB
- 60dB
- 63dB
- 66dB
- 69dB
- 72dB

Revision Details	By Check	Check Date	Suffix

Purpose of Issue: FINAL

Client: RUNWAY INNOVATIONS LIMITED

Project Title: SUBMISSION TO THE AIRPORTS COMMISSION - SHORTLISTED OPTIONS

Drawing Title: 60% NEXT GENERATION AIRCRAFT WITH AC FLIGHT PATHS

Drawn	Checked	Approved	Date
BB	ER	ER	11/07/2014

URS Internal Project No.: 47067372

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Drawing Number: FIGURE 1.30

Rev: 1

N

2 0 2 4 6 8 10 km

File Name:I:\5004 - Information Systems\47067372_Submission_to_the_Davies_Commission\project_files\MXDs\Noise\Figure 1-30 60 next gen aircraft AC flightpath V2.mxd

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LEGEND

Future Noise Contours

- 54dB
- 57dB
- 60dB
- 63dB
- 66dB
- 69dB
- 72dB

Revision Details	By / Check	Check Date	Suffix

Purpose of Issue: FINAL

Client: RUNWAY INNOVATIONS LIMITED

Project Title: SUBMISSION TO THE AIRPORTS COMMISSION - SHORTLISTED OPTIONS

Drawing Title: 90% NEXT GENERATION AIRCRAFT WITH AC FLIGHT PATHS

Drawn	Checked	Approved	Date
BB	ER	ER	11/07/2014

URS Internal Project No.: 47067372

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Drawing Number: FIGURE 1.31

Rev: 1

File Name:\\5004 - Information Systems\47067372_Submission_to_the_Davies_Commission\project_files\MXDs\NoiseFigure 1-31 90 next gen aircraft AC flightpath V2.mxd

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LEGEND

Future Noise Contours

- 54dB
- 57dB
- 60dB
- 63dB
- 66dB
- 69dB
- 72dB

Revision Details	By / Check	Check Date	Suffix

Purpose of Issue: FINAL

Client: RUNWAY INNOVATIONS LIMITED

Project Title: SUBMISSION TO THE AIRPORTS COMMISSION - SHORTLISTED OPTIONS

Drawing Title: 40% NEXT GENERATION AIRCRAFT WITH CURVED APPROACHES

Drawn	Checked	Approved	Date
BB	ER	ER	08/07/2014

URS Internal Project No.: 47067372

Scale @ A3: 1:125,000

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Drawing Number: FIGURE 1.35

Rev: 1

2 0 2 4 6 8 10 km

N

File Name:I:\5004 - Information Systems\47067372_Submission_to_the_Davies_Commission\project_files\MXDs\NoiseFigure 1-35 40 next gen aircraft curved V2.mxd

2 APPENDIX 1 – RESPONSE TO COMMISSION'S QUERIES ON NOISE

Clarification Reference	Discipline	Document	Doc. Reference	Clarification to SCHEME PROMOTER	Response from SCHEME PROMOTER
HUB-NOISE-N-001	Noise	5-1 Environmental Technical Notes		H**as the noise assessment year for full use of the proposed development been taken as 2023?** If not, please confirm the year of operation that the noise assessment assumes.	The noise assessment year has been assumed to be 2023 (as stated in section 1.9).
HUB-NOISE-N-002	Noise	5-1 Environmental Technical Notes		The noise modelling assumes 40% Chapter 14 aircraft by the assessment date, which is currently presumed from the text to be 2023 (see clarification N-001); **can the promoter please advise of their assumptions regarding the percentage of Chapter 14 aircraft in 2030 (2040, 2050)? If the approximate percentage is greater than 40%, can the promoter advise what level of reduced noise impact should be expected post assessment year?**	For consistency a fleet mix of 40% Chapter 14 aircraft was assumed throughout. However, it is acknowledged that the proportion of Chapter 14 aircraft will increase over time, leading to a decrease in noise levels over the 60 year period. This was not been modelled for the original submission but was discussed in section 1.11.2.2. We have subsequently modelled two further fleet mixes - to include 60% and 90% next generation aircraft - and provide the analysis in the Clarifications Response document and in Figures 1.23 and 1.24. Changes to the proposed flight paths by both the AC and HH have also been modelled and are presented in Figures 1.26 and 1.27. A displaced threshold option on runway 27L has also been included (using a 40% fleet mix) and is presented in Figure 1.25. Details of changes to affected population for all these options can be found in the Clarifications Response document.
HUB-NOISE-N-003	Noise	5-1 Environmental Technical Notes		The output of the INM contouring for the future is advised to show good correlation with the CAA ANCON contours; **can the promoter clarify to what extent the INM and ANCON modelling take into account the operational noise control measures** (e.g. various preferential runway usage, deeper landings in the early morning, deep takeoffs in the late evening, steeper approaches) **discussed in the Attachment?**	Operational noise control measures have not been modelled at this time. The reference to deeper landings and takeoffs refers to use of the proposed extended runway which has been modelled as part of our runway operations scenarios.
HUB-NOISE-N-004	Noise	HH Attachment 5-1 Environmental Technical Notes		**Is the promoter able to share any further detail regarding the implication of the future noise contours presented** (e.g. absolute numbers of people affected and change in the number of people exposed to aviation noise, and similar information for local amenities)**?**	Data has been provided in the Clarifications Response document.
HUB-NOISE-N-005	Noise	5-1 Environmental Technical Notes		The submission does not include any assessment for the night period (23.30-06.00) in terms of $_{LAeq,T}$ contours; **If such an assessment has been undertaken, could this be shared?**	Figure 1.7 submitted in the Stage 2 Submission Attachment 5-1 report shows a comprison of the baseline and future Laeq, 8h night-time period (2300-0700) as per the Appraisal Framework requirements. Our scheme does not contain any aircraft movements between 23.30 and 06.00 therefore there will be no aircraft noise during this period.
HUB-NOISE-N-006	Noise	5-1 Environmental Technical Notes		Change in noise for the 15 settlements currently assessed (e.g. Table 1.7 for $L_{Aeq,16h}$/Table 1.8 for $L_{Aeq,8h}$/Table 1.9 for L_{den}), is presented from 2012 to the future assessment year; **is it possible to articulate change from today to operational assessment year in terms of a basecase (without development) and scheme (with development)?** If so, please articulate the year under consideration for the future assessment.	Heathrow, under current operational conditions, is operating at maximum capacity. If mixed mode operations were implemented, the maximum capacity would increase from approximately 480,000 ATMs to 540,000 ATMs (2015 being the case year). The Hub scheme proposes approximately 690,000 ATMs which is an increase of 150,000 on the mixed mode base case. In general noise terms, an increase of this magnitude (approximately 28%) is equivalent to a 1dB increase in noise. It should be noted that the Hub scenario uses the same flight paths as the mixed mode case so aircraft noise will not affect new areas; however, the extended runway will result in a different distribution of aircraft movements with more movements occuring on the northern and extended runway than the southern runway. Consequently, although the general increase in noise from the future base case can be generally stated for the entire scheme, it is likely that habitations on the northern flight paths will experience an increase in noise exceeding 1dB whereas habitations on the southern runway fligh paths will experience changes in noise of less than 1dB.

Clarification Reference	Discipline	Document	Doc. Reference	Clarification to SCHEME PROMOTER	Response from SCHEME PROMOTER
HUB-NOISE-N-007	Noise	5-1 Environmental Technical Notes		**With regard to the information presented in Table 1.7, 1.8 and 1.9, can the absolute values from which the calculation has been derived be provided?**	Absolute noise levels have been provided in the Clarifications Response document.
HUB-NOISE-N-008	Noise	5-1 Environmental Technical Notes		The $L_{Aeq,T}$ contours usually adopted in the UK relate to the summer period 15th June to 16th September; **can the promoter clarify whether that is the period used for the $L_{Aeq,T}$ contours included in the Attachment?**	Yes, this is the period used for the Laeq, 16hr assessment.
HUB-NOISE-N-009	Noise	5-1 Environmental Technical Notes		The detailed table of "CAA Future Daytime Movements" indicates during daytime 159 aircraft movements by the Fokker 70/100 aircraft, whereas only 11 aircraft movements by this aircraft occurred in 2011, and a growth in such movements is not expected as the aircraft is out of production and does not reflect Heathrow demand profile; **Can the promoter confirm whether the table is correct, and whether the noise contour modelling assumed this volume of ATM?**	An error occurred through transposition of data; the table in the Stage 2 Submission Attachment 5-1 report is incorrect and has been updated in the Clarifications Response document. Additional aircraft movements for the 60% and 90% next generation aircraft scenarios have also been included in the updated table.