

Introduction of RNP AR Procedures at EGLC

Stage 3 Full Options Appraisal
ACP-2025-003

Issue 1.0



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Change History

Issue	Month/Year	Changes this issue (most recent first)
Issue 1.0	03/26	Published for consultation launch

Referenced Documents across all Stage 3 material

Ref No	Name and description	Links
1.	CAP1616 Edition 5.1	Link
2.	Statement of Need	Link
3.	Introduction of RNP AR Procedures at EGLC Airspace Change Portal Page	Link
4.	CAP1616i: Environmental Assessment Requirements and Guidance for Airspace Change Proposals, 2023	Link
5.	Assessment Meeting Minutes	Link
6.	Stage 1 Define	Link
7.	UK Aeronautical Information Publication, July 2025	Link
8.	CAA Publication: Steep Approach Approval Compliance Statement and Checklist	Link
9.	London Airspace Management Programme (LAMP) Deployment 2 airspace change portal page	Link
10.	LCY Stage 2 Engagement Workshops Slides	Link
11.	London City Airport Annual Performance Report 2024	Link
12.	London City Airport Annual Performance Report 2024, Annexes	Link
13.	CADP1 S73 Application Environmental Statement	Link
14.	UK Government Air Quality Statistics	Link
15.	CADP1 Air Quality Management Strategy	Link
16.	Above and Beyond: Our roadmap to a sustainable future	Link
17.	CAP1616f: Guidance on Airspace Change Process for Permanent Airspace Change Proposals, 2025 (v1.1)	Link
18.	Stage 1 Timeline Agreement	Link
19.	CAP1498 Definition of Overflight, Edition 2	Link
20.	CAA Policy on Minimum Standards for Noise Modelling	Link
21.	ICAO Aircraft Engine Emissions Databank	Link
22.	Datasheets (06/2025)	Link
23.	Airspace Modernisation Strategy 2030-2040 Part 1: Strategic objectives and enablers, CAP1711, 2024	Link
24.	Airport Surface Access Strategy 2017-2025	Link
25.	Air Navigation Guidance 2017	Link

List of technical options appraisal reports supporting this consultation:

- Annex A** 12 pages Airspace change forecasts and methodology
- Annex B** 23 pages Cost-benefit analysis including passenger surface access time savings
- Annex C** 89 pages Aircraft noise assessment
- Annex D** 73 pages Air quality assessment
- Annex E** 10 pages Greenhouse gas emissions and fuel burn assessment

Options appraisal Excel workbooks separately-supplied to the CAA (not for publication):

- WebTAG Greenhouse gas impacts monetisation
- WebTAG Noise impacts monetisation
- Cost-benefit analysis calculation assessment model

1. Introduction

1.1 Background

- 1.1.1 We are London City Airport LCY, the sponsor of this airspace change proposal (ACP). The CAA's reference for this change is ACP-2025-003.
- 1.1.2 This document forms part of the document set submitted to the Civil Aviation Authority (CAA) in accordance with the requirements of the CAP1616 Airspace Change Process [Ref 1].
- 1.1.3 This document's purpose is to satisfy the Stage 3 Consult Gateway requirement for a full options appraisal (FOA). It provides evidence to support our proposed introduction of additional landing approach procedures known as RNP-AR.
- 1.1.4 Two complementary documents provide more details on this consultation and how it will be conducted – we recommend all three documents are read in order to ensure the most thorough understanding of this proposal:
- Stage 3 Consultation Document, which is the main document introducing the current arrangements and explaining what the change would mean for stakeholders
 - Stage 3 Consultation Strategy, which provides details on how we will conduct the consultation

1.2 How to read this document

- 1.2.1 This FOA document provides noise contour maps, data analysis, the methodology behind that analysis, and an initial safety assessment in support of the consultation on this ACP. It is technical by nature but has been written without the need for technical knowledge. More detailed technical materials are available separately as annexes.
- 1.2.2 Each element of the appraisal illustrates the current and predicted impacts of air traffic, divided into specific topics, and also the types of stakeholder(s) they would affect. This is described in more detail in Section 3 below.
- 1.2.3 This FOA document compares the without-change baseline option with the with-change option. It summarises the impacts of the current airspace design on each topic/stakeholder, without and with the airspace change, over the CAA-agreed 12-year appraisal period from 2027-2038 (see 2.3.3 below). It also takes account of the forecast changes in air traffic and fleet mix under both options.
- 1.2.4 The purpose of the change is to allow a new fleet mix which would not be possible under the without-change option. The forecast changes in air traffic and fleet mix are due to the with-change option which enables and encourages a quicker transition to new generation, efficient, larger capacity aircraft. This means overall fewer flights and more passengers, making quicker progress towards 9m passengers per year¹.
- 1.2.5 This appraisal summarises the impacts of the additional airspace design on each topic/stakeholder, and describes how this would be different from doing nothing to the proposed airspace design where specific aircraft types would be unable to use our airport.
- 1.2.6 Most impacts are described in a quantified and monetised way. In some cases this is not possible (or would be disproportionate to attempt), so we have provided the most complete information available at time of writing. Thus some

¹ Our planning limit is 9m passengers per annum (mppa), within 111,000 air traffic movements, and other daily/weekly/weekend limits.

items may have elements of quantified data, or they may be qualitatively described.

1.2.7 A cost-benefit analysis is provided, and a preferred design option is declared, with reasons for the preference.

1.3 Progression from previous stage of airspace change process

1.3.1 In Stage 2, three design components² were progressed. They were refined and combined with current procedure components into sets of additional instrument flight procedures per runway. These IFPs are considered as a single design option, enabling with-change option for this proposal. For full details of the development of this design please see the main consultation document.

1.3.2 In the Stage 2 document v1.1 paragraph 5.9.5 p.152-154, we listed impact assessments which we knew would need greater detail at Stage 3. These evidence gaps have been addressed, and the evidence itself is supplied within this document and separate technical annexes (along with the methodology and assumptions used).

- Noise modelling to Category B³ standards completed, with process-compliant contours, associated data tables and monetisation provided where required. Agreement was reached with the CAA regarding proportionate alternate diagrams and a reduced requirement for some metrics.
- Local air quality modelling analysis completed for oxides of nitrogen NO_x, particulate matter PM_{2.5} and PM₁₀, appropriate metrics are provided.
- Fuel burn and greenhouse gas emissions were modelled, appropriate data tables and monetisation are provided where required.
- Tranquillity and biodiversity qualitative assessments have been updated.
- Capacity and resilience qualitative assessments have been updated.
- Airspace access qualitative assessment has been updated.
- Economic impact qualitative assessments have been updated.
- Other costs qualitative assessment has been updated.

1.3.3 The evidence in the list above is supplied within subsections of the options appraisal Section 3 from p.8, and/or in technical appendices at the end of this document. For more details on specific design decisions since Stage 2, see the main Consultation Document Section 4.

2. Context for data in this document

2.1 Rounding

2.1.1 Throughout this document, data has been rounded to the nearest whole number (such as flights or passengers, where averages often result in fractions) or appropriate significant figure for ease of display. Data using decimal points is rounded to the fewest appropriate decimal places. This includes the totals in data columns, and numbers stated within the narrative, which are **always calculated using unrounded data, and then rounded for presentation**. Therefore, adding up data items may result in a different number from that presented as the total due to the fractional or significant figure rounding differences not shown.

2.2 Scope

2.2.1 The without-change and with-change options are assessed by comparing the key impacts as set out in CAP1616f (Ref 17).

² "Design components" means the parts of the full-length approach where changes would have differing impacts (see Stage 2).

³ As defined in the CAA's document CAP2091 Policy on minimum standards for noise modelling.

2.2.2 We assume the easterly runway 09 is used for 32% of air traffic movements (ATMs) and the westerly runway 27 for 68% of ATMs, where a “movement” is either a take-off or a landing⁴. This east-west proportion⁵ is a 20-year average.

2.2.3 In 2024, our baseline year, we managed **50,933 ATMs at LCY, carrying 3.6m passengers**.

2.3 Total numbers of flights impacted by this ACP

2.3.1 As stated in paragraph 1.2.4 above, different forecast changes in air traffic and fleet mix are caused by the with-change option because it enables and encourages a quicker transition to new generation, efficient, larger capacity aircraft, reducing the overall number of flights needed to reach the planning limit on passenger capacity (9 million passengers per annum).

2.3.2 The tables below illustrate two versions of the same data, with different details.

- Figure 1 provides detailed forecasts for the numbers and types of aircraft to operate at LCY in the planned implementation year of this proposal (2027) and 12 years later (2038 inclusive), with the runway (rwy) proportions assumed consistent as per paragraph 2.2.2 above. It also includes the forecast annual passenger numbers (abbreviated as pax) for 2027 and 2038.
- Figure 2 provides detailed forecasts on annual ATMs and passenger numbers over the 12-year appraisal period.

Figure 1 Implementation year and 12 years later: detailed fleet mix, ATMs and passenger forecast

Aircraft	Without change				With change			
	2027 Year 1		2038 Year 12		2027 Year 1		2038 Year 12	
	Rwy 09	Rwy 27	Rwy 09	Rwy 27	Rwy 09	Rwy 27	Rwy 09	Rwy 27
A220	2,240	4,760	6,432	13,668	2,240	4,760	4,448	9,452
ATR72	768	1,632	992	2,108	768	1,632	960	2,040
DHC8	1,216	2,584	0	0	1,216	2,584	0	0
E190	11,712	24,888	1,248	2,652	9,920	21,080	0	0
E190E2	448	952	1,248	2,652	448	952	864	1,836
E195E2	512	1,088	21,440	45,560	512	1,088	5,408	11,492
Corp Jets	1,124	2,390	1,124	2,390	1,124	2,390	1,124	2,390
A320neo	Not possible without change				544	1,156	11,968	25,432
Per Rwy	18,020	38,294	32,484	69,030	16,772	35,642	24,772	52,642
Total ATM	56,311		101,502		52,389		77,368	
Pax	4.1m		9.0m		4.1m		9.0m	

Figure 2 Detailed annual ATMs and passenger forecast to 9.0mppa limit (*not inc corporate jets)

Year	Without change			With change		
	ATMs	Pax	Pax/ATM*	ATMs	Pax	Pax/ATM*
2027	56,311	4.1	73	52,389	4.1	78
2028	58,206	4.2	72	55,644	4.4	79
2029	60,395	4.4	73	57,636	5.1	89
2030	60,006	4.6	77	56,016	5.6	100
2031	62,906	4.8	76	56,747	6.2	109
2032	64,656	5.1	79	57,354	6.6	115
2033	66,968	5.4	80	61,719	7.1	115
2034	69,249	5.7	82	66,149	7.7	116
2035	71,675	6.0	84	72,411	8.4	116
2036	80,793	6.9	85	77,368	9.0	116
2037	91,985	8.0	87	77,368	9.0	116
2038	101,502	9.0	89	77,368	9.0	116

12-year total	844,652 ATMs	c.68m pax	768,169 ATMs	c.82m pax
			c.76,500 fewer	c.14m more

⁴ An aircraft arriving, landing, taxiing in, taxiing out and taking off counts as two ATMs.

⁵ Air quality analysis necessarily uses slightly different proportions, see section 3.2.2

- 2.3.3 Note the table contains a mix of rounded and unrounded numbers (see 2.1.1 above), the totals are presented rounded from the raw data.
- 2.3.4 All tables in this document follow the above colour scheme – pink columns show information without the airspace change, green columns show the same information with the change.
- 2.3.5 As indicated in the final 12-year total row of Figure 2 above, the with-change option delivers our 9mppa cap across far fewer flights over the period, due to more passengers per flight. The 9mppa cap is also reached 2 years earlier (2036) when comparing the with-change to without-change forecasts.
- 2.3.6 Typically, the airspace change process requires a 10-year appraisal period. However, it was agreed with the CAA that a 12-year period should be used so that we would be able to present and compare impacts using like-for-like passenger numbers. Adopting a 10-year period would have meant comparing the airport at 6.9mppa with the airport at 9.0mppa which would not have shown the full effects of both the with-change option and the without-change option.
- ## 2.4 Summary of main analysis assumptions
- 2.4.1 This subsection provided high-level summaries of how the data was analysed. For detailed technical methodologies and assumptions see the list of technical supporting annexes on p.3.
- 2.4.2 Annual data from 2024 was studied and used to determine the flightplans and schedules for the forecasts. This FOA also assumes that the additional IFPs this ACP would introduce are flown only by the A320neo aircraft type, in accordance with the most up-to-date and credible forecast provided to us by specialist air transport consultants York Aviation Ltd (see Annex A for details). Therefore all the calculations are presented using the A320neo as the main change. This assumption is the best available, however we are clear that the IFPs would not be restricted to a specific aircraft type. Any aircraft operator wishing to use these IFPs would need airport authorisation, following an assessment of the potential benefits and impacts. It would be disproportionate to attempt to calculate and provide analysis for multiple combinations of aircraft fleet mixes.
- 2.4.3 We used 2024's baseline traffic flow proportions to illustrate how the forecast traffic would be expected to use the main flows.
- 2.4.4 Appropriate aircraft weight and performance was used in the modelling.
- 2.4.5 For fuel and greenhouse gas emission models, the full flight emissions for origin to destination was calculated, including the landing-take off cycle (LTO) at LCY, which covers taxiing in and taxiing out, as well as use of Auxiliary Power Units (APUs).
- 2.4.6 In general, vertical descriptions refer to altitude (above mean sea level in the region). For noise modelling and local air quality, terrain elevation was taken into account.
- 2.4.7 Flights were assumed to take off or land without delay and without missed approaches.

3. Options Appraisal

3.1 Communities: Noise impacts, quantified and monetised with primary metrics

- 3.1.1 Further to our Stage 2 commitment, we commissioned renowned acoustic consultants Bickerdike Allen Partners LLP to provide a dataset and report comparing the without-change option and the with-change option. We took their data and formatted it into this document. Their full report is available separately as a technical supporting Annex C, including details of the Aviation Environmental Design Tool (AEDT) version, dataset and assumptions used. This was completed to CAP2091 Category B standards as required by the airspace change process. For a complete description of the noise assessment methodology please read technical supporting Annex C.
- 3.1.2 The standard primary metrics for noise impacts are L_{Aeq} noise contours. These illustrate the average sound level in decibels (dB L) over a specific time period as described below, and the letter A reflects the human ear's varying sensitivity to different frequencies. Equivalent (eq) means that the changes in noise are expressed as a constant average level over the time periods.
- 3.1.3 Note that the definition of night time is the 8h period from 2300-0700, so for LCY the night time data is only for our earliest flights between 0630-0700 on weekdays and Saturdays, excluding public holidays. All other flights are in the 16h daytime period, 0700-2300; the latest LCY operates is 2230 hours.
- 3.1.4 Units for this section are therefore mainly dB L_{Aeq16h} (day) or dB L_{Aeq8h} (night).
- 3.1.5 Forecasts are used for the 2027 and 2038 summer seasons (defined from 16 June-15 Sept annually). Contours are produced without the change and with the change, and for daytime and night time flights.
- 3.1.6 The long-term average runway proportions were used (32% runway 09, 68% runway 27), this is known as "Average mode".
- 3.1.7 There are six contour diagrams below, showing:
- 2024 (current) daytime (L_{Aeq16h}), to show the most recent actual contours
 - 2027 (implementation year) daytime (L_{Aeq16h}), without and with change
 - 2038 (12 years later) daytime (L_{Aeq16h}), without and with change
 - 2024 (current) night time (L_{Aeq8h}), to show the most recent actual contours
 - 2027 (implementation year) night time (L_{Aeq8h}), without and with change
 - 2038 (12 years later) night time (L_{Aeq8h}), without and with change
- 3.1.8 Additionally, we supply a diagram showing noise-sensitive buildings within (and just outside) the largest of those contours. These show buildings associated with long-term healthcare, schools & education, and places of religious worship. These are also listed in our Consultation Strategy document as stakeholders.
- 3.1.9 Contours are shown from 51dB-69dB for daytime, and from 45dB-63dB for night time, both in 3dB intervals.
- 3.1.10 We also present data tables for each of the areas enclosed by the contours, illustrating the changes in:
- Total area of each contour, without and with change
 - Population within each contour, without and with change (see paragraph 3.1.13 below)
 - Dwellings within each contour, without and with change (see paragraph 3.1.13 below)
 - The number of each type of noise-sensitive building, without and with change

- 3.1.11 We also provide the monetised impacts using a standard Government tool called WebTAG. It uses standard Government statistics to apply prices to the combined impacts on, for example, sleep disturbance and various illnesses. This is the cost or benefit to society of those changes in noise exposure over the 12-year appraisal period, measured in net present value (£NPV), using 2023 as the price base.
- 3.1.12 These primary metrics provide sufficient information for the reader to understand and make informed decisions on the nature and scale of changing noise impacts under this proposal.
- 3.1.13 Note on population: London is a vibrant, growing city. We used the official London Population Projection application⁶ to determine how that population is expected to change within the primary metrics contour areas (specifically, to borough ward level). This is all detailed in the separately-published noise technical report methodology Annex C.
- 3.1.14 There are two points to make from a regulatory point of view:
- It would be disproportionate to attempt this for the area overflowed below 7,000ft. The primary metrics are used for regulatory decision-making, therefore making the population as accurate as possible within the area covered by the primary metrics contours is a sensible step to take for this proposal.
 - Compliance with the process requirement⁷ to consider the increase in population such as expected housing provision, i.e. to account for a changing baseline. It would not be proportionate to attempt to identify and validate every proposed housing development in large parts of London, however the official London Population app is an ideal publicly-available resource for the area covered by the primary metrics contours.
- 3.1.15 Regarding our contour diagrams and maps: The diagrams are designed, where appropriate, to show both the without-change and with-change contours on the same diagram. In some cases the difference between contours is small and can be hard to discern at normal viewing screen size. Please use the zoom tools on your PDF reading application (or browser) to look more closely at your area of interest. For even more details, map files are available to download from our consultation website (in KMZ format, suitable for use in Google Earth and many other mapping applications), as is Technical Annex C Aircraft Noise Assessment, which has alternative versions of all the contour maps produced for this consultation.

⁶ <https://apps.london.gov.uk/population-projections/>

⁷ CAP1616f p30 para 3.13

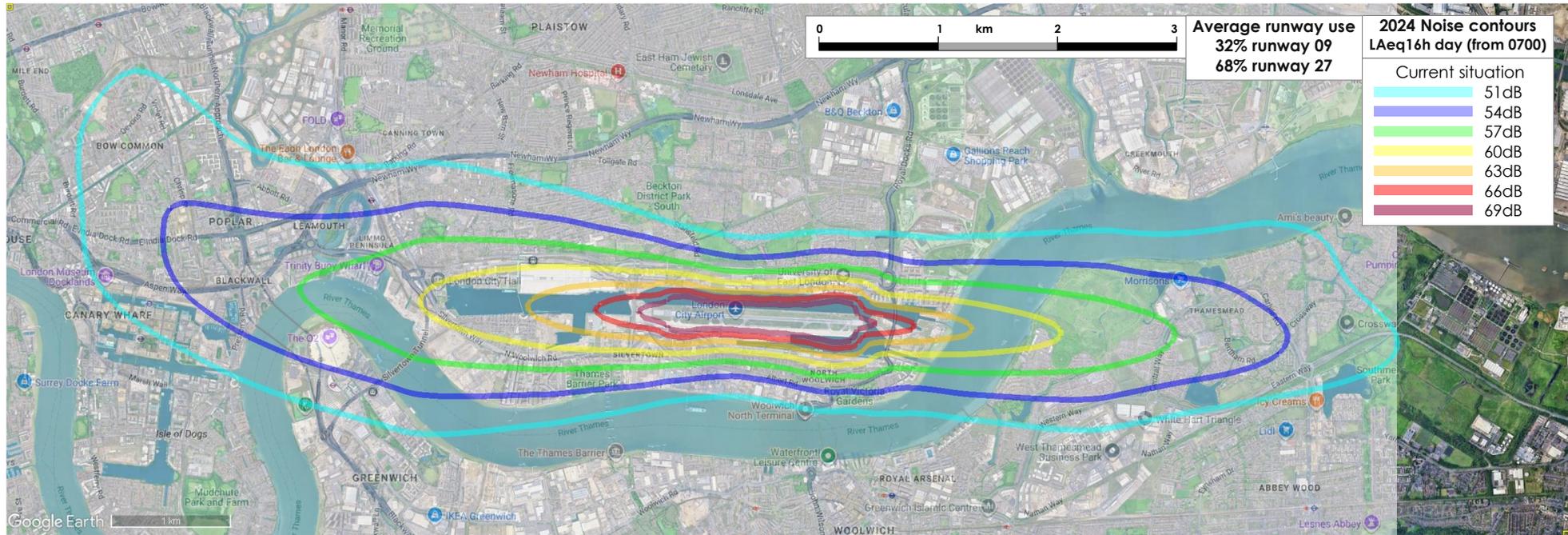


Figure 3 Primary noise metric L_{Aeq16h} average mode contours for 2024, the current situation

3.1.16 The contours shown in the diagram above indicate the average daytime noise impacts in 2024.

Figure 4 Primary noise metric L_{Aeq16h} , 2024 data relating to contours (cumulative)

2024 current situation			
dB day	Area km ²	Population (1,000s)	Dwellings (1,000s)
51	18.2	132.2	51.9
54	10.6	68.3	28.1
57	5.7	26.3	10.6
60	2.9	9.5	3.9
63	1.4	1.1	0.4
66	0.8	<0.1	<0.1
69	0.4	0.0	0.0

3.1.17 The data table shows the number of square km enclosed by each contour, the population and the number of dwellings. Each contour/data row is cumulative, i.e. larger contours of lower dB enclose the smaller contours of higher dB, so the data numbers get smaller as each contour (higher dB) gets smaller closer to the airport.

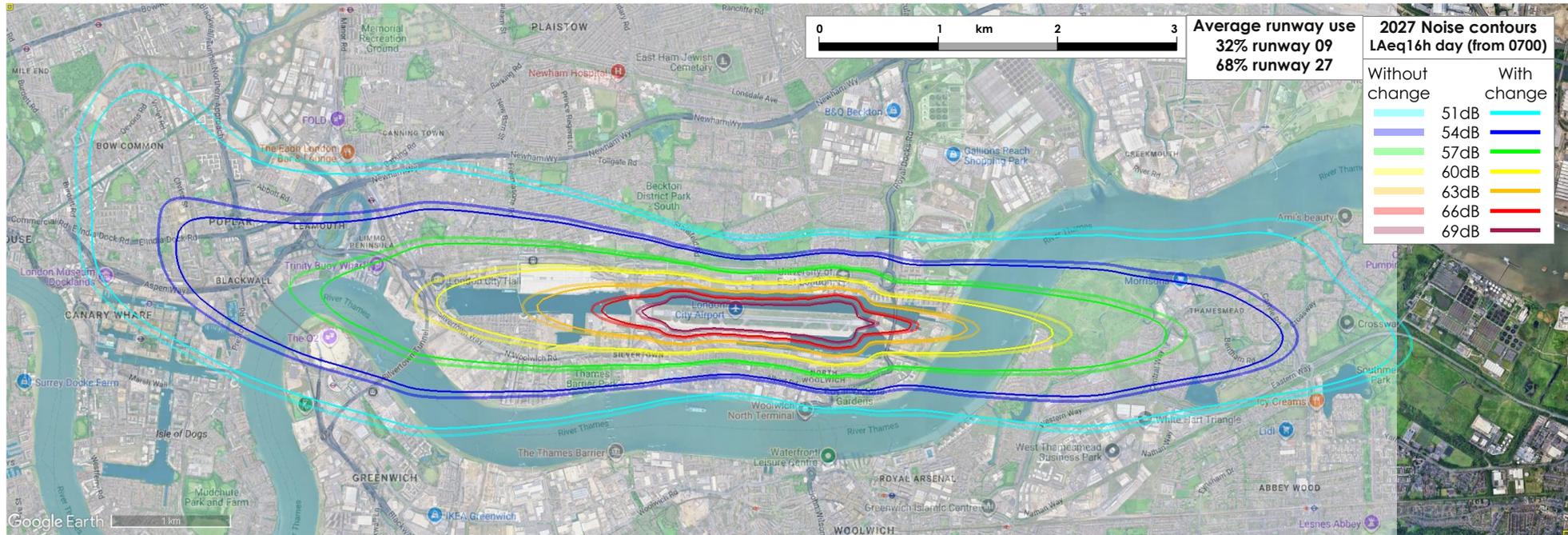


Figure 5 Primary noise metric LA_{eq16h} average mode contours for 2027, without and with change

3.1.18 The 2027 without-change daytime contours are similar in shape to, but slightly bigger than, 2024's current contours (previous page). In Figure 5 above, the solid with-change contours are smaller than the translucent without-change contours for each dB colour band, and the with-change contours are always entirely inside their colour-equivalent without-change contours.

Figure 6a/b/c Primary noise metric LA_{eq16h} 2027 data relating to contours (cumulative, i.e. contours of lower dB contain the contours of higher dB)

dB day	Area km ²		Population (1,000s)		Dwellings (1,000s)	
	2027 Without	2027 With	2027 Without	2027 With	2027 Without	2027 With
51	18.8	17.1	146.9	133.7	57.5	52.8
54	10.9	9.9	78.6	68.2	32.4	28.1
57	5.9	5.3	31.3	25.0	12.6	10.2
60	3.0	2.7	11.9	9.2	5.0	3.6
63	1.5	1.3	1.3	1.1	0.4	0.4
66	0.8	0.7	<0.1	<0.1	<0.1	<0.1
69	0.5	0.4	0.0	0.0	0.0	0.0

3.1.19 In the data tables, lower numbers per row mean an overall lower noise impact. In most rows the with-change numbers are lower than the without-change numbers. At the highest dBs they mainly are the same. Where numbers are the same, the changes are so small as to appear identical when rounded. <0.1 means fewer than 100 people/dwellings were impacted.

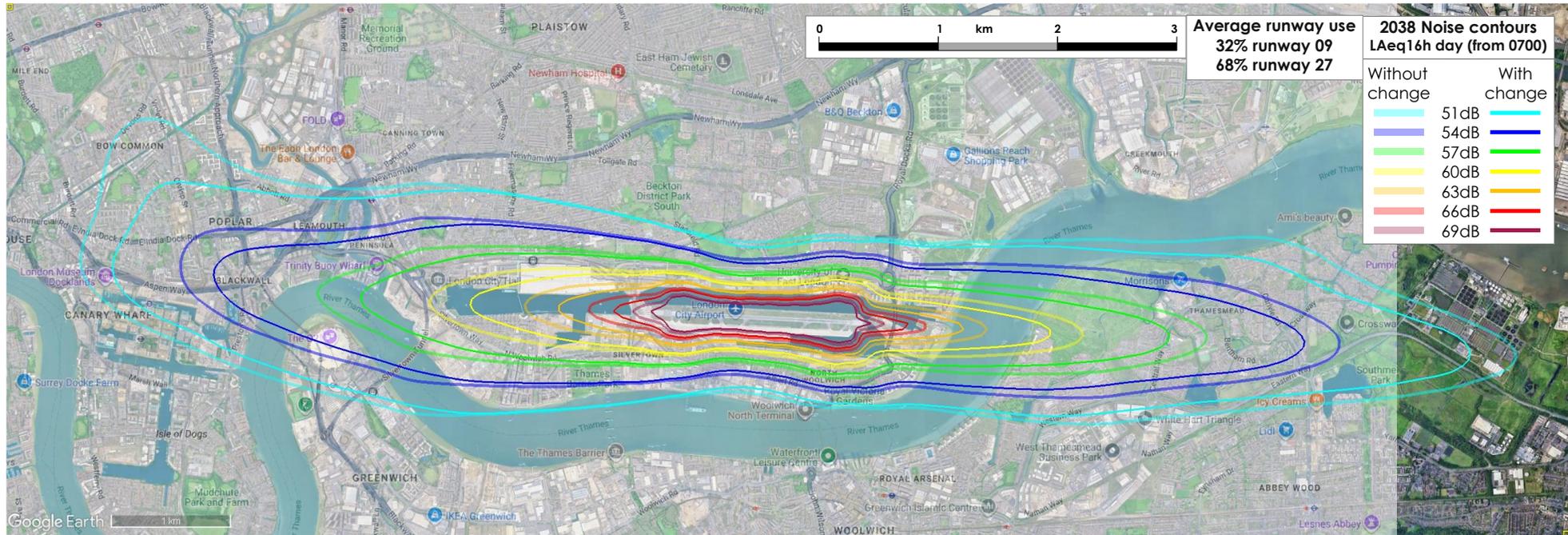


Figure 7 Primary noise metric LA_{eq16h} average mode contours for 2038, without and with change

3.1.20 In Figure 7 above, the solid with-change daytime contours are smaller than the translucent without-change contours for each dB colour band, and the with-change contours are always entirely inside the equivalent without-change contours.

Figure 8a/b/c Primary noise metric LA_{eq16h} 2038 data relating to contours (cumulative, i.e. contours of lower dB contain the contours of higher dB)

dB day	Area km ²		Population (1,000s)		Dwellings (1,000s)	
	2038 Without	2038 With	2038 Without	2038 With	2038 Without	2038 With
51	17.0	14.6	164.4	135.3	65.7	54.9
54	9.9	8.5	92.2	76.1	37.9	31.4
57	5.5	4.5	38.6	27.9	15.5	11.4
60	2.9	2.3	14.5	7.1	5.7	2.5
63	1.5	1.2	2.0	1.5	0.7	0.5
66	0.9	0.7	0.1	0.0	<0.1	0.0
69	0.5	0.4	0.0	0.0	0.0	0.0

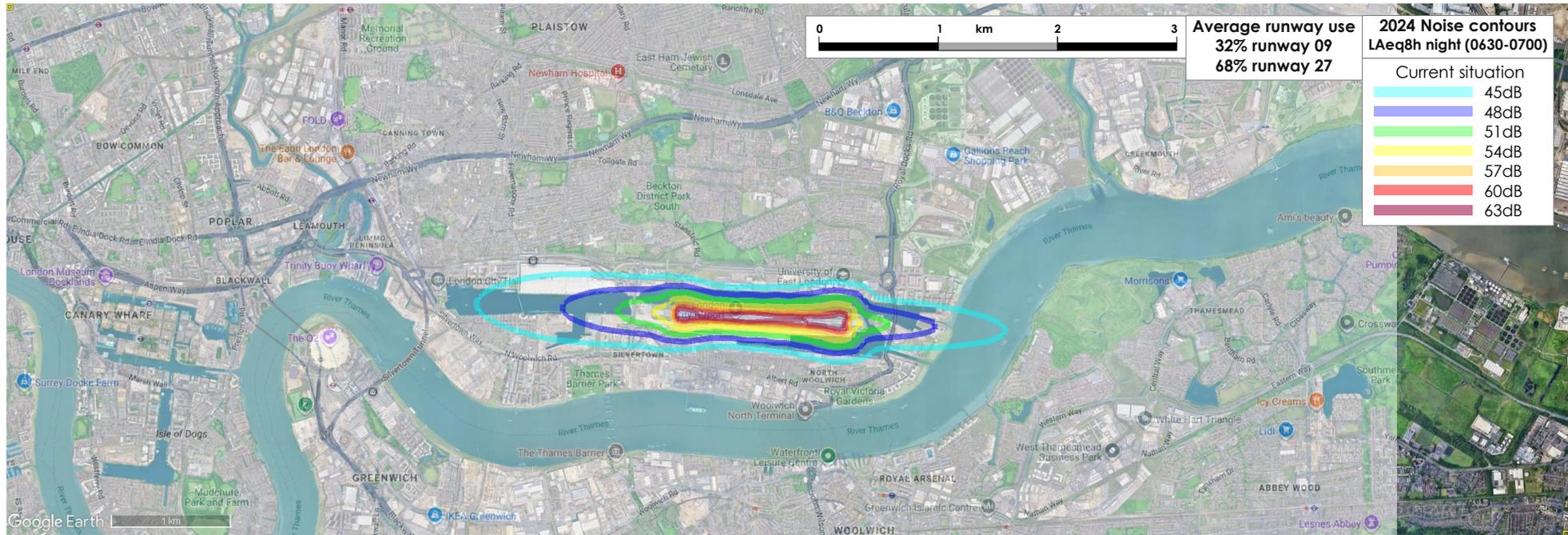


Figure 9 Primary noise metric L_{Aeq8h} average mode contours for 2024, the current situation

3.1.21 The contours shown in Figure 9 above indicate the current average night time noise impacts in 2024, with the runway in use 32% easterly 09 and 68% westerly runway 27.

Figure 10 Primary noise metric L_{Aeq8h} , 2024 data relating to contours (cumulative, i.e. contours of lower dB contain the contours of higher dB)

2024 current situation			
dB night	Area km ²	Population (1,000s)	Dwellings (1,000s)
45	2.1	3.5	1.3
48	1.1	0.8	0.2
51	0.6	0.0	0.0
54	0.4	0.0	0.0
57	0.2	0.0	0.0
60	0.1	0.0	0.0
63	0.1	0.0	0.0

3.1.22 The night time data and contours for L_{Aeq8h} are much smaller than for the daytime L_{Aeq16h} because the noise energy is averaged out over the whole 8h period even though the airport is only open for 30min before 0700. This is how the metric is defined for all UK airports that have any ATMs between 2300-0700 local time.

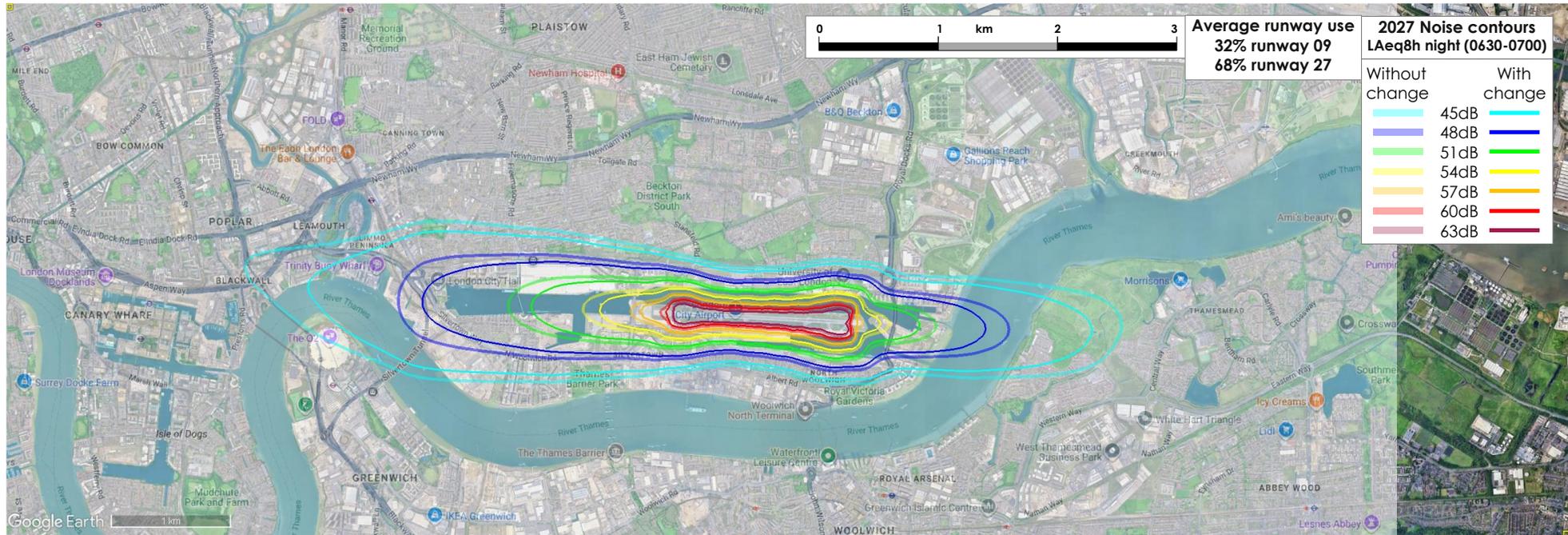


Figure 11 Primary noise metric L_{Aeq8h} average mode contours for 2027, without and with change

3.1.23 The 2027 without-change night-time contours are bigger than 2024's current contours (previous page) because we expect a small increase in the number of flights before 0700, as permitted by the most recent planning permission for LCY. This has a proportionally-large effect on the contour size. In Figure 11 above, the solid with-change contours are smaller than the translucent without-change contours for each dB colour band, and the with-change contours are always entirely inside their colour-equivalent without-change contours.

Figure 12a/b/c Primary noise metric L_{Aeq8h} 2027 data relating to contours (cumulative, i.e. contours of lower dB contain the contours of higher dB)

dB night	Area km ²		Population (1,000s)		Dwellings (1,000s)	
	2027 Without	2027 With	2027 Without	2027 With	2027 Without	2027 With
45	6.8	5.6	38.5	29.6	15.9	12.2
48	3.5	2.8	14.6	12.0	6.1	5.0
51	1.7	1.4	1.9	1.1	0.6	0.3
54	0.9	0.8	0.1	0.1	<0.1	<0.1
57	0.5	0.5	0.0	0.0	0.0	0.0
60	0.3	0.3	0.0	0.0	0.0	0.0
63	0.2	0.2	0.0	0.0	0.0	0.0

3.1.24 In most rows, the with-change numbers are lower than the without-change numbers. In the other rows, the numbers are the same negligible number, indicating minimal impact at those dB levels and no change within those contours.

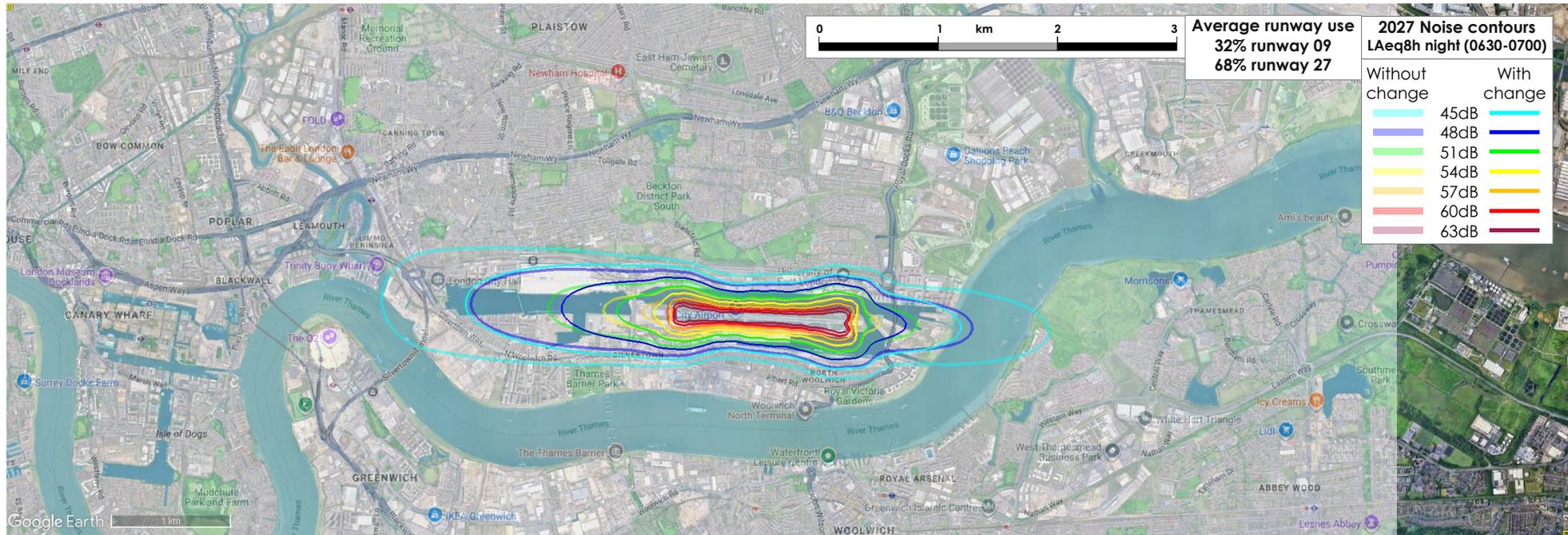


Figure 13 Primary noise metric L_{Aeq8h} average mode contours for 2038, without and with change

3.1.25 In Figure 13 above, the solid with-change contours are smaller than – and always entirely within – the translucent without-change contours for each dB colour band.

Figure 14a/b/c Primary noise metric L_{Aeq8h} 2038 data relating to contours (cumulative, i.e. contours of lower dB contain the contours of higher dB)

dB night	Area km ²		Population (1,000s)		Dwellings (1,000s)	
	2038 Without	2038 With	2038 Without	2038 With	2038 Without	2038 With
45	4.3	2.5	28.2	10.4	11.7	3.9
48	2.3	1.3	8.9	1.8	3.3	0.6
51	1.3	0.8	1.6	0.1	0.5	<0.1
54	0.8	0.5	0.1	0.0	<0.1	0.0
57	0.5	0.3	0.0	0.0	0.0	0.0
60	0.3	0.2	0.0	0.0	0.0	0.0
63	0.2	0.1	0.0	0.0	0.0	0.0

3.1.26 In the data tables, lower numbers per row mean an overall lower noise impact. In all rows, the with-change numbers are lower than the without-change numbers (except where the numbers are both 0.0).

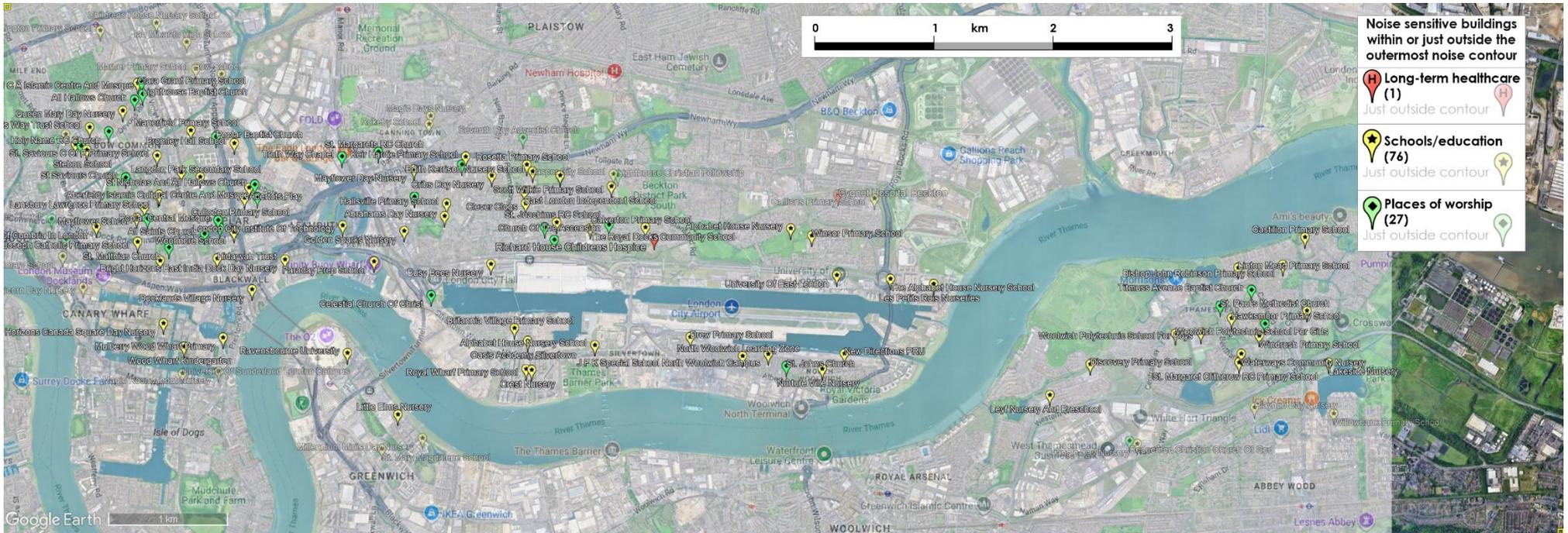


Figure 15 Noise-sensitive buildings within, or just outside, the widest L_{Aeq} noise contours for this proposal
 Figure 16a/b/c upper, d/e/f lower Noise sensitive buildings data relating to contours (cumulative, i.e. contours of lower dB contain the contours of higher dB)

Long term healthcare						Places of religious worship						Schools/education					
dB day	2024 Current	2027 Without	2027 With	2038 Without	2038 With	dB day	2024 Current	2027 Without	2027 With	2038 Without	2038 With	dB day	2024 Current	2027 Without	2027 With	2038 Without	2038 With
51	1	1	1	1	1	51	25	26	23	17	16	51	71	72	66	60	54
54	1	1	1	1	1	54	13	13	10	11	6	54	36	37	33	33	29
57	0	0	0	0	0	57	2	2	2	2	1	57	10	12	10	11	9
60	0	0	0	0	0	60	1	1	0	1	0	60	4	4	3	3	2
63	0	0	0	0	0	63	0	0	0	0	0	63	1	1	0	1	0
dB night	2024 Current	2027 Without	2027 With	2038 Without	2038 With	dB night	2024 Current	2027 Without	2027 With	2038 Without	2038 With	dB night	2024 Current	2027 Without	2027 With	2038 Without	2038 With
45	0	1	0	0	0	45	0	3	3	2	0	45	1	17	11	9	3
48	0	0	0	0	0	48	0	1	1	0	0	48	0	9	5	3	1
51	0	0	0	0	0	51	0	0	0	0	0	51	0	1	1	1	0

3.1.27 Figure 15 shows the location of noise sensitive buildings within or just outside the widest L_{Aeq} noise contours. In 2027 the without-change contours are larger (day and night) than 2024, therefore the number of buildings within would increase. In most rows 2027-2038, the number of noise-sensitive buildings is lower with-change, indicating a reduced impact. In those that are not lower, they are the same, indicating minimal change in impact at that dB level. NB rows for 66/69dB (day) and 54/57/60/63dB (night) show zero noise-sensitive buildings affected and are thus omitted.

Communities: Noise impacts quantified with secondary metrics

- 3.1.28 Secondary metrics assist in the wider understanding of changing noise impacts.
- 3.1.29 Number Above 65dB L_{ASmax} contours are provided, known as N65.
- 3.1.30 65dB L_{ASmax} means an event measured in decibel level (dB L), A-weighted for the human ear, over a slow (S) time period (1 second, where fast time periods are measured in 125 milliseconds) and the maximum noise level reached is 65dB.
- 3.1.31 N65 contours show locations where a noise event of 65dB L_{ASmax} is exceeded a specified number of times (200 close or within the airport, 100, 50, 20 and 5 further away, fewer than 5 is not required⁸). This is slightly louder than holding a conversation (c.60dB L_{ASmax}).
- 3.1.32 L_{ASmax} is the maximum noise level from an individual noise event rather than L_{Aeq} which is an average noise energy over a long period – they are not directly comparable.
- 3.1.33 We provide three secondary contour diagrams and associated data tables:
- 2024 daytime N65, showing the current situation
 - 2027 daytime N65, without and with change
 - 2038 daytime N65, without and with change
- 3.1.34 It is typical to also supply night time N60 contours. However, LCY is only open for half an hour (0630-0700 weekdays and Saturdays excluding public holidays) within the formal night time definition (2300-0700). Our forecast does not predict there to be sufficient flights in that half-hour period to reach the minimum 5 events exceeding 60dB L_{ASmax} that would cause a contour. We agreed with the CAA that N60 would be omitted.
- 3.1.35 We also provide an overflight assessment. The CAA document CAP1498 (Ref 19) sets out how "overflight" is defined based on an imagined cone projected beneath the aircraft, which becomes a circle on the ground, bigger if the aircraft is higher (but with noise more spread out and further away), smaller if the aircraft is lower (noise closer to the ground, more intense).
- 3.1.36 That circle is beneath the flightpath like a shadow, and as the aircraft moves forward it leaves a track. Numbers are counted of population and dwellings within that track at its different widths, which changes with the altitude of the aircraft. See Figure 17 below for a diagram.
- 3.1.37 We agreed with the CAA to provide overflight areas as far as 4,000ft.

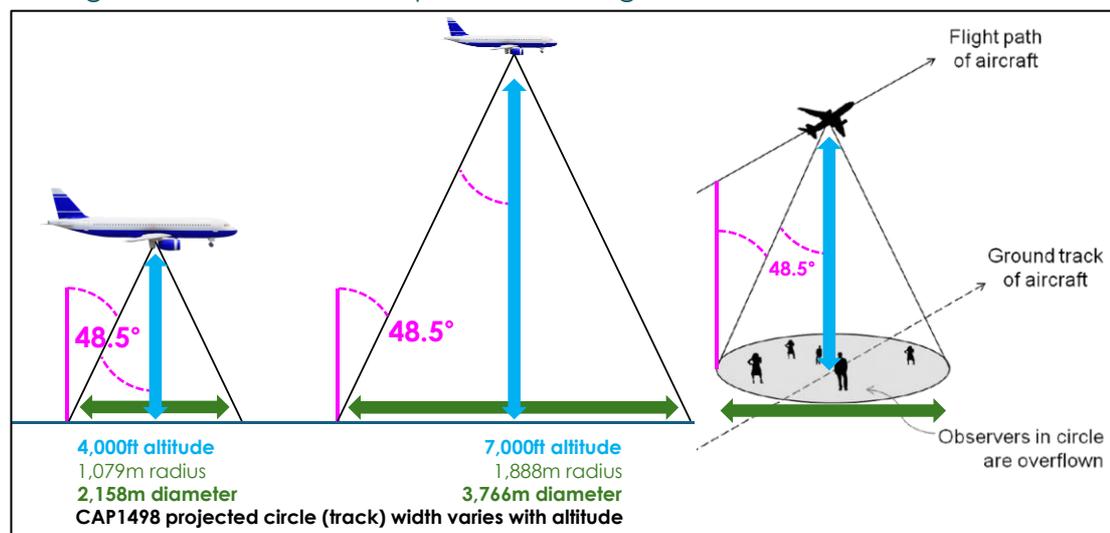


Figure 17 Definition of overflight, diagrams adapted from CAP1498 (Ref 19)

⁸ In accordance with CAP1616i (Ref 4) p.23 paragraph 5.35.

- 3.1.38 We provide three overflight diagrams and associated population data tables:
- 2024 daytime overflight, showing the current situation
 - 2027 daytime overflight, without and with change
 - 2038 daytime overflight, without and with change
- 3.1.39 There are no night time diagrams for the same reason there are no N60 diagrams, see paragraph 3.1.34 above.
- 3.1.40 Note that this ACP is not expected to change aircraft tracks, nor altitudes except for the final approach slope close to the airport.
- 3.1.41 Regarding our contour diagrams and maps: The diagrams are designed, where appropriate, to show both the without-change and with-change contours on the same diagram. In some cases the difference between contours is small and can be hard to discern at normal viewing screen size. Please use the zoom tools on your PDF reading application (or browser) to look more closely at your area of interest. For even more details, map files are available to download from our consultation website (in KMZ format, suitable for use in Google Earth and many other mapping applications), as is Technical Annex C Aircraft Noise Assessment, which has alternative versions of all the contour maps produced for this consultation.

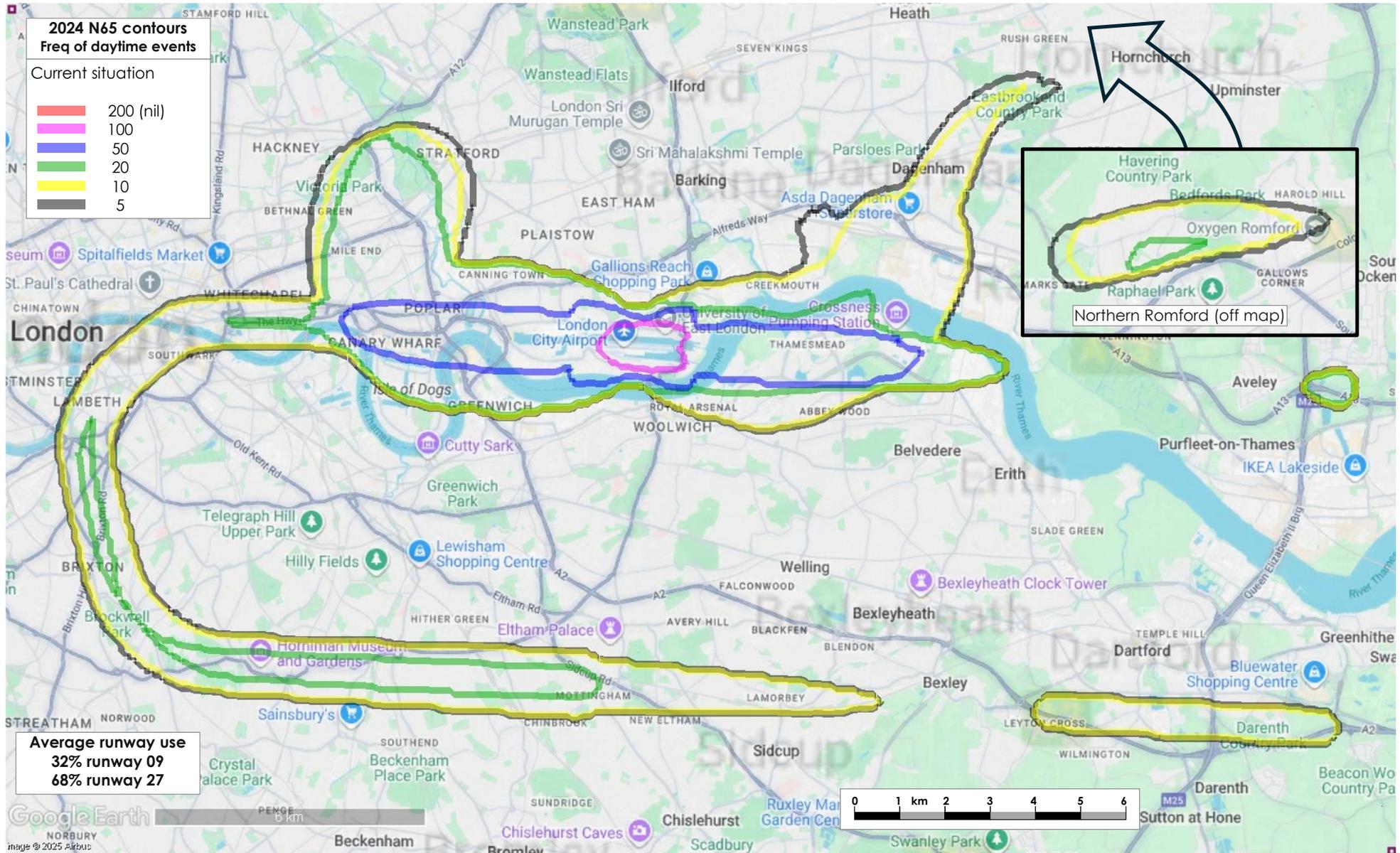


Figure 18 Secondary noise metric N65 contours for 2024, the current situation

3.1.42 See Figure 21 on p.22 for data tables relating to this contour diagram. There are no 200 per day contours (red) because there are not enough flights to cause them for this diagram, and the same applies to the 2027 diagram on the next page.

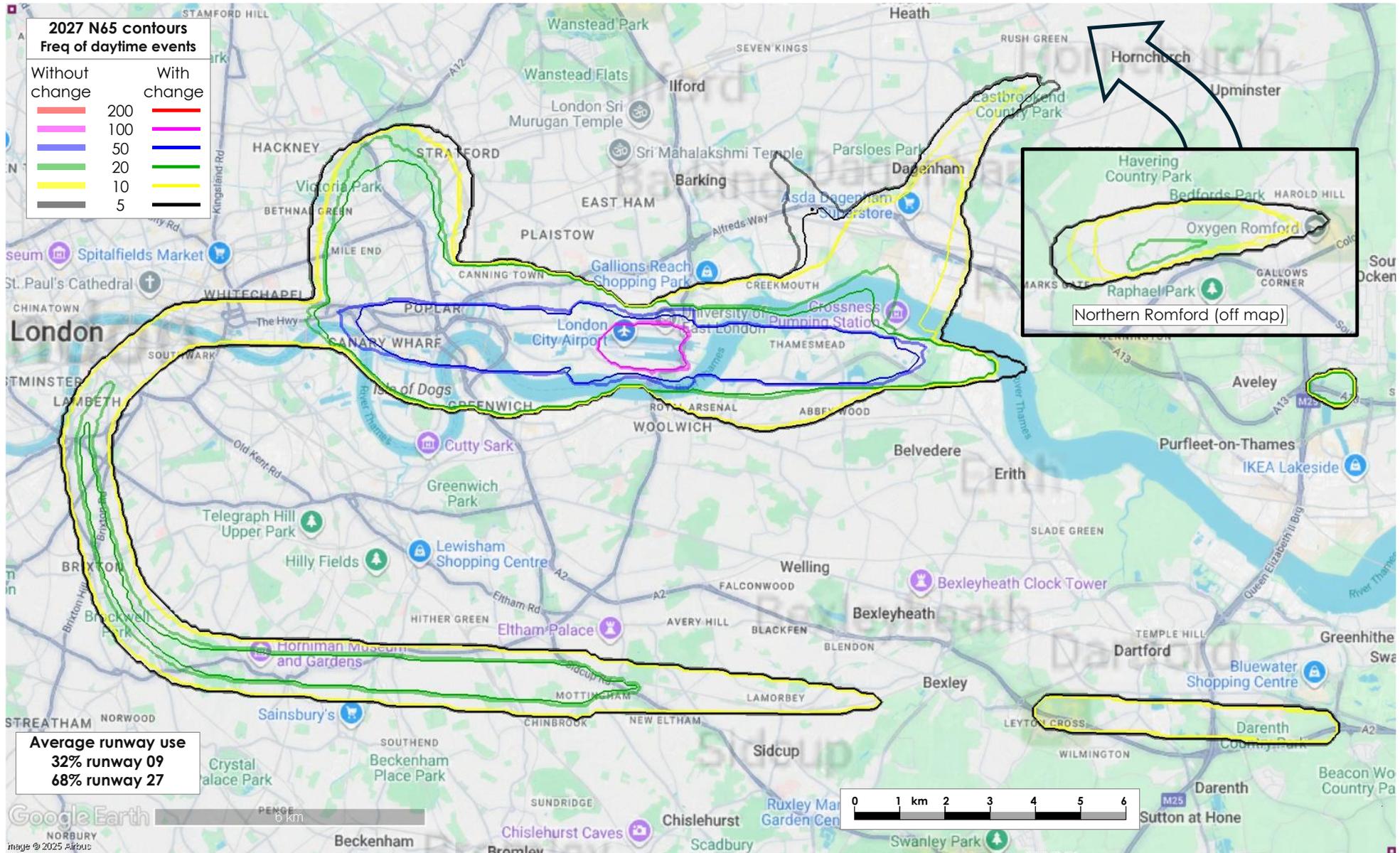


Figure 19 Secondary noise metric N65 contours for 2027, without and with change

3.1.43 See Figure 21 on p.22 for data tables relating to this contour diagram. The 2027 without-change contours are mainly similar, but slightly larger in two places (Barking/Dagenham and eastern Thames) than the 2024 diagram (previous page).

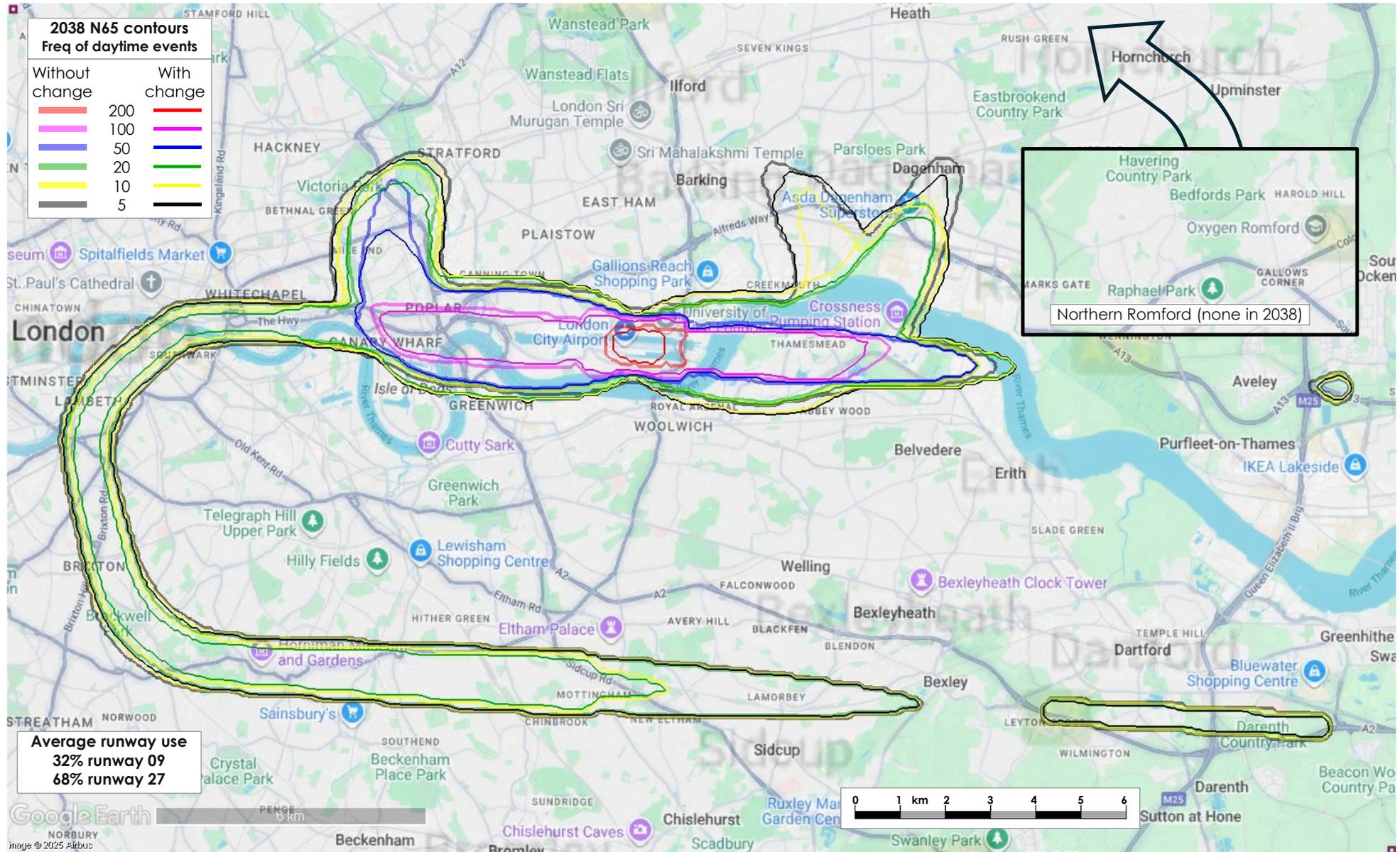


Figure 20 Secondary noise metric N65 contours for 2038, without and with change

3.1.44 See Figure 21 on p.22 for data tables relating to this contour diagram.

3.1.45 N65 contour data tables are provided below, relating to Figure 18, Figure 19 and Figure 20.

Upper tables: Area km², Population and Dwellings. **Lower tables:** Noise sensitive buildings.

Data is cumulative, i.e. contours of lower daily frequency (Frqy) contain the contours of higher daily frequency

Cells containing "N/A" mean there were too few flights to draw a contour for this frequency of noise events

Figure 21 a/b/c upper, d/e/f lower

Area km ²						Population (1,000s)						Dwellings (1,000s)					
Frqy day	2024 Current	2027 Without	2027 With	2038 Without	2038 With	Frqy day	2024 Current	2027 Without	2027 With	2038 Without	2038 With	Frqy day	2024 Current	2027 Without	2027 With	2038 Without	2038 With
5	104.0	103.8	101.1	80.0	77.3	5	711.1	716.7	702.8	642.5	620.3	5	290.6	292.3	287.0	262.5	253.7
10	93.5	91.9	86.8	71.3	59.2	10	660.1	658.1	634.8	565.9	503.9	10	269.9	268.8	259.8	232.4	206.5
20	44.4	49.5	43.3	63.2	49.7	20	368.3	409.7	374.4	513.9	444.6	20	149.9	167.3	152.3	211.2	181.8
50	15.7	16.5	14.8	21.3	20.0	50	95.5	106.7	97.0	214.4	199.1	50	39.3	44.0	39.8	86.1	79.5
100	1.6	1.8	1.6	12.4	10.1	100	6.2	9.0	6.6	107.5	95.5	100	2.1	3.2	2.3	43.8	38.8
200	N/A	N/A	N/A	1.3	0.7	200	N/A	N/A	N/A	6.3	0.1	200	N/A	N/A	N/A	2.1	<0.1

Long term healthcare						Places of religious worship						Schools/education					
Frqy day	2024 Current	2027 Without	2027 With	2038 Without	2038 With	Frqy day	2024 Current	2027 Without	2027 With	2038 Without	2038 With	Frqy day	2024 Current	2027 Without	2027 With	2038 Without	2038 With
5	2	2	2	2	2	5	33	33	33	32	33	5	95	95	95	89	92
10	2	2	2	1	2	10	33	33	33	29	33	10	95	95	95	87	91
20	2	2	2	1	1	20	32	32	32	29	32	20	92	92	92	84	89
50	1	1	1	1	1	50	15	15	15	28	28	50	47	54	46	76	74
100	0	0	0	1	1	100	0	1	0	11	11	100	6	7	6	40	33
200	N/A	N/A	N/A	0	0	200	N/A	N/A	N/A	0	0	200	N/A	N/A	N/A	4	0

3.1.46 The 2027 without-change contours have similarities to, and differences from, the 2024 diagram as traffic levels increase over time.

3.1.47 In the upper tables (km², population and dwellings), the 2027 and 2038 with-change number is always lower than the equivalent without-change number, indicating a reduced overall impact area. In the 2027 data the with-change contours are entirely inside, or align with, the equivalent without-change contour. There are some locations in the 2038 data where the with-change contour is slightly outside the without-change contour (e.g. the with-change contour 5 solid black line, in the vicinity of Asda Dagenham). In most places this difference is small and barely visible in the diagrams unless substantially zoomed in. In many cases this difference occurs over industrial areas, such as the east over Dagenham Breach lake and the Ford plant for easterly departures, and also the Thames for westerly arrivals. However we do recognise a few populated areas may observe more frequent noise events of 65dB L_{ASmax} than without-change in 2038. The overall contour areas remain smaller (Figure 21a), providing a benefit with-change.

3.1.48 Regarding the noise-sensitive buildings data: The N65 contours cover a wider area than the primary metrics, however our database of noise-sensitive buildings ends at the extents of the primary metric area. Therefore the results are based on this area. We also recognise that, in some areas, some noise sensitive buildings would be overflown more frequently in 2038 with the change.

3.1.49 The following diagrams are contours showing frequency of overflight up to 4,000ft, see also Figure 17 and paragraph 3.1.30 above for an explanation.

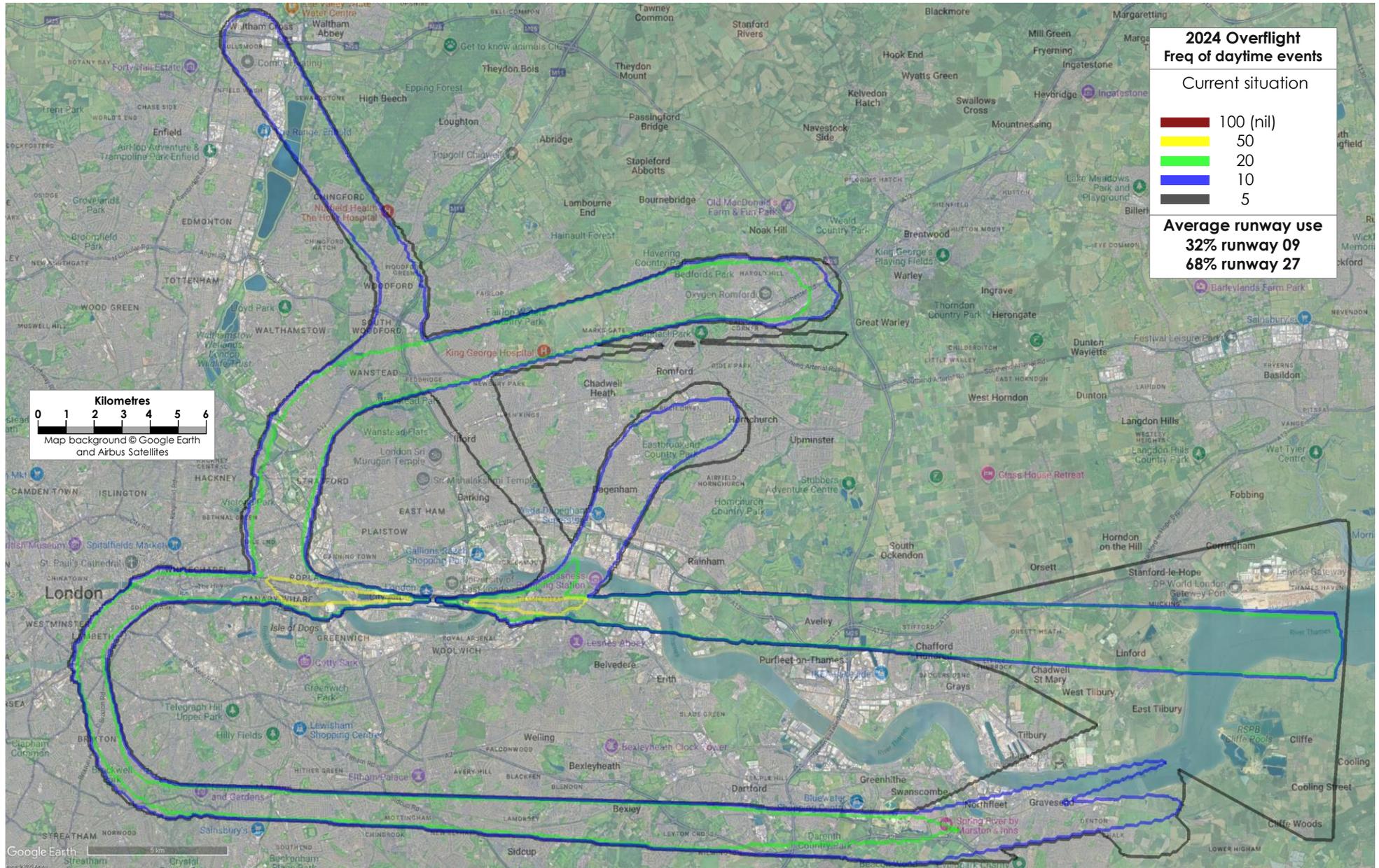


Figure 22 Secondary noise metric, overflight areas to 4,000ft, 2024 daytime frequency, showing the current situation

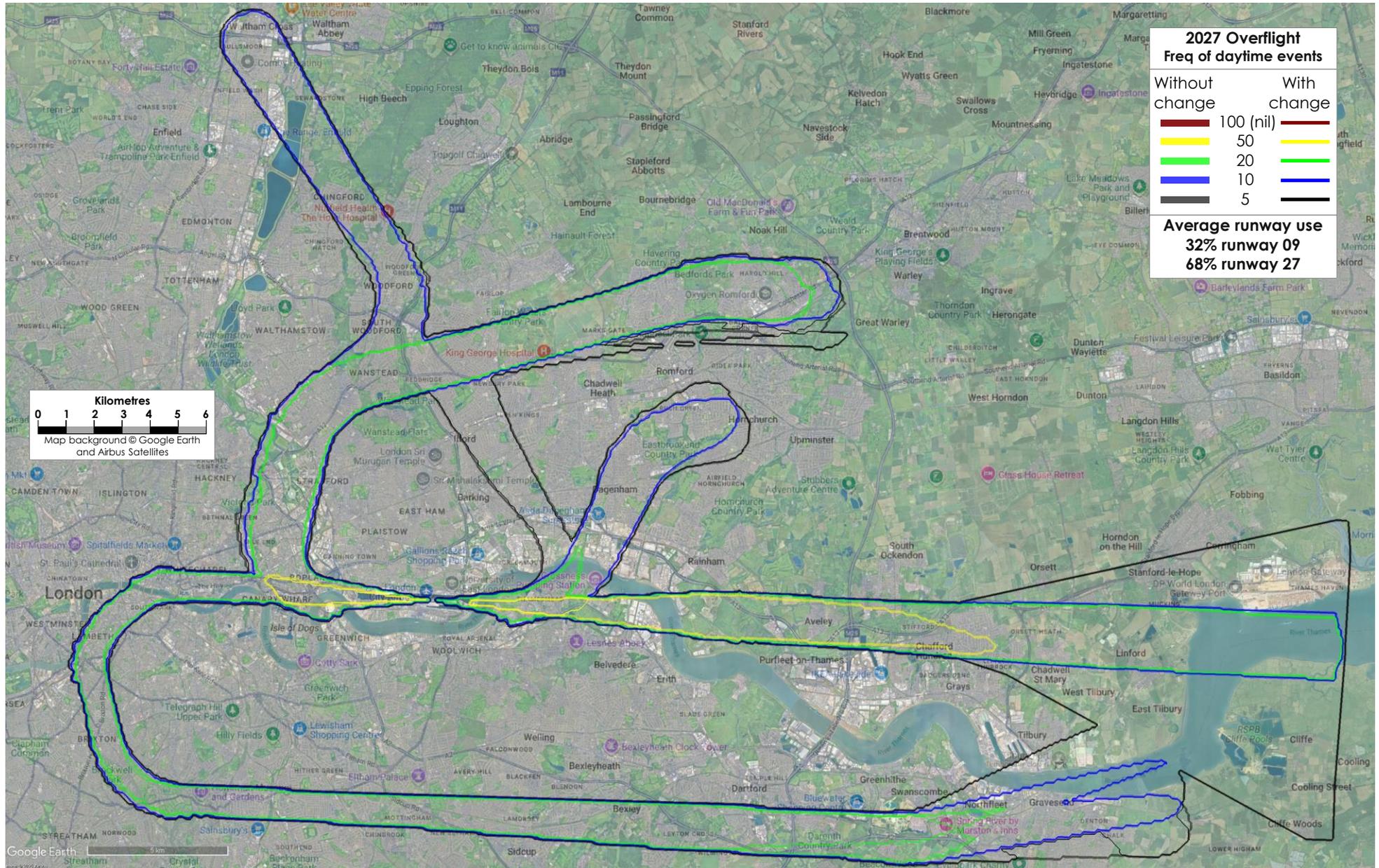


Figure 23 Secondary noise metric, overflight areas to 4,000ft, 2027 daytime frequency, without and with change

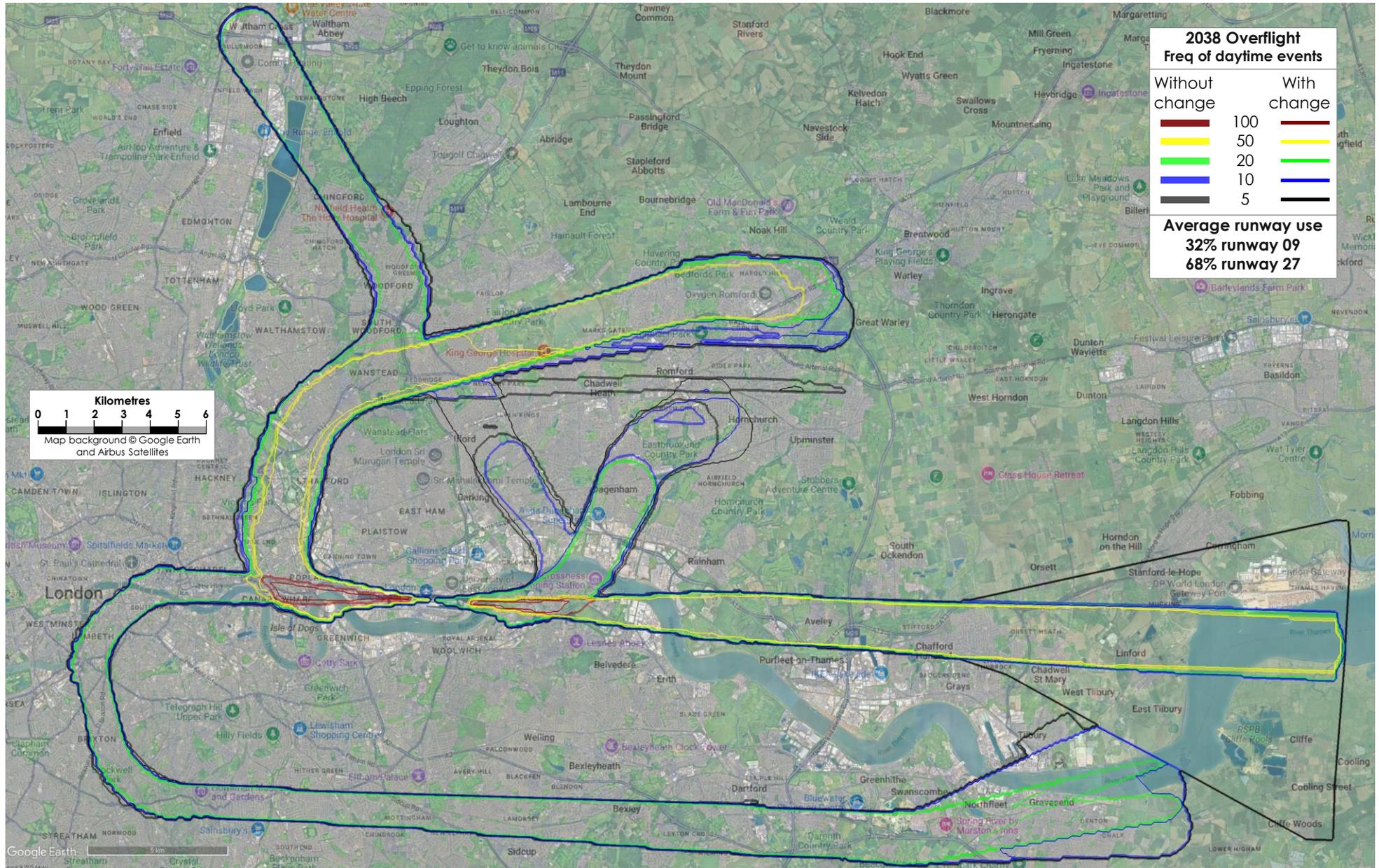


Figure 24 Secondary noise metric, overflight areas to 4,000ft, 2038 daytime frequency, without and with change

3.1.50 Overflight data tables are provided below, relating to Figure 22, Figure 23 and Figure 24 above.

Figure 25a/b Secondary noise metric overflight data

Frqy day	Population (1,000s)					Frqy day	Dwellings (1,000s)				
	2024 Current	2027 Without	2027 With	2038 Without	2038 With		2024 Current	2027 Without	2027 With	2038 Without	2038 With
5	1,137.5	1,190.6	1,160.3	1,291.0	1,287.5	5	448.5	469.1	457.6	509.5	506.7
10	942.0	960.6	952.0	1,116.9	1,054.4	10	376.8	384.2	380.8	444.8	421.4
20	639.2	676.2	655.8	955.8	818.9	20	256.3	272.1	263.6	383.2	328.7
50	29.4	59.5	33.2	403.7	306.2	50	12.3	24.1	14.0	158.2	119.3
100	N/A#	N/A#	N/A#	45.3	24.1	100	N/A#	N/A#	N/A#	19.1	10.4

indicates there are too few current or forecast ATMs to result in a contour

- 3.1.51 In the population and dwelling tables, the with-change number is always lower than the without-change option, indicating a reduced overall impact. In most of the contours shown in Figure 23 and Figure 24 above, the with-change contours are completely, or slightly, inside the without-change contours.
- 3.1.52 In some cases the with-change areas are significantly inside or outside the equivalent without-change areas. This is mainly a function of how the frequency of overflights changes, coupled with precisely where the modelling places aircraft reaching 4,000ft.
- 3.1.53 In theory this implies that some areas would be overflown more in that band with-change, but the experience would be less variable than the overflight contours imply. For example, the daily overflight frequency of 20 (green) does not occur between South Woodford and Chingford in the 2038 with-change compared to without-change, but is present in the lower-frequency contours.

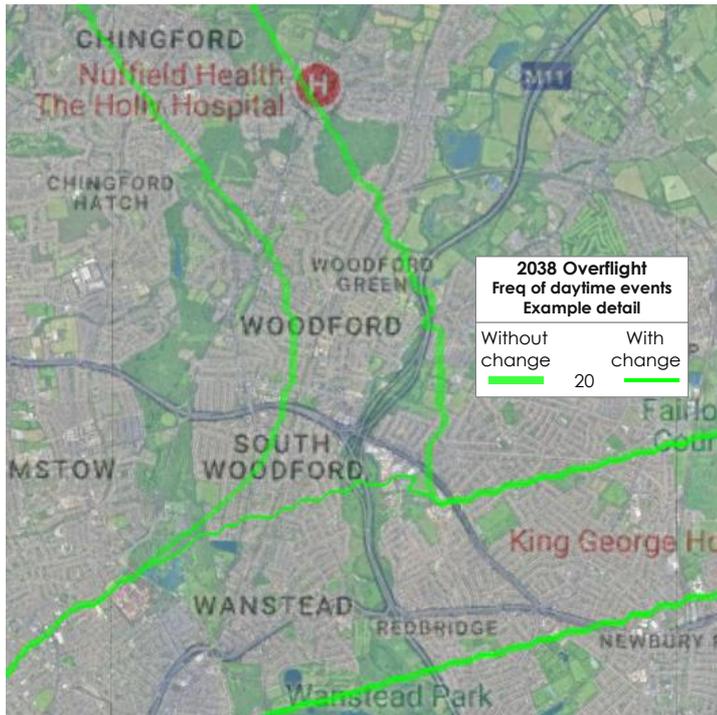


Figure 26 Overflight – example detail extracted and adapted from Figure 24 above

3.1.54 This lack of northbound green contour indicates that there would be no overflight frequency of 20+ per day in that area, therefore the entire flow north of South Woodford would be overflown by 10+ and 5+ as per the blue and black contours on Figure 24 above. This is factually correct, however the raw data behind this contour shows that the actual daily frequency would be, on average, 19.4, just beneath the contour limit. The experience in that area would thus be barely different than if the average was 20.1 per day, which would trigger a green contour northwards. This is an example of how contour banding can illustrate apparently-large changes in impact that may not exist in practice.

The actual 2038 without-change green northbound contour averages 25.4 per day, which is 6 more daily flights than with-change.

- 3.1.55 An additional explanation is required for the black triangular area to the east, and its associated hard edges (including the blue straight edge in Figure 24). Within that triangle (but excluding the central strip), the modelling predicts a frequency of 5 to fewer than 20 overflights per day. However, the statistical output provides lots of "bubbles" where overflight exceeds 5 but not 20, mainly due to ATC vectoring⁹ in that region. It would not be proportionate to attempt to show all those bubbles because they would give a confusing picture and not be a realistic illustration of the impacts we intended to convey. We have created that triangle to express a more realistic picture, so an observer in that area would be more accurately expected to experience 5 or more overflights per day.

Airport Planning condition special mention

- 3.1.56 Our planning permission stipulates that our operating hours noise contour of 57dB L_{Aeq16h} must not exceed 9.1km². We are required to operate the airport in accordance with a Noise Contour Strategy to reduce the area of that contour over time. The planning permission stipulates that the 57dB L_{Aeq16h} contour must reduce to 7.2km² by the time the airport reaches its new passenger cap of 9mppa.
- 3.1.57 Both without and with this airspace change, the limit and target areas would not be exceeded.
- 3.1.58 The with-change 57dB L_{Aeq16h} contour in 2027 would be c.0.7km² smaller than the without-change contour, 3.7km² smaller than the current planning limit, and 0.3km² smaller than in 2024. In 2038 the contour would be more than 1km² smaller than in 2024, and would be 2.6km² smaller than the 7.2km² limit.

Figure 27 Operating hours Summer Day contour areas L_{Aeq16h} (0630-2230)

Contour	Area km ²				
	2024 Current	2027 Without	2027 With	2038 Without	2038 With
57dB	5.7	6.1	5.4	5.6	4.6

- 3.1.59 In all cases above, **the with-change area is smaller than without-change**, reducing the overall impact on people.

Communities: Noise impacts conclusion

- 3.1.60 Using all the information above we have illustrated, quantified and monetised changes in noise impacts, without and with the change over the 12-year appraisal period using primary and secondary metrics.
- 3.1.61 We illustrated that, in general, the 2027 without change option has greater impacts than the 2024 current situation because more flights would lead to larger contour and overflight areas.
- 3.1.62 We also showed that, using the primary metrics, the with-change L_{Aeq} contour areas are always smaller and entirely within the without-change contours, for both 2027 and 2038. This means smaller areas would be impacted on average, with fewer dwellings and fewer people. Likewise for noise-sensitive buildings, overall fewer would be impacted with the change than without. As previously stated, there would be **c.76,500 fewer flights** with the change than without, over the 12-year appraisal period.
- 3.1.63 The output from the standard Government WebTAG tool (see Appendix A – WebTAG Noise Output on p.46), which uses the primary noise contour metrics as its input, shows that, over the 12-year appraisal period, the **benefit would be £32.2m NPV**. Overall, almost 112,000 people would experience reduced

⁹ Vectoring is where ATC instructs an aircraft to make heading and altitude changes, in this case to ensure the correct spacing for the arrival sequence.

daytime noise over the appraisal period (more than the city of Worcester), and more than 10,000 would experience reduced night time noise (i.e. 0630-0700).

- 3.1.64 Using the secondary metrics, the with-change N65 contours are also always smaller in area than the without-change contours, reducing the overall impact areas with fewer dwellings and fewer people. The 2027 with-change contours are entirely inside, or align with, the equivalent without-change contour. There are some areas where the 2038 with-change contours cross slightly outside the equivalent without-change contours, indicating some industrial areas and some populated areas may observe more frequent noise events of 65dB $L_{A_{Smax}}$ than without-change in 2038. The total overall N65 impact is, however, always smaller overall with-change than without, due to fewer flights overall.
- 3.1.65 The overflight contours provide similar data to the N65 contour data, i.e. in every case the with-change population is lower than the without-change.
- 3.1.66 The primary metrics feed into Section 4 cost-benefit analysis, on p.41.
- 3.1.67 We conclude that, considering the overall noise impacts of each option, the with-change option is preferable to the without-change option.

Data available for download

- 3.1.68 All noise contours are available to download from the consultation website, in KMZ format (as used by the popular Google Earth application, and compatible with most other geographical information systems). With a suitable application installed such as Google Earth, this will allow you to switch on and off data layers, move the map and zoom in to your area of interest. Note that, while we used Google Earth to present this data, we cannot recommend any specific GIS application. Download and installation is at your own risk, and we cannot provide technical support on its setup or use.

3.2 Communities: Local air quality, quantified

- 3.2.1 Further to our Stage 2 commitment, we commissioned an air quality assessment report from highly qualified expert Air Quality Consultants, part of the Logika Group environmental consultancy.
- 3.2.2 The airspace change process requires quantification of the change in impacts on nitrogen oxides (NO_x), and particulate matters PM_{2.5} and PM₁₀. For this, AQC used hour-by-hour runway usage and associated meteorological data for the dispersion modelling, therefore they do not use the long-term average runway proportions of 32% easterly 68% westerly.
- 3.2.3 We reproduce their summary below. Their full air quality assessment report is available separately as a technical supporting Annex D, including details of concentration targets, limits, baseline characteristics, monitoring evidence, receptors and assumptions.
- 3.2.4 For a complete description of the methodology please read the technical supporting Annex D.

Extract from AQC report Section 5

5 Summary and Conclusions

- 5.1.1 The assessment set out above has described the likely significant effects of the Airspace Change Proposal through a comparison against the future baseline case. The change will enable the replacement of E190 movements with a smaller number of A32N movements, with the same number of passengers, which results in lower aircraft emissions compared to the future baseline (Do Nothing, i.e. without-change) scenario.
- 5.1.2 The model has shown that concentrations of nitrogen dioxide, PM₁₀ and PM_{2.5} will be well below their respective air quality objectives in both future assessment years and in both Do Something (DS, with-change) and Do Nothing (DN, without-change) scenarios. The DS scenarios result in slightly lower concentrations than the DN scenarios, for all pollutants, but the

differences are small. The air quality impacts of the ACP, although slightly beneficial, are all negligible.

- 5.1.3 Considering the results of the model, it is concluded that the air quality impacts of the ACP, although slightly beneficial, are negligible and not significant. In particular, the ACP will not result in pollutants breaching legal limits or target values following the implementation of the ACP, or worsen an existing breach of legal limits or target values.

- 3.2.5 The airspace change process only requires monetisation of air quality impacts if there is the possibility of air quality limit/target breaches or worsening of existing breaches. Due to the lack of significant impacts, and their slightly beneficial nature, monetisation is not required for this topic.

Communities: Local air quality conclusion

- 3.2.6 From the report, there are negligible differences in impact between the with-change and without-change options, with the balance slightly in favour of with-change. Therefore we conclude that, in considering the air quality impacts of both options, the with-change option is preferable.

3.3 Wider society: Greenhouse gas emissions (GHG), monetised

- 3.3.1 At LCY our GHG emissions are published as part of our sustainability reporting¹⁰ and certification under ACI Airport Carbon Accreditation.
- 3.3.2 For our 2024 baseline, our aircraft emissions were 189.5 kilotonnes (kT) of CO₂e¹¹, and we carried 3,567,871 passengers. Therefore our average emissions per passenger was 53.11kg CO₂e in 2024.
- 3.3.3 For this ACP we have assumed 100% fossil-based jet fuel, presenting the worst-case assessment because sustainable aviation fuel (SAF) is required to be blended in increasing proportions under the UK's SAF mandate. Greenhouse gas emissions including SAF are lower than from pure fossil-based fuel.
- 3.3.4 We commissioned EcoLyse Ltd, with expertise in aviation fuel and greenhouse gas analysis, to provide a detailed report compliant with the airspace change process CAPI616i [Ref 4]. See Annex E for the full technical report, including the scope and methodology of EcoLyse's analysis.
- 3.3.5 The following table provides CO₂e emissions forecasts and also how that relates to passenger forecasts, without and with the airspace change (in the difference columns, negative numbers are a benefit):

Figure 28 Details per year of greenhouse gas emissions in kT of CO₂e without and with change, and per pax

Year	Emissions CO ₂ e (kT)			Passengers (m)		CO ₂ e per passenger (kg)		
	Without change	With change	Difference "With" minus "Without"	Without change	With change	Without change	With change	Difference "With" minus "Without"
2027	250.52	232.29	-18.23	4.1	4.1	61.80	57.31	-4.50
2028	265.86	255.89	-9.98	4.2	4.4	62.86	57.65	-5.21
2029	276.50	273.99	-2.52	4.4	5.1	62.40	53.79	-8.61
2030	285.42	284.35	-1.07	4.6	5.6	62.63	50.99	-11.63
2031	290.91	284.24	-6.67	4.8	6.2	60.55	46.19	-14.37
2032	296.51	288.31	-8.20	5.1	6.6	58.51	43.83	-14.68
2033	305.82	311.71	5.89	5.4	7.1	57.16	43.66	-13.50
2034	313.85	335.03	21.18	5.7	7.7	55.53	43.54	-11.99
2035	322.50	368.90	46.40	6.0	8.4	53.97	43.75	-10.22
2036	363.68	397.42	33.74	6.9	9.0	52.62	44.16	-8.46
2037	415.35	397.42	-17.93	8.0	9.0	51.79	44.16	-7.63
2038	458.42	397.42	-61.00	9.0	9.0	50.94	44.16	-6.78
Total	3,845.35 kT	3,826.97 kT	-18.38 kT benefit	Average CO₂e/passenger:		56.50 kg	46.58 kg	-9.93 kg benefit

¹⁰ <https://sustainability.londoncityairport.com>

¹¹ CO₂e is carbon dioxide equivalent, which considers impacts as if all greenhouse gas emissions had the same effect as CO₂. Used as a standard metric to avoid needing to state each type of greenhouse gas in varying proportions of impact.

- 3.3.6 Over the 12-year appraisal period, the with-change **emissions would reduce by 18.38kT CO₂e** when compared to the without-change emissions, a benefit.
- 3.3.7 This is a 12-year average **9.93kg/passenger CO₂e benefit** from the proposed change.
- 3.3.8 The cause of the increase in CO₂e from years 2033-2036 is the large disparity in passenger forecast with the change vs. without.
- 3.3.9 As shown in section 2.3 Figure 2, without the change we forecast c.68m passengers over 12 years and with the change we forecast c.14m more (c.82m).
- 3.3.10 For each of the years 2033-2036 there would be between **1.7m-2.4m more passengers** using the airport each year, with the airspace change than without. The A320neo aircraft have greater passenger capacity, and this accelerates the passenger throughput for the airport towards our 9mppa limit under the with-change option. As the 9mppa planning limit is approached more slowly without-change (based on a fleet mix without A320neo aircraft), with effect from 2033 total CO₂e emissions are lower compared to the with-change option, until the passenger numbers converge from 2037. At this point, the differences between the with-change and without-change option convert to significant benefits with the proposed airspace change.
- 3.3.11 In all cases, including between 2033-36, the emissions per passenger remain beneficial with-change, consistent with enabling the transition to more efficient aircraft.
- 3.3.12 Regarding other airspace users, i.e. non-LCY aviation activity, the relative decrease in LCY traffic this ACP would cause, compared to the without-change scenario, could mean more general aviation (GA) transits, leading to GA flying fewer detours around our controlled airspace. Hypothetically this could decrease GA-related fuel burn and greenhouse gas emissions, however this is not quantifiable given the random nature of GA, and may not manifest in practice.
- Monetisation of greenhouse gas emissions**
- 3.3.13 The DfT's WebTAG greenhouse gas workbook was used to monetise greenhouse gas impacts for the 12-year appraisal period, comparing without-change to with-change.
- 3.3.14 For both options, more than 98.5% of LCY's emissions are from flights which are traded under the UK Emissions Trading Scheme (UK ETS), and only c.1.5% of emissions fall outside that scheme (i.e. non-traded), and these are priced differently.
- 3.3.15 The 12-year monetised benefit calculated by WebTAG due to the reduction in CO₂e emissions is £3.7m NPV. The detailed results are in Appendix B – WebTAG Greenhouse Gas Output on p.47, and the workbook itself has been sent to the CAA for validation.
- 3.3.16
- Wider society: Greenhouse gas emissions conclusion**
- 3.3.17 Over the 12-year appraisal period there would be an overall benefit of **18.38 kT CO₂e** under this proposal, a reduction of **9.93kg/passenger**.
- 3.3.18 Monetised, this would be a benefit to wider society of **£3.7m NPV**.
- 3.3.19 This feeds into Section 4 cost-benefit analysis, on p.41.
- 3.3.20 We conclude that, in considering greenhouse gas emissions for both options, the with-change option is preferable to the without-change option.

3.4 Wider society: Tranquillity, qualitatively assessed

3.4.1 The airspace change process requires us to consider the ACP's impacts with specific reference to National Parks and National Landscapes (formerly known as Areas of Outstanding Natural Beauty or AONB), along with locally-identified tranquil areas to be considered. In Stage 2 the RSPB's Rainham Marshes nature reserve (c.10km east of LCY) was identified as such a place.

3.4.2 Further to Stage 2, we have refined the areas where impacts may be expected to occur. We have confirmed no National Parks or National Landscapes (AONBs) would be overflowed 5 or more times per day, based on our flight density study for August 2025. In Figure 29 below, Kent Downs (highlighted in green) is the only such National Landscape in the vicinity, however it is overflowed fewer than 5 times per day on average.

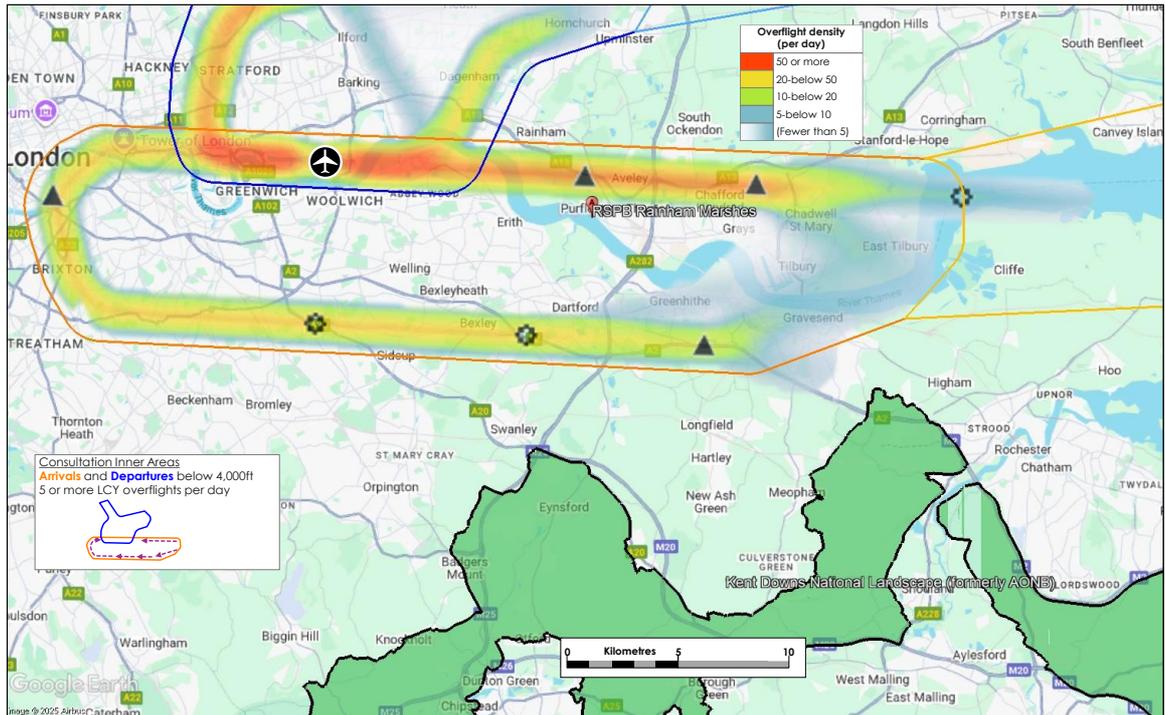


Figure 29 Tranquillity considerations: Kent Downs and Rainham Marshes overview

3.4.3 RSPB's Rainham Marshes nature reserve was overflowed on average 47 times per day by arrivals to runway 27 for the baseline year of 2024, ranging from nil (when runway 09 is in use) to 107 (the busiest single day for runway 27 arrivals in 2024).

3.4.4 Figure 30 below provides forecast overflight data for 2027 and 2038, without the change and with the change.

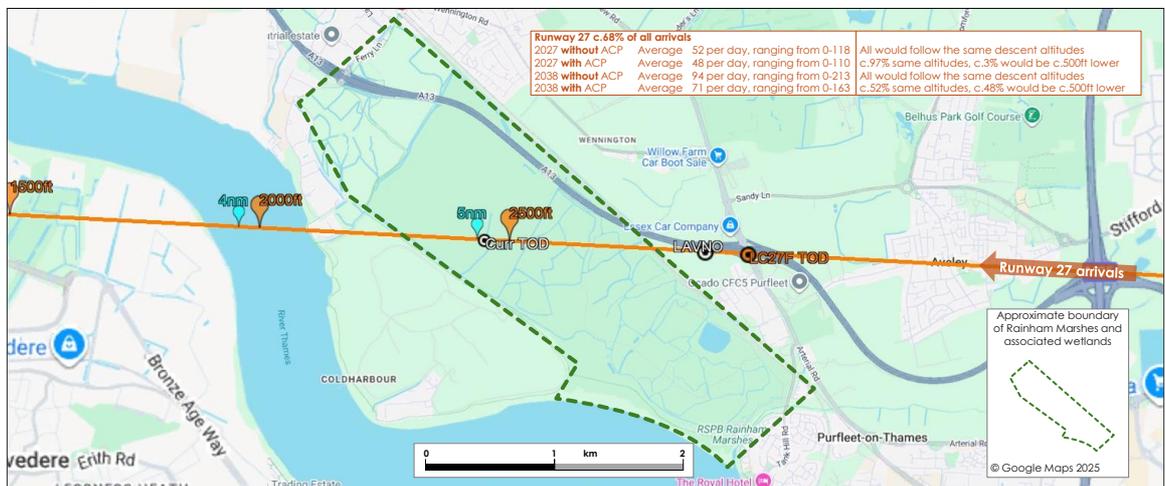


Figure 30 Tranquillity considerations: RSPB Rainham Marshes detail

- 3.4.5 In Figure 30 above, the final approach and descent path for LCY runway 27 is shown by the orange line. The orange markers along the line show the altitude of the proposed additional descent path starting descent from the marker “LC27F TOD” (Top of Descent) at 3,000ft. From this point, a proportion of arrivals would be slightly lower (by c.500ft) than the current (and unchanging) descent path, with that difference decreasing closer to the runway. Descent from 3,000ft currently starts at the white marker “Curr TOD”, 2.1km closer to the runway than this proposal.
- 3.4.6 Note that this ACP would not **replace** the current descent path, and there are no options for moving it laterally. The proportion of aircraft using it is expected to increase as detailed on Figure 30 above, increasing to an expected maximum 10-12 years after its planned introduction in 2027. As with the proposed additional arrival path, we forecast fewer flights overall (see section 2.3 Figure 1 and Figure 2) due to the greater passenger capacity of the aircraft type we expect would use it.
- 3.4.7 From a flight safety point of view, this change is not expected to increase the risk of aircraft bird-strikes (this risk generally increases from 2,000ft to the runway, and most UK birds fly below 500ft, though migrators fly much higher). Rainham Marshes formally opened as a nature reserve in the 2000s but was well used by birds for decades before that. It is known to LCY and has been appropriately considered in our safety management plans for many years.

Wider society: tranquillity conclusion

- 3.4.8 The potential negative impacts on tranquillity of this proposal on RSPB Rainham Marshes nature reserve (attributable to a minority proportion of flights operating slightly lower) would be more than offset by the benefit in reduced overall flights over the 12-year appraisal period.
- 3.4.9 We conclude that the with-change option is preferable to the without-change option.

3.5 Wider society: Biodiversity, qualitatively assessed

- 3.5.1 In addition to RSPB Rainham Marshes nature reserve (discussed in Section 3.4 above), biodiversity impacts must be considered from the point of view of a Habitats Regulations Assessment (HRA). An HRA screening report was completed in our Stage 2 submission (Section 7 p.106 of that document) and concluded that there was no potential for adverse effects on any nationally protected sensitive habitats known as “European Sites” as a result of the ACP. The airspace change process requires the same assessment work and supporting evidence to be included in our Stage 3 full options appraisal, therefore we reproduce the information from Stage 2 below.
- 3.5.2 This Stage 2 extract, in a grey font over the following two pages, uses the same paragraph numbering as the Stage 2 document. Its numbering and cross-referencing does not align with this document. References to headings, tables and figures are prefixed and suffixed with an “x” to avoid confusing them with the figures and tables in this Stage 3 document.
- 3.5.3 Note that the Stage 2 content remains correct. We have provided more details for Stage 3 elsewhere in this consultation document set, however it is more than sufficient to reach an updated conclusion.

HRA screening, as extracted from Stage 2's Section 7

7.1 Assessment

- 7.1.1 To identify any potential adverse effects of this airspace change proposal on European sites a screening exercise has been undertaken in line with the requirements of the CAP1616i [Ref 4].

7.1.2 The Habitats Regulations Assessment (HRA) early screening criteria form is completed in Table x25x below.

Table x25x: Habitats regulations assessment early screening criteria form

Question	Answer
<p>Q1. Are there any changes to air traffic patterns or number of movements expected below 3,000 feet due to the airspace change proposal? If the answer to Q1 is 'no' then habitats regulations assessment is no longer required. If the answer to Q1 is 'yes' then proceed to Q2 below</p>	<p>Yes. Air Traffic Patterns: This airspace change proposes minor lateral variation in the final stages of the approach, for aircraft flying the new RNP AR approach procedure, specifically: 1)The point at which aircraft begin their final descent (and consequently a shallower angle of approach) for landing. Depending on which runway is being used, this distance is approximately 3NM/6km (for Runway 09) and 5NM/9km (for Runway 27) from the end of the runway. 2)How aircraft commence the turns on the approach to position themselves and line up with the centreline of the runway. For Runway 27 the approach does not require aircraft to turn (the flight path is a straight line). However, arrivals to Runway 09 turn twice, at approximately 10NM/ 18km and 7NM/13km from the end of the runway, (see Figure x16x). Number of movements: This airspace change proposal enables larger aircraft (with greater passenger capacity) to operate at LCY, enabling the airport to increase its passenger capacity with fewer air traffic movements; a potential 23.7% reduction in annual air traffic growth by 9 million passengers per annum (when compared to the baseline scenario) is predicted with this airspace change proposal (see section x3.3x for the traffic forecast associated with this airspace change).</p>
<p>Q2A. Are there any European sites within a radius of 18 km of each runway end?</p>	<p>Yes. There are two European sites, (see Figure x16x), situated within 18km of each runway end that are located under the current LCY departure flight paths: Special Protection Areas: Lee Valley, and Special Areas of Conservation: Epping Forest</p>
<p>Q2B. Are any European sites identified in Q2A overflown (i.e. plane passing directly overhead or within 2,655 feet of the boundary of a European site at 3,000 feet or below) by proposed flight routes? If the answer to Q2A and Q2B are both 'no' then habitats regulations assessment is no longer required. If the answer to Q2A or Q2B is 'yes' then proceed to Q3 below.</p>	<p>No. The proposed new RNP AR flight routes, (see Figure x16x), affect LCY arrival flight paths which lie south of the airfield. The European sites identified in Q2A are overflown by LCY extant departure flight paths which lie to the north of the airfield.</p>
<p>Q3A. Will the airspace change proposal reduce the number of movements overflying one or more European sites, while not increasing them over another?</p>	<p>Yes. This airspace change proposal enables larger aircraft (with greater passenger capacity) to operate at LCY, enabling the airport to increase its passenger capacity with fewer air traffic movements; a potential 23.7% reduction in annual air traffic growth by 9 million passengers per annum (when compared to the baseline scenario) is predicted with this airspace change proposal (see section x3.3x for the traffic forecast associated with this airspace change).</p>
<p>Q3B. Will the airspace change proposal increase the altitude of aircraft overflying one or more European sites, whilst not decreasing altitude over another? If the answer to Q3A and Q3B are both 'yes' then habitats regulations assessment is no longer required. If the answer to Q3A or Q3B is 'no' then secondary screening will be required.</p>	<p>No. There is no change to departure flight paths or departure procedures within this airspace change proposal; as such, there is no change to the altitude of aircraft overflying the European sites. The changes associated with aircraft overflying the European sites are 1) a change in the fleet mix due to larger aircraft with greater passenger capacity operating at LCY and 2) a reduction in air traffic growth (when compared with the baseline scenario) reducing the number of aircraft over-flying these sites.</p>

7.1.3 An illustration of the proposed route changes for this airspace change proposal, alongside current LCY arrival and departure routes and proximate European sites is shown in Figure x16x.

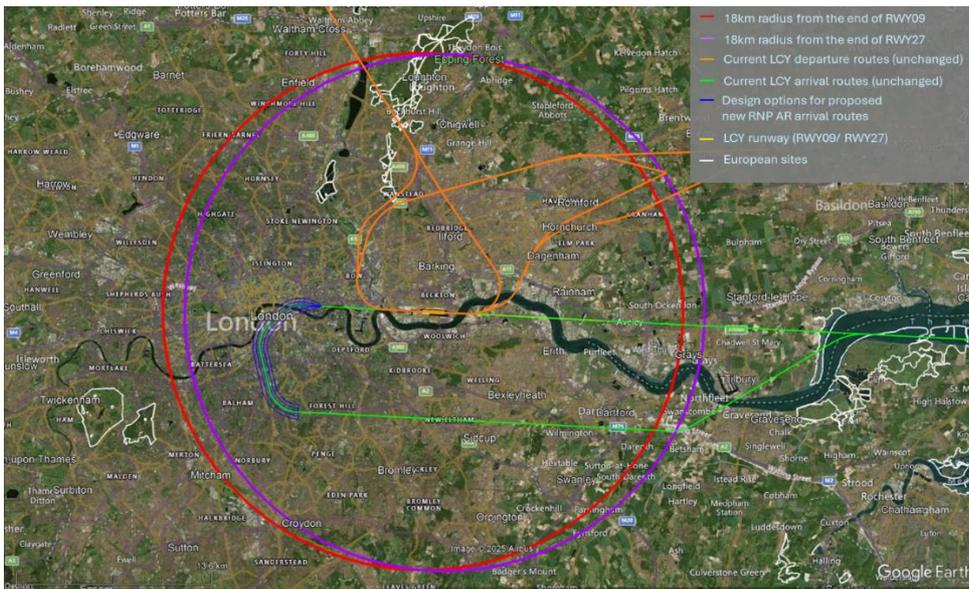


Figure x16x: Illustration of the proposed route changes for this airspace change proposal, alongside current LCY arrival and departure routes and proximate European sites. [Google Earth, 2025].

7.2 Summary

7.2.1 A habitats regulation assessment has been carried out in section x7.1x and describes the effects of this airspace change proposal on European sites.

Arrivals

7.2.2 This airspace change proposes the introduction of RNP AR procedures at LCY.

7.2.3 For aircraft flying the new RNP AR approach procedure there is minor lateral variation in the final stages of the approach, and a shallower approach angle, compared to extant LCY arrival flight paths.

7.2.4 No European sites are overflown by LCY extant arrival flight paths; no European sites are overflown by the proposed new RNP AR approach procedures.

7.2.5 Stakeholder feedback from Natural England has advised that “unless the change in height would significantly affect the noise of the aircraft approaching, to the extent that it impacted the features of a designated site then it is unlikely that Natural England would need to provide detailed comments on these proposals”.

Departures

7.2.6 Two European sites are impacted by LCY extant departure flight paths; the Lee Valley and Epping Forest. It should be noted that current procedures mitigate the impact of departures on these sites through the use of vertical restrictions which ensure that aircraft have a minimum altitude of 3,000ft overflying these sites. Aircraft can be higher but are not permitted to be lower.

7.2.7 There are no changes to extant departure flight paths or departure procedures with this airspace change proposal.

7.2.8 However, the airspace change enables a reduction in air traffic growth at LCY (by supporting larger aircraft with greater passenger capacity); a potential 23.7% reduction in annual air traffic growth by 9 million passengers per annum (when compared to the baseline scenario) is predicted.

7.2.9 As such, although there is no change to departure flight paths/procedures within this airspace change proposal, the number of departure flights is expected to decrease, reducing the number of aircraft over-flying these sites.

7.3 HRA Conclusion

7.3.1 We do not believe that this airspace change proposal will result in potential adverse effects on the integrity of the Lee Valley and Epping Forest European sites on the basis that there is no change to the extant flight paths or procedures associated with aircraft overflying these sites. Overflight of these sites is (unchanged from today) at a minimum vertical distance of 3,000ft and we do not believe that, at this altitude, the change in fleet mix resulting from this change, will impact upon the ecological character and functions of these sites. In addition, we consider the reduction in air traffic growth will provide benefit by reducing the number of aircraft over-flying these sites.

7.3.2 As such, a conclusion of no adverse effects on European sites has been made.

Wider society: biodiversity conclusion (Stage 3 update)

3.5.4 As noted in paragraph 3.5.2 above, the Stage 2 HRA screening report remains correct. On that basis and in view of our additional assessment of impacts on Rainham Marshes (see paragraph 3.4.8 above), we conclude that there would be no significant changes to biodiversity as a result of the ACP. We consider that the with-change option is preferable due to the expected benefit of the reduction in overall numbers of flights over the 12-year period, compared to the without-change option.

3.5.5 Finally, aviation biodiversity impacts can be linked to ground based infrastructure changes. This proposal does not require any such changes.

3.6 Wider society: Capacity and resilience, qualitatively and quantitatively assessed, with monetisation

- 3.6.1 The qualitative assessments in Stage 2 have been reviewed and remain accurate, however we have also identified a quantifiable and monetisable benefit of the increased passenger capacity and its influence on passenger surface access time savings.
- 3.6.2 We anticipate some improvements to capacity and resilience with the airspace change vs. without the change.
- 3.6.3 Over the 12-year appraisal period, c.**76,500 fewer flights** would be needed to reach and maintain 9mppa for two years before the without-change option also reaches 9mppa, as per our forecasts (see section 2.3 Figure 1 and Figure 2).
- 3.6.4 Without the change, existing published airspace arrangements remain the same and aircraft will continue to be managed as per today. As traffic numbers continue to grow as per the without-change forecast, effective airspace capacity and runway capacity will become increasingly constrained, due to the volume of flights and increasing controller workload. This could, in turn, lead to a reduction in resilience.
- 3.6.5 By enabling a faster transition to aircraft types with increased passenger capacity, and by systemising the RNP AR approach procedure, the with-change option is considered to increase capacity and resilience for LCY (airport and runway) in addition to the lower airspace network (London Terminal Airspace) through an overall reduction in:
- air traffic volumes and density
 - air traffic complexity
 - controller intervention/workload, which also benefits pilot workload
- 3.6.6 The impact from capacity improvements (due to the reduction in flights over the 12-year appraisal period) was qualitatively assessed because we expect the benefits to be minor, and would be disproportionate to quantify.
- Passenger surface access time savings – quantified and monetised**
- 3.6.7 This represents a key benefit of the airspace change and reflects improved accessibility within the London airport system. York Aviation, our expert transport consultants, have analysed how this is forecast to influence passenger choice. For full details of their analysis see the separately-supplied technical Annex B.
- 3.6.8 The with-change option enables LCY to serve a wider range of markets. As a result, passengers within LCY's natural catchment are able to use LCY for a greater proportion of their air travel needs, rather than travelling to alternative London system airports. This reduces surface access journey times for affected passengers.
- 3.6.9 A weighted average surface access time saving has been calculated by comparing travel times to LCY with travel times to the most popular alternative airport for passengers from each Local Authority area in London and the South East.
- 3.6.10 The analysis uses the following data sources and steps:
- Passenger origins, alternative airports and mode shares identified using the CAA Passenger Survey 2024;
 - The number of LCY passengers originating from each Local Authority area used to weight the results;
 - Drive times and public transport access times to each airport derived using Google Maps;
 - A weighted average time saving calculated across all Local Authority areas.

- 3.6.11 This analysis indicates that a typical LCY passenger **saves 8.5 minutes** in surface access time compared with travelling to the most commonly used alternative London airport.
- 3.6.12 These time savings have been valued using standard values of time for air passengers taken from Economy: Transport Economic Efficiency Impacts¹². The resulting benefits of 8.5 mins per passenger are classified under TAG as transport economic efficiency impacts and have been monetised at £0.70 per passenger.

Figure 31 Summary of how changing passenger choice of airport saves time and money

Year	Without change Passengers (m)	With change Passengers (m)	Difference Passengers (m)	Time saved: (Days, based on 8.5 min/pax)	Undiscounted Benefit (£, based on 70p/min/pax)	Discount factor 3.5%	Present Value (£, based on 70p/min/pax)
2023	3.4	3.4	0	0	£0	1.000	£0
2024	3.6	3.6	0	0	£0	1.035	£0
2025	3.8	3.8	0	0	£0	1.071	£0
2026	3.8	3.8	0	0	£0	1.109	£0
2027	4.1	4.1	0	0	£0	1.148	£0
2028	4.2	4.4	0.2	1,236	£1,251,361	1.188	£1,053,612
2029	4.4	5.1	0.7	3,911	£3,959,627	1.229	£3,221,159
2030	4.6	5.6	1.0	6,014	£6,087,816	1.272	£4,784,968
2031	4.8	6.2	1.4	7,969	£8,067,127	1.317	£6,126,270
2032	5.1	6.6	1.5	8,917	£9,027,311	1.363	£6,623,618
2033	5.4	7.1	1.8	10,563	£10,692,928	1.411	£7,580,418
2034	5.7	7.7	2.0	12,062	£12,211,310	1.460	£8,364,084
2035	6.0	8.4	2.5	14,496	£14,674,547	1.511	£9,711,370
2036	6.9	9.0	2.1	12,326	£12,477,948	1.564	£7,978,452
2037	8.0	9.0	1.0	5,785	£5,856,361	1.619	£3,617,953
2038	9.0	9.0	0	0	£0	1.675	£0
Total	c.68m	c.82m	c.14m	c.83,279 days (228 years)	£84,306,337 Undiscounted		£59,061,905 NPV (12-year NPV when discounted at standard Social Time Preference Rate of 3.5%)

- 3.6.13 The 12-year benefit of this change is forecast to be **£59.1m NPV**. While these benefits represent a plausible and evidence-based behavioural response within the London airport system, they are subject to greater uncertainty than other monetised impacts because they depend on future airline market development and passenger airport choice. Accordingly, these passenger surface access time savings are treated as an adjusted ("Level 2") monetised impact within the standalone Cost Benefit Analysis (Annex B), which was also sensitivity-tested.
- 3.6.14 Appendix C – Sensitivity testing of passenger surface access time monetisation is shown on p.48. Making an assumption that only half of this additional benefit would be realised, the 12-year benefit would still be £29.5m NPV.
- 3.6.15 Reminder: tables present rounded data in each cell, with raw data used for calculations, therefore adding up columns may not match the displayed totals. See paragraph 2.1 on p.5.

Conclusion

- 3.6.16 We conclude that, considering the implications for capacity and resilience, the with-change option is preferable to the without-change option due to **c.76,500 fewer flights** over the appraisal period and the associated benefits for operational efficiency and passenger experience. Passenger surface access time savings provide an **additional** potential benefit and are reported transparently within the cost-benefit analysis at their full potential. Sensitivity testing on p.48 at a 50% potential still gives a substantial benefit, given the

¹² Airports Commission, July 2015, ISBN 9781848641648 ([link](#) to Airports Commission download page), updated to 2023 prices.

inherent uncertainty in future passenger airport choice and airline market development.

3.7 General aviation: Access, qualitatively assessed

- 3.7.1 Other airspace users, i.e. non-LCY aviation activities, are unlikely to be significantly impacted. The relative decrease in LCY traffic this ACP would cause, compared to the without-change traffic levels, could mean more general aviation (GA) transits, leading to GA flying fewer detours around our controlled airspace. However, this is a hypothetical potential benefit which may not manifest in practice.
- 3.7.2 This proposal would not cause any changes to controlled airspace dimensions or classifications; thus GA access impacts would not change.

Conclusion

- 3.7.3 We conclude that this proposal is unlikely to change access impacts on other airspace users.

3.8 General aviation/commercial airlines: Economic impact from increased effective capacity, qualitatively assessed

- 3.8.1 As described in our ATM forecasts (see section 2.3 Figure 1 and Figure 2) above, **c.76,500 fewer flights** would use the airport and associated air route network over the 12-year appraisal period.
- 3.8.2 This is likely to have an economic benefit with a reduced likelihood of delays compared with the without-change option. LCY's on-time performance¹³ would be expected to improve from an already-good 73.1% on-time (within 15min) – we are, and would make efforts to remain, the best London airport for on-time flights.
- 3.8.3 From a general economic point of view the passenger capacity would increase – over the 12-year appraisal period there would be up to **c.14m more passengers** using the airport. This would economically benefit the airlines using the new procedures (deploying aircraft with greater capacity, lower seat costs and increased yields), and the airport itself due to more people using our shops and services.
- 3.8.4 The main economic benefit of increased capacity would come from this earlier passenger increase towards our 9mppa cap, with the reduced surface access journey times as described in Section 3.6 above.
- 3.8.5 The economic impact from increased effective capacity (due to the reduction in flights over the 12-year appraisal period) was qualitatively assessed because the benefits to our already-good on-time performance would be minor, and would be disproportionate to quantify.
- 3.8.6 As noted in the previous section, there is a hypothetical potential benefit for GA which may not manifest in practice, and we would not claim any such benefit.
- 3.8.7 Our corporate jet operators are technically GA flights using LCY, and we expect them to remain at the same level of ATMs (see section 2.3 Figure 1). They would benefit from the overall reduction in flights in the same way airlines and passengers would; i.e. an overall reduced likelihood of delay due to fewer flights than the without-change option.

Conclusion

- 3.8.8 We conclude that the with-change option is economically preferable to the without-change option due to **c.76,500 fewer flights** over the appraisal period combined with **c.14m more passengers**.

¹³ CAA data 2024 ([link](#))

3.9 General aviation/commercial airlines: Fuel burn, quantified

- 3.9.1 This section is inextricably linked with section 3.3 from p.29, which explains the greenhouse gas impacts. There is a direct link between fuel burn and CO_{2e} emissions; typically the conversion factor is c.3.18kg CO_{2e} per kg of aviation turbine fuel. This number varies slightly from time to time around the third decimal place; the number used for this appraisal is rounded to 3.18 from the DfT's dataset¹⁴.
- 3.9.2 For our 2024 baseline, our aircraft burned c.59.6kT of fuel, worth approximately £35.1m assuming a cost of £588.41/tonne¹⁵. We carried 3,567,871 passengers, so the average fuel cost was **£9.83** per passenger.
- 3.9.3 For this ACP we have assumed 100% fossil-based jet fuel, which is currently cheaper than sustainable aviation fuel (SAF). SAF is required to be blended in increasing proportions under the UK's SAF mandate.
- 3.9.4 The following table provides fuel forecasts and also how that relates to passenger forecasts, without and with the airspace change (in the difference columns, negative numbers are a benefit). NB the costs in this illustration refer to a snapshot as if all data was for November 2025.

Figure 32a/b/c Annual Jet A1 fuel burn in kT without and with change, with illustrative costs in Nov 2025 prices

Year	Jet A1 fuel (kT)			Passengers (m)		Fuel cost per passenger £		
	Without change	With change	Difference "With" minus "Without"	Without change	With change	Without change	With change	Difference "With" minus "Without"
2027	78.78	73.05	-5.73	4.1	4.1	11.44	10.60	-0.83
2028	83.61	80.47	-3.14	4.2	4.4	11.63	10.67	-0.96
2029	86.95	86.16	-0.79	4.4	5.1	11.55	9.95	-1.59
2030	89.75	89.42	-0.34	4.6	5.6	11.59	9.44	-2.15
2031	91.48	89.38	-2.10	4.8	6.2	11.20	8.55	-2.66
2032	93.24	90.66	-2.58	5.1	6.6	10.83	8.11	-2.72
2033	96.17	98.02	1.85	5.4	7.1	10.58	8.08	-2.50
2034	98.69	105.36	6.66	5.7	7.7	10.27	8.06	-2.22
2035	101.42	116.01	14.59	6.0	8.4	9.99	8.10	-1.89
2036	114.36	124.97	10.61	6.9	9.0	9.74	8.17	-1.57
2037	130.61	124.97	-5.64	8.0	9.0	9.58	8.17	-1.41
2038	144.16	124.97	-19.18	9.0	9.0	9.42	8.17	-1.25
Total	1,209.23 kT	1,203.45 kT	-5.78 kT benefit	Average fuel cost per passenger:		£10.46	£8.62	-£1.84 benefit

Year	Fuel cost £m		
	Without change	With change	Difference "With" minus "Without"
2027	46.35	42.98	-3.37
2028	49.19	47.35	-1.85
2029	51.16	50.70	-0.47
2030	52.81	52.61	-0.20
2031	53.83	52.59	-1.23
2032	54.86	53.35	-1.52
2033	56.59	57.68	1.09
2034	58.07	61.99	3.92
2035	59.67	68.26	8.59
2036	67.29	73.54	6.24
2037	76.85	73.54	-3.32
2038	84.82	73.54	-11.29
Total	£711.52m	£708.12m	-£3.40m

Nov 2025 snapshot illustration

¹⁴ Greenhouse gas reporting conversion factors 2025 ([link](#))

¹⁵ IATA jet fuel price 778.74USD/T ([link](#)), currency 1USD=0.7556GBP (Reuters [link](#)), both as of specific times on 25 Nov 2025.

- 3.9.5 Over the 12-year appraisal period, the with-change **fuel burn would reduce by 5.78kT** against the without-change emissions, a benefit, which would cost airlines **c.£3.4m less** with-change (November 2025 snapshot price illustration).
- 3.9.6 This is a 12-year average **£1.84 per passenger fuel benefit** of the change (November 2025 snapshot price illustration).
- 3.9.7 The cause of the positive (disbenefit) fuel data in years 2033-2036 is the disparity in passenger forecast with the change vs. without – the following is the same explanation from the greenhouse gas paragraphs 3.3.8-3.3.11 on p.30:
- 3.9.8 As shown in section 2.3 Figure 2, without the change we forecast c.68m passengers over 12 years and with the change we forecast c.14m more (c.82m).
- 3.9.9 For each of the years 2033-2036 there would be between **1.7m-2.4m more passengers** using the airport each year, with the airspace change than without. The A320neo aircraft have greater passenger capacity, and this accelerates the passenger throughput for the airport towards our 9mppa limit under the with-change option. As the 9mppa planning limit is approached more slowly without-change (based on a fleet mix without A320neo aircraft), with effect from 2033 Jet A1 fuel burn is lower compared to the with-change option, until the passenger numbers converge from 2037. At this point, the differences between the with-change and without-change option convert to significant benefits with the proposed airspace change.
- 3.9.10 In all cases, including between 2033-36, the emissions per passenger remain beneficial with-change, consistent with enabling the transition to more efficient aircraft.
- 3.9.11 Regarding other airspace users, i.e. non-LCY aviation activity, the relative decrease in LCY traffic this ACP would cause, compared to the without-change scenario, could mean more general aviation (GA) transits, leading to GA flying fewer detours around our controlled airspace. Hypothetically this could decrease GA-related fuel burn and greenhouse gas emissions, however this is not quantifiable given the random nature of GA flights, and may not manifest in practice.

Monetisation of fuel burn

- 3.9.12 The 12-year monetised benefit is **£2.6m NPV** after conversion to 2023 price base and social time discounting at 3.5%.

General aviation/commercial airlines: Fuel burn conclusion

- 3.9.13 Over the 12-year appraisal period there would be an overall fuel benefit of **5.78 kT** under this proposal, which is **£1.84/passenger**.
- 3.9.14 Formally monetised, this would be a benefit to wider society of **£2.6m NPV**.
- 3.9.15 This feeds into Section 4 cost-benefit analysis, on p.41.
- 3.9.16 We conclude that, in consideration of fuel burn for both options, the with-change option is preferable to the without-change option.

3.10 Commercial airlines: Training costs, qualitatively assessed

- 3.10.1 The with-change option may result in additional training cost impacts for airlines compared to the without-change option. Specialised training will be required for airline personnel to safely and effectively operate aircraft using RNP AR procedures at LCY. However, today's steep approaches also require special training, so the differences are likely minimal in practice. Finally, these costs would be mitigated by the training being applicable elsewhere on other routes and at other airports.

- 3.10.2 These costs would be a factor in the airlines' decision-making, however these are not quantifiable by LCY.
- 3.11 Commercial airlines: Other costs, qualitatively assessed**
- 3.11.1 RNP AR equipment and operational approvals may involve costs for airlines including initial investment in aircraft and avionics, ongoing costs for navigation database subscriptions and potential procedure-specific approvals. However, these costs would be mitigated by the equipment and approvals being applicable elsewhere on other routes and at other airports.
- 3.11.2 As above, these costs would be a factor in the airlines' decision-making, however these are not quantifiable by LCY.
- 3.12 Airport/ANSP: Infrastructure costs, qualitatively assessed**
- 3.12.1 Airport infrastructure costs would be unaffected by this ACP.
- 3.12.2 Such changes supporting traffic growth over the 2027-2038 time period are already agreed within current planning permissions, and include the terminal building and associated infrastructure. There are no new airport infrastructure requirements for the with-change option.
- 3.13 Airport/ANSP: Operational costs, qualitatively assessed**
- 3.13.1 Airport operational costs are not expected to change under this ACP following its deployment.
- 3.14 Airport/ANSP: Deployment costs, qualitatively assessed**
- 3.14.1 LCY already operates ground equipment and associated hardware suitable for use by the A320neo, the aircraft type forecast to be the user of the with-change procedure (noting that the with-change option is not exclusive to this aircraft type, subject to assessment of the potential impacts and benefits of the use of the new procedure by other aircraft types in the future – for more details see the Consultation Document paragraphs 2.3.5-2.3.6 and its Appendix B). Most of such equipment is interchangeable and used for a wide variety of aircraft types.
- 3.14.2 Therefore we do not expect the airport to incur significant deployment costs under the with-change option, and over the 12-year period equipment renewal/maintenance would be business as usual; many of our existing stands can already accommodate new aircraft types such as the A320neo.
- 3.14.3 Our contracted ANSP, NATS, runs the air traffic control at LCY, and NERL (its monopoly-licensed national air traffic side NATS En Route Ltd) runs the air traffic route network across the UK. Under the with-change option, their controllers and support staff will need to undergo familiarisation training and/or briefings. Some use of NATS' simulator facilities may be required. Further support staff are required to run the simulator (e.g. activity planning, data preparation, simulator testing, pseudo-pilots, Safety/Validation/Human Factors, data analysts etc).
- 3.14.4 There may also be additional costs associated with the development, assurance and implementation of the designed procedures, as well as this ACP. These are deemed acceptable by LCY in order to enable the with-change option to be implemented, presuming approval.
- 3.15 Airport/ANSP: Other costs, qualitatively assessed**
- 3.15.1 None are foreseen.

4. Cost-benefit analysis

4.1 Introduction and approach

- 4.1.1 This section brings together the evidence presented in Section 3 to provide a consolidated cost-benefit analysis (CBA) of the proposed introduction of RNP AR procedures at LCY. The purpose of the CBA is to assess whether, over the agreed 12-year appraisal period from 2027 to 2038, the with-change option delivers a net benefit relative to the without-change baseline.
- 4.1.2 The cost-benefit analysis has been undertaken in line with the Department for Transport's Transport Analysis Guidance (TAG), including the application of TAG methodologies and values where impacts can be robustly quantified and monetised. All monetised impacts are presented in 2023 prices and expressed as net present values (NPV), with discounting applied in accordance with HM Treasury Green Book conventions as implemented within TAG.
- 4.1.3 In accordance with TAG guidance, impacts have been monetised only where this is proportionate and where accepted valuation methodologies exist. Where impacts are expected to be small, negligible, or where no exceedances or material effects are identified, these impacts have been assessed qualitatively rather than monetised.
- 4.1.4 Our approach includes Level 2 (adjusted) impacts. These are monetised impacts considered plausible and evidence-based, but which are subject to greater uncertainty than "core" Level 1, impacts due to behavioural assumptions, future market development, or limitations in available data or modelling. In accordance with TAG, Level 2 impacts may be monetised and presented transparently, but should be accompanied by sensitivity testing, clear caveats, and presentation that ensures they are not relied upon in isolation for decision-making.
- 4.1.5 The appraisal compares the with-change option against the without-change baseline, taking account of forecast changes in passenger volumes, aircraft movements and fleet mix that arise because the proposed airspace change enables LCY to accommodate larger, more fuel-efficient aircraft and to serve a wider range of markets from its existing catchment.
- 4.1.6 See Annex B for additional CBA details.

4.2 Quantified and monetised impacts

- 4.2.1 A number of impacts assessed in Section 3 have been quantified and monetised using standard Government methodologies with a 2023 price base year. These comprise Level 1 monetised appraisals of community noise impacts, greenhouse gas emissions, and fuel burn. Passenger surface access time savings are treated as an adjusted (Level 2) monetised impact within the standalone CBA given their higher uncertainty.
- 4.2.2 Local air quality impacts have not been monetised. As set out in Section 3.2, modelling demonstrates that pollutant concentrations remain well below relevant limit values in all scenarios, with no exceedances and only negligible (beneficial) differences between the with-change and without-change options. In line with TAG guidance, monetisation is therefore not required or proportionate, and air quality is considered qualitatively within the overall appraisal.

4.2.3 Figure 33 summarises the quantified and monetised impacts over the 12-year appraisal period. Positive values represent net benefits relative to the without-change baseline. Benefits are split into Level 1 (core) and Level 2 (additional).

Figure 33 Summary of quantified and monetised impacts (NPV, £m at 2023 prices)

Impact category	Net Present Value (£m)
Level 1 Impacts	
Communities: Noise impacts	£32.2
Wider society: Greenhouse gas emissions	£3.7
General aviation / commercial airlines: Fuel burn	£2.6
Level 1 Impacts Sub-Total NPV	£38.4
Level 2 Impacts	
General aviation / commercial airlines: Passenger surface access time savings	£59.1
Level 2 Impacts Sub-Total NPV	£59.1
Total Quantified NPV (including Level 2 impacts)	£97.4
Total Quantified NPV (excluding Level 2 impacts)	£38.4

- 4.2.4 The largest monetised benefit arises from passenger surface access time savings. These reflect the improved ability of passengers within LCY's catchment to access air services from LCY following the airspace change, rather than travelling to other London system airports. For transparency, the CBA reports results both excluding and including passenger surface access time savings, recognising that this Level 2 benefit stream is more uncertain than the other monetised impacts.
- 4.2.5 In the without-change scenario, constrained aircraft types limit the range of markets that can be served efficiently from LCY. As a result, a proportion of passengers within LCY's natural catchment are required to travel to alternative London airports, incurring longer surface access journeys. The with-change option enables LCY to serve a broader range of destinations using larger aircraft, allowing more passengers to use their nearest appropriate airport.
- 4.2.6 In TAG terms, these benefits are captured as passenger surface access time savings within the London airport system. They represent genuine welfare benefits arising from reduced travel time and improved accessibility, rather than a transfer between airports, and are therefore appropriately included in the CBA. Given the reliance on future passenger airport choice and airline market development, these impacts are treated as adjusted (Level 2) and are accompanied by sensitivity testing in the separately-published CBA technical document Annex B. Even at a 50% realisation (see Appendix C – Sensitivity testing of passenger surface access time monetisation on p.48), under this significantly more conservative assumption, the surface access benefit remains substantially positive and continues to make a meaningful contribution to the overall appraisal.
- 4.2.7 Monetised noise impacts also represent a substantial benefit. As demonstrated in Section 3.1, the with-change option results in smaller primary noise contour areas and fewer people exposed to higher average noise levels over the appraisal period. When valued using TAG noise appraisal methods, this delivers a significant net benefit to affected communities.
- 4.2.8 Greenhouse gas impacts have been monetised using the TAG greenhouse gas workbook. While total emissions increase over time in both scenarios as passenger numbers grow, the with-change option delivers lower emissions per passenger and a reduction in cumulative CO_{2e} over the 12-year appraisal period, resulting in a net benefit to wider society.
- 4.2.9 Fuel burn reductions provide a further quantified benefit, reflecting greater aircraft efficiency and a reduction in the total number of flights required to accommodate forecast passenger demand. While these benefits accrue

primarily to airlines, they are included in line with TAG guidance as an indicator of improved economic efficiency.

- 4.2.10 Taken together, the quantified impacts result over 12 years would be **between £38.m-£97.4m NPV**, with the lower figure excluding the less-certain £59.1m passenger access benefit. This indicates a strong monetised case in favour of the with-change option.

4.3 Qualitative impacts

- 4.3.1 Several impacts identified in Section 3 cannot be robustly monetised or would be disproportionate to quantify. These impacts have therefore been assessed qualitatively, in line with TAG and CAP1616 guidance.

- 4.3.2 Figure 34 summarises the qualitative impacts considered within the appraisal and indicates the direction of impact relative to the without-change baseline.

Figure 34 Summary of qualitatively assessed impacts

Impact category	Assessment summary	Direction of impact
Communities: Local air quality	No exceedances of limit values; differences between scenarios are negligible and slightly beneficial with-change	Neutral to slight benefit
Wider society: Tranquillity	Some flights operate marginally lower in limited areas, but fewer overall flights over the appraisal period	Net benefit
Wider society: Biodiversity	No adverse effects on European sites; reduced flight growth provides a small indirect benefit	Net benefit
Wider society: Capacity and resilience	Fewer flights required to meet demand, reduced airspace and runway congestion, improved operational resilience	Net benefit
General aviation: Access	No material change anticipated; potential benefits for GA transits are hypothetical and not relied upon	Neutral
Commercial airlines: Training costs	Additional RNP AR training required but commercially recoverable and transferable	Minor disbenefit
Commercial airlines: Other operational costs	Equipage and approvals required but offset by wider operational utility	Neutral to minor disbenefit
Airport / ANSP: Infrastructure costs	No new airport infrastructure required	Neutral
Airport / ANSP: Deployment and operational costs	Some implementation and familiarisation costs expected but proportionate and manageable	Minor disbenefit

- 4.3.3 Overall, the qualitative assessment indicates that non-monetised impacts are predominantly neutral or beneficial. Where minor disbenefits occur, these are limited in scale, largely transitional, and do not outweigh the significant benefits identified elsewhere in the appraisal.

4.4 Overall cost-benefit balance

- 4.4.1 The cost-benefit analysis demonstrates that the with-change option delivers a clear and substantial net benefit relative to the without-change baseline.

- 4.4.2 The quantified appraisal produces a positive NPV over the 12-year appraisal period on the basis of core (Level 1) monetised impacts alone, with passenger surface access time savings reported separately as an adjusted (Level 2) benefit due to greater uncertainty, which also underwent sensitivity testing. When qualitative impacts are also taken into account—including improvements in capacity, resilience and environmental efficiency—the overall balance of impacts is strongly in favour of the with-change option.

- 4.4.3 The CBA findings are consistent with, and reinforce, the conclusions reached in Section 3 of this Full Options Appraisal. They provide clear evidence that the proposed introduction of RNP AR procedures represents a proportionate and beneficial airspace change in accordance with CAP1616 and DfT TAG guidance.

5. Safety assessment

5.1 Introduction

5.1.1 The text in this section is the same as that used in Stage 2 with an additional item explicitly covering Traffic Collision Avoidance System (TCAS) alerts.

5.1.2 TCAS is a system which gives flight-deck warnings when equipped aircraft are predicted to get within vertical and/or lateral distances such that safety might be compromised. Occasionally these alerts cause a nuisance where aircraft are safely separated by ATC radar (such as helicopters in the vicinity), but the warning system triggers. The shallower approach of the with-change option is not anticipated to cause any change in TCAS impacts because aircraft on final approach would not be any closer, laterally or vertically, to such traffic (for example, helicopters following London's helicopter routes are held clear of final approach while an aircraft is landing). Typically these nuisance alerts occur earlier in the approach while level and still turning on to final, which would not change.

5.2 Overview

5.2.1 This summary covers the safety assessment meetings with LCY Tower controllers on 14th July 2025 and with London Terminal Control (TC) controllers on 21st July 2025.

5.2.2 Both safety meetings determined that this change would not present any major issues to controllers or adversely impact the operation.

5.2.3 The use of different-angled approach paths would not have an impact on how the controllers performed. Even though the shallower approach angles will present aircraft at a lower altitude than steeper approach angles, at a given range, the LCY controllers felt they only had to check the flight strips¹⁶ to confirm the type of aircraft and the expected angle associated with that approach. This issue is currently assessed as no impact.

5.2.4 The Airbus A320neo will initially be the only aircraft to be authorised to fly the RNP AR approach (noting that the with-change option is not exclusive to this aircraft type, subject to assessment of the potential impacts and benefits of the use of the new procedure by other aircraft types in the future). It is larger and heavier than other aircraft and has a higher approach speed. This could result in a catch-up scenario¹⁷. This is not a new situation for either TC or LCY controllers as it exists between the current aircraft that use the airport (i.e. Embraer vs. ATR). As this issue already exists, it is currently assessed as no impact.

5.2.5 Runway occupancy was a consideration as the A320neo is heavier than current LCY aircraft and has a higher approach speed. However, the controllers reasoned that the A320neo would not take any more time to clear the runway than the Embraer jet aircraft that already use the runway. This issue is currently assessed as no impact.

5.2.6 The Precision Approach Path Indicators (PAPIs) are set at 5.5°. Even though the new RNP AR glidepaths are lower than the current PAPI angle, the CAA have accepted that PAPIs are not required for the RNP AR approach which is consistent with other RNP AR approaches. Consequently, this issue is currently assessed as no impact.

¹⁶ ATC uses data items known as flight progress strips to manage each flight, originally these were paper strips mounted in plastic holders but LCY now uses electronic versions.

¹⁷ Where a slower aircraft precedes a faster (following) aircraft, the distances between them can erode on final approach. Careful ATC management ensures safe separation of this scenario, which is "business as usual" for ATC.

5.3 Summary

- 5.3.1 The addition of RNP AR routes can be assessed as acceptably safe as there are no increased risks or additional hazards identified. The overall assessment from both LCY and TC is that the introduction of RNP AR routes to both runways does not present controllers with any additional issues or risk over what they already deal with on a day-to-day basis.
- 5.3.2 Future safety activities will be undertaken at a later stage in the process and will include: the development of an Assurance Plan; Safety and Human Factors Hazard Analysis workshop/s; Safety and Human Factors report/s and; a Change Assurance report. These typically happen closer to formal ACP submission and subsequent implementation preparation, presuming approval, therefore these plans remain in place.

6. Statement of preferred option

- 6.1.1 This full options appraisal document has provided detailed quantified monetised evidence, and qualitatively-assessed impacts, with the most up-to-date and credible information available.
- 6.1.2 The cost-benefit analysis supports the selection of the with-change option as the preferred option for this proposal. The monetised case is positive on the basis of core impacts, with passenger surface access time savings providing an additional adjusted benefit reported transparently alongside sensitivity testing in the separately-published CBA technical document Annex B, summarised in this document at Appendix C – Sensitivity testing of passenger surface access time monetisation on p.48.

7. Appendix A – WebTAG Noise Output

Sources: Bickerdike Allen Partners LLP
Calculation Basis: TAG Noise Databook

	WebTAG assessment	Sensitivity test excluding impacts below 51 dB (for aviation proposals only)
Net present value of change in noise (£, 2023 prices):	£32,152,441	£26,609,167
	*positive value reflects a net benefit (i.e. a reduction in noise)	
	£6,596,333	£1,053,059
Net present value of impact on amenity (£, 2023 prices):	£18,463,025	£18,463,025
Net present value of impact on AMI (£, 2023 prices):	£372,009	£372,009
Net present value of impact on stroke (£, 2023 prices):	£2,681,686	£2,681,686
Net present value of impact on dementia (£, 2023 prices):	£4,039,388	£4,039,388

Quantitative results

individuals experiencing increased daytime noise in forecast year:

0

individuals experiencing reduced daytime noise in forecast year:

111,923

individuals experiencing increased night time noise in forecast year:

0

individuals experiencing reduced night time noise in forecast year:

10,380

8. Appendix B – WebTAG Greenhouse Gas Output

Sources: Ecolyse Ltd
Calculation Basis: TAG Greenhouse Gases Databook

Net Present Value of carbon dioxide equivalent emissions of proposal (£):

£3,667,288

(Sum of traded and non-traded emissions - see note below on accounting for UK allowances in the traded sector)

*positive value reflects a **net benefit** (i.e. CO₂e emissions reduction)

Quantitative Assessment:

Change in carbon dioxide equivalent emissions over 60 year appraisal period (tonnes):

-18,382

(between 'with scheme' and 'without scheme' scenarios)

*negative value reflects a **net benefit** (CO₂e emissions reduction)

Of which Traded

-18,107

Change in carbon dioxide equivalent emissions in opening year (tonnes):

-18,227

(between 'with scheme' and 'without scheme' scenarios)

Net Present Value of traded sector carbon dioxide equivalent emissions of proposal (£):

£3,596,927

*N.B. This value has been adjusted to account for the cost of emissions covered by the UK Emissions Trading Scheme (UK ETS), **under the assumption that all assessed traded emissions are within the scope of the UK ETS. For further information, including guidance on the valuation of traded emissions outside the scope of the UK ETS, please refer to TAG Unit A3, section 4.1.***

*positive value reflects a **net benefit** (i.e. CO₂e emissions reduction)

9. Appendix C – Sensitivity testing of passenger surface access time monetisation

9.1 Assumption that only half would be realised

9.1.1 As discussed in paragraphs 3.6.14 and 3.6.16, we sensitivity-tested the potential benefit at half its maximum and the 12-year benefit would be £29.5m NPV.

9.1.2 The table below is a duplicate of Figure 31 on p.36 where the time saved has been assumed to be half of the original assumption. The £0.70 per minute per passenger monetisation rate has not been changed.

Figure 35 Sensitivity test at 50% of quantified benefits in Figure 31 on p.36

Year	Without change Passengers (m)	With change Passengers (m)	Difference Passengers (m)	Time saved: (Days, based on 8.5 min/pax, half of original assumption)	Undiscounted Benefit (£, based on 70p/min/pax)	Discount factor 3.5%	Present Value (£, based on 70p/min/pax)
2023	3.4	3.4	0	0	£0	1.000	£0
2024	3.6	3.6	0	0	£0	1.035	£0
2025	3.8	3.8	0	0	£0	1.071	£0
2026	3.8	3.8	0	0	£0	1.109	£0
2027	4.1	4.1	0	0	£0	1.148	£0
2028	4.2	4.4	0.2	618	£625,680	1.188	£526,806
2029	4.4	5.1	0.7	1,956	£1,979,814	1.229	£1,610,580
2030	4.6	5.6	1.0	3,007	£3,043,908	1.272	£2,392,484
2031	4.8	6.2	1.4	3,985	£4,033,564	1.317	£3,063,135
2032	5.1	6.6	1.5	4,459	£4,513,656	1.363	£3,311,809
2033	5.4	7.1	1.8	5,282	£5,346,464	1.411	£3,790,209
2034	5.7	7.7	2.0	6,031	£6,105,655	1.460	£4,182,042
2035	6.0	8.4	2.5	7,248	£7,337,273	1.511	£4,855,685
2036	6.9	9.0	2.1	6,163	£6,238,974	1.564	£3,989,226
2037	8.0	9.0	1.0	2,893	£2,928,181	1.619	£1,808,977
2038	9.0	9.0	0	0	£0	1.675	£0
Total	c.68m	c.82m	c.14m	c.41,640 days (114 years)	£42,153,168 Undiscounted		£29,530,952 NPV (12-year NPV when discounted at standard Social Time Preference Rate of 3.5%)

9.1.3 Under this significantly more conservative assumption, the surface access benefit remains substantially positive and continues to make a meaningful contribution to the overall appraisal.

End of Stage 3 Full Options Appraisal