Gatwick Airport Northern Runway Project

Environmental Statement
Appendix 14.9.5: Air Noise Envelope Background

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1 Introduction

1.1.1 This document forms Appendix 14.9.5 of the Environmental Statement (ES) prepared on behalf of Gatwick Airport Limited (GAL). The ES presents the findings of the Environmental Impact Assessment (EIA) process for the proposal to make best use of Gatwick Airport's existing runways and infrastructure (referred to within this report as 'the Project'). The Project proposes alterations to the existing northern runway which, together with the lifting of the current restrictions on its use, would enable dual runway operations. The Project includes the development of a range of infrastructure and facilities which, with the alterations to the northern runway, would enable the airport passenger and aircraft operations to increase. Further details regarding the components of the Project can be found in Chapter 5: Project Description.

1.1.2 This appendix describes background material used to develop the Noise Envelope, including details of the guidance followed, approaches that can be taken, the pros and cons of the range of noise metrics available, and information relevant to the consideration of Regulation 598. Further information on development of the noise envelope is contained in the following ES appendices:

Appendix 14.9.7: The Noise Envelope

Appendix 14.9.8: Noise Envelope Group Output Report

Appendix 14.9.9: Report on Engagement on the Noise Envelope

1.1.3 Appendix 14.9.7: The Noise Envelope, details the noise envelope for the Project. It summarises existing noise control measures at Gatwick and DfT's role, the requirements of a noise envelope in policy, the noise limits and metrics used to set the noise envelope, and the monitoring and review processes. This information is not repeated here.

1.1.4 Appendix 14.9.8: Noise Envelope Group Output Report summarises the output of the Noise Envelope Group that worked from May to October 2022. The content is not repeated here.

1.1.5 Appendix 14.9.9: Report on Engagement on the Noise Envelope provides a summary of the consultation carried out, with its appendices including notes of the 12 meetings held, the presentations given by GAL and various stakeholders, and feedback documents received. The summary of the consultation undertaken is not repeated here.

2 Noise Envelope Options

2.1 Planning Guidance

2.1.1 The Noise Envelope for the Project would be enforced through the Development Consent Order. It would form the primary Requirement to limit noise from the Project. Government guidance on planning conditions (and in this context DCO Requirements) is therefore applicable.

2.1.2 The Secretary of State takes the view that conditions should not be imposed unless they are both necessary and effective, and do not place unjustifiable burdens on applicants. The Planning Inspectorate's Advice Note 15 confirms that policy and guidance relating to planning conditions will generally apply when considering requirements to be imposed in a DCO. Requirements should therefore be precise, enforceable, necessary, relevant to the development, relevant to planning and reasonable in all other respects[1].

2.1.3 In summary, the Noise Envelope therefore has to comply with government policy on noise envelopes, whilst also meeting the more general requirements in respect of planning conditions.

2.2 CAA Guidance

2.2.1 CAP 1129 Noise Envelopes (CAA, 2013) reports the results of research carried out by the CAA regarding the different forms that noise envelopes can take, and how they can be implemented. CAP 1129 provides guidance under the following headings:

Chapter 2 Current Thinking on the Noise Envelope Concept

Chapter 3 Defining a Noise Envelope

- Characteristics
- Parameters

Chapter 4 Setting the limits

- Sharing the benefits
- Providing certainty
- Reviews

Chapter 5 Implementation

- Process
- Obtaining agreement among stakeholders
- Legal basis, planning and controls
- The role of government in implementing envelopes

Chapter 6 In Operation

- Monitoring compliance in operation
- Enforcement
- Local monitoring and enforcement plan

2.2.2 In Chapter 3 Defining a Noise Envelope CAP 1129 (2013) states that:

'To function as intended, a noise envelope should as a minimum:

1. be clearly defined
2. be agreed among stakeholders
3. be legally binding
4. not be compromised by the lack of up-to-date understanding of the relationship between annoyance and the exposure to aircraft noise
5. take account of new technology
6. have proportionate aims which are appropriate for the airport to which it applies i.e. to permit growth, maintain a status quo, or manage a reduction in noise impact.'

2.2.3 Chapter 3 discusses the benefits and disadvantages of various forms of noise limit and the metrics available. The following section summarises how each option has been considered.

[1] See for example the discussion at paragraphs 142 and 143 of the Stansted Appeal ref APP/C1570/W/20/3256619, where the panel came to the conclusion that Uttlesford District Council's proposal to periodically review the noise conditions and make them more stringent in the future would be likely to seriously undermine the certainty that a planning permission should provide that the development could be fully implemented.

2.2.4 Chapter 4 gives guidance on setting limits including the policy of sharing benefits, referring to examples from different airports. GAL and Community Noise Groups presented material on possible methods to quantify sharing benefits in the June 2022 meetings of the Noise Envelope Group. See Appendix 14.9.9 Report on Engagement on the Noise Envelope.

2.2.5 Chapter 5 offers the guidance on the process of developing a noise envelope including the following:

2.2.6 The key stages in the process of implementing a noise envelope at an airport are likely to include:

1. Establishing the need. A noise envelope would be necessary for a new major airport or a major airport undergoing significant expansion. A decision may also be required on how a major airport is defined. Depending on the views of the stakeholders, it may be appropriate to implement envelopes at airports not undergoing development, and at smaller airports.

2. Identify stakeholders. These are the groups of people for which the noise envelope is intended to provide assurances over the future growth and associated noise impact of the airport. This will include, as a minimum, the airport operator and the local authority responsible for licensing the airport. In addition, it may include representatives from local authority responsible for areas not including the airport, but in the vicinity of, and affected by, the airport. It may also include airline representatives. The DfT Guidelines for Airport Consultative Committees offers useful advice in this regard.

3. Set up an envelope design team including technical and legal representatives from stakeholder groups.

4. Produce a proposal for the noise envelope design including appropriate metrics and respective limit values.

5. Undertake an appropriate consultation exercise, with the extent of coverage, means of informing and duration agreed between stakeholders.

6. Revise envelope design in light of consultation responses.

7. Write the envelope criteria into the planning agreement between the local authority and the airport.

2.2.7 This process has been followed, as summarised below. Appendix 14.9.9 Report on Engagement on the Noise Envelope gives details.

2.2.8 The initial noise envelope proposal was published for consultation in the PEIR in September 2021. This provided an outline of the proposed noise envelope and sought views on how this should be developed. The outline noise envelope proposal in the PEIR gave proposed noise limits and an outline of the proposed management process, seeking views on each.

2.2.9 There were 5,941 comments submitted on the PEIR under the consultation report heading 13b Managing and Mitigating Effects: Noise Envelope. Of these:

- 9% supported the Noise Envelope proposal
- 4% opposed the principle of the proposed Noise Envelope
- 87% made suggestion to improve the Noise Envelope
- 1,000 comments specifically referred to the Noise Envelope. Several organisations made multiple comments. These have been considered in developing the noise envelope.

2.2.10 GAL formed a Noise Envelope Group in May 2022 to seek further views on the noise envelope to guide the development of the final proposal for the DCO. Terms of reference were produced, and two sub-groups were established; the Local sub-group and the Aviation sub-group, to facilitate discussions with local communities, local authorities, and aviation stakeholders. 12 meetings were held between 26 May 2022 and 11 October 2022. These were structured around four themes drawn from the PEIR consultation response and CAP 1129, illustrated in Figure 1.

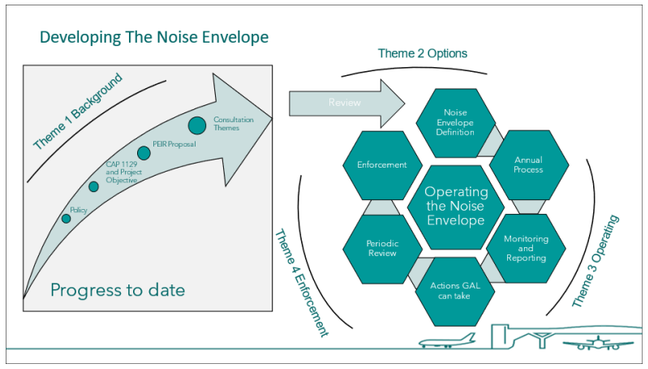

Figure 1:

Noise Envelope Group Consultation Themes

2.2.11 All of these aspects of a noise envelope were discussed and debated. Details can be seen in Appendix 14.9.9: Report on Engagement on the Noise Envelope, which provides copies of the various presentations given, papers submitted and notes on the meetings. The final two meetings focussed on producing Appendix 14.9.8: The Noise Envelope Group Output Report. The consultation challenged GAL's PEIR proposal, which was modified to develop a better noise envelope, as discussed below.

2.3 Approaches to Noise Envelopes

2.3.1 CAP 1129 observes there are three possible approaches to setting a noise envelope:

- restricting inputs;
- restricting noise impact; and
- restricting noise exposure.

2.3.2 The Night Restrictions are an example of a noise envelope already in place at Gatwick Airport that restricts inputs. In this case, the restrictions relate to the numbers of night flights and total quota counts (QCs) of night flights, in the summer and winter seasons.

2.3.3 Noise envelopes that restrict or limit inputs have the advantage of being relatively easy to predict and administer, but they do not give a direct measure or limit on the noise impact experienced in the communities around the airport. Neither do they provide any incentive for the airport or airlines to bring forward quieter operating procedures.

2.3.4 Noise envelopes that restrict noise impacts can be set in terms of the extent of noise effects (e.g. Schiphol Airport has limits of populations highly annoyed and populations sleep disturbed). However, these rely on applying dose/response relationships for the effects, which along with population growth or change can generate uncertainty.

2.3.5 More commonly, noise envelopes that restrict noise impacts use noise contours to either limit the area of the contour or the population within it. The choice of noise contour metric should reflect the impact. Stakeholders generally welcomed this approach, with concerns that appropriate metrics should be used and should cover the areas affected by noise adequately.

2.3.6 Setting a noise envelope in terms of the population within a given noise contour has the advantage that it directly relates to the

noise impact on the community. However, the population size (and number of properties) within the area around Gatwick Airport is not within the airport's control, and a contour set on this basis could not be monitored or applied with any certainty. Using the physical size of the noise contours avoids this uncertainty.

2.4 Options for a Noise Envelope at Gatwick

Introduction

2.4.1 CAP 1129 outlines the following main options for noise envelopes:

- aircraft movement caps;
- passenger throughput cap;
- noise quota count (QC) cap;
- noise level caps;
- population/dwellings exposed to noise;
- number of people annoyed (daytime);
- number of people sleep-disturbed (night-time);
- Person-Events Index (PEI);
- Average Individual Exposure (AIE);
- noise contour shape; and
- noise contour area.

2.4.2 These are discussed below.

Aircraft Movement Cap

2.4.3 CAP 1129 notes that: '*The simplicity of the movement cap is clearly attractive in terms of engaging people, but it has drawbacks as well. A key drawback is that it does not take into account the noisiness of aircraft and would therefore not offer incentives to industry to operate quieter aircraft.'*

2.4.4 It is also noted that movement caps do not encourage any other noise reduction measures such as quieter operating procedures. Community stakeholders were keen on an ATM cap because it provides certainty as to the maximum number of aircraft they may experience. The broader environmental controls proposed in relation to the NRP DCO include a cap on the overall number of Air Transport Movements (ATMs) annually at 386,000. Whilst this control is not directly related to limiting the noise of aircraft emanating from the airport, it meets the communities wish for such a limit on the number of aircraft that can operate regardless of the noise levels they generate.

Passenger Throughput Cap

2.4.5 The disadvantages of the passenger movement cap are similar to an aircraft movement cap. The intent of a passenger cap may be to use passenger numbers per flight as a proxy for noise level, but in practice there is a weak link between the two.

2.4.6 Restricting passenger throughput can have unintended consequences, such as limiting aircraft occupancy, and it is also harder to administer.

Noise Quota Count (QC) Cap

2.4.7 Gatwick already has a Quota Count and movements noise envelope for night flights under Government Night Flights Restrictions, which are in place at the designated London airports.

2.4.8 The Quota Count element of the system gives each aircraft a separate score based on its certificated noise levels for arrival and departure. Thus, for example, a particular aircraft could score 1 point on departure, and 0.5 points on arrival.

2.4.9 During the summer season, night-time (23:30-06:00 hours) air traffic movements at Gatwick are capped at 11,200 and during winter this reduces to 3,250. The night quota limits are 5,150 points in the summer (reduced from 6,200 in 2018) and 1,785 points in the winter (reduced from 2,000 in 2017/18).

2.4.10 A QC system aimed at meeting the objectives of a noise envelope would need to extend the Night Restrictions system to cover the full 24 hours and may split day and night.

2.4.11 The CAA reviewed the QC system in use at the designated airports in 2002 (ERCD Report 0204, CAA 2002) and concluded that the system was still valid, but noted: '*Ultimately the reliability of any classification system based on certification depends on the correlation between certificated and operational noise.'*

2.4.12 The CAA carried out a Quota Count validation study at Heathrow Airport (CAP 1869, CAA 2020) which compared in service noise levels and QCs for 131 aircraft types. It concluded: '*For the majority of aircraft types monitored, including new aircraft designs such as the Airbus A350 and Boeing 787, the operational arrival and departure noise levels correlated well with the QC classifications. However, large differences between the operational noise levels and the QC classifications were observed for some aircraft types, including some relatively new aircraft designs.*

… the operational approach levels of 13 aircraft types (out of 111) lie entirely above their QC bands.

On departure, the operational levels of 21 aircraft types (out of 131) lie entirely above their QC bands, including variants of the A320neo and B737 MAX 8.'

2.4.13 The QC system applies a quota count to each aircraft related to its noise levels measured at three locations during certification; 2 km from touchdown, and on departure on a side-line and 6.5 km from 'start of roll'. At Gatwick Airport, these locations are all within approximately 3 km of the airport. Two shortcomings of the QC system arise from this. As noted by the CAA review, aircraft in operation may systematically generate slightly different noise levels than during certification, due to airline procedures, leading to incorrect weightings between aircraft. Secondly, QC takes no account of aircraft noise levels more than about 3 km from the airport. Most of the people affected by noise from Gatwick airport live well beyond 3 km from the airport.

2.4.14 So, a QC limit would give no credit to an airport that develops advanced noise abatement operating procedures that reduce noise further away. Greater climb rates, for example, would go unnoticed in a QC system envelope, whereas they would reduce noise levels in affected areas and potentially make for significant changes in the shape and size of noise contours.

2.4.15 During consultation QC limits were discussed, but the preference among stakeholders was generally on limits to noise levels on the ground, noting many stakeholders would like both types.

2.4.16 During consultation a community stakeholder noted that the noise impact communities experienced was the combination of the intensity of the sound and the number of aircraft, so a metric relating to the intensity of sound would we be useful to track over time, in the same way that ATM numbers are easily tracked. Such a metric should relate to the noise of the whole fleet operating at Gatwick, or an average of them all, and instead of setting a limit, this metric could be used to track progress to a quieter fleet. Options using QCs were discussed, but a metric relating to individual aircraft noise levels was preferred. In response to this suggestion the Noise Envelope includes reporting for a secondary noise metric (i.e. one without a limit), the Airport Fleet Average Aircraft Noise L_{max}, which is the average L_{max} noise level from all aircraft measured under the Departure Noise Limits monitoring regime over the summer season or a representative part of it.

Noise Level Caps

2.4.17 Noise contours are modelled based on noise measurements and cover entire areas affected by noise. It is possible to limit noise levels measured at particular locations, under particular arrivals and departure routes, but this has several disadvantages compared to contours. Clearly only limited locations are represented, not all communities. There may be ways to reduce noise levels at these locations that increase noise at the other locations. Measurements can also be affected by other noise and weather conditions. Noise contours, provided they are reliably predicted based on detailed information on aircraft operations, are therefore considered more appropriate than noise levels for setting a noise envelope.

Population/Dwellings Exposed to Noise

2.4.18 Setting a noise envelope in terms of the population within a given noise contour, such as $L_{eq\ 16\ hour}$ day and $L_{eq\ 8\ hour}$ night has the apparent characteristic that it directly relates to the size of the noise impact on the community and can be used to track how that changes over time. Local authority stakeholders were keen on this form of limit because in their view it related to the total impact. However, the population within the area around Gatwick Airport is not within the airport's control and a limit set on this basis could not be monitored or applied with any certainty into the future. Furthermore, any new noise sensitive development under the airport flight paths should be consented with noise mitigation in place where necessary to mitigate noise impacts, but the extent to which this is achieved varies across local planning authorities and would be complex to account for when administering a noise envelope.

2.4.19 So, the potential advantage of setting noise envelope limits in terms of the population within given noise contours is likely to be outweighed by the uncertainty it creates compared to setting a noise envelope in terms of noise contour areas.

Number of People Annoyed or Sleep Disturbed

2.4.20 As noted above, noise envelopes that restrict noise impacts can be set in terms of the extent of noise effects (e.g. Schiphol Airport has limits of populations highly annoyed and populations sleep disturbed). However, these rely on applying dose/response relationships for the effects, which can generate uncertainty, can vary between locations and over time, and can be subject to challenge.

2.4.21 In addition, existing housing may be fitted with sound insulation reducing sleep disturbance. Similarly, new housing may only be permitted with good sound insulation to reduce sleep disturbance. But the benefits of these would be very difficult to capture in this form of envelope.

2.4.22 Local Authority stakeholders were keen that the noise envelope limits health effects, but this form of noise limit was not proposed in any detail by stakeholders.

Person-Events Index (PEI)

2.4.23 The Person Events Index is a measure developed in Australia that uses the number of noise events above a given threshold, like the Number Above metrics (N65 and N60) used in this ES. It then sums the results at every population point (e.g. home) within the community. It is a measure of the total noise load or burden the airport places on the surrounding population. However, it takes no account of the extent to which noise events are above the threshold and, as with noise impact metrics, uses population size and so is affected by population growth with the inherent complications and uncertainty discussed above.

Average Individual Exposure (AIE)

2.4.24 Average Individual Exposure is simply the PEI divided by the total population, i.e. the average number of noise events per exposed person. Like PEI it takes a simplistic account for noise level and uses population and so is affected by population growth. PEI and AIE were described in the consultation presentation packs, but were not pursued by stakeholders.

Noise Contour Shape

2.4.25 In principle, a contour shape provides a contour that relates to community locations and so provides greater protection for communities. However, this would be more onerous than a contour area, placing greater restriction on an airport's operations. Fluctuations in weather or operational requirements could pose challenges. Schiphol airport is probably the most well-known example of a form of contour area limit. It has five runways providing some flexibility in implementation that would not be available at Gatwick. A contour area shape is also complex to administer, and not considered to be appropriate for a single runway airport such as Gatwick.

Noise Contour Area

2.4.26 CAP 1129 notes that:

'A clear and concise way of describing the noise exposure in the vicinity of an airport is to quote the area enclosed by the noise contour of a particular noise metric and level. Being a single numerical value, it is straightforward to set a limit on this value to restrict aircraft noise exposure in the vicinity of an airport.'

2.4.27 A noise contour area limit would incentivise the airport to use the quietest aircraft, using the quietest operating procedures, whilst allowing the airport to grow within a certain noise limit.

2.4.28 The choice of noise contour metric should reflect the impact. Summer season $L_{eq\ 16\ hour}$ day or $L_{eq\ 8\ hour}$ night contours are the most common contours used in the UK because their relationships to annoyance and sleep disturbance in this country are well understood. Community stakeholders, however, stated that L_{eq} noise levels did not describe well their experience of noise. Noise event metrics such as L_{max} are less effective, because, taking no allowance for numbers of noise events or their duration, they are not good indicators of health effects when used in isolation, and provide no control on the numbers of events. Other noise metrics that accumulate noise events during the day or night are available, such as N60 and N65, but their relationship with health effects is less well understood than the L_{eq} metrics. GAL has been producing N65 and N60 contours in its annual noise contour reports since 2019 and community and local authority stakeholders were in favour of these metrics in addition to L_{eq}.

2.4.29 CAP 1506 Survey of Noise Attitudes (SONA) 2014: Aircraft Noise and Annoyance, Second Edition, July 2021 provides the latest CAA analysis of the results of the major social survey on noise annoyance from aircraft noise in the UK carried out in 2014. The summary provides the following conclusions on the relative merits on $L_{eq\ 16\ hr}$, L_{den} and N65 relating to community noise annoyance.

Is $L_{Aeq,16h}$ still the most appropriate indicator to use to estimate the annoyance arising from aircraft noise?

8.7 The study compared reported mean annoyance scores against average summer-day noise exposure defined using four different noise indicators: $L_{Aeq,16h}$, L_{den}, N70 and N65.

8.8 Evidence was found that mean annoyance score correlated well with average summer day noise

exposure, $L_{Aeq,16h}$ (r2=0.87). There was no evidence found to suggest that any of the other indicators L_{den}, N70 or N65 (r2=0.66-0.73) correlated better with annoyance than $L_{Aeq,16h}$.

8.9 Having said this, the study recognises that residents can struggle to understand the concept of a time-averaged metric such as $L_{Aeq,16h}$ and L_{den} and the fact that it is measured and reported on a logarithmic scale where a change of 3 dB representatives a doubling or halving of noise energy.

8.10 There is, therefore merit in considering greater use of 'Number Above' metrics as supplemental indicators to help portray noise exposure, but recognising that evidence-based decisions should continue to use $L_{Aeq,16h}$. In this context N65 is preferred over N70 as noise events in many areas are already beginning to occur at levels less than 70 dB L_{ASmax} and are forecast to reduce over time.

2.4.30 Using the areas of $L_{eq\ 16\ hour}$ day or $L_{eq\ 8\ hour}$ night contours is the most reliable noise contour option, backed by government policy, CAA guidance and supporting research. In order to give certainty on future both day and night noise, $L_{eq\ 16\ hour}$ day and $L_{eq\ 8\ hour}$ night contours would be needed.

2.4.31 The decision on which contour noise levels to use (e.g. for daytime $L_{eq\ 16\ hour}$ 51, 54, 57, 60 dB etc) would affect both its performance as an indicator of noise impact and the extent to which it incentivises good operating procedures. In theory any contour value of $L_{eq\ 16\ hour}$ day or $L_{eq\ 8\ hour}$ night relates to other contour noise level in terms of its growth, but in practice small variations can be seen. A larger contour, encompassing communities affected further from the airport would better reflect community impact, and unlike a QC limit would allow the benefit of improved operating procedures, such as steeper departures and low noise arrivals procedures, to be measured and where necessary incentivised. Local Authority stakeholders suggested that the ANCON model may not be sufficiently accurate in the areas where the lower LOAEL noise levels occur further from the airport. ERCD presented an ANCON validation report to the Noise Topic Working Group indicating sufficient accuracy. To further address this concern a requirement has been added to the Noise Envelope for the model to be reviewed after the Northern Runway opens and every five years including the Noise and Track Keeping (NTK) data used to validate it and the processes adopted to seek continued improvements in the level of accuracy.

2.4.32 Local Authority stakeholders were keen that the noise envelope managed noise levels for those worst affected by noise, such as those within the SOAEL contours, and expressed concern that limiting noise around the much larger LOAEL contours may not account for this. The possibility that noise management measures aimed at reducing the LOAEL contour could have the unexpected consequence of increasing the SOAEL contour was discussed. GAL showed trends in the two contours followed one another. The noise control measures that could produce this unexpected consequence were discussed. Referring to the 4 pillars of the Balanced Approach: reducing noise at source would reduce noise levels in all locations, operational restrictions would also. Operational procedures could reduce noise more in the LOAEL areas, but given that the SOAEL contours lie within about 5km from the airport within which the opportunities to adjust aircraft operating procedures are greatly restricted by safety considerations, the unexpected consequence of increasing noise levels in the SOAEL area as a consequence of reducing noise in the LOAEL area is considered small. Finally, land use planning applies greater restrictions in the SOAEL area than the LOAEL, and in the event that the SOAEL contour increased above that expected all properties would be offered the inner zone Noise Insulation Scheme to mitigate impacts. Consequently, it was not considered necessary to set limits on the areas of the SOAEL contours in the Noise Envelope. Instead to address this concern the Noise Envelope requires the areas of the SOAEL contours to be modelled to check whether this unexpected consequence arises.

2.4.33 The most appropriate contour levels to limit in the Noise Envelope are therefore the day and night Lowest Observable Adverse Effect Level (LOAEL) prescribed by DfT of $L_{eq\ 16\ hour}$ day 51 dB and $L_{eq\ 8\ hour}$ night 45 dB.

2.4.34 To avoid fluctuations from year to year due to variations in runway use because of different weather, standard mode contours should be used based on long-term average day and night runway modal splits.

2.4.35 The limiting $L_{eq\ 16\ hour}$ day and $L_{eq\ 8\ hour}$ night contour areas should be based on the predicted ranges of contour areas foreseeable at the time, taking account of the operating and other noise mitigation measures that the airport is committed to.

2.5 Preferred Option

Development of the Noise Envelope

2.5.1 GAL has considered these options, the benefits and disbenefits of each for Gatwick Airport, and the many and varied views of stakeholders noted during consultation. GAL has also considered how the noise envelope would be administered, managed and enforced, and again taken account of the views of stakeholders noted during consultation, the noise metric and limits to be used, and the processes by which it will be monitored, reviewed and enforced including procedures to ensure timely approvals at the various stages. The resultant noise envelope is described in Appendix 14.9.7: The Noise Envelope. The following section summarises the noise metric options adopted.

Noise Metrics

2.5.2 CAP 1129 guidance notes in the summary and conclusions:

An envelope is likely to be defined by a combination of parameters.

2.5.3 CAP1129 gives the following guidance in Chapter 3 under the heading Combining Parameters:

For a noise envelope to be effective, it should be simple and easily understood by all stakeholders. Therefore, the introduction of separate criteria for different time periods and/or seasons must be on the condition that there is a clear and justifiable need for it.

2.5.4 Therefore, the number of metrics should be limited.

2.5.5 Stakeholders made clear they would like multiple metrics to limit noise from the airport. The need for multiple metrics acknowledged by CAP 1129 is to limit the various time varying aspects of noise and the impacts it may have on affected communities; in particular during the night when residents are more sensitive to noise than during the day, and during the summer as opposed to during other seasons. The Noise Envelope therefore uses two metrics, one for daytime noise and one for night-time noise.

2.5.6 The sections above discuss the advantages and disadvantages of various metrics in limiting the total effects on the local communities. The total effects on the communities around the airport can be considered as total population highly annoyed during the day and total population highly sleep disturbed at

night. CAP 1731 Aviation Strategy: Noise Forecast and Analyses, 2019 provides a review of suitable noise metrics for health impacts and noise limits around UK airports. In Section 7 it provides an analysis of the correlation between the following 13 noise metrics:

- *ATMs average summer day*
- *ATMs average summer night*
- *QC average summer day*
- *QC average summer night*
- *Area 54 dB $L_{eq\ 16\ hr}$*
- *Area 48dB $L_{eq\ 8\ hr}$*
- *Population exposed > 54 dB $L_{eq\ 16\ hr}$*
- *Population exposed > 48dB $L_{eq\ 8\ hr}$*
- *Population exposed to N60 >10 events*
- *Population exposed to N65 >10 events*
- *Population exposed to N70 >10 events*
- *No people highly sleep disturbed*
- *No. people highly annoyed*

2.5.7 For annoyance, the metrics that correlate closest to the number of people highly annoyed are population exposed > 54 dB $L_{eq\ 16\ hr}$ (correlation 0.94) and Area 54 dB $L_{eq\ 16\ hr}$ (correlation 0.70). The next closest correlating metric is average summer day QC with a much lower correlation of 0.58. The Noise Envelope adopts $L_{eq\ 16\ hr}$ for daytime noise, and the area of the 51 dB LOAEL, for the reasons summarised above.

2.5.8 For sleep disturbance, the metrics that correlate closest to the number of people highly sleep disturbed are population exposed > 58 dB $L_{eq\ 8\ hr}$ (correlation 0.62) and Area 48 dB $L_{eq\ 8\ hr}$ (correlation 0.49). The next best closest correlating metric is average summer night QC with a much lower correlation of 0.20. The Noise Envelope adopts $L_{eq\ 8\ hr}$ for night-time noise, and the area of the 45 dB LOAEL, for the reasons summarised above.

2.5.9 The noise envelope sets limits on $L_{eq\ 16\ hr}$ 51dB contour area and $L_{eq\ 8\ hr}$ 45 dB contour area, to address day and night, and summer and annual noise levels.

2.5.10 Other secondary noise metrics are to be used to provide more detail on the noise experienced, but not with limits.

2.5.11 CAP 1616 Airspace Design: Guidance on the Regulatory Process for Changing Airspace Design including Community Engagement Requirements, fourth edition (CAA, 2021) defines two categories of metrics for describing aircraft noise:

Primary Noise Metrics - $L_{eq,\ 16\ hour}$ day and $L_{eq,\ 8\ hour}$ night.

Secondary Noise Metrics - N65 day and N60 night.

2.5.12 CAP 1616 also defines Overflights as Secondary Non-Noise Metric, but since this metric does not quantity or relate directly to noise levels it is not proposed for the Noise Envelope.

2.5.13 The Noise Envelope adopts the same terminology.

2.5.14 Paragraph 55 of the NPPF and Planning Practice Guidance in relation to the planning conditions is also relevant because the noise envelope will be a planning condition created by the DCO. This requires planning conditions to be amongst other tests 'necessary'. Similarly, CAP 1229 notes additional metrics should only be used when justified. Given that the Project is not proposing new routes populations within $L_{eq\ 16\ hr}$ 51dB contours generally correlate with $L_{eq\ 16\ hr}$ 51dB contour areas. Similarly for night-time populations within $L_{eq\ 8\ hr}$ 45dB contours generally correlate with $L_{eq\ 8\ hr}$ 45dB contour areas. If limits were to be set on N65 and N60 contour areas, $L_{eq,\ 16\ hr}$ 63dB and $L_{eq,\ 8\ hr}$ 55dB contour areas, and populations within $L_{eq\ 16\ hr}$ 51dB and $L_{eq\ 8\ hr}$ 45dB contours, these would add substantial complexity to the noise envelope. This is not considered to be necessary because limits on the primary metrics $L_{eq\ 16\ hr}$ 51dB and $L_{eq\ 8\ hr}$ 45dB contour areas would serve to adequately and clearly limit the noise impacts of the airport. Therefore, limits are not considered necessary for the secondary metrics and instead secondary metrics will be monitored and reported along with the primary metric noise contours.

2.5.15 The metrics used to define the Noise Envelope are listed in Table 2.1. The limiting levels for the Primary noise metrics and how they and the Secondary metrics will be reported, is described in Appendix 14.9.7 the Noise Envelope.

Table 2.1: Noise Envelope Metrics

Metrics	Description
Primary Noise Metrics:	
$L_{eq,\ 16\ hour}$ day 51 dB contour area	The area enclosed by the 92 day summer season average mode noise contours produced by the CAA
$L_{eq,\ 8\ hour}$ night 45 dB contour area	The area enclosed by the 92 day summer season average mode noise contours produced by the CAA
$L_{eq,\ 16\ hour}$ day 51 dB contour population	The population enclosed by the 92 day summer season average mode noise contours produced by the CAA, both with reference to a fixed point in time such as the opening year of the Project, and annually thereafter noting population changing.
$L_{eq,\ 8\ hour}$ night 45 dB contour population	The population enclosed by the 92 day summer season average mode noise contours produced by the CAA, both with reference to a fixed point in time such as the opening year of the Project, and annually thereafter noting population changing.
$L_{eq,\ 16\ hour}$ day 63 dB contour area	The area enclosed by the 92 day summer season average mode noise contours produced by the CAA.
Annual Commercial Air Traffic Movements	Annual Commercial Air Traffic Movements, excluding non-commercial flights
Secondary Noise Metrics:	
Airport Fleet Average Aircraft Noise L_{max} dB	The average L_{max} noise level from all aircraft measured under the Departure Noise Limits monitoring regime over the summer season or a representative part of it.
N65 Day 20 contour area	The area enclosed by the 92 day summer season average mode noise contours produced by the CAA
N60 Night 10 contour area	The area enclosed by the 92 day summer season average mode noise contours produced by the CAA

Metrics	Description
$L_{eq,\ 8\ hour}$ night 55 dB contour area	The area enclosed by the 92 day summer season average mode noise contours produced by the CAA.

3 Regulation 598 Considerations

3.1 Introduction

3.1.1 Following the UK's exit from the EU, most EU Regulations relating to aviation have been adopted as UK law (so-called 'retained EU legislation'), subject to any minor amendments necessary to address the UK's sovereignty post-Brexit. This includes EU Regulation No 598/2014.[2]

3.1.2 Regulation 598 provides a process to be followed for the introduction of noise-related operating restrictions at major airports[3] in a consistent manner on an airport-by-airport basis, so as to help improve the noise climate and to limit or reduce the number of people significantly affected by potentially harmful effects of aircraft noise, in accordance with the International Civil Aviation Organisation's (ICAO) Balanced Approach.

3.1.3 As it is considered the proposed noise envelope may represent a noise operating restriction under Regulation 598, a review of the proposal in accordance with Regulation 598 and its Annexes has been undertaken. The paragraphs below explain how we have taken these requirements into account.

3.1.4 The stated objectives of the Regulations are:

- to facilitate the achievement of specific noise abatement objectives, including health aspects, at the level of individual airports, while respecting relevant legislation within the United Kingdom; and
- to enable the use of operating restrictions in accordance with the Balanced Approach so as to achieve the sustainable development of the airport and air traffic management network capacity from a gate-to-gate perspective.

3.1.5 The way in which GAL manages noise at the airport following the "Balanced Approach" is discussed in Section 3 of Appendix 14.9.2. Within the Balanced Approach 'Operating Restrictions' are to be used only after all other measures have first been considered, and where those other measures are not in themselves sufficient to attain the specific noise abatement objectives for the airport. Regulation 598 requires a Noise Objective to be set when considering operating restrictions in the context of the Balanced Approach.

3.1.6 GAL propose the following noise objective for the Project:

- The Project will:
  - Avoid significant adverse impacts on health and quality of life from noise;
  - Mitigate and minimise adverse impacts on health and quality of life from noise;
  - Where possible, contribute to improvements to health and quality of life; and
  - provide certainty to the communities around Gatwick that noise will not exceed contour limits and will reduce over time, consistent with the ICAO Balanced Approach.

3.1.7 The Regulations define Noise Related Actions and Operating Restrictions in Article 2 as follows.

'(5) 'noise-related action' means any measure that affects the noise climate around airports, for which the principles of the Balanced Approach apply, including other non-operational actions that can affect the number of people exposed to aircraft noise;

(6) 'operating restriction' means a noise-related action that limits access to or reduces the operational capacity of an airport, including operating restrictions aimed at the withdrawal from operations of marginally compliant aircraft at specific airports as well as operating restrictions of a partial nature, which for example apply for an identified period of time during the day or only for certain runways at the airport.'

3.1.8 Paragraph 15 in the preamble to the Regulations clarifies that the implementation of the regulations:

'....should not lead to delay in the implementation of operational measures which could immediately alleviate the noise impact without substantially affecting the operational capacity of an airport. Such measures should therefore not be considered to constitute new operating restrictions'.

3.1.9 The Regulations apply to noise related measures that where they limit access to or reduce the operational capacity of an airport, not to all noise related actions.

3.1.10 The DfT's Night Flight Restrictions include seasonal limits of ATMs and Quota Counts and thus limit airport capacity at night. They are therefore existing operating restrictions for the purpose of Regulation 598.

3.1.11 The wide range of other noise abatement measures currently adopted at Gatwick and described in Section 3 of Appendix 14.9.2 – including the proposals for revised and lowered departure noise limits - do not limit access to or the operational capacity of the airport in GAL's view. These are not considered to be operating restrictions, but rather noise related actions without implications on capacity.

3.1.12 The noise envelope proposed for the Project could have the effect of limiting access to increases in the operational capacity at the airport, until such time as the set limits can be achieved whilst allowing for further capacity to be released. As such, taking a precautionary approach the noise envelope would be an operating restriction for the purpose of Regulation 598.

3.2 Noise Assessment

3.2.1 Where an operating restriction is proposed, Regulation 598 requires consultation with relevant stakeholders who may be

[2] See the Aviation Noise (Amendment) (EU Exit) Regulations 2019, which also amended the Airports (Noise-related Operating Restrictions) (England and Wales) Regulations 2018

[3] A major airport is an airport with more than 50,000 civil aircraft movements per calendar year (a movement being a take-off or landing), on the basis of the average number of movements in the last 3 calendar years before the most recent noise assessment.

affected by it. The PEIR provided an assessment of the noise proposal at that time, for consultees to consider.

3.2.2 The requirements of a noise assessment where an operating restriction is proposed are provided at Article 6 and the two annexes of the Regulations. Annex 1 of the Regulations requires noise impacts to be described using L_{den} and L_{night} metrics at the least, but states that additional noise indicators which have an objective basis may be used. Annex 2 provides a methodology to assess the cost-effectiveness of proposed noise related operating restrictions.

3.2.3 It is proposed that the noise envelope should be based on Leq day and night metrics, however, for the purposes of the consultation under the Regulations L_{den} and L_{night} contours are also included to further describe impacts. Both L_{eq} and L_{den} average noise exposure over time: for L_{eq} this is a 92 day period in the summer; for L_{den} and L_{night} noise exposure is averaged over the calendar year.

3.2.4 The effects of the Project have been assessed by comparing the predicted noise levels with the Project against the current and future baseline noise levels in the absence of the Project. The assessment considers two future aircraft fleets referred to as the 'central case' fleet and 'slower transition case' fleet, reflecting a range rates of fleet transition expected in the future.

3.2.5 The rate of fleet transition in the central case reflects GAL's expectations of fleet improvement based on pre-Covid market trends, taking into account airlines' fleet procurement programmes and business models. The slower transition fleet supposes the rate of fleet transition is delayed by about five years. This accounts for uncertainty brought by Covid or other disruption within the period which could affect airline fleet procurement plans (and are outside of GAL's control).

3.2.6 The fleet transition programmes in the central case and slower transition case are summarised in Table 4.2.1 which gives the forecast percentage of Next Generation aircraft in each assessment year under the two fleet transition scenarios.

3.2.7 The central case fleet forecast anticipates that between 2019 and 2032 airline investment will increase the proportion of quieter next generation aircraft in the Gatwick fleet from 13% to 82%, and to 100% by 2038.

Table 3.1: Future Fleet Compositions

Year	Central Case Fleet % Next Generation Aircraft	Slower Transition Case Fleet % Next Generation Aircraft
2019	13%	13%
2029	59%	40%
2032	82%	50%
2038	100%	82%
2047	100%	100%

3.2.8 For the slower transition fleet, the effect of the 5 year delay is that by 2032 50% of the aircraft operating are future generation types, increasing to 82% by 2038.

3.2.9 The slower transition fleet therefore still builds in assumptions that the noisiest aircraft currently flying at Gatwick are phased out by the point the northern runway opens and that substantial investment in next generation aircraft will occur. For example, in 2019, around 2% of the Gatwick fleet did not meet the ICAO Chapter 4 noise standard, however, these aircraft produce the highest individual noise levels and make a disproportionate contribution to the contour area. Therefore, the expected removal by airlines of a proportion of these aircraft will deliver a significant improvement in the noise environment.

3.2.10 UK Government research[4] has shown that whether or not people think an airport is going to get noisier has a significant influence on how annoying they find it today. The research found that this expectation factor (referred to as a non-acoustic factor) alone changed the proportion of the population highly annoyed by 30-50%. Thus, there is strong evidence that providing the communities affected by noise with certainty over future noise levels, will reduce community annoyance.

3.2.11 Whilst the central case fleet is considered more likely to occur, the slower transition fleet could still occur, and therefore measures are proposed to ensure that effects do not exceed those assessed for this slower transition fleet so as to meet the Project noise abatement objective.

3.2.12 Gatwick has applied the balanced approach process to evaluate the available noise related actions.

3.2.13 Land use planning in the UK is focused on avoiding noise sensitive development being consented in areas of high noise unless mitigation can be provided to avoid significant effects. Land use planning is the responsibility of the local planning authorities around Gatwick and derives from Government planning policy. Planning policies adopted by local planning authorities may limit development within the noise envelope contours but that is not within Gatwick's control. It is not considered that the policies adopted by local planning authorities around the Airport are likely to restrict development and population increase over the wider area between the 63 the 51 dB $L_{Aeq,\ 16\ hr}$ contours. Thus, land use planning policy, in itself, is unlikely to meet the Project noise abatement objective. This is notwithstanding that Gatwick is proposing a tiered noise insulation scheme which will be amongst the most generous in the UK.

3.2.14 The ongoing noise abatement measures adopted by the airport are summarised in Section 14.8 of Chapter 14 and Section 3 of Appendix 14.9.2 and are included in the base case noise modelling for each of the 2019 base and future assessment years. Whilst this suite of noise related actions will reduce noise impacts in the future, depending on the rate of fleet transition, and other factors, they may not in themselves prevent noise impacts greater than that modelled in the "slower transition" case.

3.2.15 Thus, a noise envelope is proposed to provide certainty that noise levels in the future are not worse than those arising from the slower transition fleet.

3.2.16 A series of noise envelope options have been reviewed with stakeholders as discussed earlier in this appendix. Overall, a noise envelope based on defining the limits of potential exposure was considered to be the most appropriate option, best aligned with the Project's noise objective and in a cost-effective manner.

3.2.17 The noise envelope proposed is based on the 92 day summer season day and night time L_{eq} contour areas for the slower

[4] Survey of noise attitudes 2014: Aircraft CAP 1506

transition fleet and two points relating to air transport movement throughputs, first the maximum noise contour is likely to occur, and a second, a smaller noise contour when the development is fully built out and operating at 382,000 ATM's per year or 9 years after opening (whichever is the sooner). The noise envelope will limit noise exposure around the Airport to, at the least, the area of the slower fleet transition contours. 9 years after opening the noise envelope limits would be reviewed to ensure they remain relevant.

3.2.18 The envelope proposed will not have any adverse consequences for safety, or unintended operational or environmental impacts.

3.2.19 The envelope will provide an incentive to Gatwick to ensure in turn that its airline partners remain incentivised to continue investment so as to avoid more onerous interventions being required to be within the envelope. Without the envelope, the impact of the Project could be higher, and a greater level of intervention could be required to avoid greater effects. The envelope will therefore provide certainty to the public that effects will be limited and that noise levels would have to reduce for the airport to be able to handle the ATM throughput forecast when the development is fully built out.

3.2.20 Regulation 598 provides for consultation on any noise related action which could limit access to or reduce the operational capacity of an Airport. Annex 1 provides a summary of how the noise envelope proposal accords with the rules on the introduction of aircraft operating restrictions provided for by Regulation 598 and how noise assessment has been undertaken in accordance with Article 6.

3.2.21 It is for the Secretary of State for Transport as the competent authority to consider Gatwick's proposal for a noise envelope and other measures, and to conduct any consultation in accordance with the requirements of Regulation 598. Annex 1 provides the information to assist any such consultation to be undertaken.

4 References

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Regulation (EU) No 598/2014 of the European Parliament and of the Council of 16 April 2014 on the establishment of rules and procedures with regard to the introduction of noise-related operating restrictions at Union airports within a Balanced Approach and repealing Directive 2002/30/EC.

Planning Inspectorate Advice Note Fifteen: Drafting Development Consent Orders, July 2018 (version 2)

[Online] Available at: https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-15/

Annex 1: The Noise Envelope Proposal in the context of the Balanced Approach, and the application of the general rules on the introduction of operating restrictions (EU Regulation 598/2014).

EU Regulation 598/2014 establishes the rules and procedures on the introduction of noise-related operating restrictions at airports within a “balanced approach” to noise management, as promoted by the International Civil Aviation Organisation. Regulation 598 applies when operating restrictions are being considered at a major airport. A major airport is an airport with more than 50,000 civil aircraft movements per calendar year (a movement being a take-off or landing), on the basis of the average number of movements in the last 3 calendar years before the most recent noise assessment.

When an application for development consent at a major airport proposes the introduction of an operating restriction, the Secretary of State for Transport in his role as the competent authority is required to ensure that noise is assessed and consulted on in accordance with Regulation 598.

As the competent authority, the Secretary of State for Transport shall ensure that all requirements identified under regulation 598 have been satisfied. This includes:

1. each type of measure to address noise under the balanced approach is assessed in line with the requirements set out in Annex I of the regulation.
2. technical co-operation is ensured to examine best noise mitigation measures.
3. the cost effectiveness of the different measures to address noise is assessed in accordance with Annex II of the regulation.
4. local residents or representatives are consulted and local authorities providing relevant technical information.
5. the consultation process is organised in an open and transparent manner with a minimum of 3 months for consultees to respond.

Before any new operating restrictions are introduced, the competent authority shall ensure that:

1. the member states, the EU Commission and the relevant interested parties are given 6 months’ notice. This notice must end at least 2 months prior to determining the boundaries of slot co-ordination for the airport’s scheduling period.
2. a written report is provided along with the above notification outlining the reasons for the introduction of operating restrictions, the noise abatement objective established, measures considered in meeting this objective and an evaluation of its cost-effectiveness.
3. if the EU Commission has reviewed the proposed operating restriction and notified the competent authority that the introduction of the operating restriction does not follow the process set out in regulation 598, the competent authority must examine the notification and inform the EU Commission of its intentions before introducing the proposed operating restrictions.

Set out below is summary of the relevant requirements of Articles 5 and 6 of Regulation 598 and how have been satisfied, to assist with facilitating the notification and consultation relating to the introduction of operating restrictions at major airports, in accordance with the rules provided for at Article 8 of Regulation 598.

Relevant provisions within Article 5	**Where these are provided for within the DCO application**
Article 5 (2) The competent authority shall ensure that the Balanced Approach is adopted in respect of aircraft noise management at those airports where a noise problem has been identified. To that end, they shall ensure that:	
a) the noise abatement objective for that airport, taking into account, as appropriate, Article 8 of, and Annex V to, Directive 2002/49/EC, is defined;	The noise abatement objective was defined and consulted upon within Gatwick’s PEIR in Autumn 2021 and is repeated in paragraph 3.1.6 of this Appendix. The noise abatement objective for the Project is as follows: *The Project will:* - *Avoid significant adverse impacts on health and quality of life from noise;* - *Mitigate and minimise adverse impacts on health and quality of life from noise;*

Relevant provisions within Article 5	Where these are provided for within the DCO application
	- *Where possible, contribute to improvements to health and quality of life; and* - *provide certainty to the communities around Gatwick that noise will not exceed contour limits and will reduce over time, consistent with the ICAO Balanced Approach.*
b) measures available to reduce the noise impact are identified;	The range of noise abatement measures which are currently used to reduce air noise impacts are described in Section 3 of ES Appendix 14.9.2: Air Noise Modelling. A limitation is proposed in relation to the use of the Northern Runway so that it will not be routinely used as part of a dual runway operation between 2300 and 0600 hours (see DCO schedule 2), limiting the potential for increased aircraft noise during this period. The proposed noise envelope to be secured in connection with the operation of Project is described in Appendix 14.9.7: The Noise Envelope.
(c) the likely cost-effectiveness of the noise mitigation measures is thoroughly evaluated;	The cost-effectiveness assessment requirements of Regulation 598 (see Annex II) focuses on assessing how the noise abatement objective may be achieved in the most cost-effective way, requiring a comparison of only the costs. The cost effectiveness of the noise proposal has been considered qualitatively based on 3 options: 1) Do nothing; 2) Implement the noise envelope measures proposed; and 3) Implement a tighter envelope and measures than currently proposed; ***Option (1) – Do nothing*** Whereas GAL would still provide for a noise insulation scheme and operational measures which assist with the first two elements of the objective, not providing for a noise envelope would not provide certainty to communities of the level of noise that may be experienced over time. The cost of not implementing a noise envelope could be that the Project was deemed by the Secretary of State to not meet the policy requirement at §5.60 in the Airports NPS. This expects a noise envelope to be provided, and hence there is a risk that the development might not be approved. In those circumstances, airlines operating at Gatwick would be denied the opportunity to grow their businesses and the public would be prevented from accessing the capacity. Gatwick would not play its part in meeting the national need for aviation capacity. ***Option (2) – Implement the noise envelope and restriction on northern runway operating hours proposed in Appendix 14.9.7*** The noise envelope provides for forecast traffic growth based on a forecast of airline fleet transition, which anticipates that nearly four times as many next generation aircraft will be operating in 2032 than were in 2019 (50% of the fleet in 2032 compared with 13% in 2019), with around 82% of aircraft expected to be next generation types by 2038. Actual airline investment may be higher, and if the industry continues to invest, the envelope will not form an operating restriction limiting the release of capacity but will provide certainty to the public that effects will be limited and that the envelope will be periodically reviewed to confirm the applicable contour limit. As such the envelope should allow the airport to invest with confidence in the Project and to grow, and for the wider economic and societal benefits from this growth to accrue. ***Option (3) Implement a tighter envelope and measures than currently proposed.*** Airlines are unlikely to accelerate their fleet transition simply to access new slots at Gatwick, and it is reasonable and necessary for Gatwick to build in assumptions relevant to the rate of fleet transition when determining how the limits are to be set. In the event that a more onerous contour area was imposed, its main effect could be to slow the expected uptake of capacity, as Gatwick would be forced to schedule conservatively to remain within the cap and provide operational certainty. Growth might be displaced to other airports in the short to medium term, so the noise impact of the additional flights would be moved to elsewhere – or growth would not materialise with adverse consequences for the economy and conflict with national policy. Gatwick's confidence to invest would be reduced so as to delay the Project or require restrictions on the release of slots. Variants of Option 3 could also include consideration of envelopes based on metrics other than the Leq 16 hour day or Leq 8 hour night contours (see the discussion in this Appendix at section 2.1). The proposed envelope metrics employing the areas of Leq 16 hour day or Leq 8 hour night contours provide the most reliable noise contour options to

Relevant provisions within Article 5	Where these are provided for within the DCO application
	understand effects to health and quality of life, backed by government policy, CAA guidance and supporting research. They also allow for the flexible use of available capacity and will provide evidence of the success of GAL in reducing noise by working with partner airlines to develop operational procedures. Basing the limits of the envelope on other metrics could result in restrictions on capacity and additional administration costs which would otherwise not occur and are not considered to be necessary to appropriately limit air noise related impacts. Therefore, it follows that any variant of Option 3 is likely to impose higher costs on Airlines and GAL without providing any notable benefit. Notwithstanding that the above assessment is a qualitative review of the relative performance of available options, an Economic Impact Assessment Report is provided in Appendix 7.2 of the ES which provides information relating to the net benefit associated with the delivery of the Project (i.e. effectively the cost estimate of the difference between Options 1 and 2). The Project is estimated to deliver £13.1bn to passengers, airlines and airports, with total benefits to the national economy of £21.6bn. This estimate includes noise costs, which have been valued at £9.2m. Although it is not possible to quantify the costs and benefits associated with Option 3, any form of tighter envelope, which delays growth at Gatwick or increases costs to Gatwick or partner airlines, will deliver lower economic benefits to passengers and providers of aviation services and to the national economy. In summary the cost effectiveness analysis has considered the proposed measures over the life of the Project. The measures will not have any effect on the safety of aviation operations (see below), including third-party risks or on the European aviation network. They will only present a capacity restriction on GAL if airlines do not continue to invest in technologies which result in aircraft with reduced noise emissions, such that the limits then prevent further releases of capacity.
(d) the measures, taking into account public interest in the field of air transport as regards the development prospects of their airports, are selected without detriment to safety;	Any noise related action which had unintended operational consequences such that it affected flight safety, increased third party risk, or in some way affected the health and safety of local residents in the vicinity of the airport would not be considered acceptable. The envelope proposed has no such operational consequences. During the stakeholder consultation facilitated by GAL in the Noise Envelope Group, the view expressed by Airlines was that whatever form of envelope was decided upon, crews should be able to deviate outside of it in the interest of safety whenever required without bringing the airline out of compliance. Moreover, it was identified that there should not be any requirement for abnormal manoeuvring/procedures, e.g., steep descents as a result of the noise envelope (see Appendix 14.9.8 Noise Envelope Group Output report at page 32). The choice of an envelope based on the logarithmic averaging metric over both day and night, and for the 51dB contour as opposed to the inner contours associated with critical arrival and departure phases of flight, should not have any safety implications. The restriction on dual runway operations for departures in the period 2300-0600 will also not have any implications on safety. As such, the measures have been selected without detriment to safety.
(e) the stakeholders are consulted in a transparent way on the intended actions;	GAL's Section 42 consultation in Autumn 2021 included the parties identified under Article 6(d) of Regulation 598. Specific aviation stakeholders written to included BAR, Airlines UK, ACL, NATS, Eurocontrol, the main airports in the South East of England, and over 60 airlines using Gatwick. The letter clearly advised that the Project included proposals which may constitute new noise 'operating restrictions' as defined under Regulation 598/2014 and that the consultation documents included information on these and formed part of the engagement being undertaken by GAL to reflect the consultation requirements of Regulation 598/2014. Consultation will also be ongoing as part of the DCO process, and any further consultation undertaken by the Secretary of State to satisfy his required processes under Regulation 598. As described in Section 2 GAL has developed the noise envelope taking account of the local situation at Gatwick. Views have been sought via the PEIR consultation. See **ES Appendix 14.3.2: Summary of PEIR and Updated PEIR Responses – Noise and Vibration**. The view of local community noise groups, expressed through the Noise Management Board, have been considered in developing this proposal. See **ES Appendix 14.9.8: The Noise Envelope Group Output Report** and **ES Appendix 14.9.9: Report on Engagement on the Noise Envelope** The Secretary of State for Transport is the competent authority for consulting on and confirming noise related operating restrictions in accordance with Regulation 598 and hence responsible for ensuring that the balanced approach has been followed prior to the introduction of any operating restrictions. The SoS will also ultimately be responsible for determining the application for development consent.
(f) the measures are adopted and sufficient notification is provided for;	The DCO will include Requirements which will implement the measures. The noise envelope proposals have been consulted on previously and will be consulted on as part of the DCO examination process. As the DCO when made would secure the noise envelope and the controls in relation to dual runway operations, notification should be issued, and consultation should be undertaken in parallel with the DCO examination to ensure at the point at which any DCO is made securing the operating restrictions these have been consulted on and lawfully adopted in accordance with Regulation 598.
(g) the measures are implemented; and	The DCO will confirm the measures to be implemented and Gatwick may be subject to enforcement action in accordance with the provision of the Planning Act 2008 in the event of non-compliance with the terms of the DCO.

Relevant provisions within Article 5	Where these are provided for within the DCO application
(h) dispute resolution is provided for.	The administrative processes in connection with the Noise Envelope, including how this is monitored and reviewed, are provided for in the DCO. Those processes are subject to dispute resolution procedures. Decision taken in accordance with the DCO may also be subject to legal challenge, which is a method of resolving legal disputes open to third parties. Details of the approvals process in connection with the monitoring and reviews of the noise envelope is also detailed within **ES Appendix 14.9.7: The Noise Envelope**.
Article 5(3). The competent authority shall ensure that, when noise-related action is taken, the following combination of available measures is considered, with a view to determining the most cost-effective measure or combination of measures:	
(a) the foreseeable effect of a reduction of aircraft noise at source;	The effect of a reduction in noise at source is considered within ES Chapter 14 Sections 6 Baseline and Section 9 Assessment, in associated Figures, and in **ES Appendix 14.9.2 Air Noise Modelling**. The Central Case fleet forecast anticipates that between 2019 and 2032 airline investment will increase the proportion of quieter next generation aircraft in the Gatwick fleet from 13% to 82% in 2032, and to 100% by 2038. There is some evidence post the pandemic that the Central Case forecast may be optimistic, as there has effectively been a 2-year production slow down during Covid, coupled with supply chain issues impacting the current rate of aircraft deliveries. For the slower transition fleet some 50% of the aircraft operating are predicted to be future generation types in 2032 increasing to 82% by 2038. The envelope proposed uses the upper range of the foreseeable effects represented by the slower transition fleet. Research has shown that if people think it will become noisier in future they are more likely to be annoyed (see this Appendix at paragraph 3.2.10). The fourth part of the noise objective provides reassurance that effects will not be worse than forecast and that noise will reduce over time. The noise envelope provides the guarantee that the airport will be less noisy in 2038 than it is in 2019, whilst also allowing for the growth of the airport and the significant socio-economic benefits that such growth would provide. The impact of the Project with no fleet transition from now has not been modelled but can be inferred from the increase in ATMs expected from the Project, as an increase over the 2019 daytime contours areas of approximately 15%. Night-time increases are already controlled by the Night Restrictions and would be smaller. This increase on the 2019 daytime Leq 16 hr 51 dB contour area would, assuming a uniform population density, increase the population above the LOAEL similarly from 24,050 in 2019 to approximately 27,700 in 2032. GAL is confident, however, that some fleet transition will be achieved and proposes to commit to restrictive contours on that basis.
(b) land-use planning and management;	Land use planning policy, either alone or in-combination with other measures, will not meet the Project noise abatement objective of providing for certainty that the airport will become quieter over time. Land-use planning and management measures are described in this Appendix at paragraph 3.2.13.
(c) noise abatement operational procedures;	Noise abatement operational procedures, either alone or in combination with other measures, will not meet the Project noise abatement objective of providing for certainty that the airport will become quieter over time. Operational measures are referenced in this Appendix at paragraph 3.2.14 and also Section 14.8 of the ES.
(d) not applying operating restrictions as a first resort, but only after consideration of the other measures of the Balanced Approach.	The application of the ICAO balanced approach is described in ES Chapter 14 at Section 8 (see from paragraph 14.8.5). The analysis undertaken in this Appendix and in Appendix 14.9.7 Noise Envelope explains that the noise envelope has only been proposed following consideration of the other measures of the balanced approach. The noise envelope will meet the Project noise objective of providing certainty that noise levels in the future are not worse than those arising from the slower transition fleet and that noise will reduce over time. The other measures within the balanced approach would not be sufficient by themselves or in combination to achieve the noise objective.
The available measures may if necessary, include the withdrawal of marginally compliant aircraft. Airport managing bodies may offer economic incentives to encourage aircraft operators to use less noisy aircraft during the transitional period referred to in point (4) of Article 2. Those economic incentives shall comply with the applicable rules on State aid.	The noise envelope does not mandate the phase out of marginally compliant aircraft as defined by the Regulation.
4. The measures may, within the Balanced Approach, be differentiated according to aircraft type, aircraft noise performance, use of airport and air navigation facilities, flight path and/or the timeframe covered.	The noise envelope proposed does not differentiate according to aircraft type, aircraft noise performance, use of airport and air navigation facilities or flight path.
5. Without prejudice to paragraph 4, operating restrictions which take the form of the withdrawal of marginally compliant aircraft from	The noise envelope does not mandate the phase out of marginally compliant aircraft as defined by the Regulation.

Relevant provisions within Article 5	Where these are provided for within the DCO application
airport operations shall not affect civil subsonic aircraft that comply, through either original certification or re-certification, with the noise standard laid down in Volume 1, Part II, Chapter 4 of Annex 16 to the Chicago Convention.	
6. Measures or a combination of measures taken in accordance with this Regulation for a given airport shall not be more restrictive than is necessary in order to achieve the environmental noise abatement objectives set for that airport. Operating restrictions shall be non-discriminatory, in particular on grounds of nationality or identity, and shall not be arbitrary.	As set out in section 6 of Appendix 14.9.7, in order to control future noise levels from the Project, Gatwick is proposing a noise envelope setting the limits of the maximum areas of day and night noise contours in the future. Gatwick considers this noise envelope may constitute a noise related operating restriction for the purposes of Regulation 598. If the airline industry continues to invest as it is expected to, the envelope is no more restrictive than required to meet the Project noise abatement objective. This notwithstanding, the envelope still requires a very substantial amount of investment by airlines in the coming decade, and will incentivise Gatwick to do what it can to reduce noise and hence allow the full capacity and the socio-economic benefits of the NRP to be fully realised at the earliest opportunity. The Operating restrictions proposed are non-discriminatory, for example on grounds of nationality or identity, and are not arbitrary, having taken account of the ICAO Balanced Approach and the Project noise objective.

Relevant provisions within Article 6	Where these are provided for within the DCO application
2. If the assessment indicates that new operating restriction measures may be required to address a noise problem at an airport, the competent authorities shall ensure that:	GAL is progressing its DCO application having regard the scoping opinion of the Planning Inspectorate as related in ES Chapter 14, Table 14.3.1 and reproduced below: *The Inspectorate notes that there is no reference to a defined 'noise envelope' as referred to in paragraph 5.60 of the Airports NPS, and the Applicant should make efforts to agree the need for such provisions with relevant consultation bodies as a mechanism to manage noise effects.* GAL consulted on the noise envelope in its PEIR proposal, and in the Noise Envelope Group. Consultees were strongly in support of a noise envelope being required (see **ES Appendix 14.9.7 The Air Noise Envelope,** Section 4, **ES Appendix 14.9.8 Noise Envelope Output Report** and **ES Appendix 14.9.9 Report of Engagement on the Noise Envelope**.
(a) the method, indicators and information in Annex I are applied in such a way as to take due account of the contribution of each type of measure under the Balanced Approach, before operating restrictions are introduced;	The ES provides a detailed consideration of the baseline, future baseline, and assessment cases. A description of Gatwick Airport, including information about its size, location, surroundings and air traffic using it, is given in **ES Chapter 1 Introduction**, and **ES Chapter 4 Existing Site**. Gatwick's status as a designated Airport, and the measures that are employed to manage noise at Gatwick Airport, are described in ES Chapter 14 Noise and vibration in Section 14.8 and in **ES Appendix 14.9.2** at Section 3. The Project has set a specific noise objective as described in this Appendix. ES Chapter 14 Noise and Vibration, Appendix 14.9.2 Air Noise Modelling and the air noise figures, provide a comprehensive assessment of the noise environment with and without the Project for the assessment years of 2019, 2032, 2038 and 2047 using the appropriate indicators, and identifies population numbers. The approach taken to considering each of the type of measures detailed within the balanced approach is summarised above.
(b) at the appropriate level, technical cooperation is established between the airport operators, aircraft operators and air navigation service providers to examine measures to mitigate noise. The competent authorities shall also ensure that local residents, or their representatives, and relevant local authorities are consulted, and that technical information	GAL coordinates activities between the airport, the Air Navigation Service Providers, airlines, communities, Local Authorities and the DfT in a number of fora. These include the Noise & Track Monitoring Advisory Group and the Noise Management Board which monitor current performance and progress technical initiatives to improve operational procedures. For the Project, a specific Noise Envelope Group was established to bring parties together and understand options for the introduction of a noise envelope (see **ES Appendix 14.9.8 Noise Envelope Output Report** and **Appendix 14.9.9 Report of Engagement on the Noise Envelope**. Information contained within the application documents relevant to the noise related operating restrictions will be consulted upon as part of the DCO examination, and as necessary the Secretary of State for Transport in his role as competent authority will also conduct consultation on the proposals in accordance with Regulation 598.

Relevant provisions within Article 6	Where these are provided for within the DCO application
on noise mitigation measures is provided to them;	
(c) the cost-effectiveness of any new operating restriction is assessed, in accordance with Annex II. Minor technical amendments to measures without substantive implications on capacity or operations shall not be considered new operating restrictions;	The cost effectiveness of the noise envelope proposal has been reviewed in accordance with Annex II as described above.
(d) the process of consultation with interested parties, which may take the form of a mediation process, is organised in a timely and substantive manner, ensuring openness and transparency as regards data and computation methodologies. Interested parties shall have at least three months prior to the adoption of the new operating restrictions to submit comments. The interested parties shall include at least: (i) local residents living in the vicinity of the airport and affected by air traffic noise, or their representatives, and the relevant local authorities; (ii) representatives of local businesses based in the vicinity of the airport, whose activities are affected by air traffic and the operation of the airport; (iii) relevant airport operators; (iv) representatives of those aircraft operators which may be affected by noise-related actions; (v) the relevant air navigation service providers; (vi) the Network Manager, as defined in Commission Regulation (EU) No 677/2011 (2); (vii) where applicable, the designated slots coordinator.	Gatwick's Section 42 consultation in Autumn 2021 included the parties identified under Article 6(d) of Regulation 598. Specific aviation stakeholders written to included BAR, Airlines UK, ACL, NATS, Eurocontrol, the main airports in the Southeast of England, and over 60 airlines using Gatwick. The letter informing of the consultation clearly advised that the Project included proposals which may constitute new noise 'operating restrictions' as defined under Regulation 598/2014 and that the consultation documents included information on these and formed part of the engagement being undertaken by GAL to reflect the consultation requirements of Regulation 598/2014. Consultation will also be ongoing as part of the DCO examination process, and any further consultation undertaken by the Secretary of State to satisfy his required processes under Regulation 598. As described in Section 2 GAL has developed the noise envelope taking account of the local situation at Gatwick. Views have been sought via the PEIR consultation. See **ES Appendix 14.3.2: Summary of PEIR and Updated PEIR Responses – Noise and Vibration.** The view of local community noise groups, expressed through the Noise Management Board, have been considered in developing this proposal. See **ES Appendix 14.9.8: The Noise Envelope Group Output Report** and **ES Appendix 14.9.9: Report on Engagement on the Noise Envelope** Gatwick has had regard to comments from ACL, Airlines, Local Authorities and the Community regarding the operation and administration of the noise envelope.
3. The competent authorities shall follow up and monitor the implementation of the operating restrictions and take action as appropriate. They shall ensure that relevant information is made available free of charge and that it is readily and promptly accessible to local residents living in the vicinity of the airports and to the relevant local authorities.	**ES Appendix 14.9.7 Noise Envelope** provides a process for Gatwick to submit an Annual Monitoring and Forecasting Report (AMFR) to the CAA. The AMFR will be placed online and will be available free of charge to all stakeholders once approved.
4. The relevant information (referred to above) may include: (a) while respecting national law, information on alleged infringements due to changes in flight procedures, in terms of their impact and the reasons why such changes were made; (b) the general criteria applied when distributing and managing traffic in each	The Annual Monitoring and Forecasting Report for the noise envelope will contain all necessary information relevant to Gatwick's compliance with the noise envelope following the first operation of the Project.

Relevant provisions within Article 6	Where these are provided for within the DCO application
airport, to the extent that those criteria may have an environmental or noise impact; and (c) data collected by noise measuring systems, if available.	