Luton Airport Public Inquiry

Proof of Evidence

for LADACAN

Seth Roberts, Hayes McKenzie Partnership Ltd

3617_N01_EXT4, 29 August 2022

Client:

LADACAN

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LADACAN

Contents

1. INTRODUCTION

1.1 A section 73 application (under the Town and Country Planning Act 1990) to vary planning conditions has been submitted by Luton Airport (**LPA ref: 21/00031/VARCON**). The Application has been called in by the Secretary of State and the Planning Inspectorate has scheduled a Public Inquiry for later this year (**PINS ref: APP/B0230/V/22/3296455**).

1.2 LADACAN has commissioned Hayes McKenzie to review aircraft noise impacts resulting from the proposed variations to existing planning conditions at Luton Airport (LTN), as assessed by the applicant's acoustic consultants and presented in the Environmental Statement ("ES").

1.3 LADACAN has asked Hayes McKenzie to comment on the following aspects of the ES being considered by the Public Inquiry:

1.3.1 The "without development" case presented in the ES
1.3.2 The forecast 92-day summer ATMs presented in the ES
1.3.3 The noise modelling presented in the ES with respect to Conditions 8 and 10
1.3.4 The forecast numbers of ATMs and the fleet mix presented in the ES
1.3.5 The modelling of the noise impacts of Luton Airport
1.3.6 The contour bands used for LOAEL and SOAEL
1.3.7 The mitigation measures relative to the planning conditions

1.4 This report has been prepared in accordance with Annex O of the Planning Inspectorate Procedural Guide[1]. Seth Roberts is the author of this report and no other staff members have been involved in the preparation of the material contained in this report.

Author's Statement

1.5 I, Seth Roberts (the author of this report), hold a Bachelor's degree in Acoustical Engineering (BEng) from the Institute of Sound and Vibration Research (ISVR) at Southampton University. I am a member of the Institute of Acoustics (IOA) and have over 12 years of experience working as a consultant in environmental and building acoustics.

1.6 I declare that, with regards to the content of this export report (proof of evidence):

"I believe that the facts stated in this report are true and the opinions expressed are correct. I confirm that I have made clear which facts and matters referred to in this report are within my own

1 https://www.gov.uk/government/publications/planning-appeals-procedural-guide/procedural-guide-planning-appeals-england#annexe-o-what-is-expert-evidence

knowledge and which are not. The opinions I have expressed represent my true and complete professional opinions on the matters to which they refer."

1.7 I confirm that the basis of remuneration, for the professional fees incurred (through the Service that Hayes McKenzie is providing), is not related to the outcome of the proceedings.

1.8 I confirm that as a full professional member of the IOA, I follow the latest (2016) version of their professional code of conduct which is available to view on the IOA Website. In preparing this report I have given due regard to this code of conduct as necessary.

1.9 In reaching the conclusions of this report I gave regard to the following documents and sources of information:

- CAA document CAP 2091 CAA Policy on Minimum Standards for Noise Modelling (January 2021)
- Environmental Noise (England) Regulations 2006
- CAA document DORA Report 9023 *The use of L_{eq} as an Aircraft Noise Index* (September 1990)
- Planning decision notice (Luton Borough Council planning ref. 12/01400/FUL)
- Section 73 Planning decision notice (Luton Borough Council planning ref. 15-00950-VARCON)
- Planning Document: Luton Airport Proposed Expansion Environmental Statement (ES), final issue dated November 2012
- Documents in the Core Document Library for the Inquiry
- The Town and Country Planning (Environmental Impact Assessment) Regulations 2017
- ECAC document 29 4th Edition 'Report on Standard Method of Computing Noise Contours around Civil Airports' volume 1 (7 December 2016)

2. INTRODUCTION TO AIRPORT NOISE ASSESSMENT

2.1 Aircraft noise in the UK is typically quantified as an average over a 92-day summer period which is considered to be representative of a period of the year when the greatest noise impact is likely to occur. This summer period is defined in the CAA document CAP2091 as follows:

'Summer is often used, since, in the UK, airports are likely to be busier in the summer season than in the winter season, and because residents are more likely to be outside or with windows

open in the summer than in the winter, and so will be more affected by any aviation noise. Summer is defined here as the 92-day period between 16 June and 15 September inclusive'

2.2 Airports designated for noise purposes by the Secretary of State (under the Civil Aviation Act 1982) are required to publish a range of noise maps, typically referred to as 'noise contours', which represent lines of equal noise level calculated for both an average day and night period over the 92-day summer period. It should be noted that LTN is not a designated airport.

2.3 The Environmental Noise (England) Regulations 2006 were brought into effect to implement the European Commission's Environmental Noise Directive (Directive 2002/49/EC). These regulations require strategic noise mapping for non-designated airports (such as LTN) and along with a range of annual average noise metrics, the regulations also require 16-hour daytime (07:00 – 23:00) equivalent continuous sound level ($L_{Aeq,\ 16\text{-}hour}$) contours to be produced.

2.4 The equivalent continuous sound level, or L_{eq}, is a way of averaging a varying sound level over a given time period. It represents the equivalent constant level that would result in the same total sound energy as summed over the given time period. This average sound level metric has been in use as a metric for quantifying aircraft noise in the UK since 1990 when the CAA published the results of a study into its use (DORA Report 9023 *The use of L_{eq} as an Aircraft Noise Index*).

2.5 The A-weighting is a correction applied to the frequency spectrum of a measured sound level, which is intended to account for the relative loudness perceived by the human ear. This correction is very widely used and when applied to a measured (or predicted) equivalent continuous sound level, it is often denoted by including the letter 'A' in the suffix describing the metric (i.e., L_{Aeq}). Therefore, in the context of aircraft noise, $L_{Aeq\ 16\text{-}hour}$ represents the A-weighted equivalent continuous sound level (L_{eq}) as measured or predicted over a 16-hour daytime period.

2.6 The L_{eq} metric is inherently an average value and in the context of aircraft noise, it does not represent the highest or maximum noise level as an aircraft passes overhead. There are various metrics for assessing maximum noise level but current aviation noise guidance supports the use of L_{Amax} as a secondary metric to the primary L_{eq} metric discussed above.

2.7 The L_{Amax} is the maximum RMS (root mean squared) sound level over a given time period. The RMS value is typically calculated with either a fast or slow time weighting (100 ms or 1 s respectively). Generally speaking, the fast time weighting will tend to give a slightly higher level than the slow time weighting but for noise sources without any particularly impulsive characteristics (sharp staccato noise, e.g., hammer blow) such as aircraft noise, there is often very little difference and no distinction is made between fast or slow time weighting.

2.8 In relation to aircraft noise, the L_{Amax} can be used to calculate 'Number Above' metrics such as the NA65 (more commonly referred to as N65) which represents the number of aircraft overflights which exceed 65 dB L_{Amax} at a given measurement or assessment location.

2.9 LTN has a single runway but depending on wind direction, aircraft take off and land to the east or to the west and, for the purposes of operations, the different directions are referred to as different runways. In relation to aircraft taking off and landing in a direction which is generally west to east, the airport operations are referred to as aircraft using Runway 08 (RW08). In relation to aircraft taking off and landing in a direction which is generally east to west, the airport operations are referred to as aircraft using Runway 26 (RW26). Note that due to magnetic drift the runways were recently redesignated 07 and 25 but this does not affect the general point.

3. MATERIAL FACTS RELEVANT TO THE NOISE ASSESSMENT

History of Planning Conditions in Question

3.1 Some of the noise restrictions contained in planning conditions attached to the decision notice consenting the 2012 planning application (LPA ref. 12/01400/FUL) were based on local policies outlined in the Luton Local Plan 2001 – 2011. Specifically in relation to condition 12 attached to the consent (which is based on requirements of policy LLA1), at paragraph 1.38 in Technical Appendix H of the 2012 ES, it states:

'Policy LLA1, as drafted, does not clearly delineate the 1999 descriptor that is either predicted 1999 levels or actual 1999 levels. This however was referred to in the previous Luton Local Plan 2001-2011, specifically in paragraph 9.73. This advised that at the Local Plan Inquiry in 2004, the Inspector recommended a policy was adopted that would enable expansion, subject to noise impact that is below 1999 levels. In this context, the Inspector made reference to noise controls within the 1998 planning consent for the terminal building extension that related to predicted contours produced in the associated (1997) Environmental Statement. The regime under which the airport currently operates refers to noise contours for 1999 from this 1997 Environmental Statement. Aircraft noise had previously been monitored annually against 1984 levels. The 2001-2011 Local Plan stated that applications for further development will be assessed against this 1999 benchmark.'

3.2 Clarity over the reference to '1999 levels' was sought by LADACAN and in a letter from the LPA to LADACAN's lawyer, Richard Buxton prior to granting consent (CD13.30), the LPA confirmed that the intention was to use noise contours based on actual not predicted air-traffic flows from 1999:

'proposed condition 12 which is to control aircraft noise is based on the actual not the predicted 1999 contours, and therefore imposes a stricter control than if based on the predicted 1999 contours'

3.3 This clarification is in itself somewhat confusing since airport noise contours cannot actually be measured and are always predicted. However, it is understood that what is meant by this is that the 57 dB $L_{Aeq\ 16\ hr}$ contour referred to in condition 12 (attached to the 2014 consent) is based on actual recorded aircraft traffic movements (ATMs) rather than the forecast ATMs that would have necessarily been used for contours presented in the 1997 ES.

3.4 In June 2015 a section 73 application was submitted to vary condition 11(i) of the original 2012 planning application that was granted consent 1 year earlier in June 2014. This application was consented and a new set of conditions attached to the decision notice saw conditions 10 and 12 being renumbered to become conditions 8 and 10.

3.5 The current condition 8 is specified as follows:

'At no time shall the commercial passenger throughput of the airport exceed 18 million passengers in any twelve month period. From the date of this permission the applicant shall every quarter report in writing to the Local Planning Authority the moving annual total numbers of passengers through the airport (arrivals plus departures). The report shall be made no later than 28 days after the end of each quarter to which the data relates.'

3.6 The current condition 10 is specified as follows:

'The development shall be operated in accordance with the Noise report approved on 2 March 2015 (ref: 14/01519/DOC), including providing details of forecast aircraft movements and consequential noise contours as set out in that report.

The area enclosed by the 57dB(A) L_{eq16hr} (0700-2300) contour shall not exceed 19.4 sq km for daytime noise, and the area enclosed by the 48dB(A) L_{eq8hr} (2300-0700) contour shall not exceed 37.2 sq km for night-time noise, when calculated by the Federal Aviation Authority Integrated Noise Model version 7.0-d (or as may be updated or amended).

Within five years of the commencement of development a strategy shall be submitted to the Local Planning Authority for their approval which defines the methods to be used by LLAOL or any successor or airport operator to reduce the area of the noise contours by 2028 for daytime noise to 15.2sq km for the area exposed to 57dB(A) L_{eq16hr} (0700-2300) and above and for night-time noise to 31.6 sq km for the area exposed to 48dB(A) L_{eq8hr} (2300-0700) and above.'

3.7 The proposed changes to these conditions, as stated at paragraph 6.1.3 in the addendum to the ES (CD1.16), are as follows:

- the passenger limit within condition 8 should be raised to 19 million passengers per annum (mppa);
- the 57 dB daytime contour area limit within condition 10 should be increased from 19.4 to 21.1 km^2;
- the 48 dB night-time contour area limit within condition 10 should be increased from 37.2 to 42.1 km^2;
- the target date within condition 10 for reducing day and night 57 and 48 dB contours to 15.1 km^2 and 31.6 km^2 respectively should be delayed by three years from 2028 to 2031, and;
- interim area limits of 15.5 km^2 and 35.5 km^2 for the day and night 57 and 48 dB contours respectively should be introduced for assessment years 2028 to 2031 within condition 10

ES Noise Contours

3.8 The revised ES (CD4.06) prepared in support of the section 73 application for the variation of the two conditions, provides L_{Aeq} noise contours showing predicted 2028 baseline (without the proposed 2012 expansion) noise levels and predicted noise levels based on forecast ATMs for 2021, 2022, 2023, 2024, and 2028. The document also presents pseudo-baseline[2] noise contours for the same 5 assessment years based on ATMs that have been artificially adjusted to get the contours to match the extant area limits set in Condition 10.

3.9 It is stated very clearly in an unnumbered paragraph located between 8.6.3 and 8.6.4 in the revised ES (CD4.06) that 2028 is the key assessment year and that:

'As the proposal is to vary a condition of the 2014 Planning Permission, it is considered relevant to use the baseline of 12.5 mppa in 2028, as was assumed for the 2012 ES (as updated with runway operation and population numbers)'

It is also stated in the same paragraph that for the other assessment years: '*it is more appropriate to compare with what it is permissible currently*' although there is no justification provided for this and it is unclear why the intervening years should be different from the key year of 2028. In relation to this point, it is important to understand that a proposed development which meets the

2 The term 'pseudo-baseline' has been used here to describe the pre-existing 'with development' scenarios that are used to assess change against the proposed 'with development' scenarios. Since a baseline presented within an ES is inherently something which should be a 'without development' scenario, the term 'pseudo-baseline' has been used to clearly differentiate.

requirements for a full environmental impact assessment (EIA) must present an ES in accordance with the EIA regulations. The EIA regulations[3] state at paragraph 3 of schedule 4 (Information for Inclusion in Environmental Statements) that an ES should include the following information (noting that it is assumed that the ES is written prior to the development taking place):

'A description of the relevant aspects of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without implementation of the development as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge.'

3.10 The revised ES also provides Number Above contours (N60 and N65) representing contours at which there are 25, 50, 100 or 200 flyovers producing noise levels in excess of the relevant L_{Amax} level (60 or 65 dB). These contours are produced at Appendix 8G as supplementary metrics in line with current best practice. These Number Above contours are provided for scenarios where the predicted L_{eq} meets the extant (pseudo-baseline) and proposed condition 10 contour area limits.

ES Addendum Noise Contours

3.11 The addendum to the revised ES (CD1.16) prepared in support of the Application, provides L_{Aeq} noise contours showing predicted noise levels based on updated ATM forecasts for 2023, 2024, 2025, 2028, and 2031. The document also presents updated pseudo-baseline noise contours for the same 5 assessment years based on ATMs that have been artificially adjusted to get the contours to match the extant area limits set in Condition 10.

3.12 The addendum to the revised ES also provides updated Number Above contours (N60 and N65) representing contours at which there are 25, 50, 100 or 200 flyovers producing noise levels in excess of the relevant L_{Amax} level (60 or 65 dB). These contours are produced within figures of the addendum as supplementary metrics in line with current best practice. These Number Above contours are provided for assessment years 2023 and 2028 for the with development scenario and the pseudo-baseline scenario of meeting the extant condition 10 L_{eq} area limits.

Technical Details of the Noise Modelling

3.13 Between the 2012 Application and the Application there have been changes to the noise model used by the acoustic consultants, Bickerdike Allen Partners (BAP), who prepared the noise assessments. Some of these changes are briefly covered in the two versions of Appendix 8C – one contained in the revised ES (CD4.06) and one in the figures of the addendum to the ES

3 The Town and Country Planning (Environmental Impact Assessment) Regulations 2017

(CD1.17). Both versions of Appendix 8C refer to measurements of newer aircraft types at the airport in 2018 and 2019 that have been used to calibrate the inputs into the Integrated Noise Model (INM) which is the software which is used for calculating noise contours.

3.14 Calibration of the noise model was carried out through noise measurements at a measurement location in Ludlow Avenue close to the airport at the end of 2015 and this was detailed in a BAP report (CD8.06). This document is mentioned in passing within the ES vol.2 (CD1.09) but is not discussed in the noise chapter and the significance of the document is not highlighted in any way. No further reference to this document is given anywhere in either the revised ES (CD4.06) or the addendum (CD1.16) but since the assessment presents predicted noise contours assessed against benchmark LOAEL and SOAEL thresholds, it should be noted that this calibration information is highly pertinent to the outcome of the assessment. The BAP report notes that the 2015 measured levels were lower than predicted by around 4 dB(A) SEL for the three main aircraft types included in the noise contours presented in the 2014 annual noise monitoring report. This discrepancy between predicted and measured values led to BAP adjusting standard INM flight profiles to provide results which better matched measured levels at the noise monitoring location in Ludlow Avenue. There are a number of concerns related to the adjusted flight profiles and how this has considerably reduced predicted noise contours, the concerns are detailed at section 5 of this report.

3.15 The fleet mix for the 2028 12.5 mppa baseline is detailed in Appendix 3A of the 2019 ES (p.163 CD1.10) and is clearly quite different to the 19mppa with development case presented in Table 8B.1 of Appendix 8B of the addendum (CD117 p.55 – 56). No explanation has been provided as to why the fleet mix between the baseline and with development cases is so different. Andrew Lambourne's proof of evidence details how fleet mix changed between 2014 to the present day due to non-permitted development and a growth incentive scheme that could have encouraged airlines to use aircraft with larger capacity seating layouts. Without any explanation, it is impossible to determine whether or not these factors have fed into the forecast fleet mix and what alternative assumptions might have been assumed for the baseline.

3.16 The addendum to the ES (CD1.16) refers to a without development scenario in 2028 with 12.4 mppa rather than the 12.5 mppa specified within the updated ES (CD4.06) with no explanation within the noise chapter or Appendix 8C. It is not clear whether or not this is a typographical error but it appears to have been carried right through the document and associated appendices suggesting that perhaps there has been an update to the ATM forecasts for this baseline scenario.

3.17 There are no updated forecast traffic flows for the 2028 12.4 mppa baseline within Appendix 8B of the revised ES or the addendum and this 2028 baseline is not included in the list of noise contours described at Appendix 8B of the addendum. In fact, the only place that forecast traffic flow data for the 2028 baseline (12.5 mppa) is supplied is within Appendix 3A of the ES (CD1.10 p.163). A document was recently prepared by the Applicant entitled 'Note on Environmental Statement Documentation' (dated August 2022) and within a table at page 3 of this document it is explicitly stated that Appendix 3A is superseded by Appendix 8B of the revised ES. However, since information on the assumed traffic flows for the 2028 baseline is not available anywhere else, it is assumed that the table in Appendix 3A of the 2019 ES (CD1.10) is still relevant and represents the assumed traffic flows used in the most recent iteration of the noise model for the 2028 baseline.

3.18 LADACAN has requested clarification on which parts of the ES and revised ES are still relevant following the release of the ES addendum and in particular clarification was sought over the ATM data presented in Table 8B.1 of Appendix 8B (CD1.17). The Applicant has now supplied two notes giving clarification on which parts have been superseded but the information supplied does not make sense as information within Appendix 3A (discussed at paragraph 3.17 above) is either still relevant or updated information has not been provided in Appendix 8B of the ES addendum. Furthermore, the 2028 with development scenario for 18 mppa presented in Appendix 8B of the revised ES (CD4.07) does not appear to have been brought forward into the latest version of this Appendix and it is also unclear whether or not this alternative development scenario is still relevant.

3.19 Predicted baseline noise levels for the 2028 12.4 mppa scenario and numbers of properties within the 2028 baseline contours are given in the ES addendum but the numbers vary from those presented in the revised ES. To give an example of this, the number of properties within the 51 dB daytime noise contour for the 12.5 mppa 2028 baseline as set out in table 8.8 of the revised ES (CD4.06 p.23) is 9990 whilst the corresponding number at table 6.1 within the ES addendum (CD1.16 p.53) for the 12.4 mppa 2028 baseline is 9788. It is unclear if the numbers have been misreported in one of the documents or if there has in fact been an update to the forecast ATMs.

4. SUMMARY OF CURRENT NOISE GUIDANCE, POLICY AND METHODOLOGY

4.1 It has long been understood by acoustics practitioners that average L_{Aeq} noise levels are often not representative of aircraft noise experienced at locations surrounding an airport, particularly those close to a runway where measured noise levels include very high peak levels during take-off and landing.

4.2 The most significant shortcoming of the L_{Aeq} metric, in relation to aircraft noise, is that it effectively equates increases in actual sound pressure with increases in numbers of overflights. Sound levels are measured as pressure and then represented as decibels to reflect the fact that the perceived loudness is proportional to the logarithm of the sound pressure. This means that an increase of 3 dB is actually representative of a doubling in the measured sound pressure. The way that L_{Aeq} is calculated means that, for aircraft noise close to a runway, an increase of 3 dB can also represent a doubling of the number of overflights. Whilst there is plenty of scientific evidence to justify the fact that perception of loudness is proportional to the logarithm of sound pressure, there is no such evidence to suggest that any kind of similar relationship exists in terms of the perceived numbers of aircraft flyovers.

4.3 In relation to measured noise levels, 3 dB is often referred to as being the minimum perceptible change and is therefore often used as a significance criterion for assessing change in noise levels within environmental noise assessments. However, when it comes to a long term L_{Aeq} such as the $L_{Aeq\ 16\text{-}hr}$ used for assessing aviation noise a 3 dB increase might simply be a doubling of the number of flyovers and it is unreasonable to suggest that a doubling in the number of overflights would only just be perceptible to the owner of a property underneath a flight path. To illustrate this further, if all aircraft were to reduce their noise emissions by 3dB and at the same time the number of aircraft movements were to double with the same fleet mix, the size of any given L_{Aeq} contour would stay the same. The reduction in noise of each aircraft overflight would be just perceptible but the doubling of air traffic movements would be very noticeable.

4.4 Airport noise guidance and policy has historically developed very slowly but it has eventually been recognised that maximum noise levels (measured using the L_{Amax} index) play an important role in describing aircraft noise. The Government Consultation Response on UK Airspace Policy, the Draft Aviation Strategy, the Airports Commission Appraisal Framework and CAP1506 all support the use of secondary metrics, specifically the L_{Amax} and/or the Number Above L_{Amax} metrics.

4.5 The L_{ASmax} metric (L_{Amax} measured using slow time weighting) was used to define Number Above metrics N65 and N70 for correlation with the results of the 2014 Survey of Noise Attitudes (SoNA). Outputs from the study were first published by the CAA in February 2017 and then a second edition was published in 2021 (CAP 1506). The results show good correlation between N65/N70 metrics and annoyance.

4.6 Outputs of SoNA fed into the Government's *Consultation Response on UK Airspace Policy: A Framework for Balanced Decisions on the Design and Use of Airspace*, October 2017. The consultation response document recognised that the lowest observable adverse effect level (LOAEL) in terms of average noise is lower than previously assumed and is now 51 dB $L_{Aeq\ 16\ hr}$ rather than 57 dB $L_{Aeq,\ 16\ hr}$ as assumed for the 2012 planning application. This change has been acknowledged by BAP (see table 8.6 and para 8.8.8 at page 18 of the revised ES document CD4.06). The consultation response also notes that the number of overflights can be an important factor and that additional noise metrics other than L_{Aeq} are required for assessing airspace change. Subsequently, the CAA published CAP1616 which requires N65 and N70 to be used as secondary metrics in airspace change applications.

4.7 Regardless of guidance or policy it is clear that an average noise level metric such as the L_{Aeq} can either represent a large number of low-level noises or a smaller number of high-level noises. If an assessment only looks at the L_{Aeq} metric there could be no significant change in the average noise level but a big change in the number and level of individual noise events. The Application includes proposed increases in passenger numbers and reductions in noise output achieved through anticipated fleet modernisation which are precisely the kind of changes that could be hidden by the L_{Aeq} metric. I do not consider it appropriate to assess the noise impact by looking at the average L_{Aeq} noise levels alone since this metric by its nature as an average does not indicate the changes to both number and level of maximum noise events during flyovers.

4.8 Irrespective of aircraft noise policy, the WHO night noise guidelines 2009 identify L_{Amax} as the most suitable metric for correlation with sleep disturbance. This is intuitive since a loud sharp noise is likely to cause awakenings but a low (or even high) level droning noise that is continuous in the background is much easier to ignore and less likely to cause awakenings once asleep. It is therefore considered that in order to investigate noise impacts associated with the Application, the L_{Amax} is a key metric in understanding the significance.

4.9 ECAC document 29 4th Edition (7 December 2016) is a '*Report on Standard Method of Computing Noise Contours around Civil Airports*' and volume 1 of this document is a guide to how the generalised method can be applied. Section 3.3.5 of volume 1 (starting on page 37 of the document) deals with airport noise monitoring and how this relates to the generalised method for noise contour modelling. The section talks about how Noise and Track Keeping (NTK) systems can be used to link measured noise data to individual aircraft overflights which then allows potential recalibration of source noise data used in a noise model. However, it then goes on to state at page 38 that such measurements should be used with caution:

'Despite this elaboration, airport monitoring data has to be treated and processed with very great care as there are many potential sources of error and inconsistency, including:

- *Contamination of event noise by extraneous noise (i.e. from non-aircraft sources)*
- *Coincidence of two (or more) aircraft events*
- *Event not an aircraft*
- *Radar data corrupted*
- *Inadequate monitor location - received sound influenced by reflections from ground or other surfaces*

- *Weather conditions outside acceptable range*
- *Incorrect matching of data from different sources - noise, radar, flight recorders, meteorology, flight information, ATC, runway logs, etc.*
- *Inaccurate or incorrectly logged data*
- *Failure to account for individual variations of the flight paths (variations in the slant distance)*
- *Maximum level of the event below measuring threshold (or less than the top 10dB above the threshold)*

……Finally, there must be enough measurements to allow mean (normalised) sound levels to be estimated with adequate statistical confidence (depending on the degree of normalisation, up to 50 or more measurements for each combination of aircraft type and ground track might be needed).'

5. ASSUMPTIONS USED FOR THE NOISE MODELLING

5.1 At paragraph 8.2.1 to 8.22 of the updated ES (CD4.06) there is a discussion about the limitations of the assessment where it states:

'There is an inherent uncertainty in forecasting aircraft movements which is based on multiple factors including fleet mix assumptions.

Aircraft operation forecasts for the Proposed Scheme's scenarios have been supplied by LLAOL[126] and are therefore assumed to be correct at the time of writing. It is understood that the assumed numbers of new generation aircraft are based on airline orders for the relevant aircraft between now and 2026, and this has been represented in LLAOL's fleet mix assumptions.'

5.2 The quote above includes a footnote (126) which refers the reader to Appendix 10B which is said to contain a discussion about how the forecasts have been incorporated into the noise model. I have not been able to find this appendix in any of the core documents that you might expect it to be contained within (CD4.06, CD1.10 or CD1.17). However, this appendix is also referred to in the ES vol 2 (CD1.09) indicating that it is not a typographical error. It should therefore be noted that the way in which forecast ATMs have been included within the noise model remains unclear.

5.3 Since the 2012 planning application and the noise contour predictions contained within the associated ES, there have been modifications to the noise model. Mr Lambourne's proof of evidence sets out some of the modifications and provides information about noise measurement equipment including details of maintenance, calibration and how measurements have been used for verification and calibration of the noise prediction model.

Fleet and Operational Changes

5.4 The assumed rate of modernisation of the aircraft fleet at LTN is a critical part of the noise modelling and it should be noted that noise reductions achieved through design of more modern 'next generation' aircraft can have a substantial impact on predicted noise contours.

5.5 The reductions in noise contours that would occur over time anyway (without the development) are an inevitability since older aircraft types will eventually become uneconomical to maintain and airlines will ultimately buy new models to ensure the profitability of their businesses. It is therefore important to take this expected noise reduction into account as the subtleties about how much modernisation of the fleet might occur both with and without the development can be crucial to the outcome of the noise assessment.

5.6 The 2014 planning consent took into account the importance of fleet modernisation by introducing the reduced noise contour area limits for years 2028 and beyond (as part of what was then condition 12). This inherent reduction of the noise contour area limit helps to prevent the possibility of a greater number of quieter next generation aircraft types fitting within the same noise contour area limit. However, the expected reductions in noise output were, at that time, entirely theoretical and the assumptions about uptake of next generation aircraft types (and the resulting fleet mix at LTN) may well be significantly different to the assumptions that have been used for the forecast ATMs used in the Application. Given that these assumptions about fleet mix have the potential to be considerably different, it would be useful to compare the assumptions in order to better understand:

- how much of a reduction of noise contours could reasonably have been expected at the time of the 2012 planning application both with and without the development;
- how accurate the predicted reductions would have been, particularly in relation to the suitability of the assumed 2028 baseline;
- If currently available data had been available in 2012, would this have affected the reduced noise contour area limit for 2028 which was included within condition 12 attached to the 2014 consent and;
- what would be the likely fleet mix without the influences of the Growth Incentive Scheme towards larger aircraft and consolidation of the airline customers towards those which delivered consistent growth.

Numbers of Flyovers

5.7 In order to better understand the proposed changes, it is useful to compare the forecast traffic flows from the key assessment year of 2028 and the year 2031 (when it is now predicted that the reduced condition 10 contour area limits would be met). An analysis of total forecast traffic flows (92-day summer period daytime and night time) has been made by taking information from three separate sources and combining them to allow easy comparisons to be made. The source of the data is as follows:

- the 2028 baseline without development (12.5 mppa) traffic flows have been taken from Table 3A.1 of Appendix 3A (CD1.10 p.163);
- the 2028 with development case for 18 mppa (which may now have become obsolete but this is not clear) has been taken from table 8B.1 of Appendix 8B to the revised ES (CD406 p.56 – 57);
- the 2028 and 2031 with development scenarios for 19 mppa have been taken from table 8B.1 of Appendix 8B to the ES Addendum (CD117 p.55 – 56).

5.8 Table 1 shows the total forecast ATMs for the 2028 baseline and the three with development scenarios described above. It can be seen that there is a difference (increase) of 475 between the 2028 baseline of 12.5 mppa and the 2028 18 mppa. There is then a further increase of 414 movements between the 2028 18 mppa and 19 mppa scenarios and a decrease of 99 between the 2028 19 mppa and the 2031 19 mppa scenarios.

Table 1: Total Forecast ATMs with and without the development in 2028 and 2031

Aircraft type	2028 Baseline without development (12.5mppa)	2028 with development (18mppa)	2028 with development (19mppa)	2031 with development (19mppa)
TOTAL	**38962**	**39437**	**39851**	**39752**

5.9 The increase of 414 between the two 2028 with development cases can easily be assumed to be a result of the additional 1 mppa. The reduction of 99 moving to 2031 can be plausibly explained by a significant change in fleet mix with newer aircraft having greater seating capacity. However, the change between the 12.5 mppa baseline and the 2028 18 mppa scenario is surprisingly small and cannot readily be explained by passenger numbers alone.

5.10 It is noted that the fleet mix for the 2028 18 mppa scenario is substantially different to the 2028 baseline 12.5 mppa scenario, most notably including many more (almost 10,000 more) A320neos than the baseline. However, it is unclear why the fleet mix between the baseline and 18 mppa scenarios should be so significantly different or if this change in fleet mix is the sole reason for the similar number of ATMs between the two scenarios. It would seem that there could also be some different assumptions about the spread of flights throughout the year with a greater concentration through the summer months assumed for the baseline. Without the missing Appendix 10B (mentioned at paragraph 5.2 above) it is difficult to comment any further but suffice to say that further explanation of the assumed ATM data is required.

Night Flights

5.11 The numbers of flyovers that occur is more critical at night and the forecast summer night time ATM data provided by the applicant has been analysed separately to understand the anticipated changes for the same assessment years as presented at Table 1 above. Analysis of the night-time ATM data is provided below at Table 2 where it should be noted that a colour scale has been provided using traffic light colours to indicate low numbers with green and high numbers with red (colour scale has been produced with standard Excel conditional formatting which gives a linear scale between the lowest and highest numbers). The analysis presented in the table only includes the most significant aircraft, excluding those with very low numbers that have little or no effect on predicted noise contours and the data has been taken from the same sources as described at 5.7 above.

Table 2: Night Time Forecast ATMs With and Without the Development in 2028 and 2031

Aircraft type	2028 Baseline without development (12.5mppa)	2028 with development (18mppa)	2028 with development (19mppa)	2031 with development (19mppa)
A320ceo	441	644	438	0
A320neo	441	2061	2040	2354
A321ceo	610	11	0	0
A321neo	610	605	1210	1150
B737-Max	329	771	758	805
B737-400	0	112	103	103
B737-800/73H	329	301	49	0
B757	13	112	129	129
TOTAL	**2773**	**4617**	**4727**	**4541**

5.12 It can be seen that there is a significant increase in the total number of night time flights between the 2028 baseline and all of the with development scenarios, showing an increase of almost 2000 between the baseline and the 2028 with development 19 mppa scenario.

5.13 The colour scale shows that there is a very significant shift in the predicted night time fleet mix with nearly all the night flights in 2031 being related to three next generation aircraft types (A320neo, A321neo and B737-Max). It should be noted that the predicted fleet mix is something which is outside of the Applicant's control and therefore requires considerable explanation and justification to ensure that plausible forecasts have been made. Such explanations may be available in the missing Appendix 10B (mentioned at paragraph 5.2 above) but given the relevance of this to the outcome of the noise assessment, the importance of this information should not be underestimated.

Aircraft Flight Profiles

5.14 The climb rate of any particular aircraft during any given departure route is dependent upon a number of different factors including weather conditions but two fundamental factors are the maximum take-off weight of the aircraft and the power to weight ratio of the engines. This is logical since there is only a finite amount of lift provided by the aircraft design based upon the maximum thrust provided by the engines operating at full power.

5.15 The 2015 BAP report (CD8.06) indicates that noise monitoring data and associated NTK system data highlighted a discrepancy between assumed departure profiles and actual departure profiles for a number of aircraft. However, the noise monitoring equipment section of Mr. Lambourne's proof of evidence highlights a number of areas where discrepancies occurred most of which are inline with the highlighted areas of caution listed in ECAC document 29 (see paragraph 4.9 above). The charts in the Mr. Lambourne's proof also highlight that the monitoring occurred for a total of 3 weeks in midwinter whereas the noise contouring is calculated for a 3 month summer period. Mr. Lambourne also notes that no altitude data was provided in the requested data relating to the 2015 survey at Ludlow Avenue. Without information about the height of the aircraft it is very difficult to know whether or not the recorded noise levels are valid for all scenarios used in the noise modelling. A number of factors affecting flight profiles are discussed below.

Maximum Take-off Weight and Take-off Distance

5.16 The maximum take-off weight (MTOW) is a specification provided by the manufacturer for all aircraft types which represents the maximum weight in kg of the aircraft including all passengers, cargo and fuel. Because the weight of any given aircraft determines the amount of thrust required to get it airborne and keep it maintaining a constant altitude, the noise output is also inherently linked to the weight (since more thrust creates more noise). In addition to this, the weight of an aircraft also determines the runway length required to get airborne using maximum thrust settings and the maximum climb rate that can be achieved. Manufacturers therefore also specify take-off distance for a fully laden aircraft and typical climb rate settings to be used under normal operation.

5.17 Close to an airport, the weight of an aircraft and its take-off distance can have a significant effect on how high a departing aircraft is when it passes overhead which means that more heavily laden aircraft are likely to be both noisier and closer to the ground for locations under a flight path close to an airport. The reason that take-off distance has an effect is simply because aircraft always typically start from the same 'start of roll' position on the runway and a shorter take-off distance means that they become airborne more quickly and would therefore climb to a higher altitude (for the same rate of climb) at any given position below the flight path during the initial stages of climbing to a cruising altitude.

Specified Climb Rates

5.18 The Boeing B737 - 800 manufacturer's specifications indicate that from 500 ft up to FL150[4], the maximum climb rate would typically be set at 2000 fpm[5] with an airspeed (IAS) of 290 kt. It is assumed that this is a reasonable estimate for the typical climb rate of a B737 that is close to fully laden. The Boeing 737 Max has more efficient engines and the specifications indicate that from 500 feet up to FL150, the maximum climb rate would typically be set at 2300 fpm whilst maintaining the same airspeed of 290kt.

5.19 Operational guidance for the Airbus A320, A321 and A320neo indicates that standard operating procedures are identical to those of the Boeing 737-800 with maximum climb rates of 2000 fpm from 500ft up to FL150 and an airspeed of 290kt. The A321neo specifications indicate a lower climb rate of 1500 fpm from 500 ft up to FL150 but the same airspeed of 290 kt.

5.20 It should be noted that the assumptions about typical climb rates for the six different aircraft discussed above have been investigated for the purposes of estimating likely aircraft heights above Ludlow Avenue since it is not the climb rate that is of specific interest so much as the height which has been obtained above Ludlow Avenue monitoring location during a flyover.

Resulting Height Differences at Ludlow Avenue

5.21 LADACAN have been unable to obtain altitude data for 2015 BAP report (CD8.06) but the report states that data from the NTK system indicated that the RW26 departure profiles (heights along flight path) did not match the modelled profiles. However, the Applicant's 2017 South Luton Community Noise Report (available by searching "Luton Airport Community Noise Reports" online) includes analysis of gate data which indicates that 58 % of the flights were above 2000ft above sea level.

5.22 The typical climb rates (discussed above), an assumption that ground speeds are broadly similar to typical air speeds, take-off distance and calculated distance from point of take-off have been used to calculate typical aircraft heights above Ludlow Avenue (and heights above sea level) for aircraft taking off on RW26. Some additional specifications relating to initial climb rates up to 500

4 'Flight Level' FL150 is an altitude of 15,000 feet above a defined sea level reference. Similarly, FL180 is an altitude of 18,000 feet above the same reference height.

5 Climb rates are typically specified in feet per minute (fpm)

ft about have also been used in the calculation but all information pertinent to the estimates of heights is included at Table 3 below.

Table 3: Calculated Average Heights above Ludlow Avenue for Most Common Aircraft Departing on RW26

Descriptor		Aircraft type					
		B737-800	**B737 Max**	**A320**	**A320neo**	**A321**	**A321neo**
Initial climb rate up to 500ft	ft/min	3000.0	2500.0	2500.0	2200.0	2500.0	2000.0
	m/s	15.2	12.7	12.7	11.2	12.7	10.2
Max climb rate up to FL150	ft/min	2000.0	2300.0	2000.0	2000.0	2000.0	1500.0
	m/s	10.2	11.7	10.2	10.2	10.2	7.6
Airspeed to 500ft	kts	165.0	165.0	175.0	175.0	175.0	175.0
	m/s	84.9	84.9	90.0	90.0	90.0	90.0
Airspeed to FL150	kts	290.0	290.0	290.0	290.0	290.0	290.0
	m/s	149.2	149.2	149.2	149.2	149.2	149.2
Distances	Takeoff	2300.0	2500.0	2190.0	1951.0	2210.0	2150.0
	from start of roll to Ludlow Avenue	4500.0	4500.0	4500.0	4500.0	4500.0	4500.0
	Airborne	2200.0	2000.0	2310.0	2549.0	2290.0	2350.0
	from take-off up to 500 ft	848.8	1018.6	1080.3	1227.7	1080.3	1350.4
Altitude	above ground (m)	244.4	229.3	236.1	242.4	234.8	203.5
	above sea level (ft)	1359.6	1309.9	1332.5	1353.0	1328.0	1225.2

5.23 The range of average heights from the gate data analysis are higher than might be expected when compared to the calculated range of altitude (above sea level) in the table above and it is considered that this is highly likely to be due to lower average passenger numbers and/or lower aircraft loading overall allowing greater climb rates than under worst-case (maximum take-off weight) conditions during the 2017 noise monitoring survey period. It is reasonable to assume that similar aircraft heights may have been present during the 2015 survey and that the greatly increased height combined with a slightly lower thrust setting may well provide an explanation for measured noise levels that were lower than expected.

5.24 Following this exercise to calculate the likely altitude, investigation of the Airport's operational parameters has revealed that the runway length is only 2162m at LTN which would preclude all but the A320neo from being able to safely depart when laden to the maximum take-off weight (see take-off distances specified in Table 3). This is an interesting finding since it means that the runway length does not meet minimum requirements set by manufacturers and in such situations it is down to individual airline operators discretion and their adopted operational procedures as to what take-off weight is considered to be safe. The A320 is one of the most common aircraft at LTN and for this aircraft type, the disparity between the runway length and the take-off distance is relatively small and unlikely to have a significant impact on the load that a departing aircraft could carry. However, for slightly larger aircraft variants carrying more passengers, greater take-off distances are required and the runway length would clearly start to become a limiting factor in the commercial viability of operating such aircraft at LTN.

5.25 I consider that, for the A320 aircraft type, the implication of the runway length limiting take-off weights is likely to have a fairly minimal effect and I would still expect the heaviest A320 aircraft taking off from LTN to be lower than 2000 ft ASL when passing over Ludlow Avenue. If the aircraft measured during the 2015 noise monitoring survey were in fact generally higher than they might have been under worst-case conditions (fully laden within the confines of what is considered to be safe by the airline operator), this suggests that adjusting the modelled departure profiles may not be representative of fully laden aircraft. Since the Application is predicated on achieving greater passenger throughput without greatly increasing the number of ATMs, it is questionable as to whether or not it would be appropriate to model forecast future scenarios using the altered departure profiles.

5.26 A secondary point raised by the runway length starting to become a limiting factor for larger aircraft models or variants is that it raises questions over the inclusion of larger aircraft types within the forecast fleet mix. It could be hypothesised that the planned growth is not economically viable for airlines without either subsidisation and/or significant changes to the fleet mix. The fact that the 2012 Application relied heavily on the modernisation of the aircraft fleet (next generation aircraft generally have shorter take-off distances) and the fact that the growth incentive scheme was introduced by the Applicant both support such a hypothesis.

6. QUALITATIVE NOISE IMPACTS RESULTING FROM AIRPORT EXPANSION

6.1 The average L_{Aeq} noise contours presented in the revised ES and the addendum all show very little change to the average noise levels produced around the airport. This is to be expected for most of the scenarios since comparison with the 'pseudo baseline' will only indicate the additional noise above the existing noise contour area limits rather than describing the full impact of the scheme as it was proposed in 2012 but including the proposed changes.

6.2 In the context of the date of the original planning application in 2012, there have been relatively recent changes to the way airport noise is assessed and the importance of additional noise metrics such as the L_{Amax} is now recognised by the Government (acknowledged by Bickerdike

Allen Partners at paragraph 8.8.3 of CD1.09). Whilst there is a use for average noise metrics, there is a general consensus and understanding that aircraft noise is not perceived by humans as an average and that metrics which incorporate the maximum level of noise during an overflight and the frequency of occurrence better represent the way in which the noise is perceived. It is expected that the government's updated aviation strategy will include provision for this type of alternative metric in terms of policy surrounding compensation for noise impacts.

6.3 What is surprising is that the 2028 12.4 mppa scenario produces predicted noise levels that are in some instances actually higher than the 2028 19mppa levels. To give an example, the predicted daytime noise level for the 2028 12.4 mppa baseline at Old Knebworth Lodge Farm reported at table 6.15 of the addendum to the ES (see p.68 CD1.16) is 43 dB $L_{Aeq,16hr}$ compared with 42 dB $L_{Aeq,16hr}$ for the 19 mppa with development scenario. This does not logically make sense since a development scenario accommodating almost twice as many passengers per annum than the baseline would seem to indicate an increase in predicted noise over the baseline. Whilst this disparity could perhaps be explained by variations in the fleet mix between the baseline and with development scenarios, it is unclear why the fleet mix should be so significantly different between the scenarios so as to cause this anomaly.

6.4 It is logical that greater passenger numbers mean more flights and aircraft which are more heavily laden with passengers and cargo. Heavier aircraft require more power in order to be able to produce enough lift to get airborne and stay airborne. For any given aircraft type, more heavily laden aircraft therefore generally require higher thrust settings and generate more noise and this is reflected in the available certified EPNL noise data for most aircraft. It therefore stands to reason that heavier aircraft departing the airport generate higher maximum noise levels as they pass overhead.

6.5 It is logical that for any given aircraft, there is a limit to the amount of lift that can be generated by the combination of the wings and engines that are fitted. When taking off, it is logical that the relative amount of lift which results in the vertical speed (or climb rate) of the aircraft is the difference between the amount of lift generated and the weight of the aircraft. Therefore, for a given distance along a departure route, a given thrust setting and a given aircraft (whilst the aircraft is still increasing its altitude), a heavier load will generally result in a lower altitude than a lighter load.

6.6 The next logical conclusion is that for any given aircraft type, a lower altitude means that the jet engines which produce the noise are closer to the property and therefore louder. This means that for all aircraft types where passenger numbers were predicted to increase following the airport expansion, assuming that routes and levels of cargo remain similar, the aircraft are likely to be producing higher noise levels and at generally lower altitudes resulting in greater maximum noise levels than before the airport expansion.

6.7 A qualitative assessment of the change in noise impact arising from the airport expansion indicates that an increase in maximum noise levels would be expected for any given aircraft type on which passenger numbers increase, and that the number of overflights would also increase.

7. UNCERTAINTIES IN NOISE IMPACT AND CONCLUSIONS

7.1 There is uncertainty in the appropriateness of the assumed fleet mix particularly surrounding the 2028 baseline 12.5 mppa scenario and the missing Appendix 10B (see paragraph 5.2) leaves question marks over how the assumed fleet mix has been derived and how it has been incorporated in to the noise model.

7.2 The predicted noise levels for the 2028 12.5 mppa baseline seem to be very high particularly when compared to the 2028 19 mppa with development scenario. This raises questions about the validity of these predictions and makes it difficult to have confidence in the quantified noise impact.

7.3 The pseudo-baseline predicted noise levels can be considered to be useful additional information but presenting them as baseline predicted noise levels is misleading and leads to an incorrect assessment methodology. The assessment methodology presents change between pseudo-baseline and with development that substantially underestimates the noise impact of the airport expansion.

7.4 A key metric in understanding the impacts of the with development case is the L_{Amax} (see paragraph 4.8) and the associated Number Above contours which are an appropriate way of comparing the predicted increases in overflights between the baseline and with development scenarios. However, the ES addendum does not present Number Above contours for the 2028 12.4 mppa baseline (see paragraph 3.12) making it impossible to assess the change according to this metric.

7.5 Changes to the calibration of the noise model, particularly in 2015, means that absolute predicted noise levels have reduced when qualitatively, they might reasonably be expected to have increased. The uncertainty associated with this calibration of the noise model brings into question the assessment of absolute predicted noise levels against the benchmark thresholds for LOAEL and SOAEL.

7.6 Furthermore, estimated altitudes for six aircraft types (see Table 3) at the 2015 noise monitoring location in Ludlow Avenue have been compared with gate data analysis presented for 2017 noise monitoring at a similar location. The comparison indicates that subsequent changes to the RW26 departure profiles may not be representative of future scenarios where more heavily laden aircraft would be expected to be taking off more regularly as part of the expected growth in passenger numbers. Comparative altitude analysis in South Luton over a representative period of time could have provided a more accurate indication of changes to departure profiles on the RW26 routes, when correlated with aircraft type and MTOW. There is also the possibility that different profiles apply for RW08 departures.

7.7 The content of the ES, revised ES and ES addendum have not been presented in a clear way, leading to significant confusion over which parts of which document are still current and which are obsolete. This confusion has still not been properly resolved and discrepancies in the presented 12.4 mppa compared with the 12.5 mppa 2028 baseline (see paragraph 3.19) indicate that there may be updates to the 2028 baseline that have not been documented at all.

7.8 To answer the questions on which I have been asked to opine, in relation to the noise impact presented as part of the Application:

- The ES has not in my opinion presented a clear, transparent or correctly formulated baseline for the without development case. It is considered that the only relevant baseline which has been presented is the 2028 12.5 mppa (or perhaps 12.4 mppa?) that was used for the 2012 ES. However, the updated assumptions around this baseline scenario have not been made sufficiently clear and it is considered that the predicted noise levels that have been presented for this baseline are not plausible in the context of the with development scenarios.

- The ES has presented forecast 92 day ATMs data across a number of different tables, and it is not clear which values apply, particularly in the case of the 2028 12.5 mppa baseline. It is also unclear how the forecast numbers have been formulated as there is no explanation provided. Hayes McKenzie would typically expect to see a report from an aviation consultant (such as York Aviation) explaining how forecast ATMs have been derived for the purposes of the ES.

- So far as I can tell from the noise contours, the forecast pseudo-baseline scenarios comply with the contour area limits specified in Condition 10. However, it should be noted that the long-term limit (currently enforced by reduced area limits applying from 2028 onwards) assumes that there will be a gradual reduction in noise output achieved by a contour reduction strategy. The pseudo-baseline noise contours do not appear to reflect this gradual reduction in contour area up to 2028 that was stipulated as part of the 2014 planning consent. It is not possible to determine whether or not any of the forecast scenarios comply with Condition 8 since only the summer period ATM forecast data has been provided and Condition 8 specifies passenger throughput within a 12 month period. It is possible that this question could be answered more fully by the missing appendix 10B and it is considered that the omission of this document is a significant failing of the ES documentation.

- The total forecast number of ATMs are shown to increase year on year up to 2025 and then start to reduce for 2028 and 2031. Therefore the predicted noise reduction up to 2025 is entirely dependent on the fleet mix, which is not within the control of the Applicant. For assessment years 2028 and 2031, the total forecast ATMs are predicted to decrease but it is understood that once slots have been granted, they cannot be rescinded by the Applicant so it is unclear how the reduction in ATMs is expected to come about. The effect that these two factors could have on the long term noise envelope reduction requirement has not been discussed within the ES, revised ES or addendum.

- The only baseline which I consider to be theoretically suitable for assessing the noise impacts is the 2028 12.5 mppa (or 12.4 mppa) and I do not consider the other, pseudo-baseline scenarios to be appropriate for assessing impact. Given the uncertainty surrounding the presented 2028 baseline, I am not confident that it is correct and in its present form, the assessment does not stand up to scrutiny.

- The contour bands which have been used for LOAEL and SOAEL are appropriate and in line with best practice adopted for other airport planning applications.

- The existing planning requirement to implement mitigation to ensure a trend of reducing noise contours long term has not been appropriately managed as it is clear from Mr. Lambourne's proof of evidence that the noise contour area limits have been exceeded already and passenger limits are likely to be exceeded. It is understood that the main reason behind this is that slots were granted more quickly than the fleet was predicted to be modernised. In fact, the current planning obligations required a long-term noise contour reduction plan to be submitted to the LPA in January 2020 and it is understood that this has still not been provided by the applicant. Since there is no information on how the ATM forecasts have been calculated and the existing planning obligations have not yet been fulfilled with regards to a noise contour reduction plan, it seems unlikely that a management plan has been drafted to address the need to balance granting of slots with fleet modernisation, and forecasts therefore seem unlikely to adequately meet the expectations set out in the proposed planning conditions. The assumed fleet modernisation appears to be the only form of mitigation that has been relied upon to ensure a trend of reducing noise contours, and this is outside of the direct control of the Applicant.