LBN/PoE4

Proof of Evidence
Rupert Thornely-Taylor

APPEAL BY: London City Airport Limited

SITE AT: London City Airport, Hartmann Road, Royal Docks, London, E16 2PX

APPEAL AGAINST THE REFUSAL OF PLANNING PERMISSION FOR WORKS TO DEMOLISH EXISTING BUILDINGS AND STRUCTURES AND PROVIDE ADDITIONAL INFRASTRUCTURE AND PASSENGER FACILITIES (INCLUDING TAXIWAY EXTENSION, FOUR UPGRADED AIRCRAFT STANDS, SEVEN NEW AIRCRAFT STANDS, TERMINAL EXTENSION, NEW PASSENGER PIER AND ASSOCIATED FACILITIES)

LBN Reference 13/01228/FUL

PINS Ref: APP/G5750/W/15/3035673

16 February 2016

London Borough of Newham

Newham Dockside

1000 Dockside Road

TOWN & COUNTRY PLANNING ACT (AS AMENDED)

LONDON CITY AIRPORT – APPEAL AGAINST REFUSED PLANNING PERMISSION
Reference APP/G5750/W/15/3035673

PROOF OF EVIDENCE

ON MATTERS OF AIR NOISE

RUPERT THORNELY-TAYLOR

On behalf of the London Borough of Newham

Inquiry Document Reference	
Author	Rupert Thornely-Taylor
Date	10 February 2016

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1. QUALIFICATIONS AND EXPERIENCE

1.1 My name is Rupert Maurice Thornely-Taylor.

1.2 I am a Fellow and a founder member of, the Institute of Acoustics. I am also a Member of the Institute of Noise Control Engineering of the USA and a Member of the International Institute of Acoustics and Vibration. I have specialised exclusively in the subjects of noise, vibration and acoustics for more than 51 years. I have been the head of the Rupert Taylor Ltd consultancy practice, as well as an independent consultant in these areas for the past forty-seven years.

1.3 I am also a past President and Honorary Member of the Association of Noise Consultants and the Director of the International Institute of Acoustics and Vibration. I was, for ten years, a member of the Noise Advisory Council chaired by the Secretary of State for the Environment, and I was chairman and deputy chairman of two of its working groups; I was a member of the Scott Committee, which drafted the basis of the noise section of the Control of Pollution Act 1974. I am the author of the Pelican book NOISE, and editor or co-author of many other books.

1.4 I have been consultant to the planning authorities for promoters of and objectors to many airport development schemes. I was the expert witness in the House of Lords select committee on the Maplin Development Bill on behalf of objectors the Defenders of Essex, for whom I also appeared as expert witness at the Airports Inquiries 1981-3. I was consultant to the London Docklands Development Corporation at the time London City Airport was first promoted, and at the time of the subsequent expansion scheme. I was also a consultant to the then Northavon District Council in connection with British Aerospace's proposals to develop a civil aerodrome at Filton, and appeared as the expert witness at the public inquiry. I subsequently advised South

Gloucestershire District Council on Concorde noise levels at Filton. I carried out a study of ground noise at the former Hong Kong Kai Tak airport, and was part of the team which produced the environmental statement for the new Nanjing Airport. I was consultant to Crawley Borough Council, the planning authority for Gatwick Airport and to North West Leicestershire District Council, the planning authority for East Midlands Airport in connection with which I was also consultant to Leicestershire County Council. I was expert witness for objectors in the public inquiry into Robin Hood airport. I have been expert witness in many planning inquiries relating to heliports and general aviation airfields. I carried out noise assessment work at Luton Airport, have also recently been advising on noise matters with respect to planning applications for Rochester Airport. I acted as consultant to the Inspector at the Dublin Airport Oral hearing into the additional runway proposals in 2006. Since 2007 I have been consultant to the former BAA and subsequently to Heathrow Airport Ltd for whom I was expert witness at the planning appeal relating to the ending of the Cranford Agreement. I also have long experience of other areas of noise assessment, and was expert witness for the Secretary of State for Transport in the House of Commons Select Committee on the High Speed Rail (London-West Midlands) Bill.

1.5 I have provided consultancy advice and expert evidence with respect to London City Airport since its earliest stage when it was an idea considered by the then planning authority, The London Docklands Development Corporation (LDDC) in 1982. The airport was originally proposed as a short take-off and landing facility known as a STOLport, from which operations would be primarily by the de Havilland Dash 7 (DHC-7), a quiet four-engined Turbo-Prop with the capability of steep approaches and departures requiring only a short runway. Some operations by the Twin Otter (DHC-6) were also envisaged. I was asked by the LDDC whether a STOLport would be acceptable in an area which included

residential development and schools, and if so what conditions would be appropriate to control the noise impact. My conclusions are set out in 4.1.1 below.

1.6 I was a contributor to noise topics in the technical assessment review by Amec Foster Wheeler for the London Borough of Newham. The results of the review were reported in January 2015.

2. INTRODUCTION

2.1 Scope of Evidence

2.1.1 My Proof of Evidence has been prepared in relation to noise caused by the operation of London City Airport and in particular the noise effects of the appeal proposals

2.1.2 The topic of noise and vibration from construction of the proposed works is contained in the evidence of Mr Robin Whitehouse as is noise from surface access.

2.1.3 In section 3 of my evidence I describe the technical basis of the calculation and assessment of noise and explain noise scales and indices. In section 4 I give an overview of the noise history of the airport and the sequence of planning permissions from its inception to the present day. In section 5 I address the aircraft categorisation regime which forms a key part of the noise controls at the airport. In section 6 I outline relevant features of the current appeal proposals and in section 7 I consider those parts of the Statement of Matters which relate to noise within the scope of my evidence. In section 8 I consider the statements of case by the Rule 6 parties and respond to them, and I reach my overall conclusions in Section 9.

2.2 Statement of matters

2.2.1 My evidence deals with those parts of the Statement of Matters issued by the inspector that relate to air noise, and in particular to

ii) The extent to which the proposals would be consistent with the National Planning Policy Framework and with policies in the London Plan, with particular regard to policies 6.6 (Aviation) and 7.15 (reducing and managing noise, improving and enhancing the acoustic environment and promoting appropriate soundscapes).

iii) The likely environmental effects of [constructing and] operating the development, with particular regard to noise.

iv) The adequacy of the Environmental Statement submitted with the application, in particular with regard to noise.

3. CALCULATION AND ASSESSMENT OF NOISE

3.1 Noise measurement

3.1.1 Because of the complexity both of the human hearing mechanism and the psycho-physical response of humans to noise, the measurement of noise has evolved over the period since sound measuring or recording instruments became available, in response to research into the relationship between noise and human response, and also in response to the advance of measurement technology.

3.1.2 The measurement of sound pressure has been possible since the nineteenth century, and the fundamental characteristic of human perception of sound, as with other stimuli, that people judge increments according to proportional changes in the magnitude of the stimulus rather than to absolute changes, was first enshrined in a measuring scale by Alexander Graham Bell who devised the Bel scale (later subdivided in to ten sub units to create the decibel or dB scale) to measure the amplitude of sound pressure. However, a sound pressure level measurement expressed in Bels or decibels is only useful for the assessment of human response if it is of interest to compare two sounds of the same single frequency but different amplitudes. Whenever sound made up of more than one frequency is concerned, measurements of the amplitude in decibels of two different sounds may give a seriously misleading comparison as far as human response is concerned. This is because of the

frequency response of the human ear, which, in amplitude terms, discriminates strongly against sound of low frequency and of very high frequency, and in terms of perceptions of loudness changes is more sensitive at low frequencies.

3.1.3 Early researchers devised procedures for measuring loudness to take these human features into account. The procedures ranged from the inclusion of frequency weighting of various kinds to more complex mathematical processing of the frequency spectrum of a sound to compute a loudness value. Subsequent research into annoyance response led to noise indices that take sound duration into account as well as magnitude, with additional corrections for the character of the noise.

3.2 Noise scales and indices

3.2.1 A scale is a system which seeks to express a quantity expressing a property such as loudness. An index is a complex system that takes account of loudness, duration and other properties in order to rate total noise exposure, or to express the sound reduction afforded by a structure, for instance.

Scales

3.2.2 When electronic sound level meters became available, before the availability of computers, it became possible to quantify loudness by introducing frequency-weighting networks into the circuitry of sound level meters to approximate the frequency response of the human ear. Human hearing sensitivity is non-linear, and the hearing's unequal frequency response for quiet sounds is much more pronounced than it is for loud sounds. A system for taking account of the complexity of the human ear's sensitivity was developed, leading to a scale called Perceived Noise Level. It was

expressed in decibels and the scale known as PNdB. It was extended, in the aircraft noise context, to take duration and tonal character into account and the scale was called Effective Perceived Noise Level, EPNL, in units of EPNdB. This is the most accurate method of calculating the loudness of sound and although it is too complex for general application today, it is the approach used for aircraft noise certification and remains one of the most sophisticated scales for the quantification of the loudness and/or annoyance value for aircraft noise.

3.2.3 Research papers published in the 1970s and 1980s found that the correlation between environmental noise measured using the A-weighting scale and social survey responses to questions about noise annoyance was not significantly worse than correlations using more elaborate scales, and the trend towards the universal use of the A-weighted decibel or dB(A) became irreversible. Today environmental and occupational noise is almost exclusively measured and assessed using indices based on the dB(A) scale. Because of the complexity of the PNdB scale, as explained below the CAA used to adopt the practice of approximating it as the level in dB(A) plus a correction of 13 units. Today, airport noise contours are normally computed in indices based on the dB(A) scale as explained further below. Use of the EPNdB scale is confined to the noise certification of aircraft.

3.2.4 Noise levels in dB(A), like the basic decibel scale, measure proportions so that a 10 dB(A) increase is approximately a doubling of loudness and a 10 dB(A) decrease is approximately a halving of loudness. Judgement of loudness is subjective, and dependent on the characteristics of the sound, but the ‘10 dB(A) increase is a doubling of loudness' rule is a useful general guide. For example, ten motor cycles close together sound only about twice as loud as one motor

cycle, and certainly not ten times as loud; the same is true of one motorcycle that emits ten times as much sound power as another. As a further guide, one may say that a sound level of less than 20 dB(A) is virtual silence, 30 dB(A) is very quiet. 50 dB(A) is a moderate level of noise, 70 dB(A) is quite noisy and in a noise level of 90 dB(A) one has to shout to be understood. If the sound is predominantly of low frequency, a doubling of loudness may be perceived with an increase of less than 10 dB(A).

3.2.5 The measurement of sound levels in decibels involves a kind of averaging process in which the fluctuating pressure signal is squared, averaged, and the square root obtained. This process is known as root-mean-square or r.m.s. averaging, and it takes place over a defined time. A sound level expressed in decibels is denoted by the symbol 'L' which indicates a value expressed in decibels (abbreviated dB) relative to a standard reference level (0 dB = 20 micropascals of root mean square sound pressure). In this way the dB scale can measure absolute levels as well as relative levels. When instantaneous levels are measured, the result is dependent on the choice of r.m.s. averaging time, particularly with measurements of sounds of fluctuating level. There are two standard averaging times, "fast" and "slow". Measurements of the instantaneous sound level are denoted by the symbols L_{AS} or L_{AF}. The subscript 'S' or 'F' specifies a method of exponential averaging as defined in IEC 61672, using the standard 'slow' time constant of 1 second or the 'F' or 'fast' time constant of 1/8 second. 'S' has a greater smoothing effect on sound that varies in level. The subscript 'max' means the highest averaged value reached during an event. The value of $L_{Amax,S}$ nearly equals the value of $L_{Amax,F}$ for a steady sound that lasts for one second or more, otherwise $L_{Amax,F}$ levels exceed $L_{Amax,S}$ levels

by an amount dependent on the rapidity and magnitude of the variations. $L_{Amax,S}$ can alternatively be written as L_{Asmax} and is defined in IEC 61672.

Indices

3.2.6 The basic dB(A) scale can only measure the instantaneous level of sound, and where the level of sound fluctuates up and down, as it normally does in the environment, the dB(A) level also fluctuates. When it is necessary to measure a fluctuating noise environment by means of single number, an index known as equivalent continuous sound level, or L_{Aeq}, is employed. L_{Aeq} (which in some documents is referred to as L_{eq} in units of dB(A) rather than L_{Aeq} in units of dB– the two terms have the same meaning) is a long term average of the amount of energy in the fluctuating sound, expressed in A-weighted decibels. In the case of a continuous, unchanging sound, its L_{Aeq} level is the same as its sound level, L_A, in dB(A). Since L_{Aeq} always relates to a specified time period, the notation $L_{Aeq,T}$ is used with T representing the time over which the index is determined.

3.2.7 If the noise measured using $L_{Aeq,T}$ does not vary in its energy average over time, then the value of $L_{Aeq,T}$ is actually independent of the value of T. However, if the noise is of finite length shorter than the value of T then increasing the length of T decreases the value of $L_{Aeq,T}$ according to 10 $\log_{10}$ (T_1/T_2) where T_2 is the longer time.

3.2.8 The L_{Aeq} scale is effectively a composite measure of sound level, duration and number of occurrences where there are discrete noise events. In the case of a noise environment which is entirely dominated by discrete events it can in fact be synthesised from measurements of the energy content of each event. This is done by integrating, over a time at least

as long as the event duration, the squared pressure, and taking the square root. The resultant index is known as Sound Exposure Level (or Single Event Level), denoted SEL. Because the integration is in units of seconds, SEL is equivalent to L_{Aeq} corrected for the hypothetical case that the noise has a duration of one second. SEL is also denoted as L_{AE}. The L_{AX} index is very similar, except that the integration takes place only of the part of the noise event that is not more than 10 dB below the maximum level.

3.2.9 The L_{Aeq} index is the descendant of earlier indices devised to address the problem of accounting both for loudness and number of occurrences. These earlier indices have tended to be developed in a source-specific way. For aircraft noise, research carried out at the time of the Wilson report[1] found that there was a reasonable correlation between the logarithmic average maximum noise level, with a correction for the number of events in a 12-hour day such that the correction increased by 4.5 dB for every doubling of the number of movements, starting with zero correction at 1 movement per 12 hours. This index was called the Noise and Number Index (NNI) and used the PNdB scale, and only events equal to or greater than 80 PNdB were included in the calculation of the index. The index was defined as the logarithmic average maximum noise level of aircraft noise events, plus 15 log N where N is the number of events in a 12-hour day minus the constant 80.

3.2.10 Because noise levels in PNdB could not, at the time of the introduction of NNI, be measured on a sound level meter and had to be calculated using a time-consuming process, a relationship between noise levels in PNdB and dB(A) was found to enable NNI to be estimated readily. The Wilson

[1] NOISE, Final Report, Committee on the Problem of Noise, Cmnd. 2056, London , HMSO 1963

Report included an appendix that considered the relationship between aircraft noise level in PNdB and dBA to be PNdB=dBA+13. The correction of 13 was the mean difference between the PNL and the dB(A) level from two studies in which the range of the difference was 8.8 to 19.5 dB. Throughout the life of the NNI index, although it was formally stated in terms of PNL, it was actually computed using the substitution PNdB=dBA+13.

3.2.11 Because NNI is now obsolete, no work has been done to study whether the spectra of modern aircraft, which are very different from those in flight in 1962 when the Wilson research was carried out, still give the relationship.

3.2.12 The NNI index was the basis of the original noise assessment when the airport was first proposed, and at the time of the changes which allowed the introduction of additional aircraft types the changeover from the use of NNI to L_{Aeq} was in progress, with both indices being referred to at the time.

3.2.13 The NNI index has no duration correction, so no matter how short or long a time the noise is at or near its maximum value the NNI value will be the same for the same log average maximum and number of movements. As a general principle, the more distant the aircraft, the longer the duration of the noise. The main criticism of $L_{Aeq,T}$ made at the T5 and G1 inquiries was that it may not be right to equate a doubling of number of events to a 3 dB increase in noise level or vice-versa, and when applied to aircraft, the effect of increases in numbers is masked when the noise levels of the events are reduced, eg by the introduction of quieter aircraft types. One of the several reasons that aircraft noise levels are lower now than in the 1960s when the NNI scale was devised is that rates of climb on departure have increased (large two-engined aircraft which were rare in the 1960s

have to have a greater rate of climb than four- or three-engined aircraft). Higher, and therefore more distant, aircraft cause maximum noise levels of longer duration because they reach their closest point more slowly. The noise scale used for aircraft certification, for L_{Aeq} computation, and for setting Quota Count values is duration sensitive, and this means that when the certificated noise level goes down by 3 dB (or the QC is halved), the maximum noise level as used in the NNI formula may go down by more than 3 dB. A reversion to the NNI-style of accounting for numbers and noise levels would not necessarily reveal an effect masked by L_{Aeq}.

3.2.14 For a given mix of aircraft, the assessment of the effect of numbers of movements was actually made slightly more sensitive by the switch from NNI to L_{Aeq} because NNI was assessed in 5 dB steps (equivalent to 2.154 times the number of similar events) whereas L_{Aeq} is assessed in 3 dB steps (equivalent to 1.995 times the number of similar events) so that the L_{Aeq} system is actually 8% more sensitive to numbers than was the NNI system.

3.2.15 Part of the layman's concern about the 3 dB trade-off is that twice the number of identical aircraft noise events produces a change in the L_{Aeq} index that is not as much as twice the loudness. It takes an increase in numbers of the order of eight fold to cause a rise in L_{Aeq} that, for a continuous sound, would be perceived by most people as a doubling in loudness and this appears to be counterintuitive. However, extensive research has been carried out into the trade-off between numbers and noise levels. In the UK, the L_{Aeq} index was adopted following the 1985 report of the United Kingdom Aircraft Noise Index Study (ANIS). Fields, in a study which examined more than 70 aircraft and railway noise surveys, found that although estimates of the impact of the number

of events differ considerably, none is significantly greater than the impact implicit in the L_{Aeq} index. Miedema, Vos and de Jong found that the trade-off between the levels of events assumed by a metric based on L_{Aeq} is approximately correct for the prediction of annoyance caused by aircraft noise in a large study conducted around Schiphol. Vogt found that in a laboratory assessment the effect of number was less than in the L_{Aeq} index.

3.2.16 The L_{Aeq} scale is very logical to the extent that, if two aircraft noise events occur almost at the same time, the value of the L_{Aeq} index will be the same if the two events overlap and form effectively one noise peak, or if they are sufficiently separated to cause two separate peaks. By contrast, the NNI index would jump by a step of 1.5 units at the point where separation between the two events leads to two separate peaks.

3.2.17 The assessment of aircraft noise moved from the use of NNI to $L_{Aeq\ 24}$ hour following the results of the Aircraft Noise Index Study (ANIS). However, the use of a 24 hour index of this kind did not survive a process of rationalisation to try to bring noise indices more into line with each other, and when the switch from NNI to L_{Aeq} was made, it was $L_{Aeq\ 16h}$ that was substituted for NNI.

3.2.18 The making of the Environmental Noise Directive, the "END", (2002/49/EC) brought with it a variant of the L_{Aeq} index intended to address the increased annoyance/disturbance value of noise at night, and to a lesser extent in the evening. The day-evening-night level denoted L_{den} is L_{Aeq} computed over 24 hours, but with noise between 2300 and 0700 increase by the additional of 10 dB and noise between 1900 and 2300 increase by the addition of 5 dB. This index is used

for the preparation of the statutory noise maps required by the END.

3.2.19 The way in which the L_{Aeq} index is used in Updated Environmental Assessment makes it highly sensitive to small changes. The area within a noise contour, and therefore counts of populations and changes in populations are not expressed on a logarithmic scale, and a 3 dB change has a very marked effect on population and area counts as can be seen from the tables in Appendix 8.3 of the UES. When conclusions in an ES are expressed in terms of populations or contour areas, a doubling of movement numbers tends to cause an increase in contour area or population very much greater than twofold.

4. HISTORIC OVERVIEW

4.1 The 1983 Public Inquiry

4.1.1 In January 1983 I prepared a report for the London Docklands Development Corporation (LDDC) into a proposal for an aerodrome for use by short take-off and landing aircraft known as a STOLport. The proposed operation was based on operations by the de Havilland Dash 7 (DHC-7) or aircraft which have noise characteristics comparable with or better than the Dash 7, with up to 100 movements per day between 06:30 and 23:00. The report considered the likely impact of noise on the surrounding population and on the desirability of imposing limitations and control, such as might be achieved by the use of a Section 52[2] agreement. The conclusion of the report was that the impact of noise from aircraft in flight would be confined to a small area to the south west of the runway. In this area about 700 people would suffer annoyance that was moderate, or greater. The

[2] of the Town and Country Planning Act 1971

report found that the highest impact would be from ground-based activities. It was recommended that a Section 52 Agreement should be used to limit the types of aircraft which may be operated from the STOLport according to their noise characteristics and to limit the number of permissible movements and hours of operation. A public inquiry was held,in which I was expert witness for the LDDC. My evidence was that overall, the Leq $_{16h}$ due to airborne, taking off and landing aircraft would vary from 53 to 68 across the residential area and the ground noise would not exceed 60. In the residential area to the south-west of the site the previous level of about 55 would be increased to about 60 to 63 dB Leq. A draft Section 52 Agreement was agreed with the applicants. In a letter of 14 August 1984 it was indicated that the Secretary of State for the Environment was disposed to adopt the Inspector's suggestion that there should be a more direct simple and easily understood method of controlling noise than the noise contour level on which the draft Section 52 Agreement was based.

4.1.2 The inspector, in his report, had expressed the view that "the STOLport operations should be controlled to ensure that the surrounding noise climate is no worse than that resulting from 100 Dash 7 movements in a day. This could be achieved by identifying 2 categories of acceptable aircraft types. In simple terms, category 1 would include STOL aircraft of equal or less noise than the Dash 7 and category 2 would include those STOL aircraft noisier than the Dash 7 but no noisier than the Twin Otter. The total weekday ATMs would be linked to 100 category I aircraft movements or a mixture of categories 1 and 2 according to a sliding scale table."

4.1.3 Following a period of consultation, a control regime was implemented in which there were two classes of aircraft. The

first class was designed to accommodate the Dash 7, and the second class would accommodate the Twin Otter. Because the latter was noisier than the first, it was to count as 3.63 aircraft for every movement it made in order to offset the increase in the noise contour value caused by its additional noise. The noise contours on which this was based was the Noise and Number Index, NNI, the predecessor to Leq (now denoted $L_{Aeq\ 16h}$) used for the description of airport noise. The Section 52 Agreement was designed to limit the size of the 35 NNI contour and houses within the 35 NNI contour were to be offered noise insulation.

4.2 The 1989 Planning Application

4.2.1 On 12 September 1989 London City Airport submitted two planning applications, one for the extension of the runway from 1030m (actually two overlapping 762m runways) to 1199m with two starter strips, and to amend the then existing noise control regime to allow the operation of BAe 146 aircraft and additional 2-engined turboprops. The applicants also sought an extension of the operating day from 2200 to 2300 and an increase in the number of movements from 120 per day (40 at weekends) to 130 per day and from 30,160 per annum to 36,500.

4.2.2 This application led to the conclusion of a supplemental Section 52 Agreement which contained an extended Aircraft Noise Categorisation system, that instead of the previous two categories of aircraft now had five, with the highest category having a noise factor of 1.26, and lower categories reducing the noise level by 3 dB and the noise factor by half. This is the original of the ACR system currently applicable to London City Airport. As part of the ACR regime, the airport was required to submit an annual categorisation report for

the purpose of assigning noise categories to each type of aircraft in operation at the airport.

4.2.3 The ACR system sought to control noise to a new set of NNI contours in which the 42NNI contour lay approximately over the previous 35 NNI contour.

4.2.4 The inspector, in his report on the public inquiry in 1990-1, concluded that "The expansion of the airport would be of benefit to the economy of east London and the City. It would assist in the regeneration of Docklands and in redressing the imbalance between west and east London. To that extent the proposals accord with policies and place for the area. There are however disadvantages, most notably the increase in noise levels and the effect on the design of ELRC [the East London River Crossing then proposed but subsequently abandoned]. The increase in noise would be most significant in residential areas in the vicinity of the airport but would be unlikely to deter the redevelopment of sites in the Royal Docks or the implementation of proposals in Thamesmead to the east." He concluded that if the airport continued to cater mainly for the business sector and its operations were strictly controlled, the disadvantages of the proposed expansion would be outweighed by the benefits. The Secretary of State, in his decision letter, said he had carefully considered the disadvantages of the proposals, the most notable of which in his opinion was the increase in noise levels and the effect on the Thames Bridge design. On the question of noise, the Secretary of State agreed with the inspector that the noise management scheme to be agreed under the section 106 agreement [actually a Supplemental Section 52 Agreement] in conjunction with the conditions suggested by the Inspector would ensure that the effects of the additional noise resulting from the proposals will not be excessive.

4.2.5 Planning permission was granted by the Secretary of State in September 1991. The Supplemental Section 52 Agreement varied the previous Section 52 Agreement so as, among other things, to introduce a requirement that the aircraft categorization scheme, which remains current prior to the proposed revisions in 2016, would not exceed 36,500 – the same number as the limit on air transport movements.

4.3 The 1997 Planning Application

4.3.1 In 1997 London City Airport made an application to vary Condition 13 to increase the limit on the permitted number of air transport movements from 36,500 per year to 73,000 per year with an increase in the maximum number of daily movements from 130 to 240 (weekdays) and from 40 to 120 (weekends). A previous planning application had sought to increase the limit on movements at weekends and bank holidays on a temporary basis. The numbers of movements which were not ATMs were minimal.

4.3.2 The accompanying Environmental Statement found that if the proposed variation in planning condition 13 were approved, and if full usage of the increased aircraft movements were implemented, an increase of 2-3 dB(A) in airborne noise in the area would occur over that for which planning permission was approved in 1991.

4.3.3 The LDDC officers' report concluded that "following submission of the application and the carrying out of extensive public consultation thereon, it became clear that there was concern notably from residents in the locality over the noise consequences of the proposed expansion, particularly over weekend, holiday and early morning flights and the identification of areas affected by noise." Following negotiations with the LDDC and Newham during which the

Airport were reported to have responded positively to these concerns, amendments to the proposals submitted were agreed and these were considered by both the LDDC and LB Newham as both statutory authorities and signatories to the Agreement to strike what was considered to be an appropriate balance between the needs of the Airport to be able to expand, within the defined parameters, whilst protecting the amenities of existing and incoming residents and businesses.

4.3.4 The application was granted in 1998 with the addition of Condition 15 that between 06.30 and 06.59 hours on Monday to Saturdays (excluding Bank Holidays and Public Holidays when the airport will be closed between these times) the number of air transport movements shall not exceed 6 on any day.

4.3.5 The previous Section 52 Agreement was replaced by a new Section 106[3] Agreement. The Section 106 agreement provided that the number of noise factored movements, calculated according to the aircraft categorization scheme would not exceed 73,000 – the same number as the limit on air transport movements.

4.4 The 2007 Planning Permission

4.4.1 The daily limits were varied by a planning permission granted in 2007 for a three year temporary period which expired on 11 July 2010. This allowed 360 daily movements with fewer movements at weekends and bank holidays, while retaining the overall limit of 73,000 noise factored movements.

[3] of the Town and Country Planning Act 1990

4.5 The 2009 Planning Application

4.5.1 Planning permission was granted for variation of conditions 13 and 15 of the outline planning permission no. N/82/104 dated 23 May 1985, as previously varied by the Secretary of State on the 26thSeptember 1991 and by the London Borough of Newham on the 21st July 1998 and 11th July 2007, to allow up to 120,000 total aircraft movements per annum (number of total movements in 2006 was 79,616) with related modifications to other limits including noise factored movements.

4.5.2 The number of noise factored movements was increased from 73,000 to 120,000. The officers' report found that there would be an increase in noise level from road transport serving the airport operations on the ground at the airport and planes taking off and landing. There would be a doubling of the number of properties within the 57 dB L_{Aeq} contour and a tripling if new developments were included. The contours also encompassed outdoor amenity areas and schools. The conclusion was that if planning permission were to be granted a series of mitigation measures to limit the noise impacts should be used.

5. THE AIRCRAFT CATEGORISATION REGIME

5.1 The principle of Aircraft Categorisation

5.1.1 While noise limits at a number of airports in the UK are couched in terms of the area of a specified noise contour, and the original 1983 draft S52 Agreement was based on limiting the size of the 35 NNI contour, there are drawbacks to this approach. These include the fact that noise contours in the UK are based on aircraft movement numbers in the summer months only (mid-June to mid-September), and that a contour-based control is largely retrospective. The

reason for this is that noise contours are produced using historic data when the movement information becomes available after mid-September, and breach of a planning control based on such contours is not discovered until some time after it has occurred. To attempt enforcement on the basis of forecast contours would be subject to difficulty. Furthermore, whereas noise contours at the designated airports (Heathrow, Stansted and Gatwick) are calculated by the ERCD section of the CAA using its own Ancon noise model, at other airports they are calculated by contractors appointed by the airports and there are different ways in which the Integrated Noise Model (INM), which they usually use, can be applied leading to some potential uncertainty. The Secretary of State in 1984 took the view that a more direct, simple and easily understood method of controlling noise was needed at LCY, and effectively the method adopted separated out the two input parameters of noise contours equations, namely numbers of aircraft and their noise levels. Since the original S52 agreement, the L_{Aeq} index has come into universal use for airport noise contour generation, and this index follows the principles set out in section 3 above such that the value of the index increases by 3 units for every doubling of aircraft numbers, and vice versa. It follows that, to maintain the same level of the L_{Aeq} index, if aircraft operated which are 3 dB noisier then their numbers must be halved to maintain the same L_{Aeq} value. This is known as the equal energy principle.

5.1.2 The original noise categorisation system was extended at the time of the 1991 planning permission to incorporate the equal energy principles of the L_{Aeq} index, rather than the different trade-off between noise and numbers which was the basis of the NNI index. It relates, however, solely to noise on departures as measured at the four monitoring

locations installed at the Airport. The effect of the regime is broadly to hold constant the value of the L_{Aeq} index, although strictly speaking that is true only at the four noise monitoring locations. These are the locations which are used to determine the noise levels of aircraft for the purpose of categorisation, where departure noise tends to dominate.

5.1.3 Conditions 7 and 8 planning permission of 07/01510/VAR granted on the 9th July 2009, control the Airport with a cap of 120,000 noise factored movements using the current system as defined in the existing S106. The S106 also includes a review of that system and the introduction of the Aircraft Categorisation Review (ACR), which would also comply with the Aerodrome Regulations 2003. The ACR was formally submitted in October 2014 for consideration (Application; 14/02819/S106). The submission is based on the Quota Count System. The Quota Count System is used to control night time noise limits at other Airports such as Heathrow and Gatwick. The data can be transferred over to controlling day time noise at LCA. A review has taken place which will involve a budget for annual movements based on noise levels of each individual aircraft that uses the Airport similar in a way to the current system, however with the Quota Count System the budgets are scaled down depending on how quiet the aircraft are.

5.1.4 At LCY aircraft approach on a 5.5 degree glideslope as opposed to 3 or 3.2 degrees at conventional airports, their departure profiles are steeper. On departure, aircraft using runway 27 (westerly departures) are required to maintain a minimum 7.20% climb gradient to 275 feet and on runway 09 a 6.76% climb gradient to 1102 feet. For all aircraft the approach glideslope is significantly higher than the 3 degree standard used for ICAO certification and at the designated airports. While some aircraft normally use a climb gradient

at least as high as 7.2%, the normal climb gradient for others is less.

5.1.5 In order to adapt the Quota Count system for use as LCY it is necessary to address the differences between aircraft noise levels when a 3 degree glideslope if being flown on approach, and those resulting from the use of a 5.5 degree glideslope, and the steeper approach profile means that aircraft are higher and therefore quieter during approach.

5.1.6 The proposed new System will centre on the virtual recertification of the Quota Count System using the INM model. This model is used by the Airport to calculate its contours. Any new planning permission under the current proposals should re-impose the existing controls and conditions controlling aircraft noise and the 120,000 noise factored movements cap. The new system will run for 12 months with the current system to understand and ensure that whatever system that is introduced is fit for purpose and works for both the Council and the Airport.

6. THE CURRENT APPEAL PROPOSALS

6.1 Chapter 8 of the UES concludes that average mode noise levels will increase by 0.5 to 1.0 dB in the $L_{Aeq,16h}$ metric due to the proposals. This increase is due to an increase in ATMs from 97,000 to 111,000. The changes in average mode $L_{Aeq,16h}$ contour areas and populations respectively, excluding the effect of any permitted developments, would involve an increase in the number of people into the 57 dB $L_{Aeq,16h}$ contour, marking the approximate onset of significant community annoyance under the Aviation Policy Framework, from 27,800 to 34,100.

6.2 For comparison with the impact of the airport since the first planning permission, the 57 dB L_{Aeq} contour, when the changeover was introduced by the CAA, was taken as

approximately equivalent to the former 35 NNI contour. However, at LCY the 55 dB L_{Aeq} contour was originally slightly larger than the 35 NNI contour. My 1983 report found that the population within the 55 dB L_{Aeq} contour was approximately 500, involving approximately 200 dwellings.

6.3 The report of the Airport's noise consultant in 1997 associated with the planning application reported an estimate of 190 dwellings in the 57 dB L_{Aeq} contour in 1997, and forecast in increase to 413 dwellings in 2005 without the development, 1813 with the development. The report predicted an increase of 2-3 dB(A) over that for which planning permission was granted in 1991.

6.4 Since the airport was first permitted there has been an increase in the size of the noise contours and consequently an increase in the noise impact. The decision makers including Secretaries of State, the London Docklands Development Corporation and the London Borough of Newham considered that the benefits of the developments which led to the increase in noise outweighed the noise disbenefit.

6.5 The view of the London Borough of Newham was that it was a finely balanced decision. The negative impacts such as greater disturbance in the peaks, construction noise and building over the dock could be mitigated against through conditions or a s106 agreement. However some impacts such as air noise to open spaces could not be mitigated. Regeneration was considered a positive impact arising from the proposal; locally, regionally and nationally. 1500 new jobs were associated with the proposals, both direct and indirect. A large amount, secured through a s106, can be secured for local residents. The Environmental Statement assessed that the proposal will create £51 million gross added for the area.

7. CRITIQUE OF THE APPELLANT'S NOISE ASSESSMENT

7.1 The Amec Foster Wheeler report of January 2015, to which I was a contributor, concluded that the impacts presented in the ES indicate that the development would result in adverse noise effects and some significance was attached to the impacts. In the case of airport operations, although not relevant to the assessment of the CADP proposals, the report concluded that the ES demonstrated that there will be deterioration in the noise environment over the period 2012 to 2023 as the airport reaches its current realistic and permitted capacity. It was identified that there were some areas where further information would help.

7.2 The ES was updated in September 2015 to account for developments in the field of planning and noise. The UES also includes an updated baseline and accounts for updates to the future aircraft movement forecasts, as well as construction programme changes.

7.3 The UES develops the concepts of LOAEL and SOAEL introduced by the NPSE and further developed by PPG Noise. The conclusions with regard to air and ground noise were that more people are predicted to become annoyed by aircraft noise both with and without the CADP. The estimated increase in the number of people likely to be highly annoyed as a result of air noise in 2025, should the proposed CADP proposal proceed, is 0.9% when compared to the Without Development case in 2025. There will be continued restriction on flights outside the daytime periods and therefore there are no residual effects. Some dwellings will experience a reduction in noise due to the screening by the development; the 16m terminal extension will act as a sound barrier, while others will see an increase due to the proximity of the new stands. The small number exposed to adverse impacts will be provided with sound insulation either from the Airport (where an offer of treatment has been accepted) or as required

by planning condition, therefore residual ground noise impacts are likely to be negligible to minor adverse.

7.4 I have concluded that the UES adequately addresses the relevant noise issues, that appropriate mitigation is proposed and that the conclusions are supportable.

8. CONSIDERATION OF THE RELEVANT PARTS OF THE STATEMENT OF MATTERS

Matter ii)

8.1 The National Planning Policy Framework gives effect to the Noise Policy Statement for England which requires mitigation and minimisation of noise between LOAEL and SOAEL, and avoidance of SOAEL. It is explained in the NPSE that the aims of the policy do not mean that adverse effects cannot occur but that effort should be focused on minimising such effects. The Planning Practice Guidance advises that noise should not be considered in isolation, separately from the economic, social and other environmental dimensions of a proposed development. While the latter topics are outside the scope of my evidence, I note the views of LB Newham in paragraph 6.5 above. As explained above, Secretary of State decisions have made clear that avoidance of SOAEL is achieved by noise insulation. The Airport currently operates a Sound Insulation Scheme (SIS) comprising a two tier system. Residential and Community Buildings become eligible under the scheme, subject to when they were built, when first exposed to air noise at the First Tier Eligibility Criterion of 57 dB $L_{Aeq,16h}$. Additional mitigation is offered at air noise exposure levels of 66 dB $L_{Aeq,16h}$. The Airport proposes under CADP to improve the First Tier of works by providing thermal double glazing to eligible existing single glazed properties in addition to acoustic ventilation and to introduce an 'Intermediate Tier' of treatment at 63 dB $L_{Aeq,16h}$ comprising an offer of secondary glazing and acoustic treatment, or a contribution of £3,000

towards high performance acoustic double glazing and acoustic vents. There will be an upgrade of the Second Tier to further protect those most affected by noise with secondary glazing or a 100% contribution towards high acoustic performance thermal double glazing as well as sound insulating ventilators. The current and future Sound Insulation Schemes are presented in Table 8.40 of the UES. Thus the scheme not only operates at SOAEL and above, but also mitigates in part of the region between LOAEL and SOAEL. For residents affected below the level of Tier 1 eligibility, mitigation and minimisation, over and above the current noise controls implemented by the airport set out in 8.289 of the UES, will take the form of expansion and upgrading of the Noise Monitoring and Flight Track Keeping System, under the Airport's Noise Monitoring and Mitigation Strategy (NOMMS).

8.2 Policy 7.15 of the London Plan focusses on reducing and managing noise, improving and enhancing the acoustic environment and promoting appropriate soundscapes, as well as implementing the aims of the NPSE. The emphasis in the London Plan is slightly more on reducing noise than the NPPF and NPSE. In this case the noise reduction is achieved by the enhancement of the noise insulation scheme by the introduction of the Intermediate Tier of noise insulation, and the enhancement of the ACR scheme to include sideline and approach noise as well as departure noise as in the current ACR. The only respect in which the Mayor of London's case is that the appeal proposals do not conform to the London Plan is that the application does not fully acknowledge or appropriately mitigate its adverse noise impacts. I deal with this point in 9.5.1 below.

8.3 Proposed Condition 31 [CD7.3.6] introduces a new control to the effect that the area enclosed by the 57 dB(A) $L_{Aeq,\ 16h}$ Contour shall not exceed 9.1 km^2.

8.4 Within five years of the Commencement of Development a Noise Contour strategy shall be submitted to the Local Planning Authority for approval in writing which defines the methods to be used by the Airport operator to reduce the area of the Noise Contour by 2030.

8.5 Thereafter the Airport shall be operated in accordance with the approved Noise Contour strategy.

Matter iii)

8.6 The likely environmental effects of constructing the development are dealt with in the evidence of Mr Robin Whitehouse. With regard to air noise, the underlying limit on noise imposed by the ACR system will remain unchanged. The increases in noise identified in the UES are caused by greater uptake of already permitted noise-factored movement limits.

Matter iv)

8.7 The UES has taken account of the latest best practice, both in terms of identification of LOAEL and SOAEL and implementation of the NPSE, but also in considering additional noise metrics such as N 70 and L_{den} as suggested by the APF and the Airports Commission. The function of additional noise metrics is to provide the noise information in slightly different ways to assist in its interpretation and this has been done. They are not directly used in any current government policy. The UES has appropriately addressed all relevant noise aspects.

9. OBJECTIONS FROM RULE 6 PARTIES

9.1 HACAN East

9.2 HACAN East make the following points on noise in their statement of case

9.2.1 HACAN East (HE) HE argues that LCY has underestimated the true number of people impacted by noise and in, doing so, has failed to adequately follow emerging Government policy. It has also failed to take account of the cumulative impact of both Heathrow and London City airports and those under its flight paths.

9.2.2 HE quotes the Aviation Policy Framework as stating that: 'We will continue to treat the 57dB L_{Aeq} 16 hour contour as the average level of daytime aircraft noise marking the approximate onset of significant community annoyance. However, this does not mean that all people within this contour will experience significant adverse effects from aircraft noise, nor does it mean that no-one outside of this contour will consider themselves annoyed by aircraft noise'. LCY propose no measures to deal with those affected outside the contour.

9.2.3 HE notes that Airports Commission also recognised that there is no firm consensus on the way to measure the noise

impacts of aviation. The noise modelling work commissioned by the Airports Commission used a variety of metrics: 57L_{Aeq}: 55Lden; N60; and N70. They did so in order to get a more complete picture than the 57L_{Aeq} on its own would have done. By failing to use a range of metrics, LCY has only provided a partial picture of the impact on local communities, restricted by its rigidity to the 57L_{Aeq} metric.

9.2.4 HE states that Average noise exposure contours are a well established measure of annoyance and are important to show historic trends in total noise around airports. However, the Government recognises that people do not experience noise in an averaged manner and that the value of the L_{Aeq} indicator does not necessarily reflect all aspects of the perception of aircraft noise. For this reason we recommend that average noise contours should not be the only measure used when airports seek to explain how locations under flight paths are affected by aircraft noise.

9.2.5 HE states that the Government encourages airport operators to use alternative measures which better reflect how aircraft noise is experienced in different localities, developing these measures in consultation with their consultative committee and local communities. The objective should be to ensure a better understanding of noise impacts and to inform the development of targeted noise mitigation measures.

9.2.6 HE asserts that is requirement by the European Commission that 55Lden is the metric used as it is regarded as giving a more accurate picture of aircraft noise than the 57 L_{Aeq} contour.

9.2.7 HE expresses the view that they consider that LCY has not fully complied with the Government guidance.

9.2.8 HE states that London City Airport has not used the model required by the CAA if an airport is to make an airspace change in the UK and as is also required in the current DfT Air Navigation Guidance document, which is the ANCON 2.3 model.

9.2.9 HE assert that he LCY FAA INM model can produce a very different size and shape of noise contours from the CAA required model.

9.3 Response to noise case of HACAN East

Cumulative impact of Heathrow and London City Airport

9.3.1 Adding noise from aircraft approaching and departing from Heathrow to the contours at LCY would not make a material change to the contours. HE assert, however, that other noise indices should be used besides the standard $L_{Aeq\ 16h\ contours}$, and this is further commented upon below. Including noise from Heathrow movements would not make a material change to these other indices. There is a potential effect on the N60 index (the number of aircraft noise events exceeding 60 dBA), but the marginal change in N60 resulting from adding the appeal proposals to the baseline would be smaller than the effect on the other indices if the baseline includes noise events from Heathrow related aircraft movements.

Other noise indices

9.3.2 The UES presents L_{den}, L_{Amax} and N 70 contours in addition to $L_{Aeq\ 16h}$ so therefore the failure alleged by HE has not occurred.

LCY has not used the CAA model

9.3.3 CAP 725 states in Appendix B, Section 4 at paragraph 46 that "The contours **should** be produced using either the UK

Aircraft Noise Contour Model (ANCON) or the US Integrated Noise Model (INM) but ANCON must be used when it is currently in use at the airport for other purpose." ANCON is not currently in use at LCY. There is no failure to use the correct model. The principal difference between ANCON and the INM, which use the same basic algorithms, is that ANCON uses an airport-specific database of aircraft noise levels. LCY calibrates its INM database by reference to noise monitoring at LCY, and therefore if ANCON and INM contours were both to be produced for LCY I would expect them to be very similar.

9.4 Mayor of London

9.4.1 The Mayor's case is that the application does not fully acknowledge or appropriately mitigate its adverse noise impacts.

9.4.2 The case is centred on the fact that the noise contours used to determine eligibility for either the Tier 1 or Tier 2 noise insulation schemes use the average of the modes of operation of an airport over the 92 day period between 16 July and 15 September to create a hypothetical cumulative representation of the distribution of aircraft noise based on the proportion of time the airport is on westerly or easterly modes during this period. However, the typical annual modal split at London City Airport is between 70% westerly and 30% easterly modes; i.e. in any year the minimum total duration of noise exposure under the least common easterly mode is more than the three months used to define the summer average of the modes. In reality, the noise contours of the individual modes of operation extend over different areas compared to the contours derived from averaging the modes, with the westerly and easterly single modes extending beyond the boundary of the combined average of

both these modes in westerly and easterly directions; and shrinking inside this boundary in the easterly and westerly directions respectively.

9.4.3 According to the Mayor, there are therefore significant areas falling outside the Appellant's hypothetical summer averaged mode whose inhabitants will not be offered noise insulation by the Appellant, but who will nonetheless be exposed to the qualifying noise level thresholds for noise insulation for a substantial majority of the year both during the westerly mode of operation and for a significant minority of the year under the easterly mode of operation. The Appellant's preferred noise mitigation measure (summer average of the airport's modes of operation), therefore does not properly reflect the real world noise impacts of its operations, nor does it offer appropriate mitigation to all the people, premises and noise sensitive uses that would be adversely affected if planning permission were granted for the current proposals e.g. dwellings, schools, educational establishments, and community facilities.

9.4.4 The Mayor's case is that the application does not comply with the noise parts of the Aviation Policy Framework (APF), National Planning Policy Framework (NPPF) and the Noise Policy Statement for England (NPSE).

9.5 Response to noise case of the Mayor of London

Single mode contours

9.5.1 The technical part of the Mayor's case on noise is limited to the assertion that single mode contours should be used for the purpose of identifying eligibility for noise insulation.

9.5.2 The use of single mode contours is not linked to any evidence of dose-response relationships, and therefore lacks sufficient scientific underpinning to use it as a means of

determining the likely community response to any particular level of noise. Single mode contours fail to reflect the overall experience of noise at any given receptor as it includes only periods when that receptor is being overflown. It is not correct to say that inhabitants will not be offered noise insulation by the Appellant, but who will nonetheless be exposed to the qualifying noise level thresholds for noise insulation for a substantial majority of the year. The threshold is not a noise level threshold. It is a threshold based on a composite index taking account of noise level and number of events over a three month period, and it was set on the basis of the known response to populations living around airports to noise exposure taking account of the proportion of the year for which they were exposed to different noise levels. The noise levels which are part of the L_{Aeq} index computation are not so high that the length of time over which the exposures occur is irrelevant. Frequent overflights are more annoying than occasional overflights and noise indices, including those on which noise insulation schemes are based, correctly take this into account.

9.5.3 Use of single mode contours makes it impossible to relate the noise insulation thresholds to the triggers for insulation and compensation in the APF, which are based on the average-mode L_{Aeq} 16 hr metric.

Noise Policy

9.5.4 Noise policies in the APF and the NPPF are all linked to the NPSE, and guidance relating to the NPSE is expanded in the Planning Practice Guidance (PPG). The PPG states:

"Can noise override other planning concerns?
It can, but neither the Noise Policy Statement for England nor the National Planning Policy Framework (which reflects

the Noise Policy Statement) expects noise to be considered in isolation, separately from the economic, social and other environmental dimensions of proposed development."

9.5.5 The NPSE requires noise between LOAEL and SOAEL to be mitigated and minimised, and noise at or above SOAEL to be avoided. The meaning of avoidance was made clear in the Secretary of State's decision on the Thames Tideway Tunnel DCO which makes it clear that SOAEL is aligned with established noise insulation thresholds. The noise insulation thresholds at LCY are set at materially lower noise levels than those in use at other airports or recommended by the APF, and Tier 1 insulation operates at a lower noise level than the SOAEL identified in the UES, which agrees with the figure given in the Mayor of London's evidence to the public inquiry into works to enable full runway alternation on easterly operations at Heathrow. It is only 3 dB above LOAEL. LCY operates many noise management regimes to mitigate and minimise the effects of noise between LOAEL and SOAEL.

10. CONCLUSIONS

10.1 My conclusions are firstly that having regard to the position of LB Newham concerning the economic and social dimensions of the proposed development the proposals would be consistent with the National Planning Policy Framework and with policies in the London Plan, and secondly that the likely environmental noise effects of operating the development have been adequately assessed in the Updated Environmental Statement.

11. WITNESS DECLARATION

I hereby declare as follows:

11.1 This proof of evidence includes all facts which I regard as being relevant to the opinions that I have expressed and that the inquiry's attention has been drawn to any matter which would affect the validity of that opinion.

11.2 I believe the facts that I have stated in this proof of evidence are true and that the opinions expressed are correct.

11.3 I understand my duty to the inquiry to help it with matters within my expertise and I have complied with that duty.

APPENDIX I

1.1 National Policy and Guidance

1.0 National Planning Policy Framework

1.1.1 The National Planning Policy Framework (NPPF) **[CD7.1.8]** was published in March 2012 and replaced Planning Policy Guidance Note 24: 'Planning and Noise' (PPG24).

1.1.2 The NPPF paragraph 109 states that the planning system should contribute to and enhance the natural and local environment by:

1.1.3 "preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, water or noise pollution or land instability".

1.1.4 The NPPF does not define what it considers to be an 'unacceptable risk' or an 'unacceptable level'. To this end, it is the role of assessors and decision makers to determine what is and is not acceptable in each case.

2.0 Noise Policy Statement for England

1.1.5 The Noise Policy Statement for England (NPSE) **[CD7.1.6]** published in 2010 sets out the long term vision of Government noise policy. The Noise Policy Vision is to:

1.1.6 "Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development"

1.1.7 The Noise Policy Statement for England contains the following aims:

1.1.8 "Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development::

1.1.9 1. Avoid significant adverse impacts on health and quality of life;

1.1.10 2. Mitigate and minimise adverse impacts on heath and quality of life; and

1.1.11 3. Where possible, contribute to the improvement of health and quality of life."

1.1.12 The Statement refers to two established concepts from toxicology that are currently being applied to noise impacts, for example by the World Health Organization, namely the *"No Observed Effect Level"* (NOEL) and the *"Lowest Observed Adverse Effect Level"* (LOAEL). This is the level above which adverse effects on health and quality of life can be detected. It also introduces the concept of *"Significant Observed Adverse Effect Level"* (SOAEL). This is the level above which significant adverse effects on health and quality of life occur.

1.1.13 The first aim of the NPSE states that significant adverse effects on health and quality of life should be avoided while also taking into account the guiding principles of sustainable development. The second aim of the NPSE refers to the situation where the impact lies somewhere between the Lowest Observed Adverse Effect Level (LOAEL) and the Significant Observed Adverse Effect Level (SOAEL). It requires that all reasonable

steps should be taken to mitigate and minimise adverse effects in health and quality of life while together taking into account the guiding principles of sustainable development. This does not mean that adverse effects cannot occur but that effort should be focused on minimising such effects. The third aim seeks, where possible, to improve health and quality of life through the proactive management of noise, recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society.

1.1.14 The NPSE observes (para 2.22) that it is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently the SOAEL is likely to be different for different noise sources, and for different receptors and at different times.

1.1.15 The NPSE is directly referenced by the Aviation Policy Framework discussed below. The Aviation Policy Framework considers that its objective with respect to noise is consistent with the aims and objectives of the NPSE.

3.0 Planning Practice Guidance

1.1.16 The Planning Practice Guidance (PPG) was issued in March 2014 by the Department for Communities and Local Government (DCLG) and updated in December 2014.

1.1.17 This guidance introduced the concepts of NOAEL (No Observed Adverse Effect Level), and UAEL (Unacceptable Adverse Effect Level). NOAEL differs from NOEL in that it represents a situation where the acoustic character of an area can be slightly affected (but not such that there is a perceived change in the quality of life). UAEL represents a situation where noise is 'noticeable', 'very disruptive' and should be 'prevented' (as opposed to SOAEL, which represents a situation where noise is 'noticeable' and 'disruptive', and should be 'avoided').

1.1.18 The guidance explains in paragraph 009 that the management of the noise associated with aircraft and airports is considered specifically by the Aviation Policy Framework (APF) **[CD7.1.10]**.

1.2 The Aviation Policy Framework

1.2.1 The Aviation Policy Framework sets out the Government's overall policy on aviation noise which is:

1.2.2 "3.12 to limit and, where possible, reduce the number of people in the UK significantly affected by aircraft noise"

1.2.3 The policy states (Paragraph 3.13) that this is consistent with the Government's Noise Policy as set out in the NPSE.

1.2.4 Along with the its overall objectives, the APF also sets out the Government's policy and position with respect to aircraft noise quantification, management and mitigation measures, including sound insulation and compensation schemes.

1.2.5 It makes clear recommendations as to what the Government expects airport operators to provide with respect to mitigation and insulation, and provides advice and guidance on what other measures can be used to minimise aircraft noise.

4.0 Assessment and Quantification of Aircraft Noise

1.2.6 With regard to the assessment aircraft noise, the APF reaffirms the use of the $L_{Aeq, 16h}$ metric and the value of 57 dB as the *"approximate onset of significant community annoyance"*. The APF states (3.17)

1.2.7 *"We will continue to treat the 57dB $L_{Aeq,16\ hour}$ contour as the average level of daytime aircraft noise marking the approximate onset of significant community annoyance. However, this does not mean that all people within this contour will experience significant adverse effects from aircraft noise. Nor does it mean that no-one outside of this contour will consider themselves annoyed by aircraft noise."*

1.2.8 The APF add at 3.19:

1.2.9 *"Average noise exposure contours are a well established measure of annoyance and are important to show historic trends in total noise around airports. However, the Government recognises that people do not experience noise in an averaged manner and that the value of the L_{Aeq} indicator does not necessarily reflect all aspects of the perception of aircraft noise. For this reason we recommend that average noise contours should not be the only measure used when airports seek to explain how locations under flight paths are affected by aircraft noise. Instead the Government encourages airport operators to use alternative measures which better reflect how aircraft noise is experienced in different localities[96] developing these measures in consultation with their consultative committee and local communities. The objective should be to ensure a better understanding of noise impacts and to inform the development of targeted noise mitigation measures."*

1.2.10 Footnote 96 states:

1.2.11 *"Examples include frequency and pattern of movements and highest noise levels which can be expected."*

5.0 Noise Insulation Schemes

1.2.12 With regard to noise insulation schemes, the APF is clear on what the Government expects Airport operators to provide as a minimum for residential and community buildings.

1.2.13 Paragraph 3.37 of the APF states that:

1.2.14 *"The Government also expects airport operators to offer acoustic insulation to noise-sensitive buildings, such as schools and hospitals, exposed to levels of noise of 63 dB $L_{Aeq,16h}$ or more. Where acoustic insulation cannot provide an appropriate or cost-effective solution, alternative mitigation measures should be offered."*

1.2.15 It goes on to state in Paragraph 3.39 that where airports are considering development that would result in an increase in noise, airports should:

1.2.16 *"… review their compensation schemes to ensure that they offer appropriate compensation to those potentially affected. As a minimum, the Government would expect airport operators to offer financial assistance towards acoustic insulation to residential properties which experience an increase in noise of 3dB or more which leaves them exposed to levels of noise of 63 dB $L_{Aeq,16h}$ or more."*

1.2.17 The APF is clear that any proposals for a nationally significant airport development, such as airport expansion would require specific

consideration with respect to noise insulation schemes. Paragraph 3.40 states:

1.2.18 *"Any potential proposals for new nationally significant airport development projects following any Government decision on future recommendation(s) from the Airports Commission would need to consider tailored compensation schemes where appropriate, which would be subject to separate consultation."*

1.2.19 Finally, the APF does not rule out airports using alternative criteria for or have additional noise insulation schemes for night noise. It recommends in Paragraph 3.41 that Airport Consultative Committees should be involved in reviewing these proposed and be invited to give views on the criterion that should be used.

6.0 Relocation Assistance Compensation

1.2.20 The APF indicates that there are levels of aircraft noise exposure that are sufficient to warrant assistance to those that are exposed. Paragraph 3.36 of the APF states that:

1.2.21 *"The Government continues to expect airport operators to offer households exposed to levels of noise of 69 dB $L_{Aeq,16h}$ or more, assistance with the costs of moving."*

1.2.22 The APF does not clarify the extent to which financial assistance should be afforded.

APPENDIX II

EXPLANATION OF TERMS

ICAO "Chapters"

Aircraft noise limits are often referred to in terms of ICAO "Chapters".

ICAO Annex 16 Chapter 2 applied to aircraft with an application for a certificate of airworthiness between 1 March 1972 and 6 October 1977 (by-pass ratio[4] of 2 or more) or 1 January 1969 and 6 October 1977 (prototypes with by-pass ratios less than 2) or 1 January 1976 and 6 October 1977 (certificate of airworthiness with by-pass ratios less than 2). Chapter 3 applied to aircraft with an application for a certificate of airworthiness between 6 October 1977 and 1 January 2006. Chapter 4 applied from 1 January 2006 for new aircraft, or Chapter 3 aircraft for which re-certification to Chapter 4 was requested.

A new standard known as Chapter 14 will apply from 2017.

Aircraft were required by the Aeroplane Noise Regulations 1999 to comply with Chapter 3 from 1 April 2002, with very limited exceptions. Broadly, Chapter 4 aircraft must have a cumulative noise value (the sum of the three noise certification levels) 10 dB better than Chapter 3 aircraft, and Chapter 14 will require a further 7 dB improvement (i.e. 17 dB better than Chapter 3).

The Aerodromes (Noise Restriction)(Rules and Procedures) Regulations 2003, give powers to the competent authority for each airport in accordance with Directive 2002/30/EC for the achievement of any environmental objective for that airport subject to a Schedule of matters to be taken into account. Those powers include the use of operating restrictions, aimed at withdrawal from operations of marginally compliant aircraft5 at specific airports either totally or according to time period. A balanced approach is required by the Regulations in dealing with noise problems, taking into account the costs and benefits of the various measures.

N70 and N60 Metrics

[4] The ratio of the volume of air passing only through the fan at the front of the engine (and bypassing the turbine) to the volume passing through the turbine

[5] The definition of marginally compliant aircraft is aircraft that meet the requirements of Chapter 3 by a cumulative margin of not more than 5EPNdB at each of the three reference points.

Discussion around the use of these metrics within the UK was brought to light in the Airports Commission in their July 2013 discussion paper *"Discussion Paper 05: Aviation Noise"*. This document followed the submission of the planning application.

The Commission explains that it believes this noise metric is useful for describing aircraft flyover frequency citing its origin and use in Australia at Sydney Airport. It concludes by recommending the use of the N70 and N60 metrics i.e. the number of noise events above 70 dB and 60 dB L_{Amax} respectively but cautions that the metric does not consider event duration or time-above that level.

There are no social survey relationships developed against the N70 or any other 'number-above' metrics. To this end, the general consensus is that metrics of this nature provide a means of developing an understanding of the impact rather than a conclusion regarding the effects. The Airports Commission state in Paragraph 3.29 of *"Discussion Paper 05: Aviation Noise"*: *"In Australia, N70 metrics do not replace the Australian ANEF (their version of L_{Aeq}) system, which remains the metric for use in Australian policy making. The Australian position is that N70 contours are a supplementary method to L_{Aeq}; this is also the position of the CAA in the UK"* [emphasis added] The Airports Commission has made use of the "number above" indicators N70 (for day) and N60 (for night) in their assessment of expansion options at Heathrow and Gatwick. This indicator is a simple count of the average number of aircraft noise events above L_{Amax} levels of 70 dB and 60 dB respectively. In considering the N70, the Airports Commission have used average conditions.

Air Noise

Air Noise is the term applied to noise caused between start or roll of departure and the completion of the landing run before an aircraft turns off the runway. It therefore includes any use of reverse thrust.

Ground Noise

Ground noise applies to all noise caused airside other than air noise, and includes noise from taxying, use of auxiliary power units, engine running on stand, the use of ground power units and other mobile plant, and noise from vehicles. Test running of engines is normally considered separately.

APPENDIX III

Glossary

AIP	Aeronautical Information Publication
ANIS	Aircraft Noise Index Study
APF	Aviation Policy Framework
ATMs	Air Traffic Movements
CAA	Civil Aviation Authority
CDA	Continuous Decent Approach
dB	Decibel (A-weighted Sound Pressure Level)
DCLG	Department for Communities and Local Government
Defra	Department for Environment, Food and Rural Affairs
DfES	Department for Education and Skills
DfT	Department for Transport
EIA	Environmental Impact Assessment
EPNL	Effective Perceived Noise Level
ERCD	Environmental Research and Consultancy Department
ES	Environmental Statement
GLA	Greater London Authority
HTM	Health Technical Memorandum
ICAO	International Civil Aviation Organisation
L_{Aeq}	A-weighted equivalent continuous sound level
$L_{Aeq, T}$	A-weighted equivalent continuous sound level as measured over the time period, T
$L_{Aeq, 16h}$	Equivalent continuous sound level of aircraft noise in dB. For conventional historical contours this is based on the daily average movements that take place in the 16 hour period (0700-2259 hrs local time) during the 92 day period between the 16 June and 15 September inclusive.
$L_{Aeq, 1hr}$	Equivalent continuous sound level of aircraft noise in dB. For conventional historical contours this is based on the daily average movements that take place in 1 hour period (0700-2259 hrs local time) during the 92 day period between the 16 June and 15 September inclusive.
$L_{Aeq, 30min}$	Equivalent continuous sound level of aircraft noise in dB. For the assessment, the indicator has been used to present the daily average movements that take place in 30 minutes period (0700-2259 hrs local time) during the 92 day period between the 16 June and 15 September inclusive.

$L_{Aeq, 8hr}$	Equivalent continuous sound level of aircraft noise in dB. For the assessment, the indicator has been used to present the daily average movements that take place in the 8 hour period (0700-2259 hrs local time) during the 92 day period between the 16 June and 15 September inclusive.
L_{Amax}	The maximum recorded noise level. For aircraft noise the results usually use the 's' time weighting.
L_{den}	The day, evening, night level, L_{den} is a logarithmic composite of the L_{day}, $L_{evening}$, and L_{night} levels but with 5 dB being added to the $L_{evening}$ value and 10 dB being added to the L_{night} value.
L_{eq}	Equivalent continuous sound level
$L_{evening}$	The A-weighted equivalent continuous sound level calculated using the annual average of aircraft movements over the 4 hour evening period of 1900- 2259 hrs local time.
L_{night}	The A-weighted equivalent continuous sound level calculated using the annual average of aircraft movements over the 8 hour night period of 2300 – 0659 hrs local time.
LOAEL	Lowest Observed Adverse Effect Level
N_{60}	Number of noise events above L_{Amax} of 60 dB
N_{70}	Number of noise events above L_{Amax} of 70 dB
NATS	National Air Traffic Service
NOEL	No Observed Effect Level
NPPF	National Planning Policy Framework
NPPG	National Planning Practice Guidance
NPRs	Noise Preferential Routes
NPSE	National Policy Statement for England
QC	Quota Count
SEL	Sound Exposure Level
SID	Standard Instrument Departure Route
SoCG	Statement of Common Ground
SOAEL	Significant Observed Adverse Effect Level
SoS	Secretary of State
UAEL	Unacceptable Adverse Effect Level
UDB	Unitary Development Plan
UES	Updated Environmental Statement