



**Air Quality Proof of
Evidence on Behalf of
the London Borough of
Hillingdon:**

Appeal

APP/R5510/A/14/2225774

May 2015



Experts in air quality
management & assessment

Document Control

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1 Introduction

- 1.1 My name is Duncan Laxen. I hold Bachelor of Science and Master of Science degrees in Environmental Sciences and a Doctor of Philosophy degree in air pollution chemistry, all obtained at Lancaster University in 1971, 1975 and 1978 respectively. I am a Visiting Professor in Air Quality Management and Assessment at the University of the West of England, Bristol. I have over 40 years' experience in environmental sciences, most of them in the field of air pollution. I am Managing Director of Air Quality Consultants Ltd.
- 1.2 I have been a member of various Government expert groups, including the Department of the Environment, Food and Rural Affairs' ("Defra") *Air Quality Expert Group* and the Department of Health's *Committee on the Medical Effects of Air Pollution*. I was involved with the Department for Transport's Project for the Sustainable Development of Heathrow Airport, chairing its Monitoring Panel and being a member of its Modelling Panel. These Panels were set up to help develop tools to assess the air quality impact of Heathrow Airport. I have been a member of the Steering Group established by the European Commission to oversee the Clean Air for Europe initiative. In support of this I was a member of the Commission's Working Groups on particles and on implementation. I am also a member of the Air Quality Committee of Environmental Protection UK. In 2004, I was an invited expert reviewer for the World Health Organisation's response to questions from the European Commission on the Health Aspects of Air Pollution. I am a Fellow of the Institute of Air Quality Management, the professional body for air quality practitioners. I have published over 70 scientific and technical papers and have made numerous presentations at conferences.
- 1.3 I have considered air quality in relation to many airports across the UK, including Heathrow, London City, Gatwick, Manchester, East Midlands, John Lennon Liverpool, Robin Hood Doncaster Sheffield, Cardiff and Coventry. I have also presented expert evidence at public inquiries, including the Inquiry into Terminal 5 at Heathrow, on behalf of the London Boroughs of Hillingdon and Hounslow, as well the inquiries for Robin Hood Airport, Doncaster Sheffield and Coventry Airport. I also have considerable experience of assessing road traffic emissions, which has included presentation of expert evidence at many public inquiries into road schemes, including the Thames Gateway Bridge on behalf of Transport for London.
- 1.4 I have been closely involved with the development of air quality management and assessment in the UK. This includes a close involvement in the preparation of technical guidance to support the Local Air Quality Management responsibilities of local authorities, on behalf of Defra, and guidance on air quality assessments for the planning regime, on behalf of the Institute of Air Quality Management and Environmental Protection UK.
- 1.5 I was invited by the London Borough of Hillingdon ("LBH") in October 2014 to present its air quality evidence at the Inquiry into the Appeal by Heathrow Airport Ltd (HAL) for refusal of planning

permission for enabling works to allow implementation of full runway alternation during easterly operations.

2 Scope of Evidence

2.1 In my proof of evidence I will address the second reason for refusal, which I reproduce below:

“2 The scheme would facilitate altered aircraft movements/operations (including queuing), and the application fails to demonstrate that this would not result in an unacceptable deterioration in local air quality (failing to sustain compliance with European Union health-based air quality limit values), and additionally no specific mitigation measures are proposed to minimise the exposure of the nearby impacted communities to the resultant polluted air, contrary to paragraph 124 of the National Planning Policy Framework, paragraph 3.47 of the Aviation Policy Framework (March 2013), Policies 2.6, 3.2, 5.3, 6.6, 7.14 of the London Plan (July 2011) and Policies EM1, EM8 and T4 of the Hillingdon Local Plan: Part 1, Hillingdon Local Plan: Part Two Saved UDP (November 2012) Policies A1, A2 and OE1.”

2.2 I will confine my evidence to addressing the pollutant nitrogen dioxide, as this is the pollutant that is the basis of the second reason for refusal. In doing this I will recognise that nitrogen dioxide is directly emitted as such from combustion of fuel in aircraft and motor vehicle engines, and formed in the atmosphere from emissions of nitric oxide from the same sources. The term ‘nitrogen oxides’ is used to represent the combination of nitrogen dioxide and nitric oxide, either as emissions or concentrations.

2.3 It should be recognised that my evidence is based on the large body of information provided by HAL in the few weeks before submission of my proof of evidence. HAL has made it clear that this recent information is to replace most of that used for the air quality assessment set out in the ES (CD/01/02). I had concerns about the original assessment set out in the ES, but will not present these concerns here, given that HAL has submitted its new assessment of the air quality effects of the Scheme, which supersedes that provided in the ES.

2.4 I set out below the information received from HAL since mid-February 2015 and selected, associated correspondence:

- Heathrow Airport 2013 Air Quality Assessment, dated 16 January 2015 (which I received on 17th February 2015);
- Enabling works to allow implementation of full runway alternation during easterly operations at Heathrow Airport: Proposed sensitivity analysis to understand the forecast compliance year for NO₂ in Longford, dated February (which I received on 10 February 2015);
- Enabling works to allow implementation of full runway alternation during easterly operations at Heathrow Airport – undated memo received from HAL responding to request for further information, with accompanying letter dated 17 February 2015 (which I received on 17 February 2015);

- Heathrow Airport 2013 Air Quality Assessment: Model Evaluation, dated 26 February 2015 (which I received on 26 February 2015);
- Enabling works to allow implementation of full runway alternation during easterly operations at Heathrow Airport: Results Summary – Updated Dispersion Modelling, dated 6 March 2015 (which I received on 11 March 2015). This information was subsequently incorporated in CD/03/04;
- Letter from LBH to HAL dated 18 March 2015, requesting clarification as to HAL’s position in relation to the Appeal;
- Letter from HAL to LBH dated 27 March 2015, responding to LBH’s letter of 18 March 2015;
- Enabling works to allow implementation of full runway alternation during easterly operations at Heathrow Airport: Air Quality Assessment of NO₂ Concentrations in 2017 and 2020, dated 26 March 2015 (which I received on 31 March 2015). This is CD/03/04;
- Letter from HAL dated 8 April 2015, setting out those parts of the Air Quality Chapter in the ES (CD/01/02) that have been replaced by CD/03/04;
- Enabling works to allow implementation of full runway alternation during easterly operations at Heathrow Airport: Air quality assessment of 480k movements and 2008/9 meteorology, dated April 2015 (which I received on 16 April 2015);
- Enabling works to allow implementation of full runway alternation during easterly operations at Heathrow Airport: Further information requested by Hillingdon on 10 April 2015, dated April 2015 (which I received on 21 April 2015); and
- Enabling works to allow implementation of full runway alternation during easterly operations at Heathrow Airport: APU running times, dated April 2015 (which I received on 28 April 2015).

2.5 I note that HAL has not updated its Statement of Case (CD/01/06). I will therefore have to consider this in my proof of evidence.

2.6 My evidence is accompanied by Appendices (HIL/DL/A/1) that cover the Figures (Appendix A1), the Tables (Appendix A2) and a further series of Appendices that I refer to in my proof of evidence.

2.7 The Summary and Conclusions section is to be read as my summary proof of evidence.

3 Context

- 3.1 I will address the context for the assessment, which ranges from the European, through the national to the local levels. These policy-related items underpin the position adopted by the LBH in determining this application.

European

- 3.2 The European Union has established a set of air quality 'limit values' and 'targets' that provide a key part of the plan to improve air quality across Europe to protect human health and the environment. These are set out in Directive 2008/50/EC of 21 May 2008 on ambient air quality and cleaner air for Europe, as implemented in England and Wales under The Air Quality Standards Regulation 2010 (No. 1001) ("2010 Regulations").
- 3.3 Compliance with the limit values is a legal requirement, with Member States being responsible for assessing and delivering compliance. The competent authority in the UK is the Secretary of State for the Environment, Food and Rural Affairs (para 3 in Part 1 of the 2010 Regulations), who has a duty to ensure concentrations do not exceed the limit values (para 17 in Part 3 of the 2010 Regulations) and who must provide details of all cases where levels of pollutants have exceeded limit values in annual reports (para 30 in Part 3 of the 2010 Regulations).
- 3.4 The UK Government's failure to secure compliance with nitrogen dioxide levels in certain zones under the Directive has recently been the subject of legal proceedings in the case of *R (on the application of Clientearth) v Secretary of State for the Environment, Food and Rural Affairs [2015] UKSC 28*. The judgment in this case left no doubt about the seriousness of the breach of Art 13 (failure to ensure that limit values are not exceeded) or about the national court's responsibility to secure compliance (para 29 in the Judgement, Appendix A3 (HIL/DL/A/1)). As a result of this, the Supreme Court granted a mandatory order requiring the Secretary of State to deliver a revised air quality plan to the European Commission by 31 December 2015 (para 31 and 35 in the Judgement, Appendix A3 (HIL/DL/A/1)).
- 3.5 The Government has made clear to local authorities that they have a role to play in meeting the limit values. Defra sent a letter to local authorities in 2014 that related to infraction proceedings by the European Commission against the UK Government for breach of nitrogen dioxide limit values (see Appendix A4 (HIL/DL/A/1)). This said:

"The Government is committed to working towards full compliance with the Air Quality Directive and we will be working with the Commission to ensure compliance in the shortest possible time.

Local authorities have already done much to help improve air quality: not just to comply with legal duties for air quality management - especially action planning - but also because you appreciate

the local public health benefits. We also know that achieving further NO₂ reductions will not be easy and will need us to work together and to take action by central government and its agencies as well as local authorities.”

This letter emphasises the need for local authority action in relation to limit value breaches by adding:

“ we feel we ought to remind you of the discretionary power in Part 2 of the Localism Act under which the Government could require responsible authorities to pay all or part of an infraction fine.”

- 3.6 I provide information on the relevant limit value for this Appeal in the next section of my proof of evidence (section 4).

National

Air Quality Strategy

- 3.7 The Air Quality Strategy (the “Strategy”) published by the Department for Environment, Food, and Rural Affairs (Defra) in 2007 provides the policy framework for air quality management and assessment in the UK (para 2 in the Strategy, Appendix A5 (HIL/DL/A/1)). It provides air quality standards and objectives for key air pollutants, which are designed to protect human health and the environment (para 17). Local authorities are seen to play a particularly important role (para 55). The strategy describes the Local Air Quality Management (LAQM) regime that has been established, whereby every authority has to carry out regular reviews and assessments of air quality in its area to identify whether the objectives have been, or will be, achieved at relevant locations, by the applicable date. If this is not the case, the authority must declare an Air Quality Management Area (AQMA), and prepare an action plan which identifies appropriate measures that will be introduced in pursuit of the objectives (para 56).
- 3.8 I provide further information on the relevant Strategy objective for this Appeal in the next section of my proof of evidence (section 4).

Planning Policy

National Policies

National Planning Policy Framework

- 3.9 The National Planning Policy Framework (the “NPPF”) (2012) sets out planning policy for England. It places a general presumption in favour of sustainable development, stressing the importance of local development plans, and states that the planning system should perform an environmental role to minimise pollution. Indeed, one of the twelve core planning principles is that planning should “contribute to...reducing pollution” (para 17, 7th bullet on page 6). To prevent unacceptable

risks from air pollution, planning decisions should ensure that new development is appropriate for its location, and the effects of pollution on health and the sensitivity of the area and the development should be taken into account (para 120 on page 28).

- 3.10 More specifically, the NPPF makes clear in para 124 (page 29) that: *“Planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan”*.

Planning Practice Guidance

- 3.11 The NPPF is supported by Planning Practice Guidance (“PPG”) (DCLG, 2014), which includes guiding principles on how planning can take account of the impacts of new development on air quality. The guidance is not published as a document, but as text on the website. I therefore reproduce the relevant paragraphs from the PPG in Appendix A6 (HIL/DL/A/1).
- 3.12 The PPG states in paragraph 001 that: *“Defra carries out an annual national assessment of air quality using modelling and monitoring to determine compliance with EU Limit Values”* and *“It is important that the potential impact of new development on air quality is taken into account ... where the national assessment indicates that relevant limits have been exceeded or are near the limit”*. The role of the local authorities is covered by the LAQM regime, with the PPG stating that local authority Air Quality Action Plans *“identify measures that will be introduced in pursuit of the objectives”*.
- 3.13 The PPG states in paragraph 005 that *“Whether or not air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to generate air quality impact in an area where air quality is known to be poor. They could also arise where the development is likely to adversely impact upon the implementation of air quality strategies and action plans and/or, in particular, lead to a breach of EU legislation (including that applicable to wildlife)”*.
- 3.14 The PPG sets out in paragraph 007 the information that may be required in an air quality assessment, making clear that *“Assessments should be proportional to the nature and scale of development proposed and the level of concern about air quality”*. It also provides guidance on options for mitigating air quality impacts, as well as examples of the types of measures to be considered. It makes clear in paragraph 008 that *“Mitigation options where necessary will be locationally specific, will depend on the proposed development and should be proportionate to the likely impact”*.

- 3.15 Finally the PPG sets out in paragraph 009 how air quality considerations fit into the development management process. This makes clear that consideration needs to be given to the effects of a development in relation to limit values, objectives and whether the development would lead to unacceptable risks from air pollution and the role of mitigation.

Aviation Policy Framework

- 3.16 The Aviation Policy Framework (CD/01/17) was presented to Parliament in March 2013. The policy relevant to this Inquiry is set out in paragraph 3.48 (page 65):

“Our policy on air quality is to seek improved international standards to reduce emissions from aircraft and vehicles and to work with airports and local authorities as appropriate to improve air quality, including encouraging HGV, bus and taxi operators to replace or retrofit with pollution-reducing technology older, more polluting vehicles. There will be additional air quality (and noise pollution) benefits as the UK progresses to a low carbon economy with the likely increase in the proportion of electric vehicles and plug-in hybrid vehicles.”

- 3.17 It also points out in paragraph 3.50 that:

“The Government assesses the UK’s compliance with the EU air quality limits and target values. Air quality monitoring is also carried out by local authorities to support their local air quality management objectives. PM limits are largely met, but challenges remain with nitrogen dioxide, while pressures from increasing population, demands on transport and land use mean that considerable efforts to improve air quality to protect health and the environment continue to be needed. Air quality in local air quality management areas or where limit values are exceeded is particularly sensitive to new developments or transport pressures, and cumulative impacts from different individual sites can exacerbate this.

- 3.18 It goes on to say (in paragraph 3.51) that:

“Airports are large generators of surface transport journeys and as such share a responsibility to minimise the air quality impact of these operations. The Government expects them to take this responsibility seriously and to work with the Government, its agencies and local authorities to improve air quality.”

National Policy Statement on National Networks

- 3.19 The National Policy Statement on National Networks (“the Statement”) was published in December 2014. Although not directly relevant to this Appeal, it does make clear the Government’s approach to air quality and, in particular, limit values. The Statement includes a section on Air Quality that is dealing with Decision Making (paragraphs 5.3-5.15), in which it makes clear that:

“Air quality considerations are likely to be particularly relevant where schemes are proposed:

- *within or adjacent to Air Quality Management Areas (AQMAs) where changes are sufficient to bring about the need for a new AQMAs or change the size of an existing AQMA; or bring about changes to exceedences of the Limit Values ...*
- *where changes are sufficient to ... bring about changes to exceedences of Limit Values, ...* (paragraph 5.11).

“The Secretary of State must give air quality considerations substantial weight where, after taking into account mitigation, a project would lead to a significant air quality impact in relation to EIA and / or where they lead to deterioration in air quality in a zone/agglomeration.” (paragraph 5.12).

Regional

The London Plan

- 3.20 The London Plan 2015 (CD/01/19) sets out the spatial development strategy for London. It brings together all relevant strategies, including those relating to air quality.
- 3.21 The policies relevant to this Inquiry are:
- 3.22 Policy 2.6 (on page 61), ‘Outer London: Vision and Strategy’, which states: *“The Mayor will, and boroughs and other stakeholders should, enhance the quality of life in outer London for present and future residents ...”*.
- 3.23 Policy 3.2 (on page 102), ‘Improving Health and Addressing Health Inequalities’, which sets out under item D, dealing with planning decisions, that *“New developments should be designed, constructed and managed in ways that improve health ...”*.
- 3.24 Policy 5.3 (on page 189), ‘Sustainable Design and Construction’, which sets out under item C, which deals with planning decisions, that *“Major development proposals should meet minimum standards ... (which) include measures to achieve the following design principles ... d) minimising pollution (including ... air ...)...”*
- 3.25 Policy 6.6 (on page 252), ‘Aviation’, which sets out under item D, dealing with planning decisions *“Development proposals ... should: a) ... take full account of environmental impacts (particularly noise and air quality).”*.
- 3.26 Policy 7.14 (on page 297), ‘Improving Air Quality’, addresses the spatial implications of the Mayor’s Air Quality Strategy and how development and land use can help achieve its objectives. It recognises that Boroughs should have policies in place to reduce pollutant concentrations, having regard to the Mayor’s Air Quality Strategy.
- 3.27 In relation to Planning decisions Policy 7.14 item B(c) (on page 298), requires that development proposals should be *“at least ‘air quality neutral’ and not lead to further deterioration of existing*

poor air quality (such as designated Air Quality Management Areas (AQMAs))”, and at item B(d) (on page 298) development proposals should “ensure that where provision needs to be made to reduce emissions from a development, this is usually made on-site. Where it can be demonstrated that on-site provision is impractical or inappropriate, and that it is possible to put in place measures having clearly demonstrated equivalent air quality benefits, planning obligations or planning conditions should be used as appropriate to ensure this ...”

The Mayor’s Air Quality Strategy

- 3.28 The revised Mayor’s Air Quality Strategy (“MAQS”) was published in December 2010 (CD/03.01). *“The overarching aim of this Strategy is to reduce air pollution in London so that the health of Londoners is improved. The most effective means to do this is to achieve the European Union (EU) air quality limit values as soon as possible. This will also achieve compliance with nationally prescribed air quality standards and objectives”* (para 1.4.1 on page 7).
- 3.29 In Box 12 (on page 84 and 85) the Strategy deals with ‘Ground based aviation, airport operations, and surface access at Heathrow airport’, stating:
- “NO₂ concentrations are a cause for concern at and around Heathrow Airport, with the highest concentrations beyond the airport boundary occurring close to roads in the vicinity of the airport. Ground-level aircraft operations emit large amounts of NO_x, as do landside vehicles including cars, taxis, coaches, and freight. Many roads in the area, including the M25, M4 and A40 carry traffic accessing the airport for both passenger and freight related journeys, as well as other general traffic.*
- ... It is important that airport-related road traffic sources of emissions, including private cars and freight are tackled. However, concentrations of NO₂ are also predicted to be high within the airport boundary and it is important to continue to work to reduce emissions from airport operations in order to improve local air quality.*
- Heathrow has not yet reached its authorised capacity, serving 66 million passengers per annum (mppa) in 2009. This is predicted to rise to 80mppa by 2015 when Terminal 5 becomes fully operational. This could have a significant adverse impact on local NO_x emissions and concentrations of NO₂ close to the airport and surrounding roads without strong and appropriate mitigation measures.”*
- 3.30 Policy 3 (page 71) on ‘Identifying priority locations and improving air quality through a package of local measures’ states that *“The Mayor, through TfL and working with the boroughs, will introduce targeted local measures to improve air quality at locations with high air pollution concentrations.”*
- 3.31 Policy 7 (page 107) on ‘Using the planning process to improve air quality’ states that the output of this policy will be to *“ensure that measures to improve air quality are embedded in the planning process.”*

Local

Local Policies

The Hillingdon Local Plan

3.32 The Hillingdon Local Plan: Part 1 – Strategic Policies (previously known as the Core Strategy) was adopted on 8th November 2012 (CD/01/20). The Local Plan includes three relevant strategic policies, Policy EM1, Policy EM8 and Policy T4. I set out the relevant sections of these policies below.

3.33 Policy EM1: Climate Change Adaptation and Mitigation, states in point 6:

“Targeting areas with high carbon emissions for additional reductions through low carbon strategies. These strategies will also have an objective to minimise other pollutants that impact on local air quality. Targeting areas of poor air quality for additional emissions reductions.”

This policy will be monitored through a number of indicators, including

“LO17 (Local) Indicator: Annual average concentrations of nitrogen dioxide (NO₂) in specific parts of the Borough. Target: 40 µg/m³.”

3.34 Policy EM8: Land, Water, Air and Noise, states under the heading Air Quality:

“All development should not cause deterioration in the local air quality levels and should ensure the protection of both existing and new sensitive receptors.

All major development within the Air Quality Management Area (AQMA) should demonstrate air quality neutrality (no worsening of impacts) where appropriate; actively contribute to the promotion of sustainable transport measures such as vehicle charging points and the increased provision for vehicles with cleaner transport fuels; deliver increased planting through soft landscaping and living walls and roofs; and provide a management plan for ensuring air quality impacts can be kept to a minimum.

The Council seeks to reduce the levels of pollutants referred to in the Government’s National Air Quality Strategy and will have regard to the Mayor’s Air Quality Strategy. London Boroughs should also take account of the findings of the Air Quality Review and Assessments and Actions plans, in particular where Air Quality Management Areas have been designated.

The Council has a network of Air Quality Monitoring stations but recognises that this can be widened to improve understanding of air quality impacts. The Council may therefore require new major development in an AQMA to fund additional air quality monitoring stations to assist in managing air quality improvements.”

- 3.35 In addition, the Council has a number of saved policies from its UDP (CD/01/21). The relevant ones, A1, A2 and OE1, are summarised below.
- 3.36 Policy A1, in Section 11, which deals with Airports and Aviation, states that *“the Local Planning Authority will oppose any proposals for development which ... fail to include sufficient measures to mitigate or redress the effect of the airport on the local environment.”*
- 3.37 Policy A2, also in Section 11, states that *“Planning applications for proposals within the boundary of Heathrow Airport which are likely to ... have significant adverse environmental impact ... should include sufficient measures to mitigate for or redress the effects of the airport on the local environment. ... In appropriate cases the Local Planning Authority will seek a financial contribution from the developer to secure the necessary improvements in public transport.”*
- 3.38 Policy OE1, in Section 6, which deals with Other Environmental Considerations, states that *“Planning permission will not normally be granted for uses and associated structures which are, or are likely to become detrimental to ... amenities of surrounding properties or the areas generally, because of: (iv) .. the emission of dust, smell or other pollutants Unless sufficient measures are taken to mitigate the environmental impact of the development and ensure that it remains acceptable.”*

Planning Obligations

- 3.39 The LBH has a Supplementary Planning Document (SPD) covering planning obligations that was adopted on the 10th July 2014, see Appendix AW/02 of Mr Waite's proof. The SPD includes a section on air quality and when appropriate contributions will be required. *“Planning obligations may be sought for developments that are either in the AQMA or adjacent to the AQMA and considered likely to impact on the objectives to improve air quality...”*(para 5.11 in the SPD). *“Obligations may be sought to ensure no detrimental impacts on air quality and/or to ensure compliance with the objective of the AQMA.”*(para 5.12 in the SPD). The obligations to be sought to improve air quality include: *“use of low emission fuel technology and other measures to minimise emissions.”* and *“any other appropriate measures to meet the objective of the Air Quality Action Plan.”*(para 5.13 in the SPD). *“In some cases, air quality monitoring may be required to ensure these standards can be met and maintained.”*(para 5.14 in the SPD).

Air Quality Action Plan

- 3.40 The LBH has declared an AQMA for nitrogen dioxide that covers all of the borough to the south of the Chiltern-Marylebone railway line. The Council developed an Air Quality Action Plan which was published in 2004. I have included extracts in Appendix A7 (HIL/DL/A/1). The objectives of the plan are to pursue the air quality objectives (Box 1 on page 14). There are measures specific to Heathrow set out in Package 4 on page 37. These are in recognition that the airport is a significant contributor to NOx emissions and the Council will *“pursue all opportunities to reduce emissions*

arising from Heathrow and its associated activities". The Air Quality Action Plan Progress Report 2014 (the "Progress Report") includes a section on health impacts in the Executive Summary that makes clear the important role that HAL should play in helping deliver air quality improvements (pages 1 and 2 of the Progress Report - see Appendix A8 (HIL/DL/A/1):

Updated information from Defra shows that compliance with the NO₂ limit value will only be achieved sometime after 2030 for the Greater London Area. Across the Borough, official estimates indicate that air pollution leads to the loss of 1,335 years of life annually, equivalent to 114 deaths per year. This compares with, for example, 2 road accident fatalities in the Borough in 2013. There is growing evidence that these estimates of the burden of air pollution on health are underestimated. It is also recognised that the statutory limits for air quality are not fully protective.

The improvement of air quality in the Borough should thus be treated as a matter of urgency. Over the last 10 years the Borough has implemented a wide-ranging action plan for air quality improvement. The Borough Council has, in large part, followed through with implementation of the measures that it has control over and the plan now needs to be revised. However, it must be recognised that other stakeholders also have responsibilities for reducing pollution in the Borough, as the major sources, particularly Heathrow Airport and the major road network, are outside the Borough's control. ...

...

The lack of urgency shown by those able to make significant improvements in air quality is highlighted by a press release from Heathrow Airport Ltd from May 9th 2014, in which it is stated that a Heathrow congestion charge could be used to fund public transport improvements to reduce congestion and improve air quality. However, it is also noted that charging would only be introduced once improvements to public transport to the airport have been delivered. This ignores two important issues:

- 1. No progress has been made on the congestion charge proposal since the Borough Council raised it in its Action Plan published 10 years ago.*
- 2. In the interests of protecting public health, air quality needs to be improved now, not some unknown number of years into the future."*

3.41 Dealing with 'Progress with the action plan' the Progress Report notes (page 69 and 70) that:

"The area around Heathrow and the major road network is in breach now and predicted to be so for the foreseeable future. The current situation must be solved, mechanisms must be put in place now to ensure compliance in the area is reached and maintained as soon as possible, in line with European legislation. The alternative is to continue exposing the people of Hillingdon and other Boroughs that surround the airport to a level of pollution that poses excessive risk to health."

4 Assessment Criteria

European Union Limit Value

- 4.1 The relevant limit value for nitrogen dioxide set in Directive 2008/50/EC is $40 \mu\text{g}/\text{m}^3$, as an annual mean (over a calendar year). This was to have been achieved in all zones and agglomerations by 2010. The Directive allowed Member States to apply for time extensions, as long as they could show that the limit value would be achieved by 2015. The UK Government did not apply for a time extension for some zones/agglomerations, as it recognised that it would not achieve the limit value by 2015. The assessment by Defra is that the limit value will not be achieved in some zones/agglomerations, in particular in London, until some time after 2030 (see Appendix A9 (HIL/DL/A/1)).
- 4.2 Exceedences of the limit value are identified by the UK Government and reported annually to the Commission. These exceedences are identified by monitoring and modelling carried out by the competent authorities and bodies designated by the Member States. In the UK, the Secretary of State for the Environment, Food and Rural Affairs is the designated authority.
- 4.3 I should also note that I will only be addressing the annual mean limit value for nitrogen dioxide. There is also a 1-hour mean limit value for nitrogen dioxide, but experience has shown that this is less stringent than the annual mean. Generally, it is assumed that there is only a risk of the 1-hour mean limit value being exceeded where the annual mean is above $60 \mu\text{g}/\text{m}^3$ (see para 2.34 on page 2-9 of the Defra's Technical Guidance LAQM.TG(09) ("Technical Guidance LAQM.TG(09)") in Appendix A10 (HIL/DL/A/1))

UK Government Objectives

- 4.4 The annual mean objective for nitrogen dioxide is numerically the same as the limit value, but the requirements for assessment differ in a number of respects. I set out the differences in Table 2 in Appendix A2 (HIL/DL/A/1).
- 4.5 The objective, which is $40 \mu\text{g}/\text{m}^3$ as an annual mean, was to have been achieved by 2005, and is still in place (see Table 1.1 in the Technical Guidance LAQM.TG(09), Appendix A10 (HIL/DL/A/1)).
- 4.6 Technical Guidance LAQM.TG(09) makes clear that objectives apply at locations where members of the public are likely to be regularly present and where they are likely to be exposed over the averaging period of the objective. The annual mean objective, which is the focus of this Appeal, is considered to apply at the façades of residential properties, schools, hospitals etc.. (see para 1.30 on page 1-7, para 131 and 1.32 on page 1-8 and Box 1.4 on page 1-9 in the Technical Guidance LAQM.TG(09), Appendix A10 (HIL/DL/A/1)).

Recent Evidence on Health Significance of Nitrogen Dioxide

- 4.7 The strongest evidence of health impacts of air pollution, including premature deaths, has been for long-term exposure to particulate matter (PM_{2.5}). There is no recognised concentration threshold for health effects of PM_{2.5}. Nitrogen dioxide plays an important and independent role from PM_{2.5}, in exacerbating asthma, bronchial symptoms, lung inflammation and reduced lung function, especially through short-term exposure.
- 4.8 The Department of Health's Committee on the Medical Effects of Air Pollution (COMEAP) has recently reviewed the evidence on health impacts of nitrogen dioxide. It has summarised its findings in a Statement issued in March 2015 (see Appendix A11 (HIL/DL/A/1)). The Committee concluded that *"Evidence associating NO₂ with health effects has strengthened substantially in recent years ..."* (para 1 on page 1 in the COMEAP Statement). COMEAP intends to consider the best way to quantify these effects, as it has done for PM_{2.5}. (para 18 on page 5 in the COMEAP Statement).
- 4.9 In 2013, the World Health Organisation ("WHO") published recommended concentration-response functions for the health effects of three pollutants, including nitrogen dioxide. This included functions for long-term (annual mean) nitrogen dioxide exposure. The WHO recommended that *"the NO₂ impact should be calculated for levels above 20 µg/m³"* (highlighted text on page 29 of the WHO report, in Appendix A11 (HIL/DL/A/1)); a level that is half the current limit value and objective concentration for nitrogen dioxide.
- 4.10 It is evident from this new evidence that exposure to nitrogen dioxide below the annual mean standard of 40 µg/m³, which is the limit value and objective for this pollutant, should not be considered to be safe. There can therefore be no complacency in achieving a concentration that is just below the standard.

Descriptors for Air Quality Impacts and Assessment of Significance

- 4.11 There is no 'official' guidance in the UK on how to describe air quality impacts, nor on how to assess their significance. The approach developed by the Institute of Air Quality Management (IAQM – the institute for air quality professionals), and incorporated in Environmental Protection UK's (EPUK's) guidance document on planning and air quality, was used by HAL to present the results of the air quality assessment presented in the ES. This approach was the appropriate one to use at that time and is described in the ES in paragraphs 7.7.69 to 7.7.75 (CD/01/02). HAL's assessment also took account of the 'Air Quality and Planning Guidance' issued by the London Councils in 2007, as described in the ES in paragraphs 7.7.76 to 7.7.77 (CD/01/02). I reproduce the relevant section of the London Councils' guidance in Appendix A12 (HIL/DL/A/1). This guidance recommends different outcomes depending on the concentration with the scheme in relation to the objective. For example, for nitrogen dioxide, 'APEC – A' applies for with-scheme concentrations that are less than 38 µg/m³, and the recommendation is that there are *"No air*

quality grounds for refusal; however mitigation of any emission should be considered." (top entry in the Table from the London Councils' guidance in Appendix A12 (HIL/DL/A/1)).

- 4.12 The IAQM/EPUK guidance has recently been updated and will be issued in final form in early May 2015. HAL has provided LBH with a statement on the implications of the new guidance (item 10 in HAL's document 'Further information requested by Hillingdon on 10 April 2015', which I received on 21 April 2015). I will make reference to both sets of findings in my analysis of the evidence.

5 Impacts of the Scheme

- 5.1 I initially reviewed the Air Quality Chapter in the ES (CD/01/02) and supporting Appendices, which had been submitted HAL in support of the planning application, together with the further information provided in the Technical Note of 19 September 2013 submitted by HAL to the LBH. I had a number of concerns about the assessment that had been carried out, but I will not set these out here, as the early work has been superseded by the reports recently issued by HAL.
- 5.2 I have now examined the considerable volume of new material provided recently by HAL. I have also met with HAL and identified further points of clarification, which have now been provided. I will make a number of observations on the basis of the information provided by HAL.

Observations on the Modelling Methodology

- 5.3 I accept the basic approach adopted by HAL, namely the use of a detailed emission inventory, together with the use of the ADMS Airport model to predict concentrations. I do, however, have a number of significant specific concerns, which I will now set out.

Traffic data

- 5.4 The modelling evaluation report makes clear that there were significant uncertainties in relation to the road traffic NO_x contributions, which required an upward scaling of these emissions (Model Evaluation Report, paras 1 to 3, page 53, Appendix A13 (HIL/DL/A/1)). It is noted in the report that *“There are a number of discrepancies between the flows in the traffic model and those measured by the Department for Transport (DfT) in 2013.”* (para 1, page 46 in the Model Evaluation Report). Table 22a in the report shows, for instance, that the model gave an Annual Average Daily Traffic (AADT) flow on the M4 of 251 vehicles per day for buses and coaches, while the DfT traffic count gave 1,197 vehicles per day, over 4 times higher than that in the model (page 46 in the Model Evaluation Report). Table 22b shows a modelled articulated HGV flow of 1,752 vehicles per day, while the DfT count gives 7,613 vehicles per day, again over 4 times higher than that in the model (page 47 in the Model Evaluation Report) (not all the differences are this dramatic).
- 5.5 The report concluded that *“The difficulty that arises in the present study, therefore, is the evidence for a consistent underestimation of the contribution from the road network. Concentration contours derived from the raw modelling results, therefore, will underestimate NO_x concentrations and thus the extent of any NO₂ exceedance area. As noted above, the observed discrepancies point to the need for a more detailed evaluation of traffic model outputs and how these are used to calculate emissions. It may be advantageous to defer that work until a traffic model is available that has been calibrated and validated with particular reference to those traffic characteristics that are key to the quantification of road traffic emissions and to the estimation of the road network contribution to airborne pollutant concentrations.”* (last para, page 52 in the Model Evaluation Report) The

report goes on to say that in the interim “an adjustment factor is applied uniformly to the road network contribution at all points ... The required factor is found to be 1.385.” (third para, page 53 in the Model Evaluation Report)

- 5.6 In my recent meeting with HAL, it was confirmed that the same (inadequate) traffic model has underpinned the revised assessment for 2017 and 2020 recently issued by HAL.
- 5.7 In light of these observations there must be some considerable uncertainty associated with the modelled contributions of the road traffic (even after adjustment). This will give rise to uncertainty as to the absolute concentrations near to the roads in the study area.

Meteorology

- 5.8 Meteorology has an important effect on the predicted impacts of the proposed Scheme, and this can change significantly from year to year. The key parameter is the frequency of easterly winds, which will determine the frequency of easterly take-offs and hence the impacts on Longford from aircraft emissions. HAL has carried out its modelling for the meteorological year 2013 as its main assessment year. As a sensitivity test HAL has also modelled using 2008/9 meteorology. The frequency of easterly winds is summarised in Table 1 in Appendix A2 (HIL/DL/A/1). This shows that 2013 and 2008/9 were not extreme years, with easterly winds >5 kt being more frequent in 2010.
- 5.9 In the ES (CD/01/02), HAL showed that concentrations in Longford could be 2 $\mu\text{g}/\text{m}^3$ higher if 2002 meteorology was used for the model rather than 2008/9 meteorology (paragraph 7.7.33). This demonstrates that the choice of meteorological year can have a significant influence on the modelled concentrations. It cannot therefore be assumed that reliance on meteorological data for 2013 represents a worst-case assessment.
- 5.10 The analysis of the wind data in Table 1 (Appendix A2 (HIL/DL/A/1)) also shows that there would be even greater impacts in Longford if the westerly preference that currently operates were to be removed, as there would be around a third more easterly take-offs.

Trends in Concentrations

- 5.11 The modelling carried out by HAL is projecting significant reductions in annual mean concentrations of nitrogen dioxide between 2013, 2017 and 2020. The results for the Green Gates monitoring site, located in Longford, are 35.0 $\mu\text{g}/\text{m}^3$, 32.1 $\mu\text{g}/\text{m}^3$ and 29.0 $\mu\text{g}/\text{m}^3$ respectively. Most of this reduction is related to the expected reduction in road traffic emissions. There have been progressively tighter standards applied to emissions from new vehicles since 1993. These are called Euro standards. We are now introducing Euro-six vehicles (Euro VI for heavy duty, Euro 6 for light duty vehicles). Unfortunately, evidence from monitoring nationally over the last 10 years or so has shown that concentrations have not declined as expected. Studies have been carried out that have demonstrated that the problem is due to diesel vehicles, in particular light duty vehicles.

These vehicles have passed the conformity test, but have not delivered real world reductions. The predicted reductions in future years used in the HAL modelling are based on the assumption that the latest Euro-six standard will deliver real reductions. (see para 3.10 in Defra's 'Air Quality Plans for the achievement of EU air quality limit values for nitrogen dioxide (NO₂) in the UK', Appendix A14 (HIL/DL/A/1))

- 5.12 To help understand the implications for the assessment carried out by HAL, I have examined the trends in the monitoring sites located around Heathrow. I have analysed the trends using the Openair software package, and the results for the monitoring sites around Heathrow are shown in Appendix A15 (HIL/DL/A/1). The plots show the smooth trends. I have also used the Theil-Sen statistical analysis to establish whether the trend is statistically significant. The presence of a significant trend is included below each plot. The locations of the monitoring sites and the significance of the trends are summarised in Figure 1 in Appendix A1 (HIL/DL/A/1). Of the 11 monitoring sites, there is no significant trend at 7 sites, a downward trend at 3 sites and an upward trend at 1 site. In particular there is no significant trend at the Green Gates monitoring site in Longford. This contrasts with the statement made in HAL's Statement of Case (CD/01/06) "*The trend in measured concentrations at Green Gates continues to be downwards, indicating continued improvements in concentrations over time and an increasing level of headroom between measured concentrations in the Longford area and the AQO*". (para 4.18 of the Statement of Case). (I would note in passing that the idea of headroom to pollute up to is not one that is widely held in my experience, and is a somewhat disturbing attitude for HAL to have promoted in its Statement of Case).
- 5.13 To provide a clearer summary I have combined the results by normalising them to the annual mean for 2013. The resultant pattern is shown in Figure 2 in Appendix A1 (HIL/DL/A/1). There is no statistically significant downward trend identified.
- 5.14 To understand the implications for the HAL assessment, I have plotted the trend for the HAL modelling results at the Green Gates monitoring site in Longford, over the period 2013 to 2020, on the trend graph for monitoring in the Heathrow area (see Figure 2 in Appendix A1 (HIL/DL/A/1)). It is clear that the HAL predictions show a stronger downward trend than the historic data would suggest would occur in practice. The HAL predictions for 2017 are 8% lower than those in 2013, and in 2020 17% lower. This must indicate a level of uncertainty in the results presented by HAL. It is not unreasonable, in my view, to assume as a worst, but still realistic, case, that there could be no reduction in baseline concentrations in Longford from those modelled for 2013. HAL has not presented baseline 2013 concentrations for the receptors in Longford; to allow me to understand the effect of this uncertainty I have had to calculate what the 2013 concentrations might have been, had HAL modelled them. To do this I have assumed that concentrations could be 9% higher than those presented for 2017 (this is derived as the inverse of the 2017/2013 ratio of concentrations at the Green Gates site, namely $1/0.92 = 1.09$). I will address the significance of

this in the next section of my proof of evidence. The results of doing this are presented in Appendix A16 (HIL/DL/A/1).

Presentation and Interpretation of the Findings

- 5.15 I have a number of concerns about the presentation and interpretation of the findings of the assessment carried out by HAL, which I address in this section of my proof of evidence. Where I make use of the model results provided by HAL, I will only use those calculated on the basis of 483,840 ATMs and presented in HAL's 'Air quality assessment of 480k movements and 2008/9 meteorology', which I received on 16 April 2015.

Implications of Baseline Concentrations Not Declining

- 5.16 I noted in paragraphs 5.11 to 5.14 of my proof of evidence that concentrations may not decline in the way suggested by the HAL modelling. I suggested that it is not unreasonable to assume that concentrations in 2017 could be 9% higher than those provided by HAL. On this basis there are three receptors in Longford, receptors 97, 113 and 114, that would experience concentrations above the annual mean nitrogen dioxide objective of $40 \mu\text{g}/\text{m}^3$ with the Scheme in 2017 (i.e. they were above $36.7 \mu\text{g}/\text{m}^3$ in the 2017 data set ($36.7 \times 1.09 = 40.0$)) (these receptor locations can be seen in Figure 7-3 of the ES, CD/01/02). Without the Scheme, these concentrations would have been below the objective. There are also 24 receptors that would fall into the APEC-B band in the London Councils' Guidance, which requires consideration to be given to appropriate mitigation (see Appendix A12 (HIL/DL/A/1)). This is based on the recalculated results presented in Appendix A16 (HIL/DL/A/1).

Use of New Significance Criteria

- 5.17 As I noted in a previous section of my proof of evidence (paragraph 4.12), new guidance has been produced that includes a more stringent definition of the significance of impacts. I have therefore analysed the HAL model data using the new criteria. 77 of the 102 receptors within Longford would be subject to a slight adverse impacts in 2017. This contrasts with 3 receptors experiencing slight adverse impacts using the old guidance.
- 5.18 I have already noted (in paragraphs 5.8 to 5.11 of my proof of evidence) that concentrations may not decline in the way HAL has presented in its assessment. I suggested that it is not unreasonable to assume that concentrations in 2017 could be 9% higher than those provided by HAL. On this basis all receptors in Longford with a concentration $\geq 34.7 \mu\text{g}/\text{m}^3$ in 2017, with the Scheme, would experience a moderate adverse impact (i.e. they would be >37.8 , which is the boundary in the impact descriptor Table). In this case there would be 25 receptors in Longford that would experience a moderate adverse impact with the Scheme, with the rest experiencing a slight adverse impact. The full set of results is provided in Appendix A16 (HIL/DL/A/1).

5.19 In my view these impacts are significant and therefore necessitate mitigation.

Relationship to the LBH Air Quality Action Plan

5.20 The Scheme will increase nitrogen dioxide concentrations within the AQMA declared by LBH, including at sites that will potentially have concentrations above the annual mean nitrogen dioxide objective of $40 \mu\text{g}/\text{m}^3$ in 2017. The increases within Longford represent slight adverse impacts for a large number of residential properties and potentially some moderate adverse impacts. In my view, these impacts conflict with the LBH's Air Quality Action Plan, which is designed to improve air quality within the AQMA. This conflicts with the policy requirements and certainly justifies the implementation of mitigation.

EU Limit Values

5.21 Another concern is that HAL has not assessed concentrations against the annual mean EU limit value for nitrogen dioxide. This is the limit value that should have been met in 2010.

5.22 An assessment against limit values has to be carried out in relation to the roadside locations identified by Defra and reported as such to the European Commission. This is clear from the Planning Practice Guidance (paragraph 3.10 of my proof of evidence).

5.23 Exceedences of the nitrogen dioxide limit value have been identified around Heathrow for background air quality in 2012 as shown in Figure 3 and at roadside locations in Figure 4 in Appendix A1 (HIL/DL/A/1). These make clear that background concentrations exceed the limit value over residential areas to the north of the airport, while the limit value is exceeded to a greater extent along sections of the A3044 and the A4 near Longford. The roadside exceedences are substantial, with concentrations above $60 \mu\text{g}/\text{m}^3$ along the A4. Defra is currently not making available maps for future years, but it is evident that there will still be exceedences in 2017 and 2020 given the magnitude of the 2012 concentrations.

5.24 The roadside concentrations reported to the European Commission are based on concentrations 4 m from the edge of the road. An assessment of the effect of the proposed Scheme therefore requires the change in nitrogen dioxide concentrations 4 m from the key links to be determined. HAL has been asked to address this but has yet to produce the results. I can provide an indication of what the effect might be along the A3044 using receptor 176 in HAL's model output (this receptor location can be seen in Figure 7-2 of the ES, CD/01/02). The increase at this receptor is $1.7 \mu\text{g}/\text{m}^3$ in 2017. This will approximate the increase at 4 m from the A3044, as the change is due to airport emissions and is unrelated to road traffic, which does not change. The Scheme will thus be having a significant impact on the limit value exceedence. In terms of the new guidance, this impact would be described as substantial adverse. This worsening of a limit value exceedence would conflict with the policies I set out in Section 3 of my proof of evidence, and certainly justify mitigation.

6 Mitigation

- 6.1 I have demonstrated that the Scheme will produce adverse air quality impacts affecting residents in the London Borough of Hillingdon, in particular in Longford. It will also worsen exceedences of the limit value. The increases in annual mean nitrogen dioxide in 2017 in Longford range from 0.3 to 1.6 $\mu\text{g}/\text{m}^3$.
- 6.2 It is abundantly clear that impacts of the scale predicted require mitigation. This is entirely consistent with the policies I have set out in Section 3 of my proof of evidence. Mitigation will also address the growing concerns about the health effects of nitrogen dioxide at concentrations below the annual mean objective of 40 $\mu\text{g}/\text{m}^3$.
- 6.3 HAL has just published 'Heathrow's blueprint for reducing emissions – Our ten-point plan to reduce Heathrow's emissions in 2015' (extracts are set out in Appendix A17 (HIL/DL/A/1)). HAL says its *"goal is to cut ground-based emissions of NOx by 5% by 2020 (from 2009 levels)."* This is not a very ambitious goal, and would have an essentially unmeasurable impact on concentrations of nitrogen dioxide around the airport. Item 6 in the ten point plan includes *"Working with bus and coach operators to increase the number of hybrid buses."*
- 6.4 HAL has not, however, set out any specific mitigation measures to reduce the impacts of the Scheme on air quality for residents in Longford.
- 6.5 The only specific measure that would go a long way towards mitigating the impacts, identified both by myself and in discussion with HAL, involves reducing the emission from the buses that pass through Longford on Bath Road. This would involve buses on two routes, route 81 and route 423, that pass use Bath Road. I have counted the timetable for these two routes, which shows an AADT flow of 285 buses per day (HAL has assumed 303 buses per day in its modelling).
- 6.6 I have analysed the effect of the buses passing through Longford on annual mean nitrogen dioxide concentrations. The results of this analysis, which I set out in Appendix A18 (HIL/DL/A/1) show that buses can contribute up to 1 $\mu\text{g}/\text{m}^3$ to annual mean nitrogen dioxide concentrations. This compares to the increases due to the Scheme of up to 1.6 $\mu\text{g}/\text{m}^3$. Reducing emissions from the buses would therefore contribute significantly to alleviating the additional exposure that would otherwise be experienced by the residents of Longford. This measure would also help reduce concentrations alongside the roads that are currently experiencing exceedences of the limit value for nitrogen dioxide and which would experience a worsening with the Scheme.

7 Summary and Conclusions

- 7.1 I have shown that there is a considerable body of national and local policy that makes clear that air quality should be an important consideration in planning decisions. These policies clearly point to the need to mitigate the effects of schemes that have a significant adverse impact on air quality. I have shown that the Scheme will have adverse impacts on air quality within the LBH, especially within Longford, and that there should be no complacency even at those locations that are below the air quality objective, especially given the new evidence on the health effects of exposure to nitrogen dioxide. HAL has not proposed any specific mitigation measures to address these adverse impacts. The second reason for refusal set out by the LBH is, therefore, justified. The Scheme as it stands is contrary to national, regional and local policies.
- 7.2 I have shown that buses on two routes that pass through Longford, on the Bath Road, make a significant contribution to the nitrogen dioxide concentrations to which the residents of Longford are exposed. It would be appropriate to focus on reducing bus emissions as a mitigation measure.
- 7.3 It is my view that with this mitigation in place the Scheme could be considered reasonable and acceptable in air quality terms.