

**Doc. No. SSE/7/a  
Case Ref. 2032278**

Appeal by BAA Ltd and Stansted Airport Ltd following the refusal by Uttlesford District Council of planning application UTT/0717/06/FUL

## **Proof of Evidence on behalf of Saffron Walden Friends of the Earth and Stop Stansted Expansion**

### **Air Quality Issues**

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30 April 2007



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## 1 INTRODUCTION

### 1.1 Personal details

- 1.1.1 My name is Dr Patricia Elliott and I appear at the Public Inquiry jointly on behalf of the Saffron Walden branch of Friends of the Earth and Stop Stansted Expansion ('SSE').

### 1.2 Qualifications and experience

- 1.2.1 MD, MFOM, DPH, DIH.
- 1.2.2 Formerly Medical Director, Harlow Occupational Health Service, providing occupational health and hygiene services to firms and public authorities in Harlow, Bishop's Stortford and Hoddesdon. Occupational Health Adviser to Kings College Hospital, London.
- 1.2.3 I am now retired.

## 2 SCOPE OF EVIDENCE

### 2.1 Core evidence

- 2.1.1 My evidence relating to air quality impacts was originally set down in Chapter 6 of Volume 1 of SSE's submission to UDC, July 2006 [CD/201] which addressed the information provided by BAA in Volume 3 of its Environmental Statement [CD/6].
- 2.1.2 Further evidence on air quality issues was included in Volume 3 of SSE's submission to UDC, November 2006<sup>1</sup> dealing with the additional information provided by BAA [CD/22] in response to a Regulation 19 Notice from UDC [CD/39].

### 2.2 New evidence

- 2.2.1 A highly relevant report, 'The Report of the Airport Air Quality Technical Panels, The Project for the Sustainable Development of Heathrow', has become available since the submission of our original evidence on air quality and so also have the three reports that supported the information set down in CD/6:
- 'Future Emissions Analysis for Stansted Airport in 2014', Dickinson and Christou (QuinetiQ), 2005 [CD/277];
  - 'Stansted Air Quality beyond 25mppa: Modelling Test Report', Underwood et al (Netcen), 2006 [CD/278];
  - 'Stansted air quality beyond 25mppa. Methodology Report', Underwood et al (Netcen), 2006; 2.1.4 [CD/279].
- 2.2.2 In the light of the above new information, the original air quality evidence set down in CD/201 and CD/203 is replaced by this proof of evidence.

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<sup>1</sup> CD/203, paras 2.1 and 2.9 to 2.13.

### 3 STANSTED AIR QUALITY ISSUES

#### 3.1 Most relevant emissions

- 3.1.1 The air quality in and around Stansted airport is protected by both European and UK legislation. Limit levels of the main contaminants are set by the EU and the UK for the protection of both humans and vegetation.
- 3.1.2 The main emissions that are of concern at any airport are:
- NO<sub>x</sub> (nitrogen oxides) including, in particular, NO<sub>2</sub> (nitrogen dioxide), which are lung irritants;
  - PM<sub>10</sub> and PM<sub>2.5</sub> (fine and ultra-fine particles), known to be harmful to those with chest and heart conditions;
  - benzene and 1,3 butadiene, both carcinogenic.
- 3.1.3 These emissions come from a number of sources but mainly from aircraft. There are many uncertainties in the predictions made by BAA in CD/6 as to the quantity of emissions produced. Many are based on choices made by BAA as to future business opportunities some of which depend on the decisions of others, for example, airlines.
- 3.1.4 The Environmental Impact Assessment ('EIA') for the expansion to 25mppa (granted in 2003) predicted small breaches of the limit values for NO<sub>x</sub> and NO<sub>2</sub> outside the airport perimeter. Sensitivity tests carried out by BAA suggested that these predictions were unlikely and this was accepted by UDC. Since then the methodology has been modified and some changes have been applied to the modelling used for estimating the effects of expansion both to the 25mppa scenario and to the 35mppa scenario. A number of new real time baseline figures are available from both Uttlesford and East Herts District Councils as well as a limited number from BAA's monitoring.
- 3.1.5 The new predictions for 25mppa and 35mppa show a steep drop in emission levels of NO<sub>x</sub> and NO<sub>2</sub>. The annual tonnage of NO<sub>x</sub> is forecast to halve. As a result CD/6 does not predict any breaches of the EU and UK regulations with the exception of particles, PM<sub>10</sub>. This is because the limit value for this pollutant is due to be lowered in 2010. CD/6 suggests that this may be reviewed and discussions are proceeding at the moment. A decision is expected soon.
- 3.1.6 The steep fall in the predictions for NO<sub>x</sub> emissions means that the evidence on which it is based needs to be very carefully examined.
- 3.1.7 Despite the fall in predictions the level of NO<sub>x</sub> is forecast to be only just below the limit value for vegetation over the north western part of Hatfield Forest, an SSSI, and one of the few surviving ancient hunting forests in the UK. Only small variations in some of the assumptions made on future emission levels would extend the area where breaches are expected into the forest. The consequent risk of cumulative damage to such a valuable nature reserve must be material to any planning decision and is recognised in CD/13, para 10.4.4.
- 3.1.8 Our chief concerns as to the uncertainties are listed in sub-section 3.2 below with a brief explanation of the reasons for questioning them. In 3.3 we consider the findings of CD/6 on air quality, highlighting the predicted impacts from the

proposed expansion that we consider unacceptable. In 3.4 we list planning policies and legislation that are most relevant to the consideration of air quality. We compare the Stansted modelling with that recommended in the PSDH in Section 4 below which confirms some of our concerns as to the uncertainties in the Stansted modelling.

## 3.2 Uncertainties in the BAA air quality assessment

- 3.2.1 BAA has calculated the effects of the proposed development to 35mppa and only included a few sensitivity tests at 40mppa. Yet further expansion could easily lead to passenger throughput of up to 50mppa, with significant air quality implications both as a result of larger four-engine aircraft within the ATM limit and as a result of the additional road traffic that would be generated by arriving and departing passengers.
- 3.2.2 BAA has not carried out a comprehensive air quality survey of the airport and surrounding area as required by a condition imposed with the granting of permission to expand to 25mppa. The monitoring carried out has been limited in both time, methods of monitoring and the number of sites included.
- 3.2.3 No 'real time continuous automatic monitoring' has been carried out on either of the two sites selected for this purpose (High House and Thremhall Priory, on the airport perimeter) for the full year required to establish an annual mean. Five NO<sub>2</sub> diffusion tubes are situated inside the airport. These, BAA claims, have been calibrated by comparing them with the automatic monitors and the results of the tube monitoring have been found to be between 30% and 69% higher. However, BAA accepts that neither the tube results nor the suggested errors can be regarded as reliable. What is clear is that the monitoring has been inadequate, no monitoring has been carried out by BAA outside the airport or around all the public areas in the airport, the terminal and the hotels. Uttlesford and East Herts District Councils' results are quoted for all areas around the airport. There is therefore no satisfactory baseline to validate the modelling carried out.
- 3.2.4 While the M11 is very close to the western boundary of the airport the statutory NO<sub>2</sub> limits do not differentiate between the causes of the emissions and if the proposed expansion would result in the limits being exceeded – or further exceeded – this would most certainly constitute material grounds for refusing the application. Indeed, this is precisely the problem in relation to further expansion at Heathrow.
- 3.2.5 The comparisons being made by BAA between 25mppa and 35mppa projections for 2014 are inappropriate. The case for 25mppa is not based on a business as usual development scenario but on a predicted scenario for 25mppa that BAA claim would be required if permission were not given for expansion to 35mppa plus. This includes development of commercial flights up to the full allowance and provision for larger aircraft for long haul flights. This means that comparisons between 25mppa and 35mppa are being made on different business predictions, each incorporating many subjective judgements.
- 3.2.6 The existing methodologies used in the prediction of emission levels of potential pollutants at airports are now being questioned. The Department for Transport ('DfT') appointed a committee of experts to work on The Project for the Sustainable Development of Heathrow ('PSDH'). The aim of the Project is stated to be to *'review the data, knowledge and tools which underpinned the Government's assessments to date and to agree on a technically robust approach to assessing*

*the air quality impacts of future options for development at Heathrow*'. It will recommend a better methodology for airport air quality assessments and predictions at Heathrow. The first report has now been published<sup>2</sup> and we compare its recommendations where they are applicable to any airport with the methodology used in CD/6.

- 3.2.7 The chosen fleet mix is one of the determining factors in predicting emission levels and the choice of aircraft for the fleet mix at 25mppa and 35mppa are choices made by BAA. Details are given in the appendices of CD/19 but under the label of air noise data. The reasons given for the choices are based on judgements about future commercial policies, for example, the perceived need to increase cargo and business passenger flights if restricted to 25 mppa. However, the final decisions will rest with the airlines and Ryanair and Easyjet have already purchased and ordered new aircraft. New models such as the A380 and the Boeing 787 may be less noisy and use less fuel but no engine has yet been designed that also has a significant reduction in NO<sub>x</sub> emissions. To date delivery dates for the A380, apparently expected to be for freight use, are still very much in the future.
- 3.2.8 Aircraft thrust associated with the landing and take off ('LTO') cycle is likely to generate more NO<sub>x</sub> and is also likely to vary with pilots and planes. In the case of the larger planes predicted, assumptions have been made from experience at Heathrow. Can these be relied on to apply at Stansted?
- 3.2.9 In relation to airside vehicles, we are not told how many are expected to be non fossil fuel operated. In the 2004/05 Corporate Responsibility Report we are told that only 50 of the 1100 vehicles are currently electrically operated and that they are mostly out of BAA's control being employed by individual firms, with BAA only able to advise on the need to reduce fossil fuel emissions. (No update is provided in its 2005/06 Corporate Responsibility Report [CD/161]).
- 3.2.10 In the case of the use of auxiliary power units ('APUs') by stationary aircraft, Stansted already has a full complement of electrical stands but airlines may still use their own power. Anecdotal evidence suggests there is currently only limited use of APUs. Records are imprecise.<sup>3</sup>
- 3.2.11 With regard to the increase in airport-related road traffic, CD/6, paras 5.1.15 to 5.1.20 explain in some detail the methodology used to assess emissions. However, SSE's proofs of evidence on surface access highlight significant doubt regarding the underlying forecast numbers of airport-related vehicles that were presumably used in forecasting road traffic emissions.
- 3.2.12 Furthermore, it is now accepted that diesel vehicles fitted with particle traps have been found to be emitting as much as 25 – 35% more NO<sub>2</sub> than before.<sup>4</sup> We do not know if this has been allowed for in the emission calculations. This unfortunate side effect of the policy of reducing the level of PM<sub>10</sub> particles has been suspected for some time but is only very recently being quantified.
- 3.2.13 New methods of dispersion modelling of aircraft emissions have been tested at Heathrow and will be considered later. This is very important in determining the extent of the spread of the pollutants.

<sup>2</sup> 'The Report of the Airport Air Quality Technical Panels', PSDH, DfT, July 2006 [CD/280].

<sup>3</sup> 'Stansted Air Quality beyond 25mppa: Modelling Test Report', Underwood et al (Netcen), 2006, section 2.3 [CD/278].

<sup>4</sup> Air Quality Bulletin, May 2006.

- 3.2.14 Calculation of NO<sub>2</sub> from NO<sub>x</sub> concentrations is influenced by ozone concentrations which can be very dependent on the weather and are also affected by certain plants and trees. Some allowance has been made for this in the calculations in one of the sensitivity tests but uncertainties will still occur.
- 3.2.15 Table 2 in CD/6 ('Key Data Sources') illustrates the point made as to how much the information used in the assessment of emission values depends on predictions made by BAA rather than upon reliable and verifiable independent sources.
- 3.2.16 The significance criteria that have been used to evaluate the modelled emission levels are inappropriate. The National Society of Clean Air is quoted in offering guidance as to when planning decisions ought to be influenced by changes in pollution levels. This is then applied to the differences in forecast concentration levels between 25mppa and 35mppa. This method of categorisation of effects as high, medium or low may be helpful in assessing environmental assessments but it is not material to a planning decision. The listed emissions are all the subject of EU and UK legislation and the probability of there being breaches of the legislation are the relevant factors. Significance categorisation has no validity in relation to the EU Air Quality Directive 1999/30/EC and its daughter directives or in relation to the UK Air Quality (England) Regulations 2000.
- 3.2.17 The main purpose of air quality monitoring and modelling is to evaluate the legal position and the risk that the statutory limits for the pollutants considered to be harmful may be exceeded. However small the difference between 25mppa and 35mppa may be, it is irrelevant if the statutory limits are likely to be breached.
- 3.2.18 The sensitivity test at 40mppa described in CD/6 has as many uncertainties as the 25mppa and 35mppa forecasts. The sensitivity test uses a different fleet mix, including larger aircraft, to equate to a higher throughput of passengers but is based on many of the same assumptions. The second test has already been referred to. It assesses the effect of differing ozone levels (which will vary according to a number of factors especially the weather) on the levels of NO<sub>2</sub>.
- 3.2.19 Measurements relating to vegetation protection (especially in Hatfield Forest) have been inappropriately dismissed. CD/6, para 6.1.12 states that modelled concentrations of NO<sub>x</sub> at measuring stations have not been compared with NO<sub>x</sub> vegetation protection limit values as they are within five kms of the M11 and therefore excluded by the legislation. Yet BAA admits in CD/13 (Nature Conservation), para 10.4.4 that they are still relevant to a planning decision.
- 3.2.20 The consideration of odour complaints in CD/6 is inadequate. Reports of odours around the airport have been common over the years and so BAA were asked to carry out an odour survey. Para 8.2 of CD/6 gives only a brief account of a three month survey carried out at Stansted in 2005 when 99 odour complaints were received. Full information about trends in the much lower numbers of complaints recorded at Heathrow, Gatwick, Birmingham and Manchester is given and used as a justification to dismiss claims of a problem at Stansted as mainly psychological. No consideration appears to have been given to the more rural environment in which Stansted is located and which may make kerosene-type odours more noticeable. This off-hand dismissal of a locally-perceived problem is not acceptable. A further report of the Stansted survey was provided in the Regulation 19 response [CD/22] and we are told that there was a very poor response rate and that many of the forms were inadequately filled in. No attempt was made to follow these up or to contact non-respondents.

- 3.2.21 Similarly, consideration of oily droplets reports in CD/6 is inadequate. No information is available about oily droplet complaints at Stansted and no questions about droplets were included in the Stansted survey. Once again the other airports' results are discussed with the conclusion that 'The analysis of oily droplet samples from these three airports does not indicate that aviation fuel is the primary source of oily deposits at these properties' (para 8.3.9). This statement should be backed up with examples of the chemical analysis of the results.
- 3.2.22 CD/6, paras 9.1.1 to 9.1.4 provide a very brief description of BAA's current air quality management framework which contains more aims than it does policies. Comments have already been made on one element, the paucity of its monitoring programme. Actual policies that are listed for the purpose of reducing emissions are very limited and unlikely to achieve much improvement in the performance of an increasingly busy airport unless actively pursued and probably accompanied by placing financial incentives/penalties on airlines and other airport users. A continuation of the same management measures is all that is promised by way of mitigation.

### 3.3 Air quality impacts from expansion

- 3.3.1 The base case is the year 2004 though the real-time monitoring figures are from BAA's airport monitoring programme for seven months split between 2003 and 2004. Predictions are made for 25mppa and 35mppa for the airport and the area around. Contours are supplied for NO<sub>x</sub>, NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub>.
- 3.3.2 Tables 7-9 (Local Authority Monitoring) in CD/6 show that exceedances of the annual mean limit values for NO<sub>2</sub> occurred in 2005 in Saffron Walden, in Bishop's Stortford (London Road and Dunmow Road) and at Burton End, Stansted. Values have been rising in most areas with growing traffic and increasing airport traffic. Values recorded in London Road, Sawbridgeworth are approaching limit values. Some of the traffic responsible for these exceedances at Burton End and Dunmow Road, Bishop's Stortford will be airport-related, and any increase in airport-related traffic will exacerbate the position. Further rises in 2006 have led to declaration of Air Quality Management Areas (AQMA) in the centre of Saffron Walden<sup>5</sup> and in Bishop's Stortford at the London Road Hockerill traffic lights<sup>6</sup>. Dunmow Road leads from this junction to the A120/M11 junction roundabout/access to the airport. This is a route used by airport employees living on the south side of Bishop's Stortford. BAA forecasts five extra cars at peak time at 35mppa but most employees are on shift work and these extra journeys will be repeated throughout the 24 hours, a significant addition to the detriment of any AQMA Action Plan.
- 3.3.3 No predictions are included for the hotels or the terminal building. It is understood that a significant number of hotel employees live on site.
- 3.3.4 CD/6, para 10.2 discusses predicted future emissions at 25mppa and 35mppa, which are set out in Tables 21 to 28. The tables show forecast emissions as tonnes per annum for each separate source for 25mppa and 35mppa. A number of claims are made which are not especially relevant to the planning process. What is important is the annual mean of the emissions listed in the EU Directive in areas where airport-related activity occurs. If any of these means are over the statutory limit value then further expansion would be expected to breach the

<sup>5</sup> 'Third Round Updating and Screening Assessment for UDC', Kings College, London, May 2006 [CD/281].

<sup>6</sup> 'Air Quality Updating and Screening Assessment for East Hertfordshire', East Herts District Council, April 2006 [CD/282].

regulations and, as in the case of Heathrow, development could not occur without practicable and effective mitigation measures.

- 3.3.5 As expected, Table 21 shows that the greatest contribution comes from aircraft, both on the ground and during the LTO cycle. These values have been calculated from the emission ratings of the selected aircraft in the assumed fleet mix. Figures for the LTO cycle will be influenced by decisions on the thrust likely to be used. In addition, road traffic emissions have been calculated from assumptions about the future performance and numbers of new and existing vehicles, airside and landside. Comments on these figures are given in the light of the PSDH recommendations [CD/280] (see below).
- 3.3.6 Table 22 gives comparison with the '15mppa+' planning application study. This reveals that predicted NO<sub>x</sub> emissions have halved since that study (and since the SERAS calculations) though PM<sub>10</sub> has doubled. The NO<sub>x</sub> reduction is said to be the result of a better understanding about times in mode, engine thrust settings and the use of reverse thrust. Emissions from airside vehicles have fallen 'due to a better understanding of airside diesel'. PM<sub>10</sub> values have increased due to 'a change in the emission factors from aircraft engines.' If this is so it appears that a lot of new information has been obtained in a relatively short time about the performance of aircraft engines with significant effects on the amount of NO<sub>x</sub> and PM<sub>10</sub> emitted. This is discussed later.
- 3.3.7 The statutory limit value for PM<sub>10</sub> in 2010 will be breached by 35mppa. There will soon be a new EU Air Quality Directive to replace 1999/30/EC. This is now the subject of European Commission discussions. Most limit values are expected to be retained but the fate of PM<sub>10</sub> is not yet decided. It is claimed in CD/6 that the background contribution would be 95% of the total and the influence of the airport would therefore be trivial. However, when expansion is being considered any airport contribution, however small, is relevant. According to CD/6, Table 21, airport contributions are 18% at 25mppa and 23% at 35mppa. The 95% figure cannot be correct.
- 3.3.8 With regard to PM<sub>2.5</sub> no limit has yet been set though 25 micrograms/m<sup>3</sup> has been suggested. The US limit is 15 micrograms/m<sup>3</sup> and if this were applied there would be breaches at the airport.
- 3.3.9 The contour maps show that the areas with higher than present limit values for NO<sub>2</sub>, and PM<sub>10</sub> emissions lie well inside the airport boundary. Benzene and 1,3 butadiene limit values are not exceeded. The contour for NO<sub>x</sub> limit value for vegetation comes outside the airport boundary, notably crossing Start Hill on the edge of Hatfield Forest. This is more marked at 35mppa. It is clear that only a small increase in emission levels would breach the limits in Hatfield Forest. Such a small increase is quite possible given the margin for error within all the assumptions that go into these predictions.
- 3.3.10 If, as is at present required under the EU Directive, the limit value of PM<sub>10</sub> annual mean falls in 2010 to 20 micrograms/m<sup>3</sup> then PM<sub>10</sub> levels will be breached by 2014 in both the 25mppa and 35mppa cases.
- 3.3.11 Comparison of the 25mppa and 35mppa cases is made in CD/6, para 10.3. Once again the assessment recommended by the National Society for Clean Air has been used to make a comparison. This system categorises the effects of expansion from 25mppa to 35mppa at most of the sites with assigned predicted values as only showing a low adverse effect on levels of NO<sub>2</sub>, NO<sub>x</sub> and PM<sub>2.5</sub>. The



exceptions would be if the PM<sub>10</sub> limit value reduction to 20 micrograms/m<sup>3</sup> in 2010 remains in the EU Directive and/or the PM<sub>2.5</sub> level is set at 15 micrograms/m<sup>3</sup>. Then the adverse effect would be high. Whilst this comparison approach may be helpful in assessing the results of an EIA, in a planning application for a major development the important issue is whether there is a likelihood that the UK Air Quality regulations and the EU Air Quality Directive will be breached.

### ***Effects on vegetation: Hatfield Forest***

- 3.3.12 The UK regulations exclude exceedances of vegetation limits from the procedures applied for remedying the situation if the area is within five kms of a motorway. However, Hatfield Forest is an SSSI and one of the few European ancient woodlands. Even BAA admits in CD/13, para 10.4.4 that *'Notwithstanding this exclusion the concentration is still relevant to the assessment of possible ecological effects within the context of the environmental assessment'*. The likelihood of damage from NO<sub>x</sub> emissions must be a significant reason for refusing permission for further expansion. Recent Government statements have made it clear that the intention is that SSSIs will be protected from pollution.<sup>7</sup>
- 3.3.13 Sensitivity tests are described in CD/6, para 10.4. Two tests have been carried out, one on a variation in NO<sub>x</sub>/NO<sub>2</sub> conversion rates in the presence of ozone. The other test has varied the chosen fleet mix and included increased numbers of bigger aircraft allowing up to 40mppa.
- 3.3.14 In both tests emissions are higher, NO<sub>2</sub> in the first test and NO<sub>x</sub>, NO<sub>2</sub> and PM<sub>10</sub> in the second. Statutory limit values for NO<sub>x</sub> are exceeded for vegetation at 40mppa in the north west area of Hatfield Forest. They are also exceeded for PM<sub>10</sub> in 2014.

## **3.4 Legislation and planning policies relevant to consideration of air quality**

- 3.4.1 If, as is at present required under the EU Directive, the limit value of PM<sub>10</sub> annual mean falls in 2010 to 20 micrograms/m<sup>3</sup> then PM<sub>10</sub> levels will be breached by 2014 in both the 25mppa and 35mppa cases.
- 3.4.2 The uncertainties in the assumptions crucial to the modelling and to the ultimate emissions levels introduces the possibility of a significant margin of error in the predictions of emissions levels which could lead to breaches of the Air Quality Directive 1999/30/EC and UK Air Quality (England) Regulations 2000 in respect of the limit values of NO<sub>x</sub> over Hatfield Forest.

### ***The EU Air Quality Directive 1999/30/EC, the UK Air Quality Limit Values Regulations 2001 and the UK Air Quality Strategy Addendum 2003***

- 3.4.3 There is a strong probability that the limit values of NO<sub>x</sub> for vegetation will be breached over Hatfield Forest. This is not a statutory offence as it is within five kms of a motorway but it is a material consideration as Hatfield Forest is an SSSI, a National Nature Reserve and an irreplaceable ancient woodland, and Government statements referred to above make clear that protection of SSSIs from pollution is the present policy.

<sup>7</sup> 'Consultation on the Review of the Air Quality Strategy', DEFRA, April 2006 and 'Sites of Special Scientific Interest. Code of Guidance', DEFRA, 2003 [CD/186].

- 3.4.4 The present limit values for PM<sub>10</sub> in 2010 in the EU Directive will be breached in 2014 at 25mppa and 35mppa. This value has not yet been changed and should therefore be regarded as operative. This is confirmed in the May 2006 air quality report for UDC by Kings College London.<sup>8</sup> The advice given on the PM<sub>10</sub> level is 'there is a risk of the objectives being exceeded across parts of the district. UDC however is not required to take actions at this time in respect of this finding, other than to note it for longer term planning processes.'
- 3.4.5 The limit value for NO<sub>2</sub> is already exceeded at Burton End, Stansted. We do not accept the predictions for 25mppa and 35mppa which show such a significant fall in NO<sub>2</sub> levels. We attribute these lower levels to errors in assumptions. Burton End may be near to the motorway but a proportion of the NO<sub>2</sub> pollution will be airport-related. Other near motorway levels measured by diffusion tubes at Newport, Wicken Lane, and Goose Lane Little Hallingbury are now below the limit value. Further monitoring is needed to clarify the amount of airport-related pollution, especially in residential areas, before any airport expansion is allowed.
- 3.4.6 Table 3 in ES Vol 3 [CD/6] sets out the Air Quality Objectives and the European Union Limit Values and the dates for their achievement.

***Secretary of State's proposed changes to the East of England Plan [CD/76]***

- 3.4.7 ENV1 – Green Infrastructure: 'Areas and networks of green infrastructure should be identified, created, protected and managed to ensure that an improved and healthy environment is available for the benefit of present and future communities. This will be particularly important in those areas identified to accommodate the largest amounts of growth'. A paragraph follows identifying the action that should be taken through Local Development documents followed by a list of 'Assets of particular regional significance for the retention, provision and enhancement of green infrastructure'. This list includes Hatfield Forest.
- 3.4.8 ENV5 – Woodlands: Para 2 states 'Ancient semi-natural woodland and other woodlands of acknowledged national or regional importance should be identified in Local Development documents with a strong presumption against development that would result in their loss or deterioration'. Aged or veteran trees should be conserved.

***Essex & Southend Replacement Structure Plan [CD/59]***

- 3.4.9 NR 6: 'Development will not be permitted that would have an adverse effect on an SSSI or a NNR unless the need outweighs the conservation importance of the site.'
- 3.4.10 NR 9: Gives protection to trees and woods.
- 3.4.11 BIW 9: 'Airport development must not have an unacceptable impact on public health, noise pollution levels and environmental conditions.'

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<sup>8</sup> 'Third Round Updating and Screening Assessment for UDC', Kings College, London, May 2006 [CD/281].

**Uttlesford Local Plan [CD/57]**

- 3.4.12 GEN 7: 'Development that would have a harmful effect on wildlife will not be permitted unless the need outweighs the importance of the feature.' SSSIs and NNRs are given the maximum degree of protection.
- 3.4.13 ENV 7: 'Development that adversely affects areas of nationally important nature concern such as SSSIs and NNRs will not be permitted unless the need outweighs the importance of the site.'

**PPS23: Planning and Pollution Control [CD/248]**

- 3.4.14 Appendix 1G of PPS23 [CD/248] is quoted by BAA in CD/6, para 7.2.3 as a material planning consideration. This states that the impact on ambient air quality is likely to be particularly important 'where the development could in itself result in the designation of an AQMA' and 'where granting planning permission would conflict with or render unworkable elements of a local authority air quality action plan'.

**4 NEW EVIDENCE****4.1 Project for the Sustainable Development of Heathrow**

- 4.1.1 The PSDH was, as described in para 3.2.6 above, established to advise on the best methodology for assessing future air quality predictions at Heathrow Airport. It is generally accepted that modelling for air quality for airports to date has many potential uncertainties and the assembling of many experts in this field to advise on a future more accurate model for Heathrow clearly benefits the cause of better modelling at other airports.
- 4.1.2 The recommendations of the technical panels were supported by an independent group of experts and most conclusions are applicable to Stansted Airport.
- 4.1.3 In section 3.2 we examined the areas of uncertainty in the predictions for air quality in 2014 for 25 mppa and 35 mppa. Now, with the benefit of information from the reference papers as to the details of the decisions that were taken, and the advice given by the PSDH, we are able to give additional weight to most of our conclusions.
- 4.1.4 The key issues identified by the PSDH<sup>9</sup> (relevant paragraphs in brackets) as influencing uncertainties in modelling predictions were:
- It is essential to compare the base case with real time monitoring in order to validate the model (para 1.10);
  - Real time monitoring should be carried out by automatic analysers with high quality assurance and quality control (para 2.19);
  - In the case of Nitrogen oxides – NO<sub>x</sub> and NO<sub>2</sub> – a chemiluminescent monitor is approved. Nitrogen diffusion tubes present many uncertainties but can be helpful guides (para 2.22);

<sup>9</sup> 'The Report of the Airport Air Quality Technical Panels', PSDH, DfT, July 2006 [CD/280].

- In the case of PM<sub>10</sub> and PM<sub>2.5</sub>, sampling for particles is still subject to considerable uncertainties (para 3.22);
- Engine emissions data, essential for NO<sub>x</sub> emission inventories, are based on International Civil Organisation (ICAO) testing data under standard conditions at sea level. Allowance must be made for variations in actual use, forward speed as well as engine thrust, times in mode, ambient weather conditions and engine deterioration. This is especially important in relation to NO<sub>x</sub> emissions (paras 3.11, 3.27, 3.28 3,39, 3.46 and 3.50);
- Dispersion characteristics of aircraft emissions need further research but the use of the new ADMS-airport model is likely to give the best picture (para 1.95);
- Future NO<sub>x</sub> emissions from engines not yet in operation or as yet not in production must be treated with caution. The present demand is for lower fuel use and lower noise levels. The technical improvements designed to meet this demand results in relatively higher NO<sub>x</sub> emissions per unit of fuel. The panel decided that a separate review was needed to better assess the situation (paras 3.66, 3.69 & 3.70);
- Adequate operational airport records are needed in relation to emissions from operations such as APU use, engine testing, journeys by airside vehicles (paras 3.75 and 3.76, 3.111, 3.112, 3.135 and 3.148);
- An appropriate landside traffic model is required able to take account of airport traffic characteristics, e.g. airport peaks do not relate to average road use patterns and have different emission patterns (paras 3.156 and 3.157).

4.1.5 Note that the dispersion model chosen for use at Heathrow was the new ADMS-Airport model developed by Cambridge Environmental Research Consultants.

## 4.2 Comparison of PSDH recommendations [CD/280] with the Stansted model

- 4.2.1 Key pollutants: the pollutants of importance at Stansted are NO<sub>x</sub>, NO<sub>2</sub> and PM<sub>10</sub>/PM<sub>2.5</sub>.
- 4.2.2 Air quality monitoring: as already commented on in para 3.2.2 there has been no air monitoring programme at Stansted that provides an airport wide picture compatible with the key PSDH recommendation for reliable validation. Neither does it establish a reliable annual mean for the key pollutants. The monitoring results available are described in the Netcen Modelling Test Report<sup>10</sup> for CD/6 and were restricted to one automatic analyser used for only 7 months, 23 October 2003 to 18 May 2004 supplemented by nitrogen diffusion tubes.
- 4.2.3 Meteorological data: these have been allowed for in dispersion modelling but cloud cover data had to be obtained from Wattisham, which is 55 kms north east of Stansted.<sup>11</sup> Cloud cover increases the stability of emissions and helps to retain heat. Data from so far away is not satisfactory. Aircraft contrails dispersing into cirrus clouds are frequently seen in the sky south of Stansted and these would not appear in the records at Wattisham.

<sup>10</sup> 'Stansted Air Quality beyond 25mppa: Modelling Test Report', Underwood et al (Netcen), 2006, Section 4.2 [CD/278].

<sup>11</sup> Ibid, paras 4.1.45 & 46.

- 4.2.4 Engine emissions of NO<sub>x</sub>: these are especially susceptible to ambient temperatures, the PSDH recommends that variations should be allowed for and adjusted in accordance with a seasonably averaged factor.<sup>12</sup>
- 4.2.5 Changes in fleet mix: these changes have been selected by BAA on the assumption that an airport restricted to 25 mppa must develop a more commercial customer base, with more large aircraft on cargo flights and a significant increase in flights of new models, as yet to come into operation, namely, A380s and B787s. The Quinetiq report<sup>13</sup> suggests that new aircraft will form 45% of the fleet in 2014 and will conform to NO<sub>x</sub> emissions standard 'CAEP4-30%'.<sup>14</sup> This has been accepted in the modelling used for Stansted. The PSDH however warns against assuming that improvements in fuel use will reduce NO<sub>x</sub> emissions and intends to carry out a further review. This suggests more uncertainties.
- 4.2.6 Emissions from Times-in Mode: while emission factors used for the LTO cycle in general conform to the PSDH recommendations, it appears from the supporting Netcen paper<sup>15</sup> that full operational information has not been available at Stansted and is restricted to visual observations of around 1,000 movements in the morning and evening periods plus an assortment of other information.<sup>16</sup> This clearly introduces a significant element of uncertainty.
- 4.2.7 Allowances: factors not taken into account in the Stansted modelling but recommended for inclusion by the PSDH report:
- allowance should be included, where applicable, for engine deterioration leading to an increase of 4.5% NO<sub>x</sub> emissions (para 3.50 PSDH);
  - allowance should also be made for forward speeds as NO<sub>x</sub> emissions vary with speed (para 3.46 of PSDH gives specific advice on calculations).
- 4.2.8 Engine testing emissions: the Netcen Modelling Test Report<sup>17</sup> describes a number of assumptions made from admitted inadequate information. This introduces more uncertainties.
- 4.2.9 APU emissions: running times are not available for Stansted so assumptions were made that appear reasonable though again introduce uncertainties as to the emissions inventory.<sup>18</sup>
- 4.2.10 Emissions from airside vehicles: information provided appears to have been adequate for a reasonable estimation of emissions.<sup>19</sup>
- 4.2.11 Landside road network emissions: the Netcen Modelling Test Report records a series of calculations designed to deal with an almost impossible set of circumstances. The new trunk road, the A120 was opened during the base case modelling period at the end of October 2003. It would be impossible to judge

<sup>12</sup> 'The Report of the Airport Air Quality Technical Panels', PSDH, DfT, July 2006, para 3.49 [CD/280].

<sup>13</sup> 'Future emissions analysis for Stansted Airport' in 2014, Dickinson and Christou (Quinetiq), 2005 [CD/277].

<sup>14</sup> CAEP4 is a standard defined by the Committee on Aviation Environmental Protection, part of ICAO (the International Civil Aviation Organisation). As its title suggests, 'CAEP4-30%' is a tighter standard.

<sup>15</sup> 'Stansted Air Quality beyond 25mppa: Modelling Test Report', Underwood et al (Netcen), 2006 [CD/278].

<sup>16</sup> Ibid, paras 2.2.4 to 2.2.8.

<sup>17</sup> Ibid, section 2.4.

<sup>18</sup> Ibid, section 2.3.

<sup>19</sup> Ibid, section 2.6.

during this intermediate period what proportion of through traffic would be diverted from the old A120 or from the A1307 to Colchester. Para 2.7.2 of the report comments that the single automatic analyser was not situated close to the new road but it is closer to the new A120 than the old route. Considerable uncertainties must therefore remain.<sup>20</sup>

- 4.2.12 Dispersion modelling of the aircraft emissions: it would appear that the model used as described in the Netcen Modelling Test Report parameterises the effect of the jet plume buoyancy rather than including its effect explicitly. This introduces uncertainties in the dispersion modelling. The chosen model ADMS Airport is better at expressing near field dispersion.
- 4.2.13 NO<sub>x</sub>/NO<sub>2</sub> ratio: the effects of ozone and changes in primary NO<sub>2</sub>: we consider that the uncertainties discussed suggest that the levels of NO<sub>2</sub> in 2014 are likely to be higher than predicted in CD/6. However they are unlikely to exceed the limit values for human health, even if possible changes in the above aspects of modelling are taken into consideration.<sup>21</sup>

### 4.3 Effects of NO<sub>x</sub> on vegetation

- 4.3.1 The predictions in CD/6 for NO<sub>x</sub> at the north west corner of the ancient woodland and SSSI Hatfield Forest show that the limit value for vegetation is almost exceeded at 35mppa and is exceeded for the 40mppa sensitivity test. It is clear that the number of uncertainties in the modelling process increase the probability that levels will be exceeded over a significant section of this ancient woodland SSSI.
- 4.3.2 The Government has made clear, in the Air Quality Strategy<sup>22</sup> that the statutory nitrogen oxides objectives should be achieved at 99% of important nature sites (including all SSSIs) by 2010.
- 4.3.3 The levels of harmful nitrogen deposition in Hatfield Forest is stated in CD/13, para 10.4.6 to be high at the present time but the possibility that this is airport-related is dismissed by BAA as Hales Wood SSSI near Saffron Walden showed similar levels. Hales Wood is however not comparable having been part planted with conifers and used for breeding pheasants for a number of years. In addition it is a small wood (25 acres) and surrounded on three sides by agricultural land. Eutrophication is known to occur round the edges of such woodland and would extend well into the woodland in a small area. Hatfield Forest, by virtue of its size, should not be affected except round the edges.

### 4.4 PM<sub>10</sub> and PM<sub>2.5</sub>

- 4.4.1 If the present recommended limit value for PM<sub>10</sub> in 2010 is retained in the new EU Air Quality Directive then it will be breached by 2014.

<sup>20</sup> Ibid, section 2.7.

<sup>21</sup> Underwood et al, Stansted Air Quality beyond 25 mppa: Methodology. Netcen, paras 4.1.10 -4.1.14 [CD/279].

<sup>22</sup> 'Consultation on the Review of the Air Quality Strategy', DEFRA, April 2006, para 73 and Appendix 1 [CD/186].

## 4.5 Planning and Pollution Control - Air Quality Management Area ('AQMA')

- 4.5.1 There is an AQMA in Bishop's Stortford including the junction of the London Road B1383 and the A1250.<sup>23</sup> This junction is linked directly via the Dunmow road to the Airport A120/M11 roundabout. Any airport traffic from the south or south west of Bishop's Stortford is likely to use this junction. Any increase in airport traffic from airport development would be contrary to PPS23 [CD/248] as it would impede the success of the air quality action plan.<sup>24</sup>

## 5 CONCLUSIONS

- 5.1 The new evidence presented reinforces our conclusion that the critical limit values laid down by EU Directive 1999/30/EC and the UK Air Quality Limit Values Regulations, 2001, for NO<sub>x</sub> effects on vegetation would be exceeded in the SSSI and ancient woodland of Hatfield Forest if expansion to 35mppa were allowed. It is the stated intention of the Government that 99% of all SSSIs should be protected even if situated in an exclusion zone, in this case within five kms of a motorway.<sup>25</sup> There is the possibility that PM<sub>10</sub> limit values for human health will be exceeded depending on the adoption of the proposed new EU Directive on Air Quality.
- 5.2 The Secretary of State for Communities and Local Government has accepted the policies in the emerging East of England Plan proposed by the Panel for the protection of nature reserves, SSSIs and ancient woodland. Hatfield Forest is specifically mentioned in a new ENV1 and also falls into ENV5 which gives protection to woodland.
- 5.3 Protection is also given to Hatfield Forest SSSI by policies NR6 and NR9 of the Essex and Southend Replacement Structure Plan and by policies GEN 7 and ENV 7 of the Uttlesford Local Plan.
- 5.4 We therefore conclude that the probability is that Hatfield Forest will be irretrievably damaged by further expansion of the airport. At the very least there should be a comprehensive real time monitoring study of the airport and predictions made based on the recommendations of the PSDH. There can be no justification for not affording the best protection to local residents and local nature reserves even though they be fewer in number. Action taken now will prevent the situation deteriorating in the future, as has happened at Heathrow.

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<sup>23</sup> 'Air Quality Updating and Screening Assessment for East Hertfordshire', East Herts District Council, April 2006 [CD/282].

<sup>24</sup> Ibid, para 5.2.

<sup>25</sup> 'Consultation on the Review of the Air Quality Strategy', DEFRA, April 2006 and 'Sites of Special Scientific Interest. Code of Guidance', DEFRA, 2003, [CD/186] – see Annex 1 and Annex 2 SSE/7/a.

## **ANNEX 1: Code of Guidance: Sites of Special Scientific Interest, DEFRA, 2003**

Page 31 – Obligations of public bodies:

*'The new legislation imposes a duty on 'public bodies' in exercising their statutory functions to take reasonable steps, consistent with the proper exercise of those functions, to further the conservation and enhancement of the special features of an SSSI...'*

*'The Secretary of State expects that all public bodies will take full account of their responsibilities under this duty whenever their actions may affect SSSIs...'*

Page 32 – Consents granted by public bodies:

*'A public body which has powers to grant permissions, including authorisations or consents, for other parties to carry out operations (whether on or outside of an SSSI) must, when these are likely to damage the special interest features of the SSSI give English Nature not less than 28 days notice in writing before granting permission.'*

## **ANNEX 2: 'Review of the Air Quality Strategy – options for further improvements in air quality', DEFRA, April 2006**

Page 112 – Oxides of nitrogen:

*'... it is proposed to adopt a long term aspiration that the critical level will be achieved at all SSSIs, ASSIs and Natura 2000 sites (including Ramsar sites) both inside and outside exclusion areas. The UK government and the devolved administrations propose that the medium term objective towards our long term aspiration is to achieve the nitrogen oxides objectives at 99% of all sites, by area, by 2010.'*