

Mr Gavin Derrick  
Southampton City Council  
Civic Centre,  
Southampton,  
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**By email**

Date: 5th January 2019  
Reference: R8315-1 Rev 0

Dear Gavin

**RE: Proposed Runway Extension, Southampton International Airport  
Peer Review of Noise Impact Assessment**

Thank you for your recent instruction. I am pleased to provide our peer review of the noise impact assessment relating to the proposed runway extension at Southampton International Airport (Eastleigh Borough Council planning application Reference F/19/86707) below.

**1.0 PROPOSED WORKS**

- 1.1 The application is for construction of a 164-metre runway extension at the northern end of the existing runway, associated blast screen to the north of the proposed runway extension, removal of existing bund and the reconfiguration and extension of existing long stay car parking to the east and west of Mitchell Way to provide an additional 600 spaces.
- 1.2 An Environmental Impact Assessment has been undertaken by Savills and WSP. Chapter 11 and associated appendices of the Environmental Statement (ES) relate to noise impact (undertaken by WSP).
- 1.3 It is understood that the extended runway will make provision for larger jet aircraft, such as the Boeing 737 and Airbus A319/320. The same aircraft are currently capable of flying from the airport, however, the existing runway length provides weight restrictions and hence limits the range and destinations that these aircraft can fly to. The ES identifies that, over time, aircraft movements will grow (by approximately 19% in 2021 and by 36% by 2037) and that the mix of aircraft will change with a significantly greater proportion of jets as described above. There is no planned change to night flights, with currently no scheduled flights but an allowance for up to 100 per year.
- 1.4 The ES advises that the extended runway will allow the larger jet aircraft to take off in a southerly direction. In practice, of course, it will also accommodate landings from the south and approaches and departures from/ to the north (over Eastleigh).

## 2.0 SCOPE OF PEER REVIEW

- 2.1 This peer review relates to noise impact that may affect receptors within the city of Southampton.
- 2.2 Noise from groundborne operations and construction noise impacts are considered highly unlikely to affect Southampton receptors and therefore have not been considered. In addition, the construction and the operation of the proposed car park should not affect receptors in Southampton and have also not been considered.
- 2.3 This peer review therefore relates to noise from aircraft departures on runway 20 and arrivals on runway 02 only (relating to aircraft arrivals and departures over Southampton).

## 3.0 SIGNIFICANCE OF THE PROPOSALS

- 3.1 The ES describes operational scenarios in the baseline year (taken as 2016), opening year (2021) and future year, 2037. The proposals will facilitate twin engine jet aircraft including the Boeing 737 and Airbus A319 and A320. The table below summarises the split of aircraft types identified in the ES (based upon an average Summer day).

| Aircraft Type                            | Current (2016) | Opening Year (2021) | Future Year (2037) |
|--|----------------|---------------------|--------------------|
| Twin turbo-prop (eg Dash 8-400, Tristar) | 84.3           | 72.1                | 72.1               |
| Twin Engine Jet (e.g. B737, A319/A320)   | 16.8           | 52.2                | 74.9               |
| Other                                    | 36.1           | 39.5                | 39.5               |
| Total                                    | 137.2          | 163.8               | 186.5              |

**Table 1:** Total One-way Aircraft Movements, Average Summer Day

- 3.2 The figures indicate that at the current time the airport operations are dominated by large twin turbo-prop aircraft (Bombardier Dash 8-400 and Britten Norman Tristar). These currently reflect around 61% of aircraft movements on an average Summer day. This will reduce to around 44% in 2021 and 39% in 2037. The use of jet aircraft will grow substantially and they will dominate in 2037 (representing approximately 40% of the total aircraft using the airport). The figures do indicate that large twin engine turbo prop aircraft will make up only a marginally smaller proportion.
- 3.3 It is evident, that whilst the use of the Dash8-400 in particular will reduce, this will only be a small reduction as the aircraft will still continue to operate, however, the airport growth will be driven by the use of the new jet aircraft which will be able to operate over the increased runway length.
- 3.4 The analysis indicates approximately 93 2-way movements by the Summer of the year 2037 and a total of 5 million passengers per annum. This compares with Stanstead Airport which had 475 aircraft movements per day over the Summer of 2017 and has aspirations for 50 m passengers per year. Bristol Airport served 8.6 m passengers in 2018 with approximately 200 aircraft movements. Furthermore, records indicate that Gatwick Airport had 775 Summer movements and accommodated 46.1 m passengers in 2018.
- 3.5 The above stresses that, regardless of the potential increased capacity, Southampton Airport's proposals are to remain a relatively small regional airport (providing they grow only within the constraints that they have identified).

#### 4.0 NOISE ASSESSMENT CRITERIA

4.1 The ES makes reference to the National Planning Policy Framework (NPPF), the Noise Policy Statement for England and the Planning Practice Guidance (PPG). The guidance of the PPG contains a noise exposure hierarchy table which is reproduced below.

| <b>Response</b>   | <b>Examples of Outcome</b>   | <b>Increasing Effect Level</b>      | <b>Action</b>                    |
|---|--|-------------------------------------|----------------------------------|
| Not present   | No Effect  | No Observed Effect                  | No specific measures required    |
| <b>No Observed Effect Level (NOEL)</b>                    |  |                                     |                                  |
| Present and not intrusive                                 | Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but no such that there is a change in the quality of life   | No Observed Adverse Effect          | No specific measures             |
| <b>Lowest Observed Adverse Effect Level (LOAEL)</b>       |  |                                     |                                  |
| Present and intrusive                                     | Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up the volume of the television, speaking more loudly, where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.                                  | Observed Adverse Effect             | Mitigate and reduce to a minimum |
| <b>Significant Observed Adverse Effects Level (SOAEL)</b> |  |                                     |                                  |
| Present and Disruptive                                    | The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area. | Significant Observed Adverse Effect | Avoid                            |
| Present and Very Disruptive                               | Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.   | Unacceptable Adverse Effect         | Prevent                          |

**Table 2:** Noise Exposure Hierarchy Table

- 4.2 In making reference to the table it is 24 Acoustics' opinion and experience that a noise impact greater than the Lowest Observable Adverse Effects Level (LOAEL) and as high as the Significant Observed Adverse Effect Level (SOAEL) is acceptable providing it is mitigated to a minimum. An impact greater than SOAEL but lower than the Unacceptable Adverse Effects Level should be avoided. This means that an impact at this magnitude is undesirable but not unacceptable.
- 4.3 The PPG does not define LOAEL and SOAEL in objective terms. The ES has defined LOAEL as 54 dB  $L_{Aeq, 16 \text{ hr}}$  and SOAEL as 63 dB  $L_{Aeq, 16 \text{ hr}}$ . In practice the objective definition of these regions probably cannot be accurately defined and are often likely to be the subject of disagreements between different parties, however, the LOAEL level is particularly important as it defines the minimum noise level at which mitigation should be offered. It is worth referring to the AECOM/Defra report '*Possible Options for the Identification of SOAEL and LOAEL in support of the NPSE*' which defines the following for aircraft noise:
- LOAEL: 50- 54 dB  $L_{Aeq, 16 \text{ hour}}$ , averaging 52 dB  $L_{Aeq, 16 \text{ hr}}$ ;
  - SOAEL: 58-62 dB  $L_{Aeq, 16 \text{ hour}}$ , averaging 60 dB  $L_{Aeq, 16 \text{ hr}}$ .
- 4.4 In addition, the Survey of Noise Attitudes (SoNA 2014) found that the degree of annoyance (based on the percentage of respondents highly annoyed) previously occurring at 57 dB  $L_{Aeq, 16 \text{ hr}}$ , now occurs at 54 dB  $L_{Aeq, 16 \text{ hr}}$ . It is considered that residents 'highly annoyed' would experience noise impact at a level greater than the LOAEL and therefore LOAEL should potentially be regarded as lower than 54 dB  $L_{Aeq, 16 \text{ hr}}$  used in the ES. The same is considered of the SOAEL region on the basis of the findings of the Defra report.
- 4.5 Some airports also produce further noise contours in the form of N65 or N70. These are the number of aircraft movement events (in an average Summer day) in which the noise level exceeds a noise level of 65 dB  $L_{Amax, s}$  or 70 dB  $L_{Amax, s}$ . On the basis that the human ear does not integrate (average) noise levels from intermittent aircraft movements over a 16 hour period it is considered that it would also be useful to see the noise data expressed in this format.

## 5.0 CALCULATION OF AIRCRAFT NOISE

- 5.1 The characteristics of any particular aircraft noise event are controlled by aircraft type (especially its engines and propulsion system), weight at the time, mode of operation (ie flight configuration, especially whether it is taking off or landing), its power settings, flight path, speed, atmospheric conditions (temperature, humidity, wind speed and direction and turbulence), the surrounding terrain and ground cover, including the presence of obstacles (natural and/or man-made, particularly if these are close to the receiver position). To avoid the difficulties of considering the latter, it is usual to confine attention to 'free-field' sound, ie a few feet above the ground away from obstructions which affect sound propagation.
- 5.2 The issue of local topography is particularly important in relation to the noise impact in the Bitterne Park area which is elevated above the airport. Aircraft approaching over the city have a particularly low relative altitude when flying over this area.
- 5.3 Aircraft usually take off and land into the wind in order to maximise lift. The ratio between takeoff/landings in each direction is known as the modal split. The modal split for the 2016 baseline year (based on true data) was 76/24 (meaning 76% of departures occurred on runway 20, over Southampton). We note that WSP's predictions for aircraft noise levels in 2021 and 2037 have used a modal split of 64/36. No explanation is given for this difference (which would undoubtedly affect the noise contours and potentially indicate an artificially low noise impact over Southampton. This must be clarified by the Airport/ WSP.

- 5.4 WSP has used the CAA noise modelling software ANCON v2.3 to calculate receptor noise levels for an average Summer day for the 2016, 2021 and 2037 operational year scenarios. The input data for the model (types of aircraft etc.) has been provided to WSP by Southampton Airport and is detailed in an appendix. Whilst I stress that we do not challenge these figures we have no means of ratifying their accuracy. 24 Acoustics also has no means of verifying that the noise predictions are correct, without undertaking detailed calculations of our own. We can verify, however, that we consider ANCON an appropriate software for the purpose and that we have no reason not to believe the results.
- 5.5 The model results are expressed graphically in the form of acoustic contours in 3 dB steps commencing at 54 dB  $L_{Aeq, 16 \text{ hour}}$  and ending at 69 dB  $L_{Aeq, 16 \text{ hour}}$ . The data has then been analysed and has determined the number of households within each contour and the estimated population within each contour. This is reproduced below.

| Contour Noise Level, dB $L_{Aeq, 16hr}$ | Operational Year & No Households |                   |                  |
|---|----------------------------------|-------------------|------------------|
|   | 2016 Baseline                    | 2021 Starter Year | 2037 Future Year |
| >54                                     | 3800                             | 8100              | 10,800           |
| >57                                     | 1250                             | 3750              | 5,100            |
| >60                                     | 350                              | 1150              | 1,800            |
| >63                                     | 0                                | 350               | 650              |
| >66                                     | 0                                | 0                 | 50               |
| >69                                     | 0                                | 0                 | 0                |

**Table 3:** Comparison of Households in Each Noise Contour, Average Summer Day

- 5.6 The assessment indicates that an additional 3,950 households will be drawn into the region between LOAEL and SOAEL (as defined in the ES) between 2016 and 2021 and 6,300 households by 2037. 350/ 650 new households will fall into the SOAEL region in 2021 and 2037 respectively.
- 5.7 As discussed in Section 4 it is considered that LOAEL probably falls below 54 dB  $L_{Aeq, 16 \text{ hr}}$  and therefore it would be helpful if a further contour (at 51 dB  $L_{Aeq, 16 \text{ hour}}$ ) could be added with the associated householder/ population analysis. It is noteworthy that Southampton International Airport's Noise Action Plan (dated 2018) defines 51 dB  $L_{Aeq, 16 \text{ hr}}$  as LOAEL.
- 5.8 If it is considered that LOAEL should be defined as 51 dB  $L_{Aeq, 16 \text{ hour}}$  and SOAEL 60 dB  $L_{Aeq, 16 \text{ hour}}$  this will mean that the number of households affected will have been significantly underestimated within the ES. For example the number of households experiencing a significant adverse noise impact would be 1,800 in 2037, rather than the 650 quoted.
- 5.9 The ES concludes that the proposals will result in a direct, long-term, adverse effect of major significant prior to the implantation of mitigation measures. 24 Acoustics concurs with this conclusion.

## 6.0 NOISE MITIGATION

- 6.1 The ES considers mitigation for the noise impact in the region between LOAEL and SOAEL and also in the region greater than SOAEL.
- 6.2 For the region greater than SOAEL (which in Southampton applies to dwellings primarily in Bitterne Park) mitigation is to be offered through a noise insulation policy which, in itself, will be secured through a noise action plan which will form part of the Section 106 agreement with Eastleigh Borough Council.

- 6.3 No details are provided, however, it is evident that the proposals will probably relate to grants to households for sound insulation. It should be noted that, whilst sound insulation (e.g. upgraded window systems) can reduce the level of noise breaking into a dwelling, in order to be effective alternative means of ventilation and measures to prevent excess overheating in dwellings are also required (allowing the residents to occupy their properties at all times without needing to open windows). Clearly, such measures will also offer no benefit to private amenity areas (gardens, balconies and terraces). It is therefore 24 Acoustics' opinion that this mitigation should be offered as a last resort after only all other potential measures have been considered.
- 6.4 The ES states that the noise impact will reduce to 'moderate' after mitigation, however, we disagree. It is our opinion that noise mitigation at source should be considered.
- 6.5 The ES refers to the Airport's existing Noise Action Plan for mitigation to properties within the LOAEL and SOAEL region. This states the following:
- Operating a differentiated aircraft charging system to discourage noisier aircraft classed as Chapter 3 Noise Standard, Annex 16 of ICAO;
  - Banning noisier Chapter 2 aircraft i.e. those which do not meet the standards of ICAO Annex 16 Chapter 3;
  - Restrict aircraft operations during the night time period from 23:00 – 06:00 hrs (Mon – Sat) and 23:00 – 07:30 hrs (Sundays). The Section 106 Planning Agreement restricts movements in the night time period to 10 movements per month or a maximum of 100 per year. This will not be affected by the Proposed Development and this restriction will remain in place;
  - Application and monitoring of agreed Noise Preferred Routes (NPRs) for aircraft. Aircraft track keeping systems are monitored and off-track occurrences are reported to airlines and the airport's Technical Working Group;
  - Operation of the Noise and Flight Evaluation Unit which logs and responds to complaints and enquires, including further investigation where required and providing statistics to be reported to the Airport Consultative Committee;
  - Engagement and communication with the stakeholders through the Airport Consultative Committee on noise issues such as aircraft routing, results from noise monitoring, reporting on progress of actions set out in the NAP; and
  - Use of noise monitors at the direction of the Technical Working Group to address any specific noise related issues.
- 6.6 It is also stated that the airport will publish a Local Operating Procedure to outline the process of addressing aircraft which deviate from the Noise Preferred Routes (NPRs), including the use of financial penalties.
- 6.7 24 Acoustics has reviewed Southampton International Airport's Noise Action Plan and, in particular, the airport's 'Noise Preferred Routes'. This stipulates the following for arrivals and departures over Southampton:
- Aircraft Departing to the South (Runway 20). Aircraft taking off to the south will climb straight ahead to 500ft above mean sea level and then turn right to follow a 217° heading. This heading will direct aircraft towards the path of the River Itchen and the track will be maintained until reaching Southampton Water or 2000ft above mean sea level, whichever is reached first. The exact point, at which aircraft reach 500ft and subsequently turn, will vary depending on many factors, such as engine type, aircraft weight and weather conditions.

- Aircraft Arriving from the South (Runway 02). For a visual approach, the point at which aircraft are required to be on alignment with the runway's centre line, when making a visual approach is four miles. Aircraft join the approach path over the less densely populated Southampton Water area to manoeuvre onto the runway centre line for arrival. The aircraft are then required to follow a 30 angle of approach for operational reasons.
- It is noteworthy that there is no description for non- visual approaches onto Runway 02.

6.8 Given the extent of the noise impact expected over the City it is considered that Southampton International Airport should be asked to give further consideration to their noise abatement procedures and routes. In particular it is not clear if the proposed jet aircraft would have a steeper climb potential than the turboprop aircraft. This could mean that they would reach an altitude of 2000 ft earlier and then turn over the city. Measures that could be considered (which are used by other airports) include the following:

- Steeper angle of approach for landings onto Runway 02 (maintaining the existing continuous descent approach). This would keep the aircraft at greater altitude and would reduce noise impact at Bitterne Park in particular;
- For approaches into Runway 02 lowering the undercarriage at the last possible moment (to reduce turbulent noise on the airframe);
- For take-offs from Runway 20 a procedure to reduce from take-off power to climb power at a defined attitude;
- For take-offs from Runway 20 a departure track at a heading of 217 degrees until Southampton Water is reached (regardless of altitude) to prevent early turns over the densely populated areas of the city.

6.9 Provision of insulation to householders should be considered a last resort and needs to be sufficient to allow residents to occupy their properties at all times with windows closed. For benchmarking purposes, a brief review of the insulation offered by other airports is summarised below:

- Bristol Airport. Offers a grant of £7,500 to residents in/ above the 63 dB  $L_{Aeq, 16 \text{ hour}}$  contour and £3,750 for residents in the 57 and 60 dB contours;
- Gatwick Airport offers residents within the 60 dB  $L_{Aeq, 16 \text{ hr}}$  noise contour £3,000 towards double glazing and loft insulation for newly affected homes;
- Heathrow Airport offers 'full costs' for insulation to residents in the 60 dB  $L_{Aeq, 16 \text{ hr}}$  contour.

6.10 It would therefore appear that if sound insulation is to be offered to local residents as a means of noise mitigation it should potentially be at a level lower than the 63 dB  $L_{Aeq, 16 \text{ hour}}$  level proposed.

## 7.0 SUMMARY

7.1 The ES states that the runway extension will make provision for larger/ heavier jet aircraft to takeoff in a southerly direction over Southampton. It will also facilitate northerly landings in particular as well as northerly departures and southerly landings.



- 7.2 Aircraft usually take off and land into the wind to maximise lift. The prevailing wind in this part of the country is south-westerly meaning the majority of departures will occur over Southampton and the majority of approaches over Eastleigh. The ES states that this split was 76/24 in 2016 (meaning that the majority of departures occurred over Southampton and approaches over Eastleigh). For reasons unknown, however, a split of 64/36 has been used for the future scenarios. This will have the effect of underestimating the noise impact over Southampton and should be clarified by the Airport/ WSP.
- 7.3 The proposals will accommodate a 36% growth in aircraft movements between 2016 and 2037. They will also accommodate a change in aircraft type which is currently dominated by the DHC800 to the B737/A319/A320 which are estimated to represent 40% of all movements by 2037.
- 7.4 Aircraft noise levels have been expressed as 16 hour  $L_{eq}$  levels during an average Summer day. It should be noted that humans do not integrate (average) noise levels over 16 hours and the 'real world' noise impact may relate to the maximum noise level associated with each aircraft movement together with the number of daily events. It would be helpful if contours showing the number of events exceeding (for example) 65 and 70 dB  $L_{Amax,s}$  (N65 and N70) could be provided. In practice the noise level associated with a regional jet arrival may be slightly lower than that from a turbo-prop aircraft which may be of some benefit to residents living under the approach path in Southampton (such as those in Bitterne Park). Departure noise levels, however, are significantly greater.
- 7.5 24 Acoustics does not agree with WSP's determination of the noise levels that relate to LOAEL and SOAEL for aircraft movements. Levels reported in the AECOM/ Defra publication are lower. In addition, the Airport's NAP defines a lower level for LOAEL. As a result it is our opinion that the ES has significantly under-estimated the full extent of the likely noise impact. Regardless, the noise predictions do not indicate that there will be an unacceptable adverse impact and, in planning terms, this means that the noise impact may be acceptable if mitigated to a minimum. It is our opinion, however, that the mitigation offered (particularly for noise impact between LOAEL and SOAEL) is inadequate.
- 7.6 The Airport has offered to provide sound insulation to receptors which fall at/above (their definition of) SOAEL and to continue with the existing mitigation defined in their Noise Action Plan for receptors with a noise impact between LOAEL and SOAEL. The limitations of sound insulation cannot be over-stated. They will benefit internal areas at receptors providing residents keep windows closed (which may lead to ventilation and overheating issues). They will clearly be of no benefit to external amenity areas. Therefore, the provision of sound insulation to properties should be considered only as a last resort.
- 7.7 It is considered that the Airport's Noise Preferred Routes, whilst potentially suitable for the existing operations, may not go far enough for the new proposals. It is considered that the Airport should be asked to consider new noise abatement procedures/ routes to reduce the number of households affected by the proposals.



I trust you will find the above to your satisfaction. Should you have any further queries please do not hesitate to contact me.

Yours sincerely,  
**For 24 Acoustics Ltd**

A handwritten signature in black ink that reads "Reuben Peckham".

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Director & Principal Consultant