

Crawley

Local Plan

**Crawley Borough Local Plan Topic Paper 7:
Development and Noise Technical
Appendix**



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1.0 Introduction

- 1.1 The Crawley Borough Local Plan, through Policy EC4 and the accompanying Noise Annex, seeks to manage the relationship between development and noise in order to protect people's quality of life.
- 1.2 Where exposure to noise becomes noticeable or significant, this can result in changes to people's behaviour. Should the level of noise exposure become unacceptable the impacts can become far-reaching, fundamentally affecting quality of life, and potentially resulting in serious health and stress related problems, amenity issues, and negative impacts on productivity and learning. For these reasons, it is fundamental that the relationship between noise sources and noise sensitive development is effectively and appropriately managed through the Local Plan.
- 1.3 There is a growing amount of research relating to the health impacts of noise, and on the dose response (reaction to increasing noise exposure) relationship between noise and health. Recent studies have identified a number of causal links between noise exposure and health impacts. These themes are drawn together in key two documents; The Health Protection Agency (HPA) summary document *Environment Noise and Health in the UK* (2010); and through the work of the government-appointed Airports Commission in *Discussion Paper 5: Aviation Noise* (2013) including *Aircraft Noise Effects on Health* by Dr. Charlotte Clarke, Queen Mary, University of London, for the Airports Commission (2015).
- 1.3 Through these documents, it is possible to identify three specific areas in which adverse effects of noise exposure can impact on populations and individuals, these being Amenity and Quality of Life, Health, and Learning. This Topic Paper summarises the current evidence in relation to each, setting out the rationale for the noise policy and standards relating to noise from transport sources that are set out in the Local Plan. The Paper also sets out a more detailed commentary on the justification for the approach taken by the Local Plan in relation to noise from aviation sources.

2.0 Effects on Amenity and Quality of Life

- 2.1 This form of noise impact may typically affect people in two ways: annoyance, and sleep disturbance.
- 2.2 Annoyance is considered to manifest itself when noise impact disturbs a person's daily life, for example, through interrupting a conversation or causing distraction whilst resting (Airports Commission, 2013). As such, annoyance will typically increase as noise exposure increases, though changes in pitch and intermittency can also increase annoyance.
- 2.3 The *Aviation White Paper* (2003) found the onset of community annoyance to occur at 57dB L_{Aeq16hr}, a figure that originates from the 1982 Aircraft Noise Index Study (ANIS).
- 2.4 Over time, individual aircraft have become quieter, but have increased in number. The *Attitudes to Noise from Aviation Sources in England* study (ANASE), DfT, 2007) demonstrated that the number of aircraft had a greater impact on annoyance than increasing average noise levels¹. This suggests

¹ Some aspects of the ANASE methodology have been questioned at peer review.

that the level for the onset of community annoyance may actually occur below 57dBA, and that the impact of higher levels of noise may be greater than previously thought. This follows research published by the European Commission with the Environmental Noise Directive (END) in 2002 which showed that equivalent levels of Aircraft Noise created greater annoyance than other modes of transport.

- 2.5 More recent research (*ERCD CAP1506 Survey of noise attitudes 2014; Aircraft*) shows that the same percentage that was highly annoyed at 57dB LAeq, 16hr in the 1982 ANIS study is now highly annoyed at 54dB LAeq, 16hr.
- 2.6 Sleep disturbance is one of the most common impacts described by people living with high levels of noise exposure. It can have a significant impact on quality of life, and people can typically feel a strong resentment where it is felt that their sleep has been disturbed.
- 2.7 The Airports Commission (2013) cited a well-established evidence base which has found noise-induced awakenings to have an adverse effect. However, it is less clear as to what extent and level of noise exposure can result in a harmful loss of sleep, and whether lesser reactions to noise that do not involve awakening, can affect well-being. It does appear that even though some adaptation to night noise does occur, complete habituation does not occur, particularly for heart rate (See Physiological Health). It also appears that children are less likely to wake but their physiological reaction is greater.
- 2.8 In 2011, the World Health Organisation (WHO) published the *Burden of Disease from environmental noise – quantification of healthy life years lost in Europe*. The report estimated that between 1-1.6 million life years were lost each year across Europe, which, when using the Department of Health guidance on valuing life years, places the social cost at between £60 and £100 billion per annum². Within this, sleep disturbance was the single highest health impact. To put this in perspective, the total budget for the NHS in 2018/19 was £114.6bn.

3.0 Effects on Physical and Psychological Health

- 3.1 There are two significant ways in which this form of noise impact may affect people; hypertension, and mental health.
- 3.2 The links between noise and hypertension are fairly well established, with research finding that exposure to noise events can place the body under stress, even if there is no conscious reaction to the noise. When stressed, the body releases hormones that may to varying degrees increase heart rate and blood pressure, with the link between high blood pressure and cardiovascular diseases, strokes, chronic renal failure, and heart attack, already well-established. Acute noise exposure has also been linked to other forms of physiological activation including peripheral vasoconstriction with relative withdrawal of blood from the skin, and increased peripheral vascular resistance.
- 3.3 The European-wide *Hypertension and Exposure to Noise Near Airports* study (HYENA, 2008) examined links between noise from aircraft and road traffic

² Environmental Noise: Valuing impacts on Sleep Disturbance, annoyance, productivity and quiet (2014) DEFRA

and Hypertension, finding there to be direct links between increased noise exposure and increased hypertension.

- 3.4 Other research has shown that increased noise may have an exacerbating effect on existing coronary heart disease conditions³. Dose-response relationship data has also found that risk of myocardial infarction increases above 60dBA and is significant at 70dBA, with an increased risk of coronary heart disease associated with sound levels above 65-70dBA.
- 3.5 Links between noise exposure annoyance and mental health have also been hypothesised, with studies identifying anxiety and depression as the most likely psychological symptoms⁴. However, it is acknowledged that further research is needed in this area.
- 3.6 In October 2017, the New Scientist published an article, *Sleep the Good Sleep*, by Matthew Walker (Director of the Centre of Human Sleep Science, University of California, Berkeley) from his book *Why We Sleep*. The book links the build-up of toxic amyloid proteins in the brain with Alzheimer's disease and the loss of deep NREM sleep. It is during these periods of deep sleep that the body removes the amyloid protein build-ups. However, it is also known that repeated noise events during the night reduces the quality of sleep, including the deep NREM stage. This paper, therefore, shows the mechanism by which sleep loss caused by noise events could lead to an increased risk to Alzheimer's disease.

4.0 Productivity and Learning Effects

- 4.1 Noise has been linked to impacts in two particular ways; cognitive impairment in children, and loss of productivity.
- 4.2 The most consistent observed effects of noise on children (particularly for children at primary school age) are recognised as being cognitive impairments.
- 4.3 Research has established a number of negative impacts in this regard, and tasks which involve central processing and language comprehension, such as reading, attention, problem solving and memory appear to be most affected by noise exposure. Links between chronic noise exposure and children's cognition have also been suggested, including teacher and pupil frustration, learned helplessness, impaired attention, increased arousal, indiscriminate filtering out of noise during cognitive activities resulting in loss of attention, noise annoyance, and sleep disturbance⁵.
- 4.4 It has been shown that there is an association between high noise exposure and poor long-term memory and reading comprehension amongst children living around airports. Research has also suggested that the source of noise may be a factor, with the European RANCH study finding road traffic to have no observed effect on children's reading or memory, whilst observing

³ Noise: Babish, 2006; Smoking: Prescott et al. (1998); and lack of exercise: Hu et al. (2005) and Li et al. (2006).

⁴ Stansfeld, et al. (1993). Road traffic noise, noise sensitivity and psychological disorder; Hiramatsu, K., et al. (1997). A survey on health effects due to aircraft noise on residents living around Kadena airport in the Ryukyus'; Hardoy, M.C., et al. (2005). Exposure to aircraft noise and risk of psychiatric disorders.

⁵ Airports Commission (2013)

impaired reading comprehension and recognition memory in children exposed to aircraft noise.

- 4.5 The Airports Commission (2013) notes that the productivity impacts of noise are more secondary in nature, and are linked to effects previously discussed, including sleep disturbance, health impact, links between academic performance and noise, and impacts in terms of workplace distraction.
- 4.6 There is also a significant financial cost to noise and, in November 2014, DEFRA published *Environmental Noise: Valuing impacts on Sleep Disturbance, annoyance, productivity and quiet*. This estimated the cost alone of the loss of productivity due to noise in England as being between £2-6 billion per annum in England.

5.0 Noise from Aviation Transport Sources

- 5.1 The Airports Commission (2013) observes that the metrics used to measure the long-term impact of aircraft noise has recently become a subject of some discussion. UK policy has historically identified 57_{Aeq16h} as the threshold at which daytime noise marks the onset of significant community annoyance. This was based on the research carried out in 1982 and published in the Aircraft Noise Index Study (ANIS) paper. However, it has been argued that the 57_{Aeq16h} contour does not necessarily reflect the day-to-day experience of people living within the contour, who will tend to experience short bursts of intense sound, rather than a constant sound.
- 5.2 Further, it has been noted that significant annoyance may be experienced outside of the $57 L_{Aeq16h}$ contour, as acknowledged in the Department of Transport's 2012 Draft Aviation Policy Framework (APF), although in responding to comments on the draft APF the Government has decided against using a lower value to mark the onset of significant community annoyance (Airports Commission, 2013).
- 5.3 The Aviation Policy Framework (2013) sets out the Government's policy in relation to aviation noise, this being: '*to limit and, where possible, reduce the number of people in the UK significantly affected by aircraft noise...*' The document confirms that $57dB L_{Aeq,16h}$ is the approximate '*onset of significant community annoyance*'. Therefore even at 60dB there are sections of the community which will suffer significant annoyance.
- 5.4 In 2014 the CAA published CAP1506 - Survey of Noise Attitudes 2014: Aircraft (SoNA). This showed that since ANIS in 1982 the same percentage of 'highly annoyed' people now occurred at 54dB rather than $57dB L_{Aeq16h}$, suggesting that the '*onset of significant community annoyance*' should be lowered from $57dB$ to $54dB L_{Aeq16h}$.
- 5.5 In 2019 the CAA published CAP1841 – Aircraft Noise and Health Effects: A six-month update (April 2019 – September 2019). This reviews recent research of the impacts of noise and it referenced a Swiss study by Brinks et al, on the exposure-response relationship for road, rail and aircraft noise and the percentage of 'highly annoyed'. It used the metrics of L_{DEN} and shows that aircraft noise annoyance scores are higher than those given in response to railway and road traffic noise.

- 5.6 The original Planning Policy Guidance 24 (1994) had already recognised that aviation noise required a lower noise standard and stated that '*60 Leq dB(A) should be regarded as a desirable upper limit for major new noise-sensitive development.*' Road and rail were set at higher levels (63dB & 66dB) respectively. The reasoning for having a lower noise level for aircraft noise than for other transport sources was due to the fact that road and rail noise generally only affects the façades facing the source, with the buildings acting as a noise barrier and so shielding the far side of the dwelling, creating lower noise levels for that façade and any external amenity space. In the case of aircraft noise, all façades of a dwelling, its external living space and the whole surrounding neighbourhood are affected by the high levels of noise. There is ultimately no escaping the noise, apart from inside the dwelling with the windows closed.
- 5.7 The WHO published new Environmental Guidelines for the European Region in 2018 and they state that for aircraft noise they strongly recommend reducing levels of noise to below 45dB L_{den} or 40dB L_{night} as levels above these are associated with adverse health effects.
- 5.8 At present this target is aspirational and will not be achieved in the short term. However, as new housing will be in situ for possibly 100 years then reducing the ceiling to exposure to 60dB is the first step in achieving that target.
- 5.9 The need for quieter outdoor space is also recognised in the British Standard BS8233:2014 Section 7.7.3.2 (Design criteria for external noise) states '*For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments.*' These levels are also supported by the Professional Practice Guidance on Planning & Noise for New Residential Developments, produced by the ANC (Acoustics and Noise Consultants, IOA (Institute of Acoustics) and the CIEH (Chartered Institute of Environmental Health).
- 5.10 Planning Practice Guidance: Noise (July 2019) makes the following points on external amenity spaces '*where external amenity spaces are an intrinsic part of the overall design, the acoustic environment of those spaces should be considered so that they can be enjoyed as intended.*' It continues to recognise that not all locations are able to achieve this standard and recommends potential alternatives:
- *a relatively quiet façades (containing windows to habitable rooms) as part of their dwelling;*
 - *a relatively quiet external amenity space for their sole use, (e.g. a garden or balcony). Although the existence of a garden or balcony is generally desirable, the intended benefits will be reduced if this area is exposed to noise levels that result in significant adverse effects;*
 - *a relatively quiet, protected, nearby external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings; and/or*
 - *a relatively quiet, protected, external publically accessible amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minute walking distance).*
- 5.11 With aviation noise none of these options are usually available. This is because the noise descends from above and the use of barriers has only

limited effect. The only option with residential developments is to restrict the whole development to the 60dB $L_{Aeq,16hr}$ contour so that residents are not exposed to excessive levels of noise whilst carrying out external activities in their gardens, in the street, at the local shops or waiting for the bus. Neighbourhoods exposed to higher levels of noise may ultimately result in residents travelling to 'quieter' locations by bus or car which becomes unsustainable.

- 5.12 The Consultation Response on UK Aviation Policy: A framework for balanced decisions on the design and use of airspace, October 2017, set up the government's policy of LOAEL as 51dB $L_{Aeq,16h}$ and 45dB $L_{Aeq,8h}$. These levels are higher than those proposed by the WHO, and there are many residents around airports that complain about noise outside these contours due to the frequency of overflight.

6. Government Policy on SOAEL

- 6.1 There is presently no formal government policy on the SOAEL for new residential development near existing noisy transport sources. All recent publications by the government have focused more on airport expansion and the relative impacts on residents.
- 6.2 The UK Airspace Policy Consultation: *A framework for balanced decisions on the design and use of airspace* was prepared by the Department of Transport and looks to balance the need for increasing airport capacity with the impact experienced by 'existing' residents on the ground. When expanding airports there are opportunities within the planning process for compensation for residents and additional controls to protect them. Within this process it is useful to have a clear policy on noise and agreed noise levels for LOAELs & SOAELs so that impact can be clearly quantified economically using the government's Transport Appraisal Process (WebTag).
- 6.3 However the consultation document only mentions land-use planning in passing. The clearest statement in relation to Land-use Planning is made on page 73 where the document states that the Government approach is in line with the principles of International Civil Aviation Organization's (ICAO) Balanced Approach, which states:
- Land-use planning: Land-use planning and management is an effective means to ensure that the activities nearby airports are compatible with aviation. Its main goal is to minimize the population affected by aircraft noise by introducing land-use zoning around airports. Compatible land-use planning and management is also a vital instrument in ensuring that the gains achieved by the reduced noise of the latest generation of aircraft are not offset by inappropriate residential development around airports.*
- 6.4 This is also the approach that Crawley Borough Council has applied in developing its own SOAEL and UAEL table for new noise-sensitive developments. By prohibiting developments nearer Gatwick where noise exposure is greatest, it is therefore minimizing the population affect by any future growth by Gatwick.
- 6.5 There have been a number of Public Inquiries and decisions by the Secretary of State in relation to the development of new transport noise sources and expanding existing transport noise sources, including new airport infrastructure. This has included:

- *Birmingham International Airport Runway Extension, 2014;*
- *London City Airport Development Plan, 2015-2016; and*
- *Cranford Agreement Secretary of State's Decision, February 2017.*

However, all these decisions relate to the expansion of an existing noise source. Such developments can be of national economic importance and these factors may often be viewed by decision makers as outweighing the adverse impact on individuals that are affected by increased noise. This is especially the case with aviation, where expansion of existing airports is the only realistic option where it is determined that increased capacity is required and appropriate. (Airports Commission in 2014).

- 6.6 However, with new housing development there is no absolute requirement to build in such high noise locations which have a detrimental and negative effect on the health and welfare of future residents and ultimately on the economy of the UK.
- 6.7 It is therefore more appropriate to look at recent Planning Inspectorate decisions for an acceptable noise level. There has been a recent planning appeal decision on the development of new housing near Manchester Airport (Case reference: APP/R0660/W/15/3027388). The housing was located in the 60dB (73%) & 63dB (27%) contours. In conclusion the inspector stated the following:
- The external noise environment would not be positive but would have a significant adverse impact on the quality of life of future residents. Whilst noting that an acceptable internal acoustic environment would technically be achievable, the sealed box solution would further detract from future residents' quality of life and is an additional factor weighing against permission.*
- 6.8 This decision reflects the fact that even though the internal environment can be technically protected, the external environment, when exposed to levels exceeding 60dB L_{Aeq16h} would be unacceptable. The inspector correctly differentiated the expansion of existing airports with the introduction of new residents to a noisy location.