Heathrow

EASTERLY ALTERNATION INFRASTRUCTURE PROJECT

Environmental Impact Assessment Environmental Statement, Volume II Chapter 7: Noise and Vibration

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Heathrow

Contents

Graphics

Tables

Figures Noise Figures Volume IV

7. Noise and Vibration

7.1 Introduction

7.1.1 This chapter reports the outcome of the assessment of likely significant effects arising from the Proposed Development upon noise and vibration and is supported by the following appendices, figures and tables:

- **Appendix 7.1: Introduction, Human Hearing and Acoustics Terminology**;
- **Appendix 7.2: Noise Management and Mitigation at Heathrow Airport**;
- **Appendix 7.3: Noise and Vibration Baseline Conditions**;
- **Appendix 7.4: Construction Noise and Vibration**;
- **Appendix 7.5: Air Noise**;
- **Appendix 7.6: Ground Noise**;
- **Appendix 7.7: Combined Air and Ground Noise**;
- **Appendix 7.8: Community Focus Areas**; and
- **Volume IV: Noise Figures** (numbering as per Volume III and associated appendices).

7.1.2 This chapter (and its associated appendices, figures and tables) is intended to be read as part of the wider Environmental Statement, with particular reference to:

- **Chapter 8: People and Communities**;
- **Chapter 9: Public Health**;
- **Chapter 10: Landscape and Visual Impact Assessment**;
- **Chapter 11: Historic Environment**; and
- **Chapter 12: Biodiversity**.

7.1.3 The Proposed Development is described in detail in **Chapter 3: Description of the Proposed Development** and in summary comprises ground-based infrastructure (such as new taxiways) required to allow regular and scheduled departures on the northern runway in an easterly direction to enable runway alternation after 06:00hrs.

7.1.4 The Proposed Development will lead to a change in the pattern of aircraft movements on the ground and in the air, during easterly operations only. The potential effects in noise and vibration terms would result from the increase in the number of aircraft departing to the east on the northern runway (Runway 09L) and arriving to the east on the southern runway (Runway 09R) during easterly operations and the commensurate decrease in the number of aircraft departing to the east on the southern runway (Runway 09R) and landing to the east on the northern runway (Runway 09L) during the same mode of operations.

7.1.5 Importantly, the overall number of aircraft movements at Heathrow Airport will be unchanged by the Proposed Development. Therefore, noise sources such as, engine ground running, landside road vehicles, airside vehicles and ground support equipment, and fixed plant, will be unchanged.

7.1.6 Consequently, this chapter assesses potentially significant effects arising from the following activities:

- Construction – both noise and vibration
- Operational noise - aircraft 'air noise' - noise from aircraft on the runway and in the landing and take-off cycle, and
- Operational noise - aircraft 'ground noise' - noise from aircraft operating on the ground i.e. whilst at stand, holding or traversing the airfield.

7.1.7 Specifically, the assessment of noise and vibration considers any likely significant effects arising from the construction and operation of the Proposed Development on:

- People, primarily where they live ('residential receptors') on an individual dwelling basis and on a community basis, including any shared community open areas.
- Community facilities such as schools, hospitals, places of worship, and commercial properties such as offices and hotels, collectively described as "non-residential receptors".

7.1.8 The effects of noise on residential populations are set out in this chapter. Effects on non-residential noise sensitive receptors are also presented along with effects on the amenity of parks and open spaces.

7.1.9 Indirect effects of noise are those whereby the noise exposure, or change thereof, could potentially influence the determinants of health (e.g., employment or engaging in physical activity or availability of recreational spaces). Indirect effects of noise on people and communities are set out in **Chapter 8: People and Communities** and **Chapter 9: Public Health**.

7.1.10 Please note that:

- Volume II Chapter 8 (People and Communities) assesses the indirect effect of noise on community facilities, for example, by providing social support via activities or employment or impacting socio-economic factors.
- Volume II Chapter 9 (Health) assesses the indirect effect of noise on determinants of health, as well as identifying vulnerable populations for consideration in the assessment of both the indirect and direct effects of noise. Following IEMA guidance this includes health-related activities, the social environment, the economic environment, biophysical environment (noting that for noise and vibration this would only address indirect and not direct effects), and institutional and built environment.
- The assessment of likely significant effects from noise and vibration on ecological, heritage and tranquillity receptors are presented in **Chapter 9: Public Health, Chapter 10: Landscape and Visual Impact Assessment**, **Chapter 11: Historic**

Environment and **Chapter 12: Biodiversity**, and have been informed by the technical detail presented in this Chapter.

7.1.11 In this assessment 'sound' is used to describe the acoustic conditions that people experience as a part of their everyday lives. Noise is taken as unwanted sound. In line with the Control of Pollution Act 1974 (COPA 1974)[1] and the Environmental Protection Act 1990 (EPA 1990)[2], use of the term 'noise' in this assessment includes 'vibration' unless otherwise stated or vibration is considered in isolation. On occasions 'sound' and 'noise' are necessarily used interchangeably, based on historical convention rather than technical accuracy.

7.1.12 The assessment considers how exposure to environmental noise and vibration may change across the population and in specific community areas due to the Proposed Development.

7.1.13 Increases and decreases in exposure to environmental noise can result in adverse and beneficial effects. This is a key characteristic of the Proposed Development which facilitates the redistribution of aircraft noise around Heathrow Airport. This redistribution will lead to increases and decreases in aircraft noise exposure at locations around the Airport.

7.1.14 This Chapter addresses the impacts of the Proposed Development in accordance with Government noise policy as set out by the Noise Policy Statement for England (NPSE). It also presents an assessment of the likely significant effects from noise and vibration. This Chapter should be read in conjunction with the description of the Proposed Development presented in **Chapter 3: Description of the Proposed Development**.

7.1.15 Throughout this document, 'without development' and 'with development' scenarios are described as 'WoD' and 'WD' respectively. This naming convention is carried over into the associated figures and tables provided in **Volume IV: Noise Figures**.

7.2 Relevant Legislation, Policy and Technical Guidance

7.2.1 This section identifies the legislation, policy and technical guidance that has informed the scope of the assessment presented in this chapter.

Legislation

7.2.2 A summary of relevant primary and secondary legislation is provided in **Table 7.1**.

[1] *Control of Pollution Act 1974 c.40.* [online] Available at: https://www.legislation.gov.uk/ukpga/1974/40/contents (Accessed 17 July 2024).

[2] *Environmental Protection Act 1990 c.43.* [online] Available at: https://www.legislation.gov.uk/ukpga/1990/43/contents (Accessed 17 July 2024).

Table 7.1 Relevant Legislation and Regulations

Document / Reference	Summary
Primary Legislation	
Land Compensation Act 1973[3]	Part 1 of the Land Compensation Act 1973 (LCA 1973) provides for depreciation of an interest in land value caused by noise or vibration as a physical factor from certain public works (highway, aerodrome, or any works or land provided or used in the exercise of statutory powers) to be compensated by the responsible authority. Alterations to an aerodrome will not give rise to a claim for compensation under Part 1 unless they are "runway or apron alterations" as defined in section 9(6) of the LCA 1973. The LCA 1973 also provides powers to sound-proof (noise insulate) buildings from noise arising from highways and aerodromes, and to pay expenses of persons moving temporarily during construction works (due to noise).
Control of Pollution Act 1974[1]	The Control of Pollution Act (CoPA) provides Local Authorities with the power to control noise from construction sites and provides the definition of Best Practicable Means (BPM) to minimise noise (including vibration) from them. Section 60 of the Act describes the circumstances under which a local authority may serve a notice on a construction site, requiring it to carry out the works in accordance with particular conditions. Section 61 of the Act allows construction sites to seek prior consent for the works, by providing details of the works to be undertaken and the measures proposed to minimise noise resulting from the works. The Act also provides the basis for defining codes of practice for minimising noise, in particular BS 5228:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites: Part 1 - Noise and Part 2 - Vibration
Civil Aviation Act 1982 (as amended)[4,5,6]	The Civil Aviation Act 1982 was enacted on 27 May 1982 and has been amended including for relevant purposes by the Civil Aviation Act 2006. The Civil Aviation Act 1982 provides statutory immunity from actions in trespass or nuisance in respect of noise from the flight of aircraft over property or noise or vibration caused by aircraft on an aerodrome, as long

[3] *Land Compensation Act 1973 c. 26.* [online] Available at: https://www.legislation.gov.uk/ukpga/1973/26/contents (Accessed 17 July 2024).

[4] *Civil Aviation Act 1982 c.16.* [online] Available at: https://www.legislation.gov.uk/ukpga/1982/16/contents (Accessed 17 July 2024).

[5] *Civil Aviation Act 2006 c.34.* [online] Available at: https://www.legislation.gov.uk/ukpga/2006/34/contents (Accessed 17 July 2024).

[6] *Civil Aviation Act 2012 c.19.* [online] Available at: https://www.legislation.gov.uk/ukpga/2012/19/contents (Accessed 17 July 2024).

Document / Reference	Summary
	as relevant provisions of an Air Navigation Order are complied with (sections 76(1) and 77(2)). The Civil Aviation Act 1982 also provides the Secretary of State for Transport with various statutory powers to regulate and control noise and vibration from aircraft at 'designated aerodromes', i.e., Heathrow, Gatwick, and Stansted are designated for this purpose. These powers are contained in section 78 of the Civil Aviation Act 1982. In particular, the Secretary of State can impose duties on aircraft operators to comply with specified noise abatement requirements for the purpose of limiting or mitigating the effect of noise and vibration from aircraft. Implementation of this power is facilitated through penalty schemes established and maintained by the manager of the airport under s78A of the Civil Aviation Act 1982, requiring a penalty to be paid by an operator of an aircraft which does not comply with a noise abatement requirement imposed by the Secretary State. Heathrow Airport has established and administers a penalty scheme under s78A for aircraft departing from the Airport. The Government sets noise limits on departing aircraft and noise is measured at fixed monitors around the airport. In the recent past the Civil Aviation Authority (CAA) and designated airports have consulted on more stringent noise limits and financial penalties which are in the process of being implemented. Departures are continually monitored and if an aircraft generates more noise than is permitted, the airline is fined. The Secretary of State also has the power to prohibit or restrict the number of aircraft able to take off or land at 'designated aerodromes', i.e., Heathrow, Gatwick, and Stansted during certain periods where that is considered appropriate for the purpose of avoiding, limiting or mitigating the effect of noise and vibration (s78(3) Civil Aviation Act 1982). The Applicant as the airport operator has the duty of securing compliance with any such prohibitions or restrictions. Night flight restrictions have been established at 'designated aerodromes' under this statutory power. This night flying regime is based on setting a limit on the overall number of night flights, placing restrictions on the noisiest aircraft types and setting noise quotas which cap the amount of noise energy which can be emitted at night. Statutory provisions also enable the delivery of noise insulation schemes. Specifically, under section 79 of the Civil Aviation Act 1982, the Secretary of State has power to make a scheme requiring the operator of a designated airport to make grants towards the cost of insulating buildings from noise and vibration. The Act permits an airport authority to charge aircraft operators for use of the airport based on noise and emissions. Under the Act, Airport operators can thereby introduce differential charges to incentivise the use of quieter and cleaner aircraft.

Document / Reference	Summary
Airports Act 1986[7]	The Airports Act reformed civil aviation in Great Britain and privatised the British Airports Authority from a public sector organisation into BAA as a private company. It also granted additional regulatory powers to the Civil Aviation Authority (CAA). This Act gives power to the Secretary of State to limit the number of occasions on which aircraft may land or take off at an airport and to introduce schemes to allocate airport capacity.
Environmental Protection Act 1990[2]	The Environmental Protection (EPA) defines statutory nuisance due to noise and sets out the duty on local authorities to investigate and, where identified, take abatement action. The Act provides the definition of Best Practicable Means (BPM) to minimise noise (including vibration) as the basis for defence against noise abatement action taken by a local authority (section 80). The Act also provides for individuals to seek for abatement action to be taken by a magistrate's court against noise nuisance (section 82).
Transport Act 2000[8]	The Transport Act 2000 gives the Secretary of State power to give such directions as he thinks are necessary or expedient *"(a) to prevent or deal with environmental noise and vibration attributable to aircraft used for the purpose of civil aviation; and (b) to limit or mitigate the effects of such noise, vibration, pollution or disturbance."* Such directions may be given to persons licensed or otherwise authorised to provide air traffic services.
Secondary legislation	
Noise Insulation Regulations and Noise Insulation (Amendment) Regulations 1988 (1975)[9,10]	The Noise Insulation Regulations 1975 and Noise Insulation (Amendment) Regulations 1988 (NIR) set out the qualifying criteria (including noise thresholds) at which the relevant authority is mandated to offer to provide noise insulation to owners and occupiers of eligible residential buildings, affected by road traffic noise.
The Aeroplane Noise Regulations (1999) (as amended)[11]	These regulations set out the noise certificate requirements for both propeller and jet aeroplanes registered in the UK. It makes provision to ensure that no aircraft can land or take off in the UK without a noise

[7] *Airports Act 1986 c.31.* [online] Available at: https://www.legislation.gov.uk/ukpga/1986/31/contents (Accessed 17 July 2024).

[8] *Transport Act 2000 c38.* [online] Available at: https://www.legislation.gov.uk/ukpga/2000/38/contents (Accessed 17 July 2024).

[9] *The Noise Insulation Regulations 1975 No. 1763.* [online] Available at: https://www.legislation.gov.uk/uksi/1975/1763/contents/made (Accessed 17 July 2024).

[10] *The Noise Insulation (Amendment) Regulations 1988 No. 2000.* [online] Available at: https://www.legislation.gov.uk/uksi/1988/2000/regulation/2/made (Accessed 17 July 2024).

[11] *The Aeroplane Noise Regulations 1999 No. 1452.* [online] Available at: https://www.legislation.gov.uk/uksi/1999/1452/contents/made (Accessed 17 July 2024).

Document / Reference	Summary
	certificate issued by its competent authority which meets at least equal requirements to those for UK registered aircraft. The regulations make reference to noise certification standards and noise limits issued by ICAO and also provides a list of aircraft that are exempt from the ICAO noise certification.
The Environmental Noise (England) Regulations (2006) (as amended)[12]	The Environmental Noise (England) Regulations 2006 (as amended) transpose EC Directive 2002/49/EC relating to the assessment and management of environmental noise (commonly referred to as the 'Environmental Noise Directive'). The Regulations have been retained and amended through "The Environment (Amendment etc.) (EU Exit) Regulations 2019"[13]. The Regulations aim to avoid, prevent, or reduce on a prioritised basis the harmful effects, including annoyance, of exposure to environmental noise. The Regulations set out the requirement to undertake strategic noise mapping, on a five-year cycle, and implement Noise Action Plans for agglomerations and major roads, railways and airports. Heathrow's current Noise Action Plan was adopted by the Secretary of State for Environment, Food and Rural Affairs (Defra) in October 2024 and covers the period 2024 – 2028.
Air Navigation (Environmental Standards for Non-EASA Aircraft) Order 2008 (as amended)[14]	These regulations set out the noise certificate requirements for those aircraft regulated by the CAA, as opposed to the European Union Aviation Safety Agency (EASA), such as microlight aeroplanes and aircraft in the service of customs and the police.
Airports (Noise-related Operating Restrictions) (England and Wales) Regulations (2018) (as amended)[15]	The Airports (Noise-related Operating Restrictions) (England and Wales) Regulations 2018 originally implemented EU Regulation 598/2014 "*on the establishment of rules and procedures with regard to the introduction of noise-related operating restrictions at Union airports within a Balanced Approach and repealing Directive 2002/30/EC*". The Regulations are often referred to as the "balanced approach regulations" or BAR, referencing the ICAO 'Balanced Approach' which informed the Regulations. The Regulations have been retained and amended through the Aviation Noise (Amendment) (EU Exit) Regulations 2019[16].

[12] *The Environmental Noise (England) Regulations 2006 No. 2238.* [online] Available at: https://www.legislation.gov.uk/uksi/2006/2238/contents (Accessed 17 July 2024).

[13] *The Environment (Amendment etc.) (EU Exit) Regulations 2019.* [online] Available at: https://www.legislation.gov.uk/ukdsi/2019/9780111176276/contents (Accessed 23 July 2024).

[14] *Air Navigation (Environmental Standards for Non-Part 21 Aircraft) Order 2008 No. 3133.* [online] Available at: https://www.legislation.gov.uk/uksi/2008/3133/contents (Accessed 17 July 2024).

[15] *Airports (Noise-related Operating Restrictions) (England and Wales) Regulations 2018* No. 785. [online] Available at: https://www.legislation.gov.uk/uksi/2018/785/contents (Accessed 17 July 2024).

[16] *The Aviation Noise (Amendment) (EU Exit) Regulations 2019 No. XXX (Draft)*. [online] Available at: https://www.legislation.gov.uk/ukdsi/2019/9780111180877 (Accessed 17 July 2024).

Document / Reference	Summary
	The Secretary of State for Transport is designated as the relevant 'competent authority' for the purposes of the Regulations which ensure that ICAO's 'Balanced Approach' is adopted in respect of aircraft noise management and sets out the process to be followed in the implementation of an operating restriction which might restrict access to the airport. It requires that noise related operating restrictions cannot be introduced as a first resort – a range of other mitigation measures must be considered first. If a noise related operating restriction is considered necessary, it can only be imposed after the 'cost effectiveness' of the restriction has been considered. The Regulation provides a connection to the process of noise mapping and action planning as required under the END and similarly only applies to major airports with more than 50,000 movements per year. Consequently, the competent authority can utilise the outputs from the END as a means of triggering the Balanced Approach under the BAR.
The Aviation Noise (Amendment) (EU Exit) Regulations (2019)[16]	These Regulations make amendments to the Aeroplane Noise Regulations 1999[11], the Air Navigation (Environmental Standards for Non-EASA Aircraft) Order 2008[14], and the Airports (Noise-related Operating Restrictions) (England and Wales) Regulations 2018[15] following EU Exit.

Government policy

7.2.3 A summary of relevant Government policy is provided in **Table 7.2**.

Table 7.2 Relevant Government policy

Document / Reference	Summary
National Planning Policies	
Aviation Policy Framework (2013) (as updated)[17]	The APF, as updated by the Consultation Response on UK Airspace Policy, DfT, October 2017 sets out a framework for noise management at UK Airports. The APF explains the significance of government's responsibilities for noise management at airports regulated under the Civil Aviation Act 1982, as follows: *"3.10 For many years, Heathrow, Gatwick and Stansted Airports have been designated for these purposes, and we will continue to maintain their status. These airports remain strategically important to the UK economy and we therefore consider that it is appropriate for the Government to take decisions on the right balance between noise controls and economic benefits, reconciling the local and national strategic interests."*

[17] Department for Transport (2013). *Aviation Policy Framework.* [online] Available at: https://www.gov.uk/government/publications/aviation-policy-framework (Accessed 17 July 2024).

Document / Reference	Summary
	The APF sets the framework for noise management at UK Airports that applies to all airports, as updated by the *Consultation Response on UK Airspace Policy,* DfT, October 2017, which is described below. The framework for noise management, includes: • The general principle that the Government expects that future growth in aviation should ensure that benefits are shared between the aviation industry and local communities. • That Government fully recognises the International Civil Aviation Authority (ICAO) Assembly 'balanced approach' principle to aircraft noise management. Paragraph 1.63 of the APF provides direct Government support for the ending of the Cranford agreement on the grounds of allowing aircraft noise to be more fairly distributed around the airport. It states: *"To further improve operations and resilience at Heathrow we confirmed the ending of the Cranford agreement. This is an informal but long-standing agreement not to use the northern runway for departures when the wind was in from the east (roughly 30% of the time). This decision needs to be implemented by Heathrow Airport Ltd and a planning application will shortly be submitted for the necessary changes to airport infrastructure. Following implementation, noise will be distributed more fairly around the airport, extending the benefits of runway alternation to communities under the flight paths during periods of easterly winds, and delivering operational benefits by letting the airport operate consistently whether there are easterly or westerly winds."* The APF also provides a suite of policies that address the challenges of noise control at airports, with the Government recognising the ICAO Balanced Approach as underpinning aircraft noise management. In this context, the APF sets noise management policies which seek to provide a balance between the benefits of aviation and its environmental impacts. In respect of noise insulation and compensation the APF states that: *3.36 The Government continues to expect airport operators to offer households exposed to levels of noise of 69 dB LAeq,16h or more, assistance with the costs of moving.* *3.37 The Government also expects airport operators to offer acoustic insulation to noise-sensitive buildings, such as schools and hospitals, exposed to levels of noise of 63 dB $L_{Aeq,16h}$ or more. Where acoustic insulation cannot provide an appropriate or cost-effective solution, alternative mitigation measures should be offered.* *3.38 If no such schemes already exist, airport operators should consider financial assistance towards acoustic insulation for households. Where compensation schemes have been in place for many years and there are few properties still eligible for compensation, airport operators should*

Document / Reference	Summary
	review their schemes to ensure they remain reasonable and proportionate. *3.39 Where airport operators are considering developments which result in an increase in noise, they should review their compensation schemes to ensure that they offer appropriate compensation to those potentially affected. As a minimum, the Government would expect airport operators to offer financial assistance towards acoustic insulation to residential properties which experience an increase in noise of 3dB or more which leaves them exposed to levels of noise of 63 dB $L_{Aeq,16h}$ or more.* *3.40 Airports may wish to use alternative criteria or have additional schemes based on night noise where night flights are an issue. Airport consultative committees should be involved in reviewing schemes and invited to give views on the criteria to be used.* It should be noted that Paragraph 3.39 of the APF was updated by the Government's Consultation Response on UK Airspace Policy - A Framework for Balanced Decisions on the Design and Use of Airspace (2017)[18]. This, in effect, updates policy in Paragraph 3.39 of the APF to remove the 3 dB criterion resulting in a policy whereby Government expects airport operators to offer financial assistance towards the costs of acoustic insulation to residential properties that are exposed to levels of noise of 63 dB $L_{Aeq,16hr}$. Paragraph 3.28 of the APF recognises noise respite as a measure that may be used to mitigate noise impacts where there are noticeable impacts on communities. It states that: *3.28 The Government expects airports to make particular efforts to mitigate noise where changes are planned which will adversely impact the noise environment. This would be particularly relevant in the case of proposals for new airport capacity, changes to operational procedures or where an increase in movements is expected which will have a noticeable impact on local communities. In these cases, it would be appropriate to consider new and innovative approaches such as noise envelopes or provision of respite for communities already affected.*
Noise Policy Statement for England (2010)[19]	The Noise Policy Statement of England (NPSE) sets out the Government's Noise Policy Vision to: "*Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development*."

[18] Department for Transport (2017). *UK Airspace Policy: A Framework for the Design and use of Airspace.* [online] Available at: https://www.gov.uk/government/publications/uk-airspace-policy-a-framework-for-the-design-and-use-of-airspace (Accessed 17 July 2024).

[19] Department for Environment, Food & Rural Affairs (2010). *Noise Policy Statement for England.* [online] Available at: https://www.gov.uk/government/publications/noise-policy-statement-for-england (Accessed 17 July 2024).

Document / Reference	Summary
	The aims of the policy are *"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:* • *Avoid significant adverse impacts on health and quality of life* • *Mitigate and minimise adverse impacts on health and quality of life* • *Where possible, contribute to the improvement of health and quality of life."* With respect to *"significant adverse"* and *"adverse"* impacts in line with the three aims of NPSE, the policy statement notes that "*there are two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organization. They are*: • *NOEL – No Observed Effect Level: This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise* • *LOAEL – Lowest Observed Adverse Effect Level: This is the level above which adverse effects on health and quality of life can be detected.* Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed negative effect level. • *SOAEL – Significant Observed Adverse Effect Level. This is the level above which significant adverse effects on health and quality of life occur."* In respect of observed effect levels, the policy recognises that *"It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available."* The document advises that *"the first aim of the NPSE states that significant adverse effects on health and quality of life should be avoided while also taking into account the guiding principles of sustainable development".* As the definition of SOAEL is 'the level above which significant adverse effects on health and quality of life occur', the first aim is to avoid significant effects above SOAEL. The policy also states *"The second aim of the NPSE refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise negative effects on health and quality of life while also taking into account the guiding principles of sustainable development (paragraph 1.8). This does not mean that such negative effects cannot occur."*

Document / Reference	Summary
	And finally, the third aim *"seeks, where possible, to positively improve health and quality of life through the pro-active management of noise while also taking into account the guiding principles of sustainable development, recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim"* The NPSE emphasises that controls over noise related activity must be considered within the context of Government policies for sustainable development. Guiding principles for sustainable development are set out in paragraph 1.8 and include a strong, healthy and just society with equal opportunity for all. Importantly, in this context, paragraph 2.7 makes clear that noise is not the only relevant consideration: "*..the application of the NPSE should enable noise to be considered alongside other relevant issues and not to be considered in isolation. In the past, the wider benefits of a particular policy, development or other activity may not have been given adequate weight when assessing the noise implications*."
National Planning Policy Framework (2012) (as amended)[20]	The National Planning Policy Framework (NPPF), originally introduced in 2012, sets out the Government's planning policies for England and how these should be applied. The NPPF was most recently amended in December 2023. 'Planning Practice Guidance (PPG)[21] provides further context to the NPPF and sets out guidance for the application of policies in the NPPF. NPPF provides policies to promote sustainable development and sets out that the purpose of the planning system is to contribute to the achievement of sustainable development. Sustainable development includes three dimensions: economic, social, and environmental, and thus, when planning decisions are made, the process requires weighing the relative balance of these three factors. In relation to noise, it states: *"180. Planning policies and decisions should contribute to and enhance the natural local environment by: …* • *preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land*

[20] Ministry of Housing, Communities and Local Government, Ministry of Housing, Communities & Local Government (2018 to 2021) and Department for Levelling Up, Housing and Communities (2023). *National Planning Policy Framework.* [online] Available at: https://www.gov.uk/government/publications/national-planning-policy-framework--2 (Accessed 14 August 2024).

[21] Ministry of Housing, Communities and Local Government, Ministry of Housing, Communities & Local Government (2018 to 2021) and Department for Levelling Up, Housing and Communities (2019). *Noise.* [online] Available at: https://www.gov.uk/guidance/noise--2 (Accessed 14 August 2024).

Document / Reference	Summary
	instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and …." Consistently with the NPSE, the NPPF states: *"191. Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:* • *mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development - and avoid noise giving rise to significant adverse impacts on health and the quality of life;* • *identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason;"*
Air Navigation Guidance (2017)[22]	The Air Navigation Guidance 2017 (ANG17) provides guidance to the CAA on its environmental objectives when carrying out its air navigation functions, and on airspace and noise management. The CAA is required to take the ANG17 into account when exercising its air navigation functions, including when deciding on whether to approve airspace change proposals under the separate regulatory process for airspace change. The ANG17 provides 'altitude-based priorities' which require the CAA to consider airspace change proposals so that focus is given to "*reducing adverse noise effects"* below 4,000 feet, with noise remaining a priority for aircraft operations between 4,000ft and 7,000ft unless there is a disproportionate impact on CO_2 emissions. The ANG17 provides guidance on assessing the noise implications of proposed airspace changes including on the methodology and noise metrics to be used when carrying out such assessments in that context. In relation to aircraft noise, the ANG17 sets the following key environmental objective, which is: *"limit and, where possible, reduce the number of people in the UK significantly affected by adverse impacts from aircraft noise"* Further explanation of this objective is provided in Paragraph 3.5 of the ANG17 which states that: *"For the purpose of assessing airspace changes, the government wishes the CAA to interpret this objective to mean that the total adverse effects*

[22] Department for Transport and Civil Aviation Authority (2017). *UK Air Navigation Guidance.* [online] Available at: https://www.gov.uk/government/publications/uk-air-navigation-guidance-2017 (Accessed 17 July 2024).

Document / Reference	Summary
	on people as a result of aviation noise should be limited and, where possible, reduced, rather than the absolute number of people in any particular noise contour. Adverse effects are considered to be those related to health and quality of life" Paragraph 3.5 goes on to state that: *"There is no one threshold at which all individuals are considered to be significantly adversely affected by noise. It is possible to set a Lowest Observed Adverse Effect Level (LOAEL) that is regarded as the point at which adverse effects begin to be seen on a community basis."* The ANG17 sets a LOAEL for daytime and night-time air noise of 51 dB $L_{Aeq,16h}$ and 45 dB $L_{Aeq,8hr}$ respectively. These LOAELs have been used in the aircraft 'air' noise and aircraft 'ground' noise assessment methodologies as presented in Section 7.5. For communities further away from airports, that are less affected by aircraft noise above and are located beyond the LOAEL, the ANG17 requires that supplementary noise metrics, including number above metrics (N65 for daytime noise and N60 for nighttime noise) and the 'overflight' metric are used to potentially differentiate between different airspace design options and/or to help explain noise impacts to potentially affected communities. These supplementary metrics have been used in the aircraft 'air' noise assessment as presented in Section 7.8. The Air Navigation Guidance also provides the following definitions of respite and relief at Glossary in Annex A: *"Noise Respite: The principle of noise respite is to provide planned and defined periods of perceptible noise relief to people living directly under a flight path."* *"Relief: This is when multiple routes are designed and operated far enough apart to offer a perceptible reduction in noise for communities. Respite is one form of relief, but multiple flight paths could also be operated at the same time but with an alternating pattern of operation."*
Consultation Response on UK Airspace Policy - A Framework for Balanced Decisions on the Design and Use of Airspace (2017)[18]	In 2017 the UK Government published, and consulted on, its Airspace Policy (AP) framework. The Government's consultation response provided an update to some of the policies on aviation noise outlined in the Aviation Policy Framework (APF) and continues to significantly inform Government policy. The consultation response advised that: *"The government's overall policy on aviation noise is to limit and, where possible, reduce the number of people in the UK significantly affected by aircraft noise as part of a policy of sharing benefits of noise reduction with industry in support of sustainable development.* *Consistent with the Noise Policy Statement for England, our objectives in implementing this policy are to:* • *limit and, where possible, reduce the number of people in the UK significantly affected by the adverse impacts from aircraft noise;*

Document / Reference	Summary
	Acknowledging evidence from recent research, the Government's consultation response states: *"We will set a LOAEL at 51dB $L_{Aeq,16h}$ for daytime and based on feedback and further discussion with CAA we are making one minor change to the LOAEL night metric to be 45dB $L_{Aeq,8h}$ rather than L_{night} to be consistent with the daytime metric."* In respect of aviation noise compensation policy, the consultation response proposed four changes to the contents of the Aviation Policy Framework: • Change the policy wording to remove the word 'development' in terms of when financial assistance towards insulation is expected so that compensation is applicable regardless of the type of change (infrastructure or airspace change); • Change the policy wording to allow for financial assistance towards insulation in the 63dB L_{Aeq} level or above to be applicable regardless of the level of change that causes a property to be in that noise contour level (i.e. remove requirement for a minimum 3dB change); • Additional wording to encourage an airspace change promoter to consider compensation for significantly increased overflight as a result of the change, based on appropriate metrics which could be decided upon according to local circumstances and the economics of the change proposal; and • Include a requirement of an offer of full insulation to be paid for by the airport for homes within the 69dB L_{Aeq} or more contour, where the home owners do not want to move. The Government has since confirmed that the removal of the 3 dB change criteria for residential noise insulation eligibility due to an airport development (APF Paragraph 3.39) as noted by this consultation response is adopted policy. As such, Government expects airport operators to offer financial assistance towards the costs of acoustic insulation to residential properties that are exposed to levels of noise of 63 dB $L_{Aeq,16hr}$.
Airports National Policy Statement (2018)[23]	The Airports National Policy Statement (ANPS) presents a series of policies which have effect for proposals for a new North West runway at Heathrow. The ANPS also sets policy for new runway capacity and infrastructure at airports in the South East of England. The ANPS provides a series of general policies for noise assessment and specific policies that apply to noise mitigation and compensation in relation to a third runway at Heathrow Airport. In the context of airport noise assessment, the ANPS recognises that the impact of noise from airport expansion is a key concern for communities

[23] Department for Transport (2018). *Airports National Policy Statement*. [online] Available at: https://www.gov.uk/government/publications/airports-national-policy-statement (Accessed 17 July 2024).

Document / Reference	Summary
	affected, and the Government takes this issue very seriously. It also recognises that high exposure to noise is an annoyance, can disturb sleep, and can also affect people's health. The ANPS recognises that aircraft technology is key to reducing noise impacts and that over recent decades there have been reductions in aircraft noise due to technological and operational improvements, and that this trend is set to continue (paragraph 5.46). With respect to noise assessment, the ANPS highlights the need for noise to be considered during both the construction and operation of any expansion proposals. In the case of aircraft noise, it states that *"In assessing the likely significant impacts of aircraft noise, the applicant should have regard to the noise assessment principles, including noise metrics, set out in the national policy on airspace."* The ANPS presents discussion on aircraft noise mitigation. Whilst much of this mitigation focuses on proposals for a third runway at Heathrow, the following general principles are presented across paragraphs 5.54 to 5.57. These state that: *"5.54 Noise management at airports where a noise problem has been identified is subject to the concept of a 'Balanced Approach', referred to above. EU Regulation 598/2014, which adopts the Balanced Approach, also lays down a procedure for the adoption of noise-related operating restrictions, in particular a requirement for prior consultation.* *5.55 The Government recognises that aircraft noise is a significant concern to communities affected and that, as a result of additional runway capacity, noise- related action will need to be taken. Such action should strike a fair balance between the negative impacts of noise and positive impacts of flights.* *5.56 The Government also recognises that predictable periods of relief from aircraft noise (known as respite) are important for communities affected, and that noise at night is widely regarded as the least acceptable aspect of aviation noise for those communities, with the costs on communities of aircraft noise during the night (particularly the health costs associated with sleep disturbance) being higher.* *5.57 While the package and detail of noise mitigation measures should be subject to consultation with local communities and other stakeholders to ensure the most appropriate and effective measures are taken forward, in the context of Government policy on sustainable development, the Government expects the applicant to make particular efforts to avoid significant adverse noise impacts and mitigate other adverse noise impacts as a result of the Northwest Runway scheme and Heathrow Airport as a whole."*

Document / Reference	Summary
Aviation 2050: The Future of UK Aviation (2018)[24]	Aviation 2050 was a draft strategy document prepared by the Department for Transport for consultation in 2018. The document focuses on providing Government thinking on the interaction between its noise policy and its wider airspace modernisation policies and proposals. Aviation 2050 is not adopted policy but provides an indication of department thinking at that time on potential future noise policy changes. In respect of aviation noise compensation policy, the document advised that: *"The government is also:* • *proposing new measures to improve noise insulation schemes for existing properties, particularly where noise exposure may increase in the short term or to mitigate against sleep disturbance.* *Such schemes, while imposing costs on the industry, are an important element in giving impacted communities a fair deal. The government therefore proposes the following noise insulation measures:* • *to extend the noise insulation policy threshold beyond the current 63dB $L_{Aeq\ 16hr}$ contour to 60dB $L_{Aeq,16hr}$* • *to require all airports to review the effectiveness of existing schemes. This should include how effective the insulation is and whether other factors (such as ventilation) need to be considered, and also whether levels of contributions are affecting take-up* • *the government or ICCAN to issue new guidance to airports on best practice for noise insulation schemes, to improve consistency* • *for airspace changes which lead to significantly increased overflight, to set a new minimum threshold of an increase of 3dB L_{Aeq}, which leaves a household in the 54dB $L_{Aeq,16hr}$ contour or above as a new eligibility criterion for assistance with noise insulation"* The document also recognised developments in the evidence base in relation to the effects of aviation noise in stating that: • *"The government is considering the recent new environmental noise guidelines for the European region published by the World Health Organization (WHO). It agrees with the ambition to reduce noise and to minimise negative health effects, but it wants policy to be underpinned by the most robust evidence on these effects, including the total cost of action and recent UK specific evidence which the WHO report did not assess."*
Night flight restrictions at Heathrow, Gatwick and	London Heathrow, as a 'designated airport' for noise purposes under Section 78 of the Civil Aviation Act 1982, is subject to Government

[24] Department for Transport (2018). *Aviation 2050 – the future of UK aviation.* [online] Available at: https://www.gov.uk/government/consultations/aviation-2050-the-future-of-uk-aviation (Accessed 17 July 2024).

Document / Reference	Summary
Stansted - Decision Document (2021)[25]	mandated night flight restrictions. The restrictions, imposed by the Department for Transport, are defined in terms of a limit on the number of movements, limits on the maximum Quota Count (QC) for an individual aircraft and limits on the total cumulative quota count (QC) for a defined period. There have been many updates to the night fights regime, with the most recent occurring in 2017 and 2020. The 2017 Restrictions set out a regime to be in place until October 2022. The aim was to *"maintain the status quo in terms of movements while encouraging the use of quieter aircraft at all three airports"*. No changes to the movement limits were proposed for London Heathrow Airport, however, noise quotas were revised to incentivise the use of quieter aircraft. The Quota Count limits were reduced from October 2018. A consultation which began in 2020 concluded with the existing night noise objectives and night flight restrictions being maintained for a further 3-year period to October 2025. In addition, a ban on QC4 rated aircraft movements was implemented during the 'night quota period' from October 2022.
Flightpath to the Future - A strategic framework for the aviation sector (2022)[26]	'Flightpath to the Future' is a further Department for Transport policy document that sets out a strategic framework for the aviation industry over the next 10 years, building on responses to the Aviation 2050 consultation. It supports the use of noise management practices to reduce and mitigate aircraft noise.
Overarching Aviation Noise Policy Statement (2023)[27] (OANPS)	In March 2023 the Department for Transport published a policy paper on its overarching aviation noise policy. The policy wording is reproduced below. *"The government's overall policy on aviation noise is to balance the economic and consumer benefits of aviation against their social and health implications in line with the International Civil Aviation Organisation's Balanced Approach to Aircraft Noise Management. This should take into account the local and national context of both passenger and freight operations, and recognise the additional health impacts of night flights."*

[25] Department for Transport (2021). *Night Flight Restrictions at Heathrow, Gatwick and Stansted – Decision Document.* [online] Available at: https://assets.publishing.service.gov.uk/media/60f6b8dcd3bf7f568dc8a594/night-flight-restrictions-at-heathrow-gatwick-and-stansted-decision-document.pdf (Accessed 6 August 2024).

[26] Department for Transport (2022). *Flightpath to the Future: a strategic framework for the aviation sector.* [online] Available at: https://www.gov.uk/government/publications/flightpath-to-the-future-a-strategic-framework-for-the-aviation-sector (Accessed 17 July 2024).

[27] Department for Transport (2023). *Overarching Aviation Noise Policy.* [online] Available at: https://www.gov.uk/government/publications/aviation-noise-policy-statement/overarching-aviation-noise-policy (Accessed 17 July 2024).

Document / Reference	Summary
	"The impact of aviation noise must be mitigated as much as is practicable and realistic to do so, limiting, and where possible reducing, the total adverse impacts on health and quality of life from aviation noise." The policy statement acknowledges the need to *"limit, and where possible reduce"* as the appropriate wording for the policy but explains that it is important to clarify the meaning of that approach. Consequently, the policy statement confirms that "*An overall reduction in total adverse effects is desirable, but in the context of sustainable growth an increase in total adverse effects may be offset by an increase in economic and consumer benefits.* *In circumstances where there is an increase in total adverse effects, "limit" would mean to mitigate and minimise adverse effects, in line with the Noise Policy Statement for England."* The policy also notes the Government's view that *"there is clear evidence of additional health impacts of night flights, it is also right that this should be recognised within overarching noise policy."*
Consultation: Night-time Noise Abatement Objectives for the Designated Airports from October 2025 (2023-2024)[28]	The Government has commenced a consultation on night flying restrictions at designated airports (Heathrow, Gatwick and Stansted) as a two-stage consultation process to determine the restrictions for 2025. The first step included a proposal to define a new 'night-time noise abatement objective'. The Government's proposed night-time noise abatement objective was: • *"Whilst supporting sustainable growth and recognising the importance to the UK of maintaining freight connectivity, to limit and where possible reduce, the adverse effects of aviation noise at night on health and quality of life."* It sought to move away from focusing on the number of people affected by noise to a greater focus on the adverse effects on health and quality of life. The consultation ran from March to May 2023, resulting in the adoption of the following night-time noise abatement objective: • *To limit and where possible reduce, the adverse effects of aviation noise at night on health and quality of life, while supporting sustainable growth and recognising the importance to the UK of commercial passenger and freight services.* In February 2024 the Government launched stage 2 of the consultation. In anticipation of the results of two key studies[29] and the ongoing review of evidence, it is proposed that the current regime be maintained for a further

[28] Department for Transport (2024). *Night-time noise abatement objectives for the designated airports from October 2025.* [online] Available at: https://www.gov.uk/government/consultations/night-time-noise-abatement-objectives-for-the-designated-airports/night-time-noise-abatement-objectives-for-the-designated-airports-from-october-2025 (Accessed 17 July 2024).

[29] The Aviation Night Noise Effects (ANNE) study and the Aviation Noise Attitudes Survey (ANAS)

Document / Reference	Summary
	3-year period to October 2028. In respect of Heathrow Airport, no changes to the movement limits or 'Quota Count' limits are proposed.

Government and industry guidance

7.2.4 A summary of relevant Government and industry guidance is provided in **Table 7.3**.

Table 7.3 Relevant Government and Industry Guidance

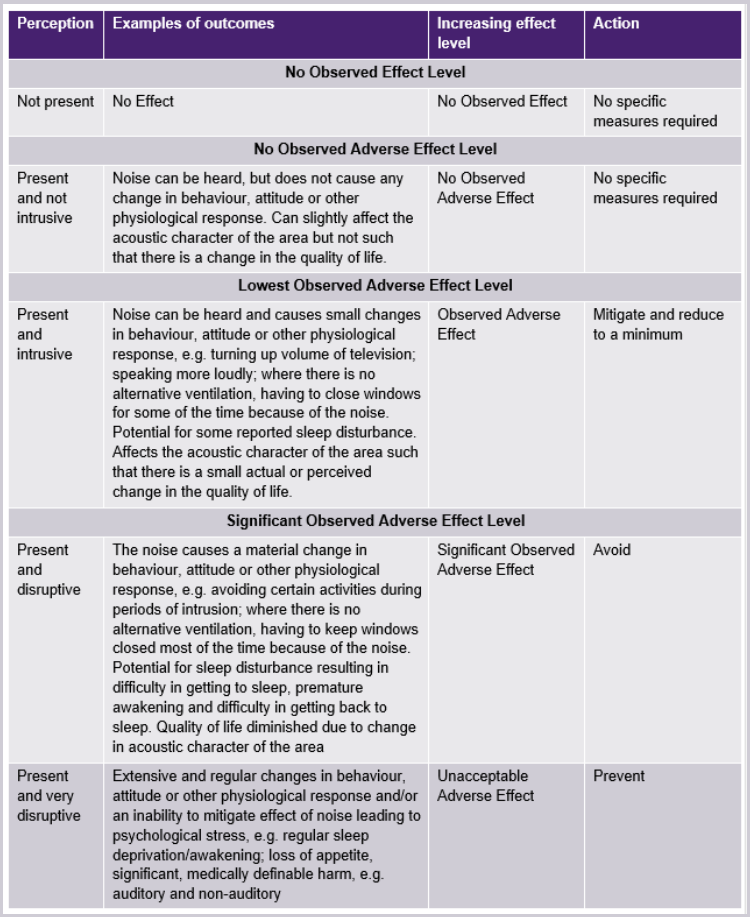
Document / Reference	Summary
World Health Organization - Guidelines for Community Noise (1999)[30]	The WHO Guidelines for Community Noise (CNG) provides guidelines based on scientific knowledge about the health impacts of community noise. This guidance was partially superseded by the WHO Environmental Noise Guidelines for the European Region, 2018[31]. However, the guideline values for internal noise and maximum noise levels from regular noise events remain relevant. The guidelines originally informed 'British Standard 8233:1999 Sound Insulation and Noise Reduction for Buildings - Code of practice' (BS 8233:1999) and continue to inform current versions of the standard.
World Health Organization – Night Noise Guidelines for Europe (2009)[32]	The WHO Night Noise Guidelines for Europe (NNG) provides guidance on the potential health effects arising from long-term night-time noise exposure and the effects this can have on sleep. The guidelines identified a LOAEL for night-time noise of 40 dB $Ln_{ight,outside}$ (free-field) and stated *"40dB should be the target of the night noise guideline (NNG) to protect the public, including the most vulnerable groups such as children, the chronically ill and the elderly".* The guidelines also advise that for levels above 55 dB $L_{night,outside}$ (free-field) that *"The situation is considered increasingly dangerous for public health. Adverse health effects occur frequently, a sizeable proportion of the population is highly annoyed and sleep-disturbed. There is evidence that the risk of cardiovascular disease increases."* Consequently, the guidelines advise that "*$L_{night,outside}$ value of 55 dB is recommended as an interim target for the countries where the NNG cannot be achieved in the short term for various reasons, and where policy-makers choose to adopt a stepwise approach".* In the absence of other guidance, for transportation noise, the NNG LOAEL is typically considered to represent a LOAEL and the interim target a SOAEL.

[30] World Health Organization (1999). *Guidelines for Community Noise*. Geneva: World Health Organization.

[31] World Health Organization (2018). *Environmental Noise Guidelines for the European Region*. Geneva: World Health Organization.

[32] World Health Organization (2009). *Night Noise Guidelines for Europe.* Geneva: World Health Organization.

Document / Reference	Summary
Planning Practice Guidance – Noise (2014)[21]	The National Planning Practice Guidance (PPG), which supplements the National Planning Policy Framework (NPPF)[20], incorporates Planning Practice Guidance – Noise (PPG-N). PPG-N, most recently updated in 2019, advises how the planning system can manage potential noise impacts in new development and draws upon the principles advocated in Noise Policy Statement for England (NPSE)[19]. The document advises how the effects of noise can be described in terms of perception and outcomes aligned to increasing effect levels. In addition, the PPG-N introduces a fourth 'Unacceptable Adverse Effect Level' (UAEL), which is described as a level at which *"noise exposure would cause extensive and sustained adverse changes in behaviour and / or health without an ability to mitigate the effect of the noise. The impacts on health and quality of life are such that regardless of the benefits of the activity causing the noise, this situation should be avoided*." The PPG-N also discusses situations where noise exposure is already high and where development may result in small increases. It states that: *"In cases where existing noise sensitive locations already experience high noise levels, a development that is expected to cause even a small increase in the overall noise level may result in a significant adverse effect occurring even though little to no change in behaviour would be likely to occur."* The Guidance advises that due to the subjective nature of noise " *there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any situation"*. PPG-N also provides guidance in terms of how adverse effects of noise can be mitigated. The PPG-N is summarised in a "noise exposure hierarchy" as presented below.

Document / Reference	Summary
	

Perception	Examples of outcomes	Increasing effect level	Action
No Observed Effect Level			
Not present	No Effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
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 not such that there is a change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of 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
Significant Observed Adverse Effect Level			
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

Institute of Environmental Management and Assessment (IEMA) Guidelines for Environmental Noise Impact Assessment (2014)[33]	The IEMA Guidelines provide key principles and methodological guidance on environmental noise impact assessment and how to effectively integrate noise impacts into the consenting process of all types of development.
Building Bulletin 93: Acoustic design of schools: performance standards. (BB93) (2015)[34]	BB93 provides guidance on the minimum acoustic performance standards for new and refurbished schools. It includes setting out upper limits for internal noise levels for rooms of specific uses. Due to the proximity of educational noise sensitive receptors in the vicinity of the Proposed Development, the BB93 guidance has been used to derive appropriate noise screening criteria for the operational noise assessment.

[33] Institute of Environmental Management & Assessment (2014). *Guidelines for Environmental Noise Impact Assessment.* Lincoln: Ruddocks.

[34] Department for Education (2015). *BB93: Acoustic Design of Schools – Performance Standards.* [online] Available at: https://www.gov.uk/government/publications/bb93-acoustic-design-of-schools-performance-standards (Accessed 17 July 2024).

Document / Reference	Summary
CAP 1616 Airspace Design: Guidance on the Regulatory Process for Changing Airspace Design Including Community Engagement Requirements (2017) (updated 2023)[35]	Airspace change is regulated by the CAA having regard to Government policy as set out in the Air Navigation Guidance, 2017 (ANG)[22]. CAP1616, last updated in 2023, describes the process and methods for assessing the environmental impacts of airspace changes. Further information on the supporting environmental requirements for noise assessments made under the CAP1616 process are set out in CAP1616i 'Environmental Assessment Requirements and Guidance for Airspace Change Proposals' (2023)[36].
Professional Practice Guidance (ProPG): on Planning & Noise – New Residential Development (2017)[37]	ProPG is a joint publication by the Chartered Institute of Environmental Health (CIEH), the Association of Noise Consultants (ANC) and the Institute of Acoustics (IoA). The guidance was produced to assist practitioners in matters relating to noise and new residential development. ProPG states that *"Once internal LAeq noise levels exceed the target levels by more than 10 dB, they are highly likely to be regarded as "unacceptable" by most people, particularly if such levels occur more than occasionally."* This principle has helped inform the derivation of UAEL values in respect of construction noise.
World Health Organization - Environmental Noise Guidelines for the European Region (2018)[31]	This document presents the recommendations of the World Health Organization in relation to long-term noise exposure from transportation sources, including road traffic, railway, and aircraft 'air' noise. The guidelines partially supersede the WHO 'Guidelines for Community Noise' (WHO, 1999)[30] and complement the WHO 'Night Noise Guidelines for Europe' (WHO NNG, 2009)[32]. The guidance is based on critical health and provides source-specific guideline values and noise exposure response functions (ERFs) in terms of the L_{den} and L_{night} metrics. Importantly, the guideline values advised are aspirational, and in focusing on health, do not consider the wider social and economic aspects of transportation noise. In the UK, the Department for Transport's current position with respect to aviation noise and the WHO guidelines is presented in Aviation 2050[24]. This states that whilst the Government agrees with the ambition to reduce and to minimise adverse health impacts, it wants policy to be underpinned by the most robust evidence on

[35] Civil Aviation Authority (2023). *CAP1616: The Process for Changing the Notified Airspace Design.* [online]. Available at: https://www.caa.co.uk/our-work/publications/documents/content/cap1616/ (Accessed 17 July 2024).

[36] Civil Aviation Authority (2023). *CAP1616i: Environmental Assessment Requirements and Guidance for Airspace Change Proposals.* [online]. Available at: https://www.caa.co.uk/our-work/publications/documents/content/cap1616i/ (Accessed 17 July 2024).

[37] Association of Noise Consultants, Institute of Acoustics and Chartered Institute of Environmental Health (2017). *ProPG: Planning & Noise. Professional Practice Guidance on Planning & Noise New Residential Development.* Lewes: Ingenious Design.

Document / Reference	Summary
	these effects, including the total cost of action and recent UK specific evidence, which the WHO report did not assess. In 2020 the ERFs from the guidelines were adopted as a means of calculating the harmful effects from transportation noise as a revision to Annex III of the Environmental Noise Directive (END) 2002/49/EC. Notably, this revised Annex of the END has not been incorporated into the Environmental Noise (England) Regulations because they were introduced after the UK exited the EU.
Design Manual for Roads and Bridges - Sustainability & Environmental Appraisal - LA111 - Noise and Vibration (2020)[38]	LA111 'Noise and vibration' of the Design Manual for Roads and Bridges (DMRB) provides guidance on undertaking noise and vibration assessments on the impact of road projects. The construction noise and vibration assessment methodologies have regard to BS 5228:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites: Part 1 - Noise and Part 2 - Vibration. The document also provides criteria for the magnitude of change in noise levels due to the addition of construction traffic on the primary traffic routes. DMRB also provides operational assessment criteria which provides consideration of changes in noise level with and without schemes in the short-term and in the long-term. It provides a semantic scale for the magnitude of noise impact.
CAP 1616i: Environmental Assessment Requirements and Guidance for Airspace Change Proposals (2023)[36]	The document is predominantly written for airspace change sponsors, such as airport operators and air navigation service providers and provides requirements and guidance on performing environmental and habitats regulations assessments undertaken in that context. In respect of noise metrics, the document states that*: "When considering noise impacts, the CAA will weigh the outcomes from 'primary' metrics over 'secondary' metrics. Primary metrics will be those that are used to quantify total adverse noise effects, such as the Department for Transport's TAG outputs. Secondary metrics will be those that are not being used to determine total adverse noise effects, but which are still able to convey noise effects, such as number above contours. While not a noise metric, overflight contours will be a secondary metric for the purposes of decision-making."* Additional metrics are also suggested that include maximum noise levels (L_{ASmax}), 100% mode L_{Aeq} contours and noise difference maps.

[38] Standards for Highways (2020). *Design Manual for Roads and Bridges. LA 111 - Noise and Vibration.* [online] Available at: https://www.standardsforhighways.co.uk/search/cc8cfcf7-c235-4052-8d32-d5398796b364 (Accessed 17 July 2024).

Regional and local planning policy

7.2.5 A summary of relevant regional and local planning policy is provided in **Table 7.4**.

Table 7.4 Relevant regional and local planning policy

Document / Reference	Summary
Regional Planning Policies	
The Mayor of London's Environment Strategy (2018)[39]	The Mayor of London's Environment Strategy was published in 2018. Chapter 9 of the Environment Strategy relates to Ambient Noise with the aim that *"Londoners' quality of life will be improved by reducing the number of people adversely affected by noise and promoting more quiet and tranquil spaces"*. The strategy has three main objectives: • *9.1 Reducing the adverse impacts of noise by targeting locations with the highest noise pollution from transport* • *9.2 Reducing the adverse impacts of noise by targeting non-transport sources that produce the most noise* • *9.3 Protect and improve the acoustic environment of London* In Policy Proposal 9.1.2.e the document advises that *"The Mayor will continue to lobby to minimise the adverse impacts of noise from aviation"*. This policy proposal states that: To minimise the adverse impacts of noise from aviation, the Mayor has, and will continue to lobby for: • *reduced night flights from airports that may affect London residents* • *an approach to airspace modernisation that is fair and efficient, and which gives full weight to the associated noise impacts for all affected communities* In respect of quiet and tranquil spaces, in Policy Proposal 9.3.2. the document advises that *"The London Plan includes policies that encourage boroughs to promote more quiet spaces across London"*. Additionally, the document states that *"In addition to this, the Mayor will encourage boroughs to nominate 'quiet areas', in line with guidance from Defra"*.
The London Plan (2021)[40]	The current version of the London Plan was published in March 2021. It provides the overall Spatial Development Strategy for London, setting out an integrated economic, environmental, transport and social framework for the development of London over the next 20–25 years, and provides a strategic, London-wide policy context within which boroughs should set their detailed local planning policies. In respect of aviation noise, in Policy T8 – A aviation, the document advises that:

[39] Mayor of London (2018). *London Environment Strategy*. London: Greater London Authority.

[40] Mayor of London (2021). *The London Plan*. London: Greater London Authority.

Document / Reference	Summary
	• *B The environmental and health impacts of aviation must be fully acknowledged and aviation-related development proposals should include mitigation measures that fully meet their external and environmental costs, particularly in respect of noise, air quality and climate change. Any airport expansion scheme must be appropriately assessed and if required demonstrate that there is an overriding public interest or no suitable alternative solution with fewer environmental impacts.* • *C The Mayor will oppose the expansion of Heathrow Airport unless it can be shown that no additional noise or air quality harm would result, and that the benefits of future regulatory and technology improvements would be fairly shared with affected communities.* • *E Development proposals that would lead to changes in airport operations or air traffic movements must take full account of their environmental impacts and the views of affected communities. Any changes to London's airspace must treat London's major airports equitably when airspace is allocated.*
Local Planning Policies	
London Borough of Hillingdon	**Local Plan: Part 1 Strategic Policies (2012)**[41] advises that Heathrow is located in the south of the Borough and has an effect on the noise environment in this area in terms of both road traffic and aircraft noise. Local Plan environmental improvement policies EM1 and EM8 support "*the need to control, reduce and mitigate noise, especially around Heathrow and the major road network*". Part 1 of the Local Plan sets out the Council's position on Heathrow operations which is to oppose *"any further capacity increase at Heathrow, including mixed mode and any further runway expansion"*. The Local Plan goes on to set out the Council's commitment to taking a *"common sense approach to dealing with Heathrow Airport"* and that the policies seek to maximise the economic benefits of Heathrow, reduce any negative environmental impacts and secure improvements for local communities. The Vision for Hillingdon 2026[42] acknowledges that *"Hillingdon has continued to prosper from the presence of Heathrow"* in an economic sense with the airport providing access to jobs and links to training whilst securing reductions in noise amongst other benefits have been achieved for the local communities.

[41] London Borough of Hillingdon (2012). *Local Plan: Part 1 Strategic Policies.* [online] Available at: https://www.hillingdon.gov.uk/local-plan-and-review (Accessed 17 July 2024).

[42] London Borough of Hillingdon (2010). *A vision for 2026: Local Development Framework Core Strategy consultation draft June 2010*. [online] Available at: https://modgov.hillingdon.gov.uk/documents/s5480/A%20vision%20for%202026%20-%20core%20strategy.pdf (Accessed 23 July 2024).

Document / Reference	Summary
	Part 1 of the Local Plan sets out strategic objectives with respect to the Heathrow Opportunity Area including objective SO23: *"develop and implement a strategy for the Heathrow Opportunity Area in order to ensure that local people benefit from economic and employment growth and social and environmental improvements including reduction in noise and poor air quality"*. The objective is supported by Policy E3 through which the Council will prepare a Local Development Document in respect of the Heathrow area in consultation with the London Borough of Hounslow and the Greater London Authority (GLA). **Local Plan: Part 2 Development Management Policies (2020)**[43] sets out policies on the Safe Operation of Airports (Policy DMAV1) including ensuring that sensitive uses are not located in areas significantly affected by aircraft noise without acceptable mitigation measures, and Heathrow Airport (Policy DMAV2) which considers environmental impacts of development proposals within the Heathrow Airport boundary.
London Borough of Hounslow	**Local Plan Volume One (2015)**[44] advises that Heathrow is located to the west of the London Borough of Hounslow with many areas in the Borough affected by aircraft noise. Local Plan policies emphasise the Council's measures to manage noise sensitive developments in the worst-affected areas of the Borough and their support for measures to minimise the impacts of aircraft noise. Policy EC3 provides that the Council "*will encourage a more sustainable Heathrow Airport by working with the airport operator and other partners to reduce environmental impacts, whilst recognising the role of the airport in the local economy*." The policy also requires Heathrow to "*demonstrate that air and noise pollution from aircraft movements, the airport's infrastructure and transport to and from the airport avoid adverse impacts on the borough*.".
London Borough of Ealing	**Ealing's Draft Local Plan (Regulation 19 Consultation Documents) (2024)**[45] establishes the economic benefits as a result of the Borough's proximity to Heathrow and sets out the Council's position on development at Heathrow. There are no policies specific to aircraft noise.

[43] London Borough of Hillingdon (2020). *Local Plan Part 2: Development Management Policies.* [online] Available: https://www.hillingdon.gov.uk/local-plan-and-review (Accessed 17 July 2024).

[44] London Borough of Hounslow (2015). *Local Plan Volume One.* [online] Available at: https://www.hounslow.gov.uk/info/20167/local_plan/1108/local_plan (Accessed 14 August 2024).

[45] London Borough of Ealing (2024). *Ealing's Draft Local Plan (Regulation 19 Consultation Documents).* [online] Available at: https://www.ealing.gov.uk/downloads/download/7588/draft_new_local_plan_document_regulation_19 (Accessed 14 August 2024).

Document / Reference	Summary
	Development (Core) Strategy Development Plan Document (2012)[46] promotes the economic benefits Heathrow affords the Borough. There are no policies specific to aircraft noise.
London Borough of Richmond upon Thames	**The Richmond Local Plan (Regulation 19 Consultation Version, 2023)**[47] sets out the Council's position on development at Heathrow Airport and confirms that there are no policies on Heathrow *"as the airport does not lie within the borough boundary"*. **The Local Plan (2018)**[48] also sets out the Council's position on development at Heathrow Airport and confirms that there are no policies on Heathrow *"as the airport does not lie within the borough boundary"*.
Slough Borough Council	**The Proposed Spatial Strategy (2020)**[49] promotes the economic benefits of the proximity of Heathrow as well as acknowledges the environmental problems created in the east of the borough. The strategy sets out restrictions on developments in the parts of the borough which are most affected by aircraft noise. **The Local Development Framework Site Allocations (2010)**[50] does not identify any development sites which require specific attention to aircraft noise from Heathrow Airport. **The Core Strategy (2008)**[51] identifies how development in Slough is constrained partly as a result of noise due to the proximity of the Borough to Heathrow airport.

[46] London Borough of Ealing (2012). *Development (Core) Strategy Development Plan Document.* [online] Available at: https://www.ealing.gov.uk/downloads/download/7530/development_or_core_strategy_dpd (Accessed 14 August 2024).

[47] London Borough of Richmond upon Thames (2023). *Richmond Local Plan 'The best for our borough' (Regulation 19).* [online] Available at: https://www.richmond.gov.uk/media/fomccpcf/publication_local_plan_low_resolution.pdf (Accessed 14 August 2024).

[48] London Borough of Richmond upon Thames (2018). *The Local Plan.* [online] Available at: https://www.richmond.gov.uk/media/15935/adopted_local_plan_interim.pdf (Accessed 14 August 2024).

[49] Slough Borough Council (2020). *The Proposed Spatial Strategy.* [online] Available at: https://www.slough.gov.uk/downloads/file/344/the-spatial-strategy-consultation-document-nov-2020 (Accessed 14 August 2024).

[50] Slough Borough Council (2010). *The Local Development Framework Site Allocations.* [online] Available at: https://www.slough.gov.uk/downloads/download/582/development-plan-site-allocations (Accessed 14 August 2024).

[51] Slough Brough Council (2008). *The Core Strategy.* [online] Available at: https://www.slough.gov.uk/downloads/download/581/development-plan-core-strategy-2006---2026 (Accessed 14 August 2024).

Document / Reference	Summary
Buckinghamshire Council	**The Draft Local Plan for Buckinghamshire (2024)**[52] is currently under development**.** **The Vale of Aylesbury Local Plan (2021)**[53] has no specific policies relating to aircraft noise and/or Heathrow Airport. **The Wycombe District Local Plan (2019)**[54] has no specific policies relating to aircraft noise and/or Heathrow Airport. **The South Bucks Core Strategy Development Plan Document (2011)**[55] sets out the Council's commitment to work with other local authorities to minimise aircraft noise from Heathrow Airport and manage new development in the context of avoiding adverse noise impacts. **South Bucks District Local Plan 1999 – Consolidated (2011)**[56] has no specific policies specifically relating to aircraft noise and/or Heathrow Airport. **The Chiltern District Core Strategy (2011)**[57] has no specific policies specifically relating to aircraft noise and/or Heathrow Airport. **Chiltern District Local Plan 1997 - Consolidated (2011)**[58] has no specific policies specifically relating to aircraft noise and/or Heathrow Airport.

[52] Buckinghamshire Council (2024). *The Draft Local Plan for Buckinghamshire.* [online] Available at: https://www.buckinghamshire.gov.uk/planning-and-building-control/local-development-plans-info/buckinghamshire-local-plan/ (Accessed 14 August 2024).

[53] Buckinghamshire Council (2021) *The Vale of Aylesbury Local Plan.* [online] Available at: https://www.buckinghamshire.gov.uk/planning-and-building-control/planning-policy/local-development-plans-and-guidance/local-development-plans/ (Accessed 14 August 2024).

[54] Wycombe District Council (2019). *The Wycombe District Local Plan.* [online] Available at: https://www.buckinghamshire.gov.uk/planning-and-building-control/planning-policy/local-development-plans-and-guidance/local-development-plans/ (Accessed 14 August 2024).

[55] South Bucks District Council (2011). *South Bucks Local Development Framework Core Strategy Development Plan Document.* [online] Available at: https://www.buckinghamshire.gov.uk/planning-and-building-control/planning-policy/local-development-plans-and-guidance/local-development-plans/ (Accessed 14 August 2024).

[56] South Bucks District Council (2011). *South Bucks District Local Plan.* [online] Available at: https://www.buckinghamshire.gov.uk/planning-and-building-control/planning-policy/local-development-plans-and-guidance/local-development-plans/ (Accessed 14 August 2024).

[57] Chiltern District Council (2011). *Core Strategy for Chiltern District.* [online] Available at: https://www.buckinghamshire.gov.uk/planning-and-building-control/planning-policy/local-development-plans-and-guidance/local-development-plans/ (Accessed 14 August 2024).

[58] Chiltern District Council (2011). *Chiltern District Local Plan.* [online] Available at: https://www.buckinghamshire.gov.uk/planning-and-building-control/planning-policy/local-development-plans-and-guidance/local-development-plans/ (Accessed 14 August 2024).

Document / Reference	Summary
Royal Borough of Windsor and Maidenhead	**The Local Plan 2022**[59] sets out the constraints on development in the Borough as a result of aircraft noise from Heathrow Airport and confirms the Council's engagement activities in respect of the impacts of Heathrow Airport.
Spelthorne Borough Council	**The Draft Pre-submission Spelthorne Local Plan (2022)**[60] identifies the areas of the Borough most affected by aircraft noise and acknowledges the benefits and issues around aircraft and ground noise management at Heathrow Airport. The draft Local Plan includes a policy on managing noise from Heathrow and in respect of development close to Heathrow. **The Core Strategies and Policies Development Plan (2009)**[61] identifies the areas of the Borough most affected by aircraft noise and acknowledges the benefits and issues around aircraft and ground noise management at Heathrow Airport. The Local Plan includes policies on managing noise from Heathrow and in respect of development close to Heathrow.

Aviation specific standards, guidance and research

7.2.6 A summary of relevant aviation specific standards, guidance and research is provided in **Table 7.5**.

Table 7.5 Relevant aviation specific standards guidance and research

Document / Reference	Summary
ERCD Report 0705 - Revised Future Aircraft Noise Exposure Estimates for Heathrow Airport (2007)[62]	In November 2007, the then Secretary of State for Transport consulted on the prospect of ending the Cranford Agreement in the 'Adding Capacity at Heathrow Airport' document[63] . This consultation was informed by technical reports by the Environmental Research and Consultancy Department (ERCD) of the Civil Aviation Authority (CAA) which advised

[59] Royal Borough of Windsor and Maidenhead (2022). *Borough Local Plan 2013 - 2033.* [online] Available at: https://www.rbwm.gov.uk/planning-and-building-control/planning-policy/development-plan/adopted-local-plan (Accessed 14 August 2024).

[60] Spelthorne Borough Council (2022). *Pre-submission Spelthorne Local Plan 2022-2037.* [online] Available at: https://www.spelthorne.gov.uk/localplan (Accessed 14 August 2024).

[61] Spelthorne Borough Council (2009). *The Core Strategies and Policies Development Plan.* [online] Available at: https://www.spelthorne.gov.uk/article/17620/Development-Plan-2009 (Accessed 14 August 2024).

[62] Civil Aviation Authority (2007). *ERCD Report 0705: Revised Future Aircraft Noise Exposure Estimates for Heathrow Airport.* [online] Available at: https://www.caa.co.uk/our-work/publications/documents/content/ercd-report-0705/ (Accessed 23 July 2024).

[63] Department for Transport (2007). *Adding capacity at Heathrow Airport.*

Document / Reference	Summary
	on the implications of ending the Cranford Agreement (among other operational changes) in terms of both noise and air quality redistribution around Heathrow Airport. The noise assessment demonstrating the implications of ending the Cranford Agreement was published in ERCD Report 0705. The document identified a net reduction of 10,500 in the population exposed to daytime noise levels of 57dB$L_{Aeq,16h}$, albeit at the expense of exposing smaller numbers (around 3,300) to higher levels of noise.
ERCD report 0907 - Environmental Noise and Health: A Review (2010)[64]	This report reviews literature in the field of noise and health with an emphasis on aviation noise. The review considers key papers published since the publication of the World Health Organization Guidelines for Community Noise in 1999 in the categories of annoyance, mental health, cardiovascular and physiological effects, performance, nighttime effects, noise and children, and foetal effects.
ERCD Report 0908 – Aircraft Noise and Children's Learning (2010)[65]	This report provides a review of documented effects of aircraft noise on children's development and learning abilities and sets out potential areas for future work.
ERCD report 1207 – Tranquillity: An Overview (2013)[66]	This provides a summary of key research into tranquility with special attention to aviation. It notes that tranquillity studies often consider visual and auditory impacts and how busy a space is with other visitors upon the perception of tranquility as well as the perception of aircraft noise.
ERCD report 1208 - Aircraft Noise, Sleep Disturbance and Health Effects: A Review (2013)[67]	This report provides a review of a wide range of noise effects on sleep from the effect on the microstructure of electroencephalogram (EEG) to obvious changes in sleep architecture and implications for sleep quality, mood and performance, including physiological implications of noise-induced sleep disturbance. The report also carried out an analysis of the economic cost-benefits of night flights which is limited to self-reported sleep disturbance and increased risk of myocardial infarctions.
CAP 1506 - Survey of Noise Attitudes 2014: Aircraft Noise and Annoyance	The second edition of the document, published in 2021, presents research carried out by the CAA on behalf of Government to obtain and update the evidence base relating to noise and annoyance from aircraft noise in England. Social survey and associated statistical analysis were conducted

[64] Civil Aviation Authority (2010). *ERCD Report 0907 Environmental Noise and Health: A Review.* [online] Available at: https://www.caa.co.uk/publication/download/13857 (Accessed 17 July 2024).

[65] Civil Aviation Authority (2010). *ERCD Report 0908 Aircraft Noise and Children's Learning*. [online] Available at: https://www.caa.co.uk/publication/download/13859 (Accessed 17 July 2024).

[66] Civil Aviation Authority (2013). *ERCD Report 1207 Tranquillity: An Overview*. [online] Available at: https://www.caa.co.uk/publication/download/14304 (Accessed 17 July 2024).

[67] Civil Aviation Authority (2013). *ERCD Report 1208 Aircraft Noise, Sleep Disturbance and Health Effects: A Review*. [online] Available at: https://www.caa.co.uk/publication/download/14424 (Accessed 17 July 2024).

Document / Reference	Summary
(2015 as amended)[68] (SONA14)	having regard to UK aircraft noise exposure indices $L_{Aeq,16h}$, L_{den}, N70 and N65, and different modes of airport operation. Evidence was found that mean annoyance score correlated well with average summer day noise exposure in terms of $L_{Aeq,16h}$ and there was no evidence to suggest that any of the other indicators correlated better, including shorter average and single mode metrics. However, the document recognised the merit in 'Number Above' metrics as supplemental indicators to help describe noise exposure. Compared with some historical studies[69], at levels of noise exposure below 63 $dBL_{Aeq,1h}$, a higher proportion of respondents were found to be highly annoyed for a given noise exposure. Evidence was also found that non-acoustic factors such as noise sensitivity, approximated social grade, and expectations of future noise exposure, influenced the reported aircraft noise annoyance and may be as important as the actual noise exposure level.
CAP 1278 - Aircraft noise and health effects: Recent findings (2016)[70]	CAP 1278 is an update to the ERCD Report 0907[64] described above with an emphasis on aircraft noise. The report reviews further studies on cardiovascular impacts, sleep disturbance and children's learning (including performance and psychological effects) published since 2009 and highlights areas that are considered important for future research. This report does not specifically focus on annoyance which is covered by the subsequent CAP 1588[71] (as referred to below). Importantly, emerging research on metabolic outcomes and foetal development are introduced.
CAP1498: Definition of Overflight (2017)[72]	CAP 1498 provides analyses in the interests of providing definitions of 'overflight' and an 'overflight metric'. Notably, overflight is a supplementary noise metric and CAP 1616[35] states: *"It is important to stress that the overflight metric does not reflect noise impacts; it contains no noise information but has been developed to recognise both that Government*

[68] Civil Aviation Authority (2015). *CAP1506: Survey of Noise Attitudes 2014: Aircraft Noise and Annoyance, Second Edition.* [online]. Available at: https://www.caa.co.uk/our-work/publications/documents/content/cap1506/ (Accessed 17 July 2024).

[69] Civil Aviation Authority (1985). *DR report 8402: United Kingdom Aircraft Noise Index Study: Main Report.* [online] Available at: https://www.caa.co.uk/our-work/publications/documents/content/dr-report-8402/ (Accessed 23 July 2024).

[70] Civil Aviation Authority (2016). *CAP1278: Aircraft noise health effects: Recent findings.* [online] Available at: https://www.caa.co.uk/our-work/publications/documents/content/cap1278/ (Accessed 17 July 2024).

[71] Civil Aviation Authority (2018). *CAP1588: Aircraft Noise and Annoyance: Recent Findings.* [online] Available at: https://www.caa.co.uk/our-work/publications/documents/content/cap1588/ (Accessed 17 July 2024).

[72] Civil Aviation Authority (2017). *CAP1498: Definition of Overflight.* [online] Available at: https://www.caa.co.uk/our-work/publications/documents/content/cap1498/ (Accessed 17 July 2024).

Document / Reference	Summary
	policy on airspace refers to overflights and that communities can find the information useful."
CAP1731: Aviation Strategy: Noise Forecast and Analyses (2018)[73]	To inform the Government's Aviation 2050 strategy (2018), the CAA were commissioned to undertake analyses of airport noise forecasts and consideration of how airport noise may be limited. The document reports on these analyses and presents a feasibility study of implementing airport noise limits nationally and locally, including consideration of the pros and cons that noise limits may create. It also provides recommendations with respect to how aviation noise policy as per the APF and ANG17 could be incorporated into a national and local limit scheme. The report states that: *"In order to address the Aviation Policy Framework objective to "limit and where possible reduce the number of people in the UK significantly affected by aircraft noise" and take into account the latest UK airspace policy noise objectives to avoid significant adverse impacts and mitigate and minimise adverse impacts, the proposed limit scheme would contain the following:* *1) A nationally set absolute Quota Count limit or noise contour area limit at a particular noise level, for both day and night, aggregated across all major airports;* *2) A locally set absolute Quota Count or noise contour area limit at a particular noise level, for both day and night, for each airport;* *3) Local monitoring of the number of highly annoyed and highly sleep disturbed people;* *4) Reporting requirements."*
CAP 1588 - Aircraft Annoyance: Recent Findings (2018)[71]	This report provides an overview of the recent research into and state of knowledge on the effects of aircraft noise and annoyance responses. The report covers the background of annoyance, how it interacts with other health endpoints and external factors and the current thresholds for describing degrees of annoyance, methodologies used to measure aircraft noise-induced annoyance and dose-response relationships, recent developments (over approximately the past ten years) in research findings and suggestions for future improvements to methodologies, and the complexities of how non-acoustic factors can influence annoyance along with new methods that take these into account in future studies.

[73] Civil Aviation Authority (2018). *CAP1731: Aviation Strategy – Noise Forecast and Analyses.* [online] Available at: https://www.caa.co.uk/our-work/publications/documents/content/cap1731/ (Accessed 17 July 2024).

Document / Reference	Summary
ICCAN Review of the Survey of Noise Attitudes (SoNA, 2014) (2019)[74]	The aim of the ICCAN Review of the Survey of Noise Attitudes (SoNA) 2014, in 2019 was "*to consider the lessons from SoNA 2014 and make recommendations on the scope of future research in this area*", acknowledging the wide variety of views on SoNA. The issues explored in the review included: • The use of clustered sampling in the areas between the 51 and 54 dB $L_{eq,16hr}$ noise contours. • The use of SoNA as evidence for establishing 51 dB $L_{Aeq,16hr}$ as the LOAEL. • Changes to attitudes over time. • Noise metrics used. • The different findings of SoNA compared with the World Health Organization's Environmental Noise Guidelines for the European Region (2018), including differences in the methodologies used by the studies reviewed by WHO. • The wider uses of SoNA, predominantly its use in TAG assessment The key recommendations set out by ICCAN were: • A new, regular attitudinal survey is begun before the end of 2021, and repeated frequently. • New surveys should be commissioned, run and analysed independent of Government, regulators and industry. • To find a sustainable and equitable solution to funding the surveys, which involves government and industry, but does not impinge on the independence of the ownership and management of the surveys. • Improvements should be made for the new surveys using lessons learned from SoNA. • ICCAN will run a development study to identify the best way to implement improvements for the new surveys.
CAP2091 CAA Policy on Minimum Standards for Noise Modelling (2021)[75]	CAP2091 sets out the minimum acceptable level of sophistication for airport noise modelling for that can be used to provide the CAA with outputs as part of discharging its duties. It is also used in general by aircraft noise practitioners when preparing aircraft noise models and assessments that are not regulated by the CAA. It can therefore be considered as providing best practice.

[74] Independent Commission on Civil Aviation Noise (2019). *Review of the Survey of Noise Attitudes 2014*. Woking: ICCAN.

[75] Civil Aviation Authority (2021). *CAP2091: CAA Policy on Minimum Standards for Noise Modelling.* [online] Available at: https://www.caa.co.uk/our-work/publications/documents/content/cap2091/ (Accessed 17 July 2024).

Document / Reference	Summary
CAP 2161 Survey of Noise Attitudes 2014: Aircraft Noise and Sleep Disturbance (2021)[76]	This document presents further analysis of the research carried out and reported as part of CAP 1506[68]. The further analysis focusses on the effect of aircraft noise on sleep disturbance. Notably, CAP 2161 concludes *"N60 is found to correlate almost as well as L_{Aeq8h} and L_{night}. Based on this exploratory analysis, there is insufficient evidence to change from the current practice of using average summer night $L_{Aeq,8h}$ noise exposure for UK assessments".*
CAP 2370 - Aircraft Noise and Sleep Disturbance: An update (2014-2022) (2022)[77]	This report provides an update to the ERCD Report 1208[67] described above by way of a review of studies published between 2014 and 2022. The focus is on the findings of the NORAH study[78], updated WHO Environmental Noise Guidelines for the European Region[31], the DEBATS[79] study, the Survey of Noise Attitudes (SoNA)[68] study and other relevant publications.
CAP2250 Survey of Noise Attitudes 2014: Aircraft Noise and Annoyance, Further Analysis (2022)[80]	This report expands on the work conducted in CAP1506 - Survey of Noise Attitudes 2014: Aircraft Noise and Annoyance (2015 as amended)[68], by examining further non-acoustic factors and their association with aircraft noise along with the factors that may act as mediators. In particular consideration is given to the effects of runway alternation and respite on annoyance at Heathrow Airport. The report concludes that: • *Noise respite of 8dB and 9dB L_{Aeq8hr} between modes of operation were found to have a statistically significant effect on the likelihood of a respondent describing themselves as highly annoyed;* • *For residents experiencing at least 8 dB $L_{Aeq,8hr}$ noise respite, 10% highly annoyed accorded with an average summer day noise exposure of 57 dB $L_{Aeq,16h}$, a shift of 5 dB $L_{Aeq,16hr}$, for the same annoyance response;*

[76] Civil Aviation Authority (2021). *CAP2161: Survey of Noise Attitudes 2014: Aircraft Noise and Sleep Disturbance.* [online] Available at: https://www.caa.co.uk/our-work/publications/documents/content/cap2161/ (Accessed 17 July 2024).

[77] Civil Aviation Authority (2022). *CAP2370: Aircraft Noise and Health Effects: An update. (2014-2022).* [online] Available at: https://www.caa.co.uk/our-work/publications/documents/content/cap2370/ (Accessed 17 July 2024).

[78] *Noise Related Annoyance, Cognition and Health (NORAH).* [online] Available at: https://www.norah-studie.de/en/about-us.html (Accessed: 23 July 2024).

[79] *DEBATS (Discussion on the Health Effects of Aircraft Noise).* [online] Available at: http://debats-avions.ifsttar.fr/index.php (Accessed: 23 July 2024).

[80] Civil Aviation Authority (2022). *CAP2250: Survey of Noise Attitudes 14: Aircraft Noise and Annoyance, Further Analysis.* [online] Available at: https://www.caa.co.uk/our-work/publications/documents/content/cap2250/ (Accessed 17 July 2024).

Document / Reference	Summary
	• *For residents experiencing at least 9 dB $L_{Aeq,8hr}$ noise respite, 10% highly annoyed accorded with an average summer day noise exposure of 59.5 dB $L_{Aeq,16h}$, a shift of 7.5 dB $L_{Aeq,16h}$ for the same annoyance response; and* • *For residents experiencing no landing noise respite, 10% highly annoyed accorded with an average summer day noise exposure of 52 dB $L_{Aeq,16hr}$* CAP2250 reports a major finding with respect to noise respite and aircraft noise annoyance with respect to Heathrow's runway alternation system. Paragraph 7.26 of CAP2250 states that: *"A major finding is that Heathrow's runway alternation system, that provides noise respite – predictable periods of noise relief, is found to be associated with a reduced likelihood of being highly annoyed in relation to those primarily affected by westerly arrivals. Dose response functions estimating the likelihood of being highly annoyed are presented for residents experiencing no respite and respite of at least 8 dB LAeq,8h."* A discussion of the evidence base provided in CAP2250 supporting these conclusions is provided in Section 3 of **Volume III Appendix 7.5: Air Noise**. Sensitivity tests in relation to aircraft noise annoyance are also provided in this appendix.

British and International standards

7.2.7 A summary of relevant British and International standards is provided in **Table 7.6**.

Table 7.6 Relevant British and International Standards

Document / Reference	Summary
British Standard 7385-2:1993 Evaluation and Measurement for Vibration in Buildings – Part 2: Guide to Damage Levels from Ground-borne Vibration[81]	BS 7385-2 gives guidance on the assessment of the possibility of vibration-induced damage in buildings due to a variety of sources and identifies the factors which influence the vibration response of buildings.
ISO 9613-2:1996 Acoustics - Attenuation of Sound During Propagation	ISO 9613 defines a method for predicting the propagation of noise outdoors. It accounts for distance attenuation, air absorption, topography, ground cover and screening and reflections caused by buildings and other features.[83]

[81] British Standards Institution (1993). *BS 7385-2:1993 Evaluation and measurement for vibration in buildings – Guide to damage levels from groundborne vibration.* London: BSI.

[83] It is noted that a revision of ISO 9613-2 was published in January 2024. However, the Standard was only incorporated within the noise modelling software used for this project in June 2024. At the time of writing the 1996 version is still relevant because of its reference within the Environmental Noise Directive (END).

Document / Reference	Summary
Outdoors - Part 2: General Method of calculation[82]	
British Standard 7445-1:2003. Description and Measurement of Environmental Noise. Guide to Quantities and Procedures[84]	BS 7445-1 defines the basic quantities to be used for the description of noise in community environments and describes basic procedures for the determination of these quantities.
British Standard 5228-1:2009+A1: 2014 Code of practice for noise and vibration control on construction and open sites: Part one – Noise[85]	Part one of BS 5228 relates to the potential effects on existing noise sensitive human receptors as a result of noise arising from construction activities. This includes construction vehicles travelling on haulage routes across the construction site.
British Standard 5228-2 Code of Practice for Noise and Vibration Control on Open Construction Sites – Part 2: Vibration[86]	Part 2 of BS 5228 relates to the potential effects on existing noise sensitive human receptors as a result of vibration arising from construction activities. This includes construction vehicles travelling on haulage routes to and from the construction site.
British Standard 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings[87]	BS 8233:2014 provides guidance for the control of noise in and around buildings. It is applicable to the design of new buildings, or refurbished buildings undergoing a change of use.

7.3 Technical and Public Engagement

Introduction

7.3.1 This Section describes the relevant technical engagement which was undertaken by the Applicant in relation to the noise and vibration assessment. This is in addition to the submission of a Scoping Report, requesting a Scoping Opinion from London Borough of Hillingdon (LBH which was submitted on 1 November 2023 (**Appendix 1.5: Scoping Report**). A Scoping Opinion was provided on 1 February 2024 (**Appendix 1.6: Scoping**

[82] International Organization for Standardization (1996). *ISO 9613-2 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation.* Geneva: ISO.

[84] British Standards Institution (2003). *BS 7445-1:2003 Description and measurement environmental noise – Guide to quantities and procedures.* London: BSI.

[85] British Standards Institution (2014). *BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites: Part 1 – Noise*. London: BSI.

[86] British Standards Institution (2014). *BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open site: Part 2 – Vibration.* London: BSI.

[87] British Standards Institution (2014). *BS 8233: 2014 Guidance on sound insulation and noise reduction for buildings.* London: BSI.

Opinion). Information received in the Scoping Opinion has informed the scope of the noise and vibration assessment. This is summarised in **Table 7.25** in **Section 7.6.3** of this chapter.

7.3.2 **Table 7.7** provides a summary of the engagement activities undertaken in support of the preparation of this assessment.

Table 7.7 Summary of consultation undertaken

Body/organization/location	Individual/stat body/organisation	Meeting dates and other forms of consultation	Summary of outcome of discussions
London Borough of Hillingdon (LBH)	LBH planning and environmental teams	14 August 2023	Overview of easterly alternation project and approach to noise assessment prior to scoping report finalisation.
London Borough of Hillingdon	LBH planning and environmental teams, and noise advisor (Temple Group)	14 March 2024	Presentation of noise assessment methodologies.
London Borough of Hillingdon	LBH planning and environmental teams.	21 May 2024	Presentation of draft construction, aircraft ground and aircraft air noise findings.
Longford Residents Association	Longford Residents Association, Heathrow Engagement Team	28 May 2024	Meeting to discuss noise assessment and how Longford Village will be considered in the assessment.
The Council for the Independent Scrutiny of Heathrow Airport (CISHA)	CISHA members	25 June 2024	Presentation of draft noise assessment outcomes
London Borough of Hillingdon	LBH planning and environmental teams, and noise advisor (Temple Group)	9 September 2024	Presentation of Noise Mitigation Measures (see **Section 7.7**)
Hounslow (Isleworth Hall)	Public information event	10 September 2024	General information regarding the Proposed Development and its noise impact.

Body/organization/location	Individual/stat body/organisation	Meeting dates and other forms of consultation	Summary of outcome of discussions
Southall (Havelock Family Centre)	Public information event	11 September 2024	General information regarding the Proposed Development and its noise impact.
Longford (Thistle Hotel)	Public information event	12 September 2024	General information regarding the Proposed Development and its noise impact.
Cranford (Cranford Community College)	Public information event	14 September 2024	General information regarding the Proposed Development and its noise impact.
Stanwell Moor (Memorial Hall)	Public information event	17 September 2024	General information regarding the Proposed Development and its noise impact.
Old Windsor (Memorial Hall)	Public information event	18 September 2024	General information regarding the Proposed Development and its noise impact.
Longford (Thistle Hotel)	Public information event	19 September 2024	General information regarding the Proposed Development and its noise impact.
The Council for the Independent Scrutiny of Heathrow Airport (CISHA)	CISHA members	24 September 2024	Presentation of Noise Mitigation Measures (see **Section 7.7**).

7.3.3 A **Statement of Community Involvement** is provided alongside the planning application which details the public engagement undertaken including the outcomes and feedback from this engagement.

7.4 Baseline Conditions

Introduction

7.4.1 Existing receptors in the area surrounding Heathrow are currently exposed to varying levels of noise and vibration from the following sources:

- Aircraft 'air' noise – noise from aircraft on the runway and in the landing and take-off cycle;
- Aircraft 'ground' noise – noise from aircraft operating on the ground i.e. whilst at stand, holding or traversing the airfield; and
- Surface access transport noise (road and rail).

7.4.2 For construction noise, baseline conditions for the period Summer 2025 to Summer 2027 are required as this is the period currently identified for construction works to take place.

7.4.3 For operational noise sources, the following years have been considered:

- Baseline year – 2019
- Assessment year – 2028

7.4.4 In respect of the assessment year of 2028, based upon the scoping response, the operational noise modelling reflects the 480,000 annual movements limit at the Airport, imposed by the Terminal 5 planning permission. This takes into account feedback from the Scoping Opinion and has been adopted for all annual average noise metrics.

7.4.5 The study areas for the respective assessments are discussed in the following sections.

Method of baseline data collection

7.4.6 The information used to define baseline conditions has been obtained in two rounds of data gathering exercises. The two rounds have been split into:

- A desk study; and
- Surveys and modelling

7.4.7 With respect to aircraft 'air' noise, Heathrow operates an array of fixed and mobile noise monitors located around the airport. These are used to monitor compliance with noise limits set by the DfT for aircraft departing from the airport, to assist annual noise contour mapping and air traffic management improvement initiatives, and to measure noise in community locations where requests have been received to assist our understanding of aircraft noise and to help us shape future policy commitments.

7.4.8 Further detail on the baseline data collection and baseline conditions can be found in **Appendix 7.3: Noise and Vibration Baseline Conditions**.

Round 1: Desk study

7.4.9 Round one baseline data collection comprised a review of publicly available measurement and prediction datasets and reports including the following:

- Aircraft noise contours and exposure data published by Heathrow each year and prepared by the Environmental Research and Consultancy Department (ERCD) of the Civil Aviation Authority (CAA) (see **Figure 7.1** and **Figure 7.2** (**Volume IV**) which present the daytime, 92-day summer, actual modal split and night-time, 92-day summer, actual modal split noise contours for 2019, respectively);
- The results of noise mapping published by the Department for the Environment, Food and Rural Affairs (Defra); and
- A review of noise assessment reports supporting recent planning applications.

Round 2: Surveys and Modelling

7.4.10 Information collected as part of the round one data collection exercise was reviewed to identify locations and scenarios where there was a lack of existing information, or where more detailed information was required to facilitate assessments.

7.4.11 To support the construction noise assessment a baseline noise measurement survey was carried out to support the assessment of noise sensitive receptors in Longford. The survey was carried out at three locations within the Terminal 5 Pod Parking area over a one-week period in May 2024. The measurement locations were selected to provide an indication of noise during the core night hours at specific groups of receptors in Longford.

7.4.12 To support the aircraft 'air' noise and aircraft 'ground' noise assessments, noise modelling has been carried out for baseline conditions in 2028. The detailed methodologies for the preparation of these baselines are presented in **Appendix 7.5: Air Noise** and **Appendix 7.6: Ground Noise** and are informed by airfield noise measurements and measurements of aircraft noise.

Study areas

Construction Phase: Construction Noise

7.4.13 The construction noise study area is presented in **Figure 7.3** (**Volume IV**). The study area focuses on Longford Village given its close proximity to the construction works for the proposed 'Longford Noise Barrier' and '09L infrastructure' work sites, and on Stanwell given its proximity to the construction works for the 09R/27L "redundant pavement removal works" (also shown in **Figure 7.3** (**Volume IV**)).

Operational Phase: Aircraft Air Noise

7.4.14 The study area for the aircraft air noise assessment has been set as approximately 40 nautical miles west-east, and approximately 20 nautical miles north-south, centred on Heathrow Airport as shown **Figure 7.4** (**Volume IV**).

7.4.15 This study area provides for the assessment of aircraft air noise with respect to relevant noise policy thresholds and likely significant effects. This study also represents the area within which all residential populations have been assessed with respect to all primary, secondary, and informative air noise metrics as described in **Section 7.5**.

Operational Phase: Aircraft Ground Noise

7.4.16 The study area for aircraft 'ground' noise covers a spatial area 1 km from the airfield boundary as shown in **Figure 7.5** (**Volume IV**).

7.4.17 This study area represents the of noise sensitive receptors that are likely to be exposed to levels of ground noise considered adverse with respect to health and quality of life i.e. above LOAEL.

Operational Phase: Noise Induced Vibration

7.4.18 The study area for noise induced vibration effects due to aircraft start of roll noise has focussed on receptors in Longford Village. These receptors are located in a proximity to aircraft start of roll which introduce a risk of routine low frequency noise events due to scheduled Runway 09L departures.

Current baseline

Current construction baseline

7.4.19 With reference to **Appendix 7.3: Noise and Vibration Baseline Conditions**, aircraft noise typically dominates the noise environment at the nearest noise sensitive receptors (NSRs) to the Proposed Development in Longford during the day.

7.4.20 Aircraft noise also dominates the noise environment at the nearest NSRs in Longford and Stanwell at night, when considered over the whole 8-hour period (23:00 – 07:00hrs). Notably, some night-time construction works will be carried out between 23:00 and 04:30hrs. Importantly, aircraft 'air' noise levels during this time are at their lowest therefore, noise from local and distant road traffic noise along with any activities on the airfield will typically dominate. The baseline noise survey, which focused on Longford, established sound levels, in the absence of aircraft activity over this construction period, to be approximately 48 dB to 51 dB $L_{Aeq,5.5hr}$. A desk-based study of noise levels in Stanwell concluded a similar range of noise levels for receptors to the south of the airfield.

Current aircraft 'air' noise baseline

7.4.21 An existing baseline scenario is not required for the assessment of aircraft 'air' noise, because the assessment focuses on a future assessment year of 2028, which represents the proposed first full year of implementation of Easterly Alternation.

7.4.22 However, for information purposes, historical air noise exposure information is provided in **Appendix 7.3: Noise and Vibration Baseline Conditions** with average summer daytime and average summer night-time noise contours for 2019 presented in **Figure 7.1** and **Figure 7.2** (**Volume IV**) respectively.

7.4.23 A reference year of 2019 has been considered as this represents the final calendar year of normal airport operations before the COVID-19 global pandemic. This approach has been adopted by a number of airport Environmental Statements (ES) and is also supported by Defra Guidance[88] in respect of the preparation of Noise Action Plans (NAPs). In 2019 there were just under 478,000 aircraft movements at the Airport handling around 80.9 million passengers.

Current aircraft 'ground' noise baseline

7.4.24 An existing baseline scenario is not required for the assessment of aircraft 'ground' noise due to the assessment focusing on a future assessment year of 2028, which represents the proposed first full year of implementation of Easterly Alternation.

7.4.25 Noise exposure from ground noise is not routinely predicted like air noise, however it is reasonable to expect that noise exposure from aircraft on the ground will reduce over time in line with improvements in aircraft technology and general reductions in aircraft noise. For this reason, it is reasonable to expect that future ground noise baseline conditions in the assessment year of 2028 will be lower than in 2019.

Future baseline

Future Construction Baseline

7.4.26 The current baseline conditions established for Longford and Stanwell are considered representative of the future baseline conditions immediately before the start of the construction works. In respect of the daytime period, ambient noise exposure from aircraft noise is considered to dominate and therefore marginally reduce over time as a result of continued modernisation and improvements in aircraft noise emissions. During the main night-time construction period of between 23:00 and 04:30hrs, there are a limited number of aircraft movements and as such the baseline during this period is less influenced by future trends in aircraft noise performance.

Future Aircraft Air Noise Baseline

7.4.27 Future baseline conditions have been calculated using the methodology advised in **Appendix 7.5: Air Noise**. The future baseline represents the air noise conditions for the assessment year of 2028 in the absence of the Proposed Development.

7.4.28 There are many operational factors which will affect the air noise baseline conditions. These include:

- the proportion of westerly and easterly operations which is determined by the prevailing wind direction, along with the 'westerly preference' measure;

[88] Department for Environment Food & Rural Affairs (2022). *Guidance for Airport Operators on how to revise Noise Action Plans under the Environmental Noise (England) Regulations 2006 (as amended)*. London: Defra.

- runway use;
- the proportion and use of Heathrow's departure routes;
- noise abatement measures;
- the point at which aircraft join the final approach; and
- the evolution and modernisation of the Heathrow's aircraft fleet towards quieter aircraft.

7.4.29 Operational parameters such as these would not be affected by the Proposed Development and would apply equally to the future baseline in 2028 and with the Proposed Development in 2028.

7.4.30 Future baseline air noise exposure data is reported in **Appendix 7.5: Air Noise**. Specifically **Figure 7.6** presents summer average daytime $L_{Aeq,16hr}$ noise contours and **Figure 7.7** presents summer average night-time $L_{Aeq,8hr}$ noise contours (**Volume IV**).

7.4.31 **Table 7.8** provides a comparison of the baseline air noise exposure statistics published for Heathrow Airport by ERCD[89] for 2019 and the 2028 future baseline as prepared for this assessment as per the methodology set out in **Appendix 7.5: Air Noise**.

7.4.32 **Table 7.8** demonstrates a reduction in the area, population and households exposed to aircraft noise for both the summer daytime and summer night-time periods in 2028 without the Proposed Development, compared with conditions in 2019, despite aircraft operations at the airport trending towards larger aircraft types. The reductions between 2019 and 2028 are predominantly driven by changes in aircraft fleet mix at Heathrow Airport. For example, British Airways retired their Boeing 747-400 aircraft earlier than planned in 2020 due to the impact of the COVID-19 pandemic. Boeing 747-400 aircraft have been replaced with more modern aircraft such as the Boeing 787 Dreamliner and Airbus A350 types which are quieter both on arrival and departure compared to the Boeing 747-400.

7.4.33 As Heathrow operates within its 480,000 aircraft movement cap and assuming that passenger movements are unlikely to increase substantially without further terminal infrastructure, over the period 2024 to 2028, in line with Heathrow's Noise Action Plan, aircraft noise is expected to continue to reduce due to continued fleet modernisation. Actions 1B and 1C of the Noise Action Plan 2024 – 2028 set targets in relation to this. As such, further fleet modernisation at Heathrow is expected to occur over the period of the NAP coinciding with the 2028 assessment year.

7.4.34 ICAO's Independent Expert Noise Technology Review[90] has estimated a rate of technological improvement will result in improvements of around 0.1 to 0.3 dB per year (0.1

[89] Civil Aviation Authority (2020). *ERCD Report 2001: Heathrow Airport 2019 Summer Noise Contours and Action Plan Contours.* [online] Available at: https://www.heathrow.com/content/dam/heathrow/web/common/documents/company/local-community/noise/reports-and-statistics/reports/noise-action-plan-contours/LHR_2020_Summer_and_NAP_Contours.pdf (Accessed 23 July 2024).

[90] International Civil Aviation Organisation (ICAO) (2019). *Independent Expert Integrated Technology Goals Assessment and Review for Engines and Aircraft (Doc 10127)*

dB being the lower bound of this improvement rate). This review considered periods up to 2027 and 2037. Assuming Heathrow continues to operate within its 480,000 aircraft movement cap and passenger infrastructure, it is reasonable to expect that noise will continue to decrease beyond the assessment year of 2028. As such, 2028 can be considered a reasonable worst-case year for assessment of the Proposed Development with respect to noise output.

Table 7.8 Summer Day and Summer Night Noise Exposure Statistics for Heathrow Airport for the 2019 baseline and future 2028 baseline

Year	Total Aircraft Movements	Summer Day 'standard' ($L_{Aeq,16hr}$) ≥ 54dB			Summer Night 'actual' ($L_{Aeq,8hr}$) ≥ 48dB		
		Area (km^2)	Population (000's)	Households (000's)	Area (km^2)	Population (000's)	Households (000's)
2019	478,059	156.1	492.7	193.4	105.4	428.5	172.4
2028 WoD	480,000	127.3	415.4	166.1	90.5	354.3	143.0

Future Aircraft Ground Noise Baseline

7.4.35 The future baseline scenario has been calculated using the methodology advised in **Appendix 7.6: Ground Noise**. The future baseline scenario represents the aircraft 'ground' noise conditions for the assessment year of 2028 in the absence of the Proposed Development.

7.4.36 As with air noise, many operational factors which affect aircraft noise baseline conditions. These include:

- the proportion of westerly and easterly operations which is determined by the prevailing wind direction, along with the 'westerly preference' measure;
- the points at which aircraft exit and access the runways;
- the amount of time aircraft hold prior to joining the runway;
- the amount of time taken to taxi to and from the runway; and
- the evolution and modernisation of the Heathrow's aircraft fleet towards quieter aircraft.

7.4.37 Future baseline air noise exposure data is reported in **Appendix 7.6: Ground Noise**. **Figure 7.8** presents summer average daytime $L_{Aeq,16hr}$ noise contours and **Figure 7.9** presents summer average night-time $L_{Aeq,8hr}$ noise contours (**Volume IV**).

7.4.38 The NSRs most exposed to aircraft 'ground' noise are located in close proximity to the perimeter of the airfield with exposure typically higher in proximity to the active runway ends. Aircraft 'ground' noise is therefore more likely to influence the overall ambient noise climate at receptors located in:

- Longford;

- Harmondsworth;
- North Longford;
- Sipson;
- Harlington;
- Hounslow;
- Feltham;
- Stanwell; and
- Stanwell Moor.

7.5 Assessment Methodology

7.5.1 This Section presents the assessment methodologies adopted for the assessment of likely significant effects and, where appropriate, adverse effects on health and quality of life due to:

- Construction Noise;
- Aircraft 'Air' Noise;
- Aircraft 'Ground' Noise; and
- Noise Induced Vibration.

Construction: Construction Noise

Modelling Methodology and Modelled Construction Works

7.5.2 Construction noise calculations have been prepared using the Softnoise Predictor/LimA® noise modelling software. The calculations have been carried out using the methodologies set out in BS 5228-1[85] for point (static and quasi-static) and line (moving) noise sources.

7.5.3 All construction noise modelling has been informed by a well progressed but indicative construction programme, associated methodologies (including plant selections and on-times) and phasing assumptions. These have been provided by the Project's construction planner. The final construction programme and construction working methods will be developed by the selected contractor.

7.5.4 These assumptions are considered to be representative of the likely construction activities but it is also anticipated that construction activities that are demonstrated to result in impacts

and potential effects as described in this Chapter will be controlled through a Section 61[91] process. It is common through this process for construction noise to be further reduced.

7.5.5 Based on the indicative construction programme, six main phases of construction have been modelled, as set out in **Table 7.9**.

Table 7.9 Construction programme and activities

Construction Phase	Period	Approximate Duration (weeks)
Noise barrier construction along Wright Way	Night-time only	9
Noise barrier construction around Terminal 5 Pod Parking	Daytime only	10
09L airfield infrastructure Phase 1	Night-time only	21
09L airfield infrastructure Phase 2	Night-time only	31
09L airfield infrastructure Phase 3	Daytime and Night-time	28
09L airfield infrastructure On-Alternation	Night-time only, two weekends on, two weekends off coinciding with night-time runway alternation	60

7.5.6 Additionally, consideration has been given to the 09R/27L "redundant pavement removal works" which are estimated to last for a duration of approximately 20 weeks and occur on weekday nights only. These works are likely to occur simultaneously with the 09L airfield infrastructure works when the relevant plant is available and therefore may be intermittent.

7.5.7 **Appendix 7.4: Construction Noise and Vibration** describes in full the modelling methodology and assumptions adopted for the construction noise assessment.

[91] Section 61 of the Control of Pollution Act (COPA), 1974[1], which enables a person intending to carry out construction works to apply to the local authority for prior consent to agree construction practices which represent best practicable means to limit noise. Provided that the works are carried out in accordance with the consented application and any conditions attached, the local authority would not serve notice under Section 60 of the COPA.

Noise Metrics

7.5.8 The following construction noise metrics have been adopted as set out in **Table 7.10**.

Table 7.10 Construction Noise Metrics

Metric	Description
Daytime $L_{Aeq,12hr}$	The L_{Aeq} set out in the ABC method (BS 5228-1) for assessing effect significance for the daytime period 7am to 7pm on weekdays. The weekend period 7am to 1pm on Saturdays are treated as 'daytime'.
Evening $L_{Aeq,4hr}$	The L_{Aeq} set out in the ABC method (BS 5228-1) for assessing effect significance for the evening period 7pm to 11pm on weekdays. The weekend periods 1pm to 11pm on Saturdays and 7am to 11pm on Sundays are treated as 'evening'.
Night-time $L_{Aeq,8hr}$	The L_{Aeq} set out in the ABC method (BS 5228-1) for assessing effect significance for the night-time period 11pm to 7am on weekdays and weekends.
Daytime $L_{Aeq,10hr}$	The assessment L_{Aeq} for the period during the daytime between 7.30am and 5.30pm on weekdays when daytime construction shifts are forecast to occur based on the indicative construction programme and working methods.
Night-time $L_{Aeq,5.5hr}$	The assessment L_{Aeq} for the period during the night-time between 11pm and 4:30am on weekdays and weekends when night-time construction works are forecast to occur based on the indicative construction programme and working methods.

Assessment Methodology

7.5.9 Two overarching concepts of assessment have been addressed as part of the construction noise assessment:

- Adverse Effects on Health and Quality of Life; and
- Likely Significant Effects (in EIA terms).

7.5.10 The assessment of adverse effects on health and quality of life is a fundamental theme of Government noise policy (NPSE), whilst the assessment of Likely Significant Effects (LSE) is a requirement under the EIA Regulations.

7.5.11 The approach to construction noise assessment has been informed through guidance[33], and precedent set by other construction noise assessments carried out through the planning system such as HS2.

7.5.12 The UK Government's noise policy is set out in the NPSE and has three aims, which are to:

- Avoid significant adverse impacts on health and quality of life;
- Mitigate and minimise adverse impacts on health and quality of life; and
- Where possible, contribute to the improvement of health and quality of life.

7.5.13 The first aim of the NPSE is aligned to where noise exposure is above the Significant Observed Adverse Effect Level (SOAEL), with the second aim of the NPSE applying to situations where noise exposure is above the Lowest Observed Adverse Effect Level (LOAEL) but below the SOAEL. The third aim of the NPSE applies to all levels of noise exposure.

7.5.14 The LOAEL and SOAEL values for the construction noise assessment are reported in **Table 7.11** for daytime, evening and night-time periods respectively. These values broadly align with those adopted in HS2 Phase 1 – Information Paper E23: Control of construction noise[92] which provides a useful precedent.

Table 7.11 LOAEL and SOAEL values for the construction noise assessment

LOAEL			SOAEL		
Daytime (07:00-19:00)	**Evening (19:00 to 23:00)**	**Night-Time (23:00-0700)**	**Daytime (07:00-19:00)**	**Evening (19:00 to 23:00)**	**Night-Time (23:00-0700)**
65 dB $L_{Aeq,T}$	55 dB $L_{Aeq,T}$	45 dB $L_{Aeq,T}$	75 dB $L_{Aeq,T}$	65 dB $L_{Aeq,T}$	55dB $L_{Aeq,T}$

Notes:
The values above correspond to Category A and Category C of 'Example method 1 – the ABC method' presented in Section E.3.2 of BS 5228-1. The LOAEL values are also replicated in 'Example method 2 – 5dB(A) change' in Section E.3.3 of BS 5228-1 and the SOAEL values are replicated in example Section E.4 as the thresholds used to determine the eligibility for noise insulation.

7.5.15 Notably, SOAEL is aligned with established noise insulation thresholds. This has been consistently confirmed by National Highways and DfT in relation to highway projects[93] and on other infrastructure projects, such as HS2 and Thames Tideway Tunnel, where it has been determined that noise insulation will 'avoid' significant adverse effects on health and quality of life. This principle was agreed by the Inspector at the planning inquiry relating to the previous planning application for the Proposed Development[94].

7.5.16 In line with the first aim of UK Government noise policy (NPSE), which relates to noise exposure above the SOAEL, a significant effect on health and quality of life has been initially identified where forecast noise exposure from the construction works may result in a NSR temporarily exceeding SOAEL. Due to the temporary nature of construction work and potential variability in noise emissions, temporal factors have also been considered. For the purposes of this assessment, the following temporal thresholds have been adopted based on Annex E.4 of BS5228-1. The temporal thresholds relate to the duration of exceedance above SOAEL:

"for a period of 10 or more days of working in any 15 consecutive days during construction; or for a total of 40 days or more in any 6 consecutive months during construction"

[92] High Speed Two (HS2) Limited (2017). *High Speed Two Phase One Information Paper E23: Control of Construction Noise and Vibration.* [online] Available at: https://assets.publishing.service.gov.uk/media/5a821fd340f0b62305b929cb/E23_-_Control_of_construction_noise_and_vibration_v1.7.pdf (Accessed 31 July 2024)

[93] With reference to the Noise Insulation Regulations (as amended)[9,10].

[94] Planning Inspectorate, '*Report to the Secretaries of State for Transport and for Communities and Local Government – Appeal by Heathrow Airport Limited against the Decision of the Council of the London Borough of Hillingdon Concerning Enabling Works to Allow Implementation of Full Runway Alternation During Easterly Operations at Heathrow Airport*', November 2015, Paragraphs 1064 and 1087.

7.5.17 The Planning Practice Guidance on Noise[21] (PPG-Noise) introduced a further adverse effect level, the 'Unacceptable Adverse Effect Level' (UAEL). Based on recent precedents for construction noise assessments, the UAEL has been set 10 dB above SOAEL. On long-term construction projects the setting of the UAEL at 10 dB above SOAEL has been aligned with the provision of temporary rehousing however such interventions require consideration to be given to the duration of exposure above the threshold. Importantly, the temporal thresholds therefore apply to the duration of exceedance above UAEL.

7.5.18 Importantly, construction noise will cease to occur upon completion of the construction works. Therefore, any adverse effects identified may be a classified as a temporary, short to medium term effect.

Likely Significant Effects

7.5.19 Likely significant effects for the purpose of the EIA Regulations 2017[95] are normally identified separately from, and in addition to, adverse effects on health and quality of life.

7.5.20 The likely significant effects of the Proposed Development are determined in accordance with the ABC Method presented in Section E.2.2 of BS 5228-1. The full ABC Method table has been reproduced in **Table 7.12**.

Table 7.12 BS 5228-1 ABC Method

Period	Impact Category		
	Category A	Category B	Category C
Daytime	65dB $L_{Aeq,12hr}$	70dB $L_{Aeq,12hr}$	75dB $L_{Aeq,12hr}$
Evening	55dB $L_{Aeq,4hr}$	60dB $L_{Aeq,4hr}$	65dB $L_{Aeq,4hr}$
Night-time	45dB $L_{Aeq,8hr}$	50dB $L_{Aeq,8hr}$	55dB $L_{Aeq,8hr}$

Definitions and Notes:

- Daytime – Weekdays (07:00-19:00hrs) and Saturdays (07:00-13:00hrs).
- Evening – Weekdays (19:00-23:00hrs), Saturdays (13:00-23:00hrs), Sundays and Bank Holidays (07:00-23:00hrs)
- Night-time – Weekdays, Weekends and Bank Holidays (23:00-07:00hrs).
- Category A – threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.
- Category B – threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as Category A values.
- Category C – threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than Category A values.

[95] *The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 No. 571.* [online] Available at: https://www.legislation.gov.uk/uksi/2017/571/contents (Accessed 5 August 2024).

7.5.21 To determine the relevant threshold values for a noise sensitive receptor, the prevailing ambient noise level is rounded to the nearest 5 dB and compared against the noise levels set out under Category A for the relevant assessment period. In line with the definitions and notes in **Table 7.12**, the relevant category is selected for the receptor. These are presented in **Table 7.13** which sets out the relevant ABC categories and corresponding construction noise thresholds for likely significant effects at each noise sensitive receptor. **Figure 7.10** presents the locations of receptors within the Longford construction noise study area (receptors 4 to 15).

Table 7.13 ABC Category Thresholds for Likely Significant Effects

Receptor	Representative Noise Monitoring Location[96]	Baseline Noise Level $L_{Aeq,T}$ (dB)	Baseline Noise Level Rounded to Nearest 5 dB	ABC Category and Threshold	Likely Significant Effect Threshold $L_{Aeq,T}$ (dB)
Daytime					
4, 5, 6, 7	NML1	72	70	C	75
8, 9, 10	NML2	71	70	C	75
11, 12, 13, 14, 15	NML3	70	70	C	75
134 to 143	N/A	63-66	65	B	70
Night-time					
4, 5, 6, 7	NML1	51	50	C	55
8, 9, 10	NML2	48	50	C	55
11, 12, 13, 14, 15	NML3	49	50	C	55
134 to 143	N/A	50-55	50/55	C	55

7.5.22 A likely significant effect is identified when the construction noise level exceeds the relevant category value for the relevant assessment period.

7.5.23 Where a likely significant effect is identified, the following factors are discussed to provide context to the effects. These are:

- Duration of exposure[97];

[96] **Appendix 7.3: Baseline Conditions, Volume III**.

[97] A likely significant effect is indicated where construction noise exceeds the threshold level for a period of 10 or more days of working in any 15 consecutive days during construction; or for a total of 40 days or more in any 6 consecutive months during construction.

- The type of receptor - Whether receptors are considered to be more or less sensitive on the basis of differing applicable acoustic standards, intrinsic mitigation measures, or their hours of use; and
- Existing or foreseeable mitigation – Whether receptors are likely to have already benefitted from the Airport's legacy noise insulation programme, or are likely to have received noise insulation under the new 2024 'Quieter Neighbourhood Support' (QNS) schemes, as described in **Appendix 7.2: Noise Management and Mitigation at Heathrow Airport**) in advance of the works taking place; and
- The number of receptors affected.

7.5.24 Importantly, it should be noted that, in relation to construction noise, the likely significant effect thresholds (**Table 7.13)** align with the corresponding daytime and night-time SOAEL (**Table 7.11**).

Assumptions and Limitations

7.5.25 The assumptions which underpin the construction noise assessment are set out above and in **Appendix 7.4: Construction Noise and Vibration**.

7.5.26 The predicted level of noise from construction activities depends on the assumptions relating to the items of plant used, the number of items, and duration of the activity. The assumptions made regarding construction noise are based on reasonable worst-case plant types, numbers and on-times set out in **Appendix 7.4: Construction Noise and Vibration**. Whilst the assumptions may be subject to change, they are considered robust at the time of writing and any future changes will be managed by the implementation of the **Construction Environmental Management Plan (CEMP)** and controlled through a Section 61 process to ensure that best practicable means (BPM) are employed.

Operational: Aircraft 'Air' Noise

Modelling Methodology

7.5.27 Forecasts of future levels of aircraft noise exposure, events and levels have been generated by the UK Civil Aviation Authority (CAA) Environmental Research and Consultancy Department (ERCD) using the latest version of the UK Civil Aircraft Noise Model ANCON (version 2.4) software based on inputs provided by the Project Team. These inputs include:

- Number of movements by aircraft type and period of the day;
- Forecast fleet mix in 2028; and
- Use of runways, arrival and departure routes.

7.5.28 **Appendix 7.5: Air Noise** describes the modelling methodology adopted for the assessment of effects and the inputs that have been relied on. This sets out the approach taken within ANCON for modelling parameters such as the flight and noise performance of aircraft based on data obtained from Heathrow's Noise and Track Keeping (NTK) system.

Noise Metrics

7.5.29 The ANCON model has been used to generate a number of noise metrics. These metrics have been split into 'primary' and 'secondary' metrics to reflect guidance provided by the Civil Aviation Authority in CAP1616i.

7.5.30 The primary metrics are set out in **Table 7.14**. These metrics, the $L_{Aeq,16hr}$ and $L_{Aeq,8hr}$, relate to summer average daytime (0700-2300hrs) and summer average night-time (2300-0700hrs) noise exposure measured over a 92-day period from 16 June to 15 September. As these metrics relate to average noise exposure, these take into account all modes and directions of operation and the proportion of time these occur.

7.5.31 The $L_{Aeq,16hr}$ and $L_{Aeq,8hr}$ underpin Government aviation noise policy in the UK. In the case of the $L_{Aeq,16hr}$ metric, SONA14[98] concluded that this metric correlated well with mean annoyance and that there was no evidence that any other metric considered (L_{den}, N70 and N65) correlated any better. In the case of the $L_{Aeq,8hr}$, the CAA has explored the use of alternative metrics but has concluded that there is insufficient evidence to change current practice of using the $L_{Aeq,8hr}$ metric in assessments[99].

7.5.32 These metrics and the guidance on their use[100] focus on assessing air noise exposure in a standardised or 'standard' manner. The CAA recommends that noise contours and associated noise exposure data are produced based on long-term average runway use and operating directions as influenced by operating procedures and prevailing winds. This is referred to as 'modal split' and takes into consideration the amount of time the airport is operating to the east or to the west. When determining the runway modal split for preparing 'standard' aircraft noise contours and exposure data, CAP1616i recommends[101]:

"Where sufficient data is available this should be based on the last 20 years' runway usage. If less than 20 years' data is available, it should be based on the best available data".

7.5.33 **Appendix 7.5: Air Noise** presents the derivation of the 'standard' modal splits for Heathrow Airport for each noise metric considering trends in easterly and westerly operating directions at Heathrow Airport. A 'standard' modal split is used for assessment purposes as these represent an average of an airport's historical runway use. The actual runway use of 'actual' modal split for a future assessment year cannot be known at the time of the assessment. As such, the use of a 'standard' modal split is therefore representative of what can be considered most likely to occur. The 'standard' modal split for any given noise metric can differ depending on the time of day or the period over which aircraft noise is being measured. For example, different trends in prevailing winds typically occur between day

[98] Civil Aviation Authority (2015). CAP1506: Survey of Noise Attitudes 2014: Aircraft Noise and Annoyance, Second Edition. [online]. Available at: https://www.caa.co.uk/our-work/publications/documents/content/cap1506/ (Accessed 17 July 2024).

[99] Civil Aviation Authority (2021). *CAP2161: Survey of Noise Attitudes 2014: Aircraft Noise and Sleep Disturbance.* [online] Available at: https://www.caa.co.uk/our-work/publications/documents/content/cap2161/ (Accessed 17 July 2024).

[100] CAP1616i[36]

[101] CAP1616i[36], Paragraph 5.8

and night-time periods. This means that the 'standard' modal splits for day and night-time aircraft noise metrics are different.

7.5.34 The use of a 'standard' modal split allows consideration to be given to how likely adverse impacts from exposure to aircraft noise are to occur over the long-term. Most evidence relating to the adverse impacts of aircraft noise is based on long-term exposure to aircraft noise[102]. As such, the use of a 'standard' modal split provides the basis for the assessment of long term trends in exposure, as such, where these may be considered likely to occur.

7.5.35 The primary noise assessment metrics and associated 'standard' modal splits are set out in **Table 7.14**. The primary noise metrics have been used to assess the Proposed Development in line with Government noise policy and with respect to likely significant effects.

Table 7.14 Primary Air Noise Metrics

Metric	Description
$L_{Aeq,16hr}$	The L_{Aeq} for daytime noise measured between 7am-11pm measured over a 92-day summer period from 16 June to 15 September inclusive. For assessment purposes this metric has been prepared using a 'standard' modal split of 79% West / 21% East.
$L_{Aeq,8hr}$	The L_{Aeq} for nighttime noise measured between 11pm-7am measured over a 92-day summer period from 16 June to 15 September inclusive. For assessment purposes this metric has been prepared using a 'standard' modal split of 76% West / 24% East.

7.5.36 Sensitivity tests considering 'extreme' easterly and westerly modal splits are presented in **Appendix 7.5: Air Noise**. These tests consider the most easterly and westerly modal splits that have occurred over a period of up to 20 years.

7.5.37 In addition to 'standard' modal split noise contours, 'single mode' and 'busy day' contours have been produced and are presented in **Appendix 7.5: Air Noise** to provide further context. These contours represent the levels of aircraft noise forecast to occur during the use of a certain runway for arrivals or departures, or during a busy day of easterly or westerly operations and are listed as part of the informative metrics in **Table 7.16**. These metrics have been considered as informative as their correlation with annoyance is considered unsuitable for decision making. These metrics are however considered *"helpful for portraying exposure and changes to exposure"*[103].

[102] Civil Aviation Authority (2023). *CAP2519: Aircraft Noise and Health Effects: a six-month update.* [online] Available at: https://www.caa.co.uk/publication/download/20404 (Accessed 17 July 2024).

[103] Civil Aviation Authority (2021). *CAP2161: Survey of Noise Attitudes 2014: Aircraft Noise and Sleep Disturbance.* [online] Available at: https://www.caa.co.uk/our-work/publications/documents/content/cap2161/ (Accessed 17 July 2024).

7.5.38 In line with Government aviation policy (Air Navigation Guidance (ANG2017)[22]) and the Civil Aviation Authority guidance (CAP1616[35]), secondary noise metrics have been prepared to help articulate noise impacts. The secondary metrics are set out in **Table 7.15**.

Table 7.15 *Secondary Air Noise Metrics*

Metric	Description
N65	The number of aircraft events above 65 dB L_{ASmax} measured between 07:00 and 23:00hrs, measured over the 92-day summer period from 16 June to 15 September inclusive. For assessment purposes this metric has been prepared using a 'standard' modal split of 79% West / 21% East.
N60	The number of aircraft events above 60 dB L_{ASmax} measured between 23:00 and 07:00hrs, measured over the 92-day summer period from 16 June to 15 September inclusive. For assessment purposes this metric has been prepared using a 'standard' modal split of 76% West / 24% East.
Overflight	CAA's CAP1498[72] document sets out a definition of overflight for use in airspace change proposals (ACPs). "Overflown" is defined as "an aircraft in flight passing an observer at an elevation angle of 48.5˚ from the ground at an altitude below 7000ft" (CAA). The overflight metric enables the number of overflights experienced at locations on the ground to be calculated according to the agreed definition. For the purposes of presenting changes due to the Proposed Development, overflight has been calculated up to an altitude of 4,000ft as it is in these areas where noise is most likely to result in adverse effects and where changes in aircraft operations due to the Proposed Development will be most apparent.

7.5.39 Under CAP1616 and the ANG17, secondary metrics are used as part of airspace changes to help inform communities about the likely impact of proposed changes. Use of the N65 and N60 metrics can be used to demonstrate different methods of runway usage or show how movements vary at different times of day[104].

7.5.40 SONA14 advises that people can struggle to understand the concept of the $L_{Aeq,16hr}$ metric and that there is *"merit in considering greater use of Nx metrics as supplemental indicators to help portray noise exposure but recognising that evidence-based decisions should continue to use LAeq,16h."*[105]

7.5.41 Although decision making and the assessment of effects is based on the L_{Aeq}-based metrics, the N65 metric has therefore been used to help demonstrate the redistribution of aircraft noise events that would occur due to the Proposed Development.

[104] CAP1616i[36], Paragraph 1.30

[105] CAP1506[68] Survey of Noise Attitudes 2014: Aircraft, Paragraphs 8.8 – 8.10

7.5.42 The overflight metric is not an acoustic metric. Instead, as described in **Table 7.15** it is based on the altitude of aircraft above the ground and the 'elevation angle' to which these are observed from a receiving position.

7.5.43 A further set of 'informative' metrics have been prepared. These have been used to provide further information and additional context and as part of sensitivity testing. **Table 7.16** provides a further set of 'informative' metrics.

Table 7.16 Informative Air Noise Metrics

Metric	Description
$L_{Aeq,16hr}$ (busy day)	This metric has been used to describe daytime noise levels during a busy easterly or westerly 16-hour day (07:00-23:00). In the case of a busy easterly day, this metric has been used to help describe how noise levels would change during periods of easterly winds due to the Proposed Development.
N65 (busy day)	This metric has been used to describe the number of aircraft events above 65 dB L_{ASmax} during a busy easterly or westerly day (07:00-23:00). In the case of a busy easterly day, this metric has been used to help describe how aircraft noise events would be redistributed during periods of easterly winds due to the Proposed Development.
$L_{Aeq,8hr}$ (alternation period)	The L_{Aeq} for the alternation period under consideration. This metric therefore reports continuous equivalent noise levels for either morning (07:00-15:00hrs) or evening (15:00-23:00hrs) alternation periods respectively. This metric has been used to help describe noise during each mode of operation and to support the assessment of respite provision having regard to relevant publications, namely CAP2250.
N65, 8hr (alternation period)	The number of aircraft events above 65 dB L_{ASmax} during the alternation period under consideration. This metric therefore reports the number of aircraft noise events above 65 dB L_{ASmax} for either morning (07:00-15:00hrs) or evening (15:00-23:00hrs) alternation periods respectively.
Average L_{ASmax}	The logarithmic average L_{ASmax} has been produced for daytime and night-time periods to provide information on the effect of the Proposed Development on maximum aircraft noise event levels at locations around the Airport.
L_{den}	The day-evening-night level (L_{den}) is a noise indicator for overall annoyance based upon annual average A-weighted long-term sound over 24 hours based on noise during a 12-hour day, L_{day} (07:00-19:00hrs), with a 5 dB(A) penalty for evening noise, $L_{evening}$ (19:00-23:00hrs) and a 10 dB(A) penalty for night-time noise, L_{night} (23:00-07:00hrs). This metric is calculated or forecast over an annual period in line with the Environmental Noise (England) Regulations 2006 (as amended). For the purposes of presenting this metric, the following modal splits have been applied: L_{day} – 73% West / 27% East $L_{evening}$ – 73% West / 27% East L_{night} – 72% West / 28% East
L_{night}	The night level (L_{night}) is a night-time noise indicator based upon annual average A-weighted long-term sound over the night period (23:00-07:00hrs). This metric is calculated or forecast over an annual period in line with the Environmental Noise (England) Regulations 2006 (as amended).

Metric	Description
	For the purposes of presenting this metric, the following modal splits have been applied: L_{night} – 72% West / 28% East

7.5.44 **Appendix 7.5: Air Noise** presents a series of additional informative assessments which consider the impact of the Proposed Development. These include:

- An 'in year' monetisation of the Proposed Development in 2028 using TAG (formally WebTAG);
- Changes in subjective annoyance and sleep disturbance having regard for various Exposure Response Functions (ERFs) including those described within the WHO ENG 18;
- Consideration of changes in objective awakenings due to the Proposed Development; and
- An alternative TAG assessment taking into consideration alternative ERFs and exposure thresholds.

7.5.45 TAG (Transport Analysis Guidance) is the Department for Transport's (DfT) appraisal guidance and toolkit applicable for highways, railway, and aviation projects to facilitate the appraisal and development of transport interventions. It was developed based on HM Treasury's Green Book[106], that sets out the framework for appraisal and evaluation for policies, programmes and projects involving the use of public resources. It is particularly intended for use by DfT when considering different options for 'government interventions'[107], such as the different options relevant to airspace change proposals and is not required in the case of an application for planning permission[108].

7.5.46 This information can however be used as a guide for health impacts in the context of whether interventions lead to beneficial or adverse changes across the population as a whole.

7.5.47 An overview of the findings from these informative appraisals is provided in **Section 7.8** under the heading **Annoyance, Sleep Disturbance and Monetised Outcomes**.

[106] Government Finance Function (2022). *The Green Book*. [online] Available at: https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-government/the-green-book-2020 (Accessed 15 August 2024).

[107] TAG Unit A5.2 para 1.1.1

[108] TAG Unit A5.2 para 1.1.4 makes clear that *"Decisions on planning applications for airport development will be considered in the normal way, including to take account of relevant material considerations which may include evidence relating to the strategic, commercial, financial and management case of a development proposal."*

Residential Receptors

7.5.48 The assessment of air noise on residential receptors has considered three concepts. These are as follows:

- Redistribution of Aircraft Noise Events and Respite Provision;
- Adverse Impact on Health and Quality of Life in line with Noise Policy; and
- Likely Significant Effects.

7.5.49 The redistribution of aircraft noise events and the provision of aircraft noise respite is the intended outcome of Government policy (see para 1.63 of the APF) that the Proposed Development seeks to facilitate. Evidence is presented to examine whether this is being achieved.

7.5.50 The assessment of adverse impacts on health and quality of life is a fundamental theme of Government noise and aviation policies (i.e. NPSE, APF, ANG17 and OANPS). The assessment of adverse impacts on health and quality of life requires the consideration of exposure to noise above the Significant Observed Adverse Effect Level (SOAEL), as defined by the NPSE.

7.5.51 The assessment of Likely Significant Effects (LSE) is a requirement under the EIA Regulations with the approach to noise assessment informed through guidance[33] and precedent set through other airport noise assessments in the UK.

7.5.52 The two different assessments are sometimes confused as they both use the term "significant". Nevertheless, the distinction is important. Significant adverse impacts on health and quality of life arise from exposure to noise levels above SOAEL, whereas Likely Significant Effects from an environmental assessment perspective can arise from changes in noise levels.

7.5.53 This distinction is widely understood and was applied, for instance, at the previous Cranford inquiry[109].

Residential Receptors – Redistribution of Aircraft Noise Events and Respite Provision

7.5.54 Government policy (APF[110]) states that, through the implementation of Easterly Alternation:

> *"… noise will be distributed more fairly around the airport, extending the benefits of runway alternation to communities under the flight paths during periods of easterly winds, and delivering operational benefits by letting the airport operate consistently whether there are easterly or westerly winds."*

[109] The Planning Inspectorate, *Report to the Secretaries of State for Transport and for Communities and Local Government, Town and County Planning Act 1990 - Appeal by Heathrow Airport against the decision of the Council of the London Borough of Hillingdon concerning Enabling Works to Allow Implementation of Full Runway Alternation During Easterly Operations at Heathrow Airport*, 2015. Paragraph 1064.

[110] APF[17], Paragraph 1.63.

7.5.55 By redistributing aircraft noise through runway alternation, the implementation of easterly alternation seeks to provide noise respite to communities under flight paths during periods of easterly winds.

7.5.56 The effects of the Proposed Development in terms of noise policy (i.e. the NPSE) and likely significant effects are therefore a consequence of the planned redistribution of aircraft noise events and the provision of noise respite.

7.5.57 The assessment has therefore firstly sought to assess, using objective information, whether a fairer distribution of aircraft noise events and noise respite through runway alternation during periods of easterly winds would be achieved by the Proposed Development. This provides important context for the assessment of effects.

7.5.58 The impact of the Proposed Development on aircraft noise will mainly occur during daytime periods. Heathrow does not schedule departures between 23:00 and 06:00 and the level of nighttime arrivals is limited. The Proposed Development will facilitate the easterly runway alternation schedule from 06:00. The alternation schedule designates landing and departure runways which are switched at 15:00hrs each day so as to provide a predictable period of respite from aircraft noise. This will affect the number of aircraft events experienced by communities during easterly operations and overall, when taking into account the impact of westerly operations. Due to Heathrow's scheduled operations, the Proposed Development will not lead to any aircraft departing to the east from the northern runway before 06:00.

7.5.59 CAA guidance recommends that Nx metrics can be used to describe how aircraft events are distributed under different circumstances at an airport, including different methods of runway usage. The N65 metric is therefore an appropriate metric for this purpose as it applies to daytime periods. This metric represents the number of aircraft events resulting in a maximum noise level of 65 dB L_{ASmax} or more.

7.5.60 As the ending of the Cranford Agreement relates to easterly operations, the N65 metric has been prepared for a busy easterly day (this being the busiest day that occurs annually at Heathrow) to help articulate the impact of the Proposed Development. The N65 metric with and without the Proposed Development has been used to articulate the impacts of redistributing aircraft noise during easterly operations.

7.5.61 This has been achieved by examining changes in the pattern of aircraft noise events and the number of people experiencing N65 events in the following bandings:

- 5 – 10 N65;
- 10 – 20 N65;
- 20 – 50 N65;
- 50 – 100 N65;
- 100 – 200 N65;
- 200 – 300 N65;
- 300 – 400 N65;

- 400 – 500 N65;
- 500 – 600 N65; and
- ≥ 600 N65

7.5.62 These bandings have been selected as CAP1616i advises that Nx metrics should be reported from at least 5 events and above[111]. Routine reporting of the N65 on an annual basis at Heathrow Airport reports this metric from 50, 100 and 200 events. To further articulate the change in aircraft noise events during easterly days, bands in 100 event increments from 300 to 600, and above 600 N65 have been presented to reflect the number of daytime noise events that occur for arrivals and departures at Heathrow Airport. With the Proposed Development, runway alternation will occur during easterly operations in line with a published alternation schedule, as it currently does during westerly operations. This will result in aircraft noise respite being provided for a 'predictable' and 'planned' period of time, meeting the definition of respite provided within the ANG17.

7.5.63 **Appendix 7.5: Air Noise** presents a summary of the latest evidence base for aircraft noise respite. This evidence is based on a 'respite noise change' measurable by the difference in noise levels between different operational modes in terms of $L_{Aeq,T}$. In the case of runway alternation, T is a period of at least 8-hours representative of runway operations before and after runway alternation at 15:00hrs. As part of the assessment, respite noise changes have been used to identify locations that would experience predictable respite due to the Proposed Development.

Residential Receptors – Assessment in Accordance with Noise Policy

7.5.64 The redistribution of aircraft noise events and the provision of predictable respite during periods of easterly winds will result in changes in aircraft noise exposure.

7.5.65 The Noise Policy Statement for England (NPSE) is the Government's overarching noise policy and applies to exposure from all forms of noise, including aircraft noise.

7.5.66 The NPSE sets three aims with respect to impacts on health and quality of life. These aims are aligned to two noise exposure thresholds: the Lowest Observed Adverse Effect Level (LOAEL); and the Significant Observed Adverse Effect Level (SOAEL). The policy aims and associated levels of noise exposure are set out in **Table 7.17**.

Table 7.17 *NPSE Policy Aims and Associated Noise Exposure Thresholds*

Policy Aim	Level of Exposure Where Aim Applies
"avoid significant adverse impacts on health and quality of life"	Above SOAEL
"mitigate and minimise adverse impacts on health and quality of life"	Between LOAEL and SOAEL
"where possible, contribute to the improvement of health and quality of life"	All levels of exposure

[111] CAP1616i[36], Paragraph 5.31.

7.5.67 The explanatory note to the NPSE identifies that SOAEL is therefore a level of noise exposure which is considered significant with respect to adverse impacts on health and quality of life.

7.5.68 Government policy and guidance does not explicitly define SOAEL. An appropriate level for SOAEL has however been determined through various airport projects. A daytime SOAEL of 63 dB $L_{Aeq,16hr}$ was agreed by the Inspector at the planning inquiry relating to the previous planning application for the Proposed Development[112]. The setting of SOAEL at 63 dB $L_{Aeq,16hr}$ is also supported by its acceptance in other planning decisions, such as:

- London City Airport Development Plan (CADP1) Planning Appeal Decision (2016)[113];
- Stansted Airport Planning Appeal Decision (2021)[114];
- Bristol Airport Planning Appeal Decision (2022)[115]; and
- London City Airport Development Programme (CADP1) S73 Application - Appeal Decision (2024)[116].

7.5.69 The setting of a daytime SOAEL of 63 dB $L_{Aeq, 16hr}$ is consistent with Government policy[117] with respect to the provision of noise insulation. Noise insulation is a mitigation measure that can be used to 'avoid' significant impacts on health and quality of life, i.e. effects above SOAEL.

7.5.70 With respect to night-time noise exposure, a SOAEL of 55 dB $L_{Aeq,8hr}$ has been derived from the World Health Organization (WHO) – 'Night Noise Guidelines for Europe' (2009)[32]. This value has also been adopted for several other airport projects.

7.5.71 In the Scoping Report, the night-time SOAEL included consideration of *"number of N60 events and a risk assessment of objective sleep disturbance"*. This assessment has been

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[112] The Planning Inspectorate, *Report to the Secretaries of State for Transport and for Communities and Local Government, Town and County Planning Act 1990 - Appeal by Heathrow Airport against the decision of the Council of the London Borough of Hillingdon concerning Enabling Works to Allow Implementation of Full Runway Alternation During Easterly Operations at Heathrow Airport, 2015.* Paragraph 1063.

[113] Secretary of State for Housing, Communities and Local Government and Secretary of State for Transport, *Decision Notice, Town and County Planning Act 1990 – Section 78 application and appeal made by London City Airport Limited, Land at London City Airport, Hartmann Road, Royal Docks, London, E16 2PX, Application ref: 13/01228/FUL, 2016*. Paragraphs 35, 57 and 71.

[114] Not explicitly stated in Planning Inspectorate Decision Notice but inferred from its unchallenged inclusion in the Environmental Statement, Chapter 7 – Air Noise, Table 7.3 - Airborne aircraft noise effect levels.

[115] The Planning Inspectorate, *Appeal Decision 3259234*, *2022.* Paragraphs 240, 241 and 280.

[116] Secretary of State for Housing, Communities and Local Government and Secretary of State for Transport, *Decision Notice, Town and County Planning Act 1990 – Section 78 appeal made by London City Airport Limited, London City Airport, Hartmann Road, Silvertown, London, E16 2PX, Application ref: 22/03045/VAR, 2024*. Paragraphs 7.3.4 and 8.186.

[117] Aviation Policy Framework, Paragraph 3.39 as amended in Paragraph 2.39 of the 'Consultation Response on UK Aviation Policy: A framework for balanced decisions on the design and use of airspace'

carried out separately to the assessment in accordance with noise policy and can be found in **Appendix 7.5: Air Noise**.

7.5.72 The second aim of the NPSE applies to where noise exposure is above the Lowest Observed Adverse Effect Level (LOAEL) but below the SOAEL. Having regard to the NPSE, the ANG17[118] states that:

"…There is no one threshold at which all individuals are considered to be significantly adversely affected by noise. It is possible to set a Lowest Observed Adverse Effect Level (LOAEL) that is regarded as the point at which adverse effects begin to be seen on a community basis. As noise exposure increases above this level, so will the likelihood of experiencing an adverse effect. In line with this increase in risk, the proportion of the population likely to be significantly affected can be expected to grow as the noise level increases over the LOAEL. For the purposes of assessing and comparing the noise impacts of airspace changes, the government has set a LOAEL of 51dB LAeq16hr for daytime noise and 45dB LAeq8hr for night time noise..."

7.5.73 Based on the ANG17, the assessment has adopted a daytime and night-time LOAEL of 51 dB $L_{Aeq,16hr}$ and 45 dB $L_{Aeq,8hr}$ respectively.

7.5.74 The adopted values for LOAEL and SOAEL for the air noise assessment are therefore summarised in **Table 7.18** for daytime and night-time periods.

Table 7.18 *LOAEL and SOAEL values for the air noise assessment*

LOAEL		SOAEL	
Daytime (07:00-23:00hrs)	**Night-Time (23:00-07:00hrs)**	**Daytime (07:00-23:00hrs)**	**Night-time (23:00-07:00hrs)**
51dB $L_{Aeq, 16hr}$	45dB $L_{Aeq,8hr}$	63dB $L_{Aeq,16hr}$	55dB $L_{Aeq, 8hr}$

7.5.75 In line with the aims of NPSE, the assessment has considered changes in the population exposed to levels between LOAEL and SOAEL, and above SOAEL due to the Proposed Development in 2028.

7.5.76 With respect to annoyance, SONA14 indicates that at the daytime LOAEL, 7% of people exposed to this level can be considered 'highly annoyed'. At the daytime SOAEL, SONA14 identified that 23% of people exposed can be considered 'highly annoyed'.

7.5.77 In addition to the LOAEL and SOAEL, two further daytime noise exposure thresholds have been considered for assessment purposes:

- 54 dB $L_{Aeq,16hr}$ – the average summer daytime noise exposure that can be considered to represent the *"approximate onset of significant community annoyance".*

  Prior to the ANG17 being published in 2017, aircraft noise decisions were based on APF Paragraph 3.17, which states that Government will treat *"the 57dB LAeq 16 hour contour as the average level of daytime aircraft noise marking the approximate onset of significant community annoyance".*

[118] ANG17[22], Paragraph 3.8

In October 2017, following SONA14, the Government stated that *"… consistent with the findings of the recent Survey of Noise Attitudes study (SoNA 2014) commissioned by the DfT which indicated that the degree of annoyance (based on % of respondents highly annoyed) previously occurring at 57 dB LAeq,16h, now occurs at 54 dB LAeq,16h."*

This conclusion is reached by SONA14 in identifying that the level of summer average daytime noise exposure at which 9% of the population can be considered 'highly annoyed' had reduced from 57 dB $L_{Aeq,16hr}$ to 54 dB $L_{Aeq,16hr}$ when comparing the findings of the 1982 Aircraft Noise Index Study (ANIS) with SONA14[119].

54 dB $L_{Aeq,16hr}$ is therefore considered to represent a revised threshold for the *"approximate onset of significant community annoyance"*. The 54 dB $L_{Aeq,16hr}$ has been adopted by Government as part of its 'call-in' criteria under the ANG17 for airspace changes which:

"could both lead to a change in noise distribution resulting in a 10,000 net increase in the number of people subjected to a noise level of at least 54dB $L_{Aeq,16h}$ and have an identified adverse impact on health and quality of life."[120]

The 54 dB $L_{Aeq,16hr}$ is also the lowest threshold of summer average daytime noise exposure prepared for the reporting of the noise situation at the noise-designated airports and has been used by Government in policy proposals for noise insulation for airspace changes that lead to significantly increased overflight[121].

- 69 dB $L_{Aeq,16hr}$ – APF Paragraph 3.36 identifies this threshold as the level of average summer daytime noise exposure where the Government *"… continues to expect airport operators to offer households … assistance with the costs of moving."*

  SONA14 indicates that 39% of people exposed to levels of 69 dB $L_{Aeq,16hr}$ can be considered 'highly annoyed'.

  This threshold of daytime aircraft noise exposure has been used on other airport projects as the Unacceptable Adverse Effect Level (UAEL) as defined by the PPG-N on a 'precautionary' basis. The NPSE makes no reference to a UAEL and there is no reference to this threshold in DfT policy on aviation noise. There is therefore no specific aviation noise policy basis for a UAEL. The Heathrow Third Runway Airport Preliminary Environmental Information Report (PEIR) determined UAEL to the 71 dB $L_{Aeq,16hr}$ for summer average daytime noise exposure and 66 dB $L_{Aeq,8hr}$ for summer night-time noise exposure[122].

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[119] CAP1506, Table 31

[120] *The Civil Aviation Authority (Air Navigation) Directions 2023.* [online] Available at: https://www.caa.co.uk/media/lzrl3drs/caa-air-navigation-directions-2023.pdf (Accessed 17 July 2024).

[121] Aviation 2050[24], Paragraph 3.122

[122] It should be noted that with or without the Proposed Development in 2028, it is forecast that there are less than 25 people exposed to levels above 71 dB $L_{Aeq,16hr}$ and 66 dB $L_{Aeq,8hr}$ and that these numbers would not change due to the Proposed Development. These dwellings are located off Hatton Road, in Hatton.

Residential Receptors – Likely Significant Effects

7.5.78 For residential receptors, likely significant effects for the purpose of the EIA Regulations have been identified separately from, and in addition to, the impacts on health and quality of life that are identified in line with noise and aviation policy.

7.5.79 The primary factors considered in the identification of likely significant effects are:

1. The absolute level of noise exposure relative to LOAEL and SOAEL; and
2. The magnitude of change in noise exposure due to the Proposed Development.

7.5.80 With respect to the absolute level of noise exposure, **Table 7.18** sets out the adopted LOAEL and SOAEL values for the assessment.

7.5.81 With respect to the magnitude of change in noise exposure, **Table 7.19** sets out a semantic scale for the magnitude of change (adverse or beneficial) associated with changes in noise exposure due to the Proposed Development. The changes in exposure adopted in **Table 7.19** are based on noise difference bands advised in CAP1616i[123] for the purposes of demonstrating change in aircraft noise exposure as part of airspace change proposals. These changes in noise exposure have been used in support of the assessment of significance and the setting of the significance criteria presented in **Table 7.20** and **Table 7.21**.

Table 7.19 *Magnitude of Change in Noise Exposure*

Change in Noise Exposure (dB)	Magnitude of Change (adverse / beneficial)
0	No change
0.1 to 0.9	Negligible
1.0 to 2.0	Slight
2.0 to 3.0	Minor
3.0 to 6.0	Moderate
>=6.0	Major

7.5.82 A likely significant effect (adverse or beneficial) is concluded where a residential receptor is already exposed to levels above the SOAEL and is forecast to experience at least a 1 dB ('slight') change in noise exposure. In the case of adverse effects, this criterion is drawn from the approach taken in the noise insulation regulations for road and railway projects[9,124] and reflects guidance described within the Planning Practice Guidance, which states that:

"In cases where existing noise sensitive locations already experience high noise levels, a development that is expected to cause even a small increase in the overall noise level may result

[123] CAP1616i[36], Paragraph 5.44.

[124] *The Noise Insulation (Railways and Other Guided Transport Systems) Regulations 1996 No. 428.* [online] Available at: https://www.legislation.gov.uk/uksi/1996/428/contents/made (Accessed: 06 August 2024)

in a significant adverse effect occurring even though little to no change in behavior would be likely to occur."

7.5.83 Although a 1 dB change above the SOAEL has been used identify likely significant effects as part of this assessment, it is noted that recent assessments and decisions for planning appeals at London City Airport and Bristol Airport supported the use of a 2 dB change above the SOAEL for identification of likely significant effects. The approach adopted for this assessment, and the use of a 1 dB change above the SOAEL can therefore be considered conservative.

7.5.84 Where noise exposure is between the LOAEL and the SOAEL, a likely significant effect (adverse or beneficial) is concluded where a residential receptor is forecast to experience at least a 3 dB ('moderate') change in noise exposure. This approach has been universally accepted across a range of airport projects.

7.5.85 Based on the absolute level of noise exposure and the magnitude of change, the **Primary Assessment Framework** for the identification of likely significant effects has been applied in accordance with **Table 7.20** and **Table 7.21** for daytime and night-time periods respectively.

Table 7.20 Primary Assessment Framework (daytime noise exposure, residential receptors)

Absolute noise Exposure (dB $L_{Aeq,16h}$)		**Magnitude of Change in Noise Exposure (dB)**				
		< 1.0	**1.0 to 1.9**	**2.0 to 2.9**	**3.0 to 5.9**	**>=6.0**
		Negligible	**Slight**	**Minor**	**Moderate**	**Major**
LOAEL to SOAEL	51.0 – 53.9 dB	Not Significant	Not Significant	Not Significant	Significant	Significant
	54.0 – 56.9 dB	Not Significant	Not Significant	Not Significant	Significant	Significant
	57.0 – 59.9 dB	Not Significant	Not Significant	Not Significant	Significant	Significant
	60.0 – 62.9 dB	Not Significant	Not Significant	Not Significant	Significant	Significant
≥ SOAEL	63.0 – 65.9 dB	Not Significant	Significant	Significant	Significant	Significant
	66.0 – 68.9 dB	Not Significant	Significant	Significant	Significant	Significant
	≥ 69.0 dB	Not Significant	Significant	Significant	Significant	Significant

Table 7.21 Primary Assessment Framework (night-time noise exposure, residential receptors)

Absolute noise Exposure (dB $L_{Aeq,8h}$)		Change in Noise Exposure (dB)				
		< 1.0	1.0 to 1.9	2.0 to 2.9	3.0 to 5.9	>=6.0
		Negligible	Slight	Minor	Moderate	Major
LOAEL to SOAEL	45.0 – 47.9 dB	Not Significant	Not Significant	Not Significant	Significant	Significant
	48.0 – 50.9 dB	Not Significant	Not Significant	Not Significant	Significant	Significant
	51.0 – 54.9 dB	Not Significant	Not Significant	Not Significant	Significant	Significant
≥ SOAEL	55.0 – 56.9 dB	Not Significant	Significant	Significant	Significant	Significant
	57.0 – 60.9 dB	Not Significant	Significant	Significant	Significant	Significant
	≥ 61.0 dB	Not Significant	Significant	Significant	Significant	Significant

7.5.86 Where a likely significant effect is identified from the **Primary Assessment Framework**, the following factors are discussed to provide context for the identified effect.

1. **Population -** the size of the population (number of people) in the area experiencing likely significant effects.

   As part of air noise assessments presented within the Preliminary Environmental Information Report (PEIR) for Heathrow Expansion categories describing the population size were developed in consultation with the Heathrow Expansion Project's Noise Expert Review Group (NERG). These categories are presented **Table 7.22.**

Table 7.22 *Magnitude of Change in Noise Exposure (Population)*

Population Category	Magnitude of Change (adverse / beneficial)
Very Low	10 – 99
Low	100 – 399
Medium	400 – 699
High	700 – 1000
Very High	> 1000

2. **Exposure Level** - the absolute level of noise exposure at the receptor(s) with and without the Proposed Development in terms of the primary noise metrics;

3. **Respite** - whether receptors would be afforded predictable respite through runway alternation;

4. **Aircraft Noise Events** - changes in aircraft noise events using the number-above metrics along with the forecast number of events with and without the Proposed Development;

5. **Other Ambient Noise Sources** – whether the presence of other ambient noise sources from non-aviation sources are likely to influence whether or not aircraft noise will dominate the overall noise climate; and

6. **Eligibility to Noise Insulation Schemes** – whether receptors:

    a. are likely to have already benefitted from Heathrow's Airport's legacy noise insulation schemes;

    b. are eligible to benefit from Heathrow's new 'Quieter Neighbourhood Support' (QNS) schemes; and

    c. become eligible for one of Heathrow's noise insulation schemes due to the Proposed Development, namely the QNS or Easterly Alternation Noise Mitigation Scheme.

Non-Residential Noise Sensitive Receptors

7.5.87 Exposure to, and changes in air noise, can result in discrete effects on specific receptor types and vulnerable groups. This section sets out the methodology for assessing the potential impacts and effects of the Proposed Development on non-residential noise sensitive receptors (NSRs).

7.5.88 The receptors covered in this Section include those which must be reported when assessing the impact of aircraft noise due to airspace changes. CAP1616i advises that effects and impacts of aircraft noise should be reported for *"noise-sensitive buildings (for example, hospitals, places of worship, schools)"*[125].

7.5.89 However other receptor types may also be sensitive to changes in and exposure to aircraft noise, therefore further receptor groups have been considered as set out in the Scoping Report, based on recent planning precedent[126].

7.5.90 Based on this, the following non-residential noise-sensitive receptors have been considered:

[125] CAA, CAP1616i[36], Paragraph 5.24

[126] High Speed Two Limited (2017). *High Speed Two Phase One Information Paper E20: Control of Airborne Noise from Altered Roads and the Operational Railway.* [online] Available at: https://assets.publishing.service.gov.uk/media/5a82de28e5274a2e87dc3615/E20_-_Control_of_Airborne_Noise_v1.5.pdf (Accessed 20 August 2024).

- Large and small auditoria; concert halls; sound recording and broadcast studios; and theatres;
- Places of meeting for religious worship;
- Courts; cinemas, and lecture theatres;
- Museums; libraries; and community halls;
- Hospitals and other healthcare settings;
- Schools; colleges and registered nurseries;
- Hotels; and
- Offices[127].

7.5.91 To support the identification and assessment of these receptors, a Q1 2024 version of the Ordnance Survey (OS) Address Base Plus dataset has been used to identify the location and use of such receptors. This dataset, and principally receptor names and use classifications, have not been fully verified by the Project Team unless a likely significant effect has been identified through the assessment methodology.

7.5.92 For certain non-residential noise sensitive receptor types, the Government has set out policies with reference to noise insulation. Paragraph 3.37 of APF states that:

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

7.5.93 In response to this policy, Heathrow's legacy CBNIS and its QNS CBS provides insulation for the following receptor types:

- Primary and secondary schools;
- Higher/ tertiary education colleges;
- Registered nurseries;
- Community halls;
- Libraries;
- Hospices; and
- Nursing homes.

7.5.94 The assessment has therefore considered a level of 63 dB $L_{Aeq,16hr}$ as an 'upper' assessment threshold. This is relevant for the above receptor types as where noise exposure increases above this threshold due to the Proposed Development, intervention in the form of acoustic

[127] Offices' also includes commercial / industrial uses where office space is likely to be present.

insulation may be required. Furthermore, changes in noise exposure above this threshold due to the Proposed Development may constitute a likely significant effect.

7.5.95 For commercial non-residential receptors, namely hotels and offices, the setting of an upper assessment threshold of 63 dB $L_{Aeq,16hr}$ is considered a conservative approach. For these receptor types, the impact and effect of the Proposed Development will be largely dependent on each receptor's acoustic design and use. For example, in the case hotels, acoustic design informed by historic conditions will likely be a determining factor. For this reason, the assessment of effects for hotels and offices is considered separately within **Appendix 7.5: Air Noise.**

7.5.96 Whilst the 'upper' assessment threshold of 63 dB $L_{Aeq,16hr}$ represents a level of noise exposure that for some noise-sensitive receptors, exposure is considered sufficiently high that noise insulation should be afforded, receptors may still be sensitive to changes in aircraft noise below this level. The assessment has therefore adopted a series of 'lower' assessment thresholds for certain receptor types.

7.5.97 The adopted 'lower' assessment thresholds are presented in **Table 7.23** and have regard for absolute levels of noise exposure as advised in recognised acoustic design guides such as BS8233[87], HTM-08-01[128], Building Bulletin 93[34], and BCO[129] accounting for typical ventilation and cooling strategies. These are considered to represent a level of exposure above which receptors are likely to begin to become sensitive to changes in aircraft noise.

7.5.98 The assessment has identified all non-residential NSRs that are forecast to experience a 'slight' beneficial or 'slight' adverse change in noise exposure due to the Proposed Development, where external ambient summer average aircraft noise exposure with the Proposed Development exceeds the 'lower' assessment thresholds set out in **Table 7.23** for the relevant receptor type. In addition, any receptors which are brought into or out of the 'upper' assessment threshold due to the Proposed Development have also been identified.

7.5.99 The assessment has focussed on changes in daytime noise exposure as it is during the day that the Proposed Development has the greatest impact on the distribution of aircraft noise around the Airport. However, the daytime and night-time 'lower' assessment thresholds from **Table 7.23** have both been applied in identifying receptors.

[128] Department of Health (2013) *Health Technical Memorandum 08-01: Acoustics*. [online] Available at: https://www.england.nhs.uk/wp-content/uploads/2021/05/HTM_08-01.pdf (Accessed 20 August 2024).

[129] British Council for Offices (2019) *Guide to specification - Best practice for offices*. London: British Council for Offices.

Table 7.23 Non-residential noise-sensitive receptor types, and absolute 'lower' assessment thresholds

Receptor Use	Assumed Ventilation and Cooling Strategy	Daytime (0700-2300)	Night-Time (2300-0700)
Large and small auditoria; concert halls; sound recording and broadcast studios; and theatres	Closed windows / mechanically ventilated and cooled	60dB L_{AFMax} or 50dB $L_{Aeq,16h}$	60dB L_{AFMax} or 50dB $L_{Aeq,\ 8h}$
Places of meeting for religious worship[130]	Closed windows	55dB $L_{Aeq,16h}$	N/A
Courts; cinemas and lecture theatres[131]	Closed windows / mechanically ventilated and cooled	60dB $L_{Aeq,16h}$	N/A
Museums; libraries; and community halls[132]	Naturally ventilated	55dB $L_{Aeq,16h}$	N/A
Hospitals and other healthcare settings[133]	Naturally ventilated	55dB $L_{Aeq,16h}$	50dB $L_{Aeq,8h}$
Schools; colleges; and registered nurseries[134]	Naturally ventilated	50dB $L_{Aeq,16h}$	N/A

7.5.100 In determining whether a likely significant effect (adverse or beneficial) occurs, two primary factors are considered. These are:

1. The absolute level of noise exposure for each receptor type relative to the 'lower' thresholds as set out in **Table 7.23** and the 'upper' threshold of 63 dB $L_{Aeq,16hr}$; and
2. The magnitude of change in noise exposure due to the Proposed Development.

7.5.101 With respect to the magnitude of change in noise exposure, **Table 7.19** sets out a semantic scale for the magnitude of change (adverse or beneficial). A likely significant effect (adverse

[130] Address Base Plus Classification Codes: CC06, CC06CN, CC06CY, CC07, ZW, ZW99CH, ZW99CP, ZW99MQ

[131] Address Base Plus Classification Codes: CL07

[132] Address Base Plus Classification Codes: CL04, CL03, CC04

[133] Address Base Plus Classification Codes: CM01, CM02, CM02HC, CM02HL, CM03HI, CM03HP, CM05, RI01

[134] Address Base Plus Classification Codes: CE02, CE03, CE03FS, CE03IS, CE03JS, CE03MS, CE03PS, CE04, CE04SS, CE06, CE07, CE01FE, CE04SS

or beneficial) is identified where a non-residential receptor is exposed to levels resulting exposure above the 'upper' threshold or is already exposed to levels above the threshold and is forecast to experience at least a 1 dB ('slight') change.

7.5.102 Where noise exposure is between the 'lower' and 'upper' assessment thresholds, a likely significant effect (adverse or beneficial) is identified where a non-residential receptor is forecast to experience at least a 3 dB ('moderate') change in noise exposure. Where this occurs, a likely significant effect is determined on a precautionary basis with further consideration then given to other noise assessment metrics, as appropriate to the receptor type and other relevant contextual factors. These are:

- **Existing or foreseeable mitigation** - Whether the receptor is eligible or has already benefited from Heathrow's CBNIS and is eligible for insulation under the QNS Community Building Scheme (CBS) or Easterly Alternation Noise Insulation Scheme;
- **The type of receptor** - Whether the receptor is considered to be less sensitive than implied by the screening thresholds based on intrinsic mitigation measures to the building envelope (sound insulation and ventilation / cooling strategy) informed by noise exposure at the time of construction (i.e. whether the projected noise exposure is materially different to the original design constraints[135]); and
- Whether an area is anticipated to experience elevated levels of ambient noise from non-aviation sources in the area (i.e. diluting the anticipated noise change), and whether the receptor is likely to generate noise itself.

Parks and Open Spaces – Noise and Amenity

7.5.103 There is no specific guidance regarding the impacts of noise on parks and open spaces, however several themes emerge across various standards and publications which indicate the levels of noise, and potential changes in noise, which may impact a person's perception and enjoyment of that space.

7.5.104 **Appendix 7.5: Air Noise** sets out the evidence base which has informed the stepped assessment methodology set out in **Table 7.24** which has been used to determine potentially significant effects on parks and open spaces.

Table 7.24 *Stepped Assessment Methodology for Parks and Open Spaces*

Step	Approach	Purpose
Screening	All parks and open spaces which may be routinely affected by aircraft noise from all modes of operation are identified using summer average 'with' and 'without' Proposed Development 5 N65 and 50 $dBL_{Aeq,16hr}$ contours.	Allows the assessment to screen in parks and open spaces where aircraft noise may already impact such spaces.

Step	Approach	Purpose
Impact of Proposed Development	This step identifies how the Proposed Development may impact the park and open space. This step considers the following: • What are the changes in noise exposure ($L_{Aeq,16hr}$) on average due to the Proposed Development? • Does the Proposed Development result in an increase in the number of aircraft events above 65 dB L_{ASmax} (N65)? • What changes in noise occur due to the Proposed Development during a busy easterly day? These impacts are considered using aircraft noise grids for each 0.005km^2 area of the park and open space. Where impacts are found to occur, the scale of the impact over the resource has been determined. Taking into account approaches used on other amenity assessments[136], the geographic scale of the impact has been determined as follows: • Limited – small part of the receptor area (less than 10%) • Localised – part of the receptor areas (more than 10% but up to 25%) • Intermediate – approximately half of the receptor area • Wide – more than half of the receptor area	This demonstrates the impact of the Proposed Development in terms of where aircraft noise event levels would be higher due to the Proposed Development, and whether the Proposed Development leads to an increase in noise.
Assessment	Taking into account the impacts set out above, the degree to which the impacts are either adverse, beneficial or mixed are considered over the space. Where overall summer average noise exposure is found to change by 3 - 5 dB this may be considered a likely significant effect with a change of greater than 5 dB considered a likely significant effects.	Identify whether changes in noise due to the Proposed Development could be considered significant.

[136] Records of insulated buildings from Heathrow's legacy schemes have consulted to support the assessment.

[136] Importantly, the acoustic design of non-residential receptors would routinely be progressed cognisant of noise constraints at the time of construction. For many receptor types there would have been overriding commercial or public protection drivers for the development of noise mitigation. For example, in the case of schools, acoustic design has been a requirement of under Building Regulations, since 2003.

[136] *The Sizewell C Project, Volume 4 Southern Park and Ride, Chapter 8 Amenity and Recreation* (2020). [online] Available at: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010012/EN010012-002014-SZC_Bk6_ES_V4_Ch8_Amenity_and_Recreation.pdf (Accessed 15 August 2024).

Step	Approach	Purpose
	Additional factors are then applied. These include existing ambient noise sources that may impact the park and garden, and the level of aircraft noise forecast to occur due to the Proposed Development. Where levels are above 60 dB $L_{Aeq,16hr}$ this has been considered indicative of a level of noise which is likely to result in dominant aircraft noise events where such spaces are located away from other ambient noise sources.	

Assumptions and Limitations

7.5.105 The air noise assessments are based on calculated forecast levels of air noise exposure and events at receptors in 2028. This relies on a series of informed operational assumptions as set out in **Appendix 7.5: Air Noise**. These assumptions include:

- Forecast fleet mix;
- Modal split;
- Adherence to and dispersion of aircraft on arrival and departure flight paths; and
- Allocation of aircraft departures by departure route.

7.5.106 The assessments have relied on datasets to inform the location and characteristics of various receptors.

7.5.107 For the assessment of parks and open spaces, noise from other ambient sources has not been considered.

Operational: Aircraft 'Ground' Noise

Modelling Methodology

7.5.108 Future levels of aircraft 'ground' noise exposure have been calculated using the LimA® (2023) environmental noise modelling software, as developed by Stapelfeldt implementing the ISO9613-2:1996 noise calculation methodology.

7.5.109 A model has been developed utilising the outputs of aircraft ground simulations modelled using CAST simulation software for scenarios with and without the Proposed Development for a 2028 busy day schedule and assessment year. These simulations have regard for factors such as:

- Location and naming convention of taxiways;
- Average taxi speeds / engine on-times per metre length of taxiway;
- Movements by aircraft type on the taxiways;
- Location of aircraft holding and hold points and time in hold;
- Stand locations and names; and

- Stand turnaround times.

7.5.110 The modelling has been informed by measurements of aircraft ground activity at Heathrow, and Ordnance Survey digital mapping datasets.

7.5.111 All calculations using the ISO9613-2:1996 methodology have assumed downwind propagation. Whilst this provides a reasonable worst-case approach to the calculation of aircraft ground noise it is likely to overstate calculated noise exposure levels at receptors. Over distances of 300 – 1500m (representing the typical distances of receptors closest to airfield noise sources) the differences between upwind and downwind noise levels can be as much as between 5 and 20 dB increasing with distance.

7.5.112 **Appendix 7.6: Ground Noise** describes in full the modelling methodology adopted for the assessment of effects and the inputs that have been relied on.

Noise Metrics

7.5.113 Aircraft ground noise modelling has been carried out for the standard $L_{Aeq,16hr}$ and $L_{Aeq,8hr}$ noise metrics as presented in **Table 7.14**. To provide further context and to support sensitivity testing, these metrics have been calculated for a busy easterly day i.e. with the airport operating in an easterly direction.

Assessment against Noise Policy and Likely Significant Effects

7.5.114 The assessment in relation to noise policy and likely significant effects been carried out in accordance with the same methodologies applied for aircraft 'air' noise. However, this assessment has been carried out at localised representative receptors, as described in **Section 7.6**, more likely to be impacted by changes in ground noise due to the Proposed Development, rather than across the population.

Assumptions and Limitations

7.5.115 The assumptions which underpin the aircraft 'ground' noise assessments are set out above and in **Appendix 7.6: Ground Noise**.

7.5.116 The predicted level of noise from aircraft 'ground' activities depends on the assumptions relating to the sound power and directivity for aircraft, the movements of aircraft around the airfield and the duration of aircraft at hold points and on stand. The assumptions made regarding aircraft 'ground' noise are based on reasonable worst-case assumptions in accordance with **Appendix 7.6: Ground Noise**.

7.5.117 Whilst the assumptions might be subject to some uncertainty, any uncertainty will apply equally to the without development and with development scenarios. Therefore, in relative noise change terms, which is the primary design consideration for the development of mitigation, there would be no impact upon assessment outcomes.

Operational: Combined Air and Ground Noise

7.5.118 **Appendix 7.7: Combined Air and Ground Noise** presents information with respect to combined levels of aircraft air and ground noise and how these may change due to the Proposed Development in 2028. This assessment is provided for informative purposes,

Operational: Aircraft Noise Induced Vibration

7.5.119 The Proposed Development will result in routine, scheduled aircraft departures from the northern runway during easterly operations. This will result in certain receptors in Longford becoming routinely exposed to noise from aircraft as they begin their departure. The commencement of an aircraft departure is referred to as the 'start of roll'. This is where the aircraft's engines are set to a departure setting to allow the aircraft to accelerate along the runway before taking off.

7.5.120 A key characteristic of the sound produced by an aircraft during 'start of roll' is low frequency noise (LFN). Noise generated behind aircraft from 'start of roll' activity contains most of its energy at frequencies below 200 Hz. At these frequencies, LFN can propagate over larger distances than other acoustic characteristics of aircraft noise such as during taxi, on approach or during flight. LFN can travel through structures and can, in some circumstances, lead to vibrations within buildings which can cause objects and windows to rattle or even present as a sense of vibration by occupants. These factors all have the potential to result in annoyance.

7.5.121 In Longford, exposure to LFN from aircraft may already occur from aircraft using reverse thrust during easterly arrivals onto the northern runway and/or westerly northern runway departures.

7.5.122 Heathrow has previously investigated such effects. Investigations and measurements were carried out by Heathrow Airport in a conservatory at the far end of Myrtle Avenue (located approximately 475m from the eastern end of the runway centreline and approximately 130m south of the runway centreline). The property was occupied with the conservatory to the rear of the dwelling. The conservatory was fitted with sealed unit glazing and had a raised floor. The location was selected as a proxy in the absence of being able to directly measure LFN from 09L departures in Longford.

7.5.123 During the survey, which was carried out over a period of two hours, significant LFN was audible during departures on runway 27L, and the conservatory structure was induced to vibrate so as to cause creaking of the structure. During the survey, the occupants reported that their dining table, in a room adjacent to and with open access to the conservatory, was on occasions felt to vibrate. No vibration was reported elsewhere in the property.

7.5.124 This investigation identified that LFN from aircraft start of roll from operations on Runway 27L had the potential to vibrate the conservatory in a manner that could result in 'adverse comment possible' from the homeowner/occupier if such events were to occur over a full 16-hour day[137]. The vibration measurements did not demonstrate any vibration approaching criteria for the onset of structural damage.

7.5.125 This evidence was presented and accepted by the Inspector at the 2014 Inquiry.

7.5.126 The centreline of the runway is a significant factor as LFN that causes vibration effects is directional and is mainly found to the rear of departing aircraft. Due to the location and

[137] Based on measured Vibration Dose Values (VDVb) as defined in BS 6472-1:2008 '*Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting'* which were found to be 0.43ms$^{-1.75}$ for the 2-hour measurement period.

proximity of properties within Longford to the 09L runway end and the configuration of the proposed RATs, most of these properties would be located behind the aircraft.

7.5.127 Other research is available which considered such effects. A comprehensive study carried out by the Partnership for AiR Transportation Noise and Emissions Reduction in 2007[138] found that start of roll, acceleration down the runway, and thrust reversal can generate high levels of LFN at critical distances from runways which can be annoying to people living around airports.

7.5.128 The 2007 AiR study recommends thresholds developed by Tokita & Nakamura as a means of determining subjective response to LFN. This research was carried out in the early 1980s and is based on a series of studies[139,140] seeking to understand how humans are affected differently to low frequency sounds than other sounds. This research led to 'thresholds' being identified for whether LFN could prompt a person to detect a sound, feel annoyance, feel displeasure, have an oppressive feeling, or feel a vibration. This research indicates that aircraft noise events of 80 dB L_{CSmax} are likely to result in an annoying/objectionable subjective response, with events above 90 dB L_{CSmax} resulting in an increasing likelihood of resulting in a feeling of vibration.

7.5.129 A Historic England report cites the AiR 2007 study and states that:

"A study commissioned by FAA/NASA/Transport Canada showed that windows "known to rattle" would almost always produce audible rattle with peak external aircraft noise levels of 97 dB LCmax. An earlier study produced similar results with vibration becoming perceptible in lightweight buildings at peak external aircraft noise levels of 80 to 90 dB. This effect is likely to exacerbate the impact of the aircraft noise on persons inside the building, as it is a "parallel effect" i.e. a simultaneously occurring effect linked to the noise event, likely to draw more attention to the aircraft noise and increase disturbance.

Whilst airborne low frequency noise can induce perceptible vibrations in light weight structures and loose fitting components of structures, the induced levels are typically substantially below levels at which even minor cosmetic damage to buildings and structures may occur. It is also worth considering that whilst high levels of low frequency noise may induce perceptible vibration and parallel effects in light weight structures; the resulting vibration levels are likely to be substantially below those caused by persons walking around the building, using stairs and opening and closing doors etc."

7.5.130 This supports the observations made by Heathrow as part of its own investigations.

7.5.131 The actual subjective response and whether noise induced vibration occurs is dependent on the insulation and construction properties of each building. The performance of a building

[138] Kathleen K. Hodgdon, Anthony A. Atchley, Robert J. Bernhard (2007). *Low Frequency Noise Study.* REPORT N0. PARTNER-COE-2007-001.

[139] Nakamura, S., Tokita, Y., (1981). *Frequency Characteristics of Subjective Responses to Low Frequency Sound.* International Conference on Noise Control Engineering, Nederlands Akoetisch Genootschap, Delft, The Netherlands, 735-738, 1981.

[140] Tokita, Y, Nakamura, S. (1981) *Frequency Weighting Characteristics for Evaluation of Low Frequency Sound*. International Conference on Noise Control Engineering Nederlands Akoetisch Genootschap, Delft, The Netherlands, 39-742, 1981

envelope and its insulation performance can only be determined on a case-by-case basis. This means that the research determined by Tokita & Nakamura which is based on outdoor measurements can only be considered indicative.

7.5.132 Based on the above, it is considered that receptors within 500m of aircraft start of roll from Runway 09L may experience routine noise induced vibration effects due to the Proposed Development. As such, receptors within 500m of the nominal start of roll location on Runway 09L will be identified as experiencing likely significant effects.

7.5.133 To provide further context, L_{CSmax} event modelling of Runway 09L departures has been carried out using the Federal Aviation Administration's Aviation Environmental Design Tool (AEDT) version 3.0e. This has been carried out in preference to using the CAA's ANCON software as this does not allow for the computation of C-weighted metrics.

7.5.134 This modelling has been carried out for the Airbus A380, Boeing 787, Boeing 777, Airbus A350 and Airbus A320 series aircraft. From this modelling, a consolidated area exposed to 80, 90 dB and 97 dB L_{CSmax} has been produced to provide context.

Assumptions and Limitations

7.5.135 This assessment has made the following assumptions:

- C-weighted noise levels from aircraft start of roll follows the standard conversion from A-weighted values as described in the AEDT Technical Manual; and
- The Longford Noise Barrier does not have any effectiveness in mitigation of LFN from start of roll.

Assumptions and Limitations: Climate Change

7.5.136 Climate change has the potential to result in increased temperatures during summer months and cooler temperatures during the winter.

7.5.137 Increased temperatures during the warmer months have the potential to result in NSRs increasingly relying upon openable windows for the control of overheating. The NSRs will consequently become slightly more sensitive to noise.

7.5.138 Overall, it is considered that the magnitudes of impact will remain unchanged under future climate conditions. Therefore, the effects identified for the Proposed Development are considered unchanged.

7.6 Scope of the Assessment

Introduction

7.6.1 The scope of this assessment has been established through a formal process, which resulted in a Scoping Opinion (**Appendix 1.6**) that was received from LBH on 1 February 2024. Further information can be found in **Chapter 5: Approach to EIA, Volume II** of the Environmental Statement.

7.6.2 This Section explains how the assessment responds to the terms of the Scoping Opinion.

Scoping Opinion

7.6.3 **Table 7.25** sets out the comments received and how they have been addressed in this Environmental Statement.

Table 7.25 Scoping opinion comments

Scoping Opinion comment	How is this addressed?
Noise impacts from the operations should be scoped into the ES.	Noise impacts from Heathrow's main operations have been scoped into the assessment and have formed part of this Environmental Statement. The only exception to this is aircraft engine running which would not change as a result of the Proposed Development and is already subject to mitigation.
To agree a baseline noise position (i.e. opening in 2028 without the development) prior to undertaking work on the ES.	Discussions around the use of the 2028 and its suitability as an assessment year have occurred within LBH during the pre-application process. **Chapter 5: Approach to EIA** discusses trends in noise output at Heathrow Airport with respect to aircraft fleet modernisation and future trends in aircraft noise performance.
To clarify the scope of noise assessment for each topic in a consistent tabular form with clarity of overlaps and interdependencies.	Clarification has been sought as to what was specifically requested, however the scope of the noise assessment was communicated to LBH during meetings on 14 March 2024 and 21 May 2024. The full scope and methodology of the noise assessment is presented in detail in **Section 7.6** and **Section 7.5** of this Chapter.
To clarify the scope of noise assessment and evidence base in relation to health.	The aircraft 'air' noise assessment has considered changes in annoyance, sleep disturbance, acute myocardial infarction, stroke and dementia across the population as a result of the Proposed Development. Where an Exposure Response Function (ERF) has been utilised, the evidence base has been referenced. This includes sensitivity tests using alternative ERFs. This is set out in detail in **Appendix 7.5: Air Noise** and in **Chapter 9: Public Health**.
To add N55 to the suite of noise metrics to be presented.	Noise event metrics, N65 metric for daytime (07:00-23:00hrs) and N60 metric for night-time (23:00-07:00hrs) have been included in the assessment. The N55 metric is not a standard aviation noise assessment metric in the UK and Heathrow has been advised by the CAA ERCD that it cannot be

Scoping Opinion comment	How is this addressed?
	generated. For these reasons, this metric has not been produced.
To work collaboratively to agree the correct approach to LOAEL and SOAEL along with the supporting evidence base.	The setting of LOAEL for aircraft noise is a decision which has been taken by the Department for Transport in the Air Navigation Guidance 2017 (ANG17). The setting of LOAEL at 51 dB $L_{Aeq,16hr}$ for daytime periods and 45 dB $L_{Aeq,8hr}$ for night-time periods, taken from the ANG17, is used conventionally on other airport development and airspace change projects. The setting of SOAEL for aviation noise in the Environmental Statement has followed precedent on other projects. This is discussed in Section 7.5. The approach to setting LOAEL and SOAEL was discussed with LBH at technical meetings on 14 August 2023 and 14 March 2024.
To work collaboratively to agree the correct approach to determine the onset of significant effects and how the mitigation measures are used to reduce or remove significant effects.	Presentations have been made to LBH on the proposed assessment of effects. A presentation on the noise mitigation package for the Proposed Development as described in **Section 7.7** have been presented to LBH and CISHA. The relevance of the noise mitigation measures with respect to noise policy and likely significant effects is discussed in Section 7.8.
The ES will consider the likely significant effects in accordance with the regulations however, planning policies will still require all adverse effects to be considered.	The scoped-in effects, as agreed in the Scoping Opinion, and as assessed in Section 7.8 have been described as either being likely significant effects or not. Noise assessments have been carried out in line with relevant policies, namely the APF and NPSE. Beneficial and adverse effects have been presented alongside those which are considered likely significant effects.
The approach to assessing construction noise is broadly accepted with further discussions welcomed with the LPA noise consultant to finalise specific methodologies.	The proposed mitigation includes the provision for a Construction Environmental Management Plan where noise management measures during construction can be agreed with LBH. This will incorporate Section 61 controls for construction activities where noise effects as identified in this Chapter are considered significant.

Scoping Opinion comment	How is this addressed?
Further considerations of quiet areas and areas of open space would be welcomed.	Changes in noise exposure over open spaces ahave been considered in full taking into account a relevant evidence base set out in Section 7 of **Appendix 7.5: Air Noise**. No designated quiet areas have been identified as part of the assessment (See **Table 7.26**)

Elements Scoped out

7.6.4 The elements shown in **Table 7.26** are not considered to give rise to likely significant effects as a result of the Proposed Scheme and have therefore not been considered within this assessment.

Table 7.26 Elements scoped out of the assessment

Element scoped out	Justification
Construction Vibration	Notably, ground-borne noise and vibration impacts, due to high energy construction activities such as piling works and vibratory compaction have been scoped out of the assessment. This is due to the distances been nearby sensitive receptors. During the noise barrier construction works, the worst-case activity is likely to be auger piling. Assuming to be equivalent to Continuous Flight Auger (CFA) piling as described by Hiller (2003)[141], Peak Particle Velocity (PPV) of less than 0.3mm^{-s} at distances of 20m and more may be expected. *BS 5228-2:2009 +A1:2014 Code of practice for noise and vibration control on construction and open sites: Part 2 – Vibration* (BS 5228-2)[86] advises that for a PPV of 0.3mm/s *"vibration might be just perceptible in residential environments"*. All adjacent residential receptors to the noise barrier construction works are at least 32m away from any potential piling works therefore the potential worst-case vibration levels will be below the threshold of 0.3 mm/s for human exposure and perception. Adherence to appropriate mitigation measures set out in the Construction Environmental Management Plan (CEMP) is required to ensure that the type of piling is appropriate for the proximity of the works to the nearest key vibration sensitive receptors.

[141] Hiller, D. M. (2003), '*A comparison of noise and vibration from percussive and bored piling*', Proc Underground Construction 2003, pp.213-224.

Element scoped out	Justification
	During the 09L airfield infrastructure works, construction activities are in excess of 300m from NSRs, therefore the likelihood of significant effects is negligible. During the 09R/27L "redundant pavement removal works", construction activities are in excess of 300m from the NSRs, therefore the likelihood of significant effects is negligible.
Construction Traffic Noise	The number of construction vehicles required to travel on the public roads as a result of the Proposed Development is very low. Most vehicles will travel relatively short distances between the site compound and relevant work site, many only once at the start of the shift and once at the end. During noise barrier construction works, concrete deliveries will be required for approximately two to four weeks with the number of movements determined by the volume of concrete required in a specific shift. Concrete deliveries will be staggered equating to approximately one to two deliveries per hour. Vehicle movements across the airfield during the 09L airfield infrastructure works have been included within the assessment as "*mobile plant using a regular well-defined route (e.g. haul roads)*" as defined in BS 5228-1. Most off-site vehicle movements during the 09L airfield infrastructure works will travel between the airfield security access and the concrete batching plant predominantly along A-roads where there are few NSRs and the noise environment is dominated by aircraft 'air' noise in the daytime and road traffic noise during the night-time. Vehicle movements associated with aggregates deliveries to the concrete batching plant will be limited to the daytime. However, as part of the 09L infrastructure works a quantity of materials will need to be disposed of off-site. Candidate off-site disposal locations have been identified but will not be selected until the construction contract has been awarded. All of the candidate sites would be accessed via the strategic road network (i.e. motorways), however, for the final part of the journey, some of the candidate sites may be routed via quieter roads in built up areas which could result in adverse noise effects, particularly from construction vehicle movements at night. As part of the design and selection process, a noise assessment will be conducted and where calculated noise impacts are appreciable, alternative approaches will be adopted, for example, temporarily stockpiling material at night-time for disposal during the daytime. The requirement for a review of the construction traffic routing and likely noise effects is captured in the Construction Environmental Management Plan (CEMP) which will be secured by a planning condition.

Element scoped out	Justification
Direct health effects - Hearing Loss	The evidence for environmental noise effects from sources such as aircraft indicates that there would be no risk of hearing loss due to the levels of noise exposure identified at receptors beyond the airport boundary.[142,143] Effects in respect of hearing loss have therefore been scoped out.
Surface Access Noise	The Proposed Development will not give rise to changes in landside vehicle access and movement (such as road and rail). Effects from landside road and rail sources have therefore been scoped out.
Quiet Areas	There are no formally designated Quiet Areas[144] within the study areas. Effects upon designated Quiet Areas have therefore been scoped out of the assessment. However, the effects of changes in aircraft air noise due to the Proposed Development on areas which may be used for recreational amenity such as parks and open spaces has been scoped in. These areas may not be designated Quiet Areas under the Environmental Noise (England) Regulations 2006 (as amended) however they may be used by visitors as a means of escape from a noisy area.

Elements scoped in

Construction Phase

7.6.5 **Construction noise** has been identified as having the potential to give rise to adverse effects on health and quality of life and likely significant effects during construction of the Proposed Development. Construction noise during the following periods and phases of construction works have been scoped-in:

- Night-time construction noise from noise barrier works along Wright Way;
- Daytime construction noise from noise barrier works around the Terminal 5 Pod Parking;
- Night-time construction noise from three phases (Phase 1 to 3) of the 09L airfield infrastructure works forecast to occur on weekdays only;
- Night-time construction noise from on-alternation 09L airfield infrastructure works;

[142] Sliwinska-Kowalska, M. & Zabrowski, K, (2017). *WHO Environmental Noise Guidelines for the European Region: A systematic review on environmental noise and permanent hearing loss and tinnitus*. International Journal of Environmental Research and Public Health, 14, 1139, 2017.

[143] Basner, M. et al. (2014). *Auditory and non-auditory effects of noise on health*. Lancet, 383, 1325-32, 2014.

[144] 'Quiet areas' comprise areas designated under Local Plans or Neighbourhood Development Plans as Local Green Spaces and areas identified as Quiet Areas through implementation of the Environmental Noise (England) Regulations 2006 (as amended)[12].

- Daytime construction noise from 09L airfield infrastructure works on weekdays (Phase 3 only); and
- Night-time construction noise from 09R/27L “redundant pavement removal works” forecast to occur on weekdays only.

Operation Phase

7.6.6 The following elements are considered to have the potential to give rise to likely adverse effects on health and quality of life and likely significant effects due to the operation of the Proposed Development and have therefore been scoped in:

- **Aircraft air noise** – changes in and redistribution of aircraft air noise during the landing and take-off cycle (LTO) due to changes in runway use during easterly operations at the Airport due to the Proposed Development;
- **Aircraft ground noise** – change in and redistribution of aircraft ground noise due changes in aircraft ground movements due to the introduction and use of new runway new hold points and runway access taxiways due to the Proposed Development; and
- **Noise Induced Vibration** – potential risk of noise induced vibration effects due to aircraft start of roll due to the introduction of scheduled 09L departures due to the Proposed Development.

Sensitive receptors

Construction Phase: Construction Noise

7.6.7 The construction noise assessment has predominantly focussed on noise-sensitive receptors within a study area focussing on Longford Village, as presented in **Figure 7.10** (**Volume IV**). In total, 12 representative receptors have been considered within Longford Village comprising a mix of residential and non-residential uses. These are summarised in **Table 7.27**. The receptors numbers match the equivalent receptor numbers used in the aircraft ground noise assessment.

Table 7.27 Noise Sensitive Receptors for Construction Noise Assessment

Receptor	Area	Primary Use	Notes
4	Longford	Residential	Representative of: Spelthorne Farm, Bath Road including Heathrow Special Needs Centre (Equestrian) 576 Bath Road
5	Longford	Residential	Representative of: 609 to 617 Bath Road
6	Longford	Residential	Representative of: The Kings Arms, 593 Bath Road 599 to 603 Bath Road

Receptor	Area	Primary Use	Notes
7	Longford	Offices (non-residential)	Representative of: Knightsbridge House, 581 Bath Road Highbridge House, 579A Bath Road Moorbridge House, 579 Bath Road Stonebridge House, 577A Bath Road Middlebridge House, 577 Bath Road
8	Longford	Residential	Representative of: Kings Court, 575 Bath Road Blacksmiths Court, 567 Bath Road 563 Bath Road
9	Longford	Residential	Representative of: 535 to 561 Bath Road
10	Longford	Residential	Representative of: 533 Bath Road
11	Longford	Residential	Representative of: 470 to 476 Bath Road
12	Longford	Nursery (non-residential)	Representative of: Littlebrook Nursery, 501 Bath Road
13	Longford	Residential	Representative of: 493 Bath Road Margaret Cassidy House, 485 Bath Road
14	Longford	Hotel (non-residential)	Representative of: Thistle London Heathrow Terminal 5 (west façade)
15	Longford	Hotel (non-residential)	Representative of: Thistle London Heathrow Terminal 5 (south façade)

7.6.8 Receptors 134 -143 (**Figure 7.12** in **Volume IV**) have been considered in respect of the 09R/27L "redundant pavement removal works". These are all residential receptors and are located closest to the 09R/27L works.

Operational Phase: Aircraft Air Noise

7.6.9 The aircraft air noise study area is shown in **Figure 7.4** (**Volume IV**). The study area is approximately 40 nautical miles west-east, and approximately 20 nautical miles north-south, and covers the following Local Authorities:

- London Boroughs of:
  - Barking and Dagenham, Barnet, Brent, Bromley, Camden, Croydon, Ealing, Enfield, Hackney, Hammersmith and Fulham, Haringey, Harrow, Hillingdon, Hounslow, Islington, Lambeth, Lewisham, Merton, Newham, Redbridge, Richmond upon Thames, Southwark, Sutton, Tower Hamlets, Waltham Forest, Wandsworth, and Westminster.

- The City of London
- Royal Boroughs of:
  - Greenwich, Kensington and Chelsea, Kingston upon Thames, and Windsor and Maidenhead.
- Borough councils of:
  - Bracknell Forest, Broxbourne, Dacorum, Elmbridge, Epsom and Ewell, Guildford, Hertsmere, Reading, Reigate and Banstead, Runnymede, Rushmoor, Slough, Spelthorne, Surrey Heath, Watford, Waverley, Welwyn Hatfield, Woking, and Wokingham.
- District councils of:
  - Epping Forest, Hart, Mole Valley, Sevenoaks, South Oxfordshire, Tandridge and Three Rivers .
- Buckinghamshire Council, St Albans City and District Council.

7.6.10 A range of noise sensitive receptors and noise sensitive receptor groups have been considered within the study area subject to relevant thresholds of assessment (e.g. LOAEL):

- Residential receptors i.e. communities and populations within the study area;
- Non-residential receptors including places of meeting for religious worship, courts, community halls, hospitals, nursing homes and hospices, hotels, schools including nurseries, colleges, libraries, and offices[145]; and
- Places of Amenity Recreation – Parks and Open Spaces.

7.6.11 In respect to residential receptors, a household and population dataset produced by CACI has been used to identify the approximate location and number of people within the study area. This dataset includes projections for the number of dwellings and people by post code for the assessment year of 2028, and is based on outputs of the 2021 Census. This information is presented by means of population density as shown in **Figure 7.11** (**Volume IV**).

7.6.12 In respect of non-residential noise sensitive receptors, the location and use of these receptors has been informed by the Ordnance Survey Address Base Plus dataset. This dataset has been used to characterise receptors in the groups presented in **Table 7.28** and identify their location.

7.6.13 In respect of parks and open spaces for the assessment of aircraft noise and amenity, the location of such spaces has been identified using the Ordnance Survey Open Greenspace

[145] After an initial screening assessment, the following types of non-residential receptor either do not exist within the study area or experience less than 1 dB noise change as a result of the Proposed Development and have therefore not been considered further: large and small auditoria, concert halls, sound recording and broadcast studios, theatres, cinemas, lecture theatres, and museums.

and Historic England 'Register of Parks and Gardens of Special Historic Interest in England' datasets.

Operational Phase: Aircraft Ground Noise

7.6.14 A total of 165 representative receptors have been considered within the aircraft ground noise study area. These receptors comprise a mix of residential and non-residential uses. These receptors are inclusive of the construction noise receptors summarised in **Table 7.27**.

7.6.15 To support the assessment, the receptors have been grouped into four quadrants around each of the Airport's runway ends. Each receptor and their use with respect to each quadrant and the aircraft ground noise study area is presented in **Figure 7.12** (**Volume IV**). The quadrants are described as:

- North-West Quadrant: around Runway 09L, including receptors in Poyle, Longford, Harmondsworth, North Longford and Sipson
- North-East Quadrant: around Runway 27R, including Harlington and Hounslow
- South-East Quadrant: around Runway 27L, including Hounslow and Feltham
- South-West Quadrant: around Runway 09R, including Stanwell and Stanwell Moor

7.6.16 All receptors considered are of residential use with the exception of those set out in **Table 7.28**.

Table 7.28 Non-Residential Noise Sensitive Receptors included in Aircraft Ground Noise Assessment

Receptor	Area	Primary Use	Notes
Northwest Quadrant			
1	Longford	Hotel	Sofitel
7	Longford	Offices	
12	Longford	School	Littlebrook Nursery
14	Longford	Hotel	Thistle Hotel
15	Longford	Hotel	Thistle Hotel
16	Harmondsworth	Offices	
17	Harmondsworth	Hotel	Immigration Detention Centre
18	Longford	Hotel	Premier Inn
19	Harmondsworth	Hotel	Sheraton
26	Harmondsworth	School	Harmondsworth Primary School
31	North Longford	Light industry/ commercial	Car Hire
36	North Longford	Offices	The Compass Centre
37	North Longford	Hotel	Hyatt Place
38	Sipson	Hotel	Staybridge Suites/Holiday Inn

Receptor	Area	Primary Use	Notes
Northeast Quadrant			
43	Harlington	Hotel	Ibis Styles
46	Harlington	Offices	Axis House
47	Harlington	Hotel	Renaissance
51	Harlington	Offices	
54	Harlington	Hotel	Radison Blu
56	Harlington	Offices	
59	Harlington	Hotel	Marriott and Sheraton
61	Harlington	Offices	
62	Harlington	Offices	
66	Harlington	Hotel	Best Western and Marriott
69	Harlington	Light industry/ commercial	Heathrow Engineering and car hire
70	Harlington	Hotel	Ibis
77	Harlington	Hotel	Premier Inn
78	Harlington	Hall	Riverside Venue
81	Hounslow	Hotel	Moxy
87	Hounslow	Office	Eastern Business Park Epsom Square
97	Hounslow	Place of meeting for religious worship	Church of the Good Shepherd
98	Hounslow	Offices	
Southeast Quadrant			
103	Feltham	Offices	
107	Feltham	Hotel	Hilton
108	Feltham	Offices	
109	Feltham	Hotel	Atrium Hotel
118	Feltham	Offices	
119	Feltham	Hotel	Premier Inn, Hilton, Holiday Inn
Southwest Quadrant			
128	Stanwell	Commercial	Animal services/quarantine
156	Stanwell Moor	Hall	Village Hall
164	Stanwell Moor	Commercial	Animal services/quarantine
165	Stanwell Moor	School	Green Corridor at Main Road Nurseries

Operational Phase: Air Noise Induced Vibration

7.6.17 Receptors located in the vicinity of Runway 09L in Longford Village have been considered in the assessment. These are primarily the same receptors considered as part of the construction noise assessment, as presented in **Figure 7.10** (**Volume IV**).

7.7 Environmental Measures

7.7.1 This Section provides an overview of the existing noise management measures in place at Heathrow Airport, and the embedded noise management measures proposed and forming part of the Proposed Development.

Existing Noise Management Measures

7.7.2 **Appendix 7.2: Noise Management and Mitigation at Heathrow Airport, Volume III** sets out the existing noise management and mitigation measures at Heathrow Airport. Heathrow's approach to its noise management framework is summarised in **Graphic 7.1** below and is influenced by the ICAO Balanced Approach to Aircraft Noise Management.

Graphic 7.1 Overview of Heathrow's Noise Management Framework

7.7.3 The existing measures set out in **Appendix 7.2: Noise Management and Mitigation at Heathrow Airport** have been introduced to manage and mitigate the impacts of aircraft noise. The introduction of these measures has been through a range of drivers and mechanisms, including:

- International and national legislation, regulation and policies;
- Heathrow Airport's status as a designated aerodrome for noise management purposes under the Civil Aviation Act 1982;
- Planning Conditions; and
- The noise action planning process under The Environmental Noise (England) Regulations 2006 (as amended).

7.7.4 These measures will not change due to the Proposed Development and include:

- Quieter Planes;
  - Differential Landing Charges.
- Quieter Procedures;
  - Departure Noise Limits;

- 1,000ft Rule and Minimum Climb Gradient;
- Noise Preferential Routes;
- Continuous Descent Approach; and
- Joining Point Rules.

- Operating Restrictions and Voluntary Measures;
  - Air Transport Movement cap of 480,000 movements per year;
  - Department for Transport Night Flying Restrictions limiting night-time movements and aircraft types;
  - Noise Contour Area Restriction;
  - Voluntary Curfew on Scheduling Cargo Departures Between 23:30 and 06:00hrs; and
  - Voluntary Curfew on Early Morning Arrivals.

7.7.5 Of relevance to the Proposed Development and the assessment of effects presented in **Section 7.8** are Heathrow's legacy and current sound insulation and home relocation assistance schemes.

7.7.6 Eligibility for Heathrow's residential insulation schemes has evolved since the early 1990's from being based on daytime noise exposure to incorporating specific aspects of night-time noise exposure. Between 2017 and 2022, Heathrow's Quieter Homes Scheme (QHS) was introduced which provided the full cost of noise insulation for properties exposed to 69 dB $L_{Aeq,16hr}$. The boundaries of Heathrow legacy residential noise insulation schemes are shown in **Figure 7.13** (**Volume IV**). The levels of uptake of these schemes have varied due to a number of factors, including the financial contribution offered.

7.7.7 In addition to its noise insulation schemes, Heathrow has followed Government policy by offering assistance with the costs of moving to households exposed to levels of 69 dB $L_{Aeq,16h}$ or more.

7.7.8 The following sections provide details of Heathrow's current noise insulation and relocation assistance schemes.

Quieter Neighbourhood Support (QNS) Sound Insulation Schemes

7.7.9 These schemes were introduced in June 2024 and build upon Heathrow's previous legacy sound insulation schemes.

7.7.10 Government policy requires airport operators to offer financial assistance towards the costs of insulation where residential dwellings and noise-sensitive buildings are exposed to levels of noise of 63 dB $L_{Aeq,16h}$ or more. Heathrow's QNS scheme goes beyond what Government policy requires with respect to both eligibility criteria and financial assistance.

7.7.11 The QNS Residential Insulation Scheme (RIS) provides 100% funding of the noise insulation costs for eligible properties subject to a maximum expenditure of £34,000 per dwelling.

7.7.12 Eligibility for the QNS RIS applies where a receptor is forecast to be exposed to aircraft air noise:

- above the daytime and night-time SOAEL i.e. the level above which significant adverse effects on health and quality of life are considered to occur (≥63 dB $L_{Aeq,16hr}$ and ≥55 dB $L_{Aeq,8hr}$ respectively);
- 90 dBA SEL for the noisiest scheduled aircraft arriving before 6:00am (Airbus A380-800); and
- The footprint of calculated probability of more than 1 additional aircraft noise awakening night based on aircraft operating between 04:30 and 06:00hrs

7.7.13 Notably, the eligibility boundary for the QNS is not fixed at the outset (unlike Heathrow's legacy schemes) but will remain dynamic to reflect the changes in noise exposure over time. Changes to the QNS boundary due to the Proposed Development is assumed as an embedded environmental measure and therefore is described later.

7.7.14 Irrespective of the Proposed Development, Heathrow envisages that the scheme boundary will be reviewed at approximately five-year intervals or in response to new requirements such as changes to Government policy.

7.7.15 The current boundary of the QNS is shown in **Figure 7.14** (**Volume IV**) and is based on a forecast noise exposure in 2026, the midpoint of Heathrow's latest Noise Action Plan which covers the period 2024 to 2028. The levels of uptake to this scheme are expected to be high due to the generosity of the offer (full contribution up to a maximum of £34,000 per dwelling).

7.7.16 The QNS RIS will be delivered through a phased roll-out. The delivery programme is being carefully phased with learning taken to ensure that Heathrow delivers a better experience of the scheme to those that take it up.

7.7.17 The roll out of the QNS RIS is prioritised with residential dwellings and community building in the highest noise areas the first to be notified of their eligibility under the scheme. So far this has included pilot zones for homes in Longford and to the north of Stanwell Moor. The learning that Heathrow obtains from the pilot will help improve the experience of the scheme ahead of a wider launch and roll out.

7.7.18 The prioritisation of areas and those who benefit from the roll out of the QNS is being decided by an independent Prioritisation Panel. The Prioritisation Panel includes representatives from stakeholder organisations, including:

- The Council for the Independent Scrutiny of Heathrow Airport (CISHA);
- HACAN – the Heathrow Association for the Control of Aircraft Noise;
- Heathrow Strategic Planning Group (HSPG); and
- Heathrow Airline Operators Committee (AOC).

Home Relocation Assistance Scheme (HRAS)

7.7.19 Heathrow's Home Relocation Assistance Scheme (HRAS) is available for properties that fall within Heathrow's 2019 69 dB $L_{Aeq\ 16hr}$ noise contour, and residents who have been living in the property before 31 December 2022. This scheme provides eligible homeowners with financial assistance with the costs of moving away from areas of high levels of airport noise. The scheme is currently capped at £20,000 per home. **Figure 7.15** (**Volume IV**) presents the eligibility boundary for this scheme.

Embedded Noise Management Measures

7.7.20 The design of the Proposed Development is described in detail in **Chapter 3: Description of the Proposed Development**. This Section describes the noise management measures that have been embedded to mitigate and minimise noise and vibration effects arising from the construction and operation of the Proposed Development.

Construction Phase

7.7.21 Environmental measures that have been developed in respect of construction noise and vibration are set out in **Table 7.29**.

Table 7.29 Embedded noise and vibration environmental measures for the construction phase

Environmental measure	Additional Reference
Longford Noise Barrier A 5m to 7m high noise barrier is proposed. This barrier will run to the south of Longford Village running along Wright Way before extending around the boundary of the Heathrow Terminal 5 Pod Car Park. The noise barrier location is shown in **Figure 7.3** (**Volume IV**). The barrier is designed to mitigate aircraft 'ground' noise at NSRs in Longford. It is proposed that the barrier be constructed in advance of any construction activities on the airfield. This will provide acoustic screening and mitigation with respect to construction noise during the '09L infrastructure' construction works. The noise barrier design has been refined in coordination with other disciplines (landscape and visual, ecology and flood risk) to reduce the potential for other environmental effects occurring as a result of its construction.	
Construction Environmental Management Plan (CEMP) Significant construction noise effects on health and quality of life as well as in EIA terms will be managed and minimised through a CEMP and through the submission of Section 61 application(s) to secure the noise mitigation and management approach during the construction phase. Where identified through the CEMP/Section 61 process, construction noise monitoring will be carried out to ensure that impacts are managed and minimised as far as	**Construction Environmental Management Plan** **Appendix 7.4: Construction Noise and Vibration**

Environmental measure	Additional Reference
practicable by enabling the prompt response to any exceedances of noise limits and the adjustment of working methods accordingly. The requirement for a CEMP will be secured by a planning condition, to ensure that best practicable means (BPM) mitigation measures are employed.	
Section 61 applications under the Control of Pollution Act 1974 Higher impact construction activities will be controlled through a Section 61 application process. This approach allows for some flexibility in construction noise management and would allow London Borough of Hillingdon LBH to scrutinise the proposed construction methodology and mitigation approach to ensure noise is being kept as low as practically possible during higher impact activities. Importantly, it is common for this process to lead to construction noise being further reduced.	**Appendix 7.4: Construction Noise and Vibration**
Night-time off-site disposal assessment and mitigation In respect of the off-site disposal of construction waste at night, several candidate locations have been identified, with potential impacts only anticipated near the disposal site once away from the strategic road network. The final site will be selected once a contractor is appointed. The CEMP includes the requirement for a review of the construction traffic route and an assessment of the construction traffic noise effects. Where noise impacts are significant, alternative approaches will be adopted, such as temporary stockpiling of materials at night for subsequent disposal during the day.	**Appendix 7.4: Construction Noise and Vibration**

7.7.22 As those properties within Longford most affected by construction noise already fall within the QNS scheme, it is not necessary to offer sound insulation measures in respect of construction noise. Importantly, Longford has already been identified by the “prioritisation panel” as the one of the first areas to benefit from the new scheme, therefore mitigation would be in place before commencement of the construction works.

7.7.23 Temporary rehousing is not proposed as a construction noise management measure due to the short-term nature of the proposed construction works and the fact that mitigation is already available.

Operational Noise and Vibration

7.7.24 Environmental measures that have been developed in respect of operational noise and vibration are set out in **Table 7.30.**

Table 7.30 Embedded noise and vibration environmental measures for the operational phase

Environmental measure	Additional Reference
Longford Noise Barrier	**Chapter 3: Description of the Proposed Development**

Environmental measure	Additional Reference
Designed to mitigate aircraft 'ground' noise at NSRs in Longford. The 'Longford Noise Barrier' will be constructed in advance of any construction activities on the airfield in respect of '09L infrastructure' construction works to provide inherent noise screening benefits to NSRs during that construction phase. The noise barrier design has been refined in coordination with other disciplines (landscape and visual, ecology and flood risk) to minimise aircraft 'ground' noise impacts as far as is practical and sustainable. The noise barrier location is shown in **Figure 7.3** (**Volume IV**).	**Appendix 7.4: Construction Noise and Vibration** **Appendix 7.6: Ground Noise**
Predictable Respite through Easterly Runway Alternation The overriding design intent of the Proposed Development is to distribute noise more fairly around the Airport and extend the benefits of runway alternation to communities under the flight paths during periods of easterly winds. Upon completion of the Proposed Development, easterly alternation would be adopted in the same manner as westerly alternation is currently provided (i.e. easterly runways (either runway 09L (northern runway) or runway 09R (southern runway) are designated as the arrival runway and used for the majority of landings from 06:00 to 15:00hrs local time; and the other from 15:00hrs local time until after the last departure for the day's schedule). The benefits of runway alternation would be to provide affected communities with a predictable break from or reduction in aircraft noise (respite). **Figure 7.22** (**Volume IV**) illustrates the locations that would experience predicable respite due to the Proposed Development. Notably the Prosed Development proposes no changes to night-time runway alternation (this being from the time after the last departure until 06:00hrs).	**Chapter 3: Description of the Proposed Development** **Appendix 7.5: Air Noise** **Appendix 7.6: Ground Noise**
Revision to the QNS Eligibility Boundary The existing eligibility boundary for Heathrow's QNS is based on a 2026 noise forecast without easterly alternation in place. The Proposed Development has the potential to change the locations and relevant receptors as a result of them being exposed to summer average daytime and night-time noise levels of 63 dB $L_{Aeq,16hr}$ and 55 dB $L_{Aeq,8hr}$ in 2028. In line with the QNS, where the Proposed Development results in locations becoming exposed to levels of 63 dB $L_{Aeq,16hr}$ and 55 dB $L_{Aeq,8hr}$ in 2028 that are not already captured by the existing QNS eligibility boundary, the boundary of the QNS will be updated to reflect the impact of the Proposed Development. Although the QNS eligibility boundary is also informed by the location of a one additional awakening contour for operations between 04:30 and 06:00 and the	**Appendix 7.5: Air Noise**

Environmental measure	Additional Reference
extent of the 90 dB SEL contour for an A380 arrival, these elements of the QNS eligibility boundary will not change due to the Proposed Development. Where this occurs, residential dwellings will be eligible for the same benefits as those in the existing QNS boundary, i.e.100% funding of noise insulation costs subject to a maximum expenditure of £34,000 per dwelling.	

Additional Noise Mitigation Measures

7.7.25 Through the EIA process, adverse likely significant effects were initially identified for specific receptors having regard to the absolute levels of noise exposure, and the magnitude of change in noise exposure, due to the Proposed Development.

7.7.26 Heathrow has therefore prepared a package of additional noise mitigation measures as set out in **Table 7.31**.This package of mitigation covers specific residential receptors, schools and colleges, and parks and gardens.

Table 7.31 Additional Noise Mitigation Measures for the Operational Phase

Measures
Easterly Alternation Noise Mitigation Package – Residential Dwelling Insulation Heathrow has prepared a package of mitigation for residential dwellings which are forecast to experience significant increases in air noise of 3 dB $L_{Aeq,16hr}$ or more leaving them exposed to at least 54 dB $L_{Aeq,16hr}$ due to Easterly Alternation. This mitigation package is designed to provide financial assistance towards the costs of noise insulation for households that do not already qualify for insulation measures under the QNS. This scheme is based on the emerging policy as set out in Aviation 2050. The amount of financial assistance to be provided will be tiered dependent on the forecast level of aircraft air noise exposure due to the Proposed Development, as indicated below.

Air Noise Exposure due to the Proposed Development	Offer of financial assistance towards noise insulation
54 – 60 dB $L_{Aeq,16h}$ and a ≥ 3 dB increase	Fixed Contribution of £3,000
60 – 63 dB $L_{Aeq,16h}$ and a ≥ 3 dB increase	Contribution of up to £12,000 to be determined following an independent survey and assessment

Easterly Alternation Noise Mitigation Package – Schools Insulation

Heathrow will offer a package of bespoke insulation and ventilation to:

(a) **those schools that are forecast to become eligible for noise insulation under the QNS** as a result of **the Proposed Development, namely Littlebrook Nursery and Khosla House; and**

(b) those **school**s that are **forecast to experience significant increases in air noise of 3 dB $L_{Aeq,16hr}$ or more** leaving them **exposed to at least 54 dB $L_{Aeq,16hr}$** as a result of **the Proposed Development**, namely Cranford Community College and Cedars Primary School**.**

Measures
Works provided under this package of mitigation will be capped at a total value of £2.5m per school with the actual amount offered to be determined following independent survey and assessment.
Easterly Alternation Noise Mitigation Package – Noise Induced Vibration In addition to any eligibility under the QNS, Heathrow will offer additional funding of up to £10,000 to households within 500m of aircraft start of roll at Runway 09L. This additional funding is to provide households with assistance towards the costs of mitigating the effects of noise induced vibration and will be most effective for dwellings with lightweight structures attached to their main residence. Additional measures that may be available through this funding include strengthening of reinforcing structural elements such as raised floors.
Easterly Alternation Noise Mitigation Package – Parks and Gardens Heathrow will make a financial contribution of up to £250,000 in total towards the enhancement of those parks and gardens which are forecast to experience an adverse likely significant effect on a 'wide' scale as a result of the Proposed Development, namely Berkeley Meadows, Avenue Park and Cranford Park. The enhancement measures for which the financial contribution will be used will be discussed and agreed with the relevant authorities. Furthermore, Heathrow will proactivity engage with authorities to ensure that the runway alternation schedule is available and accessible so that potential visitors are aware of when these areas would be overflown during both easterly and westerly operations. This will be primarily achieved online through Heathrow's website.
Extension to Home Relocation Assistance Scheme Where the Proposed Development results in a residential dwelling being exposed to a summer average daytime noise exposure level of 69 dB $L_{Aeq,16hr}$ but outside of the HRAS eligibility boundary (which is based on a 2019 69 dB $L_{Aeq,16hr}$ contour) eligibility to HRAS will be extended.

7.8 Assessment of Potential Effects

Construction Phase: Construction Noise – Noise Barrier Construction Works – Wright Way (Night-time)

7.8.1 Construction works will be carried out during the night-time and will move progressively from the western end of the Wright Way noise barrier section to the eastern end three times across the whole construction of this section. This will include one 'pass' for each of the three construction activities:

- Activity 1: Removal of old barrier structures and site clearance;
- Activity 2: 'Noise barrier' foundations and installation of steelwork; and
- Activity 3: Installation of noise barrier panels.

7.8.2 Sections approximately 30 m in length will be worked on each night. As a result, noise levels during the construction of the noise barrier will vary from night-to-night at each receptor. Construction works will be carried out on weekday nights only.

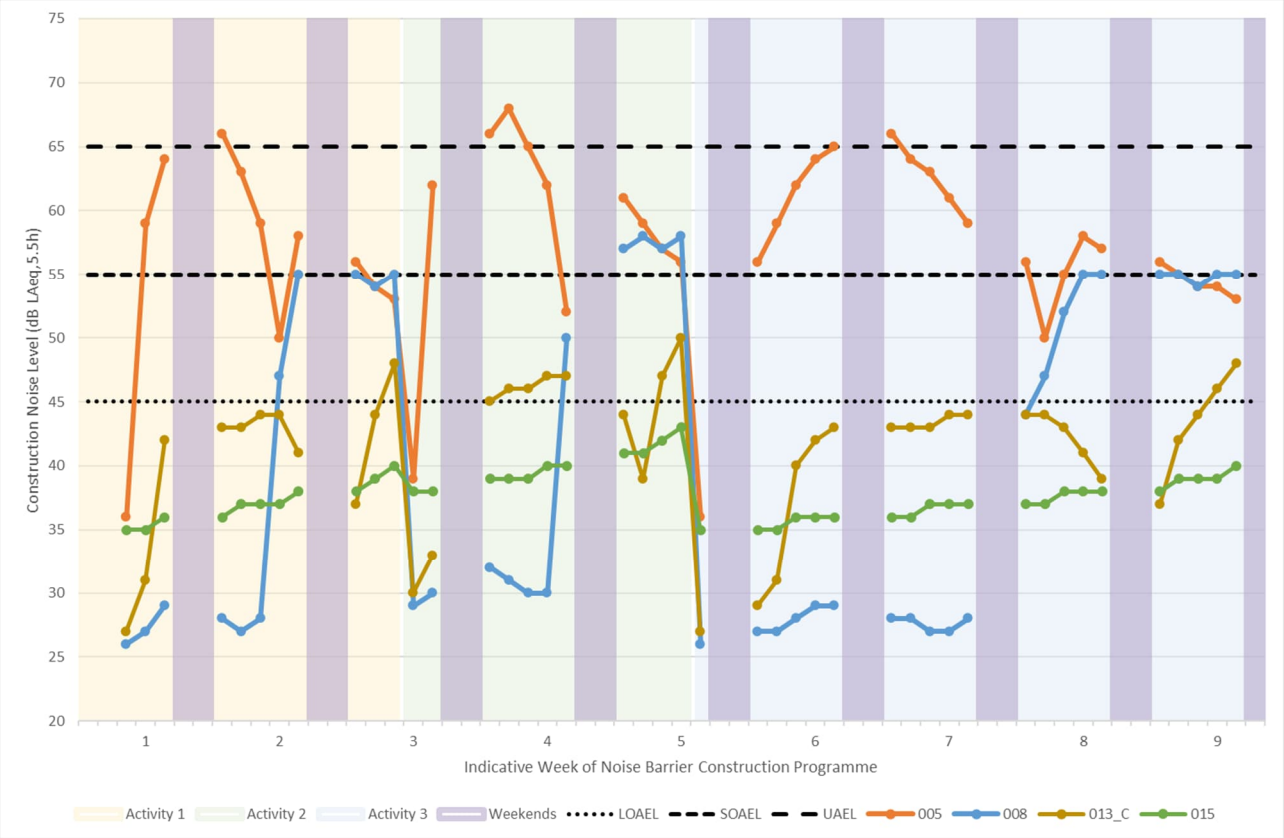
7.8.3 **Table 7.32** presents the predicted construction noise levels at the façade of each receptor. The table presents the range and logarithmic average of the calculated construction noise levels for each activity. as well as the average construction noise level across all periods. Finally, the number of nights that the construction activities are expected to exceed the SOAEL/LSE threshold is also shown.

Table 7.32 Calculated night-time construction noise levels for Wright Way noise barrier construction works

Receptor (See Figure 7.10)	Type	Façade Noise Levels (dB, $L_{Aeq,5.5h}$)							Number of Nights Construction Noise Exceeds LSE Threshold
		Activity 1		Activity 2		Activity 3		Whole Period	
		Average	Range	Average	Range	Average	Range	Average	
4	Residential	57	30 – 61	59	33 – 64	57	30 – 61	58	19
5	Residential	60	36 – 66	63	39 – 68	60	36 – 66	61	30
6	Residential	54	32 – 60	57	35 – 63	54	32 – 60	55	14
7	Offices	57	23 – 60	60	26 – 63	57	23 – 60	58	25
8	Residential	51	26 – 55	53	29 – 58	51	26 – 55	51	4
9	Residential	47	24 – 52	50	27 – 55	47	24 – 52	48	0
10	Residential	47	25 – 51	50	27 – 54	47	25 – 51	48	0
11	Residential	43	24 – 46	46	27 – 49	43	24 – 46	44	0
12	Littlebrook Nursery	42	26 – 47	45	29 – 48	42	26 – 47	43	0
13_A	Residential	42	26 – 48	45	29 – 50	42	26 – 48	43	0
13_B	Residential	42	26 – 48	45	29 – 50	42	26 – 48	43	0
13_C	Residential	43	27 – 48	46	30 – 50	43	27 – 48	44	0
14	Hotel	39	32 – 45	42	35 – 48	39	32 – 45	40	0
15	Hotel	37	35 – 40	40	38 – 43	37	35 – 40	38	0

7.8.4 **Graphic 7.2** presents the results provided in **Table 7.32** over each week of the indicative construction programme as a graph for receptors 5, 8, 13_C and 15 with each point in **Graphic 7.2** representing calculated construction noise for a single night.

Graphic 7.2 Wright Way Night-time Noise Barrier Works



7.8.5 With reference to **Graphic 7.2** and **Table 7.32**, it is concluded that the noise barrier construction works along Wright Way are forecast to:

- Rarely exceed UAEL at Receptor 5 (four nights);
- Regularly exceed SOAEL at Receptors 5 and 7 (with some 15-day periods where this occurs 10 or more times); and
- Regularly exceed SOAEL at Receptors 4, 6, and 8 (but for less than 10 or more days of working in any 15 consecutive days).

7.8.6 With reference to **Table 7.13**, which identifies that the likely significant effect thresholds are equal to SOAEL, likely significant effects are also identified at Receptors 4, 5, 6, 7 and 8.

7.8.7 Receptor 7 is a non-residential receptor group (offices) which is not expected to be occupied during the night-time. Therefore, a significant adverse effect and likely significant effects are not considered to occur at this receptor.

7.8.8 The duration of the Wright Way noise barrier construction phase is approximately 9 weeks incorporating approximately 43 weekday nights of construction activity. Noise exposure at many receptors throughout the Wright Way noise barrier construction phase is variable and intermittent as works move from one end of the noise barrier to the other for each activity.

Likely significant effects will tend to occur over relatively short durations during each of the three activities. Based on the assumptions used in the construction noise assessment, likely significant effects for Activities 1 and 2 tend not to occur for more than five consecutive working nights and are likely to be typically broken up by non-working weekend periods. As it may take longer to install the new panels, each section of Activity 3 has been assumed to last for 1.5 working nights. Therefore, the likely significant effects could last for up to 11 consecutive working nights (broken up by non-working weekends) at Receptors 4 and 5.

7.8.9 With reference to **Graphic 7.2**, Receptor 5 (a residential receptor group on Bath Road, Longford) is most affected over the first few nights of each activity, whilst Receptor 8 (also a residential receptor group on Bath Road) is most affected over the later few nights of each activity. Receptors 5 and 8 are located closest to the western and eastern end of the construction works respectively.

7.8.10 The construction noise calculations for Receptors 13 and 15, located furthest from the Wright Way noise barrier construction works, increase over the course of each activity as the works move progressively closer to the receptor, based on the order of the works assumed in this assessment. For all activities construction noise is calculated to be below SOAEL.

7.8.11 Likely significant effects are calculated at Receptor 5 for around 30 working nights of the Wright Way construction works programme. This receptor group is closest to the noise barrier construction works during night-time activity and is the worst-affected residential receptor group during this phase.

7.8.12 There is some precedent to allow much higher noise levels over the short term for the construction of mitigation that facilitates protection with respect to longer term works and wider environmental benefit. For example, guidance on minerals extraction allows for temporary higher noise levels at noise sensitive receptors where works are required to provide permitter screening through baffle mounds[146]. The likely significant effects during the Wright Way noise barrier construction allow for mitigation to be provided for the circa 80-week construction programme for the 09L airfield infrastructure construction works. If the noise barrier was not in place, then the effects from the 09L airfield infrastructure works may be significant over a longer duration.

7.8.13 Additionally, many of the receptors adjacent to the proposed construction works may have already benefited from Heathrow's legacy sound insulation schemes and would be eligible for insulation under the QNS. For some of those properties that have not previously taken advantage of the legacy schemes, opportunities remain for them to benefit from the 2024 QNS RIS scheme in advance of the construction works taking place. Where this occurs, the significant effects on health and quality of life can be avoided.

7.8.14 In summary, the Wright Way night-time construction works present likely significant effects at residential Receptors 4, 5, 6 and 8 (circa 24 residential properties). Construction works associated with the Wright Way noise barrier will be managed and mitigated through the

[146] Ministry of Housing, Communities and Local Government, Ministry of Housing, Communities and Local Government (2018 to 2021) and Department for Levelling Up, Housing and Communities. (2014). Minerals. Available at: https://www.gov.uk/guidance/minerals (Accessed 27 September 2024).

CEMP and Section 61 process which will identify and secure any further controls and the BPM approach to be implemented. The duration of residual significant effects is expected to be very limited, and all significantly affected properties have either already benefitted from legacy sound insulation schemes or will be eligible under the new QNS schemes. Notably, Longford has already been identified by the “prioritisation panel” as the one of the first areas to benefit from the new scheme, therefore mitigation would be in place before commencement of the construction works.

Construction Phase: Construction Noise – Noise Barrier Construction Works – Pod Parking (Daytime)

7.8.15 Construction activities will be undertaken during the daytime and move progressively commencing from the western end of the Terminal 5 Pod Parking noise barrier section to the eastern end three times across the whole Terminal 5 Pod Parking construction phase. This will involve the same three activities associated with the Wright Way barrier construction albeit these activities will occur during daytime periods. As a result, noise levels will vary from day-to-day at each receptor.

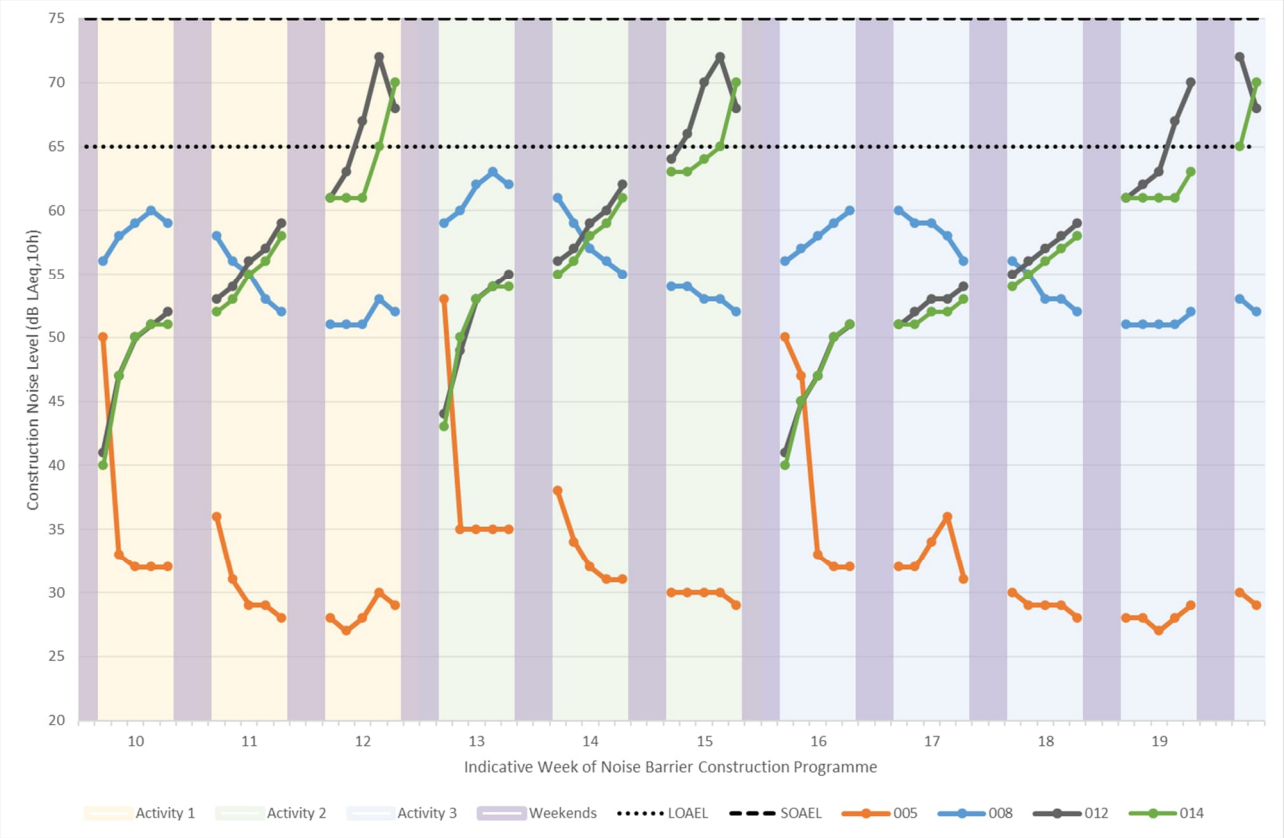
7.8.16 **Table 7.33** presents the predicted construction noise levels at the façade of each receptor. The table presents the range and logarithmic average of the calculated construction noise levels for each activity. as well as the average construction noise level across all periods. Finally, the number of nights that the construction activities are expected to exceed the SOAEL/LSE threshold is also shown.

Table 7.33 Calculated daytime construction noise levels for Terminal 5 Pod Parking noise barrier construction works

Receptor (See Figure 7.10)	Type	Façade Noise Levels (dB, $L_{Aeq,10h}$)							Number of Days Construction Noise Exceeds LSE Threshold
		Activity 1		Activity 2		Activity 3		Whole Period	
		Average	Range	Average	Range	Average	Range	Average	
4	Residential	27	20 – 32	29	23 – 35	27	20 – 32	28	0
5	Residential	39	27 – 50	42	29 – 53	39	27 – 50	40	0
6	Residential	42	23 – 50	45	25 – 53	42	23 – 50	44	0
7	Offices	55	48 – 60	58	51 – 63	55	48 – 60	57	0
8	Residential	56	51 – 60	59	52 – 63	56	51 – 60	57	0
9	Residential	56	52 – 59	58	54 – 62	56	52 – 59	57	0
10	Residential	58	47 – 61	61	50 – 64	58	47 – 61	59	0
11	Residential	56	39 – 61	58	39 – 64	56	39 – 61	57	0
12	Littlebrook Nursery	63	41 – 72	65	44 – 72	63	41 – 72	64	0
13_C	Residential	59	45 – 66	60	48 – 66	59	45 – 66	59	0
14	Residential	61	40 – 70	62	43 – 70	61	40 – 70	61	0
15	Residential	43	27 – 51	46	29 – 53	43	27 – 51	45	0

7.8.17 **Graphic 7.3** presents the results provided in **Table 7.33** over each week of the indicative construction programme as a graph receptors 5, 8, 12 and 14, with each point in **Graphic 7.3** representing noise exposure for a single day.

Graphic 7.3 Terminal 5 Pod Parking daytime noise barrier construction works



7.8.18 With reference to **Graphic 7.3** and **Table 7.33**, the noise barrier construction works around the Terminal 5 Pod Parking are forecast to:

- Avoid exceeding SOAEL at any receptor; and
- Rarely exceed LOAEL at receptors 12 (11 days), 13 (six days) and 14 (six days)

7.8.19 With reference to **Table 7.13**, which identifies that the likely significant effect thresholds are equal to SOAEL, likely significant effects are not identified at any of the receptors during this phase. This outcome is expected as baseline daytime noise levels are elevated compared to the night-time, therefore, the corresponding adverse effect and likely significant effect thresholds are higher than during the night-time.

7.8.20 The duration of the noise barrier construction around the Terminal 5 Pod Parking is expected to take approximately 10 weeks comprising weekday working. Noise exposure at many receptors throughout the Terminal 5 Pod Parking noise barrier construction phase is variable and intermittent as works move from one end of the noise barrier to the other for each activity.

7.8.21 With reference to **Graphic 7.3**, it can be seen that Receptor 12 (Littlebrook Nursery) and Receptor 14 are most affected over the last few days of each activity, whilst Receptor 8 is

most affected over the first few days of each activity. Receptors 12 and 14, and Receptor 8 are located closest to the eastern and western end of the works respectively.

7.8.22 The construction noise calculations for Receptor 5, located furthest away from the noise barrier construction works decrease over the course of each activity as the works move progressively further away from this receptor based on the order of the works assumed in this assessment. For all activities construction noise levels are below LOAEL.

7.8.23 Construction noise levels at Receptor 12 (Littlebrook Nursery) are calculated to exceed LOAEL for up to four days at a time towards the end of each activity and with at least two weeks between each peak in these activity noise levels. These peak periods will occur when the barrier sections immediately adjacent to the Littlebrook Nursey are being constructed. Construction noise levels do not exceed SOAEL or result in likely significant effects during the Terminal 5 Pod Parking noise barrier works at this receptor. Littlebrook Nursery has been identified as a receptor which has not previously been insulated by Heathrow under its legacy community building noise insulation scheme (CBNIS) but it has been identified as being eligible for insulation under the QNS community buildings scheme (CBS). In absolute terms, the construction noise levels are typically equal to or lower than the baseline noise levels with one day during each of the three activities exceeding the baseline noise level by up to 2 dB. A significant adverse effect or likely significant effect is therefore not identified for this receptor.

7.8.24 Construction noise levels at Receptor 13 (493 Bath Road, and Margaret Cassidy House, 485 Bath Road) and Receptor 14 (Thistle London Heathrow Terminal 5 hotel, west façade) would only exceed LOAEL on two days during each of the three activities. The predicted construction noise levels are, in absolute terms, no greater than the baseline noise levels. A significant adverse effect or likely significant effect is not identified for these receptors.

7.8.25 In summary, the noise barrier construction works at the Terminal 5 Pod Parking are daytime works and are not forecast to result in any significant adverse effects on health and quality of life as SOAEL is not exceeded. Additionally, no likely significant effects have been identified for any receptor.

Construction Phase: Construction Noise – 09L Airfield Infrastructure Works, Phases 1 - 3 and 'On-Alternation' (Night-time)

7.8.26 The indicative construction programme assumes that Phases 1 to 3, and the 'on-alternation' aspects of the 09L airfield infrastructure works will be carried out during night-time periods. In the case of Phases 1 to 3, these works will be carried out during weekdays with the 'on-alternation' works carried out at weekends. It should be noted that some Phase 3 works will be carried out during the daytime. These are assessed in the following section.

7.8.27 For the 09L airfield infrastructure construction works, the activities will move around defined working areas over the duration of the relevant phase (see **Figure 7.10** in **Volume IV**). The assessment is therefore based on the calculated average construction noise level across the area associated with each phase and construction activities on a weekly basis. Noise levels will vary over each phase period due to some activities within each phase generating higher noise levels than other.

7.8.28 Construction of the noise barrier before the 09L airfield infrastructure works provides beneficial acoustic screening to most receptors in Longford Village during the new airfield infrastructure works.

7.8.29 **Table 7.34** presents the calculated construction noise levels at the façade of each receptor. **Table 7.34** presents the logarithmic average of noise levels across each phase, in addition to the range of calculated construction noise levels which represents exposure across each phase period. An average noise exposure across the whole circa 80-week construction period is also provided along with the number of weeks and weekends where the construction noise level exceeds the SOAEL/LSE threshold.

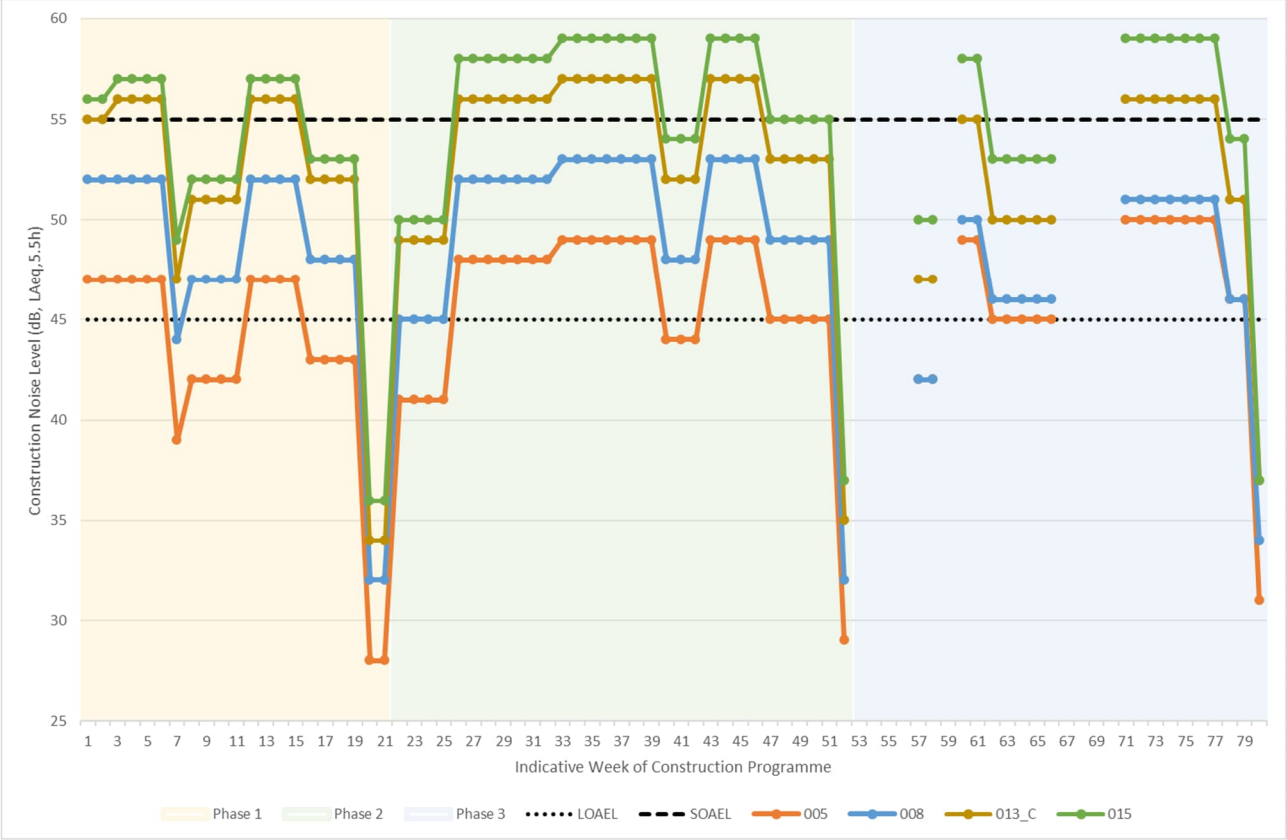
Table 7.34 Predicted night-time noise levels for Phases 1, 2 and 3 new airfield infrastructure construction works

Receptor (See Figure 7.10)	Type	Façade Noise Levels (dB, $L_{Aeq,5.5h}$)									Total Number of Weeks Ph1-3 Construction Noise Exceeds LSE Threshold	Total Number of Weekends Construction Noise Exceeds LSE Threshold
		Phase 1 (Weekday)		Phase 2 (Weekday)		Phase 3 (Weekday)		On-Alternation (Weekend)		Whole Period (c80 Weeks)		
		Average	Range	Average	Range	Average	Range	Average	Range	Average		
4	Residential	47	30 – 49	47	30 – 49	47	33 – 49	46	33 – 49	47	0	0
5	Residential	45	28 – 47	47	29 – 49	48	31 – 50	46	33 – 49	47	0	0
6	Residential	33	21 – 36	34	21 – 36	36	24 – 38	44	25 – 48	38	0	0
7	Offices	50	33 – 53	51	34 – 53	52	36 – 54	51	37 – 55	51	0	0
8	Residential	50	32 – 52	51	32 – 53	49	34 – 51	52	35 – 55	51	0	0
9	Residential	42	25 – 45	43	26 – 45	44	29 – 46	44	30 – 47	43	0	0
10	Residential	42	25 – 44	43	26 – 45	44	28 – 46	43	29 – 47	43	0	0
11	Residential	44	27 – 47	45	28 – 47	45	30 – 48	45	31 – 48	45	0	0
12	Littlebrook Nursery	42	25 – 45	43	26 – 45	54	28 – 46	44	29 – 48	43	0	0
13_A	Residential	50	30 – 52	52	31 – 54	49	32 – 51	42	34 – 46	50	0	0

Receptor (See Figure 7.10)	Type	Façade Noise Levels (dB, $L_{Aeq,5.5h}$)									Total Number of Weeks Ph1-3 Construction Noise Exceeds LSE Threshold	Total Number of Weekends Construction Noise Exceeds LSE Threshold
		Phase 1 (Weekday)		Phase 2 (Weekday)		Phase 3 (Weekday)		On-Alternation (Weekend)		Whole Period (c80 Weeks)		
		Average	Range	Average	Range	Average	Range	Average	Range	Average		
13_B	Residential	53	33 – 55	54	34 – 56	52	35 – 54	45	36 – 49	53	11	0
13_C	Residential	54	34 – 56	55	35 – 57	53	37 – 56	50	38 – 53	54	33	0
14	Hotel	53	34 – 56	54	36 – 55	55	39 – 58	56	40 – 59	54	17	10
15	Hotel	55	36 – 57	57	37 – 59	56	37 – 59	58	39 – 62	57	37	24

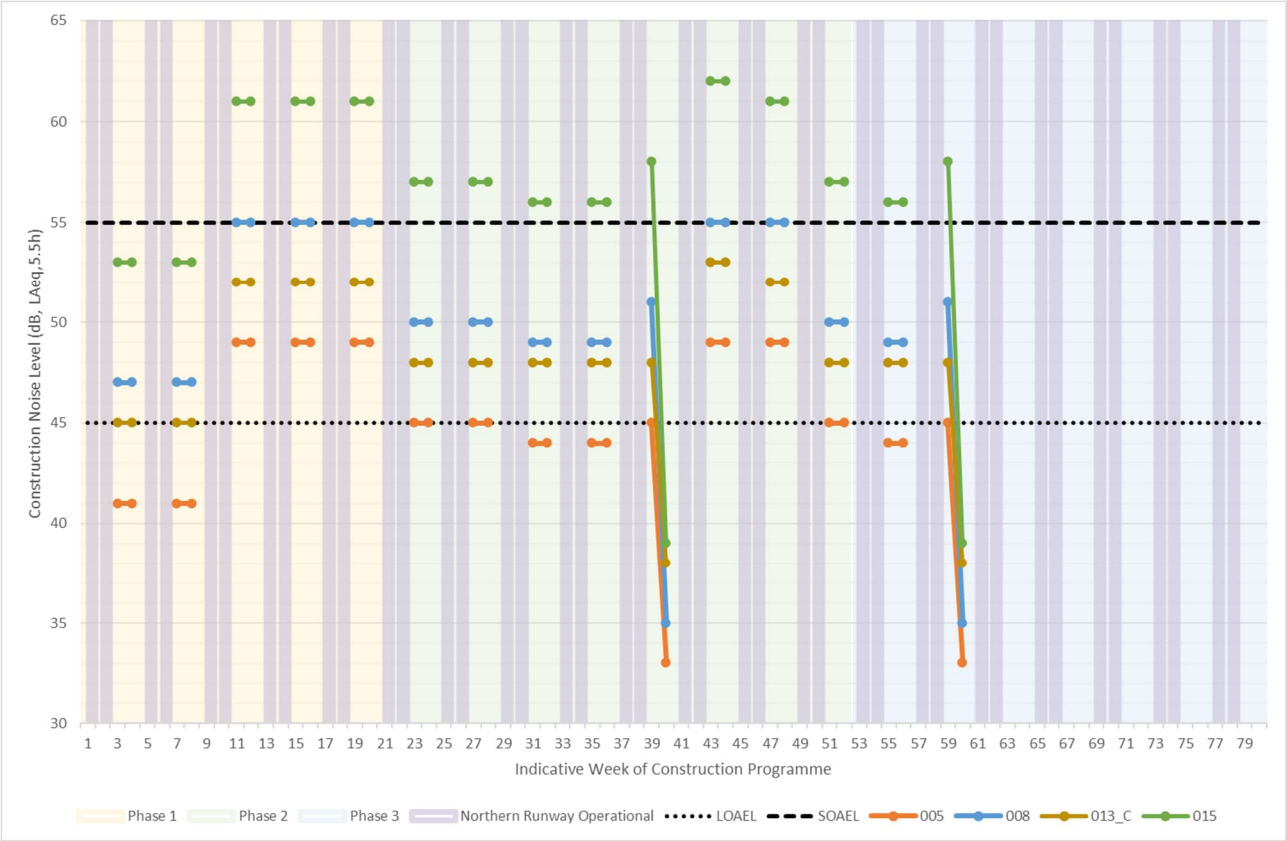
Graphic 7.4 presents the results provided in **Table 7.34** for Phases 1-3 over each week of the indicative construction programme as a graph for receptors 5, 8, 13_C and 15, with each point representing noise exposure for a single week (weekday nights only).

Graphic 7.4 Phase 1-3 night-time 09L airfield infrastructure construction works



Graphic 7.5 also shows the results for the night-time weekend on-alternation works as calculated noise level over each weekend of the indicative construction programme for receptors 5, 8, 13_C and 15, with each point representing calculated construction noise exposure over a single weekend.

Graphic 7.5 On alternation night-time 09L airfield infrastructure construction works



7.8.30 With reference to **Graphic 7.4, Graphic 7.5** and **Table 7.34**, night-time airfield 09L infrastructure works are predicted to:

- Avoid exceedances of UAEL
- Regularly exceed SOAEL at:
  - Receptor 13_B (11 weeks, no weekends)[147]
  - Receptor 13_C (33 weeks, no weekends)[148]
  - Receptor 14 (17 weeks plus 10 weekends)[149]; and
  - Receptor 15 (37 weeks plus 24 weekends)[150]
- Regularly exceed LOAEL at all other NSRs

[147] First floor, Margaret Cassidy House, 485 Bath Road.

[148] Second floor, Margaret Cassidy House, 485 Bath Road.

[149] Thistle London Heathrow Terminal 5, west façade.

[150] Thistle London Heathrow Terminal 5, south façade.

7.8.31 With reference to **Table 7.13**, which identifies that the likely significant effect thresholds are equal to SOAEL, likely significant effects are identified at Receptors 13_B, 13_C, 14 and 15.

7.8.32 The duration of the construction works is approximately 80 weeks in total, incorporating approximately 71 weeks of night-time weekday construction activity, and 30 weekends of on-alternation construction works. There are some gaps in night-time working during Phase 3 where works will be carried out in the daytime only. The temporal criteria are also exceeded at the above four receptors.

7.8.33 Receptors 14 and 15 are a hotel (Thistle London Heathrow Terminal 5), for which it is reasonable to assume that intrinsic noise mitigation measures (sound insulation, ventilation, and cooling) will have been developed to protect occupants from existing noise associated with operations at Heathrow Airport. Notably, guests in the hotel would not normally be expected to reside at the hotel for any significant period of time, i.e. exceeding the temporal assessment criteria.

7.8.34 Receptor 13 (Margaret Cassidy House) receives some benefit from the noise barrier during the 09L airfield infrastructure works, however, such benefit does not occur for the whole building[151]. Receptor 13 was outside of the legacy NIS boundaries but is now eligible for noise insulation under the QNS. Should noise mitigation under the QNS be implemented before the 09L airfield infrastructure works commencing, the significant effects of health and quality of life can be avoided.

7.8.35 Construction of the noise barrier before the 09L airfield infrastructure works provides acoustic screening to most receptors in Longford Village during the new airfield infrastructure works. Hence, no exceedances of SOAEL or likely significant effects have been identified for all other receptors. However, some receptors will experience noise levels exceeding LOAEL. Notably, many of the residential receptors already fall within the remit of Heathrow's legacy sound insulation schemes. Irrespective of this, these receptors are also eligible for noise insulation under the QNS.

7.8.36 In summary, the Phase 1-3 and on-alternation night-time 09L airfield infrastructure construction works present likely significant effects at Receptors 13_B, 13_C, 14 and 15 (which includes circa 19 residential properties). Night-time construction works associated with the 09L airfield infrastructure works will be managed and mitigated through the CEMP and Section 61 process which will identify and secure any further controls and the BPM approach to be implemented.

7.8.37 Notably, all significantly affected residential properties have either already benefitted from legacy sound insulation schemes or will be eligible under the new QNS schemes. Importantly, Longford has already been identified by the "prioritisation panel" as the one of the first areas to benefit from the new scheme, therefore mitigation would be in place before commencement of the construction works.

[151] The ground floor level of Margaret Cassidy House, as well as the adjacent 493 Bath Road, benefit from the noise barrier such that significant adverse effects on health and quality of life, as well as likely significant effects, have not been identified.

Construction Phase: Construction Noise – 09L Airfield Infrastructure Works, Phase 3 (Daytime)

7.8.38 The indicative construction programme assumes that certain activities within Phase 3 of the 09L airfield infrastructure works can be carried out during weekday daytime periods.

7.8.39 For the new 09L airfield infrastructure construction works, the activities will move around a defined working area over the duration of Phase 3 (see **Figure 7.10** in **Volume IV**). The assessment is therefore based on the calculated average construction noise level across the area of the Phase 3 works and the indicative construction activities. Noise levels will vary during Phase 3 due to some activities generating higher noise levels than other.

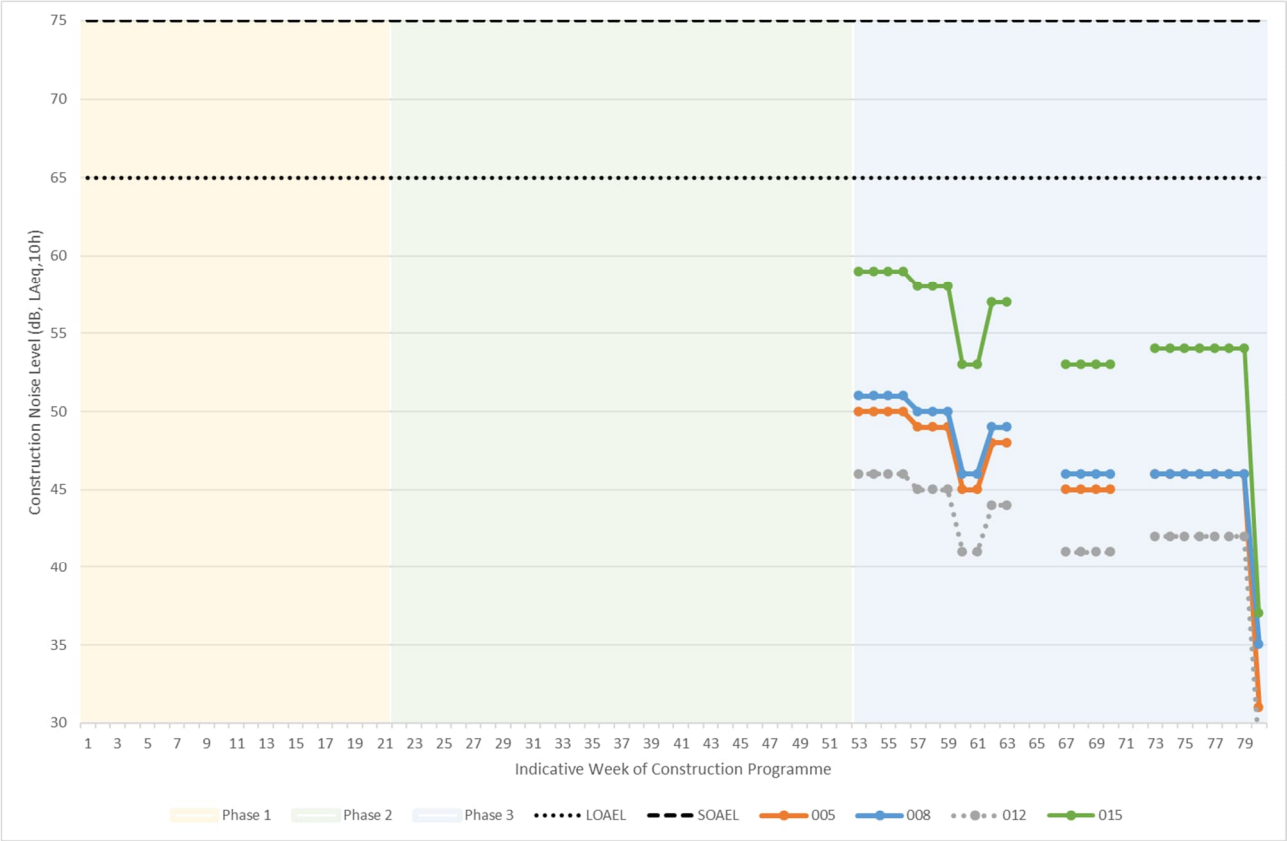
7.8.40 **Table 7.35** presents the logarithmic average of noise levels across Phase 3 during the day, in addition to the range of calculated construction noise levels calculated during the phase. The calculated average noise exposure level over the period of the daytime Phase 3 construction works are also provided along with the number of weeks where the construction noise levels exceed the SOAEL/LSE threshold.

Table 7.35 Predicted daytime noise levels for Phase 3 new airfield infrastructure construction works

Receptor (See Figure 7.10)	Type	Façade Noise Levels (dB, $L_{Aeq,10h}$)		Total Number of Weeks Construction Noise Exceeds LSE Threshold
		Phase 3		
		Average	Range	
4	Residential	46	33 – 49	0
5	Residential	47	31 – 50	0
6	Residential	35	24 – 38	0
7	Offices	51	36 – 54	0
8	Residential	48	35 – 51	0
9	Residential	43	29 – 46	0
10	Residential	43	28 – 46	0
11	Residential	45	30 – 48	0
12	Littlebrook Nursery	43	28 – 46	0
13_C	Residential	53	37 – 55	0
14	Hotel	55	39 – 57	0
15	Hotel	56	37 – 59	0

7.8.41 **Graphic 7.6** presents the results provided in **Table 7.35** over each week of the indicative construction programme as a graph for receptors 5, 8, 12 and 14, with each point in **Graphic** 7.6 representing construction noise exposure for a single day.

Graphic 7.6 Phase 3 Daytime 09L Airfield Infrastructure Works



7.8.42 With reference to **Graphic 7.6** and **Table 7.35**, the Phase 3 daytime works are forecast to avoid exceeding LOAEL at any receptor.

7.8.43 With reference to **Table 7.13**, which identifies that the likely significant effect thresholds are equal to SOAEL, likely significant effects are not identified at any of the receptors during this phase. The duration of the Phase 3 daytime works covers a total of approximately 28 weeks with construction activities occurring on approximately 23 of those weeks.

7.8.44 In summary, daytime works of Phase 3 of the 09L airfield infrastructure works do not result in adverse effects on health and quality of life or likely significant effects.

Construction Phase: Construction Noise – 09R/27L Redundant Pavement Removal (Night-time)

7.8.45 The primary source of noise during the 09R/27L redundant pavement removal works is breaking out existing pavement (described in **Appendix 7.4: Construction Noise and Vibration** as Activity A). The worst affected receptor is receptor 140 (residential receptors at Lowlands Drive, TW19 7JX) due to the direct line of sight to the most north-westerly works area[152]. The average predicted noise level at this receptor over the potential 20-week

[152] Receptor 137 (106 Oaks Road, TW19 7LB) is nearest to the 09R/27L redundant pavement removal works, however, existing buildings within the airfield at Sandringham Road and Seaford Road provide partial noise screening for this receptor.

duration of works is 54 dB $L_{Aeq,5.5hr}$. This is both below the SOAEL and likely significant effect threshold.

7.8.46 The single highest predicted noise level from any part of the 09R/27L redundant pavement removal works could be as high as 58 dB $L_{Aeq,5.5hr}$ which exceeds the SOAEL and likely significant effect threshold by up to 3 dB. Importantly, this level of noise is unlikely to exceed the temporal criteria due to the continuous progression of works across the wider area and the potential for activities to be intermittent should they concurrently with the 09L airfield infrastructure works.

7.8.47 In summary, night-time works for the 09R/27L "redundant pavement removal works" do not result in adverse effects on health and quality of life or likely significant effects.

7.8.48 Night-time construction works associated with the 09R/27L redundant pavement removal works will be managed and mitigated through the CEMP and Section 61 process which will identify and secure any further controls and the BPM approach to be implemented.

7.8.49 Due to the distance of the 09R/27L redundant pavement removal works from the receptors at Longford, activities on this part of the site will not increase the construction noise levels at receptors 4 to 15. Similarly, due to the distance of the 09L airfield infrastructure works from the receptors in Stanwell, activities to the north of the airfield will not noticeably contribute to the construction noise levels at receptors 134 to 143.

Summary of Construction Phase Noise Assessment

7.8.50 The assessment of construction noise has identified:

- Exceedances of SOAEL and likely significant effects at residential Receptors 4, 5, 6 and 8 during the night-time noise barrier construction works along Wright Way;
- No exceedances of SOAEL and no likely significant effects during the daytime noise barrier construction works around the Terminal 5 Pod Parking;
- Exceedances of SOAEL and likely significant effects at residential Receptors 13_B and 13_C, and hotel Receptor 14 and 15 during the night-time 09L airfield infrastructure works; and
- No exceedances of SOAEL and no likely significant effects during the daytime 09L airfield infrastructure works.

7.8.51 Construction noise effects will be managed through a CEMP and the submission of Section 61 application(s) to secure noise mitigation and noise management during the construction phase. This applies to all construction noise impacts whether these are identified as significant or not significant as part of this assessment. However, the emphasis of the CEMP and Section 61 application(s) will be on mitigating and minimising the significant adverse effects at the receptors identified above.

7.8.52 As greater detail on the construction methodologies, plant and programme is developed, key considerations will include whether quieter plant is available, where working methods can be adjusted to reduce noise, the practicalities and efficacy of localised screening and where plant is located relative to the receptors.

7.8.53 Importantly, Longford has already been identified by the "prioritisation panel" as the one of the first areas to benefit from the new QNS, therefore mitigation at receptors forecast to experience residual significant effects would also be in place before commencement of the construction works.

Operational Phase: Aircraft Air Noise – Residential Receptors

Redistribution of Aircraft Noise Events and Respite Provision

7.8.54 Two of the Government's objectives in ending the Cranford Agreement and introducing easterly runway alternation, as facilitated by the Proposed Development, are to:

- distribute noise more fairly around the airport; and
- extend the benefits of runway alternation by providing noise respite to communities under flight paths during periods of easterly winds.

7.8.55 The effects of the Proposed Development with respect to noise policy (i.e. the NPSE) and in terms of likely significant effects under EIA are therefore a consequence of achieving these objectives. As such, the redistribution of aircraft noise events and the provision of noise respite is important context for the assessment of effects described later in this section.

7.8.56 The impact of the Proposed Development on aircraft noise will occur during mainly daytime periods. This is because Heathrow operates in accordance with its alternation schedule from 06:00hrs. The Proposed Development will facilitate easterly runway alternation whereby the designated landing and departure runways are switched at 15:00hrs in accordance with a published runway alternation schedule so as to provide predictable periods of respite from aircraft noise.

7.8.57 **Figure 7.16** and **Figure 7.17** (**Volume IV**) present summer average daytime N65 events with and without the Proposed Development in 2028 respectively. **Figure 7.18** (**Volume IV**) presents changes in the N65 events due to the Proposed Development. **Figure 7.18** (**Volume IV**) shows how on average aircraft noise events are redistributed between the runways and the corresponding flight paths. The figure demonstrates the locations where overall aircraft noise events would, on average, increase or decrease due to the Proposed Development in 2028.

7.8.58 **Figure 7.19** and **Figure 7.20** (**Volume IV**) present busy easterly day N65 events with and without the Proposed Development in 2028 respectively. **Figure 7.21** (**Volume IV**) further articulates how during a busy easterly day aircraft noise events are transferred between each of Heathrow's easterly runways as intended by the Government in ending the Cranford Agreement.

7.8.59 There are over 600 arrivals and 600 departures at Heathrow Airport each day. To the west of the Airport, **Figure 7.20** (**Volume IV**) shows that without the Proposed Development and on a busy easterly day, N65 noise events from arriving aircraft occur almost exclusively over locations such as Poyle, Horton, Windsor and Clewer Green at rates of more than 600 N65 per day. In other words, without the Proposed Development these communities experience aircraft noise events without a break or reduction in noise. Further to the west,

the N65 events reduce due to only certain aircraft generating maximum noise levels of 65 dB L_{ASmax} or more.

7.8.60 To the east of the Airport, **Figure 7.20** (**Volume IV**) shows that without the Proposed Development, Hounslow Heath and Hatton experience at least 600 N65 events during a busy easterly day. To the north-east, locations such as Osterley, Lampton, Norwood Green, Hanwell and West Acton are forecast to experience at least 200 N65 events. To the south-east, locations such as Feltham are forecast to experience at least 400 N65 events. Beyond Feltham as the departure routes diverge, the number of N65 events under each departure route begin to reduce.

7.8.61 With the Proposed Development in 2028, **Figure 7.19** (**Volume IV**) demonstrates a more equitable distribution of aircraft noise events during a busy easterly day, indicated by the symmetry of the N65 contours to the west of the Airport. The areas experiencing more than 600 N65 events on a busy easterly day contract considerably and become limited to the airfield and in locations in the immediate vicinity of the Airport.

7.8.62 Communities such as Windsor, Clewer Green and Poyle would observe a reduction in N65 events to 300 per busy easterly day as opposed to over 600 events without the Proposed Development. With the Proposed Development, communities located under easterly arrivals to the southern runway such as Sunnymeads and Old Windsor would observe an increase in N65 events to around 300 per busy easterly day. In other words, with the Proposed Development, the number of N65 events per busy easterly day in communities located under approaches to the northern and southern runways would be more equal.

7.8.63 To the east, under departure routes, communities such as Hounslow Heath, Feltham, Osterley, Norwood Green and Hanwell observe reductions in aircraft noise events with other communities such as Cranford, North Hyde, Heston and Southall observing increases.

7.8.64 **Table 7.36** highlights that without the Proposed Development and during easterly operations, several tens of thousands of people experience noise at and above 65 dB L_{ASmax} from each arrival and departure without a break or reduction in noise. **Table 7.36** shows that with the Proposed Development, the number of people who experience aircraft noise events throughout the day without a break or reduction in noise reduces substantially as aircraft noise is redistributed and shared equally between the runways as part of introducing planned respite through easterly runway alternation at 15:00.

7.8.65 The impact of these changes on the number of people experiencing N65 events during easterly operations is presented in **Table 7.36**. **Table 7.36** shows that the number of people forecast to experience N65 events in 2028 at rates of 400 or above reduces due to the Proposed Development.

7.8.66 **Table 7.36** shows how these people are removed from the highest numbers of noise events and are redistributed to lower rates. In the case of those experiencing the lowest numbers of noise events, this is also a consequence of the 5 N65 contour becoming larger due to the Proposed Development, indicating that noise events are being shared over a larger area. This is evident within **Figure 7.21** (**Volume IV**) which shows the increased extent of the 5 N65 contour over North Hyde and Southall.

Table 7.36 Busy Easterly Day – N65 analysis with and without Proposed Development in 2028 – Population, Thousands

N65 Rate	2028 without Proposed Development	2028 with Proposed Development	Change in Population due to Proposed Development
≥ 5	1317.1	1417.0	+99.9
≥ 10	970.7	1068.2	+97.5
≥ 20	728.6	813.6	+85.0
≥ 50	464.0	539.9	+75.9
≥ 100	380.2	430.7	+50.5
≥ 200	253.2	240.9	-12.3
≥ 300	111.2	125.9	+14.7
≥ 400	75.1	41.0	-34.1
≥ 500	61.4	18.6	-42.8
≥ 600	50.7	6.4	-44.3

7.8.67 **Figure 7.21** (**Volume IV**) shows that to the north of the Airport, and in communities such as North Hyde and Southall, there is clear change in the outline of 5 N65 contour due to the Proposed Development with some changes occurring to the west of the Airport where aircraft join the easterly final approach over areas such as Hurst. In all other locations, the outline of this contour remains broadly the same. This indicates that without the Proposed Development these locations do not experience routine aircraft noise events above 65 dB L_{ASmax}.

7.8.68 The change in the outline of the 5 N65 contour alongside the increases shown in N65 events over North Hyde and Southall, as highlighted in **Figure 7.21** (**Volume IV**), are due to the scheduled use of Runway 09L for departures and the use of the northbound 09L UTLIB/BPK routes, as presented in **Figure 7.29** (**Volume IV**). These routes are distinctly separate from other flight paths to and from Heathrow Airport therefore indicating that new impacts are forecast to occur in these locations.

7.8.69 **Figure 7.21** (**Volume IV**) shows that as aircraft depart and move away from the airport, the differences in N65 events due to the Proposed Development reduce. With reference to Heathrow's easterly departure routes, as presented in **Figure 7.29** (**Volume IV**), this is due to:

- The convergence of the easterly departure routes i.e. departure routes from Runway 09L and Runway 09R eventually join together; and
- As aircraft get further away from the Airport, maximum noise levels will begin to fall below 65 dB L_{ASmax}.

7.8.70 In conclusion, the N65 metric highlights that the Proposed Development would redistribute aircraft noise events in a manner where, particularly for communities to the west the Airport,

noise events are shared more evenly. For communities to the west such as Windsor, the number of N65 events would reduce due to the introduction of easterly runway alternation. However, communities such as Old Windsor would observe an increase in N65 events due to the introduction of around 8-hour of scheduled southern runway arrivals during easterly operations.

7.8.71 By alternating runways in accordance with a published scheduled, the Proposed Development seeks to introduce noise respite during easterly operations for communities that do not currently observe a break or reduction from aircraft noise events. Even though the Proposed Development will result in some communities experiencing more noise events, runway alternation will still result in planned respite.

7.8.72 Without the Proposed Development, Heathrow does not alternate its runways during easterly operations. As indicated from the N65 analysis, this results in certain communities such as Windsor and Hounslow Heath experiencing aircraft noise events throughout the day without a break or reduction in aircraft noise overhead. For other communities such as Old Windsor and Cranford, a change in wind direction results in an unplanned break from aircraft noise.

7.8.73 By ending the Cranford Agreement, the Government intended to deliver respite through runway alternation during periods of easterly winds. Runway alternation is planned and communicated through Heathrow's runway alternation schedule. This means that any noise respite arising from easterly runway alternation would be 'predictable' whether receptors experience an increase or decrease in aircraft noise due to the Proposed Development.

7.8.74 Based on the respite noise changes described in **Table A7.5.7** in **Appendix 7.5: Air Noise** **Figure 7.22** (**Volume IV**) presents an overarching view of the locations that would experience predicable respite with the Proposed Development during easterly operations.

7.8.75 **Figure 7.22** (**Volume IV**) shows that under easterly arrivals, locations such as Poyle and parts of Windsor would experience predicable respite due to easterly alternation. In the case of Windsor and Poyle, this respite coincides with a reduction in aircraft noise events due to the Proposed Development. **Figure 7.22** (**Volume IV**) also shows that locations such as Dedworth and communities to the west of Windsor would also experience respite due to the Proposed Development.

7.8.76 Whilst there is an increase in overflights, **Figure 7.22** (**Volume IV**) shows that locations such as Old Windsor and Stanwell Moor would also experience respite with the Proposed Development. These communities continue to experience a break in aircraft noise when the airport is operating on easterlies but only for around 8 hours rather than for the whole day.

7.8.77 **Figure 7.22** (**Volume IV**) shows that under easterly departures, locations such as North Feltham and Cranford, and part of Harlington would experience predictable respite due to the Proposed Development despite the Proposed Development leading to increased noise. Many of the locations under departure routes from Runway 09L are shown to experience respite due to the Proposed Development. Many of these locations would experience increases in noise events however, as these increases occur during an alternation period, predictable respite is provided.

7.8.78 In summary, this analysis demonstrates that the Proposed Development will facilitate predictable noise respite during periods of easterly winds whether the Proposed

Development results in an increase or decrease in aircraft noise. It also highlights that in general, the locations which are forecast to experience increases in aircraft noise events due to the Proposed Development would also be afforded predictable respite.

Assessment in Accordance with the Noise Policy Statement for England

7.8.79 As highlighted in the previous section, the redistribution of aircraft noise events and the provision of predictable respite during easterly winds will result in both adverse and beneficial changes in the number of aircraft noise events experienced at different locations and receptors around the Airport. These changes will have a consequential effect on exposure to aircraft noise and the numbers of people above and below certain policy thresholds.

7.8.80 As outlined in **Section 7.5**, the Noise Policy Statement for England (NPSE) sets three aims with respect to impacts on health and quality of life. These aims are aligned to two noise exposure thresholds: the Lowest Observed Adverse Effect Level (LOAEL); and the Significant Observed Adverse Effect Level (SOAEL).

7.8.81 The three policy aims defined by the NPSE and their relevance with respect to LOAEL and SOAEL for the assessment of aircraft air noise at residential receptors are summarised in **Table 7.37**. This reflects the explanatory note for the NPSE.

Table 7.37 Respite Noise Changes and Types of Respite

NPSE Policy Aim	Level of Exposure where Policy Aim Applies
Avoid significant adverse impacts on health and quality of life	Above SOAEL
Mitigate and minimise adverse impacts on health and quality of life	Between LOAEL and SOAEL
Where possible, contribute to the improvement of health and quality of life	All levels of exposure

7.8.82 The adopted values for LOAEL and SOAEL for daytime and night-time noise exposure are set out in **Table 7.38** below. The rationale for these values is presented in **Section 7.5**.

Table 7.38 Daytime and Night-time LOAEL and SOAEL values

Exposure Threshold	Summer Average Daytime $L_{Aeq,16hr}$	Summer Average Night Time $L_{Aeq,8hr}$
LOAEL	51 dB	45 dB
SOAEL	63 dB	55 dB

7.8.83 In both cases, the daytime and night-time SOAEL are part of the eligibility criteria for Heathrow's QNS RIS.

7.8.84 The APF and wider Government policy in relation to aviation noise cites two daytime noise exposure thresholds which are relevant. These are:

- 54 dB $L_{Aeq,16hr}$ – representing a revised level of aircraft noise exposure representing the *"approximate onset of significant community annoyance"* as identified by the CAA in CAP1506; and
- 69 dB $L_{Aeq,16hr}$ – the level of noise exposure that the Government expects airport operators to offer households assistance with the costs of moving.

Assessment in Accordance with the NPSE – Daytime Exposure

7.8.85 In line with the NPSE, and summer average daytime noise exposure, **Table 7.39** shows that the effect of the Proposed Development in 2028 would be to:

- Reduce the overall number of people exposed above the daytime LOAEL by around 2,800;
- Reduce the number of people exposed to levels above 54 dB $L_{Aeq,16hr}$ ("*the approximate onset of significant community annoyance*") by 15,300;
- Reduce the overall number of people exposed between the daytime LOAEL and SOAEL by 3,900;
- Increase the overall number of people within the daytime SOAEL by around 1,100; and
- Increase the overall number of people exposed to levels above 69 dB $L_{Aeq,16hr}$ by around 500.

Table 7.39 Changes to exposure due to the Proposed Development in 2028 - Daytime

	2028 Without Proposed Development (baseline)		2028 With Proposed Development (with Easterly Alternation)		Change due to the Proposed Development	
$L_{Aeq,16hr}$ Daytime Exposure – Standard Mode– Population Exposed in 2028 (Thousands)						
	Figure 7.6[153]		**Figure 7.25[153]**		**Figure 7.26**	
Change in the Number of People above LOAEL					-2.8	
51-54 dB	532.2	**LOAEL to SOAEL** 916.7	544.7	**LOAEL to SOAEL** 912.8	+12.5	**LOAEL to SOAEL** -3.9
54-57 dB	229.6		215.5		-14.1	
57-60 dB	98.8		95.1		-3.7	
60-63 dB	56.1		57.5		+1.4	
63-66 dB	25.8	**≥ SOAEL** 30.9	26.3	**≥ SOAEL** 32.0	+0.5	**≥ SOAEL** +1.1
66-69 dB	4.3		4.4		+0.1	
≥ 69 dB	0.8		1.3		+0.5	

[153] 'without development' and 'with development' scenarios are described as 'WoD' and 'WD' respectively.

	2028 Without Proposed Development (baseline)	2028 With Proposed Development (with Easterly Alternation)	Change due to the Proposed Development
Cumulative Totals above Policy Thresholds			
≥ 51 dB (LOAEL)	947.6	944.8	-2.8
≥ 54 dB	415.4	400.1	-15.3
≥ 63 dB (SOAEL)	30.9	32.0	+1.1
≥ 69 dB	0.8	1.3	+0.5

7.8.86 With the Proposed Development in 2028, communities such as Fifield and Water Oakley, along with locations within Hanwell, Feltham, Hampton Hill and Twickenham are removed from the LOAEL. Areas including land to the west of Windsor Great Park, along with communities in North Hyde and parts of Twickenham are brought into the LOAEL.

7.8.87 The overall effect of these changes is to reduce the number of people within the LOAEL in 2028 and contribute towards a reduction in total number of people exposed to summer average daytime noise exposure between the LOAEL and the SOAEL.

7.8.88 In the case of the SOAEL, changes in the locations exposed above this threshold in 2028 due to the Proposed Development are more subtle with residential dwellings in Wraysbury and Cranford being relocated within the SOAEL in 2028 due to the Proposed Development, along with various residential streets to the south-east of the airport being removed from this contour. Further examination shows that 2,600 people would be introduced into the daytime SOAEL because of the Proposed Development in 2028 and that 1,500 people would be removed. This results in the net increase of 1,100 people as shown in **Table 7.39**.

7.8.89 Heathrow's Quieter Neighbourhood Scheme (QNS) Residential Insulation Scheme (RIS) is designed so that operational changes are captured as part of determining eligibility for noise insulation under the scheme. As described in **Section 7.7**, the existing eligibility boundary for this scheme is partially based on forecast noise exposure at and above 63 dB $L_{Aeq,16hr}$ (SOAEL) in 2026.

7.8.90 It is estimated that approximately 425 dwellings would be exposed to air noise above the SOAEL due to the Proposed Development in 2028, that are not currently captured by Heathrow's existing QNS RIS eligibility boundary. As part of the embedded measures set out in **Section 7.7** the eligibility boundary for the QNS RIS would be updated to reflect the changes in the SOAEL due to the Proposed Development. This would mean that these properties would be eligible for insulation under the QNS RIS.

7.8.91 The QNS RIS provides for 100% of the costs towards noise insulation up to a maximum of £34,000. By updating the QNS RIS boundary, significant adverse impacts on health and

quality of life due to the Proposed Development can be avoided, in line with the first aim of the NPSE.

7.8.92 The first aim of the NPSE is to avoid significant adverse impacts on health and quality of life. The noise exposure hierarchy attached to the PPG-N states that above the SOAEL, noise is *"present and disruptive"* and that *"at such levels where there is no alternative ventilation, having to keep windows closed most of the time because of the noise"*. The PPG-N notes that in line with the NPSE, the action is to "avoid". The QNS provides for a high standard of acoustic insulation and ventilation measures to be provided where noise exposure is above the SOAEL, allowing living conditions within dwellings to be protected and thus 'avoid' adverse impacts on health and quality of life in line with the NPSE.

7.8.93 The second aim of the NPSE requires adverse impacts on health and quality of life to be mitigated and minimised between the LOAEL and the SOAEL.

7.8.94 **Table 7.39** shows that between these policy thresholds the overall number of people exposed to air noise is forecast to reduce due to the Proposed Development thus contributing towards this aim.

7.8.95 **Figure 7.26** (**Volume IV**) shows that between the LOAEL and the SOAEL, various locations are forecast to experience increases and decreases in summer average daytime noise exposure. These locations and the effects of these changes are described in more detail as part of the assessment of daytime likely significant effects.

7.8.96 With respect to the 54 dB $L_{Aeq,16hr}$ metric, **Table 7.39** shows that approximately 15,300 people would be removed from this contour in 2028 due to the Proposed Development. As such the number of people exposed to levels above the *'approximate onset of significant community annoyance'* would reduce due to the Proposed Development.

7.8.97 In the case of the 69 dB $L_{Aeq,16hr}$ contour, residential receptors in Poyle would be removed from this contour in 2028 due to the Proposed Development, with certain residential receptors in Cranford and Stanwell Moor being introduced to the contour. These changes result in a net increase of approximately 500 people within the 69 dB $L_{Aeq,16hr}$ contour in 2028 due to the Proposed Development.

7.8.98 Further examination of the data indicates, however, that where receptors are brought into the 69 dB $L_{Aeq,16hr}$ contour in 2028 due to the Proposed Development, this is due to increases of around 1 dB in average summer daytime noise exposure. All people and properties that are forecast to be exposed to levels above 69 dB $L_{Aeq,16hr}$ in 2028 due the Proposed Development fall within the 2019 69 dB $L_{Aeq,16hr}$ contour that underpins Heathrow's Home Relocation Assistance Scheme (HRAS). As such it is expected that all residential receptors exposed to levels of 69 dB $L_{Aeq,16hr}$ in 2028 would be eligible for support under this scheme subject to the conditions of the scheme. Due to the proximity of the 2028 69 dB $L_{Aeq,16hr}$ with Proposed Development contour to the 2019 HRAS scheme 69 dB $L_{Aeq,16hr}$ contour, provision has been made to extend the eligibility the HRAS scheme in the event that dwellings become exposed to levels above 69 dB $L_{Aeq,16hr}$ due to the Proposed Development and fall beyond current 2019-based eligibility boundary. This will be reviewed in line with the QNS and through the Noise Action Plan's wider commitment to keep under review eligibility to Heathrow's schemes.

7.8.99 **Table 7.40** provides some context to the noise exposure forecast in 2028 with and without the Proposed Development against the situation reported in 2019. **Table 7.40** shows that above each of the summer average daytime exposure thresholds that the area and population forecast to be exposed to aircraft noise in 2028 with or without the Proposed Development would reduce. This indicates that with or without the Proposed Development, that overall population exposure to aircraft noise will continue to improve in line with the third aim of the NPSE.

Table 7.40 Changes to exposure due to the Proposed Development in 2028 compared to 2019 - Daytime

	2019 'standard' mode as reported in ERCD Report 2001		2028 Without Development (baseline)		2028 With Proposed Development (with Easterly Alternation)	
$L_{Aeq,16hr}$ Daytime Exposure						
Figure	**Figure 7.1**		**Figure 7.6**		**Figure 7.25**	
Exposure Level	**Population, Thousands**	**Area (km^2)**	**Population, Thousands**	**Area (km^2)**	**Population, Thousands**	**Area (km^2)**
≥ 54 dB	492.7	156.1	415.4	127.3	400.1	127.5
≥ 57 dB	213.9	83.3	185.8	71.2	184.6	71.5
≥ 60 dB	100.3	48.0	87	39.9	89.5	40.3
≥ 63 dB	37.9	27.9	30.9	23.2	32	23.3
≥ 66 dB	9.9	15.5	5.1	11.2	5.7	11
≥ 69 dB	2.5	7.7	0.8	5.7	1.3	5.7

Assessment in Accordance with the NPSE – Night-time Exposure

7.8.100 In line with the NPSE, and summer average night-time noise exposure, **Table 7.41** shows that the effect of the Proposed Development in 2028 would be to:

- Reduce the number of people exposed above the night-time LOAEL by around 7,900;
- Reduce the number of people exposed between the night-time LOAEL and SOAEL by 9,700; and
- Increase the number of people within the night-time SOAEL by around 1,700.

Table 7.41 Changes to exposure due to the Proposed Development in 2028 – Night-time

	2028 Without Development (baseline)		2028 With Proposed Development (with Easterly Alternation)		Change due to the Proposed Development	
$L_{Aeq,8hr}$ Night-time Exposure – Standard Mode– Population Exposed in 2028 (Thousands)						
	Figure 7.7		**Figure 7.27**		**Figure 7.28**	
Change in the Number of People above LOAEL					-7.9	
45-48	351.3		353.2		+1.9	

	2028 Without Development (baseline)		2028 With Proposed Development (with Easterly Alternation)		Change due to the Proposed Development	
48–51	172.6	**LOAEL to SOAEL** 652.3	161.5	**LOAEL to SOAEL** 642.7	-11.1	**LOAEL to SOAEL** -9.6
51–55	128.4		128		-0.4	
55-57	24.8		25		+0.2	
57-60	24.5	**≥ SOAEL** 53.3	25	**≥ SOAEL** 55.0	+0.5	**≥ SOAEL** +1.7
60-63	3.3		3.9		+0.6	
≥ 63	0.7		1.1		+0.4	
≥ LOAEL	705.6		697.7		-7.9	
≥ SOAEL	53.3		55.0		+1.7	

7.8.101 The shape of the night-time LOAEL contours reflects the greater proportion of arriving aircraft during the night as opposed to departures.

7.8.102 **Table 7.41** shows that approximately 7,900 people are removed from the night-time LOAEL due to the Proposed Development in 2028. **Figure 7.7** and **Figure 7.27** (**Volume IV**) show that to the east of the Airport this is primarily due to a contraction in the size of the LOAEL contour over residential areas in Whitton and Feltham. To the west of the Airport, the LOAEL contour is redefined resulting in Fifield and parts of Dedworth and Clewer Village being removed from the contour.

7.8.103 To the south-west of the Airport, the LOAEL contour increases in size encompassing additional residential receptors to the south and west of Old Windsor. To the north-east of the airport the LOAEL contour increases in size to incorporate an additional number of streets within Harlington and Cranford. These changes shown in **Figure 7.28** (**Volume IV**).

7.8.104 In the case of the night-time SOAEL, the main changes occur to the west of the Airport under final approaches. Under easterly approaches to the northern runway, the contour contracts however this occurs over the Queen Mother Reservoir. Under easterly approaches to the southern runway, the contour extends encompassing additional residential dwellings in Wraysbury. To the east of the Airport the changes in the size of the SOAEL contour due to the Proposed Development in 2028 are marginal. The contour increases in size under locations in Cranford, incorporating an additional number of residential streets. The contours however contacts in locations around the 09R runway end. Changes in the size and shape of the SOAEL contour in these areas are responsible for an additional 1,700 people being exposed to the SOAEL in 2028 due to the Proposed Development.

7.8.105 As with daytime noise exposure, Heathrow's QNS RIS is designed so that operational changes that affect the night-time SOAEL are captured as part of determining eligibility for noise insulation under the scheme. However, in the case of night-time noise exposure, the size and shape of the 2028 with Proposed Development SOAEL contour is already captured by the existing QNS RIS eligibility boundary. It should be noted that the QNS RIS boundary is also informed by additional night-time noise metrics, namely the occurrence of 1

additional aircraft noise awakening due to early morning arrivals between 04:30 and 06:00, and the 90 dB SEL footprint for an A380-800 aircraft arrival. To the west of the Airport, where the 2028 with Proposed Development night-time SOAEL contour extends over residential dwellings in Wraysbury, these areas are already eligible for the QNS RIS due to the 90 dB SEL A380-800 arrival footprint.

7.8.106 As outlined above, the QNS RIS provides for 100% of the costs towards noise insulation up to a maximum of £34,000. The existing QNS RIS eligibility boundary and scheme is therefore considered sufficient so that significant adverse impacts on health and quality of life due to the Proposed Development in 2028 can be avoided, in line with the first aim of the NPSE.

7.8.107 As per daytime noise exposure, and in line with the first aim of the NPSE, the QNS provides for a high standard of noise insulation and ventilation measures to be provided where noise exposure is above the night-time SOAEL, allowing conditions within bedrooms to be protected and thus 'avoid' adverse impacts on health and quality of life.

7.8.108 The second aim of the NPSE requires adverse impacts on health and quality of life to be mitigated and minimised between the LOAEL and the SOAEL. In the case of summer average night-time noise exposure **Table 7.41** shows that between these policy thresholds the overall population exposed is forecast to reduce contributing towards this aim.

7.8.109 **Table 7.42** provides some context to the noise exposure forecast in 2028 with and without the Proposed Development against the situation reported in 2019.

7.8.110 **Table 7.42** shows that above each of the summer average night-time exposure thresholds that the area and population forecast to be exposed to aircraft noise in 2028 with or without the Proposed Development would reduce. This indicates that with or without the Proposed Development, that overall population exposure to aircraft noise will continue to improve in line with the third aim of the NPSE.

Table 7.42 Changes to exposure due to the Proposed Development in 2028 compared to 2019 – Night-time

	2019 'actual' mode as reported in ERCD Report 2001		2028 Without Development (baseline)		2028 With Proposed Development (with Easterly Alternation)	
$L_{Aeq,8hr}$ Nighttime Exposure						
Figure	**Figure 7.2**		**Figure 7.7**		**Figure 7.27**	
Exposure Level	**Population, Thousands**	**Area (km²)**	**Population, Thousands**	**Area (km²)**	**Population, Thousands**	**Area (km²)**
≥ 48 dB	428.5	105.4	354.3	90.5	138.9	90.6
≥ 51 dB	201.7	63.7	181.7	53.8	70.2	54.4
≥ 54 dB	97.3	35.1	73.4	24.6	25.8	24.9
≥ 57 dB	46.3	17.3	28.5	11.6	9.7	11.7
≥ 60 dB	16.6	8.8	4.0	5.6	1.4	5.7
≥ 63 dB	2.7	4.6	0.7	3.0	0.3	3.1

7.8.111 **Appendix 7.2: Noise Management and Mitigation at Heathrow Airport** sets out the existing noise management and mitigation measures in place at Heathrow Airport. These include specific night-time measures which contribute towards the mitigation and minimisation of such effects, such as:

- night-time runway rotation; and
- DfT night flying restrictions which limit the number and types of aircraft which can operate during the night.

Assessment in Accordance with the NPSE – Conclusion

7.8.112 In conclusion, the assessment in accordance with noise policy has demonstrated the following:

- The Proposed Development will result in a marked reduction in the number of people exposed to air noise above the daytime and night-time LOAEL in 2028;
- The number of people exposed to air noise between the daytime and night-time LOAEL and SOAEL would be notably reduced due to the Proposed Development in 2028;
- Although the number of people exposed to air noise above the daytime and night-time SOAEL is forecast to increase due to the Proposed Development in 2028, the increase is much smaller and most of these receptors are already eligible or will become eligible for a funded scheme of insulation under Heathrow's QNS RIS;
- With respect to daytime noise exposure, the Proposed Development reduces the number of people exposed above levels considered to be the *'approximate onset of significant community annoyance'*; and
- Although some receptors are forecast to observe increases in daytime noise exposure leaving them exposed to 69 dB $L_{Aeq,16hr}$ or more in 2028 with the Proposed Development, these receptors are already eligible for relocation assistance under Heathrow's HRAS scheme. Provision has been made to extend eligibility should dwellings be found to become exposed to above 69 dB $L_{Aeq,16hr}$ due to the Proposed Development and not be eligible under HRAS.

Likely Significant Effects – Daytime

7.8.113 The assessment in accordance with the NPSE has considered how the Proposed Development is forecast to change population exposure to relevant noise policy thresholds in 2028 and in the context of relevant noise mitigation and noise management measures. The assessment of likely significant effects presented in this section has regard to specific locations and residential populations that may observe likely significant effects due to changes in and levels of summer average daytime aircraft noise exposure.

7.8.114 This section first considers where changes in summer average daytime noise exposure are forecast to occur due to the Proposed Development in 2028. This is discussed in the context of the N65 and respite analysis provided earlier in this section. The significance criteria set out in **Table 7.20** is then applied to identify likely significant effects which focusses on

specific areas located within the study area where likely significant effects are forecast to occur.

7.8.115 **Figure 7.26** (**Volume IV**) presents changes in summer average daytime noise exposure due to the Proposed Development in 2028 alongside LOAEL and SOAEL contours.

7.8.116 **Figure 7.26** (**Volume IV**) shows that beneficial changes of at least 1 dB in average summer daytime noise exposure are forecast to occur in locations under approaches to Runway 09L. This includes locations such as:

- Oakley Green;
- Water Oakley; and
- Windsor.

7.8.117 These locations correspond to locations that are forecast to experience predicable respite and would observe a reduction in daytime N65 aircraft noise events due to redistributing aircraft noise as facilitated by the Proposed Development.

7.8.118 **Figure 7.26** (**Volume IV**) shows that beneficial changes of at least 1 dB in average summer daytime noise exposure are also forecast to occur under Runway 09R departure routes. This includes locations such as:

- North Feltham; and
- Hatton.

7.8.119 These locations also correspond to areas that are forecast to experience predictable respite and observe a reduction in daytime N65 aircraft noise events due to redistributing aircraft noise.

7.8.120 **Figure 7.26** (**Volume IV**) shows that 'slight' adverse increases of 1 – 2 dB in average summer daytime noise exposure are also forecast to occur under Runway 09R arrival routes. This includes locations such as:

- Stanwell Moor;
- Wraysbury; and
- Old Windsor.

7.8.121 These locations correspond to areas which would observe an increase in N65 events due to introducing easterly runway alternation. As the increases in aircraft noise would occur for a period of at least 8 hours in line with the runway alternation schedule, these locations would however receive predictable respite. Impact would therefore be limited to periods where Runway 09R is designated for arrivals as part of the runway alternation schedule i.e. between 10 to 14% of the time.

7.8.122 **Figure 7.26** (**Volume IV**) shows that 'slight' and 'minor' adverse increases of 1 – 2 dB and 2 – 3 dB respectively in average summer daytime noise exposure are also forecast to occur at the departure end of Runway 09L, along with 'moderate' increases of 3 – 6 dB forecast to occur in the vicinity of the 09L ULTIB/BPK departure routes as presented in **Figure 7.29** (**Volume IV**). These adverse increases occur in areas of:

- Cranford;
- Harlington;
- Heston; and
- North Hyde.

7.8.123 These locations correspond to areas that are forecast to experience an increase in daytime N65 aircraft noise events due to redistributing aircraft noise.

7.8.124 The 'moderate' increases in locations such as North Hyde are indicative of new impacts i.e. the introduction of aircraft noise into locations where it currently occurs at much lower levels. Such magnitudes of change, beneficial or adverse, do not occur in other locations as these are already affected by noise from arrivals and departure routes during westerly operations.

7.8.125 **Table 7.43** describes changes to the population exposed to summer average daytime noise in 2028 above the LOAEL. **Table 7.43** also presents the corresponding magnitude of change in summer average daytime noise exposure due to the Proposed Development as presented in **Figure 7.26** (**Volume IV**).

7.8.126 At a high level, **Table 7.43** shows that the impact of the Proposed Development in 2028 on summer average daytime is as follows:

- 62,200 people experience a beneficial change in aircraft noise exposure of at least 1 dB;
- 39,600 people would experience an adverse change in aircraft noise exposure of at least 1 dB;
- No residential receptors experience reductions in aircraft noise exposure of more than 2 dB;
- 7,300 people would experience a 'minor' increase in aircraft noise exposure of between 2 – 2.9 dB; and
- 15,400 people would experience a 'moderate' increase in aircraft noise exposure of between 3 – 5.9 dB.

Table 7.43 Change in Daytime Noise Exposure due to the Proposed Development – Standard Mode

Standard Mode, 79%W:21%E, Population (thousands)											
$L_{Aeq,16hr}$	Reduction in Noise Exposure					No Change	Increase in Exposure				
Exposure With Development	Major > 6.0	Moderate 3.0 – 5.9	Minor 2.0 – 2.9	Slight 1.0 – 1.9	Negligible 0.1 – 0.9	< 0.1 increase or decrease	Negligible 0.1 – 0.9	Slight 1.0 – 1.9	Minor 2.0 – 2.9	Moderate 3.0 – 5.9	Major > 6.0
Lowest Observed Adverse Effect Level (LOAEL)											
51 dB – 54 dB	0	0	0	35.7	33.4	438.1	19.4	3	3	12.1	0
"Approximate Onset of Significant Community Annoyance"											
54 dB – 57 dB	0	0	0	22.4	19.2	151	17.1	3	1.5	1.4	0
57 dB – 60 dB	0	0	0	2.8	10.4	59.6	15.4	4.6	1.3	1.1	0
60 dB – 63 dB	0	0	0	0.9	7.7	22.3	21.2	3.2	1.4	0.9	0
Significant Observed Adverse Effect Level (SOAEL)											
63 dB – 66 dB	0	0	0	0.2	4.7	6.9	11.6	2.7	0.1	0	0
66 dB – 69 dB	0	0	0	0.1	0.8	0.3	2.9	0.3	0	0	0
> 69 dB	0	0	0	0	0.4	0	0.9	0	0	0	0
Totals	**Total Experience Beneficial Magnitude of Change**						**Total Experiencing Adverse Magnitude of Change**				
	0	0	0	62.2	76.4	678.2	88.5	16.8	7.3	15.4	0
	Beneficial Changes (> 1 dB)						**Adverse Changes (> 1 dB)**				
	62.2						39.6				

Eligibility to Home Relocation Assistance Scheme (HRAS) or Quieter Neighbourhood Scheme (QNS)

Eligibility to Quieter Neighbourhood Scheme (QNS)

Eligibility to Easterly Alternation Noise Insulation Scheme (Contribution of up to £12,000)

Eligibility to Easterly Alternation Noise Insulation Scheme (Fixed Contribution of £3,000)

Adverse Likely Significant Effects

Beneficial Likely Significant Effects

7.8.127 Applying the significance criteria set out in **Table 7.20**, **Table 7.43** highlights the population forecast to experience adverse and beneficial likely significant effects due to the Proposed Development in 2028. **Table 7.43** also presents:

- changes in daytime population exposure with respect to magnitude and relevant thresholds of noise exposure; and
- eligibility to Heathrow's various insulation and relocation assistance schemes, as described in **Section 7.7**.

7.8.128 To support the assessment, the locations and areas where likely significant effects have been identified are discussed in turn with reference to **Table 7.43**. In total, there are seven areas where likely significant effects have been identified. These are summarised in **Table** 7.44 presenting location, population size (having regard to the descriptors set out in **Table 7.22**), insulation eligibility and whether these locations are likely to receive predictable respite due to the Proposed Development.

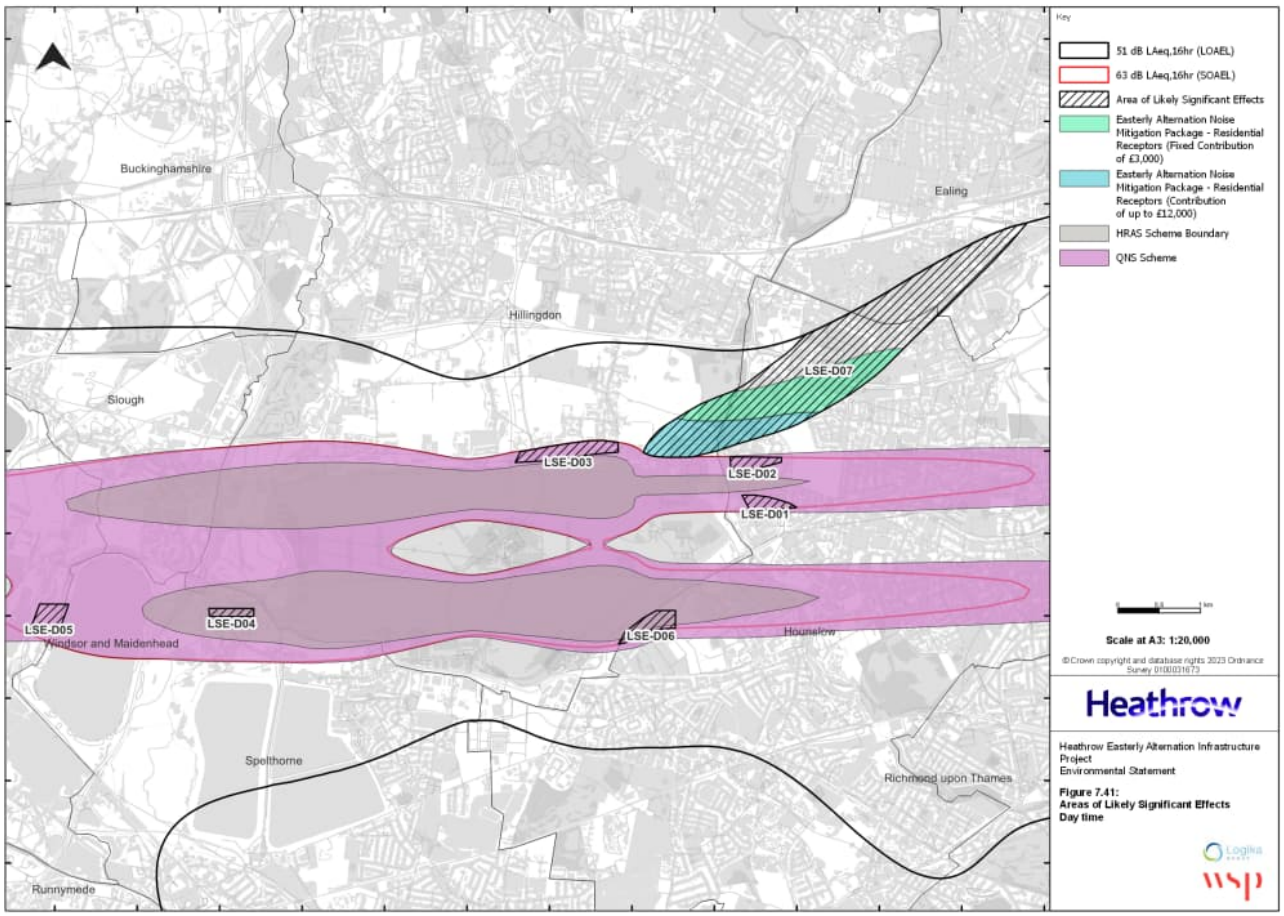
Table 7.44 Overview of Areas and Locations Forecast to Experience Likely Significant Effects in 2028 due to the Proposed Development - Daytime

LSE-Area	LSE Type	Location	Population	Insulation Eligibility	Respite Provision
LSE-D01 **Figure 7.30**	Adverse Exposure above SOAEL and a 'slight' 1 – 1.9 dB increase	Residential areas including Byron Avenue, Chaucer Avenue and Stansfield Road in Hounslow	Very High c.1,100	All people in dwellings eligible for insulation under QNS	Yes, Predictable
LSE-D02 **Figure 7.30**	Adverse Exposure above SOAEL and a 'slight' 1 – 1.9 dB increase	Residential areas off Bath Road, Cranford comprising a high population of circa 900 people.	High 900	All people in dwellings eligible for insulation under QNS	Yes, Predictable
LSE-D03 **Figure 7.30**	Adverse Exposure above SOAEL and a 'slight' 1 – 1.9 dB increase	Residential areas north of Bath Road, Harlington including Triumph Close, Brendan Close, Cheviot Close and Hall Lane.	High 850	All people in dwellings eligible for insulation under QNS	Yes, Predictable
LSE-D04 **Figure 7.31**	Adverse Exposure above SOAEL and a 'slight' 1 – 1.9 dB increase	Residential receptors located off Horton Road, Stanwell Moor	Very Low 50	All people in dwellings eligible for insulation under QNS	Yes, Predictable

LSE-Area	LSE Type	Location	Population	Insulation Eligibility	Respite Provision
LSE-D05 **Figure 7.31**	Adverse Exposure above SOAEL and a 'slight' 1 – 1.9 dB increase	Residential receptors located off Coppermill Road in Wraysbury	Low 200	All people in dwellings eligible for insulation under QNS	Yes, Predictable
LSE-D06 **Figure 7.32**	Beneficial Exposure above SOAEL and a 'slight' 1 – 1.9 dB decrease	Residential receptors, Feltham	Low 300	All people in dwellings eligible for insulation under QNS	Yes, Predictable
LSE-D07 **Figure 7.33**	Exposure between LOAEL and SOAEL and a 'moderate' 3 dB – 5.9 dB increase	Residential areas of Cranford and North Hyde	Very High 15,500	2,500 people residing in dwellings eligible for fixed contribution of £3,000 for insulation under Easterly Alternation Noise Insulation Scheme	Yes, Predictable
				900 people residing in dwellings eligible for contribution of up to £12,000 for insulation under Easterly Alternation Noise Insulation Scheme	
				12,100 people without eligibility to a noise insulation scheme	

7.8.129 An overview of each area where likely significant effects have been identified as summarised in **Table 7.42** are presented in **Graphic 7.7**.

Graphic 7.7 Overview of Areas with identified daytime likely significant effects due to the Proposed Development in 2028



7.8.130 **Areas LSE-D01 to LSE-D05** cover approximately 3,100 people that would experience at least a 'slight' (1 – 1.9 dB) increase in noise exposure and therefore experience adverse likely significant effects due to the Proposed Development in 2028. These areas are discussed with respect to wider context as follows.

7.8.131 **Area LSE-D01** (**Figure 7.30** in **Volume IV**) incorporates residential areas including Byron Avenue, Chaucer Avenue and Stansfield Road in Hounslow comprising a 'very high' population of circa 1,100 people. This area is located to the east of the Airport under 09L departures. With the Proposed Development in 2028 noise exposure ranges from approximately 63 dB to 65 dB $L_{Aeq,16hr}$ and would experience an increase of up to 10 summer average daytime N65 events. Without the Proposed Development, this area is already affected by aircraft noise from westerly arrivals onto Runway 27R and northbound departures from Runway 09R. The introduction of easterly alternation would result in departures from Runway 09L being the mode which results in the highest levels of aircraft noise in this area. In 2019, not all locations within Area LSE-D01 were exposed to levels above the SOAEL.

7.8.132 **Area LSE-D02** (**Figure 7.30** in **Volume IV**) includes residential areas off Bath Road, Cranford comprising a high population of circa 900 people. This location is to the east of the Airport under 09L departures. With the Proposed Development in 2028 noise exposure ranges from approximately 63 dB to 67 dB $L_{Aeq,16hr}$ and would experience an increase of up to 60 summer average daytime N65 events. Without the Proposed Development, this area

is already affected by aircraft noise from westerly arrivals onto Runway 27R. The introduction of easterly alternation would result in departures from Runway 09L being the mode which results in the highest levels of aircraft noise in this area. In 2019, not all locations within Area LSE-D01 were exposed to levels above the SOAEL.

7.8.133 **Area LSE-D03** (**Figure 7.30** in **Volume IV**) incorporates residential areas north of Bath Road, Harlington including Triumph Close, Brendan Close, Cheviot Close and Hall Lane comprising a high population of circa 850 people. This area is located to the north of the Airport. With the Proposed Development in 2028 noise exposure ranges from approximately 63 dB to 67 dB $L_{Aeq,16hr}$ and would experience an increase of up to 70 summer average daytime N65 events. Without the Proposed Development in 2028 this area is mostly affected by aircraft noise from westerly arrivals and departures on Runway 27R. The introduction of easterly alternation would result in departures from Runway 09L being the mode which results in the highest levels of aircraft noise in this area. In most instances, this area is brought into the SOAEL in 2028 due to the Proposed Development. In 2019, all locations within Area LSE-D03 were exposed to levels above the SOAEL.

7.8.134 **Area LSE-D04** (**Figure 7.31** in **Volume IV**) comprises residential receptors located off Horton Road in Stanwell Moor comprising a very low population of circa 50 people. This area is located to the west of the Airport. With the Proposed Development in 2028 noise exposure ranges from approximately 68 dB to 70 dB $L_{Aeq,16hr}$ and would experience an increase of around 60 summer average daytime N65 events. Without the Proposed Development in 2028 this area is mostly affected by aircraft noise from westerly departure from Runway 27L. In 2019, all locations within Area LSE-D04 were exposed to levels above the SOAEL.

7.8.135 **Area LSE-D05** (**Figure 7.31** in **Volume IV**) includes residential receptors located off Coppermill Road in Wraysbury comprising a low population of circa 200 people. This area is located to the west of the Airport. With the Proposed Development in 2028 noise exposure ranges from approximately 63 dB to 65 dB $L_{Aeq,16hr}$ and would experience an increase of around 60 summer average daytime N65 events. Without the Proposed Development in 2028 this area is already affected by aircraft noise from westerly departures from Runway 27L and southbound departures from Runway 27R. This area is forecast to be exposed to levels at and above the SOAEL in 2028 without the Proposed Development. In 2019, all locations within Area LSE-D05 were exposed to levels above the SOAEL.

7.8.136 Aircraft noise from Heathrow Airport dominates the overall ambient noise climate in Areas LSE-D01 to LSE-D05, and as such residential receptors in these areas will be sensitive to changes in exposure to aircraft noise. In all instances, the Proposed Development leads to higher levels of aircraft noise during 09L departures and 09R arrivals.

7.8.137 As highlighted in **Table 7.44**, predictable respite is forecast to occur in each of the areas experiencing likely significant effects. This is because the impacts of the Proposed Development in these areas are limited to the alternation period, which equates to around 10% of the time during the summer, and around 14% of the time over the course of a year, based on current trends in modal split.

7.8.138 As indicated by **Table 7.43** and in **Table 7.42**, as noise exposure in these areas is either already above or would become exposed to levels of 63 dB $L_{Aeq,16hr}$ (SOAEL) or more, all

residential receptors in these areas would be eligible for a package of noise insulation, up to a value of £34,000, under Heathrow's QNS RIS.

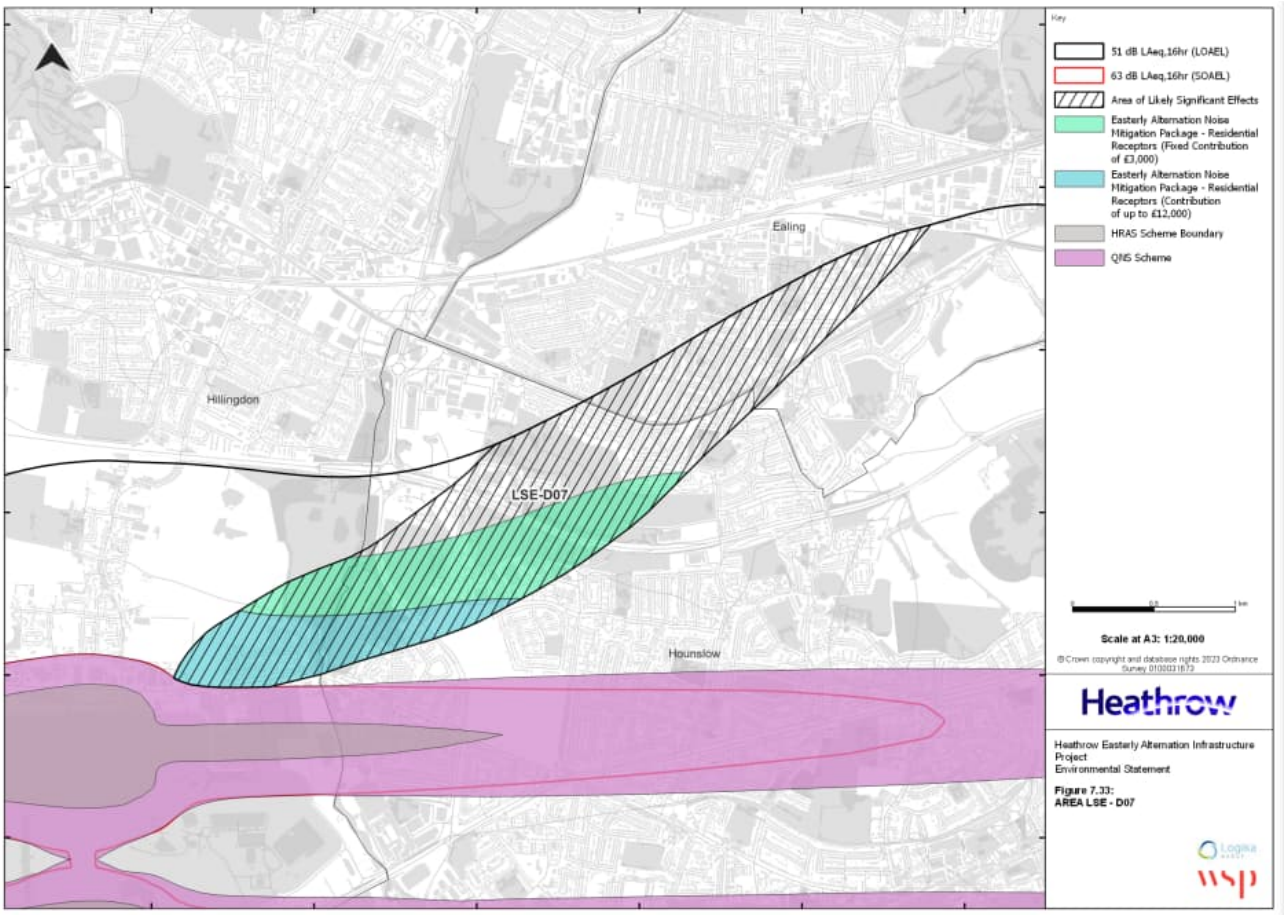
7.8.139 Although many of the receptors located within Areas LSE-D01 to LSE-D05 may have already benefited from noise insulation measures under Heathrow's legacy noise insulation schemes, this does not preclude these receptors from being eligible for new measures under the QNS RIS.

7.8.140 In conclusion, adverse likely significant effects are forecast to occur for residential receptors within LSE-D01 to LSE-D05 due to the Proposed Development in 2028. However, environmental measures in the form of predicable noise respite through easterly runway alternation, and noise insulation through Heathrow's QNS RIS will be available for receptors in these areas. Due to the package of measures available under the QNS RIS and the funding available as part of the scheme, it is concluded that the QNS RIS would limit impacts, allowing internal conditions to be protected and mitigate the adverse likely significant effects identified in LSE-D01 to LSE-D05.

7.8.141 As shown in **Table 7.42**, around 300 people at the departure end of Runway 09R in Feltham are forecast to experience beneficial likely significant effects. This is due to a reduction of 1 – 1.9 dB where their exposure is forecast to be above the SOAEL in 2028 without the Proposed Development. These receptors are shown in **Figure 7.32** (**Volume IV**) as **Area LSE-D06**. This area would observe the introduction of predictable respite due to the Proposed Development and a reduction of up to 70 summer average daytime N65 events. Residential dwellings in this area are already eligible for noise insulation under Heathrow's QNS RIS.

7.8.142 Between the LOAEL and SOAEL, **Table 7.43** shows that approximately 15,500 people would experience a 'moderate' increase of 3 – 5.9 dB in summer average daytime noise exposure due to the Proposed Development in 2028. These people are in a single area which is referred to as **Area LSE-D07** for assessment purposes as highlighted in **Table 7.42** and is presented in **Figure 7.33** (**Volume IV**). **Graphic 7.8** reproduces **Figure 7.33** (**Volume IV**).

Graphic 7.8 LSE-D07 as reproduced from Figure 7.33



7.8.143 LSE-D07 extends from the airport covering various residential streets to the north of the A4 Bath Road, such as Eton Road and Staunton Avenue. LSE-D07 extends to the north-east beyond the M4 motorway encompassing areas of North Hyde and Southall Green. The people within **Area LSE-D07** are impacted by aircraft noise from the 09L ULTIB/BPK departure route as presented in **Figure 7.29** (**Volume IV**). **Figure 7.29** (**Volume IV**) highlights how this departure route is separate from its counterpart Runway 09R ULTIB/BPK route.

7.8.144 The aircraft noise impacts in this area can be considered new both in terms of introducing receptors to levels above the LOAEL, and through a significant increase in daytime noise exposure due to the proximity and use of the 09L ULTIB/BPK route relative to all other flight paths. The effect is that certain areas become introduced to summer average daytime noise levels above the LOAEL, with receptors experiencing increases of 3 – 5.9 dB at all levels of summer average noise exposure above the LOAEL.

7.8.145 During 09L departures, aircraft noise levels within **Area LSE-D07** would range from 60 – 70 dB $L_{Aeq,8hr\ (alternation\ period)}$. These levels would however occur for around 10% of the time during the summer, and around 14% over a year based on current trends in modal split and the alternation pattern.

7.8.146 The N65 analysis highlights that this area experiences an increased number of aircraft noise events due to the Proposed Development. The number of summer average N65 events within Area LSE-D07 varies. Summer average N65 events with the Proposed Development

in 2028 within Area LSE-D07 range from 40 to over 500 for an average summer day depending on proximity to the airport. In general, and depending on location within Area LSE-D07, the Proposed Development is forecast to increase the number of average summer day N65 events by approximately 10 to 70. On a busy easterly day, the number of N65 events within LSE-D07 ranges from 60 to 300 depending on proximity to the airport and the 09L ULTIB/BPK route.

7.8.147 **Area LSE-D07** includes other sources of environmental noise, namely the A312 'The Parkway' and the M4 motorway. Aircraft noise events from landings onto Runway 27R and departures from Runway 09R may be observable. Most residential receptors within Area LSE-D07 are set back from these sources and are exposed to local road traffic noise and distance road traffic noise from the motorways and trunks roads. When considering the levels of aircraft noise during the Runway 09L departures, aircraft noise events are likely to dominate ambient noise in these areas during this mode of operation, particularly within the southern half of this area where aircraft noise is likely to dominate the overall ambient noise climate.

7.8.148 Although the proposed scheduled use and separation of the 09L ULTIB/BPK route from other flight paths results in significant increases in noise exposure within **Area LSE-D07**, this separation provides the basis for predicable respite.

7.8.149 Based on data held by Heathrow Airport, no residential dwellings within **Area LSE-D07** have been eligible for noise insulation under Heathrow's legacy sound insulation schemes, nor are these receptors eligible for noise insulation under Heathrow's QNS RIS as the absolute level of noise exposure in this area is below the SOAEL.

7.8.150 As highlighted in **Table 7.43** and as summarised in **Table 7.44**, certain receptors within Area LSE-D07 will be eligible for a financial contribution towards the costs of noise insulation under the Easterly Alternation Noise Insulation Scheme.

7.8.151 Under this scheme, residential receptors within **Area LSE-D07** that are forecast to be exposed to summer average daytime noise levels of 54 dB $L_{Aeq,16hr}$ (marking the *'approximate onset of significant community annoyance'*) to 60 dB $L_{Aeq,16hr}$ in 2028 due to the Proposed Development will be eligible for fixed contribution of £3,000 towards the costs of noise insulation, covering approximately 800 residential dwellings (2,500 people).

7.8.152 For residential receptors within **Area LSE-D07** that are forecast to experience levels of summer average noise exposure at levels of 60 dB $L_{Aeq,16hr}$ to 63 dB $L_{Aeq,16hr}$, the Easterly Alternation Noise Insulation Scheme provides a contribution of up to £12,000 towards the costs of noise insulation, covering approximately 300 residential dwellings (900 people).

7.8.153 These contributions are considered proportionate given the limited period of the year that properties would be affected, compared with those that qualify for the full QNS scheme.

7.8.154 In conclusion, adverse likely significant effects are forecast to occur for residential receptors within **Area LSE-D07** due to the Proposed Development in 2028. The adverse significant effects in this location are considered to constitute a new impact.

7.8.155 Between the LOAEL and SOAEL, PPG-N describes an outcome of being exposed to such levels as *"having to close windows for some of the time because of the noise"* recognising that noise impacts below the SOAEL are not so routine as *"having to keep windows closed*

most of the time". The Easterly Alternation Noise Insulation Scheme provides for financial contributions toward noise insulation where exposure is above the *"approximate onset of significant community annoyance"* where a significant adverse change in noise exposure is forecast to occur capturing around 1,100 dwellings and 3,400 people. Should the noise insulation offers be taken up by eligible dwellings, when windows are closed, this will help mitigate and reduce internal noise levels during Runway 09L departures.

Likely Significant Effects - Night-time

7.8.156 In line with the approach taken for daytime likely significant effects, night-time likely significant effects are first considered with respect to locations that will observe different magnitudes of change in 2028 above the LOAEL. The significant criteria set out in **Table 7.21** is then applied to identify likely significant effects which focusses on specific areas located within the study area where likely significant effects are forecast to occur.

7.8.157 **Table 7.45** applies the significance criteria and describes changes to the population exposed to summer average night-time noise in 2028 above the LOAEL. **Table 7.45** also presents the corresponding magnitude of change in summer average night-time noise exposure due to the Proposed Development. This is presented spatially in **Figure 7.28** (**Volume IV**). **Table 7.45** also presents changes in night-time noise exposure with respect to Heathrow's QNS RIS insulation scheme.

7.8.158 **Figure 7.28** (**Volume IV**) shows that for summer average night-time noise exposure, the Proposed Development would lead to increases of at least 1 dB at locations including:

- Old Windsor;
- Harlington;
- Stanwell Moor; and
- Cranford.

7.8.159 **Figure 7.28** (**Volume IV**) shows reductions in summer average night-time noise exposure of at least 1 dB as a result of the Proposed Development are forecast to occur at locations in:

- Poyle;
- Windsor;
- Oakley Green; and
- North Feltham.

7.8.160 **Table 7.45** shows that around 29,000 people would observe at least a 1 dB decrease in average summer night-time noise exposure above the LOAEL as a result of the Proposed Development. This compares to the 12,300 people forecast to observe at least a 1 dB increase in daytime noise exposure above the LOAEL as a result of the Proposed Development.

7.8.161 On balance, more people would experience at least a 1 dB reduction in average summer night-time noise exposure than would experience at least a 1 dB increase in average

summer night-time noise exposure as a result of the Proposed Development. As shown in **Table 7.41** a reduction of 7,900 exposed to levels above the LOAEL is also forecast. This indicates that the Proposed Development leads to a broadly beneficial outcome in relation to night-time noise exposure across the population. This is underpinned by the calculation of the numbers of people 'highly sleep disturbed' which is discussed in the following section which indicates a reduction in the number of people sleep disturbed.

7.8.162 To further support of these outcomes, high-level consideration has been given to potential changes in aircraft noise additional awakenings during the night (23:00 – 07:00hrs). This is described in Section 4 of **Appendix 7.5: Air Noise**. Although consideration of aircraft noise additional awakenings is becoming more commonplace, the WHO ENG18 indicates that the long-term health effects of short-term noise-induced awakenings are still not well understood and that the *"relationship between different types of single-event noise indicators and long-term health outcomes at the population level remains tentative"*. **Figure 7.35** (**Volume IV**) presents the location and pattern of potential changes in aircraft noise related objective awakenings due to the Proposed Development. This informative appraisal shows that the Proposed Development would not lead to any increase or decrease of more than 1 objective awakening at any residential receptor.

7.8.163 At a high level, **Table 7.45** shows that the impact of the Proposed Development in 2028 on summer average night-time noise exposure is as follows:

- 29,000 people experience a beneficial change in summer average night-time noise exposure of at least 1 dB;
- 12,300 people would experience an adverse change in summer average night-time noise exposure of at least 1 dB;
- No residential receptors experience reductions in aircraft noise exposure of more than 2 dB;
- 11,200 people would experience a 'slight' increase in summer average night-time noise exposure of 1.0 – 1.9 dB; and

  1,000 people would experience a 'minor' increase in aircraft noise exposure of between 2 – 2.9 dB.

Table 7.45 Change in Night-time Noise Exposure due to the Proposed Development – Standard Mode

Standard Mode, 76%W:24%E, Population (thousands)											
$L_{Aeq,8hr}$	Reduction in Noise Exposure					No Change	Increase in Exposure				
Exposure With Development	Major > 6.0	Moderate 3.0 – 5.9	Minor 2.0 – 2.9	Slight 1.0 – 1.9	Negligible 0.1 – 0.9	< 0.1 increase or decrease	Negligible 0.1 – 0.9	Slight 1.0 – 1.9	Minor 2.0 – 2.9	Moderate 3.0 – 5.9	Major > 6.0
Lowest Observed Adverse Effect Level (LOAEL)											
45 – 48 dB	0.0	0.0	0.0	18.5	17.4	304.0	10.9	3.2	0.2	0.0	0.0
48 – 51 dB	0.0	0.0	0.0	9.2	8.0	131.7	7.5	4.0	0.5	0.0	0.0
51 – 55 dB	0.0	0.0	0.0	1.1	2.6	106.6	15.2	3.7	0.3	0.0	0.0
Significant Observed Adverse Effect Level (SOAEL)											
55 – 57 dB	0.0	0.0	0.0	0.2	0.4	22.4	2.4	0.2	0.0	0.0	0.0
57 – 60 dB	0.0	0.0	0.0	0.0	0.6	21.6	2.4	0.1	0.0	0.0	0.0
60 – 63 dB	0.0	0.0	0.0	0.0	0.0	1.2	2.1	0.1	0.0	0.0	0.0
> 63 dB	0.0	0.0	0.0	0.0	0.3	0.0	0.6	0.0	0.0	0.0	0.0
Totals	**Total Experience Beneficial Magnitude of Change**						**Total Experiencing Adverse Magnitude of Change**				
	0.0	0.0	0.0	29.1	29.3	587.5	41.0	11.2	1.0	0.0	0.0
	Beneficial Changes (> 1 dB)						**Adverse Changes (> 1 dB)**				
	29,100						12,200				

Eligibility to Quieter Neighbourhood Scheme (QNS) Residential Insulation Scheme (RIS)

Adverse Likely Significant Effects

Beneficial Likely Significant Effects

7.8.164 When comparing the changes in average summer night-time exposure to those observed for the average summer day, it is noted that the magnitude of the changes in night-time noise exposure are lower than those observed for daytime periods i.e. there are no 'moderate' changes in night-time noise exposure. The 'moderate' increases in average summer daytime noise exposure occur under 09L departure routes. During the night, departures at Heathrow Airport are scheduled to commence from 06:00 local time onwards, but tend to occur from 06:20, whereas prior to this the airport receives arrivals. As such, scheduled departures occur for around one hour of the 8-hour night-time period. When taking into account the alternation schedule, the average summer night-time modal split, with the Proposed Development night-time departures from Runway 09L during the summer would make up for around 6 - 7 minutes of the overall average 8-hour night-time summer operations[154].

7.8.165 **Table 7.45** shows that are no people that are forecast to experience likely significant effects where their noise exposure is forecast to be below the SOAEL.

7.8.166 Above the SOAEL, **Table 7.45** shows that around 400 people would observe at least a 'slight' increase in summer average noise exposure due to the Proposed Development and therefore experience adverse likely significant effects. **Table 7.45** shows that 200 people would observe at least a 'slight' decrease in summer average noise exposure due to the Proposed Development which is considered a beneficial likely significant effect.

7.8.167 The likely significant effects identified in **Table 7.45** occur over three areas around the airport as summarised in **Table 7.46**.

Table 7.46 Overview of Areas and Locations Forecast to Experience Likely Significant Effects in 2028 due to the Proposed Development – Nighttime

LSE-Area	LSE Type	Location	Population	Insulation Eligibility
LSE-N01 **Figure 7.34**	Adverse Exposure above SOAEL and a 'slight' 1 – 1.9 dB increase	Residential receptors located in Wraysbury, in the vicinity of Coppermill Road.	<200 Low	All people in dwellings eligible for insulation under QNS and eligible for relocation assistance under HRAS
LSE-N02 **Figure 7.34**	Adverse Exposure above SOAEL and a 'slight' 1 – 1.9 dB increase	Residential receptors located in Stanwell Moor, in the vicinity of Horton Road and Spout Lane.	<200 Low	All people in dwellings eligible for insulation under QNS
LSE-N03 **Figure 7.34**	Beneficial	Residential receptors, off Hatton Road, Hatton Cross	c100 Low	All people in dwellings eligible for insulation under QNS.

[154] The hour 06:00 to 07:00 makes up one hour of the night-time period (23:00 to 07:00). Easterly departures in this hour over the summer would occur half of the time that the airport is operating in an easterly direction i.e. half of 21%.

LSE-Area	LSE Type	Location	Population	Insulation Eligibility
	Exposure above SOAEL and a 'slight' 1 – 1.9 dB decrease			
LSE-N04 **Figure 7.34**	Beneficial Exposure above SOAEL and a 'slight' 1 – 1.9 dB decrease	Residential receptors located in Poyle, off Bath Road including Poplar Close, Sherbourne Close, and Meadowbrook Close	<100 Low	All people in dwellings eligible for insulation under QNS and eligible for relocation assistance under HRAS

7.8.168 Areas LSE-N01 and LSE-N02 are located under the final stages of 09R arrivals and under the initial stages of westerly departures from runways 27R and 27L. In both areas, summer average night-time N60 events would increase by less than 5 due to the Proposed Development in 2028. This change would occur primarily during the period 06:00-07:00hrs as then the majority of aircraft arrivals land on the designated landing runway. During the night-time period, these locations are already impacted by aircraft arriving onto Runway 09R during easterly winds due to 'early morning TEAM'.

7.8.169 All residential receptors within Area LSE-N01 and Area LSE-N02 are already eligible for noise insulation under the QNS RIS. It is also likely that the majority of the residential receptors in this area have already benefited from noise insulation under Heathrow's legacy noise insulation programmes. In the case of Area LSE-N01, these receptors fall within the HRAS eligibility boundary for home relocation assistance.

7.8.170 Area LSE-N03 comprises a group of residential dwellings located off Hatton Road, Hatton Cross. A beneficial likely significant effect is forecast in this area which comprises a group of residential dwellings that are located under the initial stage of departure from Runway 09R and are already eligible for insulation under the QNS RIS. It likely that the majority of the residential receptors in this area have already benefited from noise insulation under Heathrow's legacy noise insulation programmes.

7.8.171 Area LSE-N04 comprises a group of residential dwellings located off Bath Road in Poyle. A beneficial likely significant effect is forecast in this area which comprises a group of residential dwellings that are located under the final approach to Runway 09L and are already eligible for insulation under the QNS RIS and relocation assistance under the HRAS scheme. It likely that the majority of the residential receptors in this area have already benefited from noise insulation under Heathrow's legacy noise insulation programmes.

7.8.172 As highlighted in **Table 7.46**, all receptors within Areas LSE-N01 to LSE-N04 are eligible for insulation under the QNS RIS. Although many of the receptors within these areas have already benefited from noise insulation measures under Heathrow's legacy noise insulation schemes, this does not preclude these receptors from being eligible for new measures under the QNS RIS. Due to the package of measures available under the QNS RIS and the funding available under the scheme, it is concluded that the QNS RIS would limit impacts,

allowing internal conditions to be protected and mitigate the adverse likely significant effects.

Likely Significant Effects – Conclusion

7.8.173 The daytime assessment of likely significant effects has identified adverse likely significant effects for 3,100 people where their summer average daytime noise exposure is above the SOAEL. These receptors are eligible for a package of noise insulation under Heathrow's QNS RIS. These adverse likely significant effects are therefore considered to be mitigated through the QNS RIS.

7.8.174 The daytime assessment has identified a further 15,500 people experiencing daytime adverse likely significant effects where their noise exposure is above the LOAEL but below the SOAEL. Of these people, 3,400 are forecast to reside within dwellings that would be eligible under the Easterly Alternation Noise Insulation Scheme. This scheme will provide a fixed contribution of £3,000 towards the costs of insulation measures for around 2,500 people within eligible dwellings forecast to be exposed to levels of 54 dB $L_{Aeq,\ 16hr}$ to 60 dB $L_{Aeq,16hr}$, and a contribution of up to £12,000 for 900 people within eligible dwellings exposed to levels of 60 dB $L_{Aeq,\ 16hr}$ to 63 dB $L_{Aeq,16hr}$. Where insulation is installed within these dwellings, this will contribute towards mitigating and minimising the indoor noise impacts of the Proposed Development. The Easterly Alternation Noise Insulation Scheme therefore provides financial assistance towards the costs of noise insulation where adverse likely significant effects are forecast and where noise exposure is forecast to be above the *"approximate onset of significant community annoyance"*.

7.8.175 Heathrow will engage with all dwellings that become eligible under the QNS RIS due to the Proposed Development and would be eligible for insulation under the Easterly Alternation Noise Insulation Scheme.

7.8.176 The assessment shows around 12,100 people would experience adverse likely significant effects due to the Proposed Development and become exposed to levels above the daytime LOAEL but below the '*approximate onset of significant community annoyance'* of 54 dB $L_{Aeq,16hr}$. Predictable respite would however occur at these receptors limiting impacts to each side of the alternation period.

7.8.177 During the night, the assessment of likely significant effects has identified three areas above the night-time SOAEL where adverse and beneficial likely significant effects are forecast. In all cases, residential receptors in these areas are eligible for full package of noise insulation under the QNS RIS and as such, this scheme is considered to mitigate these effects.

Operational Phase: Annoyance, Sleep Disturbance and Monetised Outcomes

7.8.178 **Appendix 7.5: Air Noise** presents a series of informative appraisals which consider changes in the number of people 'highly annoyed' and 'highly sleep disturbed' with and without the Proposed Development in 2028. An appraisal considering the monetised health outcomes due to changes in aircraft noise exposure due to the Proposed Development in 2028 is also provided.

7.8.179 The calculation of the number of people 'highly annoyed' and 'highly sleep disturbed' using ERFs provides an understanding of how changes in noise exposure may result in changes in annoyance and sleep disturbance due to the Proposed Development in 2028.

7.8.180 In the case of monetised outcomes, these appraisals have utilised the Department for Transport's Transport Analysis Guidance (TAG) Unit A3 Environmental Impact Appraisal tool and variations of this. TAG, formally referred to a 'WebTAG', is not a comprehensive assessment of noise impacts[155]..

Annoyance

7.8.181 **Table A7.5.20 (Appendix 7.5: Air Noise**) presents the total number of people highly annoyed in 2028 with and without the Proposed Development using the SONA14 ERF which rely on the average summer daytime $L_{Aeq,16hr}$ metric. This shows that without the Proposed Development in 2028, the total number of people highly annoyed is estimated to be 93,800. With the Proposed Development, this reduces by 400 to 93,400.

7.8.182 Annoyance has also been calculated having regard for the ERFs provided in CAA document CAP2250 (**Table A7.5.10** and **Table A7.5.11, Appendix 7.5: Air Noise**). These ERFs differ depending on the respite noise change that occurs between runway modes due to runway alternation. Two scenarios are considered which account for two different ERFs for two separate respite noise changes. In both scenarios, the effect of the Proposed Development is to reduce the number of people highly annoyed.

7.8.183 Annoyance has also been considered utilising ERFs associated with the WHO ENG18 (**Table A7.5.12, Appendix 7.5: Air Noise**). This assessment has considered the number of people highly annoyed from the WHO guideline value of 45 dB L_{den} in 2028 with and without the Proposed Development in 2028. The WHO ENG18 ERFs and guidelines have not been adopted by Government. However, this sensitivity test provides for an understanding of the impact of the Proposed Development beyond the LOAEL. Without the Proposed Development in 2028, the number of people highly annoyed by aircraft noise above 45 dB L_{den} is estimated to be 873,200. With the Proposed Development in 2028, this is estimated to reduce by 8,200.

7.8.184 In summary, all three appraisals relating to the numbers of people 'highly annoyed' by aircraft noise show that the effect of the Proposed Development in 2028 is beneficial.

7.8.185 Taking into account the *'approximate onset of significant community annoyance'* at 54 dB $L_{Aeq,16hr}$, **Table 7.39** supports these outcomes by showing a reduction of 15,300 exposed above this threshold due to the Proposed Development in 2028.

Sleep Disturbance

7.8.186 **Table A7.5.21 (Appendix 7.5: Air Noise**) presents the total number of people highly sleep disturbed in 2028 with and without the Proposed Development. This table shows that with the Proposed Development in 2028 the number of people highly sleep disturbed is forecast to reduce by 600.

[155] ANG17, Paragraph 3.6

7.8.187 When considering changes in the number of people highly sleep disturbed using the WHO ENG18 ERFs from 40 dB L_{night}, as presented in **Table A7.5.13 (Appendix 7.5: Air Noise**), this shows that the Proposed Development would result in a reduction of 1,800 people highly sleep disturbed.

Monetised Outcomes

7.8.188 The monetisation of aircraft noise in accordance with TAG is based on the valuation of health outcomes due to 1 dB changes in daytime and night-time noise exposure above their LOAELs and the number of people that experience these changes. The valuation of these changes is also dependent upon the level of aircraft noise that people experiencing these changes are exposed to.

7.8.189 As outlined in **Section 7.5**, TAG is intended for use by DfT when considering 'government interventions' on policy options, such as decision making on different 'options' relevant to airspace change proposals and is not required in the case of this application for planning permission. However, the information it provides can be used as a guide for health impacts in the context of whether interventions lead to beneficial or adverse changes across the population.

7.8.190 As established in **Table 7.43** and **Table 7.45**, the number of people that are forecast to experience at least a 1 dB decrease in daytime and night-time noise exposure is higher than those experiencing at least a 1 dB increase. When considering changes in the number of people highly annoyed and highly sleep disturbed, these changes result in a beneficial effect. These outcomes have an influence on the monetised outcomes using the TAG methodology.

7.8.191 Section 6 of **Appendix 7.5: Air Noise** presents the outcome of an 'in year' TAG appraisal which is based on summer average daytime and night-time aircraft noise exposure in 2028 with and without the Proposed Development. The TAG appraisal demonstrates a net benefit in monetised health outcomes due to the Proposed Development.

7.8.192 Section 6 of **Appendix 7.5: Air Noise** presents two further appraisals in relation to monetised health outcomes based on the TAG methodology. These appraisals consider the monetisation of aircraft noise exposure levels below the daytime and night-time LOAELs as considered by TAG down to the WHO ENG18 recommended guidelines of 45 dB L_{den} and 40 dB L_{night} and/or using alternative ERFs. This has included consideration of a mental health outcome, which is not part of TAG. These further appraisals both show beneficial outcomes due to the Proposed Development in 2028 with each health outcome indicating an improvement due to changes in noise exposure.

7.8.193 The monetised appraisals presented **Appendix 7.5: Air Noise** therefore follow the trends in changes to noise exposure as described in this Chapter. The Chapter shows that a higher number of people experience reductions in aircraft noise at levels between the LOAEL and the SOAEL as opposed to a small number of people experiencing increases in noise above the SOAEL. The TAG appraisals indicate that this trend may result in a beneficial effect on health outcomes across the population. The TAG appraisal is not however a health assessment. The health assessment for the Proposed Development can be found in **Chapter 9: Public Health**.

Operational Phase: Aircraft Air Noise – Non-Residential Noise Sensitive Receptors

7.8.194 Based on the assessment methodology set out in **Section 7.5**, the following non-residential noise sensitive receptor types were found to either: not exist within in the study area; experience a less than 1 dB ('negligible') change in summer average noise exposure; or be exposed to levels below the 'lower' assessment thresholds set out in **Table 7.23**:

- Large and small auditoria;
- Concert halls;
- Sound recording and broadcast studios;
- Theatres;
- Courts,
- Cinemas;
- Lecture theatres; and
- Museums

7.8.195 These receptor types have therefore not been considered as part of the assessment. Receptor types which have been considered are as follows:

- Places of meeting for religious worship;
- Libraries;
- Community halls;
- Hospitals or other healthcare settings; and
- Schools or registered nurseries.

7.8.196 All receptors of these types forecast to experience at least a 'negligible' change in summer average noise exposure above the 'lower' assessment threshold have been identified along with any receptor forecast to be exposed to levels above the 'upper' assessment threshold of 63 dB $L_{Aeq,16hr}$ due to the Proposed Development in 2028.

7.8.197 For the receptors considered in the assessment, tabular information relating to noise exposure and noise events with and without the Proposed Development in 2028 can be found in **Appendix 7.5: Air Noise**. These tables provide supplementary metrics for the 2028 assessment year, including:

- Summer Average Daytime N65;
- Busy Easterly Day $L_{Aeq,16hr}$;
- Highest Single Mode Level $L_{Aeq,8hr\ (alternation\ period)}$; and
- Highest Single Model N65.

7.8.198 The tables also indicate whether receptors are eligible for insulation under the QNS and whether the building has already received insulation under one of Heathrow's legacy insulation schemes.

Places of Meeting for Religious Worship

7.8.199 Above the 'lower' assessment threshold of 55dB $L_{Aeq,16h}$, 15 places of meeting for religious worship are forecast to experience at least a 'slight' change in summer average daytime noise exposure due to the Proposed Development in 2028. These are presented in **Appendix 7.5: Air Noise**.

Adverse Impacts

7.8.200 Adverse impacts on forecast at eight places of meeting for religious worship as shown in **Table A7.5.52, Appendix 7.5: Air Noise**.

7.8.201 Five places of meeting for religious worship are forecast to experience a 'slight' adverse increase of 1 – 1.9 dB in summer average daytime noise exposure due to the Proposed Development in 2028. In general, each of these receptors are forecast to be exposed to levels of between 56 dB – 59 dB $L_{Aeq,16hr}$. As the increases are 'slight' and exposure falls between the 'lower' and 'upper' assessment thresholds, no adverse likely significant effects are concluded for these receptors based on the adopted significance criteria.

7.8.202 One receptor, Heathrow Jamia Masjid (Park Lane, TW5 9RW), is forecast to experience a 'minor' adverse increase of 2 – 2.9 dB in summer average daytime noise exposure due to the Proposed Development in 2028. It is forecast to experience a 2.8 dB increase in noise exposure, leaving it exposed to a level below the 'upper' threshold of 61.7 dB $L_{Aeq,16hr}$. No adverse likely significant effects are concluded for this receptor based on the adopted significance criteria.

7.8.203 Two places of meeting for religious worship are forecast to experience a 'moderate' adverse increase of more than 3 dB in summer average daytime noise exposure due to the Proposed Development in 2028. These receptors are:

- Holy Angels Anglican Church (High Street, TW5 9RG); and
- St Christopher Roman Catholic Church (High Street, TW5 9RG).

7.8.204 These receptors are forecast to experience a 3.2 and 3.3 dB increase in summer daytime noise exposure due to the Proposed Development, respectively, and become exposed to levels of around 59 dB $L_{Aeq,16hr.}$ Adverse likely significant effects are identified at these receptors based on the magnitude of noise change in the context of elevated levels of exposure. These receptors have not previously been insulated under Heathrow's legacy CBNIS and are not eligible for noise insulation under QNS CBS, as they fall below the 63 dB $L_{Aeq,16hr}$ that Government expects airport operators to offer acoustic insulation to noise-sensitive buildings.

Beneficial Impacts

7.8.205 Beneficial impacts on forecast at seven places of meeting for religious worship as shown in **Table A7.5.53, Appendix 7.5: Air Noise**.

7.8.206 Six places of meeting for religious worship are forecast to experience a 'slight' beneficial decrease of 1 – 1.9 dB in summer average daytime noise exposure due to the Proposed Development in 2028. In general, each of these receptors are forecast to be exposed to levels of between 55 dB – 60 dB $L_{Aeq,16hr}$ due to the Proposed Development in 2028. As the change forecast for these receptors is 'slight' and below the 'upper' assessment threshold, no beneficial likely significant effects are concluded at these receptors.

7.8.207 One place of meeting for religious worship is forecast to experience a 'minor' beneficial decrease of 2 – 2.9 dB in summer average daytime noise exposure due to the Proposed Development in 2028. This receptor (Hatton Road Baptist Church, Hatton Road, TW14 9QS) is forecast to be exposed to levels above the 'upper' assessment threshold in 2028 without the Proposed Development, and below the 'upper' assessment threshold in 2028 with the Proposed Development. A beneficial likely significant effect is therefore concluded for this receptor.

Libraries

7.8.208 **Table A7.5.64, Appendix 7.5: Air Noise** shows that one receptor has been identified as experiencing at least a 'slight' change in summer average noise exposure above the 'lower' assessment threshold for libraries of 55dB $L_{Aeq,16h.}$

7.8.209 Old Windsor Memorial Hall (Straight Road, SL4 2RN) is located under 09R arrivals and is forecast to experience a 'slight' adverse increase of 1 – 1.9 dB in summer average daytime noise exposure due to the Proposed Development in 2028. It is forecast to experience a 1.6 dB increase in noise exposure, leaving it exposed to a level of 58.5 dB $L_{Aeq,16hr}$. No adverse likely significant effects are concluded for this receptor based on the adopted significance criteria.

Community Halls

7.8.210 Above the 'lower' assessment threshold of 55dB$L_{Aeq,16h,}$ seven community halls are forecast to experience at least a 'slight' change in summer average daytime noise exposure due to the Proposed Development in 2028. These are presented in **Table A7.5.54** and **Table A7.5.55** of **Appendix 7.5: Air Noise**.

Adverse Impacts

7.8.211 **Table A7.5.54** shows that three community halls are forecast to experience a 'slight' adverse increase of 1 – 1.9 dB in summer average daytime noise exposure due to the Proposed Development in 2028. These receptors are:

- Old Windsor Memorial Hall (Straight Road, SL4 2RN);
- Sipson Community Centre (Sipson Way, UB7 0DD; and
- Old Chapel Meeting Room (Church Road, SL4 2PL).

7.8.212 These receptors are forecast to experience a 1.2 to 1.6 dB increase in summer daytime noise exposure due to the Proposed Development and become exposed to levels below the 'upper' assessment threshold of between 58 – 59 dB $L_{Aeq,16hr.}$ No adverse likely significant effects are concluded for these receptors.

7.8.213 One receptor, Cranford Memorial Hall (High Street, TW5 0RQ), is forecast to experience a 'minor' adverse increase of 2 – 2.9 dB in summer average daytime noise exposure due to the Proposed Development in 2028. It is forecast to experience a 2.7 dB increase in noise exposure leaving it exposed below the 'upper' assessment threshold at a level of 60.7 dB $L_{Aeq,16hr}$. An adverse likely significant effect is therefore not concluded for this receptor.

Beneficial Impacts

7.8.214 **Table 7.5.55** shows that three community halls are forecast to experience a 'slight' beneficial decrease of 1 – 1.9 dB in summer average daytime noise exposure due to the Proposed Development in 2028. These receptors are:

- Community Centre (Edgar Road, TW4 5QP);
- Feltham Lodge (Harlington Road West, TW14 0JJ); and
- Feltham Hira Centre (764 Hounslow Road, TW14 0AX).

7.8.215 In general, each of these receptors are forecast to be exposed to levels of between 55 dB – 56 dB $L_{Aeq,16hr}$ due to the Proposed Development in 2028, below the 'upper' assessment threshold. Therefore, likely significant beneficial effects are not concluded at these receptors due to the 'slight' reduction in noise exposure.

Hospitals, Nursing Homes and Hospices

7.8.216 Above the 'lower' assessment threshold of 55dB $L_{Aeq,16h}$, seven receptors which are classified as either hospital, nursing homes or hospice use are forecast to experience at least a 'slight' change in summer average daytime noise exposure due to the Proposed Development in 2028. These are presented in **Table A7.5.56** and **Table A7.5.57** of **Appendix 7.5: Air Noise**.

Adverse Impacts

7.8.217 One receptor, Manor House Care Home (Church Road, SL4 2JW), is forecast to experience a 'slight' adverse increase of 1 – 1.9 dB in summer average daytime noise exposure due to the Proposed Development in 2028. It is forecast to experience a 1.7 dB increase in noise exposure exposed to a level below the 'upper' assessment threshold of 59.2 dB $L_{Aeq,16hr}$. Adverse likely significant effects are not concluded for this receptor.

Beneficial Impacts

7.8.218 Six receptors which are classified under hospitals, nursing homes and hospices uses are forecast to experience a 'slight' beneficial decrease of 1 – 1.9 dB in summer average daytime noise exposure due to the Proposed Development in 2028. In general, these receptors are forecast to be exposed levels below the 'upper' assessment threshold at levels of between 55 dB – 59 dB $L_{Aeq,16hr}$ due to the Proposed Development in 2028.

7.8.219 Although beneficial, no likely significant effects are concluded at these receptors based.

Schools including Registered Nurseries

7.8.220 Above the 'lower' assessment threshold of 50 dB $L_{Aeq,16h}$, 72 receptors classified as schools and registered nursery uses are forecast to experience a change in summer average daytime noise exposure due to the Proposed Development in 2028. These are presented in **Table A7.5.60** and **Table A7.5.61** of **Appendix 7.5: Air Noise**.

Adverse Impacts

7.8.221 Only Khosla House (Park Lane, TW5 9WA) is forecast to become exposed to levels above the 'upper' threshold due to the Proposed Development in 2028[156]. Therefore, a likely significant effect is identified based on the adopted significance criteria. The school which accommodates Unique Academy, is forecast to experience a 'minor' increase of 2.3 dB in summer average daytime noise exposure due to the Proposed Development in 2028. Adverse likely significant effects are therefore concluded for Khosla House. Notably, this building would become eligible for noise insulation measures under the QNS CBS due to the Proposed Development.

7.8.222 Four other schools and registered nursery uses are exposed to levels above the 'upper' threshold are forecast to experience a 'negligible' adverse increase of less than 1 dB in summer average daytime noise exposure due to the Proposed Development in 2028. These are:

- Wellington Day Centre (Staines Road, TW4 5BA);
- Littlebrook Nursey (Bath Road, UB7 0EN);
- Grove Road Primary School (Cromwell Road, TW3 3QQ); and
- Green Corridor at (Main Road Nurseries, Stanwell Moor Rd, TW19 6BS).

7.8.223 In general, each of these receptors are forecast to be exposed to levels of between 64 dB – 67 dB $L_{Aeq,16hr}$. No adverse likely significant effects are concluded for these receptors.

7.8.224 In the case of Wellington Day Centre and Grove Road Primary School these receptors have already been insulated under the legacy CBNIS and are impacted more so by westerly operations than easterly operations.

7.8.225 Littlebrook Nursey has been identified as a receptor which has not previously been insulated by Heathrow under its legacy CBNIS but has been identified as being eligible for insulation under the QNS CBS.

7.8.226 Green Corridor is within the eligibility boundary for QNS CBS. The receptor has not been eligible for previous insulation schemes due to it's the date it came into use which was part of the eligibility criteria under the legacy CBNIS.

7.8.227 Eighteen schools are forecast to be exposed to levels between the 'lower' and ''upper' assessment thresholds due to the Proposed Development in 2028. Except for Cranford

[156] Notably, although the receptor is assigned a noise exposure level of 62.6 dB $L_{Aeq,16hr}$, part of this building is forecast to fall within the updated 63.0 dB $L_{Aeq,16hr}$ QNS boundary.

Junior School and Cranford Infant and Nursery School, these receptors have not previously been insulated under Heathrow's legacy CBNIS and would not be eligible for noise insulation under QNS CBS.

7.8.228 Cranford Junior School and Cranford Infant and Nursery School share the same site and are forecast to experience summer average daytime noise exposure approaching the 'upper' threshold in 2028 with the Proposed Development. In 2028 the Proposed Development is forecast to result in a 1.7 to 1.8 dB increase in aircraft noise exposure resulting in these receptors being exposed to levels of approximately 62 dB $L_{Aeq,16hr}$. These receptors have already been insulated by Heathrow under its legacy CBNIS and are impacted more so by westerly operations than easterly operations. As the resultant level of exposure due to the Proposed Development in 2028 is below the 'upper' assessment threshold and the increase is less than 3 dB, the effect is not significant.

7.8.229 Six of the eighteen receptors are forecast to experience a 'moderate' adverse increase of 3 – 5.9 dB in summer average daytime noise exposure due to the Proposed Development in 2028. These are:

- The Cedars Primary School (High Street, TW5 9RU);
- De Lacey Day Nursery (North Hyde Lane, UB2 5TE);
- Wolf Fields Primary School (Norwood Road, UB2 4JS);
- Sybil Elgar School (Havelock Road, UB2 4NY);
- Clifton Primary School (Clifton Road, UB2 5QP); and
- Havelock Primary School (Havelock Road, UB2 4PA).

7.8.230 Except for Cedars Primary School, in absolute noise exposure terms, the Proposed Development would result in noise at levels of less than 54 dB $L_{Aeq,16h}$ with all receptors located in Southall.

7.8.231 The Cedars Primary School in Cranford has been identified as experiencing a 3.5 dB increase in noise exposure leaving it exposed to a level of 57.5 dB $L_{Aeq,16hr}$. Notably, as this school is forecast to be exposed to summer average daytime noise exposure exceeding 54 dB $L_{Aeq,16hr}$ and experience at least a 3 dB change due to the Proposed Development, it is eligible for noise insulation measures under the Easterly Alternation Noise Mitigation Package as set out in **Table 7.30**.

7.8.232 Sybil Elgar, Clifton Primary School, and Havelock Primary schools all experience similar levels of and changes in summer average daytime noise exposure due to the Proposed Development in 2028 (51.4 – 51.8 dB $L_{Aeq,16h}$, and 3.7 – 3.9 dB). Likewise, the De Lacey Day Nursery and Wolf Fields Primary School experience similar levels of noise exposure (52.9 – 53.8 dB $L_{Aeq,16h}$) and noise change (3.0 – 3.1 dB).

7.8.233 These receptors do not qualify for noise insulation under the QNS CBS or Easterly Alternation Noise Insulation Scheme due to the level of noise exposure they are forecast to experience with or without the Proposed Development, which is less than 54 dB $L_{Aeq,16hr}$. The Proposed Development will introduce higher levels of aircraft noise at these receptors limited to periods of 09L departures, which would be for around 10 – 14% of the time. During

this time noise levels would be in the region of 60 – 61 dB $L_{Aeq,8hr\ (alternation\ period)}$ at these receptors. At such levels, internal noise conditions are likely to be below 40 dB $L_{Aeq,30min}$[157] assuming standard façade and roof construction, and a closed window. In other words, no bespoke acoustic insulation measures would be necessary to achieve suitable internal noise conditions for classrooms.

7.8.234 **Chapter 9: Public Health** cites the L_{den} metric, which is presented within the WHO Environmental Noise Guidelines 2018 as part of guidelines with respect to delays in reading skills and oral comprehension in children. The WHO ENG18 states that a relevant risk increase is found with respect to impairment in reading and oral comprehension from 55 dB L_{den}.

7.8.235 Only De Lacey Day Nursery would be exposed to levels just above 55 dB L_{den} due to the Proposed Development in 2028. For the other four receptors, noise exposure is forecast to be below 55 dB L_{den} with or without the Development in 2028. Chapter 9 concludes that the scale of change in educational achievement at these receptors would be very low.

7.8.236 Adverse likely significant effects are therefore forecast to occur at Sybil Elgar, Clifton Primary School, Havelock Primary, Wolf Fields Primary School, and De Lacey Day Nursery due to a 'moderate' increase of at least 3 dB in noise exposure above the 'lower' threshold of 50 dB $L_{Aeq,16hr}$. Although significant, the effect will be mostly external, as internal noise conditions at these schools is likely to remain suitable for classroom teaching.

7.8.237 Of the remaining twelve schools, six are forecast to experience a 'minor' adverse increase of 2 – 2.9 dB and six a 'slight' adverse increase of 1 – 1.9 dB in summer average daytime noise exposure due to the Proposed Development in 2028. Although the Proposed Development would result in higher levels of aircraft noise and increases in aircraft noise events due scheduled 09L departures, adverse likely significant effects are not concluded at these receptors due to their exposure being below the 'upper' assessment threshold. In most cases summer average noise exposure in 2028 with the Proposed Development would be less than 54 dB $L_{Aeq,16hr}$ with the exception of Berkeley Primary School and the Old Windsor Day Nursery and Pre-School. For these receptors the change in summer average noise exposure due to the Proposed Development would be an increase of around 1.5 dB leaving them exposed to levels of around 57 dB $L_{Aeq,16hr}$ which is not significant.

7.8.238 In summary adverse likely significant effects are concluded for the following receptors based on the adopted significance criteria:

- Khosla House (Park Lane, TW5 9WA);
- The Cedars Primary School (High Street, Cranford, TW5 9RU);
- De Lacey Day Nursery (North Hyde Lane, UB2 5TE);
- Wolf Fields Primary School (Norwood Road, UB2 4JS);
- Sybil Elgar School (Havelock Road, UB2 4NY);

[157] Building Bullet 93 defines 40 dB $L_{Aeq,30min}$ as an 'upper limit' for indoor ambient noise levels in nursery, primary and secondary school rooms class and teaching rooms for refurbished schools.

- Clifton Primary School (Clifton Road, UB2 5QP); and
- Havelock Primary School (Havelock Road, UB2 4PA).

7.8.239 Importantly in respect of Khosla House and The Cedars Primary school, both would be eligible for noise insulation measures under the QNS CBNIS and Easterly Alternation Noise Mitigation Package respectively as set out in **Table 7.30**.

Beneficial Impacts

7.8.240 Forty-four schools and registered nurseries are forecast to experience a 'slight' reduction in summer average daytime noise exposure due to the Proposed Development in 2028. These are all forecast to be exposed to summer average daytime noise exposures of between 51 and 59 dB $L_{Aeq,16hr}$. For approximately half of the schools, located in Windsor, these changes correspond with a reduction in 09L arrivals due to the Proposed Development. For the remaining half, located in North Feltham and Twickenham, these changes correspond with a reduction in 09R departures due to the Proposed Development. Although beneficial, no likely significant effects are concluded at these receptors based on the adopted significance criteria.

7.8.241 Five schools and registered nurseries are forecast to experience a 'negligible' reduction of less than 1 dB in summer average daytime noise exposure due to the Proposed Development in 2028. However, in all cases these receptors are exposed to levels of air noise exposure above 63 dB $L_{Aeq,16hr}$ in 2028 with or without the Proposed Development. Although beneficial this effect is not significant.

Colleges

Adverse Impacts

7.8.242 One college (Cranford Community College, High Street, TW5 9PD) has been identified as experiencing a 'moderate' increase in excess of 3 dB in the summer average daytime noise exposure due to the Proposed Development in 2028. This college experiences a 3.5 dB increase in noise exposure leaving it exposed to a level of 54.7 dB $L_{Aeq,16hr}$. **Table A7.5.62** of **Appendix 7.5: Air Noise** shows that noise during 09L departures would be around 10 dB higher than the noise produced from any other mode of operation however this would occur for around 10 – 14% of the time during periods of 09L departures.

7.8.243 As Cranford Community College is forecast to be exposed to at least 54 dB $L_{Aeq,16hr}$ due to the Proposed Development in 2028 and forecast to experience at least 3 dB increase in summer average daytime noise exposure, it is eligible for noise insulation under the Easterly Alternation Noise Mitigation Package as set out in **Table 7.30.**

Beneficial Impacts

7.8.244 One college (East Berkshire College, St Leonards Road, SL4 3AZ) is forecast to experience a 'slight' decrease in summer average daytime noise exposure due to the Proposed Development 2028 leaving it exposed to a level of 55.1 dB $L_{Aeq,16hr}$. Although beneficial, no likely significant effects are concluded at this receptor based on the adopted significance criteria.

Summary of Non-Residential Noise Sensitive Receptor Assessment

Adverse Likely Significant Effects

Places of religious worship

7.8.245 Adverse likely significant effects are concluded for two places of religious worship:

- Holy Angels Anglican Church; and
- St Christopher Roman Catholic Church;

7.8.246 For these receptors, adverse likely significant effects are concluded due to a 'moderate' change in summer average daytime noise exposure. Although likely significant effects are concluded at these receptors, the level of exposure due to the Proposed Development in 2028 is around 59 dB $L_{Aeq,16hr}$. As such, these receptors due to not qualify for noise insulation under Heathrow's QNS CBS.

Schools and registered nurseries

7.8.247 Adverse likely significant effects are concluded for seven schools:

- Khosla House;
- The Cedars Primary School;
- De Lacey Day Nursery;
- Wolf Fields Primary School;
- Sybil Elgar School;
- Clifton Primary School; and
- Havelock Primary School.

7.8.248 In the case of Koshla House, an adverse likely significant effect is identified due to parts of the receptor becoming exposed to a level of 63 dB $L_{Aeq,16hr}$ due to the Proposed Development in 2028. For Cedars Primary School a likely significant effect is concluded due to 'moderate' change in noise exposure.

7.8.249 In the case of Koshla House and The Cedars Primary School these receptors are eligible for noise insulation measures under the QNS CBNIS or Easterly Alternation Noise Insulation Scheme respectively, as set out in **Table 7.30**.

7.8.250 For De Lacey Day Nursery, Wolf Fields Primary School, Sybil Elgar School, Clifton Primary School and Havelock Primary School, adverse likely significant effects are concluded with aircraft noise exposure with the Proposed Development in 2028 below 54 dB $L_{Aeq,16hr}$. Although no mitigation is proposed for these receptors, the assessment notes that even with increased aircraft noise due the Proposed Development in 2028, internal conditions are likely to remain suitable for classrooms.

Colleges

7.8.251 Adverse likely significant effects are concluded for one college:

- Cranford Community College.

7.8.252 An adverse likely significant effect is concluded for Cranford Community College. This is due to a 'moderate' change in summer average daytime noise exposure due to the Proposed Development in 2028. Cranford Community College is eligible for noise insulation measures under the Easterly Alternation Noise Insulation Scheme as set out in **Table 7.30**.

Operational Phase: Aircraft Air Noise – Parks and Open Spaces – Noise and Amenity

7.8.253 Based on the stepped assessment methodology outlined in **Table 7.24** and the impact assessments for each park and open space identified through screening, the impact of the Proposed Development has been considered at each receptor as presented in **Appendix 7.5: Air Noise**. The following outcomes have been identified:

- 159 parks and open spaces would observe no change in aircraft noise due to the Proposed Development;
- 20 parks and open spaces would observe adverse changes in aircraft noise due to the Proposed Development:
- 28 parks and open spaces would observe beneficial changes in aircraft noise due to the Proposed Development; and
- Two parks and open spaces would see a mixed impact i.e. both adverse and beneficial changes.

7.8.254 No parks and open spaces are forecast to experience a significant beneficial effect due to the Proposed Development.

7.8.255 Based on screening and the impact assessment, five parks and open spaces have been identified as experiencing potentially significant effects on noise and amenity due to the Proposed Development. These are:

- Avenue Park, Hounslow (Potentially Significant, Wide Scale) – see **Table 7.47;**
- Berkely Meadows, Hillingdon (Potentially Significant, Wide Scale) – see **Table 7.48**;
- Windsor Great Park, Windsor (Potentially Significant, Localised) – see **Table 7.49**;
- Cranford Park, Hillingdon (Potentially Significant, Wide Scale) – see **Table 7.50**; and
- Manor House Ground, Hillingdon (Potentially Significant, Wide Scale) – see **Table 7.51**.

7.8.256 In the case of Avenue Park, Berkeley Meadows, Cranford Park and Manor House Ground, the effects identified are indicative of aircraft air noise being introduced into these parks and open spaces. In these parks and gardens, overall summer average exposure can be at or above 60 dB $L_{Aeq,16hr}$ with the Proposed Development in 2028, and at or above 63 dB $L_{Aeq,16hr}$ during a busy easterly day. These levels are indicative of aircraft noise becoming a

dominant noise source during periods of easterly operations (for 10% to 14% of the time). In all three cases several parts of these parks and gardens are located away from other ambient noise sources and therefore overall noise levels will be particularly sensitive to changes in or the addition of aircraft noise. For these reasons, significant adverse effects are concluded.

7.8.257 In the case of Windsor Great Park, potentially significant effects are forecast but only on a localised scale and to the northern half of the park which contains the Home Park Golf Course, and Frogmore House and Gardens. The southern half of the park is not forecast to see any significant changes in aircraft noise exposure due to the Proposed Development. This area includes the main areas open to the public and the visitors centre. Based on current trends in modal split, impacts would occur between 10 and 14% of the time during the summer and over the course of the year, respectively. When taking into account the change in the overall $L_{Aeq,16hr}$ in 2028 due to the Proposed Development (between 1 and 3 dB) this indicates that this park already experiences aircraft noise during westerly operations which is due to departures on the 27L and 27R CPT (Compton) routes. As such it is concluded that the Proposed Development would not have a significant adverse effect on amenity within Windsor Great Park.

7.8.258 In the case of Manor House Grounds, this is a small park which with the Proposed Development would become exposed to a summer average noise exposure level of 50 dB $L_{Aeq,16hr}$. Although the change in summer average exposure is around 4 dB in 2028 due to the Proposed Development, and during an easterly day noise levels are calculated at 56 dB $L_{Aeq,16hr}$, both of which are low levels. Manor House Grounds is located off a high street which will impact the park with existing road traffic noise. For these reasons, a significant adverse impact is not concluded.

7.8.259 Significant adverse effects on amenity are therefore concluded for:

- Avenue Park, Hounslow;
- Berkeley Meadows, Hillingdon; and
- Cranford Park, Hillingdon.

7.8.260 For these parks, mitigation will be made available through the Easterly Alternation Noise Mitigation Package. This will involve Heathrow making a financial contribution in total of £250,000 towards enhancing these parks in other ways. Such measures will be discussed and agreed with the relevant authorities. Furthermore, Heathrow will proactivity engage with authorities to ensure that the runway alternation schedule is available and accessible so that potential visitors are aware of when these areas would be overflown during both easterly and westerly operations.

Table 7.47 Assessment of Effects – Avenue Park, Hounslow

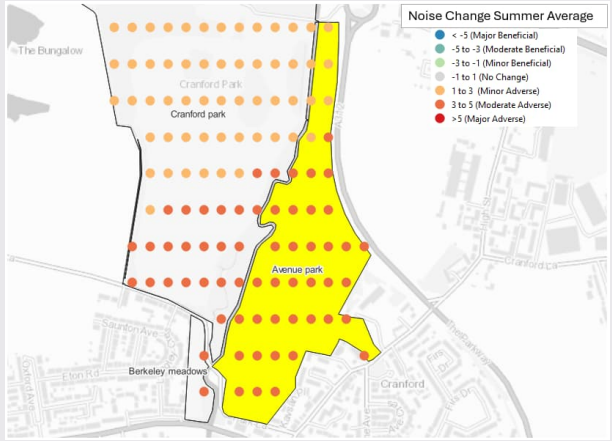
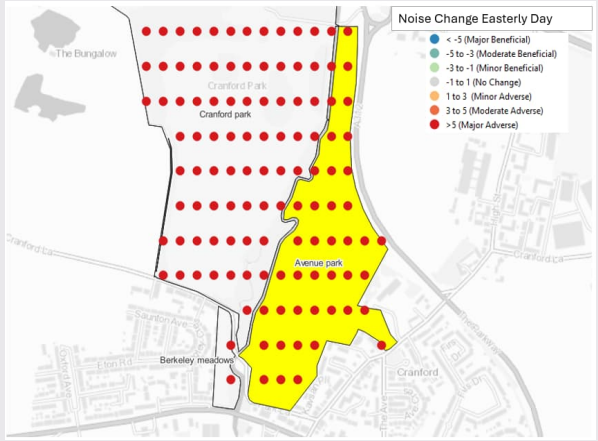
Name	Summer Average $L_{Aeq,16hr}$, dB		Easterly Day $L_{Aeq,16hr}$, dB		Change due to Easterly Alternation	Overall Effect	Total Area [km²]	Additional Metrics	
	2028 With Development	Noise Change	2028 With Development	Noise Change				N65 Effect	% of Area effected
Avenue Park located in Hounslow Borough, northeast of the LHR Airport	(52-60 dB)	3 to 4	(56-65 dB)	6 to 9	Yes, adverse	Potentially Significant Wide	0.2	Adverse	100%
								

Table 7.48 Assessment of Effects – Berkeley Meadows, Hillingdon

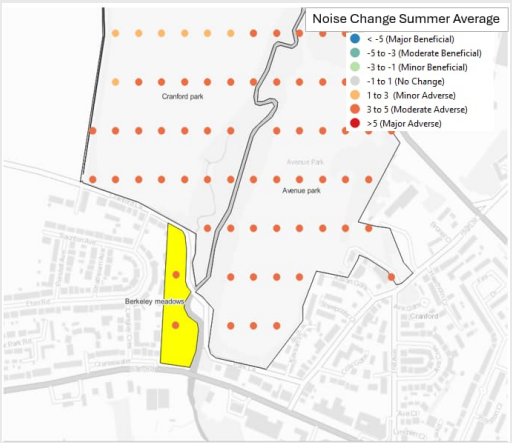
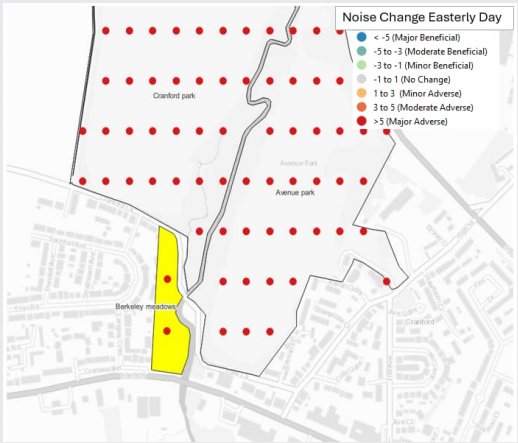
Name	Summer Average $L_{Aeq,16hr}$, dB		Easterly Day $L_{Aeq,16hr}$, dB		Change due to Easterly Alternation	Overall Effect	Total Area [km²]	Additional Metrics	
	2028 With Development	Noise Change	2028 With Development	Noise Change				N65 Effect	% of Area effected
Berkeley Meadows located in Hillingdon Borough, northeast of the LHR Airport	(59-60 dB)	3 to 4	(64-65 dB)	8 to 9	Yes, adverse	Potentially Significant Wide	0.02	Adverse	100%
								

Table 7.49 Assessment of Effects – Windsor Great Park, Windsor

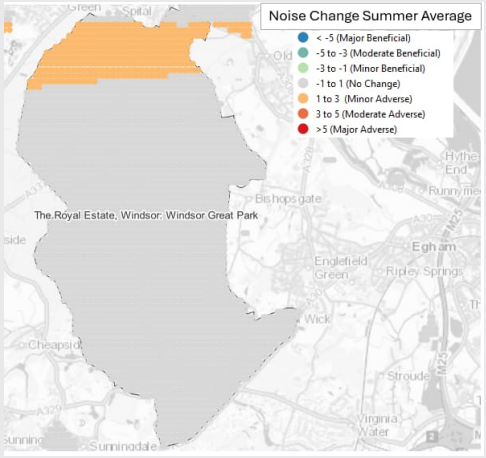
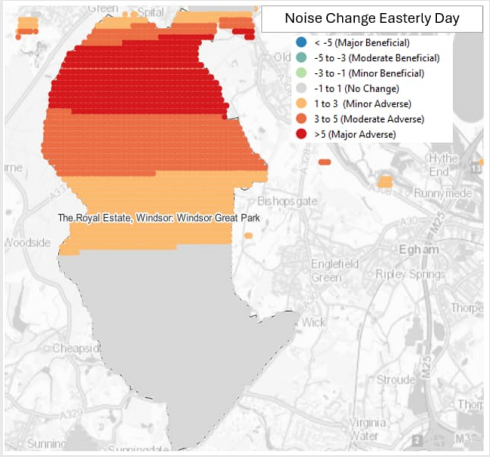
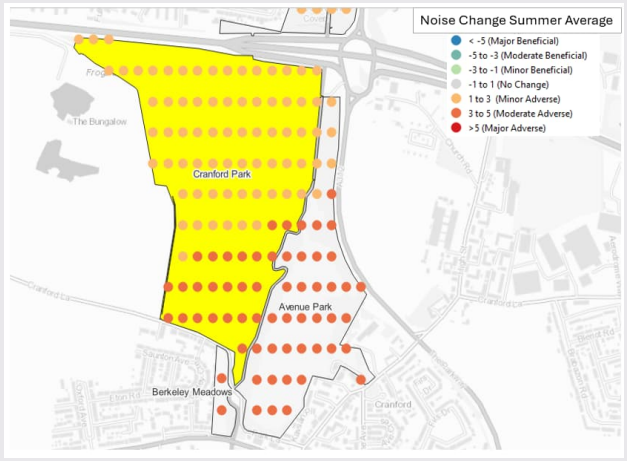
Name	Summer Average $L_{Aeq,16hr}$, dB		Easterly Day $L_{Aeq,16hr}$, dB		Change due to Easterly Alternation	Overall Effect	Total Area [km²]	Additional Metrics	
	2028 With Development	Noise Change	2028 With Development	Noise Change				N65 Effect	% of Area effected
Windsor Great Park, located in Windsor, southwest of the LHR Airport	(54-55 dB)	0 to 1	(53-59 dB)	1 to 5	Yes, adverse	Potentially Significant Localised	0.05	Adverse	100%
									

Table 7.50 Assessment of Effects – Cranford Park, Hillingdon

Name	Summer Average $L_{Aeq,16hr}$, dB		Easterly Day $L_{Aeq,16hr}$, dB		Change due to Easterly Alternation	Overall Effect	Total Area [km^2]	Additional Metrics	
	2028 With Development	Noise Change	2028 With Development	Noise Change				N65 Effect	% of Area effected
Cranford Park located in Hillingdon Borough, northeast of the LHR Airport	(48-57 dB)	2 to 4	(52-63 dB)	5 to 8	Yes, adverse	Potentially Significant Wide	0.55	Adverse	100%



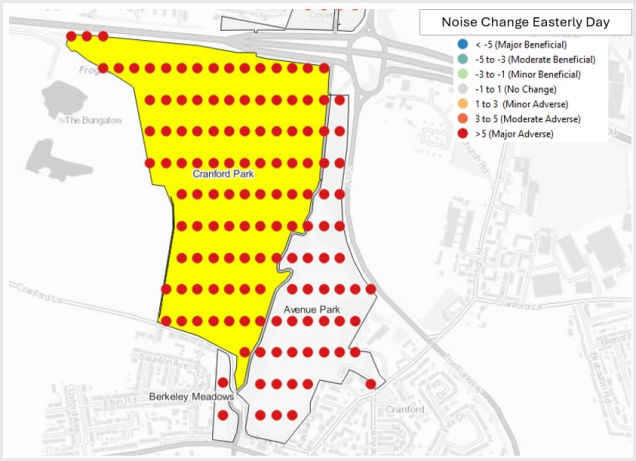
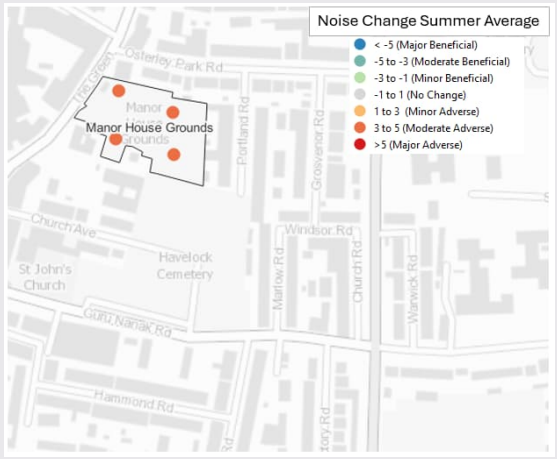
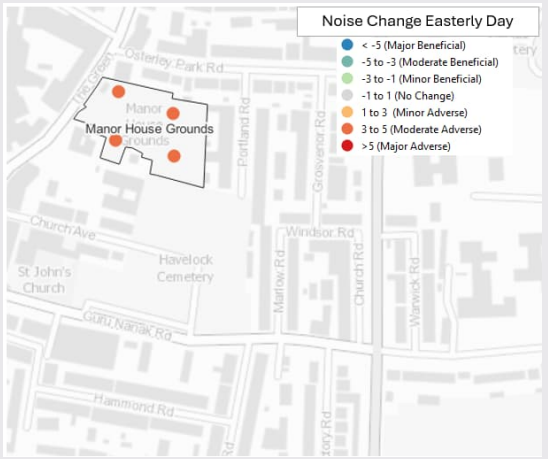


Table 7.51 Assessment of Effects – Manor House Grounds, Ealing

Name	Summer Average $L_{Aeq,16hr}$, dB		Easterly Day $L_{Aeq,16hr}$, dB		Change due to Easterly Alternation	Overall Effect	Total Area [km²]	Additional Metrics	
	2028 With Development	Noise Change	2028 With Development	Noise Change				N65 Effect	% of Area effected
Manor House Grounds located in Ealing Borough, northeast of the LHR Airport	(50-50 dB)	4	(56-56 dB)	5	Yes, adverse	Potentially Significant Wide	0.01	Adverse	100%
									

Operational Phase: Aircraft Ground Noise

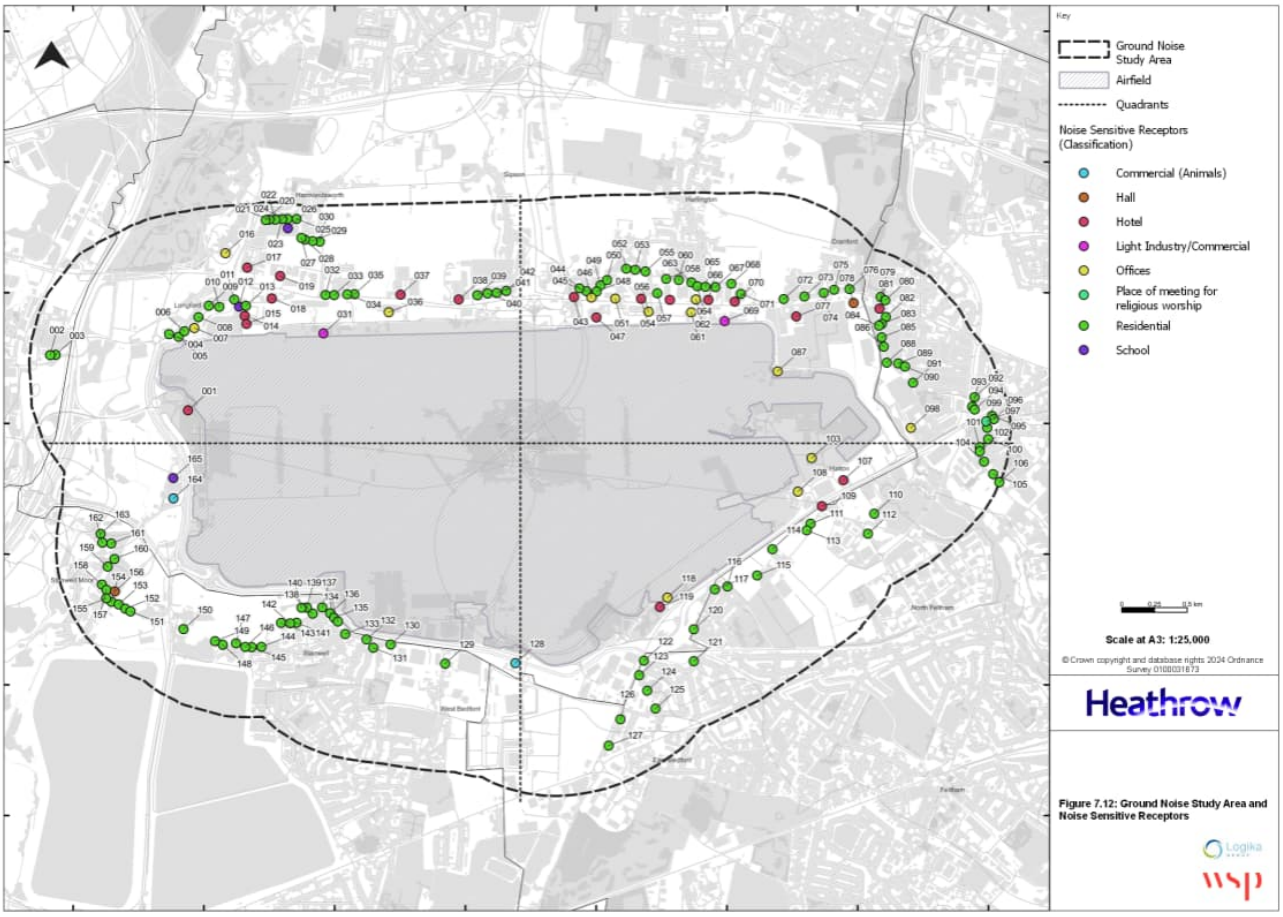
7.8.261 **Table A7.6.8** and **Table A7.6.9** of **Appendix 7.6: Ground Noise** present calculated aircraft ground noise exposure for the $L_{Aeq,16hr}$ and $L_{Aeq,8hr}$ noise metrics respectively at each of the 165 receptors considered as part of the assessment in the four quadrants making up the ground noise study area.

7.8.262 The assessment is supported by the following figures:

- **Figure 7.36**, which presents daytime noise exposure ($L_{Aeq,16hr}$) in 2028 with the Proposed Development;
- **Figure 7.8**, which presents daytime noise exposure ($L_{Aeq,16hr}$) in 2028 without the Proposed Development;
- **Figure 7.37**, which presents changes in daytime noise exposure ($L_{Aeq,16hr}$) in 2028 due to the Proposed Development;
- **Figure 7.38**, which presents night-time noise exposure ($L_{Aeq,8hr}$) in 2028 with the Proposed Development;
- **Figure 7.9**, which presents night-time noise exposure ($L_{Aeq,8hr}$) in 2028 without the Proposed Development; and
- **Figure 7.39**, which presents changes in night-time noise exposure ($L_{Aeq,8hr}$) in 2028 due to the Proposed Development.

7.8.263 The assessment has been carried out and is presented for daytime and night-time effects, at four ‘quadrants’ around the airport as presented in **Figure 7.12** (**Volume IV**) and as reproduced in **Graphic 7.9**.

Graphic 7.9 Assessment Quadrants – Aircraft Ground Noise



Northwest Quadrant Receptors – Daytime Effects

7.8.264 **Figure 7.37** (**Volume IV**) shows that the majority of the changes in daytime aircraft ground noise forecast to occur due the Proposed Development are located in Longford Village.

7.8.265 **Table A7.6.8** of **Appendix 7.6: Ground Noise** shows that no residential receptors in the north-west quadrant are forecast to exceed the daytime SOAEL in either the with or without Proposed Development scenarios. Consequently, no new significant adverse effects on health and quality of life are identified for the daytime period.

7.8.266 For residential receptors where aircraft ground noise is above the daytime SOAEL, these fall within the eligibility boundary for Heathrow's QNS. Residential receptors within Longford Village are the first receptors to be offered noise insulation under Heathrow's QNS. Therefore, significant effects on health and quality of life due to aircraft ground noise at these receptors at these receptors can be avoided. It should be noted that there is evidence that receptors within Longford Village may have already benefited from noise insulation under Heathrow's legacy noise insulation schemes.

7.8.267 No residential receptors with ground noise exposure between daytime LOAEL and SOAEL are forecast to experience a 'moderate' change (beneficial or adverse) in noise exposure due to the Proposed Development. Consequently, no likely significant effects have been identified for the daytime period.

7.8.268 Potentially significant adverse increases in aircraft ground noise exposure are identified for residential receptors in Poyle however as exposure is below daytime LOAEL this is not a likely significant effect.

7.8.269 Notably, there are generally beneficial decreases in daytime ground noise exposure at residential receptors in Longford Village due to the Proposed Development. These reductions are a consequence of the acoustic screening afforded by the noise barrier.

7.8.270 Most non-residential receptors exceed the relevant 'lower' assessment thresholds (**Table 7.23**), however, only one of these receptors results in a likely significant effect. Receptor 14 (Thistle Hotel, UB7 0EQ) is calculated to experience a 'moderate' increase (+3.1 dB) in daytime noise exposure as a result of the Proposed Development. A significant adverse effect is therefore initially identified at this receptor based on the magnitude of noise change in the context of elevated levels of exposure.

7.8.271 In respect of Receptor 14, the Proposed Development is forecast to result in additional aircraft ground events at levels of noise exposure which are noticeably lower than aircraft air noise. Receptors such as these came into use many years ago when aircraft noise exposure would have been much higher than forecast to occur as a result of the Proposed Development in 2028. It is therefore considered reasonable to assume that the acoustic and ventilation design would have been based on the noise constraints at the time. Therefore, no likely significant effects are concluded at this receptor.

7.8.272 Notably, there are beneficial decreases in ground noise exposure at Receptor 7 (Highbridge House, UB7 0EW) and Receptor 12 (Littlebrook Nursey, UB7 0EN) in Longford Village due to the acoustic screening afforded by the noise barrier. Although beneficial, no likely significant effects are concluded at this receptor based on the adopted significance criteria.

Northwest Quadrant Receptors – Night-time Effects

7.8.273 **Figure 7.39** (**Volume IV**) shows that the majority of the changes in night-time aircraft ground noise forecast to occur due the Proposed Development are located in Longford Village.

7.8.274 **Table A7.6.9** of **Appendix 7.6: Ground Noise** shows that no residential receptors are forecast to newly exceed the night-time SOAEL due to the Proposed Development. The Proposed Development is not forecast to result in any new significant adverse effects on health and quality of life due to ground noise. For residential receptors where aircraft ground noise is above the night-time SOAEL, these fall within the eligibility boundary for Heathrow's QNS. As outlined in **Paragraph 7.8.266**, these receptors may have already benefited from noise insulation under Heathrow's legacy schemes.

7.8.275 No residential receptors that exceed night-time SOAEL without the Proposed Development are forecast to experience a 'slight' increase in noise exposure due to the Proposed Development. Consequently, no adverse likely significant effects have been identified above the night-time SOAEL.

7.8.276 No residential receptors with ground noise exposure between the night-time LOAEL and SOAEL are forecast to experience a 'moderate' increase in noise exposure due to the Proposed Development. Therefore, no likely significant effects have been identified for residential receptors with ground noise exposure between the night-time LOAEL and SOAEL.

7.8.277 Receptor 10 (533 Bath Road, UB7 0EL) which has a calculated ground noise exposure between night-time LOAEL and SOAEL experiences a 'moderate' decrease in noise exposure due to the Proposed Development. This is considered a beneficial likely significant effect due to the Proposed Development and is a consequence of the acoustic screening afforded by the Noise Barrier. This outcome is due to the effectiveness of the noise barrier during all modes of operation and not just during 09L departures. Other residential receptors within Longford Village are also forecast to observe a decrease in noise exposure due to the Proposed Development.

7.8.278 Potentially significant adverse increases in aircraft ground noise exposure are identified for residential receptors in Poyle however exposure is below LOAEL therefore this is not a significant effect.

7.8.279 Most hotels exceed the relevant 'lower' assessment threshold for the night-time, however, only one is forecast to experience a 'slight' increase in noise exposure due to the Proposed Development. This is Receptor 14 (Thistle Hotel, UB7 0EQ). Adverse likely significant effects are not concluded for this receptor based on the adopted significance criteria.

7.8.280 Notably, beneficial decreases in night-time noise exposure are identified at Receptors 7 and 12 in Longford Village. which is a consequence of the acoustic screening afforded by the Longford Noise Barrier. These receptors are Receptor 7 (Highbridge House, UB7 0EW) and Receptor 12 (Littlebrook Nursey, UB7 0EN) which are unlikely to be in use during the night. Although beneficial, no likely significant effects are concluded at this receptor based on the adopted significance criteria.

Northeast Quadrant Receptors – Daytime Effects

7.8.281 **Figure 7.37** (**Volume IV**) shows that changes in daytime aircraft ground noise exposure in the north east quadrant due the Proposed Development are 'negligible' or 'no change'.

7.8.282 No residential receptors exceed the daytime SOAEL in either the with or without Proposed Development scenarios. Consequently, no significant adverse effects on health and quality of life due to ground noise have been identified for the daytime period in the north-east quadrant.

7.8.283 All residential receptors which fall between the daytime LOAEL and SOAEL are forecast to experience 'no change' in daytime ground noise exposure due to the Proposed Development. Consequently, no likely significant effects (beneficial or adverse) have been identified for the daytime period.

7.8.284 Most non-residential receptors exceed the relevant 'lower' assessment threshold for the daytime. However, all forecast changes in noise exposure are less than 1 dB. Therefore, no likely significant effects (beneficial or adverse) have been concluded based on the adopted significance criteria.

Northeast Quadrant Receptors – Night-time Effects

7.8.285 **Figure 7.39** (**Volume IV**) shows that changes in night-time aircraft ground noise exposure in the north east quadrant due the Proposed Development are 'no change' or 'negligible'.

7.8.286 No residential receptors exceed the night-time SOAEL in either the with or without Proposed Development scenarios. Consequently, no significant adverse effects on health and quality of life due to ground noise have been identified for the night-time period in the north-east quadrant.

7.8.287 All residential receptors which fall between night-time LOAEL and SOAEL are forecast to experience 'no change' ground noise exposure due to the Proposed Development. Consequently, no likely significant effects (beneficial or adverse) have been identified for the night-time period.

7.8.288 Most non-residential hotel receptors exceed the relevant 'lower' assessment threshold for the night-time. However, all forecast changes in noise exposure are less than 1 dB. Therefore, no likely significant effects (beneficial or adverse) have been concluded based on the adopted significance criteria.

Southeast Quadrant Receptors – Daytime Effects

7.8.289 **Figure 7.37** (**Volume IV**) shows that changes in daytime aircraft ground noise exposure in the south east quadrant due the Proposed Development are 'negligible' i.e. less than 1 dB.

7.8.290 No residential receptor is forecast to exceed the daytime SOAEL in either the with or without Proposed Development scenarios. Consequently, no significant adverse effects on health and quality of life have been identified due to ground noise for the daytime period in the south east quadrant.

7.8.291 All residential receptors forecast to fall between daytime LOAEL and SOAEL experience a 'negligible' change (beneficial or adverse) in ground noise exposure due to the Proposed Development. Consequently, no likely significant effects have been identified for the daytime period.

7.8.292 All non-residential receptors exceed the relevant 'lower' assessment threshold for the daytime. However, all forecast changes in noise exposure are less than 1 dB. Therefore, no likely significant effects (beneficial or adverse) have been concluded based on the adopted significance criteria

Southeast Quadrant Receptors – Night-time Effects

7.8.293 **Figure 7.39** (**Volume IV**) shows that changes in night-time aircraft ground noise exposure in the south east quadrant due the Proposed Development are 'negligible' i.e. less than 1 dB.

7.8.294 However, Receptor 115 (located at Wellington Road, Feltham) would observe an increase of 0.1 dB in night-time ground noise exposure resulting in the receptor being exposed above the night-time SOAEL. Receptor 116 (located at Orchard Avenue, Feltham) is exposed to night-time ground noise above the SOAEL in both the with and without Proposed Development scenarios. This receptor would observe 'no change' in night-time ground noise exposure due to the Proposed Development.

7.8.295 There is evidence that residential receptors in the areas represented by these receptors may have already received noise insulation under Heathrow's legacy schemes. Furthermore, both Receptors 115 and 116 fall within the eligibility boundary for Heathrow's

QNS. Therefore, significant effects on health and quality of life due to aircraft ground noise at these receptors can be avoided.

7.8.296 No residential receptors are forecast to exceed the daytime SOAEL in either the with or without Proposed Development scenarios. Consequently, no significant adverse effects on health and quality of life have been identified for the daytime period in the south east quadrant.

7.8.297 No residential receptors within the south east quadrant are forecast to experience a 'slight' change in night-time noise exposure above the SOAEL due to the Proposed Development. No residential receptors with ground noise exposure between the LOAEL and SOAEL are forecast to experience a 'moderate' change in aircraft noise exposure due to the Proposed Development. No night-time likely significant effects (adverse or beneficial) have been identified within the south east quadrant.

7.8.298 All non-residential hotel receptors are forecast to exceed the relevant 'lower' assessment threshold for the night-time. However, all forecast changes in noise exposure are less than 1 dB. Therefore, no likely significant effects (beneficial or adverse) have been concluded based on the adopted significance criteria.

Southwest Quadrant Receptors – Daytime Effects

7.8.299 **Figure 7.37** (**Volume IV**) shows that changes in daytime aircraft ground noise exposure in the south west quadrant due the Proposed Development are 'negligible' or 'no change'.

7.8.300 No residential receptors exceed the daytime SOAEL in either the with or without Proposed Development scenarios. Consequently, no significant adverse effects on health and quality of life due to ground noise have been identified for the daytime period in the south-west quadrant.

7.8.301 All residential receptors which fall between the daytime LOAEL and SOAEL are forecast to experience a 'moderate' increase in daytime ground noise exposure due to the Proposed Development. All changes in daytime ground noise exposure are forecast to be either 'negligible' or 'no change'. Three receptors are forecast to experience a 'slight' beneficial decrease in daytime ground noise exposure due to the Proposed Development. Consequently, no likely significant effects (beneficial or adverse) have been identified for the daytime period.

7.8.302 Most non-residential receptors exceed the relevant 'lower' assessment threshold for the daytime. However, all forecast changes in noise exposure are less than 1 dB. Therefore, no likely significant effects (beneficial or adverse) have been concluded based on the adopted significance criteria.

Southwest Quadrant Receptors – Night-time Effects

7.8.303 **Figure 7.39** (**Volume IV**) shows that changes in night-time aircraft ground noise exposure in the south-west quadrant due the Proposed Development are 'no change' or 'negligible'.

7.8.304 No residential receptors exceed the night-time SOAEL in either the with or without Proposed Development scenarios. Consequently, no significant adverse effects on health and quality

of life due to ground noise have been identified for the night-time period in the north-east quadrant.

7.8.305 All residential receptors which fall between night-time LOAEL and SOAEL are forecast to experience a 'negligible' change in aircraft ground noise exposure.

7.8.306 No non-residential receptors are forecast to exceed the relevant 'lower' assessment threshold for the night-time. Therefore, no likely significant effects (beneficial or adverse) have been concluded based on the adopted significance criteria.

Aircraft Ground Noise – Conclusion

7.8.307 The assessment aircraft ground noise shows that the main changes in summer average ground noise exposure at receptors occur in Longford Village. No adverse or beneficial likely significant effects are identified.

Operational Phase: Noise Induced Vibration

7.8.308 Modelling of L_{CSmax} noise events from Airbus A380, Boeing 787, Boeing 777, Airbus A350 and Airbus A320 series aircraft has been carried for 09L departures. In line with the assessment methodology set out in Section 7.5, a consolidated area presenting the locations withing Longford Village potentially exposed to events at 80, 90 dB and 97 dB L_{CSmax} has been produced and is presented in **Figure 7.40** (**Volume IV**).

7.8.309 **Figure 7.40** (**Volume IV**) shows that several properties in Longford Village are within 500m of 09L start of roll, including Littlebrook Nursery. These receptors sit behind the proposed Longford Noise Barrier however this is likely to be relatively ineffective with respect to low frequency noise.

7.8.310 **Figure 7.40** (**Volume IV**) shows that it is unlikely that any properties in Longford Village would experience levels above 97 dB L_{CSmax} with calculated levels falling between 80 – 90 dB L_{CSmax}. Based on the Tokita & Nakamura thresholds, low frequency noise and induced vibration due to aircraft start of roll could therefore result in some annoying / objectionable characteristics. As these dwellings are within 500m of aircraft stat of roll, adverse likely significant effects are therefore concluded.

7.8.311 **Figure 7.40** (**Volume IV**) shows that all dwellings within the 80 dB L_{CSmax} contour fall within Heathrow QNS eligibility boundary. Around 160 dwellings are located within the 500m of 09L start of roll along with Littlebrook Nursey. In line with the aircraft Easterly Alternation Noise Mitigation Package presented in **Table 7.30**, these dwellings would be eligible for additional funding of up to £10,000 for assistance towards the costs of mitigating potential effects. This additional funding may be used to mitigate effects through reinforcing lightweight floors.

7.9 Assessment Summary

7.9.1 **Table 7.52** and **Table 7.53** provide summaries of the findings of the construction and operational noise assessments respectively.

7.9.2 With respect to operational phase of the Proposed Development, and as evidenced in **Section 7.8**, the effects are a consequence of redistribution aircraft noise during easterly operations and the provision of aircraft noise respite. To this end, Heathrow's existing schemes such as the QNS provide mitigation for receptors exposed to higher levels of aircraft noise, with the Easterly Alternation Noise Mitigation Scheme providing a targeted package of mitigation for certain receptors experiencing likely significant effects due to the Proposed Development.

Construction effects

Table 7.52 Assessment of potential effects, embedded measures, residual effects and monitoring during construction.

Activity	Receptor type	Summary of predicted effect	Receptor(s)	Significance	Summary rationale and available mitigation
Night-time Wright Way Noise Barrier Works	Residential	Construction noise levels exceed SOAEL, significance thresholds and temporal criteria.	5	Significant	Temporary, short-term works with long-term benefits from the 09L airfield infrastructure construction works and operational phase. Receptors are likely to be insulated under legacy noise insulation schemes or are otherwise prioritised under the QNS RIS, hence significant effects on health and quality of life can be avoided. Noise emissions are to be managed and mitigated through CEMP and Section 61 process which will identify and secure the BPM approach and any further controls to be implemented during the night-time Wright Way noise barrier construction works.
		Construction noise levels exceed SOAEL and significance thresholds, but do not exceed temporal criteria.	4, 6, 8		
	Non-residential	Construction noise levels exceed significance thresholds and temporal criteria.	7	Not significant	This receptor is a group of offices which are not anticipated to be occupied at night.

Activity	Receptor type	Summary of predicted effect	Receptor(s)	Significance	Summary rationale and available mitigation
Daytime Terminal 5 Pod Parking Noise Barrier Works	Residential and non-residential	Construction noise levels avoid exceeding SOAEL or significant thresholds.	4 to 15	Not Significant	Temporary, short-term works with long-term benefits from the 09L airfield infrastructure construction works and operational phase. No exceedances of SOAEL or threshold for likely significant effects identified. Daytime baseline noise levels are elevated due to aircraft air noise.
Night-time 09L Infrastructure Works	Residential	Construction noise levels exceed SOAEL, significance thresholds and temporal criteria.	13_B and 13_C	Significant	Temporary, medium-term works. Receptors are likely to be insulated under legacy noise insulation schemes or are otherwise prioritised under the QNS RIS, hence significant effects on health and quality of life can be avoided. Effects are partially mitigated through the construction of the Longford Noise Barrier. Noise emissions are to be managed and mitigated through CEMP and Section 61 process which will identify and secure the BPM approach and any further controls to be implemented during the night-time 09L airfield infrastructure construction works.

Activity	Receptor type	Summary of predicted effect	Receptor(s)	Significance	Summary rationale and available mitigation
	Non-residential	Construction noise levels exceed significance thresholds and temporal criteria.	14 and 15	Significant	Temporary, medium-term works. These receptors represent a hotel for which it is reasonable to assume that intrinsic noise mitigation measures (sound insulation, ventilation, and cooling) will have been developed to protect occupants from noise. Guests are not normally expected to reside at the hotel for periods exceeding the temporal criteria. Effects are partially mitigated through the construction of the Longford Noise Barrier. Noise emissions are to be managed and mitigated through CEMP and Section 61 process which will identify and secure the BPM approach and any further controls to be implemented during the night-time 09L airfield infrastructure construction works.
Daytime 09L Infrastructure Works	Residential and non-residential	Construction noise levels avoid exceeding SOAEL or significance thresholds.	4 to 15	Not Significant	Temporary, medium-term works. No exceedances of SOAEL or threshold for likely significant effects identified. Daytime baseline noise levels are elevated due to aircraft air noise.
Night-time 09R/27L Redundant Pavement Removal Works	Residential	Construction noise levels exceed SOAEL and significance thresholds, but do not	134 to 143	Not Significant	Temporary, short-term works. Exceedances of SOAEL/significance threshold but short in duration and below the temporal criteria.

Activity	Receptor type	Summary of predicted effect	Receptor(s)	Significance	Summary rationale and available mitigation
		exceed temporal criteria.			Noise emissions are to be managed and mitigated through CEMP and Section 61 process which will identify and secure the BPM approach and any further controls to be implemented during the night-time 09L airfield infrastructure construction works.

Operational effects

Table 7.53 Assessment of potential effects, embedded measures, residual effects and monitoring during operation.

Activity	Receptor type	Summary of predicted effect	Receptor(s)	Significance	Summary rationale and available mitigation
Aircraft Air Noise - Daytime	Residential	Effects on Health and Quality of Life Reduction in overall population exposed to noise above daytime LOAEL	Population of 2,800	Beneficial	Proposed Development reduces the number of people exposed to levels of aircraft noise above which effects are considered adverse.
		Effects on Health and Quality of Life Reduction in the number of people exposed to levels above 54 dB $L_{Aeq,16hr}$	Population of 15,300	Beneficial	Proposed Development reduces the number of people exposed to levels of aircraft noise representing "*the appropriate onset of significant community annoyance*".
		Effects on Health and Quality of Life Reduction in the overall population exposed between LOAEL and SOAEL	Population of 3,900	Beneficial	Proposed Development reduces the number of people exposed to levels of aircraft noise between the LOAEL and the SOAEL.
		Effects on Health and Quality of Life Increased population above SOAEL	Population of 1,100	Adverse	Proposed Development increases the number of people exposed to levels above the significant observed adverse effect level. Properties newly exceeding SOAEL due to the Proposed Development will be eligible for noise insulation under QNS RIS.
		Effects on Health and Quality of Life	Population of approximately 500	Adverse	Proposed Development increases the number of people exposed to levels above 69 dB $L_{Aeq,16hr}$.

Activity	Receptor type	Summary of predicted effect	Receptor(s)	Significance	Summary rationale and available mitigation
		Increase in the overall number of people exposed to levels above 69 dB $L_{Aeq,16hr}$			All dwellings are eligible for relocation assistance under Heathrow's HRAS scheme and noise insulation under the QNS RIS.
		Adverse impact of at least a 1 dB (slight) reduction in noise exposure is forecast between LOAEL and SOAEL	Population of 61,800 in locations including Oakley Green, Water Oakley, Windsor, North Feltham, Hatton	Not Significant (Beneficial)	Likely significant effects identified through primary assessment only.
		Likely significant adverse effects: Where at least 1 dB (slight) increase in noise exposure is forecast above SOAEL	Population of 3,100 in LSE areas: LSE-D01 LSE-D02 LSE-D03 LSE-D04 LSE-D05	Significant Adverse	Primary assessment identified likely significant adverse effects. Consideration of contextual factors confirmed significant adverse effects. Mitigation is available through the QNS RIS and predicable respite.
		Likely significant beneficial effects: Where at least 1 dB (slight) reduction in noise exposure is forecast above SOAEL	Population of 300 in focus area LSE-D06	Significant Beneficial	Primary assessment identified likely significant beneficial effects. Consideration of contextual factors concluded significant beneficial effects are not modified. Mitigation is available through the QNS and predictable respite.
		Likely significant adverse effects: Where at least 3 dB (moderate) increase in noise exposure is forecast between LOAEL and SOAEL	Population of 15,500 in focus area: LSE-D07	Significant Adverse	Primary assessment identified likely significant adverse effects. Consideration of contextual factors concluded significant adverse effects are not modified.

Activity	Receptor type	Summary of predicted effect	Receptor(s)	Significance	Summary rationale and available mitigation
					• Area LSE-D07 is newly affected by aircraft air noise as a result of the Proposed Development with noise exposure levels between the LOAEL and SOAEL. • These receptors are not eligible for noise insulation through legacy schemes or QNS. • 09L departures would likely be a dominant noise source in the area. • Impacts limited to alternation periods during 09L departures (10% of time during summer and 14% over the year). • Predicable respite would however be experienced and linked to the alternation schedule. Mitigation is available to receptors forecast to experience summer average noise exposure above 54 dB $L_{Aeq,16hr}$ under the Easterly Alternation Residential Noise Insulation Scheme. Where this scheme applies: • around 2,500 people residing in dwellings within LSE-D07 will be eligible for fixed contribution of £3,000 towards the costs of insulation under the scheme; and • around 900 people residing in dwellings within LSE-D07 will be

Activity	Receptor type	Summary of predicted effect	Receptor(s)	Significance	Summary rationale and available mitigation
					eligible for a fixed contribution of £12,000 towards the costs of insulation under the scheme. Assuming insulation is installed through this scheme, this will contribute towards mitigating and minimising significant likely effects on internal noise levels. 12,100 people within LSE-D07 will not be eligible to a noise insulation scheme however these people are forecast to be exposed to levels below the '*approximate onset of significant community annoyance*' In all cases, predictable respite provides the basis for providing mitigation for outdoor conditions by providing receptors within LSE-D07 a planned period during easterly operations where there will be a break or reduction in aircraft noise.
Aircraft 'air' noise – Night-time	Residential	Effects on Health and Quality of Life Reduced population within LOAEL	Population of 7,900	Beneficial	Proposed Development reduces the number of people exposed to levels of aircraft noise above which effects are considered adverse.
		Effects on Health and Quality of Life Reduced population exposed between LOAEL and SOAEL	Population of 9,700	Beneficial	Proposed Development reduces the number of people exposed to levels of aircraft noise between the lowest observed and significant observed adverse effect levels.

Activity	Receptor type	Summary of predicted effect	Receptor(s)	Significance	Summary rationale and available mitigation
		Effects on Health and Quality of Life Increased population above SOAEL	Population of 1,700	Not Significant (Adverse)	Properties newly exceeding SOAEL will be eligible for noise insulation under QNS.
		Likely significant beneficial effects: Where at least 1 dB (slight) reduction is forecast where noise exposure between LOAEL and SOAEL	Population of 28,800 in locations including Poyle, Windsor, Oakley Green, North Feltham	Not Significant (Beneficial)	Likely significant effects identified through primary assessment only.
		Likely significant adverse effects: Where a 1 – 2 dB (slight) increase in noise exposure is forecast between LOAEL and SOAEL	Population of 10,900 in locations including Old Windsor, Harlington, Stanwell Moor, Cranford	Not Significant (Adverse)	Likely significant effects identified through primary assessment only.
		Likely significant adverse effects: Where a 2 – 3 dB (minor) increase in noise exposure is forecast between LOAEL and SOAEL	Population of 1,000 in locations including Old Windsor, Harlington, Stanwell Moor, Cranford	Not Significant (Adverse)	Likely significant effects identified through primary assessment only.
		Likely significant adverse effects: Where a 1 – 2 dB (slight) increase in noise exposure is forecast above SOAEL	Population of c400 in focus areas: LSE-N01 LSE-N02	Significant Adverse	Primary assessment identified likely significant beneficial effects. Consideration of contextual factors concluded significant beneficial effects are not modified. Mitigation is available through the QNS.

Activity	Receptor type	Summary of predicted effect	Receptor(s)	Significance	Summary rationale and available mitigation
		Likely significant beneficial effects: Where at least 1 dB (slight) reduction is forecast where noise exposure above SOAEL	Population of c200 within areas LSE-N03 and LSE-04.	Significant Beneficial	Likely significant effects identified through primary assessment only.
Aircraft 'air' noise - Daytime	Non-residential	**Places of meeting for religious worship:** 6 forecast to experience adverse effects (≥1 dB increase) 6 forecast to experience beneficial effects (≥1 dB decrease) **Community halls** 4 forecast to experience adverse effects (≥1 dB increase) 3 forecast to experience beneficial effects (≥1 dB decrease) **Libraries** 1 forecast to experience adverse effects (≥1 dB increase) **Hospitals or other healthcare settings** 1 forecast to experience adverse effects (≥1 dB increase) 6 forecast to experience beneficial effects (≥1 dB decrease) **Schools or registered nurseries**	N/A	Not Significant (Adverse or Beneficial)	Likely adverse or beneficial (not significant) effects identified based on the adopted significance criteria. Consideration of additional factors concluded effects are unmodified.

Activity	Receptor type	Summary of predicted effect	Receptor(s)	Significance	Summary rationale and available mitigation
		16 forecast to experience adverse effects (≥0 dB increase) 44 forecast to experience beneficial effects (≥0 dB decrease) **Colleges** 1 forecast to experience beneficial effects (≥0 dB decrease) **Hotels** 22 forecast to experience adverse effects (≥1 dB increase) 31 forecast to experience beneficial effects (≥1 dB decrease) **Offices** 55 forecast to experience adverse effects (≥1 dB increase) 59 forecast to experience beneficial effects (≥1 dB decrease)			
		Places of meeting for religious worship 2 forecast to experience significant adverse effects	Holy Angels Anglican Church, St Christopher Roman Catholic Church	Significant Adverse	Likely significant adverse effects concluded for these receptors based on the adopted significance criteria. Receptors not eligible under legacy or QNS noise insulation schemes.

Activity	Receptor type	Summary of predicted effect	Receptor(s)	Significance	Summary rationale and available mitigation
		Schools or registered nurseries 7 forecast to experience significant adverse effects	Khosla House The Cedars Primary School De Lacey Day Nursery Wolf Fields Primary School Sybil Elgar School Clifton Primary School Havelock Primary School	Significant Adverse	Likely significant adverse effects adverse concluded for these receptors based on the adopted significance criteria. Khosla House and The Cedars Primary School are eligible for noise insulation measures under the QNS and Easterly Alternation Noise Mitigation Package respectively.
		Colleges 1 forecast to experience significant adverse effect	Cranford Community College	Significant Adverse	Likely significant adverse effects adverse concluded for this receptor based on the adopted significance criteria. Receptor eligible for noise insulation under the Easterly Alternation Noise Mitigation Package.
Aircraft 'air' noise - daytime	Amenity – Parks and Open Spaces	No change observed	159 parks and open spaces	Not Significant	Parks and open spaces identified through screening assessment. Primary assessments identified not significant effects.

Activity	Receptor type	Summary of predicted effect	Receptor(s)	Significance	Summary rationale and available mitigation
		Adverse change observed	15 parks and open spaces	Not Significant (Adverse)	Parks and open spaces identified through screening assessment. Primary assessments identified not significant effects.
		Adverse change observed	Windsor Great Park (localised)	Not Significant (Adverse)	Parks and open spaces identified through screening assessment. Primary assessments identified potentially significant effects in a localised area. Consideration of additional factors modified conclusion of significance (impact of aircraft noise during westerly operations).
		Adverse change observed	Manor House Grounds (wide)	Not Significant (Adverse)	Parks and open spaces identified through screening assessment. Primary assessments identified potentially significant effects in a wide area. Consideration of additional factors modified conclusions of significance (absolute noise levels and impact of nearby road traffic noise sources)
		Adverse change observed	3 parks and open spaces: Avenue Park (wide) Berkley Meadows (wide) Cranford Park (wide)	Significant Adverse	Parks and open spaces identified through screening assessment. Primary assessments identified potentially significant effects in wide areas. Consideration of additional factors does not modify the conclusion of significance (aircraft noise is newly introduced and noise exposure indicates aircraft noise is a dominant source). Mitigation is available through the Easterly Alternation Noise Mitigation Package.

Activity	Receptor type	Summary of predicted effect	Receptor(s)	Significance	Summary rationale and available mitigation
		Beneficial change observed	28 parks and open spaces	Not Significant (Beneficial)	Parks and open spaces identified through screening assessment. Primary assessments identified not significant effects.
		Adverse and beneficial changes observed	2 parks and open spaces	Not Significant	Parks and open spaces identified through screening assessment. Primary assessments identified not significant effects.
Aircraft 'ground' noise - Daytime	Residential	Effects on Health and Quality of Life	All residential receptors	Not Significant (Adverse, Beneficial or Neutral)	Ground noise with or without Proposed Development does not exceed SOAEL at any receptor.
		Likely significant adverse effects	All residential receptors	Not Significant (Adverse)	No likely significant adverse effects identified based on the adopted significance criteria.
		Likely significant beneficial effects	All residential receptors	Not Significant (Beneficial)	No likely significant beneficial effects identified based on the adopted significance criteria.
	Non-residential	Likely significant adverse effects	All non-residential receptors	Not Significant (Adverse)	No likely significant adverse effects identified based on the adopted significance criteria.
		Likely significant beneficial effects	All non-residential receptors	Not Significant (Beneficial)	No likely significant beneficial effects identified based on the adopted significance criteria.
Aircraft 'ground' noise - Night-time	Residential	Effects on health and quality of life	All residential receptors	Not Significant (Adverse, Beneficial, or Neutral)	No residential receptors newly exceed SOAEL except Receptor 115 (at Wellington Road, Feltham). Receptors exceeding SOAEL are eligible under the QNS and may have already

Activity	Receptor type	Summary of predicted effect	Receptor(s)	Significance	Summary rationale and available mitigation
					been insulated under legacy noise insulation schemes.
		Likely significant adverse effects	All residential receptors	Not Significant (Adverse)	No likely significant adverse effects identified through primary assessment.
		Likely significant beneficial effects	10: 533 Bath Road, UB7 0EL	Significant Beneficial	Likely significant effects identified based on the adopted significance criteria. Moderate decrease in noise exposure as a result of the Longford noise barrier.
		Likely significant beneficial effects	All other residential receptors	Not Significant (Beneficial)	No likely significant effects identified based on the adopted significance criteria.
	Non-residential	Likely significant adverse effects	All non-residential receptors	Not Significant (Adverse)	No likely significant adverse effects identified based on the adopted significance criteria.
		Likely significant beneficial effects	All non-residential receptors	Not Significant (Beneficial)	No likely significant beneficial effects identified based on the adopted significance criteria.
Aircraft 'air' noise induced vibration	All	Likely significant adverse effects from noise induced vibration from start of roll on 09L	160 dwellings in Longford and Littlebrook Nursery (Receptor 12)	Not Significant (Adverse)	Likely significant adverse effects identified through primary assessment. Receptors within 80 dB L_{CSmax} contour fall within QNS eligibility boundary. All dwellings also eligible under Easterly Alternation Noise Mitigation Package.