Gatwick Airport Northern Runway Project

Environmental Statement
Chapter 14: Noise and Vibration

Book 5

VERSION: 1.0

DATE: JULY 2023

Application Document Ref: 5.1

PINS Reference Number: TR020005

APFP Regulations 5(2)(a) **Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009**

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14.1. Introduction

14.1.1 This chapter of the Environmental Statement (ES) presents the findings of the Environmental Impact Assessment (EIA) concerning the potential effects of the proposal to make best use of Gatwick's existing runways and infrastructure (referred to within this report as 'the Project') on the following types of noise:

- air noise – noise from aircraft in the air or departing or arriving (including reverse thrust) on a runway, generally assessed to a height up to 7,000 feet above ground level;
- ground noise – noise generated from airport activities at ground level including aircraft taxiing and traffic within the airport boundary;
- road traffic noise – noise from road traffic vehicles outside the airport on the public highway; and
- construction noise and vibration – noise and vibration from temporary construction of the Project, including the use of construction compounds.

14.1.2 In particular, this ES chapter:

- sets out the existing and future environmental baseline noise conditions, established from modelling including air noise modelling carried out by the Civil Aviation Authority (CAA);
- presents the potential environmental effects on noise and vibration arising from the Project, based on the information gathered and the analysis and assessments undertaken;
- identifies any assumptions and limitations encountered in compiling the assessment; and
- highlights mitigation measures that are proposed to minimise the likely environmental effects identified in the EIA process.

14.1.3 The noise and vibration assessment considers the likely significant effects arising from the construction and operation of the Project 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 and places of worship; and
- commercial properties such as offices and hotels, collectively described as 'non-residential receptors'.

14.1.4 Air noise has the potential to affect residents and other Noise Sensitive Receptors (NSRs) over a wide area beyond the airport boundary. This chapter reports the results of modelled changes in noise that can be expected over this area in connection with the Project. It uses a number of noise metrics to quantify the changes in noise that are expected following established guidance, and also provides additional detail on the changes that are expected at representative communities.

14.1.5 This chapter is accompanied by **ES Appendices 14.3.1 and 14.3.2** and **ES Appendices 14.9.1 to 14.9.10** (Doc Ref. 5.3) and a set of 94 figures (Doc Ref. 5.2), as listed in the contents page above. A glossary of acoustics terminology is provided in Section 14.15.

14.1.6 The Preliminary Environmental Information Report (PEIR) chapter identified Next Steps and these have been addressed in this chapter as follows:

- Further meetings have been held with the Local Authorities Noise Topic Working Group (TWG) to discuss methodologies and ensure the assessment takes account of local circumstances.
- Further work has been undertaken to identify particular non-residential receptors that may be affected.
- Further detail has been incorporated into the construction noise assessment and further mitigation has been developed.
- The Noise Envelope proposal in the PIER has been developed taking account of comments received and further stakeholder engagement.
- Ground noise and road traffic noise modelling has been refined in view of the adjustments to the scheme following the PEIR consultation.
- Temporary road traffic noise impacts during construction have been assessed quantitively taking account of strategic transport modelling for the peak period of construction work and traffic management measures.

14.2. Legislation and Policy

Legislation

14.2.1 This section provides an overview of the legislation relevant to the assessment of noise and vibration. The legislation referred to in this chapter has been taken into account where applicable to the assessment.

Land Compensation Act 1973

14.2.2 This Act provides for depreciation in property price caused by noise as a physical factor from public works (highway or aerodrome) to be compensated by the responsible authority. It also provides powers to enable the sound-proofing (noise insulating) of buildings from noise from highways and aerodromes and the payment of expenses of persons moving temporarily during construction works (due to noise).

Control of Pollution Act 1974

14.2.3 The Control of Pollution Act 1974 provides the definition of Best Practicable Means (BPM). Section 60 of the Act relates to the control of noise on construction sites and for the circumstances where a local authority may serve a notice on the person carrying out the works to undertake them in accordance with particular conditions. Section 61 of the Act allows the person carrying out construction works to seek prior consent for the works, by providing particulars of the works to be undertaken, the method by which those works will be undertaken and the steps proposed to be taken to minimise noise resulting from the works. In any proceedings for an offence under section 60(8) of this Act it shall be a defence to prove that the alleged contravention amounted to the carrying out of the works in accordance with a consent given under section 61 of the Act. The Act also provides the basis for defining codes of practice for minimising noise (e.g. BS 5228: 2014 Code of practice for noise and vibration control on construction and open sites, Part 1: Noise and Part 2: Vibration (BSI, 2014a, b)).

Environmental Protection Act 1990

14.2.4 The Environmental Protection Act 1990 sets out duties for local authorities to investigate and, where identified, take abatement action against noise nuisance. The Act provides the basis for a defence against noise abatement action taken by a local authority where it can be proved that BPM were used to prevent, or to counteract the effects of any noise nuisance complained of (section 80(7)). The Act additionally provides for individuals to pursue abatement action against noise nuisance (Section 82) via the magistrate's court, and in respect of which the BPM defence described above also applies.

Civil Aviation Act 1982 and 2012

14.2.5 The Civil Aviation Act 1982 provides that no action for trespass or nuisance can be taken as long as an aircraft observes the provisions of any Air Navigation Order. It also grants the Government powers to introduce noise control measures at designated airports.

14.2.6 Specific to the control of noise from aerodromes, this Act provides for charges to be fixed in respect of an aircraft or class or aircraft in relation to noise caused by aircraft; and in respect of designated airports, for the Secretary of State to issue requirements appearing to the Secretary of State to be appropriate for the purpose of limiting or for mitigating the effect of noise and vibration connected with the taking off or landing of aircraft at the aerodrome. The existing noise abatement procedures for Gatwick Airport are contained within the United Kingdom Aeronautical Information Package (UK-AIP) at section EGKK AD 2.21 Noise Abatement Procedures.

14.2.7 Gatwick Airport is a designated airport and as such the Department for Transport (DfT) sets a number of noise control requirements at the Airport. These include the Night Restrictions which set limits on ATMs and noise quota points for the summer and winter night (23:30 to 06:00 hours) periods. Section 3 of **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3) provides further detail in this regard. The DfT also sets departure noise limits that apply to aircraft taking off from the airport. Section 14.8 provides further details in this regard.

14.2.8 The Civil Aviation Act 2012 was introduced to modernise the regulatory framework for civil aviation in the United Kingdom (UK). It sets out the legislative framework for the economic regulation of airports and the CAA and confers certain aviation security functions on the CAA.

The Environmental Noise (England) Regulations 2006

14.2.9 These regulations transpose the provisions of the EU Environmental Noise Directive (END) 2002/49/EC relating to the assessment and management of environmental noise from transport and industry. The regulations set out the requirement to undertake strategic noise mapping and implement Noise Action Plans on a five yearly basis, for agglomerations and major roads, railways and airports. Gatwick Airport produced its latest Noise Action Plan in 2019 covering the period 2019-2024 (Gatwick Airport Limited (GAL), 2019). The objective of the Regulations is to provide for the comprehensive collection and analysis of data to prevent further deterioration in the environmental noise climate and to improve it where possible.

14.2.10 The Noise Action Plan (NAP): Agglomerations (Urban Areas), Environmental Noise (England) Regulations 2006, as amended, 2 July 2019, make provision for local authorities within

agglomerations[1] to designate 'Quiet Areas' that aim to protect existing quiet areas from an increase in noise. In 2019 there were 65 agglomerations, with the Crawley Agglomeration being the only one in the study area for the Project. The NAP identifies the Noise Receiving Authorities (NRAs) in the Crawley Agglomeration who are local authorities either wholly or partly within the approximate location of Crawley Urban Area Local Authority as: Crawley District Council; Horsham District Council; Mid Sussex District Council; Mole Valley District Council; Reigate and Banstead District Council; and Tandridge District Council. GAL has been engaged with all of these local authorities on noise matters in connection with the proposals for the Project, through the Noise TWG, and wrote to them in July 2022 to confirm that they have not designated any Quiet Areas under the Regulations. The responses received confirmed Quiet Areas had not been designated.

Regulation (EU) No 598/2014

14.2.11 Regulation (EU) No 598/2014 relates to the establishment of rules and procedures with regard to the introduction of noise-related operating restrictions at European Union airports within a 'balanced approach'. Following the departure of the UK from the European Union, Regulation (EU) No 598/2014 was adopted into UK law on 15 January 2021.

14.2.12 The aim of Regulation EU 598/2014 is to ensure that the International Civil Aviation Organization (ICAO) balanced approach (ICAO, 2008) is adopted for aircraft noise management at airports with more than 50 000 civil aircraft movements per calendar year (a movement being a take-off or landing), on the basis of the average number of movements in the last three calendar years before the noise assessment . Regulation EU 598/2014 requires a range of noise mitigation measures to be considered in accordance with the balanced approach, with a view to determining the most effective measure or combination of measures. The balanced approach consists of four main elements:

- noise at source;
- land use planning and management;
- noise abatement operating procedures; and
- noise abatement operating restrictions.

14.2.13 Regulation EU 598/2014 seeks to ensure that 'noise related operating restrictions' are only imposed when other measures within the balanced approach have first been considered, and where those other measures are not in themselves sufficient to attain the specific noise abatement objectives for the airport. Following this, if a noise based operating restriction is considered necessary, it can only be imposed after the 'cost effectiveness' of the restriction has been considered and if the measures together are no more than is necessary to achieve the environmental noise abatement objectives set for the airport. **ES Appendix 14.9.5: Air Noise Envelope Background** (Doc Ref 5.3) gives further details.

Noise Insulation Regulations 1975

14.2.14 The Noise Insulation Regulations 1975 (as amended) apply to 'new' or 'altered' roads and make provisions for the carrying out or giving of grants in respect of the cost of carrying out noise insulation. Traffic noise changes on unaltered roads are not subject to the regulations. The

[1] An agglomeration is an urban area with a population in excess of 100,000 persons and a population density equal to or greater than 500 people per km^2.

Regulations also provide discretionary powers to provide noise insulation or temporary rehousing for construction of new or altered roads.

Planning Policy Context

National Policy Statements

14.2.15 The Airports National Policy Statement (NPS) (Department for Transport, 2018a), although primarily provided in relation to a new runway at Heathrow Airport, remains a relevant consideration for other applications for airport infrastructure in London and the south-east of England.

14.2.16 The NPS for National Networks (Department for Transport, 2014)[2] sets out the need for development of road, rail and strategic rail freight interchange projects on the national networks and the policy against which decisions on major road and rail projects will be made. Table 14.2.1Table 14.2.1 provides a summary of the relevant requirements of these NPSs and how these are addressed within the ES.

Table 14.2.1: Summary of NPS Information Relevant to this Chapter

Summary of NPS requirement	How and where considered in the ES
Airports NPS	
Paragraphs 4.60 to 4.62 state: *Section 158 of the Planning Act 2008 provides a defence of statutory authority in civil or criminal proceedings for nuisance. Such a defence is also available in respect of anything else authorised by an order granting development consent. The defence does not extinguish the local authority's duties under Part III of the Environmental Protection Act 1990 to inspect its area and take reasonable steps to investigate complaints of statutory nuisance and to serve an abatement notice where satisfied of its existence, likely occurrence or recurrence.* *During the examination of an application for development consent for infrastructure covered under the Airports NPS, possible sources of nuisance under section 79(1) of the Environmental Protection Act 1990 and under sections 76 and 77 of the Civil Aviation Act 1982 should be considered by the Examining Authority. The Examining Authority should also consider how those sources of nuisance might be mitigated or limited so they can recommend appropriate requirements that the Secretary of State might include in any subsequent order granting development consent.* *The defence of statutory authority is subject to any contrary provision made by the Secretary of State in any particular case by an order granting development consent.*	The ES has: assessed sources of noise that may give rise to statutory nuisance; consulted with the surrounding Local Authorities to understand their concerns and role if required to investigate them; and assessed and provided suitable mitigation measures in particular for construction noise and ground noise.
Paragraph 5.67 states that *'The proposed development must be undertaken in accordance with statutory obligations for noise. Due regard must have been given to national policy on aviation noise, and the relevant sections of*	The noise assessment has had due regard to noise guidance within the NPSE and the NPPF,

[2] The Transport Decarbonisation Plan published by DfT on 14 July 2021 announced DfT's intention to review the NPS for National Networks in due course once demand patterns post-pandemic become clearer. It is understood this review is underway, with a previous stated intention to complete such review by Spring 2023. Revised timescales for the completion of the review are not known; however, in the interim and whilst the review is undertaken, DfT has confirmed the NPS for National Networks remains relevant government policy and has full force and effect for the purposes of the Planning Act 2008. GAL will continue to monitor the review process and reflect any necessary updates to the application for development consent for the Project as are considered appropriate at the time.

Summary of NPS requirement	How and where considered in the ES
the Noise Policy Statement for England (NPSE), the National Planning Policy Framework (NPPF) and the Government's associated planning guidance on noise.'	as discussed in the section below this table.
Paragraph 5.68 states that *'Development consent should not be granted unless the Secretary of State is satisfied that the proposals will meet the following aims for the effective management and control of noise, within the context of Government policy on sustainable development:* ▪ avoid significant adverse impacts on health and quality of life from noise; ▪ mitigate and minimise adverse impacts on health and quality of life from noise; and ▪ where possible, contribute to improvements to health and quality of life.'	The noise assessment has had due regard to guidance as it echoes the NPSE. Mitigation measures have been developed to avoid and/or reduce significant adverse effects on health and quality of life (eg noise insulation schemes). A range of mitigation measures will be used to minimise adverse effects and in accordance with the third objective, opportunities have been taken to reduce road traffic noise when designing the highway improvements (see Section 14.8 and **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3)).
Paragraph 5.52 states *'Pursuant to the terms of the Environmental Impact Assessment Regulations, the applicant should undertake a noise assessment for any period of change in air traffic movements prior to opening, for the time of opening, and at the time the airport is forecast to reach full capacity, and (if applicable, being different to either of the other assessment periods) at a point when the airport's noise impact is forecast to be highest. This should form part of the environmental statement. The noise assessment should include the following:* ▪ A description of the noise sources. ▪ An assessment of the likely significant effect of predicted changes in the noise environment on any noise sensitive premises (including schools and hospitals) and noise sensitive areas (including National Parks and Areas of Outstanding Natural Beauty). ▪ The characteristics of the existing noise environment, including noise from aircraft, using noise exposure maps, and from surface transport and ground operations associated with the [Development Consent Order (DCO)] project, the latter during both the construction and operational phases of the DCO project.	The air traffic scenarios modelled are in accordance with this guidance (see Section 14.7). Table 14.7.1 lists the maximum design parameters and is followed by an explanation of the worst-case noise assessment. The NSRs listed are all assessed. National Parks and Areas of Outstanding Natural Beauty (AONBs) are assessed in **ES Chapter 8: Landscape, Townscape and Visual Resources** (Doc Ref. 5.1). The existing noise environment is explained in this chapter, which also assesses noise impacts including road traffic noise. Mitigation is

Summary of NPS requirement	How and where considered in the ES
▪ A prediction on how the noise environment will change with the proposed DCO project. ▪ Measures to be employed in mitigating the effects of noise. *These should take into account construction and operational noise (including from surface access arrangements) and aircraft noise. The applicant's assessment of aircraft noise should be undertaken in accordance with the developing indicative airspace design. This may involve the use of appropriate design parameters and scenarios based on indicative flightpaths.'*	recommended where appropriate. Construction noise is assessed in this chapter and mitigation is recommended where appropriate. Whilst the development of a third runway at Heathrow would be contingent on major revisions to airspace in the South East of England, this Project is not. As such, the noise assessment is based on the flight paths required for the Project which are the flight paths currently flown.
Paragraph 5.53 first *states 'Operational noise, with respect to human receptors, should be assessed using the principles of the relevant British Standards and other guidance. For the prediction, assessment and management of construction noise, reference should be made to any British Standards and other guidance which give examples of mitigation strategies.'*	The assessment draws on various British Standards including BS 5228 (BSI, 2014a, b) for construction noise and vibration as described in Section 14.4.
Paragraph 5.53 goes on to state *'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 assessment of aircraft noise follows guidance for airspace change, see Section 14.4.
Para 5.52 states *'The applicant's assessment of aircraft noise should be undertaken in accordance with the developing indicative airspace design. This may involve the use of appropriate design parameters and scenarios based on indicative flightpaths'*. The Airports NPS further notes that: *'Precise flight path designs can only be defined at a later stage after detailed airspace design work has taken place. Once the design work has been completed, the airspace proposal will be subject to extensive consultation as part of the separate airspace decision making process established by the Civil Aviation Authority.'* (para 5.50).	Whilst the development of a third runway at Heathrow would be contingent on major revisions to airspace in the South East of England, this Project is not. As such, the noise assessment is based on the flight paths required for the Project which are the flight paths currently flown.
The Airports NPS also states that *'The Secretary of State will consider whether the mitigation measures put forward by the applicant following consultation are acceptable. The noise mitigation measures should ensure the impact of aircraft noise is limited and, where possible, reduced compared to the 2013 baseline assessed by the Airports Commission.'* (para 5.58).	Reference is made to the 2013 baseline in the assessment of effects in Section 14.9.

Summary of NPS requirement	How and where considered in the ES
Paragraphs 5.54-5.66 set out requirements relating to noise mitigation.	Mitigation measures included as part of the design of the Project are presented in Section 14.8.
Paragraph 5.60 refers to noise envelopes: '*The applicant should put forward plans for a noise envelope. Such an envelope should be tailored to local priorities and include clear noise performance targets. As such, the design of the envelope should be defined in consultation with local communities and relevant stakeholders, and take account of any independent guidance such as from the Independent Commission on Civil Aviation Noise. The benefits of future technological improvements should be shared between the applicant and its local communities, hence helping to achieve a balance between growth and noise reduction. Suitable review periods should be set in consultation with the parties mentioned above to ensure the noise envelope's framework remains relevant.*'	A Noise Envelope has been considered and is proposed, as summarised in Section 14.8 with details in **ES Appendix 14.9.7: Noise Envelope** (Doc Ref. 5.3).
NPS for National Networks	
In accordance with paragraph 4.7 of the Airports NPS, the NPS for National Networks is also relevant to surface access elements of the project. Of particular relevance to the assessment of road traffic noise is paragraph 5.189 of the NPS for National Networks, which states: *'Where a development is subject to EIA and significant noise impacts are likely to arise from the proposed development, the applicant should include the following in the noise assessment, which should form part of the environment statement:* ▪ A description of the noise sources including likely usage in terms of number of movements, fleet mix and diurnal pattern. For any associated fixed structures, such as ventilation fans for tunnels, information about the noise sources including the identification of any distinctive tonal, impulsive or low frequency characteristics of the noise; ▪ Identification of noise sensitive premises and noise sensitive areas that may be affected; ▪ The characteristics of the existing noise environment; ▪ A prediction on how the noise environment will change with the proposed development; - *In the shorter term such as during the construction period;* - *In the longer term during the operating life of the infrastructure;* - *At particular times of the day, evening and night as appropriate;* ▪ An assessment of the effect of predicted changes in the noise environment on any noise sensitive premises and noise sensitive areas;	The assessment of noise from construction, road traffic, ground activities and aircraft noise meet these requirements and use the relevant standards (see Section 14.9).

Summary of NPS requirement	How and where considered in the ES
▪ Measures to be employed in mitigating the effects of noise. Applicants should consider using best available techniques to reduce noise impacts. ▪ The nature and extent of the noise assessment should be proportionate to the likely noise impact.' Paragraphs 5.190 and 6.191 also note: The potential noise impact elsewhere that is directly associated with the development, such as changes in road and rail traffic movements elsewhere on the national networks, should be considered as appropriate. Operational noise, with respect to human receptors, should be assessed using the principles of the relevant British Standards and other guidance. The prediction of road traffic noise should be based on the method described in Calculation of Road Traffic Noise. The prediction of noise from new railways should be based on the method described in Calculation of Railway Noise. For the prediction, assessment and management of construction noise, reference should be made to any relevant British Standards and other guidance which also give examples of mitigation strategies.	

National Planning Policy Framework, 2021

14.2.17 The National Planning Policy Framework (NPPF) (Department of Levelling Up, Housing and Communities, 2021) does not provide specific policies for nationally significant infrastructure projects, which are determined in accordance with the decision making framework in the Planning Act 2008 (as amended) and relevant national policy statements for major infrastructure, though it may be relevant and important.

14.2.18 The NPPF provides the Government's planning 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 overarching objectives: economic; social; and environmental. which are interdependent and need to be pursued in mutually supportive ways (so that opportunities can be taken to secure net gains across each of the different objectives).

14.2.19 The NPPF at paragraph 185 in relation to pollution states the following, referring to the NPSE for further explanation:

'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:

a) 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[3]*;*

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and

c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.'

Planning Practice Guidance – Noise (PPG(N))

14.2.20 The government provides planning practice guidance on noise to assist in the management of noise through planning. The guidance set out various guiding principles including in paragraph 10 how planning can address the adverse effects of noise through mitigation which may be in the form of engineering, layout, using planning conditions or '*mitigating the impact on areas likely to be affected by noise including through noise insulation when the impact is on a building*'.

14.2.21 PPG(N) refers to various policy and guidance documents, and when introducing observable effects levels such as the significant observable adverse effect level and the lowest observed adverse effect level refers to the Noise Policy Statement for England, as discussed in the next section.

Noise Policy Statement for England (NPSE), 2010

14.2.22 In 2010, the NPSE (Defra, 2010) set out the long-term vision of the Government's noise policy 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'.

14.2.23 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:

1. Avoid significant adverse impacts on health and quality of life.

2. Mitigate and minimise adverse impacts on health and quality of life; and

3. Where possible, contribute to the improvement of health and quality of life.'

14.2.24 To identify "*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 (WHO). They are:

[3] See Explanatory Note to the Noise Policy Statement for England (Department for Environment, Food & Rural Affairs (Defra), 2010).

- 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.

14.2.25 Extending these concepts for the purpose of the NPSE leads to the concept of a significant observed adverse effect level.

- SOAEL – Significant Observed Adverse Effect Level: this is the level above which significant adverse effects on health and quality of life occur.

14.2.26 The NPSE notes 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'.

14.2.27 The NPSE further states:

'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 (paragraph 1.8)'.

14.2.28 The NPSE further 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 adverse 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 adverse effects cannot occur.'

Aviation Policy Framework, 2013

14.2.29 In 2013, the Aviation Policy Framework (Department for Transport, 2013) set out the framework for the management of noise at UK airports. It notes the role of the Government to set the overall national policy framework for aviation noise, and to use its powers under the Civil Aviation Act 1982 (as amended) to set noise controls at specific airports which it designates for noise management purposes (which includes Gatwick).

14.2.30 The Aviation Policy Framework notes that the Government fully recognises the ICAO Assembly 'balanced approach' principle to aircraft noise management. In addition, the Government's overall policy on aviation noise is summarised as being:

'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.'

14.2.31 This is identified to be consistent with the Government's noise policy, as set out in the NPSE which aims to avoid adverse impacts on health and quality of life.

Consultation Response on UK Airspace Policy: A Framework for Balanced Decisions on the Design and Use of Airspace, October 2017

14.2.32 In February 2017, the Department for Transport launched a consultation on airspace policy (Department for Transport, 2017a). The response to consultation was published in October 2017 (Department for Transport, 2017b) and reiterated the overall policy objective given in the Aviation Policy Framework, adding to it as follows:

'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 between industry and communities in support of sustainable development.'

14.2.33 Following the Survey of Noise Attitudes (SONA) report (Civil Aviation Authority, 2014), the consultation response was able to give further guidance on LOAELs for aircraft noise as follows:

Paragraph 2.70 'The government acknowledges the evidence from recent research which shows that sensitivity to aircraft noise has increased, with the same percentage of people reporting to be highly annoyed at a level of 54 dB $L_{Aeq,\ 16\ hour}$ as occurred at 57 dB $L_{Aeq,\ 16\ hour}$ in the past. The research also showed that some adverse effects of annoyance can be seen to occur down to 51 dB L_{Aeq}.'

Paragraph 2.71 'Taking account of this and other evidence on the link between exposure to noise from all sources and chronic health outcomes, we will adopt the risk based approach proposed in our consultation so that airspace decisions are made in line with the latest evidence and consistent with current guidance from the World Health Organization.'

Paragraph 2.72 'So that the potential adverse effects of an airspace change can be properly assessed, for the purpose of informing decisions on airspace design and use, we will set a LOAEL at 51 dB $L_{Aeq,\ 16\ hour}$ for daytime, and based on feedback and further discussion with CAA we are making one minor change to the LOAEL night metric to be 45 dB $L_{Aeq,\ 8\ hour}$ rather than L_{night} to be consistent with the daytime metric. These metrics will ensure that the total adverse effects on people can be assessed and airspace options compared. They will also ensure airspace decisions are consistent with the objectives of the overall policy to avoid significant adverse impacts and minimise adverse impacts.'

14.2.34 Thus, the LOAELs for aircraft noise had been established as 51 dB $L_{Aeq\ 16\ hour}$ for daytime, and 45 dB $L_{Aeq,\ 8\ hour}$ for night-time.

14.2.35 The Government recognises that a small number of people may be annoyed below the LOAEL and sets out in the consultation that it would consider which additional metrics be used to inform on effects:

Paragraph 5.43 'As explained above, a small number of people may consider themselves adversely affected by aircraft noise at levels below the LOAEL. Reactions to recent airspace changes and trials have clearly indicated that increases in the number of aircraft that people are exposed to can be noticeable and can annoy individuals, even at a noise exposure below 51 dB $L_{Aeq, 16\ hour}$. We have therefore considered which additional metrics for assessing aviation noise could be included in our guidance.'

14.2.36 Subsequently in 2018, CAP 1616 *Airspace Design: Guidance on the Regulatory Process for Changing Airspace, Design including Community Engagement Requirements* was published and provides the methodology for assessing the noise effects of an airspace change using L_{eq} and WebTAG to quantify significant effects. The document was updated in 2021 (CAA, 2021). It defines a series of "secondary noise metrics" to assess adverse effects of noise including: number above contours, L_{max} contours; difference contours; and overflight contours (a secondary metric for the purposes of decision making). These are discussed in Section 14.4.

14.2.37 The consultation response also confirms the following from the Aviation Policy Framework:

- The Government continues to expect airport operators to offer assistance with the costs of moving households exposed to levels of noise of 69 dB $L_{Aeq, 16\ hour}$ or more.
- 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 $L_{Aeq, 16\ hour}$ or more.
- 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 3 dB or more which leaves them exposed to levels of noise of 63 dB $L_{Aeq, 16\ hour}$ or more.

Aviation 2050: The Future of UK Aviation, A Consultation, December 2018

14.2.38 The consultation period for Aviation 2050 closed in June 2019. The submitted consultation document (Department for Transport, 2018b) indicates the Government's views in developing the Aviation Strategy and seeks views on these. In paragraph 3.114, it acknowledges that noise may decrease or may increase:

'The government intends to put in place a stronger and clearer framework which addresses the weaknesses in current policy and ensures industry is sufficiently incentivised to reduce noise, or to put mitigation measures in place where reductions are not possible'.

14.2.39 The consultation goes on to discuss various proposed measures including setting noise caps as part of planning applications, lower noise levels and better standards for noise insulation, and the future role of the Independent Commission on Civil Aviation Noise to assist in enforcement etc. Section 14.8 discusses the proposed lower noise levels and how these have been adopted as a mitigation standard for this Project. The Aviation Strategy was due to be released at the end of 2019.

Policy Paper, Overarching Aviation Noise Policy, DfT, March 2023

14.2.40 In March 2023 DfT published a short policy paper on their overarching aviation noise policy, as an interim statement of overarching noise policy to help frame the Night Restrictions objective for Night Restrictions Consultation that was launched, ahead of a full noise policy statement expected later in 2023.

14.2.41 The policy paper states:

'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.

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.'

14.2.42 The policy paper also provides the following guidance.

'We consider that "limit, and where possible reduce" remains appropriate wording. 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.

One of the overall objectives underpinning the Air Navigation Guidance 2017 is to "emphasise that the environmental impact of aviation must be mitigated as much as is practicable and realistic to do so." Consultation responses suggested that including this in our overall policy would be beneficial. This complements the aim of limiting and where possible reducing the total adverse impacts, and we consider helps clarify that noise mitigation as well as noise reduction can contribute to reducing total adverse effects of noise. We have therefore introduced this phrase into our overarching policy.'

We intend to publish a noise policy paper later this year which will set out our plan to monitor our progress against this objective and what specific actions we are taking in this respect and how the government will evaluate whether the policy aims are being met.'

14.2.43 The policy will be further clarified, planned for later in 2023. In the meantime, we note the overall policy suggests the following.

14.2.44 Policy requires the ICAO balanced approach to be followed. Aviation noise is to balance the economic and consumer benefits of aviation against their social and health implications. The

previous policy concerning the total population significantly affected by noise is replaced with the total adverse impacts on health and quality of life from aviation noise. The WebTAG assessment provided in Section 14.12 and **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3) quantifies this. Reference to Sharing the Benefits of aircraft noise emission reduction has been removed. We consulted on sharing the benefits through our Noise Envelope Group in summer 2022 (see **ES Appendix 14.9.8: The Noise Envelope Group Output Report** (Doc Ref 5.3) and **ES Appendix 14.9.9: Report on Engagement on the Noise Envelope** (Doc Ref 5.3), and this ES does not provide further material on sharing the benefits.

14.2.45 The policy emphasises the increased impact of night flights. The Project proposal includes specific mitigation measures to reduce night noise, including not operating the Northern Runway routinely between 23:00 and 06:00 hours.

14.2.46 The new policy recognises that growth may increase noise impacts and may be offset by an increase in economic benefits. It also places increased emphasis on mitigation in such cases. The Project proposes a substantially improved Noise Insulation Scheme (NIS), as discussed in Section 14.9, in line with the Noise Policy Statement for England.

Independent Commission on Civil Aviation Noise (ICCAN)

14.2.47 The Independent Commission on Civil Aviation Noise (ICCAN) was a non-statutory advisory body, established to act as the impartial expert adviser to Government and others on all matters relating to aviation noise from January 2019 to September 2021 when it was disbanded with its responsibilities being passed to the CAA. ICCAN published its first Corporate Strategy in Spring 2019 and in March 2021 published a new Corporate Strategy for 2021-2024 (ICCAN, 2021a) which was not implemented. In its two years ICCAN consulted widely with stakeholders and commissioned a number of studies to help inform better noise management including:

- a summary of aviation noise's health effects (ICCAN, 2020a);
- a survey of people's experience of aviation noise during lockdown (ICCAN, 2020b);
- the future of aviation noise management ICCAN's emerging view (ICCAN, 2020c);
- best practice for engagement between airports and communities on aviation noise (ICCAN, 2020d); and
- a review of airport noise insulation schemes (ICCAN, 2021b).

14.2.48 GAL engaged with ICCAN publicly through the Noise Management Board, and through regular direct communications, and has taken account of ICCAN's work when developing the Project.

WHO Environmental Noise Guidelines for the European Region

14.2.49 In October 2018, the WHO published its Environmental Noise Guidelines for the European Region (WHO, 2018). These guidelines cover external noise levels for specific noise sources, not mixed sources. The majority of people experiencing aircraft noise also experience other sources of noise, generally road traffic.

14.2.50 The WHO Community Noise Guidelines (WHO, 1999) general recommendations on non-specific noise and internal noise levels remain relevant. The 2018 Environmental Noise Guidelines use the same standardised EU noise metrics L_{den} (an annual average day, evening, night weighted L_{eq} level) and L_{night} (the annual average 8 hour night L_{eq}). Similarly, the guidance in the WHO Night Noise Guidelines (WHO, 2009) using other metrics is not superseded.

14.2.51 The 2018 Environmental Noise Guidelines are based on a detailed review of the literature from 1999 to 2015. In the case of aircraft noise, the scatter in the dose/response relationships is considerable, but a single dose response is offered for each health effect with associated target levels for aircraft noise in terms of the European annual average noise metrics L_{den} and L_{night}. However, in Section 5, Implementation of the Guidelines, the WHO note:

'Furthermore, cultural differences in what is considered annoying are significant, even within Europe. Therefore, it is not possible to determine the "exact value" of % HA [highly annoyed] for each exposure level in any generalized situation. Instead, data and exposure-response curves derived in a local context should be applied whenever possible to assess the specific relationship between noise and annoyance in a given particular situation.'

14.2.52 The SONA study assessed annoyance in the UK and reported in 2017, after the cut-off date for studies considered in the WHO report. The SONA study gives the local annoyance response relationship relevant to the UK. It shows, in the UK, about 7% of the population in 2014 was annoyed by aircraft noise at $L_{eq,\ 16\ hour}$ 51 dB, and the DfT has adopted this as the LOAEL.

Recent Planning Cases and SOAEL

14.2.53 Government guidance, as summarised above, does not explicitly define SOAEL for aviation noise. However, a number of recent applications for airport development have considered this to ensure suitable mitigation is included to comply with the NPSE and NPPF requirement to 'avoid' significant adverse effects on health and quality of life.

14.2.54 Since 2014 noise policy has been interpreted by, variously, the local planning authorities, public inquiry inspectors, the Mayor of London and the Secretary of State for Transport, in the following applications for new airport infrastructure:

- Birmingham International Airport Runway Extension, 2014;
- London City Airport Development Plan, 2015-2016;
- Cranford Agreement Secretary of State's Decision, February 2017 (DCLG, 2017);
- Stansted Airport Planning Appeal Decision, May 2021;
- Bristol Airport Planning Appeal Decision, February 2022; and
- Manston Airport Development Secretary of State's Decision, August 2022.

14.2.55 In the Cranford case, the inspector noted *'the parties do not differ about the SOAEL for aircraft noise: it is 63 dB $L_{Aeq,\ 16\ hour}$ (or its equivalent if other metrics are considered). Noise impacts at that level require to be avoided.'*

14.2.56 In the Cranford case the Inspector also noted:

'the Examining Authority's Report and the Secretaries of States' decision on the Thames Tideway Tunnel (TTT) Development Consent Order application confirms that the aims of the NPSE are satisfied by the provision of acoustic insulation at the level of SOAEL (whatever that is determined to be in the particular case), and by other mitigation measures below that level.'

14.2.57 Hence, the provision of noise insulation above a SOAEL of $L_{eq\ 16\ hr}$ 63 dB is taken as satisfying the first aim of the NPSE to '*Avoid significant adverse impacts on health and quality of life*'.

14.2.58 The Cranford case Inspector also noted:

'In consequence, I do not equate the 'significant adverse effects' identified in the ES with those that the NPSE seeks to avoid.'

14.2.59 Hence, impacts identified as significant in this ES, but below SOAEL, whilst minimised through mitigation, do not need to be avoided, or require noise insulation.

14.2.60 These decisions have been considered when developing the assessment criteria described in Section 14.4.

Local Planning Policy

14.2.61 Gatwick Airport lies within the administrative area of Crawley Borough Council and adjacent to the boundaries of Mole Valley District Council to the north west, Reigate and Banstead Borough Council to the north east and Horsham District Council to the south west. The administrative area of Tandridge District Council is located approximately 1.9 km to the east of Gatwick Airport, while Mid Sussex District Council lies approximately 2 km to the south east. Gatwick Airport is located in the county of West Sussex and immediately adjacent to the bordering county of Surrey.

14.2.62 The relevant local planning policies applicable to noise based on the extent of the study area for this assessment are summarised in Table 14.2.2Table 14.2.2.

Table 14.2.2: Local Planning Policy

Administrative Area	Plan	Policy
Adopted Policy		
Crawley	Crawley 2030: Crawley Borough Local Plan 2015-2030 (2015)	GAT1 Development of the Airport with a Single Runway
		ENV11 Development & Noise, and the Local Plan Noise Annex
Reigate and Banstead	Reigate and Banstead Local Plan: Core Strategy (2014)	CS10 Sustainable Development
	Reigate and Banstead Local Plan Development Management Plan (2019)	DES8 Construction Management
		DES9 Pollution & Contaminated Land
Mole Valley	Mole Valley Core Strategy (2009)	CS 19 Sustainable Construction, Renewable Energy & Energy Conservation
	Mole Valley Local Plan (2000) (saved policies)	ENV22 General Development Control Criteria
Horsham	Horsham District Planning Framework (2015)	Policy 24 Environmental Protection
Tandridge	Tandridge District Core Strategy (2008)	CSP 16 Aviation Development
		CSP 18 Character & Design

Administrative Area	Plan	Policy
	Tandridge Local Plan Part 2: Detailed Policies 2014-2029 (2014)	DP22 Minimising Contamination, Hazards & Pollution
Mid Sussex	Mid Sussex District Plan 2014-2031 (2018)	DP29 Noise, Air & Light Pollution
	Mid Sussex District Local Plan 2004 (saved policies)	B23: Noise Pollution
		CS22: Pollution
Emerging Policy		
Crawley	Draft Crawley Borough Local Plan 2021-2037 Regulation 19 Consultation (2021)	SD1: Presumption in Favour of Sustainable Development
		GAT1: Development of the Airport with a Single Runway
		EP4: Development and Noise and Local Plan Noise Annex (topic Paper 7)
		GAT2: Safeguarded Land
Tandridge	Our Local Plan 2033 (Regulation 22 Submission) (2019)	TLP45 Energy Efficient & Low Carbon Development
		TLP46 Pollution and Air Quality
Mole Valley	Draft Future Mole Valley, 2020-2037, Consultation Draft Local Plan, Proposed Submission Version (2021)	INF6 Gatwick Airport. EN12 Pollution Control,
Horsham	Draft Horsham District Local Plan 2019-2036 Regulation 18 Consultation (2020)	Policy 25 - Strategic Policy: Environmental Protection

14.3. Consultation and Engagement

14.3.1 In September 2019, GAL submitted a **Scoping Report** (ES Appendix 6.2.1 (Doc Ref. 5.3)) to the Planning Inspectorate (on behalf of the Secretary of State). This described the scope and methodology for the technical studies being undertaken to provide an assessment of any likely significant effects and, where necessary, to determine suitable mitigation measures for the construction and operational periods of the Project. It also described those topics or sub-topics which are proposed to be scoped out of the EIA process and provided justification as to why the Project would not have the potential to give rise to significant environmental effects in these areas.

14.3.2 Following consultation with the statutory bodies, the Planning Inspectorate (on behalf of the Secretary of State) provided a **Scoping Opinion** (ES Appendix 6.2.2 (Doc Ref. 5.3)) on 11 October 2019.

14.3.3 Key issues raised during the scoping process specific to the noise and vibration chapter are listed in **ES Appendix 14.3.1: Summary of Stakeholder Responses – Noise and Vibration** (Doc Ref

5.3) and summarised in Table 14.3.1 together with details of how these issues have been taken into account within the ES.

Table 14.3.1: Summary of Scoping Responses

Details	How/where taken into account in ES
Planning Inspectorate	
The Scoping Report attests that the "study area for noise and vibration effects…cannot be determined until noise levels resulting from the Project have been modelled". Therefore, the Inspectorate cannot agree that impacts to 'Quiet Areas' (as designated within Local Plans or Neighbourhood Development Plans or areas identified as Quiet Areas through the Environmental Noise (England) Regulations 2006)) can be scoped out of the ES. The assessment should assess impacts on these areas, where significant effects are likely to occur.	Further consultation with the relevant local authorities has confirmed there are no designated Quiet Areas within the areas where noise has been modelled and assessed. See Sections 14.9 and 14.11.
The Applicant seeks to scope out consideration of APUs on the basis that previous ground noise studies and operational reports demonstrate that the need for APUs is rare (as ground power is generally available) and that the sound power of a taxiing jet aircraft exceeds that of an APU such that increases to the overall sound power (when APU noise is combined) are 'inconsequential'. The Inspectorate does not consider that the Applicant has provided sufficient information to justify scoping this matter out. The ES should assess impacts associated with noise from APUs where significant effects are likely to occur.	Noise from aircraft auxiliary power units (APUs) has been scoped into the assessment and is considered within Section 14.9.
The Scoping Report contains limited information with regards to potential sources of construction or operational vibration and the Inspectorate is therefore unable to scope this matter out. The ES should include an assessment of operational vibration, where likely significant effects could occur.	Given the separation of the construction worksites from neighbouring sensitive receptors, significant vibration effects from construction are unlikely. However, the ES provides predictions and an assessment of vibration from construction work. In accordance with the May 2020 DMRB guidance (LA111) vibration during operation of the highway is not likely and can be scoped out. LA111 states that: '*Operational vibration is scoped out of the assessment methodology as a maintained road surface will be free of irregularities as part of project design and under general maintenance, so operational*

Details	How/where taken into account in ES
	vibration will not have the potential to lead to significant adverse effects'. Ground vibration from sources within the airport are highly unlikely to be significant at receptors off site and are not assessed.
The Scoping Report provides very little information on the type and nature of road traffic and the junction designs necessary to support the statement that "vibration from operational road traffic…is expected to be below the scoping thresholds". Accordingly, the Inspectorate does not agree to scope this matter out. The Inspectorate considers that an assessment of vibration effects arising from construction vehicles on the existing road network should be provided as part of the ES, in line with the methodological approach established in the Design Manual for Roads and Bridges (DMRB). It is unclear whether the Applicant also proposes to scope out vibration from construction traffic, but for the avoidance of doubt, the Inspectorate's comments above apply equally in the context of construction traffic (noting the additional relevance of BS:5228 'Code of practice for noise and vibration control on construction and open sites' in this regard).	As discussed above, vibration from construction plant is predicted and assessed in Section 14.9. As discussed above, in accordance with the May 2020 DMRB guidance vibration during operation of the highway can be scoped out.
The assessment should provide a clear description to distinguish between where "air noise" and "ground noise" begin and end. The description should have regards to the activities such as landing and taxiing planes. For example, once a plane lands and is off the runway, at what point does it become part of the "ground noise". Particular consideration will also need to be given to the provisions of the 'end around' taxiways and new holding spurs in this regard as they bring taxiing aircraft closer to existing sensitive receptors. The ground noise assessment should also be clear as to how other 'key components' of the project have been factored in (including substations, heating plant, engine testing and the north and south terminal extensions) in terms of any additional contributions over aircraft ground noise at sensitive receptors.	The distinction between air, ground, road and construction noise has been clarified (see Section 14.1). Ground noise includes all taxiway noise, including end around taxiways (EAT). Noise from engine testing has been assessed (see Section 14.9). Significant noise effects from the operation of substations, heating plant and other permanent fixed noise sources are assessed (see Section 14.9).
The Applicant explains that the project does require the routings of aircraft "close to the airport" to be changed, which would appear to contradict the later assertion that "any noise impacts of the Project will be the result of increases in noise due to the increased number of flights on the northern runway, rather than new noise impacts over areas previously unaffected".	As further explained in Section 14.8 and **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3), aircraft using the altered northern runway would use the same flight paths as currently flown from the existing northern runway but displaced some 12 metres further to the north

Details	How/where taken into account in ES
The ES should assess the likely significant effects associated with these changes and assess effects on additional affected noise receptors. The ES should also assess the extent to which the Proposed Development would result in an increased capacity on the main runway (potentially) allowing for additional movements by larger, nosier aircraft which could generate further increases in noise on the main runway compared to current operation. The baseline and future baseline assumptions in terms of usage of the northern runway should also be clearly set out so as to understand the number of additional movements being modelled in predicting significance of effect.	(equating to about a third of a wingspan of the average sized aircraft). The main and northern runway flight paths run parallel to each other maintaining the track of the respective extended runway centrelines. At the point that aircraft begin to turn to the north or south (between 5 and 16 km from the runway) the main and northern runway flight paths merge. Flights from both runways are included in the assessment, and the forecast allows for growth in operations of larger aircraft from the main runway. The numbers of movements in the baseline and with the Project are set out in Table 14.7.1 in Section 14.7.
The Airports NPS states that the assessment of aircraft noise should be undertaken in accordance with the developing indicative airspace design, which may involve the use of appropriate design parameters and scenarios based on indicative flight paths. The ES should ensure that it presents an assessment of the realistic worse-case scenarios for the Proposed Development, including consideration of any airspace change implications for the noise assessment and the introduction of performance-based navigation. The assumed Air Traffic Movements (ATM) should be clearly stated for all assessment scenarios. Furthermore, a WebTAG analysis to value and compare the noise impact of these options should be provided consistent with the requirements of the Air Navigation Guidance 2017 (as cited by the Applicant at 7.14.7 of the Scoping Report). When considering the introduction of quieter aircraft each year against growth in ATMs, the ES should clearly identify the worst-case scenarios in terms of noise effects (against CAA's latest estimates as set out at paragraph 7.8.30 of the Scoping Report).	Whilst the development of a third runway at Heathrow would be contingent on major revisions to airspace in the South East of England, this Project is not. It is not currently possible to consider in detail the airspace change that would be required for a third runway at Heathrow because the design of that airspace is being developed and assessed separately to a different programme. As such, this noise assessment is based on the flight paths required for the Project which are the flight paths currently flown. As above, air traffic forecasts are provided in Section 14.7. Section 14.12 and **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3) provides the WebTAG assessment. The ATM forecasts used for the modelling of noise in the future are based on estimates of how the fleet will transition based on assumptions around airlines' fleet procurement programmes and business models. The 'central case' used in the noise assessment is based on what is considered today to be the most likely

Details	How/where taken into account in ES
	rate of fleet transition. However, there is uncertainty around this, particularly following the global COVID-19 pandemic and the financial impact of this on the airlines. Therefore, noise modelling has also been carried out for a 'slower transition fleet' based on ATM forecasts in which the rate of fleet transition is delayed by about five years and which would result in higher noise levels than the central case for the same periods. A sensitivity analysis was carried out that concluded 2032 would be the year of greatest noise impacts, as explained in Section 14.7.
The Applicant explains that the baseline for the air noise assessment will be the 2018 summer season. There is also reference to Gatwick Airport Noise and Track Keeping (NTK) sites being "live with others at various stages of planning and installation". Reference is then made to additional baseline noise level measurements were conducted in August 2016 at locations shown in Figure 7.8.1. The ES should clearly describe how the monitoring locations have been selected and the extent to which they are agreed with the relevant consultation bodies. The methodology used for the baseline noise surveys should be described in the ES and/or accompanying technical appendices. The Inspectorate recognises the importance of establishing an accurate and current baseline in order to determine the need for noise mitigation measures. The ES should demonstrate regard to the Airports NPS in this respect.	The Noise and Track Keeping monitors are managed by Gatwick Airport who consult and report quarterly to the Noise and Track Keeping Monitoring Advice Group (NaTMAG) that comprises local authorities, the DfT, NATS and airlines. NaTMAG are consulted on the location of new monitoring sites. A summary of the baseline survey details is provided in Section 14.6 and the full ground noise baseline report is provided in **ES Appendix 14.9.6: Ground Noise Baseline Report** (Doc Ref 5.3). Baseline conditions have informed the development of mitigation, taking into account the requirements of the Airports NPS.
The Inspectorate notes the study area for the aircraft noise assessment is yet to be defined. The Inspectorate considers that the study area should include receptors beneath flight paths within the High Weald AONB, Surrey Hills AONB, Kent Downs AONB and South Downs National Park, including the potential for cumulative noise impacts with other development (including airports). This should also extend to the consideration of noise effects at heritage sites and historic parks and gardens that may be subject to adverse noise effects.	Overflight analysis for landscape and visual and heritage assessments has been included up to 35 miles from the airport (see Sections 14.9 and14.11).

Details	How/where taken into account in ES
Paragraphs 7.2.9 and 7.8.28 explain that the Applicant intends to consider such matters as part of the LVIA chapter, but the noise chapter should assess the potential for interrelated effects in this regard.	
The definition of the study area for the noise assessment should also assess noise effects of the Proposed Development on future residential amenity of existing allocations under the relevant local plan proposals where significant effects are likely to occur (with reference to the study area as informed by the noise modelling results).	An assessment of noise impacts on committed residential areas is provided in Section 14.11.
There is no reference to any consideration of noise sensitive ecological receptors in addition to human receptors. The ES should clearly identify the sensitive receptors considered in the impact assessment and include cross-referencing between aspect chapters, as appropriate.	There are no species that have been identified as specifically sensitive to noise in the study area.
Reference is made to the assessment years of 2026, 2029 and 2038. The ES should explain and assess the “maximum effect” in terms of noise generation which may not coincide precisely with the assessment years presented in the Scoping Report.	As explained elsewhere the runway opening date is now anticipated to be 2029 and noise is therefore assessed in 2029, 2032, 2038 and 2047. An explanation as to why 2032 is the year of maximum effect is provided in Section 14.7.
NOEL, LOAEL and SOAEL are not defined in the main body of the Scoping Report in terms of the approach to the assessment, and no definition is provided anywhere in the Scoping Report for an Unacceptable Adverse Effect Level (UEAL). The ES should use and define these for the purposes of the assessment in line with the requirements of the NPSE. The Applicant has acknowledged the World Health Organization (Environmental Noise Guidelines for the European Region (2018)) at paragraph 7.8.2 of the Scoping Report. The Inspectorate notes that this publication recommends adverse effects from aircraft noise can begin at lower levels than the corresponding figures in The Environmental Noise (England) Regulations 2006. The Applicant should specifically address how this and other relevant guidance has been factored in to the defined NOEL, LOAEL, SOEAL and UEALs.	LOAELs and SOAELs for air, ground, road traffic and construction noise are described in Section 14.4 based on national guidance including government guidance that takes account of WHO guidance since the NPSE was published in 2010. NOELs are referred to in the NPSE, but since only effects above the LOAEL require mitigation, a NOEL standard is not required for EIA purposes. UAELs are not mentioned in the NPSE. The Gatwick modelling shows zero population counts for air noise contours above the Heathrow UAELs $L_{eq,\ 16\ hour}$ 71 dB and $L_{eq,\ 8\ hour}$ 66 dB (Heathrow UAELs used as a reference point).
The ES should factor in relevant assumptions in relation to aborted landings based on actual statistics held by the Applicant. The Inspectorate considers that where the number of arrivals increase	Aborted landings result in ‘go-arounds’, the standard procedure that occurs when an arriving aircraft aborts landing during

Details	How/where taken into account in ES
then the number of aborted landings will increase proportionally which could cause a higher than normal level of effect on noise sensitive receptors due to the low altitude and displaced location of the aircraft.	the final stages of approach. They occur most often as a result of a departing aircraft or preceding arriving aircraft not fully vacating the runway ahead of a landing aircraft. On these occasions the pilot takes averting action under a defined standard missed approach procedure. On westerly operations, typically these aircraft abort landing at low level, climb to 3,000 feet and loop round over Crawley to make a fresh approach to the runway. However, the CAA do not model noise from go-arounds at UK airports because their effect on the resultant noise contours is not significant. In the busy summer season in 2019 there were approximately three go-arounds each day. 85% of these occurred within the 16 hour day and evening period, with 15% at night (23:00-07:00 hours). The Project includes eight new exit/entrance taxiways, plus the EATs and has been designed so that the numbers of go-arounds do not significantly increase. As such, noise disturbance from go-arounds is not expected to increase and accordingly these are not assessed.
The Inspectorate understands that future growth on a single runway operation will be achieved by 'peak spreading' as set out in section 4.5 of the Scoping Report and that this is also the case for the dual-runway operation (off peak periods are expected to experience a greater increase in ATMs than peak periods (paragraph 4.5.1, and as shown on diagram 4.5.1 of the Scoping Report). As such, although the summer months may still represent peak activity, the magnitude of change as a result of the Proposed Development is greater outside of these peak periods. Therefore, the ES should clearly set out how the use of the 'summer contours' accounts for the full impact of 'peak spreading'. The assessment should also include Lden and Lnight contours (in line with the Air Navigation Guidance 2017, CAP1616, and the Airports Commission noise 'scorecard') that are based on flights	Diagram 4.5.1 of the **Scoping Report** (ES Appendix 6.2.1 (Doc Ref. 5.3)) related to growth in air traffic without the Project and indicated clearly that the highest numbers of flights would continue to occur in the months of June to September (20% above winter months) as captured by the Leq noise modelling period from 16 June to 15 September. This is confirmed by current forecasts (see **ES Chapter 4: Existing Site and Operation** (Doc Ref 5.1)). Annual L_{den} and L_{night} contours are provided for baseline and with Project conditions in Section 14.6 and 14.9 to

Details	How/where taken into account in ES
year round (therefore also accounting for flights outside the busy summer period).	illustrate noise changes over the whole year including the winter months.
Paragraphs 7.8.31-44 do not specifically outline the approach in relation to construction noise, other than a brief statement in paragraph 7.8.44 that effects of construction noise will be predicted and assessed using BS 5228. Assumptions around noise generating constriction activities and plant should be clearly presented in the ES to support understanding of the modelled assessment years and scenarios. The construction noise assessment should include criteria for the assessment of noise effects during weekends and night-time hours where such works are proposed or not otherwise restricted. In particular paragraph 5.3.18 of the Scoping Report explains that much of the construction work will take place overnight to reduce impact on the operation of the airport, and access roads. The outline CoCP should detail specific mitigation measures to address effects from such works where significant effects are likely. Impacts associated with the potential increased use of Crawley Goods Yard during the construction phase should be addressed as part of the assessment as such activities may also occur overnight.	The approach to assessment is set out in Section 14.4, with the assessment of construction noise and vibration provided in Section 14.9. The construction noise model has been developed to predict noise from the main works activities required to build the Project. **ES Appendix 14.9.1: Construction Noise and Vibration Modelling** (Doc Ref. 5.3) provides details of the construction plant assumed and which activities are expected in the day evening and night. Crawley Goods Yard is no longer part of the Project.
The ES should assess on-site noise emissions from fixed plant relating to the Proposed Development where likely significant effects could occur. Static sources should be assessed using BS4142: 2014 Methods for rating and assessing industrial and commercial sound. The ES should also include an assessment of groundborne noise from increased rail movements associated with the Proposed Development and any other relevant sources.	Noise emissions from fixed operational facilities is assessed using the BS 4142 method, in Section 14.9. Groundborne noise is not understood to be an issue for the railways around Gatwick and is not proposed to be assessed in the ES.
The peak period of construction traffic flows used to inform the assessment should be explained with reference to the schedule of construction activity. Given the spatial extent of the works, the assessment should also consider whether peak periods of activity may vary by receptor or groups of receptors. Table 5.4.1 of the Scoping Report explains that the construction of the Proposed Development is due to commence in 2022 with completion of the work between 2028-2034, thereby a construction phase of up to 12 years. The approach to the assessment of construction traffic should therefore ensure that it is suitably representative of such a duration. Paragraph 7.8.44 also states that “the assessment of construction traffic noise will be based on a period of peak traffic flow” whereas paragraphs 5.3.17 – 5.3.18 imply that the construction will be scheduled at night to minimise disruption (ie outside of peak traffic	Impacts from road traffic noise during construction have been assessed for three periods; the period of peak construction activity on the airfield (ie peak construction traffic generation); the main traffic management period for the highways works, and the period of traffic management when some lanes on Airport Way are closed. This has ensured that periods of peak construction traffic and peak displacement of traffic to adjacent roads due to the highways works have been assessed.

Details	How/where taken into account in ES
flows). The ES should define the worst case scenario in this respect or present both peak construction activity and peak traffic flow scenarios as part of the assessment of effects.	
ES should explain how the Proposed Development interacts with the existing Noise Insulation Scheme prepared in accordance with the Noise Action Plan 2019-2024. If the assessment establishes that the action plan needs to be "enhanced as part of a package of noise mitigation measures" in order to mitigate adverse effects of the Proposed Development then the ES should explain how this will be achieved. The full package of potential mitigation measures will need to be presented as part of the ES and options explained in terms of a mitigation hierarchy as the Inspectorate considers noise insulation to be a 'last resort'. Where noise insulation is proposed, the ES should describe what forms of ventilation are proposed eg acoustic louvres and/or mechanical ventilation. The Inspectorate notes that there is no reference to a defined 'noise envelope' as referred to in paragraph 5.60 of the Airports NPS, and the Applicant should make efforts to agree the need for such provisions with relevant consultation bodies as a mechanism to manage noise effects.	An enhanced NIS has been developed and a full package of mitigation is proposed, including a noise envelope (see Section 14.8).

14.3.4 The PEIR was issued to inform the statutory consultation carried out on the Project in Autumn 2021 and included consultation on the draft noise envelope proposal, including identifying that the noise envelope may be an operating restriction in accordance Regulation EU 598/2014. It presented the preliminary findings of the EIA process for the Project at that time. The consultation responses specific to the noise assessment and the way in which they have been taken into account in this ES chapter are set out in **ES Appendix 14.3.2: Summary of PEIR and Updated PEI Responses – Noise and Vibration** (Doc Ref 5.3). Further detail about the consultation process for the Project and the way the consultation responses have been taken into account is provided in the separate **Consultation Report** (Doc Ref. 6.1).

14.3.5 In order to seek local technical input on the noise and vibration assessment, during preparation of the PEIR and subsequently the ES a Noise TWG was formed comprising Environmental Health offices from the authorities whose areas may be affect by noise from the Project: Crawley Borough Council; Mid Sussex District Council; West Sussex District Council; Reigate and Banstead District Council; Mole Valley District Council; Horsham District Council; Surrey County Council; East Sussex County Council; and Kent County Council. The TWG met 12 times in the preparation of the PEIR and ES. Numerous aspects of the noise and vibration assessment were discussed. These have been taken into account and helped refine many areas of the assessment and have helped ensure the assessment takes account of local circumstances. **ES Appendix 14.3.2: Summary of PEIR and Updated PEI Responses – Noise and Vibration** (Doc Ref 5.3) summarises the topics discussed, and meetings held.

14.3.6 Approximately 3,000 stakeholders provided 15,000 comments on the noise and vibration assessment provided in the PEIR. They included a substantial number of comments on the outline of the Noise Envelope provided in the Section 14.8 of the PEIR which specifically requested views to help formulate the full Noise Envelope for the DCO submission. GAL formed a Noise Envelope Group in May 2022 to seek further views on the noise envelope to guide the development of the final proposal for the DCO. Terms of reference were produced, and two sub-groups were established; the Local sub-group and the Aviation sub-group, to facilitate discussions with local communities, local authorities, and aviation stakeholders. These were structured around four themes drawn from the PEIR consultation response and CAP1129 guidance. Further details are provided in **ES Appendix 14.9.5: Noise Envelope Background** (Doc Ref 5.3) and the associated consultation reports referred to therein.

14.3.7 In June 2022 an additional consultation was undertaken to update stakeholders and the local community on the ongoing work and refinement to the Project proposals, which included a targeted statutory consultation on the design changes to the proposed highway improvements. As these changes to the Project had the potential to lead to new or materially different significant environmental effects compared to those reported in the PEIR, updated Preliminary Environmental Information (PEI) was issued as part of this additional consultation. The consultation responses specific to the noise assessment and the way in which they have been taken into account in this ES chapter are set out in **ES Appendix 14.3.2: Summary of PEIR and Updated PEI Responses – Noise and Vibration** (Doc Ref 5.3). Further detail about the consultation process for the Project and way the consultation responses have been taken into account is provided in the separate **Consultation Report** (Doc Ref. 6.1).

14.3.8 Outside of the above-described public consultations, GAL also continued to engage with key stakeholders and during such engagement, key issues raised specific to the noise assessment are listed in Table 14.3.2, together with details of how these issues have been taken into account within the ES.

Table 14.3.2: Summary of Consultation

Consultee	Date	Details	How/where taken into account in ES
Crawley Borough Council, Mid Sussex District Council, West Sussex District Council, Reigate and Banstead District Council, Mole Valley District Council, Horsham District, Council Surrey County Council, East Sussex County Council and Kent County Council.	29 August 2019	DCO Project Local Authority Noise TWG stakeholder meeting. Noise assessment methodology.	Assessment methodology has taken into account comments raised, where appropriate, see Section 14.4.
	05 February 2020, 10 August 2021	DCO Project Local Authority Noise TWG stakeholder meetings. Noise assessment emerging results.	Assessment methodology was discussed resulting in clarifications in Section 14.4. Further detail of noise mitigation from construction, the NIS, **ES Appendix 14.9.10: Noise Insulation Scheme** (Doc Ref 5.3) and proposed noise envelope was requested

Consultee	Date	Details	How/where taken into account in ES
			and is added to Section 14.8. **ES Appendix 14.9.5: Air Noise Envelope Background** (Doc Ref 5.3) has been prepared to describe the background to the noise envelope with details of the noise envelope provided in **ES Appendix 14.9.7: Noise Envelope** (Doc Ref. 5.3)**.**
	04 May 2022, 07June 2022, 28 June 2022, 25 July 2022, 05 October 2022, 29 November 2022, 14 December 2022, 04 January 2023, 08 February 2023	DCO Project Local Authority Noise TWG stakeholder meetings. Comments on PEIR and PEI, noise assessment results, mitigation measures including Noise Envelope.	Addressed in methodologies adopted Section 14.4, mitigation proposed Section 14.8 and **ES Appendix 14.9.7: Noise Envelope** (Doc Ref. 5.3)
CAA	07 May 2021	Meeting to discuss air noise assessment methodology.	As reported in Section 14.4, various aspects of the noise assessment were discussed and agreed including the choice of noise metrics, the estimation of overflights and application of the DfT WebTAG workbook.
UK Health Security Agency	December 2021	Comments on PEIR methodology and thresholds of effects, suggestion that sleep disturbance should be quantified beyond the monetised summary provided in the WebTAG assessment.	Thresholds have been noted and a physiological assessment of sleep disturbance has been carried out, see Section 14.9.
Parish and other councils	December 2021	Comments on the PEIR; increase in air noise, increase in overflights,	The overflights assessment was refined and is reported in more detail (see Section 14.9

Consultee	Date	Details	How/where taken into account in ES
		need for consultation on a noise envelope.	and associated figures (Doc Ref 5.2)). Further stakeholder engagement was undertaken on the developing proposals for the Noise Envelope.
Members of the public	December 2021	Comments on the PEIR; increase in air noise, noise impacts in specific locations, increase in overflights, need for consultation on a noise envelope.	As above.
Airlines, Airport Coordination Ltd (ACL), Noise Management Board,	May to October 2022 (12 meetings)	Noise Envelope Group, Local sub-group and the Aviation sub-group, discussion on noise envelope of the Project	The Noise Envelope proposed is summarised in Section 14.9 with details in **ES Appendix 14.9.7: Noise Envelope** (Doc Ref. 5.3)**.**

14.4. Assessment Methodology

Relevant Guidance

14.4.1 Section 14.2 provides a brief summary of the policy that has informed the methodology (described later in this section) used to quantify and assess noise. Details of relevant guidance documents are provided in this section. A glossary of the acoustics terms and metrics used in this section is provided in Section 14.15.

British Standard Institution BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites (BSI, 2014a, b)

14.4.2 BS5228 provides a method for predicting noise levels, including a database of plant noise sound power levels, and a description of calculation procedures to enable noise to be predicted at NSRs. It also provides guidance on controlling construction noise and methods with which it can be assessed. The 'ABC' assessment method defines three thresholds, which can be used to determine when construction noise would cause significant noise effects. The appropriate threshold is selected based on existing noise levels as set out in later in this section.

CAP 1616 Airspace Design: Guidance on the Regulatory Process for Changing Airspace Design including Community Engagement Requirements, fourth edition (CAA, 2021)

14.4.3 Government has been developing aviation policy, and hence aviation noise policy, since the completion of the Airports Commission work in 2015 (Airports Commission, 2015) because the industry is growing and, as confirmed in the Airports NPS (Department for Transport, 2018a), major changes are planned. In particular, a new runway at Heathrow is supported, maximising the use of existing infrastructure is promoted and a future aviation strategy is being developed to

modify UK airspace. Some of these projects would bring about changes to flight paths which would be regulated and assessed separately under the CAA's airspace change process. CAP 1616 describes the requirements for airspace change and its Appendix B *Environmental Metrics and Assessment Requirements* includes guidance on noise assessment processes and metrics. The noise metrics used to assess the Project take account of this guidance as discussed later in this section. However, it is important when considering the noise impacts of the Project to note that the Project does not require the routings of aircraft to or from the airport to be changed, but rather increases the numbers of flights on existing routes, as discussed below.

14.4.4 The existing northern runway centreline is located some 198 metres north of the main runway centreline. The Project would increase the difference between the two runway centrelines by 12 metres. The existing northern runway is currently only used when the main runway is unavailable, for example, due to maintenance work at night. In the 2019 summer season (16 June to 15 September), the northern runway was used by 1,292 flights. From January to November 2022 the northern runway was used on 160 days by over 9,500 flights due to a major resurfacing programme on the main runway. The Project would make alterations to the existing northern runway, resulting in increased use of this runway using the same flight paths offset 12 metres to the north. The smaller ICAO 'Code C' aircraft (ie <36 metre wingspan (not larger types, eg B787 and A350)) would use the northern runway when it was in coordinated use with the main runway. Given the close proximity between the existing and proposed runway centrelines, and the fact that the existing northern runway is already in regular (if limited) use, any noise impacts of the Project would be in areas already overflown by aircraft from Gatwick. This would therefore avoid most of the noise impacts often associated with new flight paths which are routed over areas not previously overflown. Nonetheless, the noise metrics recommended in CAP 1616 have been adopted where appropriate, as discussed within the Assessment Criteria and Assignment of Significance sub-section of this section.

BS 4142:2014+A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound

14.4.5 BS4142:2014+A1:2019 (BSI, 2019) defines the significance of noise effects, as rating levels, relative to background sound levels. The effect of an industrial development is described as:

- significant adverse, when the operational noise levels are 10 dB or greater above the measured background sound level, depending on context;
- adverse, when the operational noise levels are around 5 dB above the measured background sound level, depending on context; and
- low, where the rating level does not exceed the background sound level, depending on context.

14.4.6 In addition to the assessment against background sound levels, it is stated that *'where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background'.*

DMRB – Design Manual for Roads and Bridges

14.4.7 DMRB Volume 11, Section 3, Part 7 (LA111 – Noise and Vibration, Revision 2) (National Highways *et al.,* 2020) is published by National Highways (formally Highways England) and sets out requirements for the assessment and reporting of noise and vibration impacts for highways schemes. The guidance was updated in November 2019 and May 2020 with the intention of

describing a proportionate approach to environmental assessment for highways, taking into account best practice and compliance with current relevant legislation.

14.4.8 The scope of analysis includes: noise related to construction; vibration related to construction; and noise related to operation. The guidance states that operational noise assessments are required if the Project meets specific criteria involving expected increases in noise levels, proximity to sensitive receptors, and stakeholder expectations.

14.4.9 Predicted changes in operational noise are considered, together with comparisons of predicted noise levels to SOAEL and LOAEL thresholds. Methods for assessing the magnitude of impacts and significance of effects are provided. Criteria for construction noise and vibration are also provided.

Scope of the Assessment

14.4.10 The scope of this ES has been developed in consultation with relevant statutory and non-statutory consultees and also informed by the consultation on the PEIR in 2021 and updated PEI relating to the highway improvement changes in 2022 as discussed in Section 14.3 (see **ES Appendix 14.3.1: Summary of Stakeholder Scoping Responses – Noise and Vibration** (Doc Ref. 5.3)).

14.4.11 The assessment of noise and vibration considers the likely significant effects arising from the construction and operation of the Project 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, community buildings; and
- commercial properties such as offices and hotels, collectively described as 'non-residential receptors.

14.4.12 Impacts may be adverse from increased noise, or beneficial from decreased noise, and may arise in the vicinity of the Project site or, in the case of road and air traffic, in locations remote from the Project site.

14.4.13 Taking into account the scoping and consultation process, Table 14.4.1 summarises the issues considered as part of this assessment.

Table 14.4.1: Issues Considered within the Assessment

Activity	Potential Effects
Construction Period (including Demolition): Noise and Vibration	
Construction and demolition activities, including upgraded highway junctions and use of construction compounds	Construction noise and vibration.
	Construction road traffic noise.
Operational Period: Noise and Vibration	
	Aircraft noise (air noise).

Use of airport, including upgraded highway junctions	Ground noise (aircraft on the ground, eg aircraft manoeuvring and engine ground running).
	Noise emissions from airport operations/plant (not aircraft).
	Road traffic noise – upgraded highway systems, increased usage of airport and highway junctions. Traffic noise changes on existing roads not physically changed by the Project.

14.4.14 Effects which are not considered likely to be significant have been scoped out of further assessment. A summary of the effects scoped out is presented in Table 14.4.2.

Table 14.4.2: Issues Scoped Out of the Assessment

Issue	Justification
Designated 'Quiet Areas'	No 'Quiet Areas' designated within Local Plans or Neighbourhood Development Plans as Local Green Spaces or areas identified as Quiet Areas through implementation of the Environmental Noise (England) Regulations 2006 have been identified within the study area that could be affected by the Project. No impact pathway has been identified and, therefore, consideration of Quiet Areas has been scoped out of the assessment process.
Groundborne noise from railways	Groundborne noise is not understood to be an issue for the railways around Gatwick and has been scoped out of the EIA process.
Groundborne vibration from traffic	Operational vibration from traffic has been scoped out of the assessment methodology as a maintained road surface would be free of irregularities as part of design and under general maintenance, so operational vibration would not have the potential to lead to significant adverse effects, as confirmed in the most recent DMRB guidance.

Study Area

14.4.15 The study area for noise and vibration effects includes all receptors that may experience potential adverse impacts, ie the area where noise increases or decreases could occur above the threshold levels used to assess effects. For example, for some air noise metrics, this area extends more than 20 km from the airport and overflights are considered beyond this to 35 miles from the airport. Whereas for construction noise and ground noise, the nearest receptors around the airport have been assessed, as at greater distances, the impacts would be lower. Figure 14.4.2 shows the study area for construction and ground noise. This approach has ensured that the most critical receptors have been considered.

14.4.16 The modelled study area includes all roads in the strategic transport model where traffic flows could be changed by the Project. For the operational period the study area includes the 3D modelling of roads undertaken within a 600 m buffer of new highways works in accordance with DMRB.

14.4.17 Road links outside of the modelled study area have been assessed using a comparison of traffic flows within the entire strategic road network model (over 8,000 links), to identify whether or not any significant changes in noise could be identified due to the Project.

Methodology for Baseline Studies

Desk Study

14.4.18 Aircraft ground noise predictions were undertaken for the current baseline situation for comparison with the results of the baseline noise level measurements. The source sound power level data for aircraft taxiing around the airport was reviewed to ensure that appropriate assumptions were made in the modelling. Details of a literature review and study into relevant research are provided in **ES Appendix 14.9.3: Ground Noise Modelling** (Doc Ref. 5.3) where the methodology is also discussed for obtaining up to date source sound power level data.

14.4.19 2019 was the last full year before the COVID pandemic impacted the aviation industry and reduced air traffic to levels that have not yet fully recovered, so it is taken as the most recent representative baseline year for air noise. The air noise baseline for 2019 has been modelled by the CAA's Environmental Research and Consultancy Department (ERCD) using their ANCON noise model, which is validated each year based on noise and flight track data collected by the Gatwick Noise and Track Keeping (NTK) system. In recent years, 32 locations have been used with typically eight in use at any one time. In April 2019, the system was upgraded to improve functionality and ease of access for the public online. In December 2020 the following 23 sites were live (with various others planned): Rusper; Russ Hill; Orltons; Oaklands Farm; Faygate; South Holmwood; Newdigate; Charlwood; Ifold; Alfold; Slinfold; Ruckmans; Kingsfold (all to the west); Moat House; Bellwood (Burstow); Outwood; Lingfield; Cowden; Hever Castle; Chiddingstone; Withyham (Crowborough); Rusthall (all to the east); and Slinfold (to the north). The NTK data are used by GAL to respond to complaints, and to engage with the public over noise and track performance.

14.4.20 Air and ground noise has also been modelled for future baseline conditions in 2029, 2032, 2038 and 2047, based on air traffic forecasts without the Project. The air and ground noise assessments compare noise levels in these years with the Project against these future baselines without the Project, to assess the change in noise in the relevant year. The road traffic noise assessment similarly models future baseline noise levels for the year of opening of the highways scheme in 2032 and 15 years after opening in 2047 as required by the DMRB.

Site-Specific Surveys

14.4.21 For the ground noise assessment, baseline noise level measurements were conducted in August 2016 at 16 locations, 13 of which are considered to be relevant to the Project (see Figure 14.4.1). Measurements were conducted continuously over a two week period. Air traffic at Gatwick changed very little between 2016 and 2019: Average summer 16 hour day ATMs reduced by 0.6% from 771 to 766 and average summer night traffic was unchanged at 127 ATMs. Similarly, road traffic levels on local roads in general changed little in this period. Therefore, it is reasonable to assume that ambient noise levels in the 2019 baseline were very similar to those measured in the 2016 baseline survey.

14.4.22 On-airport (airside) noise measurements to verify taxi noise levels were carried out in March and April 2019. The results of these measurements were used to determine more up to date source noise data to improve the accuracy of the modelling and to allow next generation aircraft to be taken into account within the changing fleet. See **ES Appendix 14.9.3: Ground Noise Modelling** (Doc Ref. 5.3) for more details.

14.4.23 For road traffic noise, baseline conditions were modelled using the Predictor noise model. A survey was carried out in the Riverside Garden Park in May 2019 (see **ES Appendix 14.9.4: Road Traffic Noise Modelling** (Doc Ref. 5.3)) with the primary purpose of better understanding the park's sensitivity to noise and the relative contributions of the three types of noise. For construction noise, the ground noise baseline survey results have been used, as similar areas and receptors are likely to be affected.

Assessment Criteria and Assignment of Significance

Methodology for Identifying Significant Effects

Overview

14.4.24 This section sets out the approach to identifying the significance of noise and vibration effects, beneficial and adverse, that are likely to arise from the Project. The methodology uses the following overarching concepts, explained in this section, as follows:

- significant effects, adverse and beneficial (due to noise and vibration levels and noise change resulting from the Project), including effects on health and quality of life;
- combined noise effects (due to the various Project noise sources); and
- cumulative noise effects (due to noise from the Project together with other proposed developments).

14.4.25 Effects that are quantified using absolute levels of noise and vibration are defined in terms of whether they are below the LOAEL, between the LOAEL and the SOAEL or above the SOAEL. The effects likely at these levels are described in the Noise Exposure Hierarchy table in Planning Practice Guidance, Noise, summarised in Table 14.4.6.

Table 14.4.3: Noise Effect Level Descriptions

Effect	Description for PPG Noise
Below LOAEL	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.
Above LOAEL and below SOAEL	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, eg 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.
Above SOAEL	The noise causes a material change in behaviour, attitude or other physiological response, eg 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.

Effects on Health and Quality of Life

14.4.26 As described in Section 14.2, the Airports NPS (paragraph 5.68) states that:

'Development consent should not be granted unless the Secretary of State is satisfied that the proposals will meet the following aims for the effective management and control of noise, within the context of Government policy on sustainable development:

1. Avoid significant adverse impacts on health and quality of life from noise;

2. Mitigate and minimise adverse impacts on health and quality of life from noise; and

3. Where possible, contribute to improvements to health and quality of life.'

14.4.27 The approach to assessing noise effects from the Project therefore firstly identifies the potential for significant adverse effects on health and quality of life that may arise where noise at a receptor newly exceeds the SOAEL or is increased above SOAEL, and it identifies mitigation measures to avoid these. As discussed above in Section 14.2, the provision of noise insulation meets this policy requirement. Secondly, the assessment identifies adverse effects that may arise above the LOAEL but below the SOAEL and identifies mitigation measures to minimise these as far as practicable. Thirdly, opportunities to reduce noise levels from the base case so as to improve health and quality of life have been explored.

Environmental Significant Effects

14.4.28 In addition to effects that exceed the SOAEL and result in significant adverse impacts on health and quality of life from noise that should be avoided, other likely significant environmental noise effects have been identified. As discussed in Section 14.2 such effects identified as significant in this ES, but below SOAEL, are distinct from those above SOAEL and whilst they should be minimised through mitigation there is no policy requirement for them to be avoided or require noise insulation.

14.4.29 In line with the Airports NPS and the NPSE, the above approach is adopted for construction noise, air noise, ground noise, and road traffic noise, as explained in the following four sections. For each of the four types of noise, LOAELs and SOAELs are identified, and additional factors are described that inform the likely significance of an environmental effect, including effects where the noise level would be between the LOAEL and the SOAEL or where there would be a change in noise level. Methods used to predict levels are also summarised and metrics used to describe noise levels are also explained.

Combined Effects

14.4.30 Combined effects are those arising from the combination of different types of noise arising from the Project on a particular receptor. As there is no reliable means of quantitatively assessing the overall noise effect resulting from different noise sources, this ES considers the overall effect of noise from combined sources qualitatively. Section 14.11 considers potential combined effects due to various types of noise.

Cumulative Effects

14.4.31 Cumulative effects that may arise as a result of the Project, when considered together with other proposed developments are considered in Section 14.11.

Inter-Related Effects

14.4.32 Section 14.12 provides noise impact information for the assessment of inter-related effects from noise, landscape and visual, historic environment, and health impacts. The methodology used to assess effects on health, landscape, townscape and visually sensitive receptors, and on receptors of historic importance is described in **ES Chapter 7: Historic Environment** (Doc Ref. 5.1), **ES Chapter 8: Landscape, Townscape and Visual Resources** (Doc Ref. 5.1), and **ES Chapter 18: Health and Wellbeing** (Doc Ref. 5.1).

Construction Noise

Metrics

14.4.33 Construction noise has been assessed using BS5228-1:2009+A1:2014 (Code of practice for noise and vibration control on construction and open sites – noise) (BSI, 2014a). The metric used for construction noise assessment is the L_{Aeq}.

Noise Criteria

14.4.34 Construction noise has been assessed with reference to the 'ABC method' described in BS5228-1:2009+A1:2014. The ABC method defines the thresholds at building façades on the basis of existing noise levels as set out in Table 14.4.4.

14.4.35 Where the forecast construction noise exceeds the relevant threshold, this is an indicator of a potentially significant effect, ie where the level of impact is sufficient that it may lead to a likely significant effect once other aspects are considered.

14.4.36 For daytime, the widely used threshold of 75 dB L_{Aeq} (category C) being exceeded has been taken to be the SOAEL for construction noise. The threshold was originally set to avoid interference with normal speech indoors, with windows closed (Wilson, 1963). The daytime SOAEL and the corresponding SOAELs for the evening and night periods (shown in

14.4.37 Table 14.4.4) indicate likely significant effects on health and quality of life at a receptor, assuming construction noise is dominant and of sufficient duration, as discussed below.

14.4.38 Also shown are the category A and B noise criteria, which are applied as the LOAEL assessment criteria from BS 5228 depending on the existing noise levels, as noted in Table 14.4.4.

Table 14.4.4: Airborne Sound from Construction – Impact Criteria at Residential Receptors (construction noise only)

Period	Assessment Category dB $L_{Aeq, T}$		
	A (LOAEL) [(a)]	B (LOAEL) [(b)]	C (SOAEL) [(c)]
Day: T=12hr, Weekdays, 07:00-19:00, T=6hr, Saturday, 07:00-13:00	>65	>70	>75

Period	Assessment Category dB $L_{Aeq, T}$		
	A (LOAEL) [a]	**B (LOAEL) [b]**	**C (SOAEL) [c]**
Evenings and weekends: T=1hr, Weekdays 19:00–23:00, Saturdays 13:00-23:00, Sundays 07:00-23:00	>55	>60	>65
Night: T=1hr, Every day 23:00-07:00	>45	>50	>55

Notes:
All sound levels are defined at the façade of the receptor.
a) Assessment Category A: impact criteria to use when baseline ambient sound levels (rounded to the nearest 5 dB) are less than these values.
b) Assessment Category B: impact criteria to use when baseline ambient sound levels (rounded to the nearest 5 dB) are the same as category A values.
c) Assessment Category C: impact criteria to use when baseline ambient sound levels (rounded to the nearest 5 dB) are higher than category A values.

If the ambient noise level exceeds the Category C threshold values given in the table (ie the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total $L_{Aeq, T}$ noise level for the period increases by more than 3 dB due to site noise.

Significance of Effects

14.4.39 When predicted noise levels are above LOAEL thresholds, but below the SOAEL, other factors have been taken into account in determining whether the effect could be significant, such as the number of people affected, and the duration of the activity causing the noise impact in determining the significance of the noise effects.

14.4.40 Where predicted noise levels are above SOAEL the minimum duration required for a likely significant effect, subject to other considerations, is a period of 10 or more days of working in any 15 consecutive days or for a total number of days exceeding 40 in any 6 consecutive months. For the purposes of this assessment where noise modelling results for works likely to last at least two weeks are above SOAEL they are considered likely to be of sufficient duration to cause significant effects.

14.4.41 Taking account of these and considering any additional factors, the following ratings have been used to describe the significance of the predicted noise effects. The criteria attached to each rating illustrate examples of how combinations of factors can be applied, with population size as an additional factor considered as necessary.

- **Negligible**: Below LOAEL.
- **Minor**: Below SOAEL but above LOAEL with low noise exceedances (1-3 dB) or of short duration <1 month.
- **Moderate**: Above LOAEL with noise exceedances (>3 dB).
- **Major**: Above SOAEL.
- **Substantial**: Above SOAEL by a margin, affecting high population size.

14.4.42 For the purposes of this assessment, effects of moderate significance and above are identified to be 'significant'.

Construction Vibration

14.4.43 The LOAELs and SOAELs for construction vibration from the DMRB are summarised in Table 14.4.5.

Table 14.4.5: Construction Vibration Assessment Criteria for Residential Buildings

Time Period	LOAEL Threshold Peak Particle Velocity (PPV) (mm/s)	SOAEL Threshold PPV(mm/s)
All periods	0.3	1.0
Descriptions of Effect (BS5228-2)	Vibration might be just perceptible in residential environments.	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.

14.4.44 DMRB also advises that construction vibration shall constitute a likely significant effect where it is determined that the SOAEL value will occur for a duration exceeding:

- 10 or more days or nights in any 15 consecutive days or nights; or
- a total number of days exceeding 40 in any 6 consecutive months.

14.4.45 BS 5228-2 also advises that at levels above 10 mm/s PPV vibration is likely to be intolerable for any more than a very brief exposure to this level.

Air Noise

Air Noise Modelling

14.4.46 Air noise has been modelled using the CAA's ANCON v2.4 model, as used to produce Gatwick's noise exposure contours annually, and validated for Gatwick on an annual basis. The summer season contours for 2019 form the baseline, as reported below. Air traffic has been modelled for the four operational forecast years as described elsewhere in this report: 2029, 2032, 2038 and 2047. For the 2029, 2032, 2038 and 2047 scenarios, base case (do-minimum) and with Project noise modelling has been undertaken to allow comparisons between with and without Project cases in these years.

14.4.47 The basis of these models is the 2019 ANCON model. For current aircraft types, ANCON uses source noise levels, climb rates and dispersion within Noise Preferential Routes (NPRs) based on those measured in the NTK system at Gatwick. Noise emission levels from future aircraft types have been taken from the CAA's latest estimates and reported in the noise assessment, along with all other relevant input data. Further details are provided in **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3). The noise modelling of all future cases, ie 2029, 2032, 2038 and 2047, is based on forecasts of air traffic movements and fleets expected to operate, so is unavoidably approximate, albeit based on best available information at this stage. At the current time, as the aviation industry has been impacted by the COVID-19 pandemic, there is some uncertainty as to how airlines will invest in new quieter aircraft in the future. To address this uncertainty a range of

future fleets have been considered in the air noise modelling. The 'central case' fleet represents the transition envisaged prior to the COVID-19 pandemic from current generation to next generation, quieter, aircraft. The 'slower transition fleet' case represents a delayed transition leading to higher noise levels in the future, in both the future baseline and Project cases. Section 14.5 and **ES Appendix 14.9.5: Air Noise Envelope Background** (Doc Ref. 5.3) provide further details.

Primary and Secondary Noise Metrics

14.4.48 The following noise metrics are used to assess air noise in accordance with CAP 1616 (CAA, 2018).

14.4.49 Primary Noise Metrics:

- $L_{eq,\ 16\ hour}$ day 51 to 72 dB; and
- $L_{eq,\ 8\ hour}$ night 45 to 72 dB.

14.4.50 Secondary Noise Metrics:

- N65 day 20, 50, 100, 200, 500; and
- N60 night 10, 20, 50, 100.

14.4.51 N65 day refers to the number of aircraft during an average summer day above L_{max} 65 dB, while N60 night refers to the number of aircraft during an average summer night above L_{max} 60 dB. Thus, for example, an N65 day 20 contour plots the locations at which twenty noise events at or above L_{max} 65 dB occur on an average summer day. As such N65 gives an indication of the number for aircraft noise events on an average summer day that are above peak noise levels that might be disturbing to daytime activities. Similarly, N60 night gives an indication of the number of aircraft noise events on an average summer night that are above peak noise levels that might begin to cause disturbance to sleep indoors with windows open.

14.4.52 Secondary Non-Noise Metric:

- Overflight (<7,000 feet) >48.5 degrees to the horizontal[4] (see **ES Appendix 14.9.2: Air Noise Modelling (**Doc Ref. 5.3) Section 3).

14.4.53 Flight paths above 7,000 feet would not be affected by the Project.

14.4.54 These noise metrics relate to the 92 day summer period from 16 June to 15 September, as used conventionally in the UK because it represents the busiest, and hence noisiest, season. A description of the noise metrics is presented in the glossary at Section 14.15.

14.4.55 $L_{eq,\ 16\ hour}$ day and $L_{eq,\ 8\ hour}$ night have been used as the primary[5] metrics to quantify impacts in terms of the areas and population within the various 3 dB noise contour bands in the ranges above. Noise difference contours have also been used to show areas where noise levels are expected to increase and decrease.

[4] As defined in CAP 1498 Definition of Overflight (CAA 2017).
[5] As defined in CAP 1616 (CAA 2021. Para B54: Primary metrics will be those that are used to quantity significant noise impacts, such as WebTAG outputs. Secondary metrics will be those that are not being used to determine significant impacts but which are still able to convey noise effects, such as N65 contours and Lmax levels.)

14.4.56 In addition, annual average L_{den} and L_{night} noise contours have been produced to illustrate the changes in noise levels averaged over the whole year.

Noise Levels at Representative Community Locations

14.4.57 In addition to noise contours, more detail has been provided on the changes to be expected at a selection of specific locations, chosen at community facilities near the centres of towns and villages within the various noise contours, so as to be representative of the communities most affected:

- Rusper Primary School;
- Charlwood Village Infant School;
- Lingfield Primary School;
- Chiddingstone Church of England School;
- Capel Pre School;
- Willow Tree Pre-school, Ifield; and
- Barnfield Care Home, Horley.

14.4.58 At these seven Community Representative Locations, the changes in noise to be expected as a result of the Project have been described in terms of changes in day and night noise levels ($L_{eq, 16\ hour}$ day and $L_{eq, 8\ hour}$ night), and in terms of numbers of aircraft above the day L_{max} 65 dB and night L_{max} 60 dB levels, for easterly and westerly operations. This is to provide greater detail as to the noise changes that affected communities can expect in terms of peak noise levels as well as accumulated noise levels.

14.4.59 In addition to assessing impacts on residential properties, and those receptors listed above, air noise has been modelled and assessed at schools, hospitals, community buildings and places of worship.

L_{max} Contours

14.4.60 The noise modelling assumes aircraft would fly along already used flight paths. Flight paths to and from the main runway would not be affected. Only departures would routinely use the northern runway (other than during maintenance of the main runway when arrivals and departures may use it as is the case now). These would fly straight ahead until they turn onto the relevant Standard Instrument Departure (SID) Route within the Noise Preferential Route generally 5 to 16 km from the end of the runway. These flight paths would be 210 metres north of the equivalent flight paths from the main runway. Thus, areas to the north of the existing extended runway centreline, to the east and to the west of the airport up to about 5 to 16 km from the runway ends, would experience more aircraft closer to them. The changes in noise from individual aircraft taking off on the northern runway compared to the main runway have been illustrated using L_{max} 60 dB contours.

Awakenings

14.4.61 A physiological sleep disturbance assessment has been undertaken to estimate the number of additional awakenings that would be produced by the Project. The assessment draws on modelling of L_{max} levels for individual aircraft at postcode locations on an average summer night, and applies a dose/response relationship to estimate additional awakenings. Section 7 of **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3) gives details.

Overflights

14.4.62 The methodologies for assessing airspace change (CAP 1616) adopted for the EIA process require an assessment of a relatively new metric called overflight, and to consider overflights in two areas as follows:

- Air Noise – 'Overflight' as defined by CAP 1498 (CAA, 2017).
- Tranquillity – CAP 1616 requires consideration of increased overflights affecting particular areas, such as AONBs and National Parks.

14.4.63 This secondary non-noise metric, 'overflights' has been computed within a Geographic Information System, as described in **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3) Section 3. Three-dimensional radar tracks from 45,000 aircraft flying in 2019 to and from Gatwick and other airports within 35 miles of Gatwick were analysed to count overflights below 7,000 feet in accordance with the CAA guidance. The results are used to illustrate how the numbers of overflights would change with the Project.

Noise Criteria

14.4.64 In order to follow the approach required in the NPSE, it is necessary to define the LOAEL and SOAEL for aircraft noise.

14.4.65 LOAELs are provided in the Consultation Response on UK Airspace Policy: A Framework for Balanced Decisions on the Design and Use of Airspace (Department for Transport, 2017b), as described in paragraph 14.2.34.

14.4.66 SOAELs are defined with reference to Government expectations of compensation and noise insulation schemes specified in the Aviation Policy Framework (2013). For daytime, the SOAEL is set at $L_{eq,\ 16\ hour}$ 63 dB. This represents the exposure level at which the most recent UK annoyance survey (CAA, 2014) indicates that 23% of the population would be highly annoyed. The SOAEL value for night-time is taken from the interim target of the WHO Night Noise Guidelines 2009 at $L_{eq,\ 8\ hour}$ 55 dB, which is described in those guidelines as the level above which *'Adverse health effects occur frequently, a sizeable proportion of the population is highly annoyed and sleep-disturbed.'* (WHO, 2009).

14.4.67 The LOAELs and SOAELs for air noise are summarised in Table 14.4.6.

Table 14.4.6: Air Noise LOAELs and SOAELs

Issue	LOAEL	SOAEL
Day	$L_{eq,\ 16\ hour}$ day 51 dB	$L_{eq,\ 16\ hour}$ day 63 dB
Night	$L_{eq,\ 8\ hour}$ night 45 dB	$L_{eq,\ 8\ hour}$ night 55 dB

14.4.68 The assessment considers numbers of residential properties above LOAELs and SOAELs, and the effect of noise changes above these criteria. These assessment criteria relate to all residential properties based on the assumption that they have similar uses, constructions and hence sensitivity. The noise criteria relate to the totality of impacts on the residents, ie inside and outside the property if it includes outside space. In practice properties vary to some extent, as do residents uses of their properties and their sensitivities to noise. However, these criteria and the

assumptions that underpin them allow the assessment to consider the likely effects on thousands of residential properties over a wide area.

14.4.69 Non-residential noise sensitive receptors including schools, hospitals, places of worship and community buildings are in all cases already exposed to aircraft noise. So in this assessment the effects of the Project are considered with reference to the extent of change in their noise environment that is expected from the Project above a cautious threshold of $L_{eq\ 16\ hr}$ 50 dB.

14.4.70 Noise levels quantified and reported using the various supplementary noise metrics do not have direct relationships to LOAELs and SOAELs and are provided to give a clearer picture of the expected noise environment and how it will change with the Project, rather than to judge its significance.

Significance of Effects

14.4.71 The evaluation of significant air noise effects has been undertaken in two stages.

- If the level is newly above SOAEL or increases above SOAEL as a result of the Project – a significant effect on health and quality of life that should be avoided is likely, subject to consideration of any additional factors present.
- If the level is below SOAEL but above LOAEL as a result of the Project, then the following have been considered:

  - How large is the noise change?
  - How large is the population affected?
  - How close is the noise level to SOAEL?

14.4.72 In the first stage, a significant effect is likely if the noise level is or would be below SOAEL in the base case but rises above it as a result of the Project, or if the levels are above SOAEL and increase due to the Project by more than 1 dB. The 1 dB increase is drawn from the noise insulation regulations for roads and railways that require noise insulation when levels increase by more than 1 dB above noise insulation thresholds levels for those noise sources that relate to SOAEL. A significant effect can arise at a single property or at a group of properties. Additional factors that could affect this include the use and nature of the receptors, its design in terms of noise insulation, other noise sources and the duration of the effect.

14.4.73 In the second stage assessment where the predicted noise level is below SOAEL but above LOAEL, the first consideration is the extent of noise change, with increases leading to adverse impacts and decreases leading to beneficial impacts. CAP 1616 (paragraph 1.31) can be used to give the following L_{eq} ranges. The DMRB (see paragraph 14.4.99) gives similar guidance for changes in road traffic noise.

- Negligible <1 dB
- Low 1-3 dB
- Medium 3-5 dB
- High 5-9 dB
- Very High >9 dB

14.4.74 The second consideration is how many people are affected by the noise increase. The following ranges have been drawn from Institute of Environmental Management and Assessment (IEMA) Guidance on Environmental Noise Assessment (IEMA, 2014). It is noted that these ranges have

also been used in the PEIR produced for the third runway at Heathrow, with reference to that project's Noise Expert Review Group.

- Very Low 10-99
- Low 100-399
- Medium 400-699
- High 700-1,000
- Very High >1,000

14.4.75 The third consideration is how close the predicted noise level is to the SOAEL, with noise levels closer to SOAEL more likely to give rise to significant effects.

14.4.76 Noise assessment takes account of the difference in the sensitivity of different NSRs by applying different LOAEL and SOAEL values to different types of buildings, if necessary, to assess impacts. This assessment considers residential buildings, which are sensitive during the day and night. All residential buildings are assumed to be similarly sensitive, unless they have noise insulation which reduces the significance of noise effects indoors, as discussed below. The LOAELs and SOAELs given above are for residential buildings. The assessment also considers hospitals, which are sensitive during the day and night, and it considers schools, places of worship and community buildings that are sensitive to noise in the daytime and evening only. For non-residential buildings, sensitivity to noise tends to depend not just on the building use, but also its construction and other factors. For non-residential buildings specific noise assessment criteria are used where significant noise increases are expected above the threshold levels described above, with reference to their particular use, design and circumstances. Ambient noise levels from road traffic noise are also referred to when considering significant effects in particular non-residential receptors.

14.4.77 Noise insulation forms part of the noise control measures relied upon to avoid significant adverse effects on health and quality of life in line with Government policy (Department for Transport, 2018a).

14.4.78 Taking account of these additional factors, the following noise effect ratings have been used to describe the significance of the predicted noise effects. The criteria attached to each rating illustrate examples of how combinations of factors can be applied, with population size as an additional factor considered as necessary.

- **Negligible**: Below LOAEL. Or above LOAEL with a negligible noise change (<1 dB).
- **Minor**: Below SOAEL but above LOAEL with low noise changes (1-2 dB).
- **Moderate**: Below SOAEL but above LOAEL with noise changes of medium or above (>3 dB).
- **Major**: Above SOAEL.
- **Substantial**: Above SOAEL by a margin, affecting high population size.

14.4.79 The assessment of significance is based primarily on the predicted levels and changes in the primary noise metrics and the factors described above, but additional noise metrics (the secondary noise metrics) are used to provide more detail on the changes that would arise.

14.4.80 For the purposes of this assessment, effects of moderate significance and above are considered to be 'significant'.

Ground Noise

Metrics

14.4.81 The assessment of aircraft ground noise has been carried out by comparing the predicted noise levels against benchmark criteria for the LOAEL and SOAEL, defined for the night-time and daytime hours separately, and by comparing the predicted change in noise levels arising at receptors around the airport against the baseline noise levels.

14.4.82 Ground noise has been assessed using a methodology closely aligned with air noise and, for this reason, similar metrics are used. The primary metric used for assessment is the L_{Aeq} as defined over the 16 hour daytime period (07:00-23:00) and the 8 hour night-time period (23:00-07:00) and predicted for an average day over the 92 day summer period. A secondary metric that is used to assess ground noise is the L_{max} which is used to assess the peak level of noise that could be expected from ground noise rather than the inherent (logarithmic) average value that is represented by the primary L_{Aeq} metric. The secondary L_{max} metric is calculated separately for a number of individual noise sources including aircraft taxiing, engine ground runs, APU operation on stands and EAT usage since the peak levels are experienced as individual events.

Noise Criteria

14.4.83 The LOAELs and SOAELs for ground noise (L_{Aeq}) are the same as for air noise, as listed in Table 14.4.6. This approach to setting the observed effect levels is considered appropriate and is also in line with the approach adopted in the PEIR produced for the third runway at Heathrow.

14.4.84 $L_{eq\ 16\ hr}$ day and $L_{eq\ 8\ hr}$ night noise levels are the primary metrics used to judge the significance of ground noise effects. L_{max} levels have also been used to assist in determining significance of effects for particular intermittent noise sources such as Engine Ground Running and use of EATs. L_{max} levels are calculated for these activities separately and then the number of noise events are looked at as a whole. L_{max} levels above the following benchmark thresholds are considered:

- during the night-time (23:00-07:00 hours) L_{max} 60 dB; and
- during the daytime (07:00-23:00 hours) L_{max} 65 dB.

14.4.85 The 60 dB L_{max} night-time benchmark is referred to in Planning and Noise (Association of Noise Consultants *et al.*, 2017) where it is stated that the number of noisy events exceeding 60 dB L_{max} may be inversely related to the quality of sleep. It is also the basis of the N60 metric used as a supplementary metric for air noise at night. $L_{max.}$ 65 dB is the basis of the N65 noise metric that is used as a supplementary metric for air noise during the day.

Significance of Effect

14.4.86 The significance of the effects of aircraft ground noise on NSRs has been determined by taking into account the sensitivity of the receptor, the magnitude of the impact and other factors as follows. As with other types of noise the sensitivity of the receptor is accounted for in the numerical value of the LOAEL and SOAEL. The focus of this assessment is on residential receptors. A nursery, a primary school and a mental health facility have also been identified, are all considered to be of high sensitivity and are assessed on a case by case basis. However, there are up to 6,900 NSRs, that have been modelled within the LOAEL (but outside the airport boundary) and of these, six are on the list of particularly noise sensitive buildings (including schools, hospitals and community spaces) identified for the air noise assessment. Since some of

these receptors may be considered more sensitive, predictions have been carried out for these six locations so that they can be assessed specifically.

14.4.87 As with air noise, in the first stage, a significant effect is likely if: the noise level is or would be below SOAEL in the base case but rises above it; or is above SOAEL and increases as a result of the Project. A significant effect can arise at a single property or at a group of properties. Additional factors that could affect this include: the use and nature of the receptors; its design in terms of sound insulation; other noise sources; the duration of the effect; and if the receptor has noise insulation.

14.4.88 In the second stage assessment where the predicted noise level is below SOAEL but above LOAEL, the first consideration is the extent of noise change, with increases leading to adverse impacts and decreases leading to beneficial impacts.

14.4.89 To assess the change in the L_{eq} noise above the LOAEL the same magnitudes of noise change as for air noise have been used, as follows:

- Negligible <1 dB
- Low 1-3 dB
- Medium 3-5 dB
- High 5-9 dB
- Very High >9 dB

14.4.90 The same terms are used to describe corresponding decreases.

14.4.91 The change in noise level and the secondary L_{max} metric have also been used to assist in determining the magnitude of impact.

14.4.92 Where the level of ground noise is below SOAEL but above LOAEL as a result of the Project, the evaluation of significant effects considers the magnitude of the noise change and other factors including:

- how large is the noise change?
- how large is the population affected?
- how close is the noise level to SOAEL?

14.4.93 Taking account of these additional factors, the following noise effect ratings are used to describe the significance of the predicted noise effects. The criteria attached to each rating illustrate examples of how combinations of factors can be applied, with population size as an additional factor considered as necessary.

- **Negligible**: Below LOAEL, or above LOAEL with negligible noise change (<1 dB).
- **Minor**: Below SOAEL but above LOAEL with low noise changes (1-3 dB).
- **Moderate**: Above LOAEL with noise changes of medium or above (>3 dB).
- **Major**: Above SOAEL.
- **Substantial**: Above SOAEL by a margin, affecting high population size.

14.4.94 It is noted that the above changes are initially considered as changes in predicted ground noise alone. However, where the overall measured baseline across all sources is high, other sources, primarily road traffic noise, may lessen the effect of changing ground noise and the resulting change in overall noise levels may be lower than the predicted changes in ground noise.

Therefore, where high overall noise levels have been measured, the likely effect of other sources of ambient noise has been taken into account in the assessment of significance of the change in ground noise. To assist in this process, road traffic noise has been modelled across the whole ground noise study area, as discussed in Section 14.6 below.

14.4.95 Where a range of significance levels are presented based on differing magnitudes of impact and modifying factors, the final assessment for each effect is based upon professional judgement.

14.4.96 As for air noise, the assessment of significance is based primarily on the predicted levels and changes in the primary noise metrics, and the secondary noise metric L_{max} is used to provide more detail on the changes that would arise, including changes in the number of noise events.

14.4.97 For the purposes of this assessment, effects of moderate significance and above are identified to be 'significant'.

Road Traffic Noise

Metrics

14.4.98 The key metric used for the assessment of road traffic noise during the day in the UK is the $L_{A10,\ 18\ hour}$ which is referred to in the DMRB and the Noise Insulation Regulations, and which is predicted using the methodology in the Calculation of Road Traffic Noise (CRTN) guidance document (Department of Transport, Welsh Office, 1988). The DMRB also refers to the $L_{night,\ outside}$, which is effectively equivalent to a free-field $L_{eq,\ 8\ hour}$.

Criteria

14.4.99 The DMRB specifies values to define the LOAEL for road traffic noise. The daytime LOAEL value is 55 dB $L_{A10,\ 18\ hour}$ at the façade of the building and the night-time LOAEL is 40 dB $L_{Aeq,\ 8\ hour}$ night in the free-field.

14.4.100 The SOAEL value for daytime road traffic noise is 68 dB $L_{A10,\ 18\ hour}$ at the façade based on the Noise Insulation Regulations, where 68 dB $L_{A10,\ 18\ hour}$ is the trigger level for insulation from new or altered highways. The DMRB also proposes the value quoted in the regulations.

14.4.101 The SOAEL value for night-time road traffic noise is consistent with the interim target of the WHO Night Noise Guidelines 2009 at 55 dB $L_{Aeq,\ 8\ hour}$ to avoid sleep disturbance.

14.4.102 The LOAELs and SOAELs for road traffic noise are summarised in Table 14.4.7. The DMRB notes that specific variations may be required (eg where upgraded noise insulation has been fitted to a property) which have been reviewed on a case-by-case basis.

Table 14.4.7: Road Traffic Noise LOAELs and SOAELs

Issue	LOAEL	SOAEL
Day	$L_{A10,\ 18\ hour}$ day 55 dB (façade)	$L_{A10,\ 18\ hour}$ day 68 dB (façade)
Night	$L_{eq,\ 8\ hour}$ night 40 dB (free-field)	$L_{eq,\ 8\ hour}$ night 55 dB (free-field)

Significance of Effects

14.4.103 As stated in the overall approach to noise assessment above, when predicted noise levels are newly above the SOAEL significant effects are likely, and mitigation measures have been

identified to avoid these. However, for traffic noise, more specific procedures for establishing significance based on considering LOAEL and SOAEL values and other factors are set out in the DMRB, and these have been adopted for the road traffic noise assessment.

14.4.104 The DMRB procedures include a scoping procedure which determines whether further comparison should be undertaken for both the construction and operational periods. This procedure consists of two acoustic tests relating to noise change, and non-acoustic tests to determine, firstly, whether construction traffic noise generated by the Project may have the potential to adversely affect any noise sensitive receptors within 300 metres of a road, and, secondly, whether new road links (or roads physically changed by the Project) would be within 600 metres of receptors for operation. The second non-acoustic test for both periods is whether there would be a reasonable stakeholder expectation that an assessment would be undertaken. In this case both of the non-acoustic tests are met, and therefore a full DMRB assessment of noise impacts during both periods has been undertaken which is detailed in **ES Appendix 14.9.4: Road Traffic Noise Modelling** (Doc Ref 5.3).

14.4.105 Furthermore, the available traffic information has been used to make an assessment of the likely significance of the effects indirectly resulting from the operation of the Project on the wider road network, ie beyond the area where highways works are required. This has used the scoping procedure set out within the DMRB to identify the relevant road links – for roads which are not physically changed by the Project, this is usually restricted to an area within 50 metres of the roads.

14.4.106 For road links requiring consideration, the DMRB sets out an initial procedure for assessment based on the noise change. There are two sets of noise magnitude criteria in the DMRB which apply to: people's noise reaction to road changes following the opening of a road; and to the situation when the road has been open for some time and has become an established part of the noise environment.

14.4.107 To assess the change in the noise above LOAEL the following magnitudes of noise change are used for the short term, ie, the comparison in the year of opening, drawn from the DMRB[6]:

Table 14.4.8: Road Traffic Noise Change Magnitude, Short Term

Short Term Magnitude	Short Term Noise Change (dB)
High	Greater than equal to 5.0
Medium	3.0 to 4.9
Low	1.0 to 2.9
Negligible	Less than 1.0

14.4.108 To assess the change in the noise above LOAEL the following magnitudes of noise change are used for the long term, ie, the comparison 15 years after opening, drawn from the DMRB:

[6] It is noted that in DMRB the terms Negligible, Minor, Moderate, and Major are used to describe the magnitude of change criteria above rather than Negligible, Low, Medium and High, but in this ES a consistent terminology has been taken in all sections, and therefore the terms negligible, low, medium and high have therefore been used to describe magnitude here.

14.4.109

Table 14.4.9: Road Traffic Noise Change Magnitude, Long Term

Long Term Magnitude	Long Term Noise Change (dB)
High	Greater than equal to 10.0
Medium	5.0 to 9.9
Low	3.0 to 4.9
Negligible	Less than 3.0

14.4.110 The same terms are used to describe increases and decreases.

14.4.111 The DMRB indicates that impacts of medium or high magnitude are more likely to give rise to significant effects. However, other factors are considered to determine the final operational significance level. These include:

- whether the noise change is close to a boundary between two impact magnitude ratings (eg whether it is close to the boundary between a low and a medium impact);
- whether the change in the long term is similar to the short term change (and therefore whether the difference may not be due to the Project);
- the location of noise sensitive parts of the receptor;
- changes in acoustic context (including effects on acoustic character of an area); and
- whether the Project results in obvious changes in the landscape or setting of a receptor which make it likely that noise level change would be more acutely perceived.

14.4.112 These factors can affect the point at which noise changes are considered likely to give rise to a likely significant effect.

14.4.113 A final factor is considered if the 'with Project' noise level exceeds the SOAEL, and this is to consider noise change in the short term of 1 dB or over as resulting in a likely significant effect. This is more stringent than when noise levels are below SOAEL when noise changes in the short term of 3 dB or over are classed as more likely to be significant.

14.4.114 Where adverse effects may arise above the LOAEL but below the SOAEL, mitigation measures have been identified to minimise these as far as practicable. Opportunities to reduce noise levels from the baseline case and identify improvements to the noise environment have also been explored. This is particularly relevant to the assessment of road traffic noise where it has been possible to design additional mitigation into the proposed highway design.

14.4.115 For the purpose of this assessment, impacts of medium magnitude (moderate significance) and above are considered likely to give rise to a significant effect at individual properties, as identified within the DMRB, unless the factors discussed above indicated that effects of low magnitude (minor significance) may give rise to significant effects. In this respect, significance has been determined taking into account the advice in DMRB and other factors that may affect the significance of the overall effect in line with normal EIA practice.

14.5. Assumptions and Limitations of the Assessment

Construction Noise

14.5.1 Construction noise has been modelled from the main works required to construct the Project based on current knowledge of the likely construction works programme, as outlined in **ES Chapter 5: Project Description** (Doc Ref. 5.1). The approach was to model noise from all the works occurring at a series of periods within the construction programme to illustrate how noise levels will vary and to identify the noisiest periods and the significant impacts. The programme of works has allowed the main airfield construction works areas to be grouped into 13 periods: the 12 individual years between 2024 and 2035 and the period 2036 to 2038 when there will be less construction activity. For the highways works, because some noisy works are shorter in duration, various periods within each year have been modelled: 2 in 2028; 6 in 2029; 4 in 2030; and 3 in 2031. This gave an additional 11 periods to model, giving 24 periods across the assumed 15 year construction period from 2024 to 2038. Although the results of this assessment indicate the likely year in which each impact will arise, the actual year in which they arise does not affect the significance of the impact, for example if the start of construction is later than assumed.

14.5.2 170 areas of construction work across the airfield and highways areas have been modelled, each with one (sometimes two or three) activities occurring at the relevant times within the construction programme. In order to not under-estimate the possible cumulative effect of overlapping works, all works programmed within any of these 24 periods have been modelled concurrently. This is likely to be an overly worst case because not all work assumed within a given period (ie up to 12 months) will occur at the same time.

14.5.3 The various works required have been grouped into 17 types, each of which has been assigned a team of plant. For each type of work, indicative plant teams have been developed with the project engineers and with reference to equivalent projects, for the day and night periods. **ES Appendix 14.9.1: Construction Noise Modelling** (Doc Ref. 5.3) provides details of the works, plant teams, noise emission levels, and programme assumed.

14.5.4 At this stage sufficient design information for the construction works is available to model noise levels by assuming likely methods of construction, but until a contractor is on board specific details of mitigation measures that will be available to reduce noise are not available. Section 14.9 explains the approach adopted to estimate the noise reduction from a reasonable level of mitigation that can be achieved. This will be delivered through the requirements of the **ES Appendix 5.3.2: Code of Construction Practice** (CoCP) (Doc Ref. 5.3) described in Section 14.8, and further confirmed by the requirements on the contractor to seek prior approval of noisy works from the local authority to demonstrate that noise mitigation has been incorporated to minimise noise disturbance. The noise modelling in this ES is therefore necessarily worst-case. It assumes one way of building the Project with a reasonable level of mitigation, but there may be other methods of construction that are quieter, with a greater level of mitigation that would result in lower noise levels and lesser impacts than reported herein.

14.5.5 Minor works or those expected to last less than two weeks have been excluded as they are unlikely to lead to significant noise effects.

14.5.6 Vibration from construction works has been assessed where piling is required as part of the highway works.

Air Noise

14.5.7 The air noise assessment assumes the routing of aircraft to and from the main runway and from the northern runway would remain as it is today, as discussed in Section 14.4. This is because the Project can operate using these routes without need for airspace change. When the likely outcome of the FASI-South airspace is known then the noise impacts of that change will be assessed as part of that process. Further details of FASI-South and the approach are set out in **ES Chapter 6: Approach to Environmental Assessment** (Doc Ref.5.1).

14.5.8 The air noise assessment is based on the air traffic forecasts summarised in Section 14.7. The accuracy of the assessment depends primarily on these forecasts in terms of the number and types of aircraft that will operate in the future. Estimations of the noise emissions of future aircraft types are also important. These have been made by the CAA based on the latest state of knowledge as reported in Section 3 of **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3) and clearly show the extent to which newer aircraft types are quieter than their older equivalents.

14.5.9 In 2019 about 13% of the aircraft operating at Gatwick were 'next generation' aircraft, eg A320 NEO, B737 MAX etc., which are quieter than 'current generation' aircraft. As aircraft age, airlines replace them with next generation aircraft so that over time the fleet transitions to next generation aircraft and, other things being equal, overall noise levels reduce. The ATM forecasts used for the modelling of noise in the future are based on estimates of how the fleet will transition to next generation aircraft based on assumptions around airlines' fleet procurement programmes and business models. The '*central case'* used in the noise assessment is based on what was considered before the COVID-19 pandemic to be the most likely rate of fleet transition. However, there is uncertainty around this, particularly at the current time due to effect of the global pandemic and the financial impact on the airlines. Therefore, noise modelling has also been carried out for a '*slower transition fleet'* case, based on ATM forecasts in which the rate of fleet transition is delayed by about five years and which would result in higher noise levels than the central case. **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3) and **ES Appendix 14.9.5: Air Noise Envelope Background** (Doc Ref 5.3) give further details. The assessment reported in this chapter gives the ranges of noise levels expected between the central and slower fleet transition cases. Full results of all noise modelling are provided at Section 5 of **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3).

14.5.10 At this stage it is not possible to consider the effect of 'future generation' aircraft, ie those not yet in operation, because their noise characteristics are unknown. Such aircraft may begin to come into service from around 2040 onwards so could affect the 2047 noise forecasts.

14.5.11 **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3) also provides a sensitivity analysis of the effect of varying the runway modal split giving an indication of the range of possible noise contours that could arise.

Ground Noise

14.5.12 The aircraft ground noise assessment in this report covers taxiing noise, engine testing and APU noise but does not cover reverse thrust. Reverse thrust is included in the air noise assessment. Engine testing at idle power on aircraft stands immediately prior to departure as part of normal operations is subsumed within normal taxiing operations and is not separately identifiable at receiver locations outside the airport boundary.

14.5.13 Topographical noise barriers and acoustic walls have been included in the model (bunds are included as part of the general topography) as these form an essential part of existing and future mitigation measures in place for airport ground noise.

14.5.14 Predictions of aircraft ground noise have been carried out using a bespoke prediction model implemented in the noise modelling software CadnaA and adjusted for average wind directions using a Matlab code. Modelling has been carried out for an average day based on the 92 day summer period (as used for air noise) and the assessment is focused on 12 assessment areas. Baseline noise measurements have been obtained at 13 locations (as discussed at paragraph 14.4.21), two of which are in the same assessment area and hence the reduced number of assessment areas. The pattern of ground operations on the airfield is different between the two runway modes of operation (26 and 08). The differences are more marked than for air noise and unlike air noise there is no research to indicate that overall effects are best assessed using long term average noise levels. As a result, noise predictions for the two runway modes are reported separately. Details of the bespoke ground noise prediction model which is used in the assessment are provided at **ES Appendix 14.9.3: Ground Noise Modelling** (Doc Ref. 5.3).

14.5.15 The aircraft ground noise results are presented for daytime and night-time periods because the night period is more sensitive than the day and some taxi-routes are different at night.

14.5.16 The ground noise assessment also considers noise from the various new facilities that will be constructed on the airfield. Some of the airfield facilities include fixed noise sources that could generate noise at levels that could affect noise sensitive receptors beyond the site boundary. The design of these facilities is currently at an early stage. It has therefore not been possible to model noise emissions. Instead, the approach has been to set noise limits at the nearest offsite NSRs that will be used in the future design of these facilities and will ensure that acceptable noise levels are achieved at these receptors. The design standards are drawn from baseline noise levels using the BS4142 approach discussed above in Section 14.4. A review of the locations of the main fixed noise sources has been undertaken to check these levels will be achievable with good acoustic design (see **ES Appendix 14.9.3: Ground Noise Modelling** (Doc Ref. 5.3)).

Road Traffic Noise

14.5.17 The DMRB states that noise levels should be assessed in both the year of opening of a road scheme and at a future assessment year which represents 15 years after opening. The first year of assessment for road traffic noise has been taken to be 2032 (by which date key highway works would be completed and operational). A future year representing 15 years after opening, 2047 has also been considered. In order to assess the worst case effects of traffic noise during the construction period, the periods when traffic in the area is likely to be most affected were studied. Firstly, the period of peak construction on the airfield was identified as generating peak construction traffic from the airfield works. Secondly, for the highways works, the Main Traffic Management period was identified when traffic is most likely to divert to adjoining roads and expected to arise during 2029 and 2030. During this period traffic management is assumed to include single lane restrictions on the Longbridge roundabout, and narrow lanes on the A23 near North Terminal Roundabout and on Airport Way. Thirdly, other traffic management measures with durations of over two weeks were considered in terms of diverting traffic to adjoining roads. These were found to have lesser effects, for example, as they would arise in off peak periods when traffic would not need to divert, or similar and lesser effects to the Main Traffic Management periods because they are on the same roads. One additional case was identified that could divert

traffic differently; the closure of one lane of Airport Way westbound expected for six weeks in late 2029 to facilitate construction of the third lane on the Network Rail Bridge. This process gave three periods to assess for traffic noise impacts. For these three cases strategic traffic modelling was undertaken to provide traffic flow data for modelling traffic noise across the network with which daytime and night-time traffic noise changes were modelled, as reported in Section 14.9.

Conclusions

14.5.18 For the ES, sufficient information on the Project has been made available to identify the key sources of potential significant effects, to assess them and to outline the required mitigation measures.

14.6. Baseline Environment

Current Baseline

Construction Noise

14.6.1 The baseline noise environment for the construction noise assessment is assumed to be unchanged from that measured in 2016, as reported under ground noise below.

Air Noise

Aircraft Operations

14.6.2 Noise levels from Gatwick Airport are reported annually from noise modelling carried out by the ERCD of the CAA. The annual reports also record the numbers and pattern of flights that generate the airport's noise contours for the summer period used in their noise modelling. The numbers of flights in the day and night period in 2019 are listed in Section 14.7 below. In general, aircraft would take-off and land into a headwind for safety and performance reasons by maximising lift during take-off and landing. The wind direction, which varies over the course of a year, would therefore have an important influence on the usage of runways. The ratio of westerly (Runway 26) and easterly (Runway 08) operations is referred to as the runway modal split. In the summer daytime of 2019 this was 73% westerly and 27% easterly. Because wind conditions vary from year to year, so does modal split. To facilitate year on year comparisons, two sets of noise contours are produced each year:

- using the 'actual' modal split over the L_{eq} day period; and
- assuming the 'standard' modal split over the L_{eq} day period, ie the long-term modal split calculated from the 20-year rolling average.

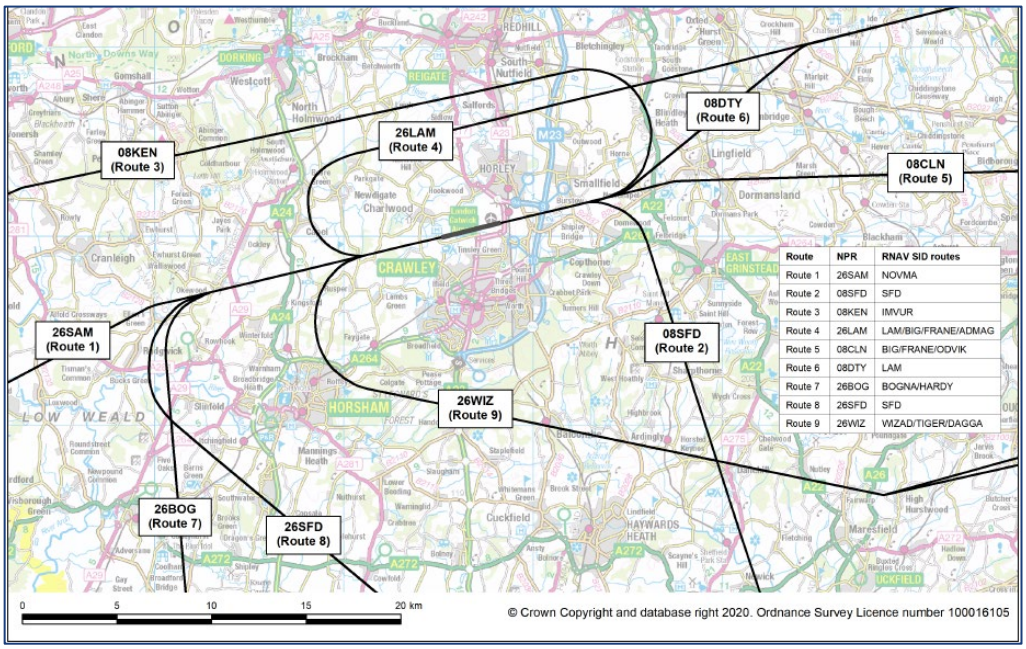
14.6.3 For 2019, this was the 20-year period from 2000 to 2019. The 16-hour daytime 'standard' modal split in 2019 was 75/25 and this modal split has been used in the baseline and all forecast years used in this assessment. **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3) gives a sensitivity analysis of how contour areas vary as modal split varies around the long term average.

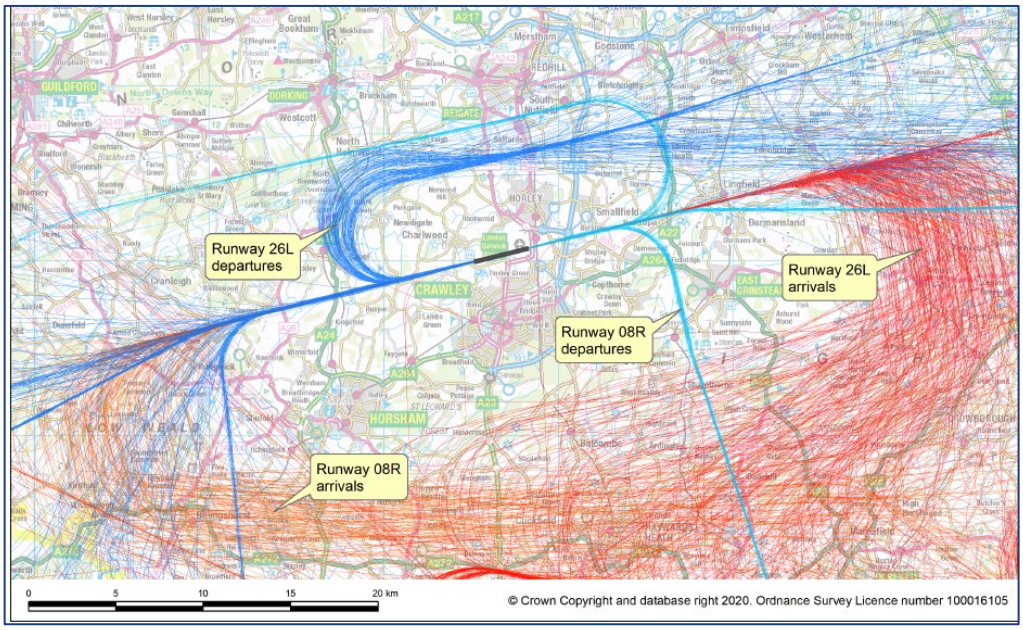
14.6.4 Wind conditions at night vary from those in the daytime, so modal splits can be slightly different. The night-time actual runway modal split for the 2019 summer period was 72% westerly and 28% easterly. The summer night-time 10-year (2010-2019) average modal split was 75% westerly 25% easterly, and this modal split has been used in all baseline and forecast years used in this assessment. The night-time standard modal split is averaged over 10 years because night-time

contours have not been produced for as long as daytime contours, so older values are not available.

14.6.5 Aircraft leaving Gatwick Airport depart along SID routes; five to the west and four to the east. Aircraft arriving into Gatwick Airport are routed from the south to converge on the extended runway centrelines where they join the Instrument Landing System to arrive at the thresholds to runway 26 and 08. Further details are available in CAA ERCD Report 2002: Noise Exposure Contours for Gatwick Airport 2019 (CAA, 2020). Similar reports are available for 2020 and 2021, but air traffic was substantially reduced in these periods due to the global COVID-19 pandemic and they are not representative of the baseline noise environment for this EIA. Diagram 14.6.1 shows the departure routes, and a sample of radar tracks for aircraft arriving and departing Gatwick Airport in 2019 taken from ERCD Report 2002.

Diagram 14.6.1: Departure Routes and Example Individual Aircraft Arrivals and Departure Flight Tracks





Primary Noise Metrics

14.6.6 The air noise baseline in 2019 can be summarised in general terms using the primary noise metrics (described below) in Table 14.6.1.

Table 14.6.1: 2019 (Standard Mode) Air Noise Baseline, Leq Day and Night

Noise Metric	Noise Contour Area (km^2)	Population
$L_{eq,\ 16\ hour}$ day:		
>51 dB	136.0	24,050
>54 dB	74.0	9,850
>57 dB	38.7	2,550
>60 dB	22.4	1,450
>63 dB	12.6	500
>66 dB	6.7	250
>69 dB	3.5	100
$L_{eq,\ 8\ hour}$ night:		
>45 dB	159.4	27,650
>48 dB	90.3	12,100
>51 dB	46.5	5,550
>54 dB	24.8	1,550
>55 dB	22.6	1,250
>57 dB	14.0	750
>60 dB	7.4	300
>63 dB	3.8	150

14.6.7 Figure 14.6.1 shows the 2019 Baseline, $L_{eq,\ 16\ hour}$ contours. The population currently within the LOAEL $L_{eq,\ 16\ hour}$ 51 dB contour is approximately 24,050 people (9,400 households). The population currently within the SOAEL $L_{eq,\ 16\ hour}$ 63 dB contour is approximately 500 people (150 households). These properties lie within the existing Noise Insulation Scheme (NIS) boundary, discussed in Section 14.8 below, with the exception of two residential properties in the Partridge Lane area west of Charlwood.

14.6.8 Figure 14.6.2 shows the 2019 Baseline, $L_{eq,\ 8\ hour}$ night contours. The population currently within the LOAEL $L_{eq,\ 8\ hour}$ night 45 dB contour is approximately 27,650 people (10,800 households). The population currently within the SOAEL $L_{eq,\ 8\ hour}$ 55 dB contour is approximately 1,250 people (500 households). These properties lie within the existing NIS boundary, discussed in Section 14.8 below, with the exception of a few in Northchapel, several west of Charlwood on Russ Hill Road and Partridge Lane, and two south of the A23 south of the airport.

Secondary Noise Metrics

14.6.9 In addition to the primary L_{eq} noise metrics reported above, the air noise baseline in 2019 can be quantified using the Number Above metrics, N65 day and N60 night, in Table 14.6.2. The Number Above metrics identify the number of aircraft during an average summer day and night above a certain peak noise threshold (L_{max} 65 dB for day and L_{max} 60 dB for night).

Table 14.6.2: 2019 (Standard Mode) Air Noise Baseline, N65 Day and N60 Night

Noise Metric (number of aircraft)	Noise Contour Area (km^2)	Population
N65 day:		
>20	149.9	24,100
>50	97.7	14,600
>100	72.7	9,500
>200	50.8	5,750
>500	2.4	100
N60 night:		
>10	204.2	33,850
>20	126.8	15,250
>50	56.4	7,600
>100	2.7	150

14.6.10 Figure 14.6.3 shows the 2019 Baseline N65 day contours. The population currently exposed to at least 20 aircraft noise events above L_{max} 65 dB on an average summer day is approximately 24,100.

14.6.11 Figure 14.6.4 shows the 2019 Baseline, N60 night contours. The population currently exposed to at least 10 aircraft noise events above L_{max} 60 dB on an average summer night is approximately 33,850.

14.6.12 In addition, and to illustrate noise levels over the whole year, annual average Day - Evening Night (L_{den}) and Night (L_{night}) noise levels have also been modelled, consistent with common practice in the European Union and associated regulations. The areas and population within these contours are shown in Table 14.6.3.

Table 14.6.3: 2019 (Standard Mode) Annual L_{den} and L_{night} Baseline Noise Levels

Noise Metric	Noise Contour Area (km^2)	Population
L_{den}:		
>55 dB	92.1	12,900
>60 dB	31.5	2,000
>65 dB	12.2	550
>70 dB	4.1	150
>75 dB	1.6	0
L_{night}:		
>45 dB	116.0	17,150
>50 dB	39.8	4,300
>55 dB	15.2	750
>60 dB	5.4	200

Noise Metric	Noise Contour Area (km^2)	Population
>65 dB	2.0	0
>70 dB	0.8	0

14.6.13 Figure 14.6.5 shows the annual average 2019 Baseline L_{den} contours.

14.6.14 Figure 14.6.6 shows the annual average 2019 Baseline L_{night} contours.

Secondary Non-Noise Metrics

14.6.15 Figure 14.6.7 shows the 2019 baseline for Gatwick Airport overflights (see **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3)). The area within which there is at least one overflight on an average summer (24 hour) day extends approximately 50 km east and west of the airport, and approximately 30 km south and extending further to the south coast over Seaford where there is an air navigation beacon. The densities of overflights increase closer to the airport, particularly under the two arrivals swathes that loop in from the south to both extended runway centrelines.

14.6.16 Figure 14.6.8 shows the 2019 baseline for Non-Gatwick Airport overflights within 35 miles (56 km) of the centre of Gatwick Airport. Areas around Gatwick where there are overflights from other airports can be seen, for example, north of Gatwick with flights from Heathrow and Redhill aerodrome, east of Gatwick with other flights over Tunbridge Wells and further south, and near the south coast over Worthing and Brighton.

14.6.17 Figure 14.6.9 shows the 2019 baseline overflights for aircraft from all airports within 35 miles (56 km) of the centre of Gatwick Airport.

Ground Noise

14.6.18 Baseline noise levels around the airport have been measured and assessed at the Noise Sensitive Receptors listed below and shown in Figure 14.4.1.

- 1 Blue Cedars
- 2 3 Charlwood Road
- 3 Brook Farm
- 4 Bear and Bunny Nursery
- 5 April Cottage
- 6 Oakfield Cottage
- 7 103 Cheyne Walk
- 8 82 The Crescent
- 9 Hyders Farm House
- 10 Myrtle Cottage
- 11 Rowley Farmhouse
- 12 Trent House.
- 13 Hoots Cottage

14.6.19 The overall average daytime and night-time measured L_{Aeq} sound levels, including all noise sources, are shown at Table 14.6.4. The pattern of ground operations on the airfield is different between the two runway modes of operation (26 and 08) so the survey results for the two runway modes are reported separately.

Table 14.6.4: Summary of Average 2016 Baseline Measurements

Descriptor	Location ($L_{Aeq,\,T}$ dB)												
	1	2	3	4	5	6	7	8	9	10	11	12	13
26 Daytime	56	60	61	58	51	55	60	60	67	60	56	61	56
26 Night	50	54	55	50	44	52	56	56	61	54	51	56	52
08 Daytime	53	56	57	56	48	57	60	61	66	60	59	68	60
08 Night	52	54	55	53	47	54	55	56	61	56	54	61	55

14.6.20 The baseline noise survey was carried out over a 16-day period in August 2016 covering a range of wind speeds and directions. The survey locations were chosen because of their proximity to the airport but ground noise was not the only noise source contributing to the total noise levels that were measured. **ES Appendix 14.9.6: Ground Noise Baseline Report** (Doc Ref.5.3) gives full details of the baseline survey. Air traffic at Gatwick changed very little between 2016 and 2019: Average summer 16 hour day ATMs reduced by 0.6% from 771 to 766 and average summer night traffic was unchanged at 127 ATMs. Similarly, road traffic levels on local roads in general changed little in this period. Therefore, it is reasonable to assume that ambient noise levels in 2019 were very similar to those measured in the 2016 baseline survey. The measured levels show a range of ambient noise levels at each site due to varying wind and other conditions. Section 2 of **ES Appendix 14.9.3: Ground Noise Modelling** (Doc Ref. 5.3) gives further details.

14.6.21 The locations shown in Figure 14.4.1 were used for the baseline noise surveys. In order to report the assessment of ground noise (and also construction noise) a set of 12 noise sensitive receptor areas was defined as shown in Figure 14.4.2.

Road Traffic Noise

14.6.22 The baseline NSRs for the study were identified based on their proximity to the Project and noise sensitivity (see Figures 14.6.10 and 14.6.11). They include the residential properties nearest to the new or altered road links and the amenity area in the Riverside Garden Park adjacent to the A23 and M23 roads as listed below:

- NSR1 The Crescent East;
- NSR2 The Crescent West;
- NSR3 Woodroyd Gardens;
- NSR4 Cheyne Walk;
- NSR5 Longbridge Road East;
- NSR6 Longbridge Road West;
- NSR7 Povey Cross Road;
- NSR8 Meadowcroft Close;
- NSR9 B2036 Balcombe Road;
- NSR10 Riverside Garden Park north;
- NSR11 Riverside Garden Park centre;
- NSR12 Riverside Garden Park south;
- NSR13 First Point office building;
- NSR14 Premier Inn;
- NSR15 Longbridge Road Centre East;
- NSR16 Longbridge Road Centre; and

- NSR17 Longbridge Road Centre West.

14.6.23 Detailed modelling of traffic noise emissions was undertaken, utilising traffic data from the Strategic Model, to produce noise levels over the day and night periods (see Figures 14.6.10 and 14.6.11 respectively) for the baseline year in 2018. The predicted levels are already above SOAEL at NSR1, NSR3–7, NSR9, and NSR13–17 during the day and NSR1, NSR3–9, and NSR13–17 during the night. Notably, the modelled noise levels are above SOAEL at both the representative NSRs in the two Noise Important Areas (NSR1 and NSR5) during both day and night time, so it is apparent that both areas are particularly sensitive to significant changes in ambient noise, consistent with their designation as Noise Important Areas.

14.6.24 A baseline noise survey was undertaken in May 2019 within the Riverside Garden Park, adjacent to the A23. It is an area used for recreation and relaxation and the primary purpose of the survey was to better understand the park's sensitivity to noise and the relative contributions of the three types of noise (air, ground and road traffic). It was observed that road traffic, aircraft, and natural sounds were all audible at the measurement locations. The park itself appeared to be widely used by the local community and despite having high measured baseline levels, mainly being dominated by continuous road traffic. It was apparent that the Riverside Garden Park is potentially sensitive to significant changes in ambient noise, given the number of users. **ES Appendix 14.9.4: Road Traffic Noise Modelling** (Doc Ref. 5.3) gives further details.

14.6.25 For reference in the ground noise and construction noise assessments, baseline road traffic noise levels in 2018 were also modelled across the ground noise and construction noise study areas, as discussed in **ES Appendix 14.9.3: Ground Noise Modelling** (Doc Ref. 5.3). The results are presented as day and night traffic noise contours in Figures 14.6.33 and 14.6.34.

Future Baseline Conditions

Initial Construction Period: 2024-2029

14.6.26 For the purposes of the construction noise assessment, the baseline at NSRs around the airport perimeter is dominated by road traffic noise (which is unlikely to change by 2029) and airport ground noise. The baseline during construction is assumed to be as measured in 2016.

First Full Year of Opening: 2029

Air Noise

14.6.27 Baseline air noise modelling has been carried out for the assessment years 2029, 2032, 2038 and 2047, and baseline levels and the levels with the Project are reported in **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3). A sensitivity analysis was undertaken to assess the likely year of highest air noise impact, ie the greatest change in noise over baseline, and it was found that the greatest air noise impacts are expected in 2032. This chapter therefore provides the results of the baseline in this worst-case year and an assessment of impacts with the project against this, with baseline and impacts in the other assessment years (2029, 2038 and 2047) summarised briefly in Section 14.9 when discussing the trends in future noise levels under the Interim Assessment Year 2032 heading, and also reported in detail within **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3).

Ground Noise

14.6.28 Baseline ground noise predictions have been carried out for the assessment years 2029, 2032 and 2038 but only the worst-case assessment year has been presented within this chapter. The worst case assessment year (highest combination of predicted noise levels and noise change for development scenario) is 2032 and baseline noise predictions for 2029 and 2038 have therefore only been included within **ES Appendix 14.9.3: Ground Noise Modelling** (Doc Ref. 5.3).

Interim Assessment Year: 2032

Air Noise

14.6.29 The 2032 baseline has been modelled based upon air traffic forecasts which include changes in the fleet to quieter types as modelled using the relevant noise emission levels described in **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3). As described above, a central fleet forecast case and a slower transition fleet case have been modelled to give a range of future baseline conditions.

14.6.30 The air noise baseline in 2032 can be summarised in general terms using the primary noise metrics (described below) in Table 14.6.5.

Table 14.6.5: 2032 (Standard Mode) Air Noise Baseline, L_{eq} Day and Night[7]

Noise Metric	Noise Contour Area (km^2)	Population
$L_{eq,\ 16\ hour}$ day:		
>51 dB	107.3 – 125.8	16,100 – 23,500
>54 dB	54.1 – 67.1	6,700 – 9,100
>57 dB	28.4 – 34.9	1,800 – 2,200
>60 dB	16.6 – 20.3	900 – 1,200
>63 dB	9.2 – 11.5	400 – 500
>66 dB	4.7 – 6.2	200
>69 dB	2.5 – 3.1	100
$L_{eq,\ 8\ hour}$ night:		
>45 dB	124.6 – 143.9	18,800 – 25,400
>48 dB	67.8 – 80.1	8,900 – 10,800
>51 dB	33.7 – 40.3	3,600 – 4,700
>54 dB	18.7 – 22.3	1,000 – 1,300
>55 dB	15.5 – 18.5	900 – 1,100
>57 dB	10.2 – 12.5	500
>60 dB	5.5 – 6.5	300
>63 dB	2.8 – 3.3	200

[7] Ranges cover the central case fleet noise modelling and the slower transition fleet noise modelling.

14.6.31 Figure 14.6.12 shows the 2032 Baseline, $L_{eq,\ 16\ hour}$ day contours. For each noise contour level (51, 54, 57, 60, 63, 66, and 69 dB), contours for the central case fleet and the slower transition fleet noise modelling are plotted with the area between shaded grey to depict the range of contours predicted. The slower transition fleet case is the noisier, forming the outer edge of the shaded range for each noise contour level. In the following discussions of the areas and populations within various noise contours, ranges are used to report the range between the central fleet and slower transition fleet cases, except for 2019 when there was only the actual fleet. The population within the LOAEL $L_{eq,\ 16\ hour}$ day 51 dB contour in 2032 is approximately 16,100 to 23,500 people, reduced from 24,050 people in 2019. The population within the SOAEL $L_{eq,\ 16\ hour}$ 63 dB contour is approximately 400 to 500 people, reduced (against the central case) from 500 people in 2019 (these estimates are rounded to the nearest 100). This demonstrates the extent to which the airport is expected to become quieter in the future notwithstanding the forecast growth in passengers and ATMs within the baseline. For example, in the central case approximately 100 people fewer with significant effects on health and quality of life from daytime noise are predicted in 2032 than in 2019.

14.6.32 Figure 14.6.13 shows the 2032 Baseline, $L_{eq,\ 8\ hour}$ night contours. The population within the LOAEL $L_{eq,\ 8\ hour}$ night 45 dB contour is approximately 18,800 to 25,400 people, reduced from 27,650 in 2019. The population within the SOAEL $L_{eq,\ 16\ hour}$ 55 dB contour is approximately 900 to 1,100 people, reduced from 1,250 in 2019. This again demonstrates the extent to which the airport is expected to become quieter in future, with, for example in the central case, approximately 350 people fewer with significant effects on health and quality of life from noise at night in 2032 than in 2019.

14.6.33 In addition to the primary L_{eq} noise metrics reported above, the air noise baseline in 2032 can be quantified using the Number Above metrics, N65 day and N60 night, as shown in Table 14.6.6.

Table 14.6.6: 2032 (Standard Mode) Air Noise Baseline, N65 Day and N60 Night[8]

Noise Metric (number of aircraft)	Noise Contour Area (km²)	Population
N65 day:		
>20	106.2 – 136.4	15,300 – 28,300
>50	75.4 – 89.4	10,900 – 12,900
>100	53.5 – 64.5	6,200 – 7,700
>200	39.6 – 44.3	4,500 – 5,000
>500	3.2 – 3.5	100
N60 night:		
>10	176.4 – 193.0	28,900 – 31,500
>20	112.9 – 121.6	13,700 – 14,700
>50	53.2 – 55.3	7,000 – 7,400
>100	2.6 – 2.7	100

[8] Ranges cover the central case fleet noise modelling and the slower transition fleet noise modelling.

14.6.34 Figure 14.6.14 shows the 2032 Baseline N65 day contours. The population exposed to at least 20 aircraft noise events above L_{max} 65 dB on an average summer day is approximately 15,300 to 28,300 in 2032, compared to 24,100 in 2019.

14.6.35 Figure 14.6.15 shows the 2032 Baseline, N60 night contours. The population exposed to at least 10 aircraft noise events above L_{max} 60 dB on an average summer night is approximately 28,900 to 31,500 in 2032, reduced from 33,850 in 2019.

14.6.36 In addition, and to illustrate noise levels over the whole year, annual average Day, Evening Night (L_{den}) and Night (L_{night}) noise levels has also been modelled, consistent with common practice in the European Union and associated regulations. The areas and population within these contours are summarised in Table 14.6.7.

Table 14.6.7: 2032 (Standard Mode) Annual L_{den} and L_{night} Baseline Noise Levels[9]

Noise Metric	Noise Contour Area (km^2)	Population
L_{den}:		
>55 dB	73.1 – 86.5	9,700 – 11,800
>60 dB	24.1 – 29.2	1,400 – 1,800
>65 dB	9.3 – 11.3	400 – 500
>70 dB	3 – 3.8	100 – 200
>75 dB	1.2 – 1.4	0 – 0
L_{night}:		
>45 dB	90.7 – 105.5	11,900 – 14,800
>50 dB	29.5 – 35.5	2,000 – 3,400
>55 dB	11.4 – 13.6	500 – 700
>60 dB	3.8 – 4.7	200 – 200
>65 dB	1.4 – 1.7	0 – 0
>70 dB	0.6 – 0.7	0 – 0

14.6.37 Figure 14.6.16 shows the baseline L_{den} contours in 2032.

14.6.38 Figure 14.6.17 shows the baseline L_{night} contours in 2032.

14.6.39 Figure 14.6.18 shows the 2032 baseline overflight densities. The methodology and assumptions used to generate this overflight density map are described in **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3). These include applying a growth factor to the 2019 overflight density modelling and the shift of 8% of traffic onto the WIZAD (Route 9) westerly standard instrument departure route on which aircraft departing west turn south between Crawley and Horsham. This shift of traffic is assumed to be required to help accommodate increased air traffic growth in the London area to the north, which is expected to have occurred in the baseline situation by 2032. The effect of this increased traffic on Route 9 can be seen in Figure 14.6.18 which shows a new

[9] Ranges cover the central case fleet noise modelling and the slower transition fleet noise modelling.

swathe of higher density overflights between Horsham and Crawley spreading to the East over and around Wakehurst Place.

Ground Noise

14.6.40 The predicted ground noise baseline in 2032 is presented in Table 14.6.8. The assessment has been carried for 12 assessment areas around the airport as detailed at **ES Appendix 14.9.3: Ground Noise Modelling** (Doc Ref. 5.3) and the results presented here are for the worst-affected locations (those with the highest predicted noise levels) within each of the 12 assessment areas, for each mode of operation and time period. The predicted baseline noise levels in 2032 are 0 to 1 dB lower than in the year of opening. Details are provided in **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3).

Table 14.6.8: Summary of Ground Noise 2032 Future Baseline Predicted Levels

Descriptor	Assessment Area ($L_{Aeq,T}$ dB)											
	Outer Charlwood 1	Charlwood 2	Charlwood Road 3	Farmfield 4	Povey Cross 5	Longbridge Road, Horley 6	Riverside, Horley 7	Bonnets Lane 8	Lowfield Heath 9	Rowley Farm 10	Balcombe Road 11	Tinsley Green 12
2032 – 26 Daytime	47	48	52	51	53	55	58	54	62	58	54	49
2032 – 26 Night	47	48	50	49	51	51	54	53	59	56	50	46
2032 – 08 Daytime	54	60	57	53	55	50	50	61	63	60	44	45
2032 – 08 Night	51	55	52	49	51	48	48	58	61	57	41	42

Road Traffic Noise

14.6.41 Figures 14.6.19 and 14.6.20 provide road traffic noise contours for the 2032 future baseline (without Project) case. Detailed results are given in **ES Appendix 14.9.4: Road Traffic Noise Modelling** (Doc Ref. 5.3).

Design Year: 2038

Air Noise

14.6.42 Between 2032 and 2038, the fleet would continue to change to quieter types, resulting in further reduction in baseline levels. Full results of modelling for primary and secondary noise metrics are provided in **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3). The following figures show the future baseline noise contours.

- Figure 14.6.21 shows the 2038 Baseline, $L_{eq,\ 16\ hour}$ day contours.
- Figure 14.6.22 shows the 2038 Baseline, $L_{eq,\ 8\ hour}$ night contours.
- Figure 14.6.23 shows the 2038 Baseline, N65 day contours.

- Figure 14.6.24 shows the 2038 Baseline, N60 night contours.
- Figure 14.6.25 shows the 2038 Baseline, L_{den} contours.
- Figure 14.6.26 shows the 2038 Baseline, L_{night} contours.

Ground Noise

14.6.43 As discussed above, baseline ground noise predictions for 2038 have not been presented here but are available at **ES Appendix 14.9.3: Ground Noise Modelling** (Doc Ref. 5.3). The ground noise predictions presented in this chapter focus on the worst-case assessment year which is 2032.

Road Traffic Noise

14.6.44 The assessment of significant effects from road traffic noise follows the methodology prescribed in the DMRB which requires future noise to be modelled 15 years after opening, ie in 2047. Future baseline levels of road traffic noise are reported in Section 14.9.

2047

Air Noise

14.6.45 Between 2038 and 2047, the fleet would continue to change to quieter types, resulting in further reduction in baseline levels. Full results of modelling primary and secondary noise metrics are provided in **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3). The following figures show the future baseline noise contours.

- Figure 14.6.27 shows the 2047 Baseline, $L_{eq,\ 16\ hour}$ day contours.
- Figure 14.6.28 shows the 2047 Baseline, $L_{eq,\ 8\ hour}$ night contours.
- Figure 14.6.29 shows the 2047 Baseline, N65 day contours.
- Figure 14.6.30 shows the 2047 Baseline, N60 night contours.
- Figure 14.6.31 shows the 2047 Baseline, L_{den} contours.
- Figure 14.6.32 shows the 2047 Baseline, L_{night} contours.

14.6.46 Table 14.6.9 summarises the future baseline noise levels by providing the areas (for the central case and slower transition case) of the outermost modelled noise contour for 2019, 2029, 2032, 2038 and 2047.

Table 14.6.9: Summary of Air Noise Baseline Future Noise Contour Areas (km^2)[10]

	2019	2029	2032	2038	2047
Leq 16 hr 51 dB	136.0	120.1 to 128.5	107.3 to 125.8	96.5 to- 107.4	96.2 to 103.5
Leq 8 hr night 45 dB	159.4	139.8 to 148.3	124.6 to 143.9	115.3 to- 124.3	114.7 to 124.4

[10] Ranges cover Central Case to Slower Transition Case fleets

N65 20	149.9	121.5 to 140	106.2 to 136.4	94.3 to- 108.5	95.1 to 104
N60 10	204.2	188.1 to 200	176.4 to 193	169.1 to- 175.7	169 to 178.9
Lden 55	92.1	82.3 to 88.7	73.1 to 86.5	66.1 to- 73.7	66.8 to 73
Lnight 45	116.0	102.1 to 108.5	90.7 to 105.5	84.4 to- 91.6	84.1 to 91.6

14.6.47 The downward trend in the areas of contours across all noise metrics indicates the expected downward trend in noise levels in the future. The downward trend slows in the period after 2038 and is also less certain due to greater uncertainty in the forecast and in fleet transition.

Ground Noise

14.6.48 As discussed above, baseline ground noise predictions for 2047 have not been presented here but are available at **ES Appendix 14.9.3: Ground Noise Modelling** (Doc Ref. 5.3). The ground noise predictions presented in this chapter focus on the worst-case assessment year which is 2032. There are some slightly increased margins between baseline and development cases in 2047 compared to 2032, but the absolute predicted levels are lower.

Road Traffic Noise

14.6.49 The assessment of significant effects from road traffic noise follows the methodology prescribed in the DMRB which requires future noise to be modelled 15 years after opening, ie in 2047.

14.7. Key Aspects of the Project

14.7.1 The assessment has been based on the description within **ES Chapter 5: Project Description** (Doc Ref. 5.1).

14.7.2 Table 14.7.1 below identifies the key assumptions relevant to this assessment. Where options exist, the maximum design scenario selected is the one having the potential to result in the greatest effect on an identified receptor or receptor group. Effects of greater adverse significance are not predicted to arise should any other options identified in **ES Chapter 5: Project Description** (Doc Ref. 5.1) be taken forward in the final design of the Project.

Table 14.7.1: Maximum Design Scenarios (Air Traffic Movements)

Potential Impact	Base Case Scenario	Maximum Design Scenario	Justification
Baseline 2019			
Existing ATMs	16 hour day 766 8 hour night 127	N/A	Base case for assessment.
Initial Construction Period: 2024-2029			
Construction noise and vibration		Worst case within each of 24 periods (eg, concurrent work or works that may be at night, see **ES Appendix 14.9.1:**	Ensures that impacts are not under-estimated, so that adequate mitigation is provided for.

Potential Impact	Base Case Scenario	Maximum Design Scenario	Justification
		Construction Noise Modelling (Doc Ref. 5.3)).	
First Full Year of Opening: 2029			
Air noise and ground noise ATMs	16 hour day 811 8 hour night 125	16 hour day 848 8 hour night 127	See explanation of assessment years in **ES Chapter 6: Approach to Environmental Assessment** (Doc Ref. 5.1) and ATM forecast in **ES Chapter 4: Existing Site and Operation** (Doc Ref. 5.1) and **ES Chapter 5: Project Description** (Doc Ref. 5.1).
Interim Assessment Year: 2032			
Air noise and ground noise ATMs	16 hour day 818 8 hour night 125	16 hour day 976 8 hour night 137	See explanation of assessment years in **ES Chapter 6: Approach to Environmental Assessment** (Doc Ref. 5.1 and ATM forecast in **ES Chapter 4: Existing Site and Operation** (Doc Ref. 5.1) and **ES Chapter 5: Project Description** (Doc Ref. 5.1).
Road traffic noise		Worst case approach is to assess changes in traffic noise in the year of opening of the highway.	As required by DMRB.
Design Year: 2038			
Air noise and ground noise ATMs	16 hour day 825 8 hour night 124	16 hour day 983 8 hour night 137	See explanation of assessment years in **ES Chapter 6: Approach to Environmental Assessment** (Doc Ref. 5.1) and ATM forecast in **ES Chapter 4: Existing Site and Operation** (Doc Ref. 5.1) and **ES Chapter 5: Project Description** (Doc Ref. 5.1).

Potential Impact	Base Case Scenario	Maximum Design Scenario	Justification
15 Years After Opening: 2047			
Air noise and ground noise ATMs	16 hour day 831 8 hour night 124	16 hour day 988 8 hour night 137	See explanation of assessment years in **ES Chapter 6: Approach to Environmental Assessment** (Doc Ref. 5.1) and ATM forecast in **ES Chapter 4: Existing Site and Operation** (Doc Ref. 5.1) and **ES Chapter 5: Project Description** (Doc Ref. 5.1).
Road traffic noise		Worst case approach is to assess changes in traffic noise 15 years after the year of opening of the highway. DMRB also requires an assessment of changes between the situation with the Project in 2047 and without the Project in the year of opening (2032).	As required by DMRB to predict highest noise levels 15 years after highway opening.

14.7.3 The construction noise and vibration assessment is based on current understanding of the methods of working required to build the Project, as summarised in **ES Chapter 5: Project Description** (Doc Ref. 5.1). Key assumptions include:

- the plant likely to be used, and hence its noise and vibration emissions (see **ES Appendix 14.9.1: Construction Noise Modelling** (Doc Ref. 5.3));
- the hours of working, night being more sensitive than day (see **ES Appendix 14.9.1: Construction Noise Modelling** (Doc Ref. 5.3));
- location and proximity to NSRs; and
- duration of works.

14.7.4 At this stage, the exact methods of working have not been defined and therefore, in common with standard practice, where there is uncertainty, a reasonable worst case has been adopted. **ES Appendix 14.9.1: Construction Noise Modelling** (Doc Ref. 5.3) summarises the key works that have been assessed and lists the types of plant assumed to carry out those works.

14.7.5 For air noise and airport ground noise, the extent of noise impacts would depend largely on the numbers and types of ATMs. These have been forecast and provided for an average summer day and night in the 92-day summer period used in the noise assessments, as summarised in the table above. Forecasts have been provided and noise modelling has been completed for four future years. 2029 was modelled as the year of opening. An analysis of the forecasts for each year between 2029 and 2038 indicated that: 2032 would be the year in which noise contours with

the Project are greatest; and the year in which the greatest difference in noise levels with the Project compared to the baseline in that year is likely to occur. Accordingly, the air and ground noise assessments for 2032 are reported in detail in this chapter as the likely worst case year. The airfield facilities are anticipated to be fully utilised by 2038, so this case has been modelled, as air traffic growth would slow after this. Noise has also been modelled for 2047, 15 years after opening of the highways scheme to show noise levels further into the future. This chapter provides full details of noise levels and expected impacts in 2032, as well as commentary on impacts in these other assessment years, with the detail for all years provided in **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3).

14.7.6 The Project includes some key changes to the airport (other than increased traffic flow) which affect ground noise impacts. It would be necessary to remove a bund at the western end of the northern runway in order to allow for alterations to taxiways. This bund currently provides mitigation for ground noise affecting properties in the Charlwood area and it would be replaced with a longer (~500 metres) combination of bund and barrier shifted slightly north and west relative to the existing bund. To allow for usage of the northern runway, all taxiing from or to the western end of the runways would take place on Taxiway Juliet, which would have to be moved slightly further north to provide a safe distance between the taxiway and the northern runway in accordance with CAA/EASA regulations. In addition, the Project requires an extension to Taxiway Lima, which would join up to Taxiway Juliet providing the main route for all aircraft taxing to or from the western end of the runways. This extension to Taxiway Lima and the planned intensification of usage mean that a large number of taxiing aircraft would be routed further north and west than for previous operations, bringing ground noise sources closer to properties in the direction of Charlwood.

14.7.7 For the road traffic noise assessment, traffic flow forecasts for the 2029, 2032 and 2047 assessment years have been provided by the traffic and transport team, as reported in **ES Chapter 12: Traffic and Transport** (Doc Ref 5.1). **ES Appendix 14.9.4: Road Traffic Noise Modelling** (Doc Ref 5.3) provides further details.

14.7.8 The overflights analysis contained within the air noise assessment has been used in **ES Chapter 8: Landscape, Townscape and Visual Resources'** (Doc Ref. 5.1) assessment of tranquillity and in **ES Chapter 7: Historic Environment** (Doc Ref. 5.1) assessment of impacts on sensitive heritage assets. The results of the noise assessment have also been used in **ES Chapter 9: Ecology and Nature Conservation** (Doc Ref. 5.1).

14.7.9 WebTAG worksheets for air noise and road traffic noise are provided in Section 14.12 to inform the health assessment (**ES Chapter 18: Health and Wellbeing** (Doc Ref. 5.1)) and the socio-economic appraisals (**ES Chapter 17: Socio-Economic** (Doc Ref. 5.1)).

14.8. Mitigation and Enhancement Measures Adopted as Part of the Project

Construction Noise

14.8.1 The measures that have been designed into the Project to reduce the potential for impacts on sensitive receptors affected by construction noise and vibration are listed in Table 14.8.3.

Table 14.8.1: Mitigation and Enhancement Measures – Construction Noise and Vibration

Measures Adopted as Part of the Project	Justification	How secured
Mitigation		
Works outside of daytime weekday working hours have been minimised	To minimise noise disturbance at night or at weekends	Construction Contracts, **ES Appendix 5.3.2: Code of Construction Practice** (Doc Ref. 5.3)
Use of percussive piling technique have been avoided where practicable	To reduce disturbance from ground vibration	Construction Contracts, **ES Appendix 5.3.2: Code of Construction Practice** (Doc Ref. 5.3)

14.8.2 The contractors will be required to take steps to further minimise noise and vibration using BPM in accordance with **ES Appendix 5.3.2: Code of Construction Practice** (Doc Ref. 5.3). The BPM noise reduction measures vary for the various types of works taking place, and in some areas (e.g. within the airport terminal areas) are not needed to minimise noise levels at receptors off-site. Therefore, the assumed BPM noise reduction measures and their benefits have been considered for each area of works required around the airfield and the highways, and are reported as further mitigation are in Section 14.9.

14.8.3 Where significant effects are predicted, the likely effects of noise barriers located on the relevant site boundaries have been explored. The likely benefits of this, and of further mitigation and how it will be secured, are discussed in Section 14.9.

Air Noise

Approach to Air Noise Mitigation

14.8.4 From engagement with the local community, GAL is aware of the level of concern that aircraft noise might increase as a result of the Project. The Gatwick Airport masterplan gave an initial assessment of noise impacts based on preliminary air traffic forecasts and noise modelling carried out at that time. This enabled mitigation to be developed as part of the Project, which has been further developed as part of the EIA process.

14.8.5 The ICAO balanced approach to mitigation (see Section 14.2) consists of four main elements:

- noise at source;
- land use planning and management;
- noise abatement operating procedures; and
- noise abatement operating restrictions.

14.8.6 Gatwick Airport has a comprehensive noise management system that follows this approach, as reported in the Noise Action Plan that is updated by GAL and reviewed by Defra every five years. Section 4 of **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3) provides a summary of the main noise mitigation activities that will continue as part of Gatwick's ongoing noise management programme as the Project is developed and into the future. The following text

focuses on some of the embedded noise mitigation measures that are most relevant to the Project.

Air Noise Mitigation at Source

14.8.7 Aircraft noise is generated by a number of different 'sources'. Though the dominant one is still the engines, on approach airframe noise is now becoming important. Through the work of ICAO and the development of the aircraft chapter standards, the industry has invested heavily in research and development to continually reduce the noise impact of aviation. The way in which aircraft noise levels are measured and reported is described in more detail in **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3) Section 4.

14.8.8 GAL operates a system of aircraft movement charges that are based in part on each aircraft's noise levels measured under ICAO certification processes. Each type of aircraft is placed in to one of five noise categories according to the margin by which it is quieter than the ICAO Chapter 3 Standard that was defined in 1977. These movement charges for the 2021 summer season are given in Table 14.8.2. Winter season charges are lower and do not include day charges, with the exception of Fuel Over Pressure Protector (FOPP) charges (see below).

14.8.9 In certain flight configurations the Airbus A320 family of aircraft is known to produce a high-pitched whine, generated by the FOPP cavities under the wings. A modification to the FOPP is available that eliminates this characteristic whine. In recognition of this, any Airbus A320 family aircraft not declared as having the FOPP modification is subject to a higher unmodified A320 family noise charge. This is intended to incentivise airlines to carry out the low-cost modification required to eliminate the specific noise disturbance associated with unmodified A320 family aircraft.

Table 14.8.2: Gatwick Airport 2021 Summer Season Movement Charges

Noise Category	Chapter 3 Margin dB	Day Charge £	Night Charge £
Chapter 14 Minus	≥23	£17.45	£458.25
Chapter 14 Base	20 to 23	£21.82	£572.80
Chapter 14 High	17 to 20	£26.19	£687.37
Chapter 4	10 to 17	£43.65	£1,145.62
Chapter 3 and below	≤10	£87.28	£2,291.25
Unmodified A320 Family		£872.85	£2,291.25

14.8.10 The ICAO certification process gives noise levels measured at three locations, and the Chapter 3 margins are for the summation of these three noise levels. Thus a margin of 20 dB does not imply a noise level measured on the ground 20 dB lower, rather about a third of this, or around 7 dB lower. Thus the ICAO Chapter categories are commonly used to place aircraft in broad categories according to their noise levels.

14.8.11 The higher landing charges for noisier aircraft are intended to incentivise airlines to operate quieter aircraft at Gatwick, especially at night. GAL regularly reviews these charges so that operators with noisier aircraft are incentivised further to re-equip with quieter types. GAL's overall charges are subject to economic regulation by the CAA and consultation with Airlines.

Land Use Planning and Management

14.8.12 Land use planning is largely the responsibility of local planning authorities. However, GAL works with local authorities and provides noise exposure information to assist them. The noise modelling forecasts provided in this ES provide further information to assist local authorities in fulfilling their role in avoiding new housing being built in unsuitably noisy locations without suitable noise insulation provided in their design.

14.8.13 Guidance to planners and house builders is provided on Planning and Noise (Association of Noise Consultants *et al.,* 2017). GAL will continue to liaise with planning authorities to help ensure land use planning is used to avoid unsuitable noise sensitive development in the relevant noise zones.

14.8.14 The Noise Management Board has included in its work plan a project to work with local authorities to help improve land use planning with regards noise sensitive developments affected by noise from the airport. (See [redacted] for more details of the Noise Management Board and its work plan).

Air Noise Operating Procedures

14.8.15 The Project does not require new flight paths, which avoids the noise impacts that can be associated with those. Only departures would use the northern runway, except during maintenance, as is currently the case. The majority of these would be above 1,000 feet before they leave the airfield.

14.8.16 The noise modelling has assumed that use of the northern runway would be limited to the period 06:00-23:00 hours, avoiding scheduling flights in the majority of the more sensitive night-time period.

14.8.17 GAL would operate flights from the northern runway using procedures designed to minimise noise impacts, compliant with established noise abatement procedures and in line with the commitments of the Noise Action Plan. The Noise Action Plan lays out a series of actions to manage and reduce noise which equally apply to flights using the northern runway. GAL will continue to work with stakeholders to develop ways to minimise noise for all operations at the airport.

14.8.18 GAL operates a system of Departure Noise Limits in which all aircraft leaving the airport are measured at a set of locations about 3 km from the airport, and airlines are fined if they exceed the following defined noise limits:

- Day (07:00-23:00 hour) L_{max} 94 dB;
- Shoulder (23:00- 23:30 and 06:00-07:00 hours) L_{max} 89 dB; and
- Night (23:00 to 06:00 hours) L_{max} 87 dB.

14.8.19 Departure noise limits are the responsibility of the DfT. They have applied at Gatwick since 1968 and were last reduced in 2001.

14.8.20 Airlines are fined £500 if their aircraft exceed these limits by up to 3 dB, and £1,000 if they exceed by more than 3 dB. Monies from fines are passed to the Gatwick Airport Community Trust.

14.8.21 Departure noise limits are intended to incentivise good operational procedures on departure, ie flying a given aircraft as quietly as possible. In 2021 GAL carried out a review of compliance with these limits that showed only three infringements of the limits from 2016 to 2022. The lack of infringement is strong evidence of the improvements in aircraft technology since 2001. GAL is reviewing the present limits and fines to recalibrate for modern aircraft performance capabilities and incentivise continued reductions of noise at source.

14.8.22 A study to review and update the Departure Noise Limits is underway, reporting to the Noise Management Board. In September 2021 the PEIR included the then proposed revisions and sought views on this. The study progressed in 2022 and 2023, including consultation with airlines and community stakeholders.

14.8.23 The proposed review is independent of the Project and would proceed in its absence (and so would form part of the future baseline).

Noise Insulation Scheme

14.8.24 The current Gatwick NIS is based on a 60 dB L_{eq} contour. The extent of the scheme is shown as the red line in Figure 14.8.1. It is based on a future $L_{eq,\ 16\ hour}$ 60 dB contour forecast in 2014, with 15 km extensions from under the runway centrelines, and adjusted to accommodate various residential areas. There are about 2,000 homes within this area of which about 1,120 have taken up the scheme (November 2022). Within this zone residents are entitled to £3,000 towards acoustic glazing and doors. Under the existing Noise Action Plan commitments GAL has recently reviewed the scheme, which resulted in an increased offer within the same zone.

14.8.25 The new enhanced NIS that would be introduced as further mitigation for the Project is discussed in Section 14.9.

Ground Noise

14.8.26 Mitigation is included as part of the Project on the airport boundary, where practicable to do so, as a combination of new earthwork bunding and acoustic barriers. These would be provided to the west of the airfield where changes in the taxiway infrastructure would be affected as a result of the Project. Additionally, very large buildings, such as the Boeing Hangar and new buildings proposed would themselves act as noise barriers. The measures that have been designed into the Project to reduce the potential for impacts on sensitive receptors affected by aircraft ground noise are listed in Table 14.8.3.

Table 14.8.3: Mitigation and Enhancement Measures – Ground Noise[11]

Measures Adopted as Part of the Project	Justification
Mitigation*	
Earthworks, bunding at least 8 metres in height situated at the western end of northern runway.	Required to screen noise close to the source to reduce noise outside the airport. Necessary to replace functionality of existing bund that would be removed as part of the design.

[11] It should be noted that all mitigation measures listed in this table are included in the prediction model; they are not separate alternative options

Noise barriers 10 metres in height adjoining the bund installed at the western end of the northern runway and running for approximately 500 metres to the north of the relocated Juliet taxiway and around the boundary of the relocated fire training ground (as shown at Figure 5.2.1g (Doc Ref. 5.2)).	Required to screen noise close to the source to reduce noise outside the airport. Necessary to replace functionality of existing bund that would be removed as part of the design and to improve on the functionality where possible.
Museum Field Bund.	Landscape bunding around the flood pond has been designed to provide additional ground noise screening.
Acoustic design of plant and fixed noise sources on buildings to meet the stated noise criteria.	To avoid noise from fixed sources creating noise impacts at receptors outside the airfield.

Road Traffic Noise

14.8.27 A number of measures have been designed into the Project to reduce the potential for impacts from traffic noise. These are listed in Table 14.8.4.

Table 14.8.4: Mitigation and Enhancement Measures – Road Traffic Noise

Measures Adopted as Part of the Project	Justification
Mitigation	
Alignment changes through optioneering of the road scheme design.	Mitigation will be built into the design of the new roundabouts and surrounding roads. This takes into account: the high existing noise levels in the Riverside Garden Park and surrounding residential area; the two Noise Important Areas to the north and south of the Riverside Garden Park; and the aims of the NPSE to reduce adverse effects of noise and where possible contribute to the improvement of health and quality of life.
The new right turn onto the A23 from the North Terminal Roundabout removes the current need for traffic wishing to turn right instead having to turn left up to the Longbridge roundabout, around it, and back down the A23, thus reducing traffic flows on this section of the A23.	
1 metre noise barrier along the North Terminal Roundabout flyover elevated section (facing Riverside Garden Park).	
1 metre noise barrier along the South Terminal Roundabout flyover elevated section, north side.	
Traffic management and speed reductions.	

14.8.28 A low noise surface was also considered as an additional form of mitigation, however, the lack of noise performance of low noise surfaces at the relatively low design speeds in the relevant areas, together with potential maintenance implications, led to the decision that this would not be a suitable and effective form of noise mitigation.

14.8.29 At the PEIR stage we considered a further noise barrier adjacent to the Riverside Garden Park. Further detailed analysis using the outputs of the Strategic Traffic model for the revised scheme concluded that the package of mitigation measures summarised above was sufficient and a noise barrier along the park side was not required. Section 5 of **ES Appendix 14.9.4: Road Traffic Noise Modelling** (Doc Ref. 5.3) provides detail of the analysis and summarises the consultation undertaken at the time.

14.9. Assessment of Effects

Initial Construction Period: 2024-2029

Construction Noise

Assessment of Reasonable Worst Case Effects

14.9.1 This section discusses the construction impacts of the Project initially based on a reasonable worst case without the inclusion of good practice measures to control construction noise and vibration. At present a construction contractor has not been identified for the Project, but a reasonably foreseeable construction programme and construction methods have been developed within the scope of the Project. This section first reports the results of this reasonable worst-case assessment to identify potential areas where significant impacts may occur. This is followed by an assessment of the benefit of further mitigation from noise barriers and the use of BPM as defined under Part III of the EPA 1990, to determine the likely significance of residual effects based upon reasonable assumptions and measures.

14.9.2 Construction noise has been modelled based on a series of worst-case assumptions as reported in Section 14.5, within 24 periods across the 15 year construction programme from 2024 to 2038. In the period from 2024 to 2029 all the runway and taxiways and some airfield facilities will be built and in 2028 and 2029 part of the highways improvements will be built. The majority of the heavy engineering work required at night will be within this period, and the majority of the most significant noise impacts are also in this period. Some receptor areas will be exposed to construction noise in this initial construction period and in later periods after 2029 too, so to assess the total effect (eg total number of NSRs affected) it is necessary to look at the whole construction period. Therefore, this section reports construction noise impacts across the whole construction period, noting where these will occur later. The following sections for the Initial Year of Operation and beyond summarise the effects in those periods with reference to this section.

14.9.3 170 areas of construction work across the airfield and highways areas have been modelled, each with construction activities occurring at the relevant times within the construction programme. In order to not under-estimate the possible effect of concurrent works, all works programmed within any of these 24 periods have been modelled concurrently, in one of 24 noise models. This is likely to be an overly worst case because not all work assumed within a given period (eg 12 months) will occur at the same time.

14.9.4 The various works required have been grouped into 17 types, each of which has been assigned a team of plant. For each type of work, an indicative plant team has been developed with the project engineers and with reference to equivalent projects, for the day and night periods. **ES Appendix 14.9.1: Construction Noise Modelling** (Doc Ref 5.3.) provides details of the works, plant teams, noise emission levels, and working hours assumed.

14.9.5 Construction noise impacts are reported across the 12 Receptor Areas that together cover the land around the perimeter of airport and highways scheme, as for ground noise, shown in Figure 14.4.2. Noise levels have been modelled at all buildings across these areas and the numbers of receptors impacted above LOAEL and SOAEL levels at day and night are reported in **ES Appendix 14.9.1: Construction Noise Modelling** (Doc Ref. 5.3). In order to give a broad picture of the noise levels across the full construction period, noise levels for the works in each of the 24 periods are reported at an example receptor in each of the 12 receptor areas (see Figure

14.4.2). For the five periods when airfield works will be occurring spread across the airfield, 'busy' (B) and 'typical' (T) cases has been modelled. These illustrate both a set of works expected to occur typically of the whole year and a set of works expected for a shorter busy period within that year, in order to help give an indication of the duration of the associated impacts. For each receptor area one receptor has been chosen to represent the area. The chosen representative receptors are 12 of the 13 baseline noise measurement locations shown in Figure 14.4.1. The Charlwood Road Receptor Area has two receptors 3 and 4, but only 3 is used here. Table 14.9.1 and Table 14.9.2 give the predicted reasonable worst case noise levels without mitigation during the day and night at the representative receptors within each receptor area. Levels below 45 dB are not shown because they are more than 10 dB below the LOAEL and are not likely to create noise impacts.

14.9.6 The 12 chosen community receptors are generally representative of the 12 Receptor Areas closest to the airport and the highways scheme. The following sections consider the predicted noise at these and whether LOAEL or SOAEL is exceeded. The assessment then provides a narrative assessment of effects at these locations and at all receptors in the relevant Receptor Area based on the worst case assumptions, and whether the effects would be significant and further mitigation is required.

14.9.7

Table 14.9.1: Predicted Reasonable Worst Case Daytime Construction Noise Levels ($L_{eq,\ 12\ hr}$ dB façade)

Period	1 Outer Charlwood	2 Charlwood	3 Charlwood Road	4 Farmfield	5 Povey Cross	6 Longbridge Road	7 Riverside, Horley	8 Bonnetts Lane	9 Lowfield Heath	10 Rowley Farm	11 Balcombe Road	12 Tinsley Green
2024	53	57	60	52	52	56	57	58	62	56	51	50
2025 T	51	55	62	52	55	56	57	54	55	53	47	--
2025 B	53	56	65	54	57	56	57	58	62	54	47	--
2026 T	49	54	58	49	54	57	58	55	53	52	46	--
2026 B	51	56	65	54	58	57	58	59	56	53	46	--
2027 T	47	50	53	47	48	57	50	53	57	52	46	--
2027 B	48	51	63	54	57	57	57	53	58	53	46	--
2028-06 T	--	48	--	--	--	56	57	52	50	51	52	--
2028-06 B	48	51	63	53	57	56	57	54	53	55	55	--
2028-07 T	--	48	47	--	47	56	57	52	50	55	55	--
2028-07 B	48	51	63	53	57	57	57	54	53	55	55	--
2029-02	51	52	63	54	58	60	**72**	50	55	56	56	49
2029-03	51	52	63	55	58	61	64	50	55	56	56	48
2029-05	51	52	63	55	59	**70**	**70**	50	55	56	56	49
2029-07	51	52	63	55	59	**67**	**68**	50	55	56	56	48

Period	1 Outer Charlwood	2 Charlwood	3 Charlwood Road	4 Farmfield	5 Povey Cross	6 Longbridge Road	7 Riverside, Horley	8 Bonnetts Lane	9 Lowfield Heath	10 Rowley Farm	11 Balcombe Road	12 Tinsley Green
2029-10	50	52	63	54	58	**66**	61	50	55	57	56	47
2029-11	50	52	63	54	58	60	53	50	55	56	55	46
2030-03	49	--	62	51	57	61	**66**	46	55	54	52	48
2030-04	49	--	62	51	57	61	65	47	55	55	53	48
2030-08	49	--	62	51	57	61	61	46	55	55	52	47
2030-12	49	--	62	51	57	63	65	46	55	54	52	46
2031-02	47	--	57	49	56	65	**67**	46	54	53	52	47
2031-05	47	--	57	47	56	61	**66**	46	54	53	52	47
2031-08	47	--	57	47	55	60	60	46	53	53	51	--
2032	47	--	61	49	56	58	53	--	51	49	49	--
2033	46	--	61	49	53	48	--	--	51	49	--	--
2034	--	--	57	46	55	57	50	--	48	49	--	--
2035	--	--	--	--	52	57	49	--	--	49	--	--
2036-2038	--	--	--	--	--	--	--	--	--	--	--	--

14.9.8 The daytime SOAEL for residential receptors for construction noise is $L_{eq,\ 12\ hr}$ 75 dB. This level of construction noise is not predicted at any of the representative community locations. The detailed assessment has identified that there will be eight receptors closer to the works with levels above SOAEL for the reasonable worst case modelling without further mitigation. These are in the Longbridge Road and Balcombe Road receptor areas and their locations are discussed below under the Longbridge Road and Balcombe Road receptor area headings.

14.9.9 The daytime LOAEL for residential receptors for construction noise is $L_{eq,\ 12\ hr}$ 65 dB. In this table levels above LOAEL are highlighted in bold.

14.9.10 **ES Appendix 14.9.1: Construction Noise Modelling** (Doc Ref. 5.3) gives estimates of the numbers of receptors above LOAEL and SOAEL in each receptor area for each of the 24 periods of construction work modelled for the reasonable worst case modelling without further mitigation. The impacts of daytime construction noise within each receptor area are discussed along with the impacts for night-time works below, after the results of the night-time modelling presented in Table 14.9.2.

Table 14.9.2: Predicted Reasonable Worst Case Night-time Construction Noise Levels ($L_{eq, 1\ hr}$ dB façade)

Period	1 Outer Charlwood	2 Charlwood	3 Charlwood Road	4 Farmfield	5 Povey Cross	6 Longbridge Road	7 Riverside, Horley	8 Bonnetts Lane	9 Lowfield Heath	10 Rowley Farm	11 Balcombe Road	12 Tinsley Green
2024	--	48	50	--	--	--	--	50	49	48	--	--
2025 T	--	49	55	47	--	--	--	51	53	49	--	--
2025 B	46	49	**57**	49	46	--	--	51	54	49	--	--
2026 T	46	52	**57**	48	47	--	--	53	51	--	--	--
2026 B	47	54	**57**	48	47	--	--	**56**	53	47	--	--
2027 T	--	50	52	47	--	--	--	55	**57**	47	--	--
2027 B	46	55	54	49	47	--	--	**60**	**58**	49	--	--
2028-06 T	--	52	47	--	--	--	--	**58**	52	46	--	--
2028-06 B	--	53	48	45	--	--	--	**59**	53	48	--	--
2028-07 T	--	50	50	--	--	--	--	54	**58**	45	--	--
2028-07 B	--	51	50	45	45	--	--	**56**	**58**	47	--	--
2029-02	46	50	45	--	45	55	48	48	47	48	--	--
2029-03	46	50	46	--	46	**56**	**58**	48	46	48	--	--
2029-05	46	50	46	--	--	--	**65**	48	46	48	--	--
2029-07	47	50	45	--	--	--	--	48	46	48	--	--
2029-10	46	50	46	--	46	55	**62**	48	46	48	--	--
2029-11	46	50	46	--	--	--	**59**	48	46	48	--	--
2030-03	--	--	--	--	--	--	--	--	47	50	--	--
2030-04	--	--	--	--	--	--	--	--	47	50	--	--
2030-08	--	--	--	--	--	--	--	--	47	50	--	--
2030-12	--	--	--	--	--	--	--	--	47	50	--	--
2031-02	--	--	--	--	--	--	--	--	--	50	--	--
2031-05	--	--	--	--	--	--	--	--	--	50	--	--
2031-08	--	--	--	--	--	--	**60**	--	--	50	--	--
2032	--	--	--	--	--	--	--	--	--	--	--	--
2033	--	--	--	--	--	--	--	--	--	--	--	--
2034	--	--	--	--	--	--	--	--	--	--	--	--
2035	--	--	--	--	--	--	--	--	--	--	--	--
2036-2038	--	--	--	--	--	--	--	--	--	--	--	--

14.9.12 The night-time SOAEL for residential receptors for construction noise is $L_{eq, 1\ hr}$ 55 dB, except where discussed below. In this table levels above SOAEL are highlighted bold and underlined.

14.9.13 The night-time LOAEL for residential receptors for construction noise is also $L_{eq, 1\ hr}$ 55 dB. The LOAEL and SOAEL are the same for construction noise because ambient noise levels at night are high (due to noise from the airport and road traffic) making the Noise Exposure Category from BS5228 'C' at night for which the LOAEL and SOAEL are 55 dB. There is one exception to this at Farmfield which is further from the airport and has lower ambient noise levels at night, but where construction noise levels are also lower.

14.9.14 For part of the Longbridge Road area and at the properties on the Balcombe Road nearest the M23, night-time traffic noise levels are above $L_{eq\ 8\ hr}$ 55 dB, with façade levels in the range 60 to 61 dB. For these particular properties the night-time LOAEL and SOAEL have been increased to 60 dB in accordance with the BS5228 methodology.

14.9.15 **ES Appendix 14.9.1: Construction Noise Modelling** (Doc Ref. 5.3) gives estimates of the numbers of receptors above LOAEL and SOAEL for night-time works in each receptor area for each of the 24 periods of construction work modelled for the reasonable worst case modelling without further mitigation. For night work levels above SOAEL are predicted at the closest receptors for the worst case night works in the Charlwood, Charlwood Road, Povey Cross, Longbridge Road, Riverside Horley, Bonnetts Lane Lowfield Heath, and Balcombe Road receptor areas. The impacts of daytime and night-time construction work within each receptor area are discussed in the following sections.

14.9.16 It is important to note that the assessment reported in this section is a reasonable worst case used to identify potential significant effects, and does not take into account on site mitigation measures that have been developed where significant effects are predicted. The significance of effects once further mitigation is applied are quantified and discussed below in the assessment of the likely residual effects.

1 Outer Charlwood and 2 Charlwood

14.9.17 For daytime construction, noise levels are predicted to be below $L_{eq, 12\ hr}$ 65 dB and impacts are not expected above LOAEL or SOAEL.

14.9.18 For night-time a noise level of $L_{eq, 1\ hr}$ 61 dB is predicted at the single property on Lowfield Heath Road nearest the runway end during the busy period of 2027, with lower levels but still above 55 dB in the typical period of 2027 and other busy periods in 2026 and 2028 indicating noise levels are likely to be above SOAEL at various times over these three years. The noise modelling predicts noise levels for nights when the plant required to carry out a given construction activity are operating. Within the three years allocated in the programme to complete the main works on the airfield there will be periods when there is no work or less work or less noisy work, when noise levels will be substantially lower than those modelled. The main works predicted to create noise impacts are taxiway construction and runway pavement works which would take a total of approximately six months of night shifts to complete. The predicted noise impacts would arise for intermittent periods for up to a total of approximately six months within the three years programme and would result in a major adverse significant effect. Further mitigation is considered and quantified below to assess residual effects.

14.9.19 For night-time construction elsewhere in this area within the village the highest noise levels predicted are $L_{eq, 1\ hr}$ 50 to 56 dB with the highest noise levels during the busy period of 2026 and 2027 when works to construct taxiways and the northern runway will be required in the west end of the airfield. Noise levels predicted at the majority of properties within the village are below the

LOAEL and SOAEL, with approximately five properties in the east end of the village just above at 56 dB result in a moderate adverse significant effect. At other times lower noise levels are predicted. Further mitigation is considered and quantified below to assess residual effects.

3 Charlwood Road

14.9.20 For daytime construction, noise levels are predicted to be below the LOAEL in the range $L_{eq, 12\ hr}$ 60-65 dB during periods of 2025, 2026 and 2027 during the closest areas for work such as in Museum field and the North Terminal long stay car park. These include the Bear and Bunny Nursery which would experience the highest noise levels up to $L_{eq, 12\ hr}$ 65 dB in the 2025 and 2026 busy periods with lower level in periods of typical works. Consultation with the nursery including a site visit indicated that the nursery is for infants and is not particularly sensitive to noise from the airport, so it has not been assessed separately from residential receptors in this area. Daytime noise impacts in this area are predicted to be negligible.

14.9.21 For night-time construction, noise levels of $L_{eq, 1\ hr}$ 55-57 dB are predicted at approximately 7 properties on Charlwood Road during busy periods of 2025 to 2026, reducing to two properties during typical periods, when works to construct taxiways and pavement works will be required in the west end of the airfield. Noise levels are likely to be above the SOAEL for intermittent periods for up to a total of approximately six months within the three years programme and would result in major adverse significant effects. Further mitigation is considered and quantified below to assess residual effects.

4 Farmfield

14.9.22 For daytime construction, noise levels are predicted to be below $L_{eq, 12\ hr}$ 60 dB and impacts are not expected above LOAEL or SOAEL.

14.9.23 For night-time construction, noise levels are predicted to be below $L_{eq, 1\ hr}$ 50 dB, below LOAEL or SOAEL.

5 Povey Cross

14.9.24 For daytime construction, noise levels are predicted to be mostly below $L_{eq, 12\ hr}$ 65 dB with two properties 2 dB above $L_{eq, 12\ hr}$ 65 dB LOAEL but below SOAEL in 2030, so there is potential for noise effects and further mitigation is considered and quantified below to assess residual effects.

14.9.25 For night-time construction, noise levels are predicted to be below $L_{eq, 1\ hr}$ 50 dB for the majority of the construction programme, except in 2029 when night work is likely to be required at the A23 Brighton Road Bridge when up to ten properties could receive noise levels above SOAEL, with a highest noise level of $L_{eq, 1\ hr}$ 64 dB during works programme for a period of approximately 20 nights and may result in major adverse significant effects. Further mitigation is considered and quantified below to assess residual effects.

6 Longbridge Road, Horley

14.9.26 For daytime construction, noise levels are predicted to be above the LOAEL of $L_{eq, 12\ hr}$ 65 dB at approximately 52 properties along Longbridge Road during the highways works between 2028 and 2032. Noise levels above SOAEL in the range of $L_{eq, 12\ hr}$ 75 to 79 dB are predicted at seven properties closest to the A23 Brighton Road Bridge and A23 London Road Bridge works for intermittent periods over the approximately 30 months of heavy engineering work which would

result in major adverse significant effects. Further mitigation is considered and quantified below to assess residual effects.

14.9.27 The Church of St Bartholomew is located approximately 200 m from the A23 Brighton Road Bridge and has a churchyard with a graveyard stretching to about 110 m from the construction site. The highest noise level predicted at the church is $L_{eq,\ 12\ hr}$ 68 dB which, if mitigation by the contractor onsite is not practicable, would likely cause some disturbance within and to users of the churchyard. Further mitigation is discussed below.

14.9.28 Church Meadows is a public open space immediately north of the A23 Brighton Road Bridge site with footpaths in regular use. Some degree of impact on users of the space is likely and further mitigation is discussed below.

14.9.29 For the majority of night-time construction (except sheet piling discussed in the next paragraph), noise levels are predicted to be above SOAEL at approximately 47 properties, mostly on Longbridge Road and on the A23 Brighton Road, with levels up to $L_{eq,\ 1\ hr}$ 58 dB from night works required on the A23 Brighton Road Bridge and the North Terminal junction area, over night periods totalling approximately 5 months and result in major adverse significant effects. Further mitigation is considered and quantified below to assess residual effects.

14.9.30 When sheet piling is required at night on the A23 Brighton Road Bridge abutments the highest noise levels in adjacent communities are expected with a highest level of $L_{eq,\ 1\ hr}$ 78 dB is predicted at the Burstow Court, 48a Longbridge Road, which is the northern most residential building on Longbridge Road. Similarly, noise levels of up to $L_{eq,\ 1\ hr}$ 68 dB are predicted at Gatwick Dairy Farm cottages near the Longbridge roundabout. The Furzedown guesthouse on Brighton Road may also be affected with noise levels of up to $L_{eq,\ 1\ hr}$ 64 dB. The sheet piling work is required at night within a programme period of 20 nights of traffic management. Further mitigation is considered and quantified below to assess residual effects.

7 Riverside, Horley

14.9.31 For daytime construction, noise levels are predicted to be above the LOAEL of $L_{eq,\ 12\ hr}$ 65 dB mostly in the range 66-75 dB at 39 properties along Riverside and the Southern part of The Crescent for intermittent periods likely to total up to six months during the highways works between 2029 and 2032 and would result in moderate adverse significant effects. Noise levels in the Riverside Garden Park are already high and have a negative impact on the park users (as discussed in **ES Appendix 14.9.4: Road Traffic Noise Modelling** (Doc Ref. 5.3)) but the park is well used and a valuable amenity. Construction noise levels will vary across the park with levels similar to those predicted for neighbouring residential properties in those areas; and with higher noise levels closer the works on the A23 and Longbridge Roundabout giving rise to short term disturbance to users of the park. Further mitigation is considered and quantified below to assess residual effects.

14.9.32 For night-time construction, noise levels are predicted to be above $L_{eq,\ 1\ hr}$ 55 dB at approximately 109 properties, mostly along Riverside and the southern part of The Crescent. The highest noise levels, up to $L_{eq,\ 1\ hr}$ 68 dB are predicted in the eastern end of The Crescent closest to night work required on the Railway bridge in 2029 and to earthworks on the Old Airport Way eastbound tie-in by the southern end of Riverside Garden Park within a programmed duration of approximately 16 weeks and would result in major adverse significant effects. Further mitigation is considered and quantified below to assess residual effects.

8 Bonnetts Lane

14.9.33 For daytime construction, noise levels are predicted to be up to $L_{eq, 12\ hr}$ 63 dB and impacts are not expected above LOAEL or SOAEL.

14.9.34 For night-time construction, noise levels of $L_{eq, 1\ hr}$ 56-60 dB are predicted and are predicted to exceed the 55 dB SOAEL at approximately seven properties on Bonnetts Lane during busy periods of 2026, 2027 and 2028 when works to construct taxiways and the northern runway will be required. In more typical periods noise levels are also predicted to be above SOAEL indicating that these properties, closest to the works to construct taxiways and the northern runway, would be exposed to noise levels above the SOAEL for intermittent periods for up to a total of approximately six months within the three year programme and would result in major adverse significant effects. Further mitigation is considered and quantified below to assess residual effects.

14.9.35 The Maple Manor Hotel on Charlwood Road would be similarly affected. Noise levels at the Gatwick Caravan and Motorhome Club Campsite could also exceed the SOAEL marginally at night. Further mitigation is considered and quantified below to assess residual effects.

9 Lowfield Heath

14.9.36 For daytime construction, at residential properties noise levels are predicted to be below $L_{eq, 12\ hr}$ 65 dB and impacts are not expected above LOAEL or SOAEL. The Charlwood House Day Nursery in Poles Lane would experience noise levels up to approximately $L_{eq, 12\ hr}$ 72 dB, with the highest noise levels due to excavation and construction works in the Car Park X area approximately 50 m from the nursery. The nursery is set back from Charlwood Road and exposed to traffic noise from it, but some degree of disturbance at the nursery is likely over a period of up to approximately 12 weeks. Further mitigation is considered and quantified below to assess residual effects.

14.9.37 St Michael and All Saints Church is located on Church Road within the Gatwick Industrial Estate. Works to provide for the Satellite Airport Fire Service Provision will be required about 170 m from the church. The church is partly screened by other buildings in the estate and the highest level of construction noise predicted is $L_{eq, 12\ hr}$ 62 dB. Further mitigation is considered and quantified below to assess residual effects.

14.9.38 For night-time construction, noise levels of $L_{eq, 1\ hr}$ 55-59 dB are predicted above SOAEL at approximately four properties on Poles Lane and Charlwood Road during periods of 2026, 2027 and 2028 when works to construct taxiways and the northern runway will be required in this centre and east of the airfield. Noise levels at most of these properties are predicted to be above SOAEL for typical periods as well as busy periods indicating noise levels are likely to be above the SOAEL for intermittent periods for up to a total of approximately six months within the three year programme and would result in major adverse significant effects. Further mitigation is considered and quantified below to assess residual effects.

10 Rowley Farm

14.9.39 For daytime construction, noise levels are not expected to be above LOAEL or SOAEL.

14.9.40 For night-time construction, the highest noise levels of approximately $L_{eq, 1\ hr}$ 50 dB are predicted at the closest property to the airport at the entrance of the driveway to Rowley Farm, which is below the SOAEL. Noise impacts are unlikely with a **negligible adverse effect**.

11 Balcombe Road

14.9.41 For daytime construction, noise levels are predicted to be above the LOAEL of $L_{eq, 12\ hr}$ 65 dB at four residential properties on Balcombe Road. Note the example representative location for which noise levels are reported in the two tables above is further south on Balcombe Road and not affected. The highest noise levels near the M23 Balcombe Road Bridge works in 2029 to 2030 are up to $L_{eq, 12\ hr}$ 78 dB and above SOAEL at 275 Balcombe Road and $L_{eq, 12\ hr}$ 77 dB at Dovenby Hall offices just to the north of the motorway. The construction programme for the bridge works covers two years, and the noisiest periods likely to exceed the SOAEL could last approximately 6 months and would result in major adverse significant effects. Further mitigation is considered and quantified below to assess residual effects.

14.9.42 For night-time construction, the highest noise level is predicted at 275 Balcombe Road at up to $L_{eq, 1\ hr}$ 70 dB during work on the Balcombe Road Bridge in 2030. At other times noise levels are predicted to be in the range of $L_{eq, 1\ hr}$ 60 to 65 dB and above the SOAEL at approximately 16 properties, along Balcombe Road and on Peeks Brook Lane and Donkey Lane due to night works required at the Network Rail Bridge, and Balcombe Road Bridge in 2029 to 2030 and would result in major adverse significant effects. In Peeks Brook Lane high ambient noise levels from the M23 Spur and the main M23 are likely to lessen these impacts. Further mitigation is considered and quantified below to assess residual effects.

12 Tinsley Green

14.9.43 For daytime and night-time construction, noise levels are predicted to be below LOAEL with a **negligible adverse effect**. City Place includes a number of offices located approximately 200 m south of the MA1 main compound. Noise levels here are predicted to be up to $L_{eq, 12\ hr}$ 65 dB. The offices are located on the far side of the A23 London Road, will tend to have air-conditioning and closed windows, and significant impacts are not predicted.

14.9.44 Night noise is predicted to be below $L_{eq, 1\ hr}$ 45 dB at residential receptors in this area.

Further Mitigation

14.9.45 Construction would be undertaken in accordance with a Code of Construction Practice (CoCP). The CoCP sets out the key management measures that contractors would be required to adopt and implement. These measures would be developed based on those identified during the EIA process. They include strategies and control measures for managing the potential environmental effects of construction and limiting disturbance from construction activities as far as reasonably practicable. This is a common approach used on major projects to secure a high level of noise management. The outline CoCP is provided at **ES Appendix 5.3.2: Code of Construction Practice** (Doc Ref. 5.3).

14.9.46 Specific to noise and vibration, the main mitigation measures required as set out within the **ES Appendix 5.3.2: Code of Construction Practice** (Doc Ref. 5.3) include the following:

- BPM as defined by the Control of Pollution Act 1974 (CoPA) and Environmental Protection Act 1990 (EPA), which would be applied during construction activities to minimise noise (including vibration) at neighbouring residential properties and other sensitive receptors[12].
- As part of BPM, mitigation measures will be applied in the following order:
  - Noise and vibration control at source: for example, the selection of quiet and low vibration equipment, review of construction methodology to consider quieter methods, location of equipment on-site, control of working hours, the provision of acoustic enclosures and the use of less intrusive alarms, such as broadband vehicle reversing warnings.
  - Screening, for example, local screening of equipment or perimeter hoarding or the use of temporary stockpiles.
  - If, despite the implementation of BPM, the noise exposure exceeds the criteria defined in **ES Appendix 5.3.2: Code of Construction Practice**, noise insulation or as a last resort temporary re-housing would be offered at qualifying properties.
- Lead contractors would seek to obtain prior consent from the relevant local authority under Section 61 of the CoPA for the proposed construction works. The consent application would set out BPM measures to minimise construction noise and vibration, including control of working hours.
- Contractors would undertake and report monitoring as is necessary to demonstrate compliance with all noise and vibration commitments. Monitoring data would be provided regularly to, and be reviewed by GAL, and made available to the local authorities.
- Contractors would be required to comply with the terms of the CoCP and appropriate action would be taken by the nominated undertaker as required to ensure compliance.

14.9.47 This approach to managing noise impacts is commonly adopted on major infrastructure projects in the UK, including the use of Section 61 applications. Indeed, GAL's contractors undertaking works to construct a new Rapid Exit Taxiway in 2023 applied to Crawley Borough Council for a Section 61 consent that was granted.

14.9.48 For the Northern Runway Project the contractor has not been appointed, so it is necessary at this stage to estimate the effect of BPM that can reasonably be expected for the required works. Guidance is provided in BS 5228- 1:2009+A1:2014: Code of practice for noise and vibration control on construction and open sites - Part 1: Noise; Annex B, Noise sources, remedies and their effectiveness. This annex has been reviewed and Table 14.9.5 lists the most relevant BPM measures.

Table 14.9.3: BS5228 BPM Noise Mitigation Measures

Plant	Noise Reduction Method
Bulldozer, compactors, cranes, dump trucks, dumpers, excavators, graders, loaders etc	Fit more efficient exhaust sound reduction equipment, manufacturers enclosure panels need to be kept closed.
Sheet piling	Acoustically damped sheet piles to reduce levels of resonant vibration.

[12] Including local businesses and quiet areas designated by the local authority.

Plant	Noise Reduction Method
Breakers	Fit suitably designed muffler or sound reduction equipment to reduce noise without impairing machine efficiency, ensure leaks in air line are sealed, use damped bit to eliminate ringing.

14.9.49 The BS5228 annex explains that noise reductions of 5 to 10 dB can be achieved using these techniques. Where it is considered that BPM would reduce the noise from certain items of plant then a conservative reduction of 5 dB has been assumed within the modelling of construction noise reported below.

14.9.50 In areas where significant noise impacts have been predicted the benefits of noise barriers have been modelled where in discussion with the construction design team noise barriers on the site boundary are likely to be practicable. The following noise barriers are identified to be practicable:

- A23 Brighton Road Bridge – along the southern side of the utilities diversion bridge.
- A23 London Road Bridge – along the eastern side of the temporary footpath.
- Airport Way Rail Bridge – on the northern side of the eastbound carriageway.
- Car Park X – along the southern site boundary.

14.9.51 The benefits of these noise barriers have been modelled and included in the assessment of residual effects below.

14.9.52 Noise insulation would be offered for qualifying buildings, where noise levels exceed defined criteria at the SOAEL. Noise insulation or, if other measures are not possible, as a last resort temporary re-housing would avoid residents being significantly affected by levels of construction noise inside their dwellings. The assessment of residual effects below provides an estimate of the buildings that are likely to qualify for noise insulation or to qualify for temporary rehousing. Details of the qualifying criteria for noise insulation and temporary rehousing are given in the CoCP and summarised as follows.

14.9.53 To be eligible a residential dwelling must be occupied and be one for which the predicted or actual noise exceeds any of the relevant thresholds 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.

14.9.54 The qualifying noise levels are as follows.

14.9.55 Noise Insulation:

- $L_{eq\ 10\ hr}$ day 75 dB; and
- $L_{eq\ 1\ hr}$ night 55 dB.

14.9.56 Temporary Rehousing:

- $L_{eq\ 10\ hr}$ day 85 dB; and
- $L_{eq\ 1\ hr}$ night 65 dB.

14.9.57 These levels are increased if ambient noise levels are higher, as explained in the CoCP.

14.9.58 Qualification for noise insulation and, where appropriate, temporary re-housing would be confirmed, prior to seeking consent from the local authority under Section 61 of the CoPA. Qualifying buildings would be identified, as required in the CoCP, so that noise insulation can be installed, or where appropriate any temporary re-housing offered, and a reasonable timescale is allowed for this to be provided before the start of the works which are predicted to exceed noise insulation or temporary re-housing criteria.

Residual Effects

14.9.59 Table 14.9.4 provides an assessment of the need for mitigation based on the reasonable worst case predicted noise levels. It describes the mitigation proposed for each receptor area, and an assessment of the likely residual effects with mitigation, for each of the receptor areas. Full results of property counts within each receptor area with BPM and noise barriers are provided in **ES Appendix 14.9.1: Construction Noise Modelling** (Doc Ref. 5.3).

Table 14.9.4 Potential Construction Noise Impacts with Additional Mitigation

Receptor Area	Mitigation and Significance of Effects
1 and 2 Charlwood	**Daytime** For daytime construction, noise levels are predicted to be below $L_{eq,\ 12\ hr}$ 65 dB and impacts are not expected above LOAEL or SOAEL resulting in a **negligible adverse effect**. **Night-time** For night-time noise levels 6 dB above SOAEL are predicted at the single property on Lowfield Heath Road, and a level 1 dB above SOAEL is predicted at approximately five properties in the east end of the village. The main works predicted to create noise impacts are taxiway construction and runway pavement works which would take a total of approximately six months of night shifts to complete. The predicted noise impacts would arise for intermittent periods for up to a total of approximately six months within the three years programme from 2026 to 2028. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within Section 7 of the CoCP requiring the application of BPM. A comprehensive list of BPM measures is presented in the section above which will be implemented where appropriate across all construction activities on the Project. With regard to this receptor area, measures would be required to include the following: ▪ Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10 dB reduction in noise). As a conservative assumption, a 5 dB attenuation attributable to the implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL at all properties in this area apart from the single property on Lowfield Heath Road where the highest predicted level would be 1 dB above SOAEL. With the inclusion of this BPM mitigation

	measure and the measures required in the CoCP night-time construction noise would be likely to give rise to minor effects in the majority of this area except this single property. The single property in Lowfield Heath Road would be offered noise insulation resulting in not significant **minor adverse effect**.
3 Charlwood Road	**Daytime** For daytime construction, noise levels are predicted to be below $L_{eq, 12\ hr}$ 65 dB and impacts are not expected above LOAEL or SOAEL resulting in a **negligible adverse effect**. **Night-time** For night-time construction, unmitigated reasonable worst case noise levels of $L_{eq, 1\ hr}$ 55-57 dB are predicted at approximately seven properties on Charlwood Road when works to construct taxiways and pavement works will be required in the west end of the airfield. Noise levels are likely to be above the SOAEL by up to 2 dB for intermittent periods for up to a total of approximately six months within the three years programme. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within Section 7 of the CoCP requiring the application of BPM. A comprehensive list of BPM measures is presented in the section above which will be implemented where appropriate across all construction activities on the Project. With regard to this receptor area, measures would be required to include the following: ▪ Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10 dB reduction in noise). As a conservative assumption, a 5 dB attenuation attributable to the implementation of BPM measures can be reasonably applied. This correction for BPM reduces the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL at all properties in this area. With the inclusion of this BPM mitigation measure and the measures required in the CoCP night-time construction noise would be likely to give rise to not significant **minor adverse effects** in this area.
4 Farmfield	**Daytime** For daytime construction, noise levels are predicted to be below $L_{eq, 12\ hr}$ 60 dB and impacts are not expected above LOAEL or SOAEL resulting in a **negligible adverse effect**. **Night-time** For night-time construction, noise levels are predicted to be below $L_{eq, 1\ hr}$ 50 dB, below LOAEL or SOAEL with a **negligible adverse effect**.
5 Povey Cross	**Daytime** For daytime construction, noise levels are predicted to be mostly below $L_{eq, 12\ hr}$ 65 dB with two properties 2 dB above $L_{eq, 12\ hr}$ 65 dB LOAEL and below SOAEL in 2030. As a result of the exceedance of a LOAEL mitigation will be required to be implemented through the controls inherent within Section 7 of the CoCP requiring the application of BPM.

	A comprehensive list of BPM measures is presented in the section above which will be implemented where appropriate across all construction activities on the Project. With regard to this receptor area, measures would be required to include the following: ▪ Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10 dB reduction in noise). As a conservative assumption, a 5 dB attenuation attributable to the implementation of BPM measures can be reasonably applied. The effect would reduce the predicted noise levels to below LOAEL resulting in **negligeable effects** in this area. **Night-time** For night-time construction, noise levels are predicted to be below $L_{eq,\ 1\ hr}$ 50 dB for the majority of the construction programme, except in 2029 when night work is likely to be required at the A23 Brighton Road Bridge when up to ten properties could receive noise levels up to 9 dB above SOAEL within a period of works on the bridge abutments programmed for approximately 20 nights. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within Section 7 of the CoCP requiring the application of BPM. A comprehensive list of BPM measures is presented in the section above which will be implemented where appropriate across all construction activities on the Project. With regard to this receptor area, measures would be required to include the following: ▪ Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10 dB reduction in noise). ▪ Acoustically damped sheet piles to reduce levels of resonant vibration. As a conservative assumption, a 5 dB attenuation attributable to the implementation of BPM measures can be reasonably applied. In addition, for the A23 Brighton Road Bridge a noise barrier along the southern side of the utilities diversion bridge has been modelled. This application of BPM with the noise barrier would reduce the predicted unmitigated reasonable worst case construction noise levels to 4 dB above SOAEL at the closest properties in this area, leaving five properties with noise levels above SOAEL. However, whilst 20 nights has been allowed for in the construction programme, night-time noise levels associated with these works would not exceed the SOAEL for a duration of 10 or more days in any 15 consecutive day period or for more than 15 days in any six-month period as detailed above. With the inclusion of this BPM mitigation measure and the measures required in the CoCP night-time construction noise would be likely to give rise to not significant **minor adverse effects** in this area.
6 Longbridge Road, Horley	**Daytime**

For daytime construction, noise levels are predicted to be above the LOAEL of $L_{eq, 12\ hr}$ 65 dB at approximately 52 properties, and above SOAEL in the range of $L_{eq, 12\ hr}$ 75 to 79 dB at seven properties closest to the A23 Brighton Road Bridge and A23 London Road Bridge works for intermittent periods over the approximately 30 months of heavy engineering work in the area.

As a result of the exceedance of a LOAEL and SOAEL mitigation will be required to be implemented through the controls inherent within Section 7 of the CoCP requiring the application of BPM.

A comprehensive list of BPM measures is presented in the section above which will be implemented where appropriate across all construction activities on the Project. With regard to this receptor area, measures would be required to include the following:

- Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10 dB reduction in noise).
- Acoustically damped sheet piles to reduce levels of resonant vibration.

As a conservative assumption, a 5 dB attenuation attributable to the implementation of BPM measures can be reasonably applied.

In additional two noise barriers have been modelled in this area:

- A23 Brighton Road Bridge – noise barrier along the southern side of the utilities diversion bridge.
- A23 London Road Bridge – noise barrier along the eastern side of the temporary footpath.

The effect of BPM combined with the benefit of the two noise barriers in this area would reduce the predicted noise levels to below SOAEL leaving 23 properties up to 8 dB above LOAEL and no properties above SOAEL, resulting in **moderate adverse significant effects** in this area.

The Church of St Bartholomew is located approximately 200 m from the A23 Brighton Road Bridge and has a churchyard with a graveyard stretching to about 110 m from the construction site. The highest noise level predicted at the church with mitigation is $L_{eq, 12\ hr}$ 63 dB which, would likely cause some disturbance within and to users of the churchyard. The contractor will be required in accordance with the CoCP to liaise with the church to manage the periods of noisiest construction work away from sensitive times such as church services wherever practicable. This will ensure only **minor adverse effects** would result.

Church Meadows is a public open space immediately north of the A23 Brighton Road Bridge site with footpaths in regular use. Some degree of impact on users of the space will be unavoidable, although users are transient and may choose to use alternative areas resulting in not significant **minor adverse effects.**

Night-time

For the majority of night-time construction (except sheet piling discussed in the next paragraph), noise levels are predicted to be above SOAEL at approximately 47 properties, mostly on Longbridge Road and on the A23 Brighton Road, with levels up to $L_{eq, 1\ hr}$ 58 dB

	from night works required on the A23 Brighton Road Bridge and the North Terminal junction area, over night periods totalling approximately five months. When sheet piling is required at night within a 20 night programmed period on the A23 Brighton Road Bridge abutments the highest noise levels in adjacent communities are expected with a highest level of $L_{eq,\ 1\ hr}$ 78 dB, ie 23 dB above the SOAEL is predicted at the Burstow Court, 48a Longbridge Road, which is the northern most residential building on Longbridge Road. Similarly, noise levels of up to $L_{eq,\ 1\ hr}$ 68 dB, ie 13 dB above the SOAEL are predicted at Gatwick Dairy Farm cottages near the Longbridge roundabout and up to $L_{eq,\ 1\ hr}$ 64 dB. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within Section 7 of the CoCP requiring the application of BPM. A comprehensive list of BPM measures is presented in the section above which will be implemented where appropriate across all construction activities on the Project. With regard to this receptor area, measures would be required to include the following: ▪ Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10 dB reduction in noise). ▪ Acoustically damped sheet piles to reduce levels of resonant vibration. As a conservative assumption, a 5 dB attenuation attributable to the implementation of BPM measures can be reasonably applied. In addition two noise barriers have been modelled in this area: ▪ A23 Brighton Road Bridge – noise barrier along the southern side of the utilities diversion bridge. ▪ A23 London Road Bridge – noise barrier along the eastern side of the temporary footpath. The effect of BPM combined with the benefit of the two noise barriers in this area would reduce the predicted noise levels to below SOAEL for all works except sheet piling on the A23 Brighton Road Bridge which could give rise to noise levels of up to $L_{eq,\ 1\ hr}$ 69 dB at the Burstow Court, 48a Longbridge Road, which is the northern most residential building on Longbridge Road and $L_{eq,\ 1\ hr}$ 63 dB at Gatwick Dairy Farm cottages near the Longbridge roundabout. 20 nights has been allowed for this activity in the construction programme and noise levels will vary during this time. At Burstow Court, 48a Longbridge Road, noise levels could exceed the $L_{eq,\ 1\ hr}$ 55 dB SOAEL for a duration of 10 or more days in any 15 consecutive day period, and if confirmed by the contractor noise insulation will be offered to these eight flats to avoid significant effects. This is unlikely at other locations, including the Gatwick Dairy Farm cottages to the north of the Longbridge Roundabout, because the predicted noise levels are at least 6 dB lower. With the inclusion of this BPM mitigation measure and the measures required in the CoCP night-time construction noise would be likely to give rise to not significant **minor adverse effects** in this area.
7 Riverside, Horley	**Daytime**

For daytime construction, noise levels are predicted to be above the LOAEL of $L_{eq, 12\ hr}$ 65 dB mostly in the range 66-75 dB at 39 properties along Riverside and the Southern part of The Crescent for intermittent periods likely to total up to six months during the highways works between 2029 and 2032.
Mitigation will be required to be implemented through the controls inherent within Section 7 of the CoCP requiring the application of BPM.
A comprehensive list of BPM measures is presented in the section above which will be implemented where appropriate across all construction activities on the Project. With regard to this receptor area, measures would be required to include the following:

- Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10 dB reduction in noise).

As a conservative assumption, a 5 dB attenuation attributable to the implementation of BPM measures can be reasonably applied.
In addition three noise barriers have been modelled in this area:

- A23 Brighton Road Bridge – noise barrier along the southern side of the utilities diversion bridge.
- A23 London Road Bridge – noise barrier along the eastern side of the temporary footpath.
- Airport Way Rail Bridge – noise barrier on the northern side of the eastbound carriageway.

The effect on BPM combined with the benefit of the three noise barriers in this area would reduce the predicted noise levels to up to $L_{eq, 12\ hr}$ 70 dB leaving 13 properties above LOAEL resulting in **moderate adverse significant effects** in this area.
Riverside Garden Park will be affected by the construction works in various ways as discussed elsewhere in this ES. Noise levels in the Riverside Garden Park are already high and have a negative impact on the park users (as discussed in **ES Appendix 14.9.4: Road Traffic Noise Modelling** (Doc Ref. 5.3)) but the park is well used and a valuable amenity. The construction noise mitigation measures described above will reduce construction noise levels within the park but some noise impact on users of the space will be unavoidable. Users are transient and may choose to use alternative areas resulting in overall minor adverse effects.

Night-time

For night-time construction, noise levels are predicted to be above $L_{eq, 1\ hr}$ 55 dB at approximately 109 properties, mostly along Riverside and the southern part of The Crescent. The highest noise levels, up to $L_{eq, 1\ hr}$ 68 dB are predicted in the eastern end of The Crescent closest to night work required on the Railway bridge in 2029 and to earthworks on the Old Airport Way eastbound tie-in by the southern end of Riverside Garden Park within a programmed duration of approximately 16 weeks.
Mitigation will be required to be implemented through the controls inherent within Section 7 of the CoCP requiring the application of BPM.

	A comprehensive list of BPM measures is presented in the section above which will be implemented where appropriate across all construction activities on the Project. With regard to this receptor area, measures would be required to include the following: ▪ Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10 dB reduction in noise). As a conservative assumption, a 5 dB attenuation attributable to the implementation of BPM measures can be reasonably applied. In addition three noise barriers have been modelled in this area: ▪ A23 Brighton Road Bridge – noise barrier along the southern side of the utilities diversion bridge. ▪ A23 London Road Bridge – noise barrier along the eastern side of the temporary footpath. ▪ Airport Way Rail Bridge – noise barrier on the northern side of the eastbound carriageway. The noise barrier on the elevated Airport Way Rail Bridge is particularly effective, reducing noise levels by more than 10 dB in the Riverside residential area to the north. The combined effect of BPM on site and the three noise barriers in this area would reduce the predicted noise levels to below the $L_{eq,\ 1\ hr}$ 55 dB SOAEL. With the inclusion of this BPM mitigation measure and the measures required in the CoCP night-time construction noise would be likely to give rise to not significant **minor adverse effects** in this area.
8 Bonnetts Lane	**Daytime** For daytime construction, noise levels are predicted to be up to $L_{eq,\ 12\ hr}$ 63 dB and impacts are not expected above LOAEL or SOAEL resulting in **negligible effects**. **Night-time** For night-time construction, noise levels of $L_{eq,\ 1\ hr}$ 56-60 dB are predicted and are predicted to exceed the 55 dB SOAEL by up to 5 dB at approximately seven properties on Bonnetts Lane during busy periods of 2026, 2027 and 2028 when works to construct taxiways and the northern runway will be required. In more typical periods noise levels are also predicted to be above SOAEL indicating that these properties closest to the works to construct taxiways and the northern runway would be exposed to noise levels above the SOAEL for intermittent periods for up to a total of approximately six months within the three year programme. The Maple Manor Hotel on Charlwood Road would be similarly affected with a highest noise level of $L_{eq,\ 1\ hr}$ 59 dB. Noise levels at the Gatwick Caravan and Motorhome Club Campsite could also exceed the SOAEL marginally at night. Mitigation will be required to be implemented through the controls inherent within Section 7 of the CoCP requiring the application of BPM.

	A comprehensive list of BPM measures is presented in the section above which will be implemented where appropriate across all construction activities on the Project. With regard to this receptor area, measures would be required to include the following: ▪ Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10 dB reduction in noise). As a conservative assumption, a 5 dB attenuation attributable to the implementation of BPM measures can be reasonably applied. The effect, combined in this area would reduce the predicted noise levels to below SOAEL at all properties resulting in not significant **minor adverse effects** in this area.
9 Lowfield Heath	**Daytime** For daytime construction, at residential properties noise levels are predicted to be below $L_{eq,\ 12\ hr}$ 65 dB and impacts are not expected above LOAEL or SOAEL. The Charlwood House Day Nursery in Poles Lane would experience noise levels up to approximately $L_{eq,\ 12\ hr}$ 72 dB, with the highest noise levels due to excavation and construction works in the Car Park X area approximately 50 m from the nursery. The nursery is set back from Charlwood Road and exposed to traffic noise from it, some degree of disturbance at the nursery is likely over a period of up to approximately 12 weeks. St Michael and All Saints Church is located on Church Road within the Gatwick Industrial Estate. The church is partly screened by other buildings in the estate and the highest level of construction noise predicted is $L_{eq,\ 12\ hr}$ 62 dB which could cause some disturbance to users of the church. Mitigation will be required to be implemented through the controls inherent within Section 7 of the CoCP requiring the application of BPM. A comprehensive list of BPM measures is presented in the section above which will be implemented where appropriate across all construction activities on the Project. With regard to this receptor area, measures would be required to include the following: ▪ Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10 dB reduction in noise). As a conservative assumption, a 5 dB attenuation attributable to the implementation of BPM measures can be reasonably applied. In addition the following noise barrier has been modelled in this area: ▪ Car Park X – noise barrier along the southern site boundary. The effect of BPM, combined with the benefit of the noise barrier in this area would reduce the predicted noise levels to 66 dB at the Charlwood Day Nursery which will be similar to ambient noise levels and not likely to cause significant disturbance to the nursery. Noise levels at St Michael and All Saints Church located on Church Road within the Gatwick Industrial Estate would be reduced to $L_{eq,\ 12\ hr}$ 50 dB which is unlikely to cause disturbance to users of the church.

	With the inclusion of the noise barrier, BPM mitigation measure and the measures required in the CoCP daytime construction noise would be likely to give rise to not significant **minor adverse effects** in this area. **Night-time** For night-time construction, noise levels of $L_{eq, 1\ hr}$ 55-59 dB are predicted above SOAEL by up to 4 dB at approximately four properties on Poles Lane and Charlwood Road during periods of 2026, 2027 and 2028 when works to construct taxiways and the northern runway will be required in this centre and east of the airfield. Noise levels at most of these properties are predicted to be above SOAEL for typical periods as well as busy periods indicating noise levels are likely to be above the SOAEL for intermittent periods for up to a total of approximately six months within the three year programme. Mitigation will be required to be implemented through the controls inherent within Section 7 of the CoCP requiring the application of BPM. A comprehensive list of BPM measures is presented in the section above which will be implemented where appropriate across all construction activities on the Project. With regard to this receptor area, measures would be required to include the following: ▪ Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10 dB reduction in noise). As a conservative assumption, a 5 dB attenuation attributable to the implementation of BPM measures can be reasonably applied. In addition the following noise barrier has been modelled in this area: ▪ Car Park X – noise barrier along the southern site boundary. The effect of BPM combined with the benefit of the noise barrier in this area would reduce the predicted noise levels to below SOAEL resulting in not significant **minor adverse effects** in this area.
10 Rowley Farm	**Daytime** For daytime construction, noise levels are not expected to be above LOAEL or SOAEL resulting in **negligible adverse effects.** **Night-time** For night-time construction, the highest noise levels of approximately $L_{eq, 1\ hr}$ 50 dB are predicted at the closest property to the airport resulting in **negligible adverse effects**.
11 Balcombe Road	**Daytime** For daytime construction, noise levels are predicted to be above the LOAEL of $L_{eq, 12\ hr}$ 65 dB at four residential properties on Balcombe Road. The highest noise levels near the M23 Balcombe Road Bridge works in 2029 to 2030 are up to $L_{eq, 12\ hr}$ 78 dB, ie 3 dB above SOAEL at 275 Balcombe Road and $L_{eq, 12\ hr}$ 77 dB at Dovenby Hall offices just to the north of the

motorway. The construction programme for the bridge works covers two years, and the noisiest periods likely to exceed the SOAEL could last approximately six months.
Mitigation will be required to be implemented through the controls inherent within Section 7 of the CoCP requiring the application of BPM.
A comprehensive list of BPM measures is presented in the section above which will be implemented where appropriate across all construction activities on the Project. With regard to this receptor area, measures would be required to include the following:

- Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10 dB reduction in noise).
- Acoustically damped sheet piles to reduce levels of resonant vibration.

As a conservative assumption, a 5 dB attenuation attributable to the implementation of BPM measures can be reasonably applied. The effect in this area would reduce the predicted noise levels to below SOAEL but up to 8 dB above LOAEL at 275 Balcombe Road and up to $L_{eq,\ 12\ hr}$ 72 dB at Dovenby Hall, resulting in **moderate significant adverse effects** in this area.

Night-time

For night-time construction, the highest noise level is predicted at 275 Balcombe Road at up to $L_{eq,\ 1\ hr}$ 70 dB, during work on the Balcombe Road Bridge in 2030. In this area the night-time SOAEL is $L_{eq,\ 1\ hr}$ 60 dB due to the high ambient noise level, so this level of 10 dB above SOAEL. At other times noise levels are predicted to be in the range of $L_{eq,\ 1\ hr}$ 60 to 65 dB and above the SOAEL by up to 5 dB at approximately 16 properties, along Balcombe Road and on Peeks Brook Lane and Donkey Lane due to night works required at the Network Rail Bridge, and Balcombe Road Bridge in 2029 to 2030. In Peeks Brook Lane high ambient noise levels from the M23 Spur and the main M23 are likely to lessen these impacts. Further mitigation is considered and quantified below to assess residual effects.
Mitigation will be required to be implemented through the controls inherent within Section 7 of the CoCP requiring the application of BPM.
A comprehensive list of BPM measures is presented in the section above which will be implemented where appropriate across all construction activities on the Project. With regard to this receptor area, measures would be required to include the following:

- Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10 dB reduction in noise).
- Acoustically damped sheet piles to reduce levels of resonant vibration.

At this stage due to limited space on the highway embankment it has been assumed that an effective site perimeter noise barrier will not be possible, but it may be that the contractor can provide local screening and other plant to further reduce noise levels below those reported here. As a conservative assumption, a 5 dB attenuation attributable to the implementation of BPM measures can be reasonably applied. The effect in this area would reduce the predicted noise levels to no higher than $L_{eq,\ 1\ hr}$ 60 dB and not above SOAEL at all properties, except a predicted level up to $L_{eq,\ 1\ hr}$ 65 dB during the noisiest work at the closest property, 275

	Balcombe Road. Night works for the Balcombe Road Bridge are programmed over two period of 15 nights, and the noisiest periods could potentially exceed the 10 out of any 15 consecutive nights. As a result, noise levels above SOAEL are predicted at 275 Balcombe Road and noise insulation will be offered to avoid significant night effects at this property. With the inclusion of BPM mitigation measure and the measures required in the CoCP night-time construction noise would be likely to give rise to not significant **minor adverse effects** in this area.
12 Tinsley Green	Day and night noise levels are expected to be below LOAEL in this area and commercial properties are no predicted to be affected resulting in **negligible effects** in this area.

14.9.60 In summary, the further mitigation identified above will be secured in accordance with the CoCP to reduce noise levels using the use of BPM that will reduce noise levels at source and through noise barriers. This assessment has made reasonable estimates of the noise mitigation this will deliver to assess the likely residual effects.

14.9.61 The Section 61 application process, whereby the local authorities will vet the contractor's proposed methods of working, will be used to ensure the BPM to minimise noise and vibration are adopted, and may identify measures to reduce noise levels further, but any further reduction is not assumed in this assessment.

14.9.62 This assessment identifies with mitigation approximately 37 properties where significant effects could arise during daytime construction with no properties identified as likely to require noise insulation for daytime noise. Various non-residential properties and open spaces could also be affected and mitigation for these has been included where necessary.

14.9.63 For night-time construction, this assessment identified approximately ten residential properties where noise levels could be above SOAEL and noise insulation could be required to avoid significant adverse effects.

Construction Vibration

14.9.64 The construction methods have been reviewed and the main source of potentially significant levels of ground vibration identified is sheet piling. There will be bored piling which creates lower levels of vibration and it is not required within 50 m of any noise sensitive receptors. Sheet piling will be required at various locations around the airfield to stabilise ground and form foundations and in connection with the highway works. The closest area of sheet piling to noise sensitive receptors outside the airport will be from the highways works. Table 14.9.5 identifies the areas of sheet piling required in connection with the highway works and their proximity to noise sensitive receptors.

Table 14.9.5: Sheet Piling Locations

Sheet Piling Location	Duration (approx.)	Distance to Nearest Residential Receptor
A23 Brighton Road Bridge abutments	2 weeks	50 m

Sheet Piling Location	Duration (approx.)	Distance to Nearest Residential Receptor
Longbridge Roundabout stilt structures	3 weeks	60 m
Network Rail Bridge	2 weeks	150 m
South Terminal Roundabout eastbound slip road	6 weeks	60 m
Balcombe Road bridge	4 weeks	60 m

14.9.65 The closest areas of piling to residential noise sensitive receptors are on the A23 Brighton Road Bridge approximately 50 m from properties on Longbridge Road, and on the South Terminal Roundabout eastbound slip road approximately 60 m from the nearest office building and dwellings to the north of the Balcombe Road Bridge. It is anticipated that sheet piling will be carried out by vibratory techniques, rather than methods requiring piles being impacted. Vibration from this form of vibratory piling may be at levels that are perceptible at some receptors on occasions but are not likely to give rise to adverse comment. **ES Appendix 14.9.1: Construction Noise Modelling** (Doc Ref 5.3) gives further details. Hence not significant **minor adverse effects** are predicted.

Construction Road Traffic Noise

14.9.66 Construction traffic on public highways has the potential to create noise disturbance. The extent of noise impact would depend on the numbers of NSRs along the relevant routes and the extent to which noise levels on routes is increased, which depends on the numbers of construction vehicles and the extent to which other traffic diverts compared to base flows during the day and night. The assessment includes the potential effect of any construction traffic at night to support the night work, and where drivers may divert to other routes which may increase noise levels elsewhere. The construction traffic noise assessment has considered all road links with a potential increase of basic noise level of 1 dB in both day and night time periods for three scenarios where the greatest changes in traffic noise during construction are expected, as discussed in Section 5:

- Airfield Construction peak (2029);
- Highway Construction - Main Traffic Management Stage (approximately a year from 2029 to 2030); and
- Highways Construction – Traffic Management on Airport Way westbound (approximately six weeks in 2029).

14.9.67 For the Peak Airfield Construction scenario, no significant road traffic noise effects in terms of the DMRB assessment criteria were found during daytime or night-time (see **ES Appendix 14.9.4: Road Traffic Noise Modelling** (Doc Ref. 5.3)). Whilst some roads were predicted to experience noise changes of greater than 1 dB, no increases of greater than 3 dB were predicted on roads within 50 m of noise sensitive receptors.

14.9.68 For the Highway Construction main traffic management stage scenario, on the vast majority of road links no significant traffic noise changes in terms of the DMRB assessment criteria were found during daytime or night-time. During daytime, the road link located on the South Terminal Roundabout southbound into the south airport terminal was calculated as a high magnitude

increase but given the traffic flow of the road link is lower than several of the adjacent links on the A23 and surrounding roads on the South Terminal Roundabout, it is unlikely there would be any significant change in total noise at the First Point offices. Decreases in basic noise levels on road links were also found which include moderate reductions in noise changes on road links on the A217 eastbound towards the Longbridge roundabout which is equivalent to a significant beneficial effect. No significant effect in terms of DMRB was found during night-time. **ES Appendix 14.9.4: Road Traffic Noise Modelling** (Doc Ref. 5.3) provides further details.

14.9.69 For the Highways Construction traffic management on Airport Way westbound scenario, the road link located on the South Terminal Roundabout southbound into the south airport terminal was also calculated to have a major magnitude noise increase. However, similarly to the main traffic management period scenario, the traffic flow of the road link is lower than several of the adjacent links on the A23 and surrounding roads on the South Terminal Roundabout, and is, therefore, unlikely to be any significant change in total noise at the First Point offices.

First Full Year of Opening: 2029

Construction Noise

14.9.70 The Initial Construction Period 2024 to 2029 assessment section above reports the representative likely impacts of construction noise and vibration across the whole construction programme from 2024 to 2038. Prior to opening, the Northern Runway and taxiway works and some airfield facilities will be built. In 2028 and 2029 a large part of the highways scheme will be built including some heavy engineering work required at night. Noise modelling was undertaken for six periods within 2029 to ensure that the worst-case noise impacts were assessed. These include night works on the Network Rail Bridge, the Balcombe Road Bridge and the M23 embankment widening programmed for this period. The modelling predicted significant noise impacts as reported in the Initial Construction Period 2024 to 2029 section above.

Air Noise

14.9.71 Air noise has been modelled for the 2029 baseline and 2029 'with Project' cases. The results in terms of the areas and populations within the primary noise contours in 2029 are presented, along with the areas and populations in 2032, 2038 and 2047 as well as the baseline year 2019, in Tables 14.9.6, 14.9.7, 14.9.8 and 14.9.9 in the following section for the Interim Assessment Year. This shows how noise levels will vary across the first 15 years after opening, including in the opening year. It was found that the opening year 2029 was the quietest year, as indicated by the smallest contours. This is also the year with the smallest air noise impacts, as indicated by the relative increases in contour areas and populations with the Project in 2029, compared to the baseline is 2029. Diagrams 14.9.1 and 14.9.2 below illustrate the trends in the key noise contours for day and for night-time. Consequently, this section does not provide a full account of the noise impacts in 2029, but the full results for all metrics are provided in **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3).

14.9.72 2029 is the year of smallest noise impacts, because the additional air traffic forecast in the opening year is expected to be the smallest of any year. The coordinated use of the northern runway with the existing main runway is anticipated to add approximately 40 additional movements in the summer daytime period and 2 additional movements at night. By 2032 the capacity uplift brought by the Northern Runway Project is anticipated to facilitate approximately 160 additional movements in the summer daytime period and 10 additional movements at night.

The impacts predicted in 2029 are lower than those predicted for 2032 (which is identified to be the worst-case year for impacts), as discussed in the following Interim Assessment Year section (2032).

Ground Noise

Aircraft Operations

14.9.73 The results of modelling of predicted ground noise from aircraft operations for the Project in the first year of opening (2029) and the associated assessment of effects are presented in **ES Appendix 14.9.3: Ground Noise Modelling** (Doc Ref. 5.3). The changes between future baseline and with Project predicted noise levels in 2029 are smaller than in 2032 because the use of the northern runway is expected to be smaller in 2029 as described above. As for air noise, in 2029 ground noise impacts will be smaller than in 2032. The assessment of ground noise from aircraft operations therefore focuses on the 2032 assessment year as a worst-case (see section on 2032 effects). **ES Appendix 14.9.3: Ground Noise Modelling** (Doc Ref. 5.3) includes information on the noise emissions levels from current and next generation aircraft used for the ground noise modelling.

Fixed Ground Noise Sources

14.9.74 The majority of the Project's new buildings and facilities that could be sources of noise will be operational by 2029, although some, notably the autonomous vehicle stations and the new 'east of railway' pumping station, will come into operation in the following years. The results of the assessment of noise from all fixed noise sources is therefore reported in this section.

14.9.75 The detailed design of the new facilities will take place following the grant of development consent, so the approach that has been adopted for the assessment is to identify the new noise sources that will be introduced as part of the proposal and derive suitable noise limits for each of the 12 assessment areas (as detailed at section 5.1 of **ES Appendix 14.9.3: Ground Noise Modelling** (Doc Ref. 5.3) and shown as highlighted areas in Figure 14.4.2 (Doc Ref. 5.3)).

14.9.76 A separation distance matrix has been prepared for the 43 nearest noise assessment locations (detailed at Table 5.1.1 within **ES Appendix 14.9.3: Ground Noise Modelling** (Doc Ref. 5.3)) and the 31 new fixed plant locations. Results are provided in **ES Appendix 14.9.3: Ground Noise Modelling** which show that the fixed ground noise sources are all a minimum of 200 m from the nearest assessment location. It is considered that given the relatively large separation distances, meeting the derived noise limits will be readily achievable through good acoustic design and no significant effects are expected.

Road Traffic Noise

14.9.77 Construction traffic on public highways has the potential to create noise disturbance and would continue into 2029. The potential for noise impacts from this source has been considered in the assessment for the initial construction period: 2024-2029 presented above. The additional fights in the year of opening will create some additional road traffic on the existing road network but this will not give rise to significant increases in road traffic noise.

Interim Assessment Year: 2032

Air Noise

14.9.78 As discussed in Section 14.4, the assessment of air noise uses a number of noise metrics to quantify the noise changes expected from the Project, as reported in the following sections.

- Primary noise metrics – $L_{eq,\ 16\ hour}$ day and $L_{eq,\ 8\ hour}$ night contours are used to quantify changes in community noise exposure in terms of populations affected and areas of noise contours, and likely significant effects on health and quality of life. $L_{eq,\ 16\ hour}$ day and $L_{eq,\ 8\ hour}$ night difference contours are used to show noise changes across the area.
- Secondary Noise metrics – N65 day and N60 night contours are used to quantify changes in community noise exposure measured in terms of the numbers of noise events (above L_{max} 65 dB and L_{max} 60 dB) as populations affected and areas of noise contours.
- L_{den} and L_{night} annual average noise contours are provided to illustrate noise changes over the entire year.
- Community Representative Locations – air noise levels in terms of primary and secondary noise metrics at seven representative locations are used to describe in more detail how noise would change in terms of changes in L_{eq} decibel levels and number of flights above L_{max} 60 and L_{max} 65 dB on average summer easterly and westerly operating days.
- L_{max} 60 and 65 dB – footprints from a common aircraft type are plotted to illustrate how L_{max} levels would change for departures from the northern runway compared to the main runway.
- Awakenings – estimates of number of additional awakenings at night due to aircraft noise (see Section 14.12).
- Noise Sensitive Buildings – noise levels at schools, hospitals, places of worship and community buildings are considered to assess impacts on these non-residential noise sensitive buildings.
- Overflights – change in the numbers of overflights expected within a wider area up to 35 miles from the airport are estimated to inform those experiencing aircraft in the sky further from the airport.

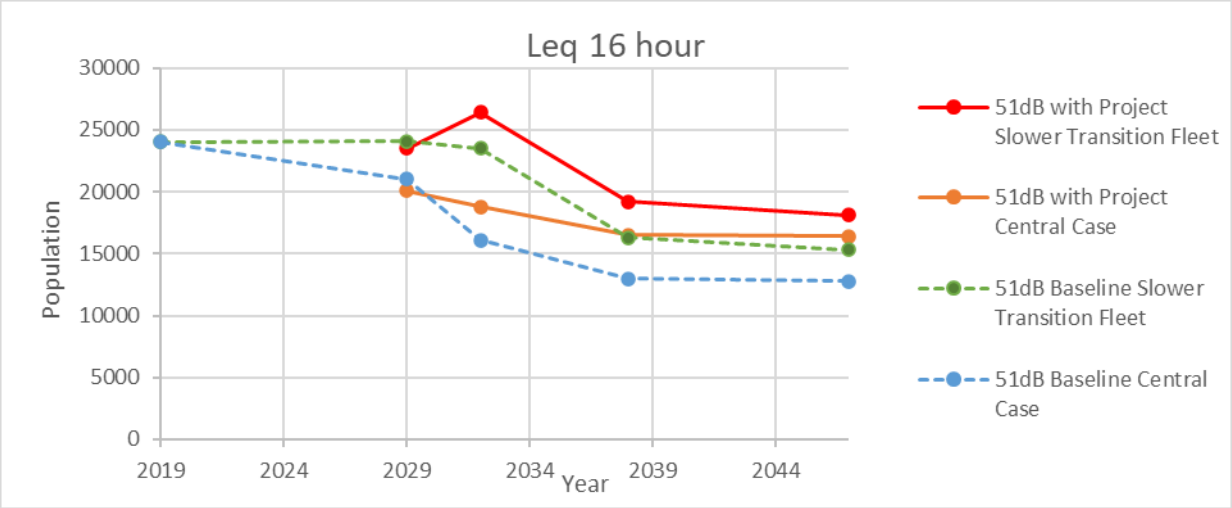
Primary Noise Metrics

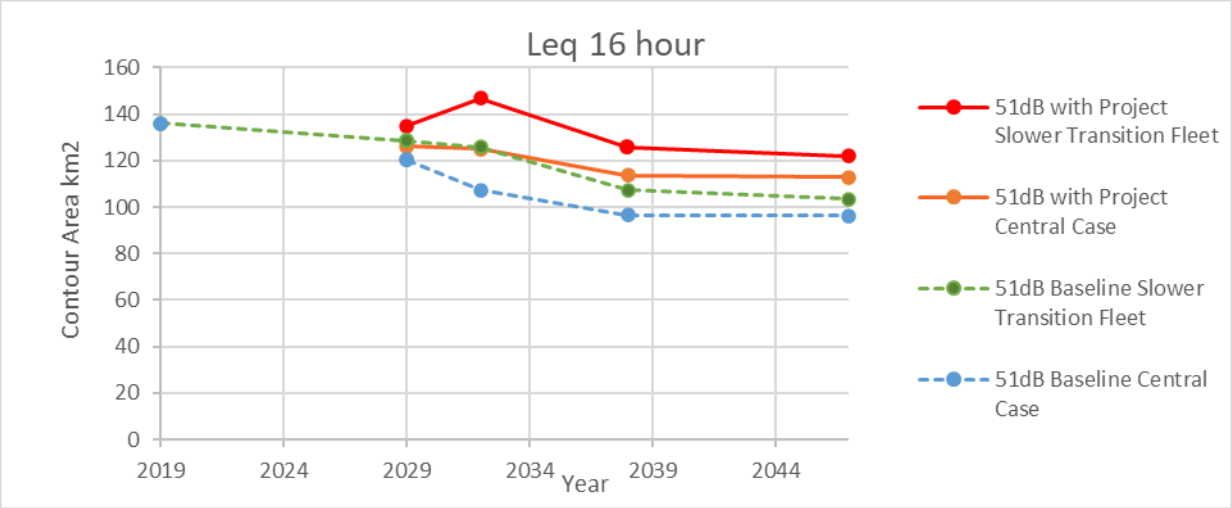
14.9.79 Figure 14.9.1 shows the 2032 scenario with the Project $L_{eq,\ 16\ hour}$ day noise contours. Also included on Figure 14.9.1 are the seven Community Representative Locations referred to elsewhere in this chapter.

14.9.80 GAL has developed an online Northern Runway Project Air Noise Viewer to assist stakeholders who wish to study the various air noise contours used in this ES. The viewer was shared with Local Authority Noise Topic Group members in March 2023 and is now available for public access at the website address shown on the Gatwick Airport Northern Runway Project website https://www.gatwickairport.com/business-community/future-plans/northern-runway/.

14.9.81 Diagram 14.9.1 summarises how the populations and areas within the $L_{eq,\ 16\ hour}$ 51 dB LOAEL contours are expected to change compared to the baseline situation in 2019, 2029, 2032, 2038 and 2047. Numerical results for all contour levels are given in the tables below the diagram, as well as being provided in **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3). As described in Section 14.5 the central fleet forecast case and a slower transition fleet case have been modelled to give the range of baseline and with Project conditions in the future.

Diagram 14.9.1: $L_{eq, 16\ hour}$ Day Contour Populations and Areas: 2019, 2029, 2032, 2038 and 2047





14.9.82 Table 14.9.6 gives the areas of the primary Leq metric noise contours in 2019, and the range of areas of the primary Leq metric noise contours with the Project for the central fleet forecast and the slower transition fleet case in the future assessment years.

Table 14.9.6 Air Noise L_{eq} Day and Night Contour Areas with the Project (km^2)[13]

Noise Metric	2019	2029	2032	2038	2047
$L_{eq, 16\ hour}$ day:					
>51 dB	136	126 - 134.9	125.1 - 146.7	113.7 - 125.7	112.9 - 121.9
>54 dB	74	66.8 - 73.3	66.1 - 80.5	58.7 - 66.8	58.3 - 63.7
>57 dB	38.7	34.4 - 37.8	33.3 - 40.6	29.9 - 33.8	29.7 - 32.2

[13] Ranges cover the central case fleet noise modelling and the slower transition fleet noise modelling.

Noise Metric	2019	2029	2032	2038	2047
>60 dB	22.4	20.2 - 22.2	19.4 - 23.6	17.6 - 19.8	17.6 - 18.9
>63 dB	12.6	11.6 - 12.8	11.3 - 13.8	10.3 - 11.6	10.3 - 11.3
>66 dB	6.7	6.3 - 7	6.2 - 7.6	5.6 - 6.3	5.6 - 6.3
>69 dB	3.5	3.5 - 3.9	3.3 - 4.2	3 - 3.4	3 - 3.5
$L_{eq,\ 8\ hour}$ night:					
>45 dB	159.4	141.5 - 150.1	136.2 - 157.4	125.8 - 136.1	125.2 - 136.7
>48 dB	90.3	78.5 - 84.1	75.1 - 88	68.7 - 75.2	68.5 - 74.9
>51 dB	46.5	39.3 - 42.9	37.5 - 45.2	34.2 - 37.7	34.2 - 37.5
>54 dB	24.8	21.9 - 23.9	20.8 - 24.8	19.1 - 21	19.1 - 20.8
>55 dB	20.6	18.2 - 19.9	17.4 - 20.7	16 - 17.5	16 - 17.4
>57 dB	14	12.4 - 13.6	12 - 14.2	11 - 12.1	11.1 - 12.2
>60 dB	7.4	6.7 - 7.4	6.5 - 7.7	6 - 6.6	6 - 6.8
>63 dB	3.8	3.5 - 3.9	3.4 - 4.1	3.1 - 3.4	3.1 - 3.6

14.9.84 Table 14.9.7 gives the populations within the primary L_{eq} metric noise contours in 2019, and the ranges of populations with the Project for the central fleet forecast and the slower transition fleet case in the future assessment years.

Table 14.9.7 Air Noise L_{eq} Day and Night Contour Populations with the Project[14]

Noise Metric	2019	2029	2032	2038	2047
$L_{eq,\ 16\ hour}$ day:					
>51 dB	24,050	20,100 - 23,500	18,800 - 26,400	16,500 - 19,200	16,400 - 18,100
>54 dB	9,850	8,800 - 9,500	9,000 - 10,900	7,500 - 8,900	7,300 - 8,700
>57 dB	2,550	2,200 - 2,700	2,200 - 3,900	1,800 - 2,200	1,800 - 2,100
>60 dB	1,450	1,200 - 1,300	1,200 - 1,400	1,000 - 1,200	1,000 - 1,200
>63 dB	500	600 - 600	500 - 600	500 - 500	500 - 500
>66 dB	250	200 - 300	200 - 300	200 - 300	200 - 300
>69 dB	100	0 - 0	0 - 100	0 - 0	0 - 0
$L_{eq,\ 8\ hour}$ night:					
>45 dB	27,650	23,700 - 26,500	21,600 - 28,500	18,300 - 21,700	18,200 - 21,800
>48 dB	12,100	10,500 - 11,200	9,900 - 11,900	8,900 - 9,900	8,800 - 9,900
>51 dB	5,550	44,00 - 51,00	4,400 - 5,400	4,000 - 4,600	4,000 - 4,700
>54 dB	1,550	1,400 - 1,400	1,300 - 1,500	1,100 - 1,300	1,100 - 1,300
>55 dB	1,250	1,100 - 1,200	1,000 - 1,200	900 - 1,000	900 - 1,000
>57 dB	750	500 - 700	500 - 700	500 - 500	500 - 500
>60 dB	300	300 - 300	300 - 300	300 - 300	300 - 300
>63 dB	150	200 - 200	200 - 200	100 - 200	100 - 200

14.9.85 Tables 14.9.8 and 14.9.9 provide the changes in the areas and populations within the various contours between the Project case (reported in the two tables immediately above) and the baseline case summarised in Table 14.6.9 and reported in full in ES Appendix 14.9.2: Air Noise Modelling (Doc Ref. 5.3). Positive changes indicate increased areas and increases in number of people resulting from increasing noise in a given year compared to the baseline in that year.

14.9.86 Table 14.9.8 gives the changes in the range of areas of the primary L_{eq} metrics noise contours with the Project in each of the future assessment years compared to the baseline in that year for the central fleet forecast and the slower transition fleet case. Examples of these are plotted in two figures as follows:

- Figure 14.9.2: 2032 Air Noise with Project Slower Transition Case and 2032 Baseline Slower Transition Case, $L_{eq\ 16\ hr}$ (Doc Ref. 5.2)

[14] Ranges cover the central case fleet noise modelling and the slower transition fleet noise modelling.Populations are rounded to the nearest 100.

- Figure 14.9.3: 2032 Air Noise With Project Slower Transition Case and 2032 Baseline Slower Transition Case, $L_{eq\ 8\ hr}$ Night (Doc Ref. 5.2)

Table 14.9.8 Air Noise L_{eq} Day and Night Contour Area Changes (With Project – Future Baseline) (km^2)[15]

Noise Metric	2029	2032	2038	2047
$L_{eq,\ 16\ hour}$ day:				
>51 dB	5.9 to 6.4	17.8 to 20.9	17.2 to 18.3	16.7 to 18.4
>54 dB	4.4 to 4.2	12 to 13.4	11.1 to 12.4	10.9 to 12
>57 dB	1.9 to 1.9	4.9 to 5.7	4.7 to 5	4.5 to 5
>60 dB	1.3 to 1.3	2.8 to 3.3	2.8 to 3	2.8 to 2.8
>63 dB	1 to 1	2.1 to 2.3	2 to 2.2	2 to 2.1
>66 dB	0.8 to 0.8	1.5 to 1.6	1.5 to 1.5	1.4 to 1.5
>69 dB	0.6 to 0.7	0.8 to 1.1	0.8 to 0.9	0.8 to 0.9
$L_{eq,\ 8\ hour}$ night:				
>45 dB	1.7 to 1.8	11.6 to 13.5	10.5 to 11.8	10.5 to 12.3
>48 dB	1.0 to 1.1	7.3 to 7.9	6.8 to 7.3	6.9 to 7.6
>51 dB	0.7 to 0.9	3.9 to 4.9	3.6 to 3.8	3.7 to 4.1
>54 dB	0.6 to 0.7	2.1 to 2.5	2 to 2.1	2 to 2.2
>55 dB	0.5 to 0.6	1.9 to 2.2	1.8 to 1.8	1.8 to 1.9
>57 dB	0.5 to 0.5	1.5 to 1.7	1.3 to 1.5	1.4 to 1.5
>60 dB	0.4 to 0.5	1 to 1.1	1 to 1	1 to 1.1
>63 dB	0.3 to 0.4	0.6 to 0.8	0.6 to 0.6	0.6 to 0.7

14.9.87 The increases in contour areas are largest in 2032 indicating the greater noise increase in this year.

14.9.88 Table 14.9.9 gives the ranges of populations within the primary Leq metrics noise contours with the Project in each of the future assessment years compared to the baseline in that year for the central fleet forecast and the slower transition fleet case.

[15] Ranges cover the central case fleet noise modelling and the slower transition fleet noise modelling.

Table 14.9.9 Air Noise L_{eq} Day and Night Contour Population Change (With Project – Future Baseline)[16]

Noise Metric	2029	2032	2038	2047
$L_{eq,\ 16\ hour}$ day:				
>51 dB	-900 to -600	2,700 to 2,900	3,500 to 2,900	3,600 to 2,800
>54 dB	600 to 300	2,300 to 1,800	1,800 to 2,100	1,700 to 2,400
>57 dB	200 to 300	400 to 1,700	200 to 400	200 to 500
>60 dB	100 to 100	300 to 200	300 to 200	300 to 300
>63 dB	100 to 100	100 to 100	200 to 100	200 to 100
>66 dB	0 to 100	0 to 100	0 to 100	0 to 100
>69 dB	-100 to -100	-100 to 0	-100 to -100	-100 to -100
$L_{eq,\ 8\ hour}$ night:				
>45 dB	0 to -100	2,800 to 3,100	2,600 to 3,000	2,600 to 3,600
>48 dB	400 to 100	1,000 to 1,100	800 to 1,100	800 to 1,200
>51 dB	100 to 100	800 to 700	700 to 1,000	700 to 700
>54 dB	100 to 0	300 to 200	100 to 300	100 to 300
>55 dB	100 to 0	100 to 100	100 to 100	100 to 100
>57 dB	0 to 100	0 to 200	100 to 0	100 to 0
>60 dB	0 to 0	0 to 0	0 to 0	0 to 0
>63 dB	0 to 0	100 to 0	0 to 100	0 to 100

14.9.89 The increases in populations are generally largest in 2032 indicating the greater noise impacts in this year, although in some cases contours around areas of high population density creates variations.

14.9.90 In the year of opening, 2029, for the central and slower transition fleet cases, the area of the LOAEL $L_{eq,\ 16\ hour}$ day 51 dB contour is predicted to increase slightly (by between 6 to 6.9 km^2) above the baseline, but the population within it is predicted to reduce slightly in the range of 900 to 600 people. The range of population exposure is 21,000 – 24,100 between central and slow fleet transition cases in the baseline to between 20,100 – 23,500 with the Project, and these numbers are below the 2019 baseline of 24,050. This is because of the slight shift in the noise contour near the airport northwards away from the Forge Wood residential area to the south, which is no longer in the contour.

14.9.91 In 2032, the population within the LOAEL $L_{eq,\ 16\ hour}$ day 51 dB contour is predicted to rise from between 16,100 - 23,500 (central case and slower transition fleet case), in the base case to the range of 18,800 - 26,400 with the Project but remain below the 2019 level of 24,050 except in the slower transition fleet case. Thus, the Project is predicted to increase the population within the LOAEL $L_{eq,\ 16\ hour}$ day 51 dB contour by between 2,700 to 2,900 people in 2032. The impacts in 2032 are higher than in 2029. In 2032, the area of the LOAEL $L_{eq,\ 16\ hour}$ day 51 dB contour is

[16] Ranges cover the central case fleet noise modelling and the slower transition fleet noise modelling. Populations are estimated to the nearest 100.

predicted to increase from 107.3 to 125.8 km^2 in the base case to 125.1 km^2 to 146.7 with the Project and would remain below the 2019 area of 136.0 km^2 in the central case but exceed it in the slower transition fleet case, before dropping back to below it before 2038 (125.7 km^2). See Diagram 14.9.1.

14.9.92 In 2032, the population within the $L_{eq,\ 16\ hour}$ day 57 dB contour is predicted to rise from 1,800 – 2,200 in the baseline case to the range of 2,200 – 3,900 with the Project but remain below the 2019 level of 2,550 except in the slower transition fleet case. Thus, the Project is predicted to increase the population within the $L_{eq,\ 16\ hour}$ day 57 dB contour by 400 to 1,700 people in 2032. The impacts in 2032 are higher than in 2029. In 2032, the area of the $L_{eq,\ 16\ hour}$ day 57 dB contour is predicted to increase in the range of 28.4 to 34.9 km^2 in the future base case to between 33.3 to 40.6 km^2 with the Project and would remain below the 2019 area of 37.8 km^2 in the central case but exceed it in the slower transition fleet case, before dropping back to below it before 2038 (33.8 km^2).

14.9.93 In 2032, the population within the SOAEL $L_{eq,\ 16\ hour}$ day 63 dB contour is predicted to rise from approximately 400 - 500 in the base case to approximately 500 - 600 with the Project, compared against approximately 500 people in 2019. These population counts are rounded to the nearest 100, and are discussed in more detail below.

14.9.94 In both the central and slower transition fleet cases, to the south of the airport approximately ten properties would be removed from the SOAEL $L_{eq,\ 16\ hour}$ day 63 dB zone.

14.9.95 Figure 14.9.4 shows the 2032 with Project versus 2032 baseline difference, $L_{eq,\ 16\ hour}$ day noise contours for the central case. Figure 14.9.5 shows the 2032 with Project versus 2032 baseline difference, $L_{eq,\ 16\ hour}$ day noise contours for the slower transition case.

14.9.96 The changes in $L_{eq,\ 16\ hour}$ day noise levels in 2032 as a result of the Project are summarised in Table 14.9.10. Only areas and populations within the LOAEL $L_{eq,\ 16\ hour}$ day 51 dB contours with the Project are shown, changes outside this are not.

Table 14.9.10: Changes in $L_{eq,\ 16\ hour}$ Day Noise Levels, 2032 With Project Versus 2032 Baseline[17]

Noise Change Band $L_{eq,\ 16\ hour}$ Day dB	Area (km^2)	Population	Comment
-6 to -3	0.5 – 0.9	-	Lowfield Farm on Charlwood Road and mostly within the airport boundary south of the main runway.
-3 to -2	1.2 – 1.4	<100	Approximately 20 houses on Charlwood Road, Poles Lane and Bonnetts Lane south of the airport.
-2 to -1	2.8 – 2.8	500	South of the airport on Charlwood Road, Bonnetts Lane and houses on the north tip of Ifield near the Crawley Rugby Club.

[17] Ranges cover the central case fleet noise modelling and the slower transition fleet noise modelling.

Noise Change Band $L_{eq, 16 hour}$ Day dB	Area (km^2)	Population	Comment
-1 to 0	4.7 – 6.4	1,200 – 4,300	Southwest of the airport in the area of Ifield Wood Road west of Ifield, and in the Tinsley Green area (Radford Road, Balcombe Road and Forge Wood) south east of the airport.
0 to +1	83.6 – 96.7	12,800 – 16,000	East of the airport (excluding an area around Smallfield) and west of the airport south of the extended runway centerline including Rusper and Kingsfold. The northern part of Charlwood, north of Horley Road.
+1 to +2	25.2 – 32.6	4,800 – 6,500	West of the airport north of the extended runway centerline including the southern part of Charlwood and Capel. East of the airport north of the extended runway centerline including parts of Smallfield.
+2 to +3	4.0 – 4.2	300 – 400	West of the airport north of the extended runway centerline including parts of Russ Hill Road, Ifield Road and Partridge Lane to the South of Charlwood.
+3 to +6	2.1 – 2.3	~100	Mainly within the airport. Approximately 20 properties on Ifield Road approximately 1 km west of the airport boundary and approximately 20 properties in Russ Hill approximately 2 km west of the airport.
> +6	0.8	0	Within the airport.

14.9.97 The following paragraphs describe the significance of these predicted noise changes using the methodology described in Section 14.4.

14.9.98 Approximately 1,700 to 4,800 people living south of the airport are predicted to experience small reductions in noise because some aircraft that would have used the main runway in 2032 would be using the northern runway instead, on a flight path 200 metres further north. These are negligible to low noise reductions affecting medium to very high populations and likely to lead to **minor beneficial** but not significant effects.

14.9.99 The majority (61 to 68%) of the population within the LOAEL $L_{eq, 16 hour}$ day 51 dB contour are predicted to experience an increase in noise level of less than 1 dB as a result of the Project in 2032 compared to the 2032 baseline. These are negligible increases and would give rise to **negligible** effects.

14.9.100 To the north of the extended runway centreline, and predominantly to the west, approximately 4,800 to 6,500 people are predicted to experience increases in noise of 1 to 2 dB. These are low increases in noise and because noise levels in this area are well below SOAEL are likely to result in **minor adverse** and not significant effects. The majority of the residential properties in these areas would be eligible for the new Outer Zone NIS, as discussed under further mitigation below, which would further reduce noise effects in these areas.

14.9.101 To the west, approximately 300 to 400 people are expected to experience noise increases of 2 to 3 dB. The majority of this area is covered by the existing NIS. These are low increases in noise affecting a low sized population giving rise to **minor adverse** effects. All of the residential

properties in these areas would be eligible for the new Outer Zone NIS, as discussed under further mitigation below, which would further reduce noise effects in these areas.

14.9.102 Approximately 2 km to the west of western end of the northern runway approximately 20 properties in the Russ Hill area have been identified as experiencing increases of greater than 3 dB, and above SOAEL. These properties are predicted to experience medium to high noise increases, so these effects are **major adverse significant** effects. All the residential properties in this area would be eligible for the new Inner Zone NIS, as discussed under further mitigation below, which help to mitigate noise effects in this area.

14.9.103 Approximately 1 km to the west of the western end of the northern runway, the following 20 properties on Ifield Road have been identified as experiencing increases of greater than 3 dB:

- Longmeadow Villas (8 dwellings);
- Cottesmore House;
- The Seasons;
- Oak Gates;
- Pine Trees;
- Squirrels Leap;
- Beech Hay;
- Little Oaks;
- The Gallops;
- Birchfield House; and
- Woodcote (approximately 3 dwellings).

14.9.104 These properties on Ifield Road are predicted to experience medium, 3 to 4 dB, noise increases for properties already above the SOAEL, so are subject to **major adverse** significant effects. These houses would be eligible for full noise insulation under the new Inner Zone NIS, as discussed under further mitigation below, to help to mitigate the predicted significant effects.

14.9.105 In addition to the 40 properties in Russ Hill and Ifield Road where noise changes of greater than 3 dB are predicted, a further approximately 40 properties are predicted to have increases of greater than 1 dB above SOAEL, in Russ Hill and Partridge Lane to the West and on Balcombe Road and Peeks Brook Lane to the East. The total number of properties with noise increase of more than 1 dB and above SOAEL is approximately 80, or approximately 210 people, for which **major adverse** significant effects are predicted.

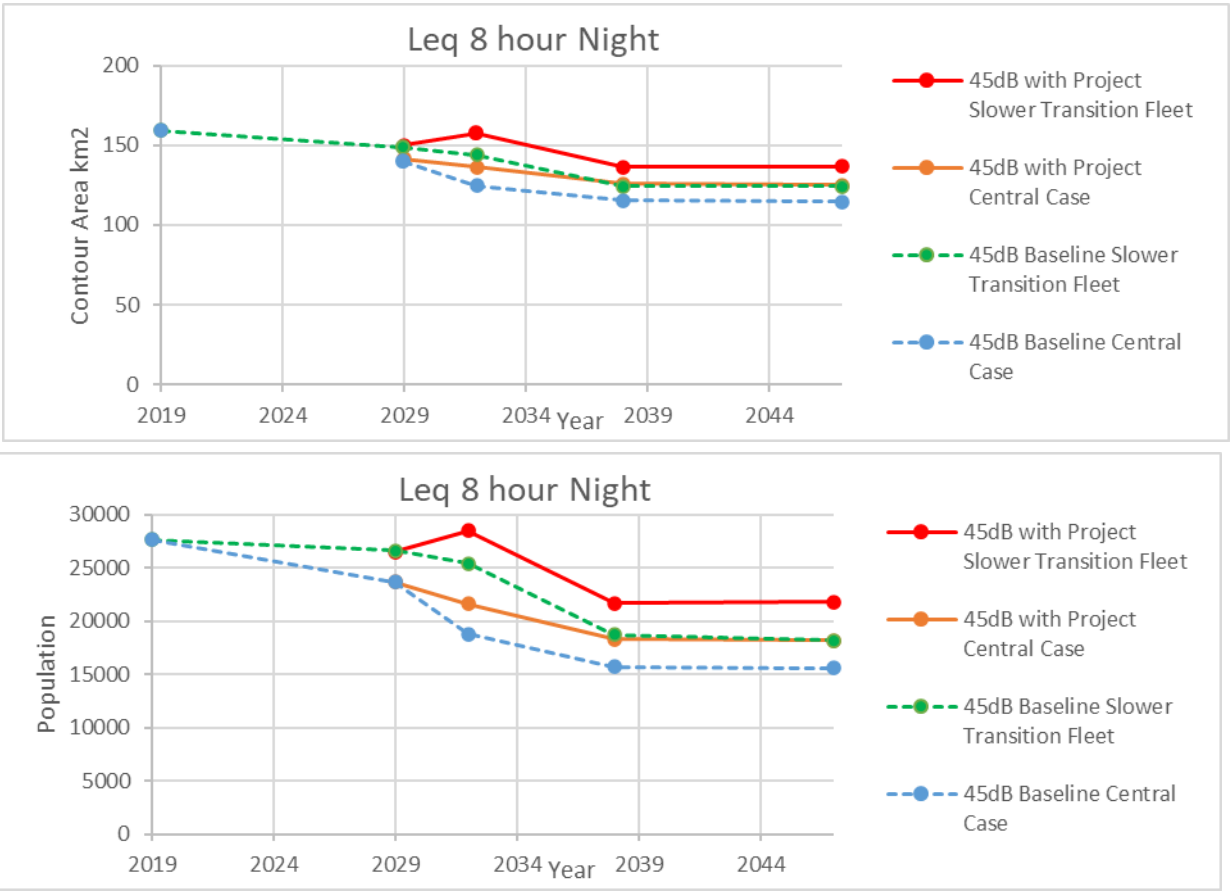
14.9.106 Figure 14.9.6 shows the central case 2032 with Project versus 2019 baseline difference, $L_{eq,\ 16\ hour}$ day noise contours, illustrating how noise levels in 2032 with the Project would change compared to the 2019 baseline. This shows larger areas with noise levels reducing from the 2019 baseline to 2032 with the Project rather than increasing, reflecting the overall reduction in the size of all the noise contours in the central case.

14.9.107 Figure 14.9.7 (Doc Ref. 5.2) shows the slower transition fleet case in 2032 with Project versus 2019 baseline difference, $L_{eq,\ 16\ hour}$ day noise contours, illustrating how noise levels in 2032 with the Project would change compared to the 2019 baseline. This shows larger areas with noise levels increasing from the 2019 baseline to 2032 with the Project than reducing, reflecting the overall increase in the size of all the noise contours in the slower transition fleet with Project case. Note however, the slower transition fleet noise contours would reduce to be smaller than those in 2019 by 2038 (see **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3) for details).

14.9.108 Figure 14.9.8 (Doc Ref. 5.2) shows the 2013 baseline $L_{eq,\ 16\ hour}$ day noise contours. The areas and populations within each are provided in **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3). At that time 51 dB levels were not produced. The largest contour, $L_{eq,\ 16\ hour}$ day 54 dB had an area of 77.1 km^2 and a population of 9,700 people. The forecast 2032 with Project $L_{eq,\ 16\ hour}$ day 54 dB contour has an area of 66.1 to 80.5 km^2 and a population of 9,000 to 10,900. Thus, for the central case forecast the 2032 with Project $L_{eq,\ 16\ hour}$ day 54 dB contour is smaller than in 2013 and for the slower transition case in 2032 it is slightly larger. In the years following 2013 the noise contours grew slightly and in 2016 and 2017 the $L_{eq,\ 16\ hour}$ day 54 dB had areas of 86.5 and 82.7 km^2, which are larger than the slower transition case forecast in 2032.

14.9.109 Figure 14.9.9 (Doc Ref. 5.2) shows the 2032 with Project $L_{eq,\ 8\ hour}$ night contours. Diagram 14.9.1 shows how the area and populations within the $L_{eq,\ 8\ hour}$ night 45 dB contours are expected to change compared to the baseline in 2019, 2029, 2032, 2038 and 2047. As described in Section 14.5 the central fleet forecast case and a slower transition fleet case have been modelled to give the range of baseline and with Project conditions in the future. Full results are provided in **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3).

Diagram 14.9.2: Populations and $L_{eq,\ 8\ hour}$ Night Contour Areas: 2019, 2029, 2032, 2038, 2047



14.9.110 Tables 14.9.6 and 14.9.7 above show the numerical values of the night noise contour populations and areas in this diagram and the changes that would results from the Project. These changes are smaller than for the daytime, as discussed below.

14.9.111 In 2032, the population within the LOAEL $L_{eq, 8\ hour}$ night 45 dB contour is predicted to rise from the range of 18,800 - 25,400 in the base case to 21,600 - 28,500 with the Project. Thus, the Project is predicted to increase the population within the LOAEL $L_{eq, 8\ hour}$ night 45 dB contour by between 2,800 to 3,100 people in 2032. In 2019 there were approximately 27,650 people living with in the LOAEL $L_{eq, 8\ hour}$ night 45 dB contour. Thus, compared to 2019, in 2032 with the Project the population within the LOAEL $L_{eq, 8\ hour}$ night 45 dB contour is predicted to decrease by 6,050 in the central case and to increase by 850 in the slower transition case. In 2032, the area of the LOAEL $L_{eq, 8\ hour}$ night 45 dB contour is predicted to increase from the range of 124.6 - 143.9 km^2 in the base case to 136.2 - 157.4 km^2 with the Project and would remain below the 2019 area of 159.4 km^2 in both the central case and slower transition fleet cases.

14.9.112 In 2032, the population within the SOAEL $L_{eq, 8\ hour}$ night 55 dB contour is predicted to rise from the range of approximately 900 - 1,100 in the base case to approximately 1,000 - 1,200 with the Project, and remain below the approximately 1,250 people in 2019. Thus, the Project is predicted to increase the population within the SOAEL $L_{eq, 8\ hour}$ night 55 dB contour by approximately 100 people in 2032 compared to the baseline in 2032 in either of the central and slower transition assessment cases. These population counts are rounded to the nearest 100. Inspection of the 55 dB contours in detail shows approximately 60 additional residential properties (approximately 160 people) are within the SOAEL contour in 2032 compared the 2032 baseline, at which significant adverse effects on health and quality of life would be expected, and mitigation is proposed in the form of noise insulation, as discussed below. The areas within the day and night SOAEL contours overlap so that the total number of properties within the day or night SOAEL contour due to noise increases from the Project in 2032 is approximately 80 (approximately 210 people).

14.9.113 Figure 14.9.10 (Doc Ref. 5.2) shows the 2032 situation with the Project versus the 2032 baseline difference $L_{eq, 8\ hour}$ night noise contours for the central case. Figure 14.9.11 (Doc Ref. 5.2) shows the 2032 with Project versus 2032 baseline difference, $L_{eq, 8\ hour}$ night noise contours for the slower transition case. The changes in $L_{eq, 8\ hour}$ night noise levels in 2032 as a result of the Project are summarised in Table 14.9.11. Only areas and populations within the LOAEL $L_{eq, 8\ hour}$ night 45 dB contours with the Project are counted, changes outside this are not.

Table 14.9.11: Changes in $L_{eq, 8\ hour}$ Night Noise Levels, 2032 With Project Versus 2032 Base[18]

Noise Change Band dB	Area (km^2)	Population	Comment
-1 to 0	3.2	100 – 200	South west of the airport in the area of Poles Lane, Bonnetts Lane and Charlwood Road.
0 to +1	124.9	20,900 – 28,100	East of the airport and west of the airport.

[18] Ranges cover the central case fleet noise modelling and the slower transition fleet noise modelling.

Noise Change Band dB	Area (km^2)	Population	Comment
+1 to +2	6.6	300 – 500	West of the airport north of the extended runway centerline including properties on Ifield Road south of Charlwood, in Russ Hill and on Partridge Lane to the west.
+2 to +3	0.7	0	Within the airport and immediately west of the west end of the northern runway.
>+3 dB	0.8	0	Within the airport.

14.9.114 Approximately 100 to 200 people living south of the airport are predicted to experience reductions in $L_{eq,\ 8\ hour}$ night noise levels of less than 1 dB. This is a negligible decrease, likely to give rise to **negligible** effects.

14.9.115 The vast majority (97 to 99%) of the population within the LOAEL $L_{eq,\ 8\ hour}$ night 45 dB contour are predicted to experience increases in noise level of less than 1 dB at night as a result of the Project in 2032 compared to the 2032 baseline. This is a negligible increase, likely to give rise to **negligible** effects.

14.9.116 To the west of the northern runway west end approximately 300 to 500 people would experience an increase of 1 to 2 dB. These are low increases affecting a low size of population, so are likely to give rise to generally **minor adverse** effects. All of the residential properties in these areas would be eligible for the new Outer Zone NIS, which would further reduce noise effects in these areas. Approximately 30 of these properties are above SOAEL and are likely to experience **major adverse** significant effects. However, these residential properties are a sub-set of the 80 properties that are predicted to experience major adverse effects due to daytime noise, and they would be eligible for full noise insulation under the new Inner Zone NIS, to help mitigate these significant effects, as discussed below. No substantial adverse effects are predicted.

14.9.117 All residential properties forecast to be within the $L_{eq\ 8\ hour}$ day 55 dB contour would be eligible for full noise insulation under the new Inner Zone NIS, to help mitigate the potentially significant effects. The extent of the NIS is shown in Figure 14.8.1.

14.9.118 The changes in noise levels expected from the Project at night-time are smaller than during the day because the northern runway would generally not be used between 23:00 and 06:00 hours and because the night flight restrictions are assumed to limit growth in night flights. All the increases in $L_{eq\ 8\ hour}$ of greater than 1 dB above the night SOAEL are within the area in which daytime $L_{eq,\ 16\ hour}$ noise levels increase by greater than 1 dB. So, there are no additional properties significantly adversely affected at night than already reported above for the daytime.

14.9.119 Figure 14.9.12 (Doc Ref. 5.2) shows the central case 2032 with Project versus 2019 baseline difference, $L_{eq,\ 8\ hour}$ night noise contours, illustrating how noise levels in 2032 with the Project would change compared to the 2019 baseline. Figure 14.9.12 shows that compared to 2019, night noise levels with the Project in 2032 would reduce in nearly all areas around the airport.

14.9.120 Figure 14.9.13 (Doc Ref. 5.2) shows the slower transition fleet case in 2032 with Project versus 2019 baseline difference, $L_{eq,\ 8\ hour}$ night noise contours, illustrating how noise levels in 2032 with the Project would change compared to the 2019 baseline. This shows areas to the west with

noise levels increasing slightly and larger areas to the east with noise levels reducing slightly from the 2019 baseline to 2032 with the Project, reflecting the overall slight decrease in the size of all the noise contours in the slower transition fleet case.

14.9.121 Figure 14.9.14 (Doc Ref. 5.2) shows the 2013 baseline $L_{eq,\ 8\ hour}$ night noise contours. The areas and populations within each are provided in **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3). At that time 45 dB contours were not produced. The largest contour, $L_{eq,\ 8\ hour}$ night 48 dB had an area of 91.2 km^2 and a population of 11,200 people. The forecast for 2032 with the Project $L_{eq,\ 8\ hour}$ night 48 dB contour has an area of 75.1 to 88.0 km^2 and a population of 9,900 to 11,900 indicating that the 2032 $L_{eq,\ 8\ hour}$ night 48 dB contour area would be lower than in 2013 and the population would be lower in the central case but slightly higher in the slower transition case. The population living in the area around the airport will have increased between 2013 and 2032 which accounts for this smaller contour yet larger population.

Secondary Noise Metrics

14.9.122 Noise levels are presented in this section using the set of required noise metrics that are supplementary to the main metrics used to judge significance of noise impacts. They provide additional information to illustrate where noise changes are expected.

14.9.123 Figure 14.9.15 (Doc Ref. 5.2) shows the 2032 northern runway N65 day contours. The population exposed to at least 20 aircraft noise events above L_{max} 65 dB on an average summer day is predicted to be approximately 17,400 to 32,200 with the Project, compared to 15,300 to 28,300 in the 2032 baseline. This would be below the 2019 level of 24,100 in the central case, but above it in the slower transition fleet case. Figure 14.9.15 shows the 2032 northern runway N65 contours with a very similar shape to the 2032 baseline shown in Figure 14.6.14, only slightly larger. This reflects the forecast similar use of the routes into and out of the airport, including Route 9, with the Project as in the baseline in 2032.

14.9.124 Figure 14.9.16 and Figure 14.9.17 (Doc Ref. 5.2) show the 2032 with Project versus 2032 baseline difference N65 day noise contours, for the central and slower transition cases, illustrating how noise levels in 2032 with the Project would change compared to the relative 2032 baselines. Areas to the south are expected to experience some reductions in numbers of flights above L_{max} 65 dB during the day including the northern edge of Crawley. North of the airport, N65 levels would increase and under the main arrivals and departure routes on the extended runway centrelines increases of 50 to 100 noise events above L_{max} 65 dB per day are expected. These changes are described more specifically in the following section on Community Representative Locations.

14.9.125 Figure 14.9.18 and Figure 14.9.19 (Doc Ref. 5.2) show the 2032 with Project versus 2019 baseline difference N65 day noise contours, for the central and slower transition cases, illustrating how noise levels in 2032 with the Project would change compared to the 2019 baseline. The anticipated increased use of Route 9 in 2032 compared to 2019 is shown by the mid-blue area over Route 9 between Horsham and Crawley, but as noted above, this increase is expected due to growth in traffic using this route in the baseline between 2019 and 2032, not as a result of the Project.

14.9.126 Figure 14.9.20 (Doc Ref. 5.2) shows the 2032 with Project N60 night contours. The population exposed to at least 10 aircraft noise events above L_{max} 60 dB on an average summer night is predicted to be approximately 29,600 to 33,800 with the Project compared to 28,900 to 31,500 in

the 2032 baseline, and below the 2019 level of 33,850. The shape of the 2032 with Project N60 night contours is very similar to those in the 2019 baseline shown in Figure 14.6.4 reflecting similar forecast use of routes in and out of the airport with the Project in 2032 compared to the 2019 baseline.

14.9.127 Figure 14.9.21 and Figure 14.9.22 (Doc Ref. 5.2) show the 2032 with Project versus 2032 Baseline difference N60 night noise contours, for the central and slower transition fleet cases, illustrating how noise levels in 2032 with the Project would change compared to the 2032 baselines. As seen above for $L_{eq,\ 8\ hour}$ night noise levels, the changes predicted due to the Project at night are smaller than during the day, with areas further from the airport seeing increases of less than 5 movements at noise levels of 60 dB and over, and areas closer seeing increases of 5-10 movements. These changes are described more specifically in the following section on Community Representative Locations.

14.9.128 Figure 14.9.23 and Figure 14.9.24 (Doc Ref. 5.2) show the 2032 with Project versus 2019 baseline difference N60 night noise contours, for the central and slower transition fleet cases, illustrating how the number of events above L_{max} 60 dB in 2032 with the Project would change compared to the 2019 baseline. The changes from 2019 to 2032 with the Project are more mixed with decreases generally to the east and increases closer to the airport to the west but decreases further from the airport to the west.

L_{max} Levels

14.9.129 Figure 14.9.25 (Doc Ref. 5.2) shows L_{max} 60 dB and L_{max} 65 dB noise footprints for an A320 departing the main runway and the northern runway along each of the main departure routes to the east and west. The A320 was chosen because it is one of the most common aircraft at Gatwick. The changes in L_{max} levels as a result of A320s using the northern runway instead of the main runway can be seen, with no or very small change in areas further from the airport.

14.9.130 Figure 14.9.26 (Doc Ref. 5.2) shows L_{max} 60 dB and L_{max} 65 dB noise footprints for an A320 Neo departing the main runway and the northern runway along each of the main departure routes to the east and west. As with the A320 footprints, it can be seen that the changes in L_{max} levels as a result of A320 Neos using the northern runway instead of the main runway are small with very small or no change in areas further from the airport. The extent to which A320 Neos are quieter than the A320s on departure is also clearly illustrated by the much smaller footprints.

14.9.131 Figure 14.9.27 (Doc Ref. 5.2) shows the A320's L_{max} difference contours for a single departure on the northern runway compared to on the main runway. To illustrate the difference in L_{max} levels for departures, a SID to the west (Bognor, BOG) and to the east (Clacton, CLN) are shown. L_{max} levels increase to the north and decrease to the south of the runways, as would be expected, and as discussed in more detail below.

14.9.132 For departures from the northern runway to the east, the area within which L_{max} levels would increase by more than 3 dB is mainly within the airfield and reaches to the east just beyond the Balcombe Road including a small area of houses. Similarly, to the east, the area within which L_{max} levels would decrease by more than 3 dB to the south affects a small area of housing as far as the Balcombe Road.

14.9.133 For departures from the northern runway to the west, the area within which L_{max} levels would increase by more than 3 dB reaches as far as Russ Hill encompassing a population of up to 300

people who may perceive A320 departures as noticeably louder. Also for departures to the west, the area within which L_{max} levels would decrease by at least 3 dB to the south includes housing areas of Langley Green and north Ifield, indicating that over 1,000 people would perceive A320 departures from the northern runway as noticeably quieter. This benefit is partly because the northern runway would move departures 200 metres to the north, but also because for westerly departures they would be moved west approximately 750 metres. The latter is due to the northern runway eastern end (where aircraft departing to the west begin their start of roll) being approximately 750 metres to the west of the position where from which main runway departures commence.

14.9.134 L_{max} levels from all aircraft have been modelled across the whole study area in order to assess the extent to which the increase in aircraft noise events from the Project may increase sleep disturbance at night. The results are reported in Section 14.12 below under the heading Health and Economic Appraisal with details in **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3).

L_{den} and L_{night} Annual Average Noise Levels

14.9.135 The primary and secondary noise metrics ($L_{eq,\ 16\ hr}$ day, $L_{eq,\ 8\ hr}$ night, N65 day and N60 night) are all predicted for an average summer day because this is when the airport is usually busiest and noisiest. However, in order to illustrate how noise levels over the whole year are anticipated to change with the Project, L_{den} and L_{night} noise levels have also been modelled, consistent with common practice in the European Union and associated regulations. The areas and population within these contours in 2032 with the Project are summarised in Table 14.9.12.

Table 14.9.12: 2032 (Standard Mode) Annual L_{den} and L_{night} Noise Levels with Project[19]

Noise Metric	Noise Contour Area (km^2)	Population
L_{den}:		
>55 dB	86.1 – 100.9	11,500 – 14,700
>60 dB	28.2 – 34	1,800 – 2,200
>65 dB	11.3 – 13.6	500 – 500
>70 dB	4 – 5	200 – 200
>75 dB	1.7 – 2	0 – 0
L_{night}:		
>45 dB	101.6 – 117.5	13,400 – 18,000
>50 dB	33.6 – 40.3	3,200 – 4,400
>55 dB	13.2 – 15.6	600 – 800
>60 dB	4.7 – 5.7	200 – 300
>65 dB	1.8 – 2.1	0 – 0
>70 dB	0.9 – 1.1	0 – 0

[19] Ranges cover the central case fleet noise modelling and the slower transition fleet noise modelling.

14.9.136 Figure 14.9.28 (Doc Ref. 5.2) shows the L_{den} contours in 2032 with the Project for the central case and slower transition fleet cases.

14.9.137 Figure 14.9.29 (Doc Ref. 5.2) shows the L_{night} contours in 2032 with the Project for the central case and slower transition fleet cases.

14.9.138 L_{night} is a measure of the 8 hour night noise levels averaged over the whole year. In all cases the summer $L_{eq\ 8\ hr}$ noise contours are larger than the annual average L_{night} contours (by about 35%) indicating how the summer noise levels, that have been used in this assessment, are higher than the annual average, on average by about 1.7 dB.

14.9.139 The increase in size of the annual L_{night} contours in 2032 due to the Project compared to the 2032 base is 11-12%, which is slightly larger than the increase in the summer $L_{eq\ 8\ hr}$ noise contours of 9%. The increase in area of the annual day evening night L_{den} noise levels due to the Project in 2032 compared to the 2032 base is 17% which is the same as the increase in the summer daytime $L_{eq\ 16\ hr}$ 51 dB contours in 2032. Overall, this suggests that any seasonality in the way the extra capacity delivered by the Project is used has little effect on noise levels across seasons.

Overflights

14.9.140 CAP 1616 notes that where a proposal is expected to change traffic patterns below 7,000 feet, the Secretary of State has specified that 'overflight' must be portrayed.

14.9.141 Using the CAA definition of overflight (see **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3)), an analysis of the areas overflown by the most common rapid climbing aircraft, the A319, has been undertaken for the main runway and the northern runway, using the mean departure profile for this aircraft. Figure 14.9.30 (Doc Ref. 5.2) shows the areas (in red) that would be routinely overflown by A319 departures from the northern runway but which are not overflown by departures from the main runway. Similarly Figure 14.9.30 (Doc Ref. 5.2) shows areas that are overflown by A319 departures from the main runway but not the northern runway (in blue).

14.9.142 Figure 14.9.30 (Doc Ref. 5.2) shows the areas (in red) that would be routinely newly overflown by the routine departures from the northern runway, as follows.

- To the east – an approximately 200 metre wide strip of land extending 6 km from the eastern edge of the airport as far as the point where departures using the KEN/SAM (Kenet/Sampton) SID route (Route 3) on the main runway and northern runways converge as they turn north.
- To the west – an approximately 200 metre wide strip of land extending 5 km from the western edge of the airport as far as the point where departures using the LAM/BIG/CLN/DVR SID route (Route 4) on the main runway and northern runways converge as they turn north. Beyond this, further west than the Route 4 northerly turn, the area extends a further 9 km as far as the where departing aircraft using the KEN/SAM (Route 1), HAR/BOG (Route 7) and SFD (Route 8) SID routes on the northern runways converge with those on the main runway as they turn south.

14.9.143 The area to be newly routinely overflown to the east crosses the A23 and mainly sparsely populated areas, apart from the area south of Smallfield which includes approximately 100 houses.

14.9.144 The area to be newly routinely overflown to the west crosses mainly sparsely populated areas, apart from approximately 10 properties on the Ifield Road and scattered properties beyond. West of the Route 4 turn the area crosses the village of Wallis Wood but in this area an A319 has typically reached a height of at least 4,500 feet.

14.9.145 This analysis is for a typical A319 aircraft. Other aircraft would climb at different rates and of course, aircraft disperse from the centreline modelled, but the analysis is intended to give an indication of size of the areas that experience overflight, within the CAA's definition of it, due to routine use of the northern runway. Figure 14.9.30 (Doc Ref. 5.2) also shows the areas to the south for which the movement of flights from the main runway to the northern runway in itself would lessen overflights.

14.9.146 Figures 14.6.7 to 14.6.9 (Doc Ref. 5.2) show the baseline modelling of overflights in 2019, with Figure 14.6.7 showing all flights within 35 miles of Gatwick below 7,000 feet above ground level. In Figure 14.9.31 (Doc Ref. 5.2) the number of Gatwick flights has been increased by 20% on the 2032 baseline while keeping all other baseline parameters (non-Gatwick flights and their airspace routings) the same. A shift of 8% of westerly Gatwick departures onto the currently little used WIZ (Route 9) SID has been applied for the 2032 baseline as this is expected to accommodate baseline growth by 2032.

14.9.147 This approach is to provide an indication of the scale of change brought by the Project purely in the terms of current cumulative overflights. Implementation of the Government's FASI-S programme would result in a different cumulative track density as a result of higher numbers of movements from other airports routing around London. There is insufficient information available at this time to assess this, and the FASI-S project will be assessing this in future and a decision on its implementation taken with that assessment taken into account. The 20% increase in flight movements equates to approximately the increase to summer season traffic in the future 2032 with the Project compared to the 2032 future baseline, (see **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3) for details).

14.9.148 Clearly under the arrivals and departure routes close to Gatwick the increase of 20% in Gatwick flights gives a 20% increase in total flights. In areas away from the extended runway centrelines, where Gatwick traffic is dispersed or where there are overflights from other airports as well as from Gatwick, this is not the case, for example over parts of Tunbridge Wells.

14.9.149 This overflights analysis has been used in the **ES Chapter 8: Landscape, Townscape and Visual Resources'** (Doc Ref. 5.1) assessment of tranquillity and in **ES Chapter 7: Historic Environment** (Doc Ref. 5.1) assessment of impacts on sensitive heritage assets, as reported with some further detail required for those assessments in Section 14.12 below.

Community Representative Locations

14.9.150 Figure 14.9.1 (Doc Ref. 5.2) shows the location of the following seven Community Representative Locations that were chosen to describe the air noise changes expected from the Project in more detail. This analysis uses a range of primary and secondary noise metrics, not for the purposes of assessing significance (which is discussed above), but for further information as to how the noise environment would change. In this section the changes expected at these locations for the noisier slower transition case are described. The equivalent information for the central case can be found in Section 5 of **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3).

- Rusper Primary School – in the centre of the village with a population of approximately 1,400, located 5 km to the west of the airport on the 2032 with Project $L_{eq, 16\ hour}$ day 51 dB contour.
- Charlwood Village Infant School – in the north of the village with a population of approximately 2,400, located 1 km to the north west of the airport near the 2032 with Project $L_{eq, 16\ hour}$ day 54 dB contour.
- Lingfield Primary School – near the centre of the village with a population of approximately 4,400, located 10 km to the east of the airport under the approach flight path and close to the eastern boundary of the 2032 with Project $L_{eq, 16\ hour}$ day 57 dB contour.
- Chiddingstone Church of England School – in the centre of the village of population approximately 1,300, located 22 km to the east of the airport near the 2032 with Project $L_{eq, 16\ hour}$ day 51 dB contour.
- Capel Pre School – in the east side of the village with a population of approximately 1,200, located 7.5 km to the west of the airport near the 2032 with Project $L_{eq, 16\ hour}$ day 54 dB contour.
- Willow Tree Pre-school, Ifield – on the north side of Ifield which is the northern district of Crawley, located 1.3 km to the south of the airport outside the 2032 with Project $L_{eq, 16\ hour}$ day 51 dB contour.
- Barnfield Care Home, Horley – within the residential area of Horley, located 600 m to the north of the airport just outside the 2032 with Project $L_{eq, 16\ hour}$ day 51 dB contour.

14.9.151 These seven locations represent approximately half of the population within the 2032 $L_{eq, 16\ hour}$ day 51 dB contour with the Project. **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3) provides 14 tables giving the full results of modelling for all noise metrics at each of these locations in the central and slow transition fleet cases. $L_{eq, 16\ hour}$ day, $L_{eq, 8\ hour}$ night, N65 day and N60 night levels are provided for easterly and westerly operating days, for 2019, the 2032 base case and the 2032 with Project case, to illustrate the changes in the noise environment that can be expected in each location. These tables are provided for the central case and the slower transition fleet case. The following sections summarise the changes in the noise environment that can be expected in 2032 with the Project, for the slower transition case, compared with the 2032 baseline and 2019 baseline in each of these areas. The discussion focuses on the changes that can be expected with the Project compared to without it in 2032 and is not repeated for the central case which has lower noise levels in both the Project and baseline cases, so the changes between the Project and baseline are broadly similar for the two different fleet cases. Each paragraph is intended to give more detail for stakeholders interested in noise impacts in that area or near to it.

Rusper Primary School

14.9.152 At Rusper Primary School, in 2032 the Project is predicted to increase average summer day L_{eq} noise levels by 0.2 dB for daytime and 0.4 dB for night-time compared to the 2032 base case, and to reduce by 0.2 dB for daytime and to increase by 0.1 dB for night-time compared to 2019. Situated to the west and offset from the arrivals route, this location has higher noise levels for westerly operations. On westerly operations the 2019 number of noise events above L_{max} 65 dB in the day was 26 and this is predicted to reduce slightly by 2032 to 21 in the baseline and 24 with the Project. On easterly operations, Rusper in 2019 had no L_{max} events above 65 dB in the day and this is not expected to change with the Project. On easterly operations, Rusper in 2019 had one L_{max} event above 60 dB in the night and this is expected to reduce to none with or without the Project. In the future Rusper would benefit from the gradual reduction in aircraft noise levels on

departure in the base case and the slight movement of some flights away from it with the Project in the daytime.

Charlwood Infant School

14.9.153 At Charlwood Infant School, in 2032 the Project is predicted to increase average summer day L_{eq} noise levels by 0.6 dB for daytime and 0.6 dB for night-time compared to the 2032 base case, and to result in daytime and night-time levels very similar to those in 2019 with a 0.1 dB reduction in daytime and no change at night. Situated to the north west of the airport, the village is exposed to noise from departures on westerlies, and noise from arrivals on easterlies. On westerly operations there were about 158 events above L_{max} 65 dB in the daytime in 2019. This is forecast to reduce in the future, in 2032, both in the base case, to 115, and with the Project, to 167. This is because aircraft are becoming quieter on departure, and the altered northern runway would not generally be used by the largest aircraft. On easterly operations there were about 23 events above L_{max} 65 dB in the daytime in 2019. This is forecast in 2032 in remain at 23 in the base case, and to increase to 58 with the Project to 7, as the number of arrivals on the main runway increases.

Lingfield Primary School

14.9.154 At Lingfield Primary School, in 2032 the Project is predicted to increase average summer day L_{eq} noise levels by 0.8 dB for daytime and 0.4 dB for night-time compared to the 2032 base case, and daytime noise levels are predicted to increase by 0.8 dB and night-time levels are predicted to decrease by 0.3 dB compared to 2019. Situated under the arrivals flight path to the east of the airport, noise levels are higher by about 5 dB L_{eq} on westerlies than easterlies. On westerly operations, there were about 286 events above L_{max} 65 dB in the daytime in 2019. This is forecast to increase in the future: in 2032 in the base case, to 306, and with the Project, to 370. On easterly operations there are roughly half as many events above L_{max} 65 dB compared to westerly operations and similar changes are predicted. At Lingfield and Chiddingstone, average summer day noise levels are dominated by arrivals noise because they are located to the east of the airport.

Chiddingstone Church of England School

14.9.155 At Chiddingstone Church of England School in 2032, the Project is predicted to increase average summer day L_{eq} noise levels by 0.8 dB for daytime and 0.3 dB for night-time compared to the 2032 base case, and daytime noise levels are predicted to increase by 0.9 dB and night-time levels to decrease by 0.3 dB compared to 2019. Situated under the arrivals swathe 22 km to the east of the airport, noise levels are higher by about 7 dB L_{eq}, on westerlies than easterlies. On easterly operations there are very few events above L_{max} 65 dB in the daytime, only one in 2019. On westerly operations there are currently about 38 events above L_{max} 60 dB in the night, and this is predicted remain unchanged with the Project in 2032 as opposed to dropping slightly to 36 in the 2032 base case.

Capel Pre-School

14.9.156 At Capel Pre-School in 2032, the Project is predicted to increase average summer day L_{eq} noise levels by 1.3 dB for daytime and 0.9 dB for night-time compared to the 2032 base case, and daytime and night-time levels are predicted to increase by 0.4 dB and 0.5 dB compared to 2019. Capel is situated to the west of the airport under a westerly departure route, and is offset from the arrivals route so this location has substantially higher noise levels for westerly operations. On

westerly operations in 2019 the number of noise events above L_{max} 65 dB in the day was 146 and this is predicted to increase to 163 by 2032 with the Project compared to a reduction to 127 in the 2032 base case. On easterly operations Capel in 2019 had no L_{max} events above 65 dB in the day or above L_{max} 60 dB at night, and this is not expected to change with the Project.

Willow Tree Pre-School, Ifield

14.9.157 At Willow Tree Pre-School, Ifield, in 2032, the Project is predicted to decrease average summer day L_{eq} noise levels by 0.6 dB for daytime and to increase them by 0.2 dB for night-time compared to the 2032 base case, and daytime and night-time levels are predicted to decrease by 1.4 dB and 0.4 dB compared to 2019. Situated to the south of the airport, the area is affected by arrivals from the west and departures to the west, and noise levels on easterly and westerly operations are similar. On westerly operations there were 11 events above L_{max} 65 dB in the daytime in 2019 and this is forecast to reduce to 9 in the 2032 baseline and 10 with the Project. On easterly operations similar changes are expected.

Barnfield Community Care Home, Horley

14.9.158 At Barnfield Community Care Home, Horley, in 2032, the Project is predicted to increase average summer day L_{eq} noise levels by 0.6 dB for daytime and 0.5 dB for night-time compared to the 2032 base case, and daytime and night-time levels are predicted to be very similar compared to 2019 with daytime noise levels unchanged and night time reducing by 0.1 dB. Situated to the north-east of the airport, the area is affected by arrivals from the east and departures along the runway to the west, and overall noise levels on easterly operations are about 3 dB higher than for westerly operations. The numbers of noise events above L_{max} 65 dB during the day on westerly operations was zero in 2019 and is not predicted to increase with the Project. On easterly operations in 2019 the number of noise events above L_{max} 65 dB in the day was 19, and this is predicted to increase to 84 by 2032 with the Project and to 22 in the base case. This location is also affected by ground noise from the airport and road traffic noise, as discussed elsewhere in this chapter, including in Section 14.11 (cumulative effects).

Noise Sensitive Buildings

14.9.159 Figure 14.9.32 (Doc Ref. 5.2) shows 50 noise sensitive community buildings taken from the 'PointX' (2018) database (see PointX.co.uk), which are predicted to be within the $L_{eq,\ 16\ hour}$ day 51 dB noise contour in 2032 with the Project in the central case. These comprise 21 schools, one hospital, 18 places of worship and 7 community buildings. Details of the predicted noise levels at each are provided in **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3) for the central and slower transition fleet cases. At 42 of these buildings noise levels are predicted to either decrease or increase by less than 1 dB, ie a negligible change, as a result of the Project compared to the 2032 baseline. The predicted noise increases above 1 dB are as follows:

- 4 Scott Broadwood C of E Infant School, RH5 5JX, +1.3 to 1.4 dB;
- 6 Capel Pre School, RH5 5JX, +1.2 to 1.3 dB;
- 25 Aurora Redehall School, RH6 9QA, +1.2 dB;
- 10 St John the Baptist's Church, Capel, RH5 7JY, +1.3 to 1.4 dB;
- 38 The Chapel, RH6 0DQ, +1.3 dB; and
- 19 Capel Village Hall, RH5 5LB, +1.2 to 1.3 dB.

14.9.160 There are two places of worship where the Project is predicted to reduce $L_{eq,\ 16\ hour}$ daytime noise levels:

- 48 St Michael and All Angels' Church, Crawley RH11 0PQ, -1.0 to -1.2 dB; and
- 15 Gurjar Hindu Union, Ifield, RH11 0AF, -1.0 to -1.2 dB.

14.9.161 These predicted increases and decreases may or may not result in increases or decreases in total noise levels at these buildings (or at the community representative locations as discussed above) depending on the level of noise from other ambient noise sources, in particular road traffic. In all cases the changes in aircraft noise are low and would result in **negligible or minor** effects, which would not be significant.

Further Mitigation

Noise Insulation Scheme

14.9.162 Since 2014, noise policy and the need for mitigation has been tested in the following successful applications for new airport infrastructure:

- Birmingham International Airport Runway Extension, 2014;
- London City Airport Development Plan, 2015-2016;
- Cranford Agreement Secretary of State's Decision, February 2017 (DCLG, 2017);
- Stansted Airport Planning Application and Appeal Decision, May 2021; and
- Bristol Airport Planning Appeal Decision, February 2022.

14.9.163 The main mitigation measure relied upon for homes affected by high noise levels was noise insulation. In the Birmingham case, properties above L_{eq} 63 dB were offered noise insulation, consistent with the Aviation Policy Framework, NPPF and NPSE requirement to 'avoid' significant adverse effects above SOAEL. Transport infrastructure projects (eg HS2 and Thames Tideway) have used noise insulation as a mitigation measure where necessary to comply with the 'avoid' requirement, and this has been accepted by the relevant competent authorities[20].

14.9.164 The most recent Government consultation document Aviation 2050 (Department for Transport, 2018b) proposes improvements to noise insulation schemes as follows:

Paragraph 3.121 '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.'

Paragraph 3.122 '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 63 dB $L_{Aeq,\ 16\ hour}$ contour to 60 dB $L_{Aeq,\ 16\ hour}$;
- 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;

[20] See also Cranford Appeal report, §1087 *"Against this background I consider that the proffered mitigation between SOAEL and UAEL* [Unacceptable Effects Level of 69 dBALeq] *is consistent with the APF and would be sufficient to avoid significant observed adverse effects."*

- the government or ICCAN to issue new guidance to airports on best practice for noise insulation schemes, to improve consistency; and
- for airspace changes which lead to significantly increased overflight, to set a new minimum threshold of an increase of 3 dB L_{Aeq}, which leaves a household in the 54 dB $L_{Aeq, 16\ hour}$ contour or above as a new eligibility criterion for assistance with noise insulation.'

14.9.165 The 2021 planning application for Stansted Airport included a three tier noise insulation scheme offering the greatest level of noise insulation for properties above $L_{Aeq\ 16\ hr}$ 66 dB, a mid level of protection in the range $L_{Aeq\ 16\ hr}$ 60 to 63 dB and a lower level of insulation package above $L_{Aeq\ 16\ hr}$ 57 dB.

14.9.166 The current Gatwick NIS is already based on a 60 dB L_{eq} contour. The extent of the scheme is shown as the red line in Figure 14.8.1 (Doc Ref. 5.2). It is based on a future $L_{eq, 16\ hour}$ 60 dB contour that was forecast in 2014, with 15 km extensions from under the runway centrelines, and adjusted to accommodate various residential areas. There are about 2,000 homes within this area of which about 1,120 have taken up the scheme (November 2022). Within this zone residents are entitled to £4,300 towards acoustic glazing and doors. Under the existing Noise Action Plan commitments GAL reviewed the scheme, and in May 2023 increased the sum offered from £3,000 to £4,300 within the same zone. The NIS developed for the Project has taken on board the results of this review.

14.9.167 An enhanced NIS would be introduced for the Project to replace the current scheme and to address expected increases in air noise, as set out in **ES Appendix 14.9.10: Noise Insulation Scheme** (Doc Ref. 5.3). The new scheme will offer additional mitigation for the housing already worst affected by noise, comprising two zones:

- Inner Zone; and
- Outer Zone.

14.9.168 A new NIS Inner Zone would offer the highest level of noise insulation sufficient to avoid noise levels above the SOAEL ($L_{eq, 16\ hour}$ 63 dB and $L_{eq, 8\ hour}$ 55 dB). The highest noise levels forecasts, for 2032, predict the following dimensions to these contours for the slower transition fleet case:

- $L_{eq, 16\ hour}$ day 63 dB: 13.9 km^2, approx. 600 people, 250 households; and
- $L_{eq, 8\ hour}$ night 55 dB: 20.7 km^2, approx.1,200 people, 400 households.

14.9.169 The NIS Inner Zone is formed by the larger of these, the $L_{eq, 8\ hour}$ night 55 dB contour, which fully encloses the $L_{eq, 16\ hour}$ day 63 dB contour. The NIS Inner Zone is shown as the black contour line in Figure 14.8.1 (Doc Ref. 5.2) for the slower transition fleet case. Residential properties within this zone would be offered noise insulation in the form of replacement acoustic glazing or internal secondary glazing to all windows, acoustic ventilators and blinds to noise sensitive rooms (bedrooms, sitting rooms, dining rooms and studies), and replacement doors to noise sensitive rooms if necessary. Additionally, the offer would include acoustic upgrading of bedroom ceilings where practicable if they are found to be allowing more noise intrusion than the closed acoustic glazing provided. Overall properties in this new Inner Zone would receive a significantly improved level of noise mitigation. The level of noise mitigation offered to homes in the new Inner Zone exceeds that of the current NIS and home owners who have taken up the current scheme would be entitled to upgrade to the new scheme. The Northern Runway NIS **ES Appendix 14.9.10: Noise Insulation Scheme** (Doc Ref. 5.3) provides further details of the scheme and how it would be administered. The noise insulation work would be carried out by GAL's contractor with the full

cost being paid up to a maximum of £20,000, that is expected to be sufficient to provide a full package of sound insulation.

14.9.170 A new NIS Outer Zone would be created for homes within the forecast $L_{eq,\ 16\ hour}$ 54 dB daytime noise contour in 2032. This noise level was chosen in view of the Government consultation document Aviation 2050 (Department for Transport, 2018b) and best practice at UK airports. The new Outer Zone is shown in blue in Figure 14.8.1 (Doc Ref. 5.2). This zone would be extended where necessary (eg along the extended runway centreline to the west) to ensure it includes all properties within the current scheme, as shown in Figure 14.8.1. Approximately 3,900 homes are predicted to be within this zone and outside the Inner Zone. In this zone noise levels are modelled below SOAEL and residents would be offered acoustic ventilators to noise sensitive rooms. This would allow windows to remain closed with ventilation, which, with modern double glazed windows, would increase the sound attenuation of the window by more than 10 dB. For properties with older single glazed windows with poor acoustic performance, double glazed windows would be offered to noise sensitive rooms in addition to ventilators to ensure equivalent levels of protection. All home owners who have taken up the current scheme would be entitled to upgrade to the new Outer Zone (or Inner Zone) scheme, including the addition on acoustic ventilators to help reduce internal noise levels by allowing windows to remain closed in hotter weather. **ES Appendix 14.9.10: Noise Insulation Scheme** (Doc Ref. 5.3) provides further details of the scheme. The appropriate package of measures will be developed and installed with GAL funding up to the following amounts, to be paid to the contractor appointed by GAL to carry out the works:

- $L_{eq\ 16\ hr}$ 54 to 57 dB £3,500
- $L_{eq\ 16\ hr}$ 57 to 60 dB £5,000
- $L_{eq\ 16\ hr}$ 60 to 63 dB £8,000

14.9.171 A schools NIS is proposed for all schools with noise sensitive teaching spaces within the forecast 2032 $L_{eq,\ 16\ hour}$ 51 dB noise contour. Where schools are concerned that aircraft noise could be affecting teaching, each classroom area would be surveyed to assess the effects of all types of noise including local road traffic. If noise insulation measures, such as improved glazing and acoustic air ventilation to reduce aircraft noise, would be practicable to implement, and would significantly improve the overall teaching conditions, then GAL would work with the school to deliver a suitable noise insulation package.

Home Owners Relocation Assistance Scheme

14.9.172 In order to offer home owners the option to move from the areas most affected by the highest noise levels, home owners within the $L_{eq,\ 16\ hour}$ 66 dB noise contour with the Project in operation would be offered a package to assist them in moving. The noise forecasts indicate about 100 homes in this noise zone in the noisiest year, 2032. The majority of these homes have already (2019) been above this noise level and we expect only a small number to consider taking up this offer.

Monitoring Performance

14.9.173 GAL reports its air noise management performance through a number of mechanisms including:

- quarterly and annual Flight Performance Team (FPT) reports that provide information on performance against noise control measures;
- live online NTK; and

- annual Noise Contour Reports.

14.9.174 In addition to the above reporting, GAL also regularly engages with stakeholders including airlines, air navigation service providers, local community groups, local authorities, Government bodies. This is done through various engagement forums such as the:

- Gatwick Airport Consultative Committee (GATCOM);
- GATCOM Steering Group;
- Noise and Track Monitoring Advisory Group (NaTMAG);
- Noise Management Board;
- Section 106 Steering Group; and
- The Gatwick Noise Monitoring Group.

14.9.175 Consultation with community noise groups through the Noise Management Board since 2017 has shown that those residents most affected by noise are keen to see not just monitoring of past or current performance but also forecasts of noise exposure in the near future. Community noise groups want certainty in how noise would change in the near term. There is good evidence, from the SONA study, that residents expecting an airport to become noisier in the future are more annoyed by the noise than those who expect it to become quieter. The research found that this expectation factor (referred to as a confounding factor) alone can change the proportion of a population highly annoyed by 30-50%. Working with community noise groups GAL agreed to develop a process by which the noise change associated with the growth of the airport could be forecast for the coming years, and reported, to help manage the expectations of local residents, and to forecast future noise management performance. The Project would take forward this process as described in the next section.

Noise Envelope

14.9.176 This section summarises the options considered and the noise envelope proposed for the Project. **ES Appendix 14.9.5: Air Noise Envelope Background** (Doc Ref. 5.3) provides further details of the options considered, and how the proposed envelope has been developed taking account of stakeholder inputs, and within the ICAO balanced approach as required under EU Regulation No 598/2014, as adopted in UK law. Full details of the Noise Envelope are provided in **ES Appendix 14.9.7: The Noise Envelope** (Doc Ref. 5.3)**.**

14.9.177 The Airports NPS (paragraph 5.60) requires Heathrow to put forward a 'noise envelope' for its third runway proposal:

'Such an envelope should be tailored to local priorities and include clear noise performance targets. As such, the design of the envelope should be defined in consultation with local communities and relevant stakeholders and take account of any independent guidance such as from the Independent Commission on Civil Aviation Noise. The benefits of future technological improvements should be shared between the applicant and its local communities, hence helping to achieve a balance between growth and noise reduction. Suitable review periods should be set in consultation with the parties mentioned above to ensure the noise envelope's framework remains relevant.'

14.9.178 In its **Scoping Opinion** (ES Appendix 6.2.2 (Doc Ref. 5.3)) for the Gatwick Northern Runway Project, the Planning Inspectorate stated:

'The Inspectorate notes that there is no reference to a defined 'noise envelope' as referred to in paragraph 5.60 of the Airports NPS, and the Applicant should make efforts to agree the need for such provisions with relevant consultation bodies as a mechanism to manage noise effects.'

14.9.179 CAP 1129 Noise Envelopes (CAA, 2013) gives guidance as to the forms that noise envelopes can take, and how they can be implemented. **ES Appendix 14.9.5: Air Noise Envelope Background** (Doc Ref. 5.3) discusses each of these options and its merits for this Project. This section briefly summarises the options available and describes the preferred options and the noise envelope that GAL proposes as most appropriate for the Project.

14.9.180 Noise envelopes for airports, as with noise conditions attached to planning consents for other types of noise generating development, can either restrict 'inputs' (eg, numbers of flights) or noise 'impacts' in some way. Night restrictions are an example of a noise envelope already in place that restricts inputs. In their case, the restrictions relate to numbers of night flights and total quota counts (QCs) of night flights, in the summer and winter seasons. Noise envelopes that restrict or limit inputs have the advantage of being relatively easy to predict and administer, but they do not give a direct measure or limit on the noise impact experienced in the communities around the airport. Neither do they provide any incentive for the airport or airlines to bring forward quieter operating procedures, ie ways to fly aircraft into and out of the airport in ways that cause less disturbance. Following undertaking the review described in **ES Appendix 14.9.5: Air Noise Envelope Background** (Doc Ref. 5.3), and as a result of stakeholder consultation GAL has decided that the choice of noise metric should reflect the noise impact.

14.9.181 Noise envelopes that restrict noise impacts can be set in terms of the extent of noise effects eg Schiphol Airport has limits of populations highly annoyed and populations sleep disturbed. However, these rely on applying dose/response relationships for the effects, which can generate uncertainty.

14.9.182 More commonly, noise envelopes that restrict noise impacts use noise contours to either limit the area of the contour or the population within it. $L_{eq,\ 16\ hour}$ day or $L_{eq,\ 8\ hour}$ night contours are the most common contours used because, although communities can feel they do not reflect their experience on noise, the relationships between $L_{eq,}$ noise levels and annoyance and sleep disturbance in the UK are well established compared to other metrics, ensuring the contour metric relates to the impact. Noise event metrics such as L_{max} are less effective, because, taking no allowance for numbers of noise events, they are not good indicators of health effects when used in isolation, and provide no certainty on the numbers of events.

14.9.183 Whilst setting a noise envelope in terms of the population within a given noise contour, such as $L_{eq,\ 16\ hour}$ day or $L_{eq,\ 8\ hour}$ night, has the advantage that it directly relates to the noise impact on the community, the population within the area around Gatwick is not within the airport's control and a contour limit set on this basis could not be monitored or applied with certainty.

14.9.184 Using the physical size of the $L_{eq,\ 16\ hour}$ day or $L_{eq,\ 8\ hour}$ night contours is therefore considered to be the most appropriate option. A contour which fixes the maximum noise footprint of the airport would limit the throughput of the airport, unless quieter planes can be encouraged to operate. It would incentivise the airport to encourage airlines to use the quietest aircraft and quietest operating procedures to meet it, whilst allowing growth to occur within a clear noise limit. It would also provide local communities with certainty on future noise levels.

14.9.185 GAL proposes a noise envelope, therefore, that sets limits in terms of the areas of the daytime LOAEL contour $L_{eq,\ 16\ hour}$ day 51 dB, and the night-time LOAEL contour $L_{eq,\ 8\ hour}$ night 45 dB. The LOAEL contours have been chosen because they represent the lowest level of observable adverse effects during the day and night, and can be modelled with reasonable accuracy so as to provide forecasts of future performance.

14.9.186 The limiting $L_{eq,\ 16\ hour}$ day and $L_{eq,\ 8\ hour}$ night contour areas are proposed with reference to the forecast noise impacts reported in this ES, taking account of operating and other measures to limit noise[21].

14.9.187 The noise assessment reporting in this chapter has reported the most likely noise impacts based on the central case fleet ATM forecasts, as discussed in Section 14.5. The 'central case' used in the noise assessment is based on what was considered before the COVID-19 pandemic to be the most likely rate of fleet transition. However, there is uncertainty around this, particularly at the current time due to the effect of the global pandemic and the financial impact on the airlines. The noise assessment in this chapter also reports the noise impacts associated with a slower transition fleet that supposes the rate of fleet transition is delayed by about five years, particularly owing to uncertainties due to COVID. Whilst the central case fleet was considered most likely to occur, the slower transition fleet could still occur and therefore the noise envelope proposed is based on the noise modelling of this fleet. **ES Appendix 14.9.5: Air Noise Envelope Background** (Doc Ref. 5.3) discusses details of the slower transition fleet and the proportions of the quieter next generation aircraft that it expects in the future years used in the noise assessment. The slower transition fleet still builds in assumptions that the noisiest aircraft currently flying at Gatwick are phased out by the point the northern runway opens and that substantial investment in next generation aircraft will occur. For example, in 2019, around 2% of the Gatwick fleet did not meet the ICAO Chapter 4 noise standard, however, these aircraft produce the highest individual noise levels and make a disproportionate contribution to the contour areas. Therefore, the expected removal by airlines of a proportion of these aircraft will deliver a significant improvement in the noise environment.

14.9.188 The noise assessment has considered noise levels from the Project in 2029, 2032, 2038 and 2047 and demonstrated that for the central case the day and night noise contour areas would decrease relative to the 2019 airport in all successive assessment years with the Project. The effect of the Project on opening in 2029 is to increase the noise levels relative to the future baseline, with maximum contour areas about three years later in 2032, before dropping in 2038, the design year for the runway, when 382,000 commercial ATMs/year would be operating. GAL proposes to set the noise envelope to limit noise levels between opening of the northern runway and the peak noise year and then to set a lower noise envelope limit to provide certainty that noise levels would reduce when the runway design throughput of 382,000 ATMs/year is reached in 2038 and beyond.

14.9.189 Regulation EU 598/2014 seeks to ensure that 'noise related operating restrictions' are only imposed when other measures within the balanced approach have first been considered, and where those other measures are not in themselves sufficient to attain the specific noise

[21] This is consistent with the approach approved by the Planning Inspectors for the Stansted planning application appeal (ref: APP/C1570/W/20/3256619) in May 2021, which consented the expansion of the airport with planning conditions that included limits on the areas of the $L_{eq,\ 16\ hour}$ day and $L_{eq,\ 8\ hour}$ night contour areas (albeit at higher noise levels of $L_{eq,\ 16\ hour}$ day 54 dB, and $L_{eq,\ 8\ hour}$ night 48 dB) based on the forecasts used in the Environmental Statement that accompanied the application.

abatement objectives for the airport. It has been assumed that the proposed noise envelope could become a noise related operating restriction under the Regulation.

14.9.190 GAL propose the following noise objective for the Project, that is unchanged from that proposed in the PEIR:

- The Project will:
  - avoid significant adverse impacts on health and quality of life from noise;
  - mitigate and minimise adverse impacts on health and quality of life from noise;
  - where possible, contribute to improvements to health and quality of life; and
  - provide certainty to the communities around Gatwick that noise will not exceed contour limits and will reduce over time, consistent with the ICAO Balanced Approach.

14.9.191 **ES Appendix 14.9.5: Air Noise Envelope Background** (Doc Ref. 5.3) gives further details on the application of Regulation EU 598/2014. The proposed noise envelope limits are as set out below.

14.9.192 By the end of the first year after opening of the reconfigured northern runway pursuant to the Project, the area enclosed by the 92 day summer season average mode noise contours shall not exceed the following:

- $L_{eq\ 16\ hour}$ day 51 dB: 146.7 km^2; and
- $L_{eq\ 8\ hour}$ night 45 dB: 157.4 km^2.

14.9.193 Nine years after the opening of the reconfigured northern runway pursuant to the Project or by the end of the year when annual commercial ATMs reach 382,000 (whichever is the sooner), the area enclosed by the 92 day summer season average mode noise contours shall not exceed the following:

- $L_{eq\ 16\ hour}$ day 51 dB: 125.7 km^2; and
- $L_{eq\ 8\ hour}$ night 45 dB: 136.1 km^2.

14.9.194 Whilst the air traffic forecasts used in the ES for the early years of operation are considered a reliable and robust basis for the noise envelope limits, projections for the longer term are inevitably less reliable. For this reason, the noise envelope limits are to be set for the first 14 years after opening within the DCO, to provide sufficient certainty of what will be achieved in the initial operating period, and every 5 years thereafter the limits will be subject to a review and where appropriate revised. This will ensure the noise envelope remains current, being based on up to date reliable forecasting data. The process for submitting and approving the review is described in ES Appendix 14.9.7: The Noise Envelope (Doc Ref 5.3).

14.9.195 The area of the L_{eq} day and night contours would not exceed the limits above, and the noise envelope would provide certainty to the community that noise levels would be limited as the airport grows.

14.9.196 In consultation with airline, local authority and community group stakeholders GAL has developed a set of processes for forecasting and reporting performance within the noise envelope and to allow its limits to be reviewed, subject to independent scrutiny. Details of that consultation can we found in **ES Appendix 14.9.9: Report on Engagement on the Noise Envelope** (Doc Ref

5.3.). The processes developed to manage compliance within the noise envelope are provided in **ES Appendix 14.9.7: The Noise Envelope** (Doc Ref 5.3) and summarised below.

14.9.197 Consultees, in particular those who feel L_{eq} noise metrics do not reflect their experience of aircraft noise, were keen to use additional noise metrics. The following supplementary noise metrics are included within the noise envelope. These do not have limits, but are to be reported annually to provide further information on noise exposure, to track performance, and help pre-empt non-compliance in years ahead. Further details are provided in the Noise Envelope.

- Airport Fleet Average Aircraft Noise L_{max} dB;
- N65 Day 20 contour area;
- N60 Night 10 contour area;
- $L_{eq,\ 16\ hour}$ day 51 dB contour population;
- $L_{eq,\ 8\ hour}$ night 45 dB contour population;
- $L_{eq,\ 16\ hour}$ day 63 dB contour area;
- $L_{eq,\ 8\ hour}$ night 55 dB contour area;
- Annual $L_{eq,\ 16\ hour}$ day 51 dB contour area; and
- Annual $L_{eq,\ 8\ hour}$ night 45 dB contour area.

14.9.198 In order to meet the objective of providing certainty on future noise levels, GAL will report compliance annually, and also forecast noise levels 5 years ahead to demonstrate expected compliance with the noise limits in the future. All noise metrics will be reported, and the annual monitoring report will be submitted to the CAA who will provide scrutiny of the report at Independent Reviewer. The report will then only be approved when it shows that the forecasts will comply with the noise envelope limits. The process for submitting and approving the annual monitoring report with the Independent Reviewer is described in the Noise Envelope.

Residual Air Noise Effects

14.9.199 All residential properties forecast to be within the $L_{eq\ 16\ hour}$ day 63 dB or $L_{eq,\ 8\ hour}$ night 55 dB slower transition fleet contour would be eligible for full noise insulation under the new NIS Inner Zone, to mitigate the predicted significant effects. The extent of the NIS is shown in Figure 14.8.1 (Doc Ref. 5.2). All the properties at which adverse significant effects are predicted (approximately 80 properties, 210 people, described above) are within this NIS Inner Zone so would be eligible. At these properties increases in daytime noise levels of greater than $L_{eq\ 16\ hour}$ 1 dB (see Figure 14.9.5 (Doc Ref. 5.2)) are expected above SOAEL. Noise insulation would avoid noise impacts indoors, including sleep disturbance and disturbance to noise sensitive activities during the day such as working, reading etc, and is consistent with policy for the first aim of the NPSE to avoid significant effects on health and quality of life. Noise insulation would not reduce noise levels outside, so some disturbance in outside activities is likely for properties with outside space, such as gardens or balconies, and significant **moderate adverse effects** are expected in this area.

14.9.200 Approximately 5,100 to 6,900 people are expected to experience noise increases in $L_{eq\ 16\ hr}$ day of 1-3 dB below SOAEL and **minor adverse effects** that are not considered significant. The majority of these would be offered noise insulation within the NIS outer zone which would help to reduce noise levels indoors and reduce these noise impacts.

14.9.201 No effects rated as substantial are expected.

Ground Noise

Leq Noise Levels

14.9.202 **ES Appendix 14.9.3: Ground Noise Modelling** (Doc Ref. 5.3) gives details of how ground noise has been predicted at 43 representative noise assessment locations surrounding the airport (listed in Table 5.1.1 within Appendix 14.9.3). These assessment locations have been grouped into 12 distinct assessment areas and, for the purposes of simplifying the reporting of the assessment, only the predicted noise levels from the worst-affected assessment location within each assessment area has been reported here. Full results at all of the 43 assessment locations can be found at Section 5.4 of **ES Appendix 14.9.3: Ground Noise Modelling** (Doc Ref. 5.3) with results for the interim assessment year (2032) detailed in Table 5.4.2 in that section. The ground noise assessment was based on the central case fleet forecasts and unlike air noise it was not necessary to also model the slower transition fleet. This is partly because the differences would be small (1-2 dB) and impacts are assessed in terms the change in noise and against total ambient noise, which is dominated by road traffic noise that is unaffected by the rate or aircraft fleet transition. Further details are provided in Section 4 of **ES Appendix 14.9.3: Ground Noise Modelling** (Doc Ref. 5.3).

14.9.203 As part of the Project, mitigation for aircraft generated ground noise in the form of noise barriers and bunds has been proposed and has been included in the predicted ground noise levels that are presented in Table 14.9.13, with the difference between the predicted levels and the 2032 baseline shown in Table 14.9.14 along with the worst case magnitude of change impact. Day and night periods are modelled and reported separately, as are noise levels when flights are towards the west (westerly operation – runway 26) and when flights are towards the east (easterly operations – runway 08).

Table 14.9.13: Summary of 2032 Ground Noise Predicted Levels including Mitigation (dB)

Descriptor	Assessment Area ($L_{Aeq,\,T}$ dB)											
	Outer Charlwood (1)	Charlwood (2)	Charlwood Road (3)	Farmfield (4)	Povey Cross (5)	Longbridge Road, Horley (6)	Riverside, Horley (7)	Bonnetts Lane (8)	Lowfield Heath (9)	Rowley Farm (10)	Balcombe Road (11)	Tinsley Green (12)
2032 – Runway 26 Daytime	48	50	58	53	55	56	59	60	65	59	54	49
2032 – Runway 26 Night	46	48	54	53	55	54	55	54	60	60	51	49
2032 – Runway 08 Daytime	55	64	58	54	55	51	50	60	64	62	44	46
2032 – Runway 08 Night	49	58	52	49	51	47	47	56	61	60	41	43

Table 14.9.14: Summary of 2032 Ground Noise Predicted Levels including Mitigation versus 2032 Baseline, Differences (dB)

Descriptor	Assessment Area (Difference in $L_{Aeq, T}$ dB)											
	Outer Charlwood (1)	Charlwood (2)	Charlwood Road (3)	Farmfield (4)	Povey Cross (5)	Longbridge Road, Horley (6)	Riverside, Horley (7)	Bonnetts Lane (8)	**Lowfield Heath (9)**	Rowley Farm (10)	Balcombe Road (11)	Tinsley Green (12)
2032 – Runway 26 Daytime	1	1	6	2	2	1	1	6	3	1	1	1
2032 – Runway 26 Night	-1	0	5	4	4	3	1	1	2	4	2	3
2032 – Runway 08 Daytime	1	4	1	1	1	1	0	-1	1	2	1	1
2032 – Runway 08 Night	-2	3	-1	0	-1	0	-1	-2	1	3	0	1
Magnitude of change impact (worst case)	High impact in areas (3) and (8);											
	Medium impact in areas (2), (4), (5), (6), (10) and (12);											
	Low impact at (7), (9) and (11).											
	At all other the remaining locations (1) the impact is negligible											

14.9.204 Table 14.9.13 indicates that Lowfield Heath and Charlwood are the only areas where ground noise levels are predicted to be above the SOAEL during the day ($L_{eq\ 16\ hr}$ 63 dB). At night, Charlwood, Lowfield Heath and Rowley Farm all have predicted ground noise levels above the SOAEL ($L_{eq\ 8\ hr}$ 55 dB). Analysis of the noise model indicates that, as represented by these assessment areas, there are likely to be approximately 13 NSRs above the SOAEL during the daytime and 16 during the night.

14.9.205 This assessment also considers the results of modelling L_{max} noise levels, discussed in the following section. The significance of the effect at the worst-case location within each of the assessment areas is then described in the relevant sections that follow the section on L_{max} noise levels along with the effects across the whole of each assessment area.

14.9.206 The acoustic screening effect of residential buildings has been included in the model since the PEIR in order to provide more accurate predicted noise levels. The predicted levels have been conservatively corrected for average wind direction and wind speed noise propagation conditions

as detailed in **ES Appendix 14.9.3: Ground Noise Modelling** (Doc Ref. 5.3). Therefore, the assessment results presented are for typical wind conditions but are still worst-case.

Maximum Noise Levels

14.9.207 Maximum noise levels (L_{max}) generated by aircraft in the noise model depend on the aircraft types included in the model, the relative locations of aircraft in relation to receptor locations and the presence of any barriers affecting the propagation. Varying air traffic forecast numbers does not affect the maximum noise levels that might be experienced at a particular location when a particular aircraft is at the closest position on the closest taxiway. For this reason, the calculated maximum levels for the baseline and with Project scenarios are the same for all design years and scenarios, although the numbers of noise events at these levels generally will change, as discussed below.

14.9.208 The results of the predicted maximum levels of aircraft taxi noise, for the baseline and with Project cases, arising at worst-case NSRs in each assessment area are shown in Table 14.9.15. Predicted maximum levels are calculated across both day and night periods for the baseline and with project cases because taxiing routes are different in some areas.

Table 14.9.15: Summary of 2032 Ground Noise Predicted Maximum Levels (dB L_{max})

Descriptor	Predicted L_{max} at worst-case location for each assessment area											
	Outer Charlwood (1)	Charlwood (2)	Charlwood Road (3)	Farmfield (4)	Povey Cross (5)	Longbridge Road, Horley (6)	Riverside, Horley (7)	Bonnets Lane (8)	Lowfield Heath (9)	Rowley Farm (10)	Balcombe Road (11)	Tinsley Green (12)
Baseline – 26 Day	61	61	66	59	64	63	68	66	74	66	59	55
With Project – 26 Day	55	58	68	58	64	63	71	69	74	67	59	55
Baseline – 08 Day	61	70	66	63	67	62	60	72	71	70	52	53
With Project – 08 Day	61	70	67	64	67	62	62	70	74	70	51	50
Baseline – 26 Night	61	64	62	60	66	64	68	68	71	67	59	56
With Project – 26 Night	58	60	64	63	66	65	71	69	74	71	59	57
Baseline – 08 Night	61	70	66	63	67	63	63	73	71	71	54	54
With Project – 08 Night	60	72	66	64	67	63	66	73	74	71	53	52

14.9.209 The predictions show that the maximum noise levels occurring for the baseline and with Project cases have the potential to exceed the 65 and 60 dB L_{max} criteria.

14.9.210 The importance of these L_{max} events depends on the number of events above the criteria and the relative change in number of events over the baseline conditions. The number of maximum noise level events exceeding the 65 and 60 dB L_{max} day and night criteria, for each scenario, are summarised in Table 14.9.16.

Table 14.9.16: Summary of 2032 Baseline and With Project Aircraft Taxiing Events Exceeding L_{max} Criteria

Descriptor	Total number of L_{max} events											
	Outer Charlwood (1)	Charlwood (2)	Charlwood Road (3)	Farmfield (4)	Povey Cross (5)	Longbridge Road, Horley (6)	Riverside, Horley (7)	Bonnetts Lane (8)	Lowfield Heath (9)	Rowley Farm (10)	Balcombe Road (11)	Tinsley Green (12)
Baseline – 26 Day (>65 dB)	0	0	1	0	0	0	8	1	125	7	0	0
With Project – 26 Day (>65 dB)	0	0	6	0	0	0	21	59	200	3	0	0
Baseline – 08 Day (>65 dB)	0	62	0	0	23	0	0	45	218	26	0	0
With Project – 08 Day (>65 dB)	0	148	47	0	24	0	0	8	324	97	0	0
Baseline – 26 Night (>60 dB)	0	4	7	0	10	1	6	39	167	74	0	0
With Project – 26 Night (>60 dB)	0	0	29	8	29	17	22	46	309	194	0	0
Baseline – 08 Night (>60 dB)	0	28	27	10	11	1	0	73	153	80	0	0
With Project – 08 Night (>60 dB)	0	56	3	8	10	3	0	44	211	93	0	0

14.9.212 During the night, the maximum number of noise events over 60 dB L_{max} would be 309, which is predicted to occur at the worst-affected location in Lowfield Heath (St Michael & All Angels Church) under westerly operations, an increase in the number of events of 142 over the 2032 future baseline scenario. The number of events during the night at other locations where the number of events is predicted to increase is generally in the region of 10 - 30 except for Rowley Farm which has an increase of 120 over the baseline scenario. The biggest increases in the number of events over 60 dB L_{max} during the night occur for westerly (26) operations in the Lowfield heath and Rowley Farm assessment areas.

14.9.213 During the daytime, the maximum number of noise events over 65 dB L_{max} threshold is predicted to be 324, which occurs during easterly operation at the worst-affected location in the Lowfield Heath receptor area. This is an increase in the number of events of 106 over the 2032 baseline scenario. A similar (and comparable) magnitude of change is also seen in the Charlwood receptor area (Westfield Place) where the with-Project scenario brings maximum noise levels above the 65 dB L_{max} daytime threshold.

14.9.214 Maximum noise levels generated by engine ground running (EGR) have been predicted based on current operational procedures and proposed operational procedures, which do not vary significantly apart from the potential number of engine ground run tests. EGR testing takes place at one of four fixed locations on the airport apron including at the eastern and western ends of Taxiway Juliet, on Taxiway Yankee and on the northern runway, as shown in Figure 5.2.1 (Doc Ref. 5.2). Logs of EGR tests indicate that testing times can vary considerably but that longer tests can take up to an hour or so to complete. However, analysis of EGR noise measurements shows that peak levels when engines are run at up to 70% of full power usually only last a couple of

minutes and that for the majority of the time noise levels are considerably lower. The predicted noise levels with the Project indicate that levels would potentially exceed the 65 dB L_{max} threshold at 16 of the 43 representative locations that have been assessed and that this is no different to noise levels experienced from this source under the current operational procedures. The predictions also indicate that the highest noise level that could be expected from engine testing would be unlikely to exceed 82 dB L_{max}, which is 8 dB higher than the maximum levels produced by taxiing aircraft. EGRs are controlled closely by the airport. Analysis of data shows that runs generally occur during the operational day and that there are rarely more than two L_{max} events generated from this noise source per day. Current records show that there were fewer than 200 EGR tests in 2018 and it is predicted that there would be up to 267 EGR tests by 2038 with the Project, so there would be a number of days per year where no EGR tests would be taking place at all.

14.9.215 The Northern Runway Project will require a minor change in how EGRs are managed as the current procedures primarily use a location known as Block 38S (which is located in the middle of the northern runway just below taxiway Sierra) and with the project this will not be possible. The current location is the most central and generally furthest from NSRs outside the airport boundary which means that it typically produces the lowest predicted noise levels. This location will be replaced with two alternative locations just to the north of it on taxiway Juliet (which of the two locations is used will depend on the mode of operation since taxiing aircraft will still have to use the Juliet taxiway). For planned EGR testing, the intention will be to use these replacement locations on taxiway Juliet wherever possible, to minimising use of the western end of Taxiway Juliet and Taxiway Yankee so as to minimise the noise generated at locations outside the airport boundary in line with the current operational procedures. The noise assessment assumes conservatively that 50% of EGRs will take place at the central Juliet Taxiway location with 10% at the west end of the Juliet taxiway and the remainder at the east end of the aircraft at the Yankee or Alpha 2 taxiway. Full results of predicted noise levels are given in **ES Appendix 14.9.3: Ground Noise Modelling** (Doc Ref. 5.3).

14.9.216 The assessment location where noise from EGR is predicted to reach 82 dB L_{max}, is Rowley Cottages which is adjacent to a dual carriageway and will be likely to experience maximum noise levels due to car pass-bys which are in the region of 80 dB L_{max}. In the context of the predicted noise levels from taxiing aircraft and existing road traffic noise, EGR is considered to generate a negligible effect. Details of the EGR predictions are included within **ES Appendix 14.9.3: Ground Noise Modelling** (Doc Ref. 5.3) which includes tables of results and information on the source data.

14.9.217 Maximum noise levels generated by APU operation on stands have been predicted, which indicate that levels would not exceed 60 dB L_{max} at any of the assessment locations. Tables of predicted maximum noise levels due to APU operation at each assessment location are included at **ES Appendix 14.9.3: Ground Noise Modelling** (Doc Ref. 5.3).

14.9.218 Internal (GAL) airport reports indicate that APUs are very rarely used on stand and that this occurs less than 3% of the time based on survey information. Forecast traffic data for 2032 indicate that 479 arrivals could be expected in a 24-hour period and, assuming that 3% of these were to use an APU, this would result in fewer than 14 instances of APU usage. Unless this was a result of certain stands with faulty power units, it would be unlikely that all of these events would occur on the same stand and therefore would be unlikely to generate more than 2 or 3 L_{max}

events at a particular property. However, if APUs are in use on stands during turnaround of an aircraft, the maximum noise levels could be present for up to an hour at a time.

14.9.219 In order to allow for a small number of Category F size aircraft under dual runway operation, EATs have been incorporated into the design. The EATs have not been integrated into the main aircraft taxi noise model because the forecast number of category F aircraft is so low that adding these specific routes in would have less than 1 dB of an effect on day and night L_{eq} levels at all but one location. The only location which is affected by more than 1 dB L_{eq} through the inclusion of EATs (under westerly operation) is Westfield Place located adjacent to the end of the northern runway, within the Charlwood assessment area. The maximum noise levels (L_{max}) generated by the proposed EAT usage would be 2 to 4 dB higher than the currently modelled development case at two locations within the Bonnetts Lane assessment area (Amberley fields Campsite and Westfield House). However, there would be very little change to the predicted numbers of events above the L_{max} criteria since in the 2032 year, there are only forecast to be 7-8 Category F movements per day and this is no different between the baseline and with Project case.

Assessment of Impacts

14.9.220 The following sections summarise the resulting assessment of effects for each assessment area. A more detailed assessment which discusses the predicted noise levels and the derivation of likely effects in each assessment area is provided at Section 8 of **ES Appendix 14.9.3: Ground Noise Modelling** (Doc Ref. 5.3).

1. Outer Charlwood

14.9.221 The Outer Charlwood assessment area contains 281 properties, representing the parts of Charlwood village that are further than approximately 75 – 100 m of the roads though the village. The properties in this area typically receive lower levels of road traffic noise, but the area excludes the properties on Lowfield Heath Road and Charlwood Road that are closest to the airport and less screened from the airport by other properties (these are in the Charlwood area discussed in the following section). For this reason, worst-case predicted noise levels in this area are 2-10 dB lower than they are for the closest properties in the Charlwood assessment area. The predicted noise impacts result in **negligible effects** at all 281 properties during the day and night under both easterly and westerly conditions. This represents a beneficial change from the effects predicted in the PEIR and it is due to the updated mitigation which includes changes to the location of the proposed noise barrier along with additional bunding in the Museum Field.

2. Charlwood

14.9.222 The Charlwood assessment area is representative of 219 properties in the vicinity of the roads through the village where road traffic elevates ambient noise levels. Without further mitigation **major adverse significant effects** apply to two properties outside the main part of the village at the extents of this assessment area that are nearest to the airport, during the night and this is predominantly under easterly operation. For one of these two worst-affected properties it is considered that medium changes resulting in a **minor adverse** effect would apply during the day which is not significant. Impacts during the day and night are significantly lower at the remaining 217 properties in this area and it is considered that the during the night hours there is a potential for **minor adverse** effects at 40 properties and negligible effects elsewhere. Further mitigation though the NIS is discussed below.

3. Charlwood Road

14.9.223 This area represents 41 properties, and without further mitigation **major adverse significant effects** are predicted at up to 8 of these receptors under easterly and westerly operations during the night-time. Impacts are lower at the remaining 33 properties in this area and resulting effects are considered to be negligible for these properties. During the day the number of properties significantly affected reduces from 8 down to 5 due to increased levels of road traffic noise relative to ground noise. Further mitigation though the NIS is discussed below.

14.9.224 This area includes the Bear and Bunny nursery. Consultation with the nursery including a site visit indicated that the nursery is for infants and is not particularly sensitive to noise from the airport. It has also been confirmed that the nursery is only in use during the daytime and that nobody is living there so that potential effects during the night hours are not relevant. Changes of 2 – 4 dB between the baseline and development scenario are predicted during the day resulting in a low to medium magnitude of impact. The highest noise levels predicted at the nursery with the Project are $L_{eq\ 16\ hr}$ day 54 to 55 dB. Given that the property has been identified as having relatively low sensitive to noise, ground noise is considered to result in a **negligible adverse** effect at this receptor.

4. Farmfield

14.9.225 This area is representative of 11 properties to the north of Charlwood Road that experience a quieter noise environment than those represented by the Charlwood Road assessment area. There is a **minor adverse effect** during the night at one receptor in this area and the effects at all other receptors during the night are considered to be negligible. During the day there is a **negligible effect** at all receptors in this area.

5. Povey Cross

14.9.226 This area is representative of 279 properties, and without further mitigation **moderate adverse significant effects** have been identified for up to 10 of these properties, south of Povey Cross Road, during the night. During the day, **minor adverse effects** are identified for the same 10 properties. For the remaining 269 properties, negligible effects are anticipated due to relatively small changes and existing levels of road traffic noise. Further mitigation though the NIS is discussed below.

6. Longbridge Road, Horley

14.9.227 This location is representative of 591 properties with the A23 between the residential area and the airport. **Minor adverse effects** are predicted at up to 66 of these properties during the night (there are fewer than this during the day). For the remaining properties, predicted noise levels are 1 – 4 dB lower than at the worst affected properties. The effects at these remaining properties reduce in relation to the existing road traffic noise and become a **negligible effect** during both the day and night.

7. Riverside, Horley

14.9.228 This assessment area is representative of 843 properties with the A23 between the residential area and the airport. **Minor adverse effects** are predicted at 220 residential properties in the vicinity of the worst-affected locations. During the day the impacts reduce, and under easterly conditions predicted noise levels are 8-9 dB lower than under westerly conditions, resulting in **negligible effects** at the remaining 623 properties.

8. Bonnetts Lane

14.9.229 Bonnetts Lane is representative of 66 properties, and as a worst-case a **minor adverse** effect is considered to apply at up to 3 properties under easterly conditions and up to 30 properties under westerly operation. For the remaining properties a **negligible adverse** effect is predicted.

9. Lowfield Heath

14.9.230 This assessment area lies immediately south of the airport and is representative of 60 properties, and without further mitigation the identified **major adverse significant** effects are likely to apply at up to 10 of these properties. Further mitigation though the NIS is discussed below.

10. Rowley Farm

14.9.231 This location is representative of 9 properties, and without further mitigation the identified **moderate adverse significant** effects during the night and **minor adverse** effects during the day are likely to apply to 7 of the properties in this area. Further mitigation though the NIS is discussed below.

11. Balcombe Road

14.9.232 This location is representative of 382 properties, and **minor adverse** effects have been identified for up to 70 properties in this area during the night under westerly operations. For the remaining 312 properties the effect is considered to be **negligible** for daytime and under easterly operation during the night.

12. Tinsley Green

14.9.233 This location is representative of 494 properties, and **minor adverse** effects have been identified in relation to night time westerly operation at a maximum of 290 of the properties in this area. For all remaining properties this identified impact is lower and is considered to be **negligible**.

Further Mitigation

14.9.234 The majority of the NSRs around the airport perimeter that may be adversely impacted by ground noise are within the areas covered by the current or proposed NIS, as shown in Figure 14.8.1 (Doc Ref. 5.2). The noise insulation available would reduce noise levels inside properties to help to mitigate the predicted impacts.

14.9.235 The same improved package of noise insulation will be offered to properties for which ground noise levels exceed the same qualifying Inner Zone noise levels, so that significant effects on heath and quality of life are avoided. For any properties outside the air noise NIS Inner Zone boundary future eligibility will be established on the basis of measurements of levels of ground noise carried out after the Project is operating. The areas where this is possible are mainly to the north (Oakfield Cottages) and to the south of the airport (Lowfield Heath) where the air noise NIS Inner Zone runs close to or inside the airfield. If ground noise is assessed through measurement after opening, the cumulative noise levels from ground noise and air noise will be considered in assessing eligibility for the Inner Zone NIS.

Residual Ground Noise Effects

14.9.236 The assessment has considered L_{max} and L_{eq} noise modelling results and has shown the contributions of maximum noise levels from APU, EGR and EAT usage are either negligible or occur infrequently enough that they are insignificant in comparison to taxiing aircraft.

14.9.237 For daytime, the results show predicted ground noise effects would not be significant (negligible or minor) at 9 of the representative receptor areas studied with moderate adverse effects within three receptor areas during the day. The effects rated as moderate are considered significant and these are predicted in the Charlwood Road, Lowfield Heath and Rowley Farm assessment areas, covering up to 22 properties of the 3,176 properties considered in these assessment areas.

14.9.238 For night-time the results show predicted ground noise effects would not be significant (negligible or minor) within seven of the representative receptor areas studied, with significant adverse effects within five receptor areas during the night. The significant effects, rated as moderate or major, are predicted in the Charlwood, Charlwood Road, Povey Cross, Lowfield Heath and Rowley Farm assessment areas, covering up to 37 properties of the 3,176 properties considered in these assessment areas.

14.9.239 There are 20 properties, 2 in the Charlwood receptor area, 8 on Charlwood Road, and 10 in the Lowfield Heath receptor area, where the effects are rated as major above SOAEL. For these the NIS inner zone insulation package would avoid noise impacts indoors, including sleep disturbance and disturbance to noise sensitive activities during the day such as working, reading etc. This is consistent with policy for the first aim of the NPSE to avoid significant effects on health and quality of life. However, noise insulation would not reduce noise levels outside and so some disturbance in outside activities is likely which is expected to result in moderate adverse significant effects in these areas.

14.9.240 Up to 17 properties in the Povey Cross and Rowley Farm receptor areas are expected to experience moderate adverse significant effects due to increases in ground noise below SOAEL. These would be offered noise insulation within the NIS outer zone which would help to reduce noise levels indoors and reduce these noise impacts.

14.9.241 In total, although noise insulation will partly mitigate the effects, residual significant **moderate adverse effects** are predicted at 37 properties.

Road Traffic Noise

14.9.242 2032 is the first year of operation for the highway improvements which is the opening year for the DMRB detailed noise assessment. The full DMRB assessment is reported in **ES Appendix 14.9.4: Road Traffic Noise Modelling** (Doc Ref. 5.3) and summarised below.

New or Altered Roads

14.9.243 The traffic noise changes from roads, which include (but is not limited to) those that are physically affected by the Project, ie around the North and South Terminal roundabouts, have been modelled, and the results are discussed below.

14.9.244 The results of modelling of traffic noise in 2032 with the mitigation described above, are presented in the following figures:

- Figure 14.9.33 – 2032 Traffic Noise Levels with Project during Daytime (Doc Ref. 5.2).

- Figure 14.9.34 – 2032 Traffic Noise Levels with Project during Night-time (Doc Ref. 5.2).

14.9.245 Table 14.9.17 and Table 14.9.18 show $L_{A10,18\ hour}$ and $L_{Aeq,night}$ road traffic noise modelling results respectively at a selection of receptor locations representing the closest nearby communities/dwellings to the Project (see Figure 14.9.33 and 14.9.34). Full results are provided in **ES Appendix 14.9.4: Road Traffic Noise Modelling** (Doc Ref. 5.3). Noise levels in the future baseline (business as usual (BAU)), have been included. A comparison of the noise levels with the Project against the future baseline has been carried out.

14.9.246 Predicted noise changes have been reported to one decimal place in order to show clearly which impact category applies to the stated noise change. Although decibels are often quoted as integers to reflect modelling accuracy, quoting to one decimal place allows a change to be compared to the noise change boundary more precisely. For example, a noise change of 1.2 dB is clearly higher than the integer boundary value for low impacts.

Table 14.9.17: Road Traffic Noise at Key Receptors during Daytime (Short Term DMRB Assessment, 2032)

Scenario	Receptor ID / Description, $L_{A10,\ 18\ hour}$ dB Results (Façade)						
	NSR1 The Crescent East	NSR2 The Crescent West	NSR3 Woodroyd Gardens	NSR4 Cheyne Walk	NSR5 Longbridge Road East	NSR9 B2036 Balcombe Road	NSR12 Riverside Garden Park South(2)
Do-minimum 2032	69.7	64.4	70.0	71.9	71.3	73.7	67.1
Do-something 2032(1)	68.7	63.8	68.9	70.8	70.0	72.3	66.5
DMRB short-term change	-1.0	-0.6	-1.1	-1.1	-1.3	-1.4	-0.6

(1) Scenario contains noise mitigation as described in Section 14.8.

(2) Noise-sensitive receptors represent open park areas, and results are presented as free-field values.

Table 14.9.18: Road Traffic Noise at Key Receptors during Night-time (Short Term DMRB Assessment, 2032)

Scenario	Receptor ID / Description, $L_{Aeq,night}$ dB Results (free-field)						
	NSR1 The Crescent East	NSR2 The Crescent West	NSR3 Woodroyd Gardens	NSR4 Cheyne Walk	NSR5 Longbridge Road East	NSR9 B2036 Balcombe Road	NSR12 Riverside Garden Park South

Do-minimum 2032	56.1	52.0	58.4	60.1	59.4	63.3	54.6
Do-something 2032(1)	54.5	50.9	57.3	59.3	58.6	61.8	53.5
DMRB short-term change	-1.6	-1.1	-1.1	-0.8	-0.8	-1.5	-1.1

(1) Scenario contains noise mitigation as described in Section 14.8.

14.9.247 Figures 14.9.35 and 14.9.36 (Doc Ref. 5.2) provide noise contour maps showing the difference in traffic noise levels predicted with the Project compared to without in 2032 during daytime and night-time.

14.9.248 Comparing the traffic noise levels with the Project in 2032 to the future baseline scenario in 2032 shows predicted reductions in noise at all of the residential receptors. In the Riverside Garden Park during the day noise levels would be reduced slightly in the southern part (NSR12) and increased slightly (by less than 1 dB) in the north (NSRs 10 and 11 are reported in **ES Appendix 14.9.4: Road Traffic Noise Modelling** (Doc Ref. 5.3)). In the Riverside Garden Park during the night, noise levels would be reduced slightly at all three modelled locations. This is a result of the noise mitigation that has been incorporated into the highway design.

14.9.249 The predicted noise levels above are daytime façade values of $L_{A10,\ 18\ hour}$, with the exception of the Riverside Garden Park which are presented as free-field noise levels during daytime and all results are presented in the free-field during night time. Noise levels that exceed 68 dB and 55 dB in the day and night respectively would exceed the SOAEL. It can be seen that although the noise levels at receptors 1, 3, 4, 5 and 9 at daytime and 3, 4, 5 and 9 at night-time are above the SOAEL threshold in the with Project (do-something), they were also above it in the base case, and would be reduced by the Project, and therefore, do not count as significant on this basis. The DMRB states that:

'where any do-something absolute noise levels are above the SOAEL, a noise change in the short term of 1.0 dB or over results in a likely significant effect.'

14.9.250 The DMRB does not specifically say that noise levels below LOAEL are not significant, however, the interpretation has been made that where noise levels are below or equal to LOAEL, the effect cannot be significant, and only noise changes above this level need to be considered. Since the predicted noise levels are above LOAEL, the next step in the assessment is to consider the changes in noise as a result of the new or altered parts of road network. The changes in traffic noise are generally reductions.

14.9.251 Reductions of between 1 and 3 dB, which indicate a low beneficial noise impact, are predicted:

- during daytime at: Receptor 1, The Crescent East; Receptor 3, Woodroyd Gardens; Receptor 4, Cheyne Walk; Receptor 5, Longbridge Road East; and Receptor 9, B2036 Balcombe Road; and

- during night-time at: Receptor 1, The Crescent East; Receptor 2, The Crescent West; Receptor 3, Woodroyd Gardens; Receptor 9, B2036 Balcombe Road; and Receptor 12, Riverside Garden Park South.

14.9.252 Other noise changes are less than 1 dB and would be negligible. In this case the low magnitude noise reductions are also considered significant positive impacts, because the absolute predicted noise levels exceed the SOAEL value, these are:

- during daytime at: Receptor 1, The Crescent East; Receptor 3, Woodroyd Gardens; Receptor 4, Cheyne Walk; Receptor 5, Longbridge Road East; and Receptor 9, B2036 Balcombe Road; and
- during night time at: Receptor 1, The Crescent East; Receptor 2, The Crescent West; Receptor 3, Woodroyd Gardens; and Receptor 9, B2036 Balcombe Road.

14.9.253 Noise levels in the Riverside Garden Park are already high and have a negative impact on the park users. The Project is designed to include noise mitigation that will offset the traffic noise effects of the Project and result in a small noise reduction in part of the park and small increases in other areas, all of which are sufficiently small to be not significant.

14.9.254 Overall, with the inclusion of the noise mitigation described in Section 14.8, the road modifications are predicted to have no change or a negligible effect in most cases with some receptors experiencing a low adverse or low beneficial impact. The DMRB assessment method requires long term (up to 2047) impacts to be assessed as well as short term impacts, in order to assess the overall significance. This is therefore provided in the following section under the Year 2047 heading.

Other Areas

14.9.255 Basic Noise Levels (BNL) were calculated for roads on the network away from the highway elements of the Project that would not be subject to physical works. The results of these predictions identified that noise changes would be small on most roads. A road link on Charlwood Road and Ifield Avenue in the Langley Green area is predicted to experience a short-term change in noise level of 1.1 dB. Approximately 30 dwellings in the front row of properties lie within 50 m of the road experience a short-term change in noise. However, no road links were calculated to have a change in noise attributing to a moderate magnitude or greater impact (ie >3 dB) so there are therefore no significant impacts.

14.9.256 Figure 14.9.57 (Doc Ref. 5.2) shows locations that would experience potentially significant noise increases from the Project and these locations are listed below:

- Premier Inn London Gatwick Airport hotel Longbridge Way;
- Premier Inn London Gatwick Airport North Terminal; and
- Gatwick Airport Police Station, Perimeter Road North.

14.9.257 All of the receptors are non-residential and have been designed to take into account existing noise levels including ventilation systems and thermal and noise insulation. Therefore, they are likely to be less sensitive to traffic noise and significant effects are not expected.

Design Year: 2038

Air Noise

14.9.258 **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3) provides the predicted noise contour areas and populations. In all cases, noise contours are smaller and levels forecast for 2038 with the Project are lower than those forecast for 2032 with the Project (on average by $L_{eq,\ 16\ hour,}$ day 0.6 dB and $L_{eq,\ 8\ hour}$ night 0.5 dB). This is because the growth in air traffic forecast from 2032 to 2038 is not sufficient to offset the reduction in noise levels from the aircraft fleet predicted over this period. The noise contours in 2038 are also smaller than in 2019, so that under the slower transition fleet case if noise contours do rise above 2019 levels when they peak in 2032, they would fall back below 2019 levels by 2038.

14.9.259 Noise contours are provided for 2038, as listed below (Doc Ref. 5.2). Noise contour areas and population for all noise metrics for 2038 are reported in **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3).

- Figure 14.9.37 shows the 2038 with Project $L_{eq,\ 16\ hour}$ day noise contours.
- Figure 14.9.38 shows the 2038 with Project $L_{eq,\ 8\ hour}$ night noise contours.
- Figure 14.9.39 shows the 2038 with Project N65 day noise contours.
- Figure 14.9.40 shows the 2038 with Project N60 night noise contours.
- Figure 14.9.41 shows the 2038 with Project L_{den} annual noise contours.
- Figure 14.9.42 shows the 2038 with Project L_{night} annual noise contours.

14.9.260 A detailed assessment of the 2038 effects is not necessary because the effects of the Project would be lower than in 2032 and any mitigation provided for the impacts in 2032 would also be adequate in 2038. The noise envelope proposed acknowledges the predicted reduction of noise contour areas after 2032 and provides a mechanism to give certainty that noise contours will be smaller by 2038 and beyond.

Ground Noise

14.9.261 The modelling of predicted ground noise for the Project in the 2038 design year and the associated assessment of effects are presented in **ES Appendix 14.9.3: Ground Noise Modelling** (Doc Ref.5.3). Due to the changing fleet which includes a greater number of next generation aircraft by 2038, the predicted ground noise (and subsequent effects) in the assessment year are lower than for 2032.

Road Traffic Noise

14.9.262 The DMRB does not strictly require an assessment of road traffic noise in 2038; however, operational traffic noise in 2038 has been considered and compared qualitatively to 2047 road traffic noise levels and are lower. It is therefore concluded that operational traffic noise impacts will be less in 2038 than the impacts assessed from 2047. This is reported below.

Design Year: 2047

Air Noise

14.9.263 **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3) Section 5 contains details of air noise levels contour areas and populations predicted in 2047, as summarised above in the main air noise assessment section under the Interim Year 2032 heading. This shows the trends in air

noise levels predicted in 2019, 2029, 2032, 2038 and 2047; and demonstrates that noise levels would be lower in 2047 than in 2032. This is because fleet transition to quieter new generation aircraft would continue beyond 2038 offsetting the projected increase in air traffic, in all cases. Noise contours are provided for 2047, as listed below (Doc Ref. 5.2):

- Figure 14.9.43 shows the 2047 with Project $L_{eq,\ 16\ hour}$ day noise contours.
- Figure 14.9.44 shows the 2047 with Project $L_{eq,\ 8\ hour}$ night noise contours.
- Figure 14.9.45 shows the 2047 with Project N65 day noise contours.
- Figure 14.9.46 shows the 2047 with Project N60 night noise contours.
- Figure 14.9.47 shows the 2047 with Project L_{den} annual noise contours.
- Figure 14.9.48 shows the 2047 with Project L_{night} annual noise contours.

Ground Noise

14.9.264 The modelling of predicted ground noise for the Project in the 2047 design year and the associated assessment of effects are presented in **ES Appendix 14.9.3: Ground Noise Modelling** (Doc Ref. 5.3) demonstrating that the effects in 2047 will be less than in 2032 reported above. Due to the changing fleet which includes a greater number of next generation aircraft by 2047, the predicted ground noise (and subsequent effects) in the assessment year are lower than for both 2032 and 2038.

Road Traffic Noise

New or Altered Roads

14.9.265 The DMRB requires an assessment of the traffic noise changes from roads in the Long Term: Do Minimum Opening Year (DMOY) (ie the situation in the opening year of the highway improvements scheme without the Project) versus Do Something Future Year (DSFY) (ie the situation 15 years after opening with the Project and associated traffic changes). Non-project noise changes (ie Do Minimum Future Year (DMFY) compared against DMOY) have also been considered. Similar noise changes in the long term with the Project and in the Do Minimum scenario can indicate changes are not likely due to the Project, therefore not indicating a likely significant effect. These scenarios have been modelled, and the results are reported in detail in **ES Appendix 14.9.4: Road Traffic Noise Modelling** (Doc Ref. 5.3) and summarised below.

14.9.266 The results of modelling of traffic noise in 2047 with the mitigation described above, are presented in the following figures (Doc Ref. 5.2):

- Figure 14.9.49 – 2047 Traffic Noise Levels Business as Usual During Daytime;
- Figure 14.9.50 – 2047 Traffic Noise Levels Business as Usual During Night-time;
- Figure 14.9.51 – 2047 Traffic Noise Levels with the Project During Daytime;
- Figure 14.9.52 – 2047 Traffic Noise Levels with the Project Night-time;
- Figure 14.9.53 - 2047 Traffic Noise Levels with Project v 2032 Baseline Daytime Difference; and
- Figure 14.9.54 - 2047 Traffic Noise Levels with Project v 2032 Baseline Night-time Difference.

14.9.267 Table 14.9.19 and Table 14.9.20 show $L_{A10,18\ hour}$ and $L_{Aeq,night}$ road traffic noise modelling results respectively at a selection of receptor locations representing the closest nearby communities/dwellings to the Project (see Figure 14.6.10 (Doc Ref. 5.2)), as required for the

DMRB long term assessment. Full results are provided in **ES Appendix 14.9.4: Road Traffic Noise Modelling** (Doc Ref. 5.3).

14.9.268 Predicted noise changes have also been reported to one decimal place in order to show clearly which impact category applies to the stated noise change.

Table 14.9.19: Road Traffic Noise at Key Receptors during Daytime (Long Term DMRB Assessment)

Scenario[22]	Receptor ID / Description, $L_{A10, 18\ hour}$ dB Results (Façade)						
	NSR1 The Crescent East	NSR2 The Crescent West	NSR3 Woodroyd Gardens	NSR4 Cheyne Walk	NSR5 Longbridge Road East	NSR9 B2036 Balcombe Road	NSR12 Riverside Garden Park South[23]
Do-minimum 2032	69.7	64.4	70.0	71.9	71.3	73.7	67.1
Do-minimum 2047	70.0	64.6	70.3	72.2	71.6	74.2	67.4
Do-something (1) 2047	69.0	64.2	69.2	71.1	70.4	72.8	66.8
DMRB long-term change	-0.7	-0.2	-0.8	-0.8	-0.9	-0.9	-0.3
DMRB non-project change	0.3	0.2	0.3	0.3	0.3	0.5	0.3

[22] Scenario contains noise mitigation as described in Section 14.8.

[23] Noise-sensitive receptors represent open park areas, and results are presented as free-field values.

Table 14.9.20: Road Traffic Noise at Key Receptors during Night-time (Long Term DMRB Assessment)

Scenario[24]	Receptor ID / Description, $L_{Aeq,night}$ dB Results (free-field)						
	NSR1 The Crescent East	NSR2 The Crescent West	NSR3 Woodroyd Gardens	NSR4 Cheyne Walk	NSR5 Longbridge Road East	NSR9 B2036 Balcombe Road	NSR12 Riverside Garden Park South
Do-minimum 2032	56.1	52.0	58.4	60.1	59.4	63.3	54.6
Do-minimum 2047	56.3	52.1	58.4	60.1	59.4	63.4	54.7
Do-something (1) 2047	54.9	51.2	57.6	59.5	58.9	62.1	53.8
DMRB long-term change	-1.2	-0.8	-0.8	-0.6	-0.5	-1.2	-0.8
DMRB non-project change	0.2	0.1	0.0	0.0	0.0	0.1	0.1

14.9.269 Figures 14.9.55 and 14.9.56 (Doc Ref. 5.2) provide noise contour maps showing the difference in traffic noise levels predicted in the baseline in 2047 versus the baseline in 2032 for daytime and night-time.

14.9.270 Comparing the predicted traffic noise levels from the Project in 2047 to the baseline scenario in 2032, reductions are predicted at all of the residential receptors and in the south side of Riverside Garden Park during daytime and night-time. Changes as a result of non-Project traffic increases have also been predicted for these years, and the predicted increases were found not to have a significant influence on the results, so that these predicted noise reductions were shown to be as a result of the Project.

14.9.271 More detailed results at all receptor locations in line with DMRB requirements can be found in **ES Appendix 14.9.4: Road Traffic Noise Modelling** (Doc Ref. 5.3).

14.9.272 The changes in traffic noise in both Table 14.9.19 and Table 14.9.20 show that, the long term noise changes for the Project would be less than 3 dB and would therefore be negligible.

14.9.273 Overall, with the inclusion of the noise barriers described in Section 14.8, the road modifications are expected to result in a negligible impact. An assessment of the numbers of properties affected by the different noise changes has also been undertaken and all effects due to the Project are of **negligible significance** in all areas in the long term. Receptors in areas identified

[24] Scenario contains noise mitigation as described in Section 14.8.

in the Interim Assessment Year to have some **minor** significant positive and negative impacts were predicted to not be impacted in the long term. Full results are provided in **ES Appendix 14.9.4: Road Traffic Noise Modelling** (Doc Ref. 5.3).

Other Areas

14.9.274 BNLs (i.e. noise levels at 10 m from the carriageway) were calculated for roads elsewhere on the network that are not subject to physical works from the Project. The BNLs were also calculated for 2047 (the situation 15 years after opening with the Project), therefore enabling an assessment of potential long-term effects of the Project in the wider area, as required by the DMRB. The change in BNL between 2032 and 2047 without the Project was also calculated to enable the (long-term) effect of non-Project traffic growth in the area to be taken into account when indirect noise effects of the Project on the wider road network are assessed.

14.9.275 The results of these predictions identified that noise changes in the long-term would be small on most roads, with no noise changes greater than 3 dB predicted.

Further Mitigation

14.9.276 There is no requirement for further mitigation for road traffic noise.

Residual Road Traffic Noise Effects

14.9.277 With the inclusion of the noise mitigation described in Section 14.8 the short term effects reported in Interim Year (2032) section above are, predicted to be negligible in most cases with some receptors experiencing a low adverse or low beneficial impact. The long term effects are negligible in all areas. Overall, the traffic noise effects are predicted to be **mainly negligeable with some minor adverse and negative effects**.

14.10. Potential Changes to the Assessment as a Result of Climate Change

14.10.1 Changes in the climate could affect aircraft performance and hence climb rates which could alter noise levels on the ground. However, such effects are likely to be small.

14.10.2 Changes in the climate could affect wind speeds and direction and hence runway modal split. The results of modelling runway modal splits from 50% to 90% westerly are given in Section 5 of **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3) and show variations in contour areas of 3% for daytime $L_{eq,\ 16\ hour}$ 51 dB contours and 2% for night-time $L_{eq,\ 8\ hour}$ 45 dB contours. The variation in contour populations are 22% for daytime $L_{eq,\ 16\ hour}$ 51 dB contours and 5% for night-time $L_{eq,\ 8\ hour}$ 45 dB contours. It is not known to what extent climate change could affect runway modal split, but this analysis suggests that in itself it is not likely to have major changes in the noise impacts of the Project.

14.10.3 Changes in weather could affect the propagation of noise from airborne aircraft to the ground, and hence noise levels at receptors. Modelling an increase in summer temperature of 4 degrees Celsius (with a corresponding reduction in relative humidity of 8%) showed noise levels within 1 dB compared to current weather conditions, so these effects are likely to be insignificant.

14.10.4 Changes in climate could increase heatwaves in the summer months and lead to more residents opening windows more frequently for cooling in the day and at night. This could lead to greater impacts in terms of disturbance to indoor activities and sleep. The proposed enhanced NIS for homes within the forecast $L_{eq,\ 16\ hour}$ 54 dB daytime air noise contour includes acoustic ventilators

to allow residents to keep windows closed. The scheme is voluntary, and it may be that climate change would increase uptake, allowing for greater mitigation of noise impacts.

14.10.5 Any change in the climate may affect the amount of time that APUs are running as they may be required for greater cooling and or warming of the aircraft as they taxi. As noted above, APU noise is considered to be insignificant in relation to the engine noise when taxiing, and when the aircraft are at the stands, they generally do not operate the APU as they are connected to Ground Power Units (GPUs). Any change, therefore, in the use of the APU as a result of climate change, assuming there is no increase in its use at the stands, would be insignificant in terms of the assessment and results presented here.

14.10.6 Potential changes to the climate in a future baseline scenario would not affect the traffic noise assessment. The CRTN noise prediction method does not take into account atmospheric conditions and temperature to calculate predicted noise levels. Wet roads are noisier than dry roads, but they are wet for a relatively small proportion of the time and the CRTN methodology does not consider the effect of wet roads. If climate change changed the pattern of rainfall in the future, this would not affect the assessment.

14.11. Cumulative Effects

Combined Effects

14.11.1 This section considers the combined effects of noise and vibration from the various parts of the Project which are reported separately in the chapter as defined in paragraph 14.1.1, ie:

- construction noise;
- air noise;
- ground noise; and
- road traffic noise.

14.11.2 As there is no reliable means of quantitatively assessing the overall noise effect resulting from different noise sources, this section considers the overall effect of noise from combined sources qualitatively. This takes account of factors including the following:

- whether the effects from the different sources would be likely to occur at the same time, or the same time of day;
- the duration of any combined effects;
- whether one effect dominates or whether effects might be additive; and
- whether the effects on individual receptors are likely to be on the same façade of the property.

14.11.3 During construction, there is potential for short term effects from construction noise. The construction noise assessment criteria take account of baseline noise levels. Impacts of the Project due to air, ground and road traffic noise would not arise until after the Project is operational, ie after 2029. Some construction works would continue after this time. However, the changes in air, ground and road traffic noise are small compared to the likely levels of construction noise that are required to generate significant short-term effects at particular receptors. So combined noise effects are likely to be minor.

14.11.4 During operation, there is potential for air, ground and traffic noise impacts to combine. Road traffic noise increases near the highway improvements would be mitigated within the design, so mitigating the potential for combined impacts in the Horley area next to the highway works. Traffic noise increases elsewhere are expected to be small so that combined traffic noise effects are expected to be minor.

14.11.5 There is potential for ground noise and air noise impacts to combine at receptors in the vicinity of the airport where ground noise impacts are predicted. However, all these properties would be included within the NIS which would be designed to mitigate air and ground noise effects. As noted in Section 14.9, if necessary, ground noise will be monitored through measurement after opening, and the cumulative noise levels from ground noise and air noise will be considered in assessing eligibility for the Inner Zone NIS.

14.11.6 Vibration effects during construction have been assessed. These are likely to be short-lived and in localised areas only, making combined effects unlikely.

Cumulative Effects

Zone of Influence

14.11.7 The zone of influence (ZoI) for noise has been identified based on the spatial extent of likely effects, which in general is the area within which noise levels above the LOAEL are expected. The largest of these are for air noise and are the 2032 with Project $L_{eq,\ 16\ hour}$ 51 dB and $L_{eq,\ 8\ hour}$ night contours shown in Figures 14.9.1 and 14.9.9 (Doc Ref. 5.2).

Screening of Other Developments and Plans

14.11.8 The cumulative effect of additional road traffic noise from other developments is included within the assessment, as the traffic noise modelling is based on traffic forecasts that take these developments into account (see **ES Chapter 12: Traffic and Transport** (Doc Ref. 5.1)).

14.11.9 It is possible for concurrent construction works to have cumulative impacts on particular NSRs. However, in practice such effects are rare because for an additive noise effect to arise, the works have to arise at the same time on the same day, affecting the same façade of a noise sensitive building. It is more common for noise disturbance from adjacent sites to add to the duration of the disturbance. At this stage it is not possible to consider the timing of adjacent developments in this level of detail, but review of the Tier 1 developments indicates none sufficiently close and concurrent with the main Project worksites. Overlaps of noisy construction works sufficiently nearby to sensitive receptors to add significantly to the predicted noise levels are unlikely and hence cumulative effects are unlikely.

14.11.10 The Cumulative Effect Assessment (CEA) takes into account the impact associated with the Project together with other developments and plans. The projects and plans selected as relevant to the CEA presented within this chapter are based upon the results of a screening exercise undertaken as part of the 'CEA short list' of developments (see **ES Appendix 20.4.1: Cumulative Effects Assessment Long and Short List** (Doc Ref. 5.3)). Each development on the CEA long list has been considered on a case by case basis for scoping in or out of this chapter's assessment based upon data confidence, effect-receptor pathways and the spatial/temporal scales involved.

14.11.11 In undertaking the CEA for the Project, it is important to bear in mind that the likelihood of other developments and plans being constructed varies depending on how far along the planning process they are. For example, relevant developments and plans that are already under construction are likely to contribute to a cumulative impact with the Project (providing impact or spatial pathways exist), whereas developments and plans not yet approved or not yet submitted are less certain to contribute to such an impact, as some may not achieve approval or may not ultimately be built due to other factors. For this reason, all relevant development and plans considered cumulatively alongside the Project have been allocated into 'Tiers', reflecting their current stage within the planning and development process. Appropriate weight is therefore given to each Tier in the decision-making process when considering the potential cumulative impact associated with the Project (eg it may be considered that greater weight can be placed on the Tier 1 assessment relative to Tier 2). Further details of the screening process for the inclusion of other developments and plans in the short list and a description of the Tiers is provided in **ES Chapter 20: Cumulative Effects and Inter-Relationships** (Doc Ref. 5.1).

14.11.12 The specific developments scoped into the CEA for noise and vibration are outlined in Table 14.11.1. Only residential developments of at least 50 units and other noise sensitive developments have been included. Projects are Tier 1 unless included as major housing application sites. The developments included as operational in this assessment have been commissioned since the baseline studies for this Project were undertaken and as such were excluded from the baseline assessment. Full details of each of the developments are provided in **ES Appendix 20.4.1: Cumulative Effects Assessment Long and Short List** (Doc Ref. 5.3).

Table 14.11.1: List of Other Developments and Plans considered within CEA

Description of Development/Plan	Planning Phase	Distance from the Project
CR/2015/0718/ARM: 169 dwellings	Permitted	1.6 km
CR2016/3/ARM: 249 dwellings	Permitted	2.1 km
CR/2016/0114/ARM: 75 dwellings	Permitted	2.1 km
CR/2016/0780/ARM: 225 dwellings	Permitted	2.2 km
CR/2017/0128/ARM: 434 dwellings	Awaiting decision	1.09 km
CR/2018/0544/OUT: 150 dwellings	No decision	2.1 km
CR/2018/0894/OUT: 185 dwellings	Permitted	1.3 km
CR/2068/3002/EIA: 315 dwellings	EIA advice given	3.56 km
CR/2017/0997/OUT: 182 dwellings	Permitted	3.3 km
Tandridge DC, 2019/548/EIA: 360 dwellings	No decision	1.5 km
Horsham DC/17/2481: 227 dwellings	Permitted	6.3 km
Horsham DC/16/1677: 2,750 dwellings allocation	Permitted	9.8 km
Horsham DC/18/2687: 300 dwellings	Permitted	10.6 m
13/04127/OUTES: 500 dwellings	Permitted	2.7 km
Horsham DC/22/1494/REM: 170 dwellings	Pending decision	10.4 km
Horsham DC/20/2047/REM: 193 dwellings	Permitted	10.4 km
Horsham DC/21/0066/REM: 197 dwellings	Permitted	10.4 km

Description of Development/Plan	Planning Phase	Distance from the Project
Horsham DC/21/1427/REM: 123 dwellings	Validated January 2023	10.6 km
CR/2015/0552/NCC: Forge Wood, up to 1,900 dwellings	Allocated in Crawley Local Plan 2030 (Adopted)	1.6 km
CR/2019/0542/FUL: up to 152 apartments	Permitted	4 km
CR/2015/0718/ARM: up to 169 dwellings	Allocation within Crawley Local Plan 2021-2037 (Regulation 19).	1.6 km
DC/10/1612: approximately 2,500 dwellings	Site allocated in the Horsham DC Planning Framework (Adopted 2015).	6.7 km
Mid-Sussex DC DM/21/0644: 197 dwellings	Approved	3.5 km
Mid-Sussex DM/18/4321: 303 dwellings	Approved	2.5 km
Horsham, West of Ifield, EIA/20/0004: 3,250 to 4,000 homes	EIA Pre-application Scoping Opinion	1.5 km
Tinsley Lane: 150 dwellings	Permitted	2.2 km
Crawley DC, Land adjacent to Desmond Anderson: 150 dwellings	Crawley Local Plan 2021-2037 (Regulation 19)	6.6 km
Crawley DC, Land to the southeast of Heathy Farm, Balcombe Road: 150 dwellings	Crawley Local Plan 2021-2037 (Regulation 19)	4.1 km
Crawley DC, Telford Place/ Haslett Avenue: 300 dwellings	Crawley Local Plan 2021-2037 (Regulation 19)	5 km
Crawley DC, Crawley College: 400 dwellings	Crawley Local Plan 2021-2037 (Regulation 19)	4.7 km
Crawley DC, Land East of London Road, Northgate:120 dwellings	Crawley Local Plan 2030 adopted	2.3 km
Crawley DC, Forge Wood Masterplan Area, Pound Hill: 1,083 dwellings outstanding	Crawley Local Plan 2021-2037 (Regulation 19)	0.7 km
Crawley DC, Forge Wood, Pound Hill: 1,900 dwellings	Crawley Local Plan 2030 (Adopted)	0.7 km
Land at Steers Lane, Forge Wood: 185 dwellings	Crawley Local Plan 2021-2037 (Regulation 19)	0.7 km
Sevenoaks DC, 20/02988/OUT: 340 dwellings	Pending consideration	17 km
Tandridge DC, Land at Plough Road and Redehall Road, Smallfield; 160 residential units	Local Plan 2033 (Reg 22)	3.6 km
Tandridge DC, Land North of Plough Road, Smallfield: 120 residential units	Local Plan 2033 (Reg 22)	4.0 km
Tandridge DC, 2019/548/EIA; circa 360 dwellings	Screening decision request	1.5-2.0 km

Description of Development/Plan	Planning Phase	Distance from the Project
Mole Valley DC, DS42 Land at Povey Cross Farm, Hookwood: 84 dwellings	Proposed Submission Local Plan (Reg 19)	0.4 km
Mole Valley DC, Land West of Reigate Road, Hookwood Site Allocation Policy SA42: 450 dwellings and two gypsy and travellers' pitches	Proposed Submission Local Plan (Reg 19)	0.5 km

14.11.13 Due to uncertainty around the third runway at London Heathrow Airport (Heathrow R3), this development has not been included in the main cumulative effects assessment. However, as Heathrow R3 remains Government policy, it has been considered separately and a qualitative assessment is provided in **ES Chapter 20: Cumulative Effects and Inter-Relationships** (Doc Ref. 5.1).

Cumulative Effects Assessment

14.11.14 The majority of the development sites, particularly Tier 1, are to the south of the airport, and although they are within a short distance, in most cases these fall within the lower air noise contour bands, and in areas where the Project would slightly reduce air noise levels. Nonetheless, there is potential for noise impacts on the future residents of these developments as a result of Gatwick's operations, which in some cases would increase or decrease due to the Project. The site West of Ifield (EIA/20/0004) is a large site that could introduce 3,250 to 4,000 homes to a site partly within the airport's LOAEL noise contours, although it is noted that the part of the site with the highest air noise levels with the Project is zoned for car park and sports use that are less sensitive to noise.

14.11.15 In seeking permission to develop sites for residential use in noisy areas, in accordance with the NPPF and other policy, developers are required to consider the potential for noise impacts on future residents and to design the developments with suitable mitigation accordingly. Local planning authorities have a duty to enforce this requirement though through the local planning application process. Professional Planning Guidance on Planning and Noise (2017), local plans (including supplementary planning guidance, eg the Draft Crawley Borough Local Plan 2021-2037 Noise Annex) and other guidance give guidance on the process and mitigation that should be used to ensure good acoustics design mitigates noise impacts. This ES provides forecasts of air noise, ground noise and road traffic noise that will assist in designing for future conditions to ensure adverse effects are minimised and significant effects are avoided.

14.12. Inter-Related Effects

Introduction

14.12.1 Noise impacts have the potential to affect the assessments carried out under the following related topics:

- landscape and visual impacts;
- historic environment;
- health; and
- economics.

14.12.2 The following sections discuss how each inter-related effect has been considered and assessed. In general, the approach is to assess the significance of the noise effect within the chapter, and then to provide information from the noise modelling results to these other topic areas to inform their assessment of significant effects for these other topics.

Landscape and Visual Effects

14.12.3 The assessment of landscape and visual impacts has drawn on the assessment of overflights reported in this chapter, using two sets of results. Firstly, the mapping of overflights from the northern runway close to the airport, as reported in Section 14.9 (see Figure 14.9.30 (Doc Ref. 5.2)), has been used to assess visual impacts in those areas.

14.12.4 Secondly, the assessment of landscape and visual impacts has used the overflight analysis covering the wider area 35 miles around Gatwick Airport, as reported in Section 14.9 and illustrated in Figures 14.6.7, 14.6.8, 14.6.9, 14.6.18, 14.9.30 and 14.9.31 (Doc Ref. 5.2). In addition, the change in the numbers of overflights expected at nine locations that are representative of important landscapes have been assessed individually. These ten locations were chosen by the landscape and visual assessment team to represent the more sensitive landscapes in the areas and are shown on each of the overflight figures.

14.12.5 The assessment of the Project in 2032 is approximated by considering the change in the total number of overflights at these locations that would arise if 20% more Gatwick fights were added to the 2032 baseline. **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3) gives details of the methodology. In practice, non-Gatwick overflights would also increase slightly from 2019 to 2032, so the proportional increase of the additional Gatwick flights would be slightly diluted, ie this is a worst case approximation. The results are summarised in Table 14.12.1.

Table 14.12.1: Daily Overflights at Landscape Assessment Locations

Landscape Assessment Location	2019 Gatwick Daily Overflights	2019 Non-Gatwick Daily Overflights	2019 All Daily Overflights	2032 Baseline All Daily Overflights	2032 NRP All Daily Overflights (with 20% increase in Gatwick Overflight)	2032 % Increase with Project versus 2032 Baseline
Witley and Milford Commons	6	7	13	13.0	14.2	9%
Hever Castle	308	1	309	325.1	389.9	20%
Wakehurst Place	21	0	21	28.2	33.8	20%
Leith Hill	3	0	3	3.0	3.6	20%
Petworth House	3	8	11	11.2	11.8	6%
Temple of the Winds, Blackdown	4	6	10	10.0	10.8	8%
Ditchling Beacon	1	1	2	2.1	2.3	10%
Firle Beacon	9	2	11	11.0	12.8	16%
Ashdown Forest	113	0	113	119.3	143.2	20%
Knole Park near Sevenoaks	9	5	14	13.6	15.4	13%

14.12.6 For example, in 2019 at Hever Castle, there were 308 Gatwick overflights each 24 hour day on average within the 92 day summer period. There was one overflight from other airports, giving 309 in total. In 2032 this is forecast to increase to 325.1 in the baseline and to 389.9 with the Project, giving a 20% increase due to the Project. This is because Hever is directly aligned with the easterly arrivals runway centreline so is overflown by most arrivals from the east, and is also overflown by departures to the east.

14.12.7 Temple of the Winds, Blackdown is located to the west under a Gatwick departure route but some 35 km from the airport by which time Gatwick fights are partly dispersed. It is also overflown by some arrivals from the west, but again few in number due to the distance from the airport. On an average summer day in 2019 it had 4 overflights from Gatwick and 6 by aircraft from other airports including Heathrow, on average, giving a total of 10 overflights per day. In 2032 this is forecast to be 10.0 in the baseline and to be 10.8 with the Project, giving an 8% increase due to the Project. Witley and Milford Commons, Petworth House, and Ditchling Beacon would see similarly small changes as a result of the Project.

14.12.8 Wakehurst Place sees the largest increase in overflights in the baseline case between 2019 and the 2032 due to the increased use of the Route 9 Westerly departure route expected in the base case. The increase due to the Project in 2032 versus the 2032 baseline is 20%.

14.12.9 The changes in tranquillity and overall effects on the designated areas that the eight locations represented are discussed in **ES Chapter 8: Landscape, Townscape and Visual Resources** (Doc Ref. 5.1).

Historic Environment

14.12.10 The assessment of impacts on historic environment resources has considered the noise changes reported in this chapter where relevant, as reported in **ES Chapter 7: Historic Environment** (Doc Ref. 5.1).

14.12.11 For air noise, consultation with Historic England confirmed that changes in noise levels should be used to scope the assets that could potentially affected by noise. Noise modelling was carried out and two heritage assets were identified as potentially affected by noise increases of more than $L_{eq\ 16\ hour}$ 1 dB as follows:

- Lowfield Heath Windmill, RH6 0EQ, +2.0 dB
- Thunderfield Castle, RH6 9PP, +1.2 dB

14.12.12 Noise modelling results were provided to the historic environment assessment team, the details of which are given in **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3).

Health and Economic Appraisal

Information to Inform the Health Assessment

14.12.13 The assessment of noise and vibration effects reported above has provided information used to inform the health assessment reported in **ES Chapter 18: Health and Wellbeing** (Doc Ref. 5.1) including the extent of temporary construction effects and permanent effects due to ground and air noise levels above LOAEL and SOAEL with mitigation. In addition, an assessment of awakenings due to aircraft noise as night, as reported below has been used.

Awakenings

14.12.14 Section 7 of **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3) gives the results of a physiological sleep disturbance assessment that has been undertaken to estimate the number of additional awakenings that would be produced by the Project. The assessment draws on modelling of L_{max} levels for individual aircraft at postcode locations on an average summer night, and applies a dose/response relationship to estimate additional awakenings.

14.12.15 An 'awakening' is defined as a move from deep Stage 4 or REM sleep to Stage 1 or awake. It is important to note that as we sleep, we change sleep stage numerous times and 'awaken' for all manner of reasons, eg, temperature, humidity, light levels, and internal reasons such as sleep disorders, health conditions, bad dreams etc. Whether or not noise will disturb sleep also depends on situational effects, or moderators, eg depth of sleep phase, background noise level, and individual factors (eg noise sensitivity). A healthy adult briefly awakens about 20 times during an eight hour night and most of these awakenings are too short to be remembered the next morning.

14.12.16 In the study area of 34,000 people, as described above each person is likely to experience about 20 awakenings without considering the effect of aircraft noise, implying 680,000 awakenings each night.

14.12.17 The numbers of awakenings estimated due to aircraft noise are as follows:

- 2019 base 32,317
- 2032 Central Case baseline 26,508
- 2032 Central Case with Project 29,560
- 2032 Slower Transition Fleet Case baseline 29,061
- 2032 Slower Transition Fleet Case with Project 32,843

14.12.18 In the Central Case, in 2032 the effect of the Project is to increase awakenings due to aircraft noise by 3,052 from 26,508 to 29,560 per night, but still below the 2019 base of 32,317. These figures compare to the underlying total awakening for all other reasons in the affected community of approximately 680,000 per night. The effect of aircraft noise from the Project is an increase of 0.4% on underlying awakenings in the community.

14.12.19 In the Slower Transition Fleet Case, in 2032 the effect of the Project is to increase awakenings due to aircraft noise by 3,782 from 29,061 to 32,843 per night, and 526 above the 2019 base of 32,317. These figures compare to the underlying total awakening for all other reasons in the affected community of approximately 680,000 per night. The effect of aircraft noise from the Project is an increase of 0.6% on underlying awakenings in the community.

14.12.20 Over the whole study area of 34,000 people, in the Slow Transition Fleet Case the effect of the Project is to increase awakenings in 2032 (compared to the baseline in 2032) by 3,782, ie an average of 0.11 additional awakening per person. The extent of increased awakenings will be higher where the additional flights are closest to populations. **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3) considers the area where the additional 12 flights at night forecast in 2032 as a result of the Project are anticipated to create the highest noise levels over an average summer night, and concludes that in this location the effect of the change in L_{max} levels when summed across all aircraft, would create for each person on average 0.8 additional awakenings per night.

14.12.21 This is a statistical result, and does not predict the effects of individuals, but it does indicate that even at the worst affected locations, where noise levels will increase the most as a result of the Project, there is likely to be less than one additional awakening per summer night per person as a result of the Project, in the population in that area overall. As noted in the methodology section above, it is currently unclear how many additional noise-induced awakenings are acceptable and without consequences for sleep recuperation and health. But, in the context described above, that an average healthy person awakens about 20 times a night for various reasons not connected with noise, an increase of less than one awakening per night in the busy summer season as a result of the Project seems likely to have a small health effect. This is considered further in health assessment provided in **ES Chapter 18: Health and Wellbeing** (Doc Ref. 5.1).

WebTAG

14.12.22 Transport Appraisal Guidance (WebTAG) offers a method to appraise the following quantifiable health effect of noise and to assign a cost to each based on a 60 year net present value (NPV):

- sleep disturbance;
- annoyance (amenity);
- acute myocardial infarction (AMI) heart attacks;
- strokes; and
- dementia.

14.12.23 For the air noise assessment, the CAA noise modelling team carried out a WebTAG assessment for air noise using the 2029, 2032, 2038 and 2047 noise modelling results for the Project. Details are provided in **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3). The results for the Slower Transition Fleet are summarised in Table 14.12.2 (negative values are costs due to noise increase).

Table 14.12.2: Summary of TAG Assessment of NPV (Net Present Value) Information for Air Noise

Health Effect	NPV in 2010 Prices (£)
Sleep Disturbance	-£4,190,678
Amenity	-£5,205,079
Acute Myocardial Infarction	-£46,572
Strokes	-£830,588
Dementia	-£1,252,772
Total	-£11,525,688

14.12.24 A number of assumptions are made in order to complete the workbook. There is an assumption that for the 42 years beyond 2047 noise levels are assumed constant in order to arrive at a 60 year discounted appraisal result. This is unlikely and more so for night noise given the night noise restrictions which are expected to prevail and reduce night noise levels.

14.12.25 The sleep disturbance costs are less than half the total. This is shown in the night-time noise contours changing less with the Project than day contours.

14.12.26 For the operational period traffic noise assessment, a WebTAG assessment was undertaken for traffic noise using the 2032 and 2047 noise modelling results for the Project. Details are provided

in **ES Appendix 14.9.4: Road Traffic Noise Modelling** (Doc Ref. 5.3). The results are summarised in Table 14.12.2 (negative values are costs due to noise increase).

Table 14.12.3: Summary TAG Assessment for Operational Traffic Noise

Health Effect	NPV (£)
Sleep Disturbance	£460,585
Amenity	£170,298
Acute Myocardial Infarction	£-6,988
Net Present Value of Impact on Stroke	£30,513
Net Present Value of Impact on Dementia	£46,165
Total	£700,573

14.12.27 The traffic noise WebTAG assessment shows a £700,573 benefit due to small noise reductions around the highway scheme in the residential areas around the North and South Terminal roundabouts and Longbridge roundabout. Whist this area is affected to some extent by air noise, in the majority of the area over which road traffic noise is predicted to reduce, it is the dominant noise source, so it is justified for these noise benefits in general to be aggregated with the air noise disbenefits quantified in the air noise WebTAG assessment above.

14.12.28 Ground noise is due to increase to varying degrees around the majority of the perimeter of the airport. These changes have been quantified in the ground noise assessment. Road traffic noise around the majority of the airport perimeter (apart from around the highway improvements) is not expected to change significantly as a result of the Project. Road traffic noise is present in the majority of areas affected by ground noise because of the local roads around the airport. A WebTAG assessment using the changes in ground noise alone would therefore overstate the likely health effects over the wider area, and has not been undertaken. Also, the areas affected by ground noise are predominantly also affected by air noise, that has been assessed in the air noise WebTAG results above.

14.12.29 The WebTAG results above are used in the economic appraisal reported in **ES Chapter 17: Socio-Economic** (Doc Ref. 5.1).

14.13. Summary

Overview

14.13.1 The noise and vibration assessment considers the following sources and their potential impact on NSRs:

- construction noise and vibration – noise and vibration from temporary construction of the Project, including the use of construction compounds;
- air noise – noise from aircraft in the air or departing or arriving (including reverse thrust) on a runway;
- ground noise – noise generated from airport activities at ground level including aircraft taxiing and traffic within the airport boundary; and
- road traffic noise – noise from road traffic vehicles outside the airport on the public highway.

14.13.2 All four types of noise have been modelled based on forecasts of plant, road and airport traffic expected in the various assessment years. The noise changes are compared to the do-minimum in the relevant year, and also to the baseline conditions in 2019. The noise assessment results are summarised in this chapter, with seven supporting appendices and illustrated by 94 figures.

Approach

14.13.3 The EIA Regulations require the identification of likely significant effects and mitigation to avoid or reduce significant effects. This ES chapter presents the findings of the assessment.

14.13.4 As described in Section 14.2, the Airports NPS states that:

'Development consent should not be granted unless the Secretary of State is satisfied that the proposals will meet the following aims for the effective management and control of noise, within the context of Government policy on sustainable development:

1. Avoid significant adverse impacts on health and quality of life from noise;

2. Mitigate and minimise adverse impacts on health and quality of life from noise; and

3. Where possible, contribute to improvements to health and quality of life.'

14.13.5 The approach to assessing noise effects from the Project therefore firstly identifies significant adverse effects on health and quality of life that may arise where noise at a receptor newly exceeds the SOAEL or is significantly increased above SOAEL, and it identifies mitigation measures to avoid these. The assessment also identifies adverse effects that may arise above LOAEL but below SOAEL and identifies mitigation measures to minimise these as far as practicable. In addition, opportunities to reduce noise levels from the base case so as to improve health and quality of life have been explored.

Construction Noise and Vibration

14.13.6 Construction noise has been assessed based on the current design of the works, making a series of worst case approximations where necessary. Noise levels have been predicted for 24 stages of construction at 170 locations across the airfield and highway areas. Works required at night, such as those near the runway and taxiways, and main roadways, will give rise to the greatest noise impacts without mitigation around the airfield perimeter from 2026 to 2028 and around the main highway works between 2029 and 2032. The likely programme of day and night works has been analysed to make sure that cumulative noise from potentially overlapping works have been modelled and assessed.

14.13.7 Predicted noise impacts are based on assumed standard methods of working and assuming the BPM to reduce noise on site are adopted. The effect of site perimeter noise barriers has been assessed to mitigate four areas of noise impact. Overall, with this mitigation the assessment results indicate that there is potential for significant adverse noise effects at approximately 37 properties during the day and approximately 10 during the night.

14.13.8 The CoCP places various requirements on the contractor to minimise and monitor noise and vibration, including using the BPM to reduce noise onsite. The CoCP also requires the contractor to apply to the Local Authority to carry out the works under Section 61 of the Control of Pollution

Act, which will require the contractor to demonstrate the proposed methods of working adopt the BPM to minimise noise and vibration.

14.13.9 The CoCP (ES Appendix 5.3.2 (Doc Ref. 5.3)) also provides for noise insulation to be offered above the SOAEL. The assessment identifies 10 properties with significant night noise impacts, and none for daytime, that qualify for noise insulation. The majority of night works required for the highways works in the vicinity of residential areas are near Longbridge Roundabout and the Balcombe Road Bridge and are brief, programmed to be completed within four to six weeks. Taxiway construction and runway pavement works in the west of the airfield that may give rise to significant noise effects at night to the single property on Lowfield Heath Road south of Charlwood would take a total of approximately six months of night shifts to complete.

14.13.10 The construction phase NIS is described in the CoCP and will be developed as: the Project progresses; construction methods are refined; the Section 61 process is engaged; and the contractor develops details of the scheme. Noise insulation would then be offered to all properties predicted to be exposed to noise levels above SOAEL so as to mitigate all significant effects above SOAEL.

14.13.11 The potential for impacts arising from construction traffic have been assessed as not significant.

14.13.12 Vibration is unlikely to give rise to significant effects.

14.13.13 Residual noise effects are likely and the magnitude of noise impact from construction is assessed as medium magnitude, which would give rise to a temporary **moderate adverse significant effect**.

Air Noise

14.13.14 Air noise has the potential to affect residents, and other NSRs over a wide area beyond the airport boundary. The assessment has included modelling changes in noise that can be expected over this area. It uses a number of noise metrics to quantify and characterise the changes in noise that are expected following established guidance, and also provides additional detail on the changes that are expected at representative communities and noise sensitive community buildings. Air noise modelling carried out by the CAA's ERCD indicates that noise impacts would be greatest in the 2032 interim assessment year. After this, the effect of the aircraft fleet shifting to quieter types outweighs the effect in increasing ATMs.

14.13.15 The air noise assessment has considered the range of noise levels likely in each future assessment year, 2029, 2032, 2038 and 2047, that would result from the range of aircraft fleet that could operate. As aircraft age, airlines replace them with next generation aircraft so that over time the fleet transitions to next generation aircraft and, other things being equal, overall noise levels reduce. The ATM forecasts used for the modelling of noise in the future are based on estimates of how the fleet will transition based on assumptions around airlines' fleet procurement programmes and business models. The '*central case'* used in the noise assessment is based on what was considered before the COVID-19 pandemic to be the most likely rate of fleet transition. However, there is uncertainty around this, particularly at the current time due to effect of the global pandemic and the financial impact on the airlines. Therefore, noise modelling has also been carried out for a '*slower transition fleet'* case, based on ATM forecasts in which the rate of fleet transition is delayed by about five years, and which would result in higher noise levels than

the central case. **ES Appendix 14.9.2: Air Noise Modelling** (Doc Ref. 5.3) and **ES Appendix 14.9.5: Air Noise Envelope Background** (Doc Ref. 5.3) give further details.

14.13.16 The existing northern runway centreline is located some 198 metres north of the main runway centreline. The Project would increase the difference between the two runway centrelines by 12 metres. The existing northern runway is currently only used when the main runway is unavailable, for example, due to maintenance work at night. In the 2019 summer season (16 June to 15 September), the northern runway was used by 1,292 flights. From January to November 2022 the northern runway was used on 160 days by over 9,500 flights due to a major resurfacing programme on the main runway. The Project would make alterations to the existing northern runway, resulting in increased use of this runway using the same flight paths offset 12 metres to the north. The smaller ICAO 'Code C' aircraft (ie <36 metre wingspan (not larger types, eg B787 and A350)) would use the northern runway in coordinated use with the main runway. Given the close proximity between the existing and proposed runway centrelines, and the fact that the existing northern runway is already in regular (if limited) use, any noise impacts of the Project would not be over areas currently unaffected by noise from Gatwick. This would therefore avoid most of the noise impacts often associated with new flight paths which are routed over areas not previously overflown.

14.13.17 In the noisiest year 2032, the population within the daytime LOAEL $L_{eq,\ 16\ hour}$ day 51 dB contour is predicted to rise from between 16,100 to 23,500 in the base case (the ranges provided cover the range of noise levels arising from the central case and slower transition fleet cases), to between 18,800 to 26,400 with the Project, and to remain below the 24,050 in 2019, except in the slower transition fleet case. Thus the Project is predicted to increase the population within the LOAEL $L_{eq,\ 16\ hour}$ day 51 dB contour by between 2,700 to 2,900 people in 2032. However, for the majority of those affected (61 to 68% for daytime and 97 to 99% for night-time), the noise changes would be less than 1 dB and negligible. Approximately 1,800 to 4,900 people living to the south of the airport would see noise levels reduce, with 1,200 to 4,300 of these being negligible (<1 dB) and about 600 low (1-3 dB).

14.13.18 To the north and in the Smallfield area to the north east, approximately 4,800 to 6,500 people are predicted to experience 1 to 2 dB increases in daytime noise, which is likely to result in **minor adverse** and not significant effects. The majority of the residential properties in this area would be eligible for the new Outer Zone NIS, which would further reduce noise effects in this area.

14.13.19 To the west, approximately 300 to 400 people are expected to experience noise increases in daytime of 2-3 dB, which are likely to be minor adverse and not significant effects. All the residential properties in this area would be eligible for the new Outer Zone NIS, which would further reduce noise effects in this area.

14.13.20 To the west of the western end of the northern runway approximately 40 properties on Ifield Road and near Russ Hill have been identified as experiencing daytime noise increases above 3 dB, above the daytime SOAEL which are major significant effects without consideration of mitigation. A further approximately 40 properties are predicted to have daytime noise increases of greater than 1 dB above SOAEL, in Russ Hill and Partridge Lane to the West and on Balcombe Road and Peeks Brook Lane to the East, which are major adverse significant effects. The total number of properties with major adverse significant effects without consideration of mitigation is approximately 80, or approximately 210 people.

14.13.21 Noise changes at night would be lower than during the day because it is assumed that the current night restrictions would continue to cap aircraft numbers in the 23:30-06:00 hours period. In 2032, the population within the SOAEL $L_{eq,\ 8\ hour}$ night 55 dB contour is predicted to rise from a range of approximately 900 to 1,100 in the base case, by approximately 160 with the Project, but to remain below the population in 2019 when it was approximately 1,250. The areas within the day and night SOAEL contours overlap and all those significantly affected at night are also significantly affected during the day; so the total number of people significantly affected day or night is as reported above for daytime, approximately 210.

14.13.22 All residential properties forecast to be within the $L_{eq\ 16\ hour}$ day 63 dB or the $L_{eq\ 8\ hour}$ night 55 dB slower transition fleet SOAEL contours would be eligible for full noise insulation under the new Inner Zone NIS, to mitigate the predicted significant effects. The extent of the NIS is shown in Figure 14.8.1 (Doc Ref. 5.2). All the properties at which adverse significant effects are predicted (approximately 80 properties, 210 people, described above) are within this NIS inner zone so would be eligible. The NIS inner zone would avoid noise impacts indoors, including sleep disturbance and disturbance to noise sensitive activities during the day such as working, reading etc. This is consistent with policy for the first aim of the NPSE to avoid significant effects on health and quality of life. However, at these approximately 80 properties (approximately 210 people) increases in daytime noise levels of greater than $L_{eq\ 16\ hour}$ 1 dB are expected above SOAEL and noise insulation would not reduce noise levels outside; so some disturbance in outside activities is likely, which is expected to result in **moderate adverse significant effects** in these areas.

14.13.23 50 noise sensitive community buildings within the $L_{eq,\ 16\ hour}$ day 51 dB noise contour in 2032 with the Project have been assessed. These comprise 21 schools, 1 hospital, 18 places of worship and 7 community buildings. At two places of worship in Crawley noise levels are expected to reduce by 1-2 dB. At 42 of these buildings noise levels are predicted to either decrease or increase by less than 1 dB, ie a negligible increase, as a result of the Project compared to the 2032 baseline, with low increases of 1-2 dB at the others. A noise insulation scheme has been included for any school adversely affected.

14.13.24 The assessment of significant effects is based primarily on the predicted levels and changes in the primary noise metrics, $L_{eq,\ 16\ hour}$ day and $L_{eq,\ 8\ hour}$ night, but additional noise metrics are used to provide more detail on the changes that would arise. Number Above metrics N65 and N60 night show how the numbers of aircraft above L_{max} 65 dB and L_{max} 60 dB are expected to change. Seven Community Representative Locations have been used to illustrate the effects on the most populated areas affected by aircraft noise. The European metrics L_{den} and L_{night} have also been used to report air noise changes as annual averages for day evening and night and also separately for night. A physiological sleep disturbance study has been undertaken which concludes that, even in the area of greatest noise increase beyond the west end of the Northern Runway, there would be no more than one additional 'awakening' per summer night per person as a result of the Project in the population in that area overall. An 'awakening' in this study means a change of sleep state, not waking up, and an average healthy person awakens about 20 times a night for various reasons not connected with noise.

14.13.25 Beyond the noise contours, the extent to which the number of overflights below 7,000 feet would change have been computed to give stakeholders further from the airport information on how many more aircraft would overfly them as a result of the Project.

14.13.26 A noise envelope is proposed to set limits on noise from future operations at the airport in terms of the areas of $L_{eq,\ 16\ hour}$ day and $L_{eq,\ 8\ hour}$ night noise contour. Noise contour area limits are proposed for two periods: first for the period from when the northern runway opens for dual runway operation up to when the noise impacts are expected to be greatest about three years later; and second for when the airport grows to operate at 382,000 commercial ATMs or 9 years after opening. The noise envelope would provide certainty to the community that noise levels would be limited and would reduce in the future.

14.13.27 Compliance with the Noise Envelope would be assessed every year and reported in an annual monitoring report along with forecasts for future compliance up to 5 years ahead. This would ensure that GAL is planning its operations to stay within the noise envelope limits and is planning ahead for any measures required to remain in compliance.

14.13.28 Whilst the air traffic forecasts used in the ES for the early years of operation are considered a reliable and robust basis for the noise envelope limits, projections for the longer term are inevitably less reliable. For this reason, the noise envelope limits are to be set for the first 14 years after opening within the DCO, to provide sufficient certainty of what will be achieved in the initial operating period, and every 5 years thereafter the limits will be subject to a review and where appropriate revised. This will ensure the noise envelope remains current, being based on up to date reliable forecasting data.

14.13.29 The CAA would act as Independent Reviewer to scrutinise annual compliance reports and 5 year reviews. **ES Appendix 14.9.7: The Noise Envelope** (Doc Ref 5.3) provides details of the noise envelope, the options considered through stakeholder consultation are discussed in **ES Appendix 14.9.5: Noise Envelope Background** (Doc Ref 5.3), **ES Appendix 14.9.8: The Noise Envelope Group Output Report** (Doc Ref 5.3) and **ES Appendix 14.9.9: Report on Engagement on the Noise Envelope** (Doc Ref 5.3).

Ground Noise

14.13.30 Ground noise from aircraft taxiing and within the airfield has been modelled using a model calibrated with measurements made on the airfield in spring 2019 and baseline measurements made at 13 representative receptors across 12 assessment areas. The increase in numbers of aircraft and the addition of taxiways closer to neighbouring properties to the north has the potential to lead to noise increases, and mitigation has been incorporated including: bunding 8 metres in height situated at the western end of northern runway, and noise barriers 10 metres high adjoining the bund installed at the western end of the northern runway and running for approximately 500 metres just to the north of the relocated Juliet Taxiway.

14.13.31 For daytime, the results show predicted ground noise effects would not be significant (negligible or minor) at nine of the representative receptor areas studied, with moderate adverse effects within three receptor areas during the day. The effects rated as moderate are considered significant and these are predicted in the Charlwood Road, Lowfield Heath and Rowley Farm assessment areas, covering up to 22 properties of the 3,176 properties considered in these assessment areas.

14.13.32 For night-time the results show predicted ground noise effects would not be significant (negligible or minor) at seven of the representative receptor areas studied with significant adverse effects

within five receptor areas during the night. The effects, rated as moderate or major, are considered significant and these are predicted in the Charlwood, Charlwood Road, Povey Cross, Lowfield Heath and Rowley Farm assessment areas, covering up to 37 properties of the 3,176 properties considered in these assessment areas.

14.13.33 There are 20 properties, 2 in the Charlwood receptor area, 8 on Charlwood Road and 10 in the Lowfield Heath receptor area, where the effects are rated as major above SOAEL. For these the NIS inner zone insulation package would avoid noise impacts indoors, including sleep disturbance and disturbance to noise sensitive activities during the day such as working, reading etc. This is consistent with policy for the first aim of the NPSE to avoid significant effects on health and quality of life. However, noise insulation would not reduce noise levels outside and so some disturbance in outside activities is likely, which is expected to result in **moderate adverse significant effects** in these areas.

14.13.34 Up to 17 properties in the Povey Cross and Rowley Farm receptor areas are expected to experience **moderate adverse significant effects** due to increases in ground noise below SOAEL. These would be offered noise insulation within the NIS outer zone, which would help to reduce noise levels indoors and reduce these noise impacts.

14.13.35 In total, although noise insulation will partly mitigate the effects, residual **significant adverse effects** are predicted at 37 properties.

Road Traffic Noise

14.13.36 A construction traffic noise assessment was undertaken in accordance with the DMRB methodology which considered three main scenarios where peak changes in road traffic are excepted due peaks in the constriction works taking place and traffic management measured on the highways creating diverted traffic. No significant effects were predicted.

14.13.37 A detailed noise model has been used to predict noise levels from the operation of the highway scheme and to compare them to the do-minimum in 2032 and 2047 as required by the DMRB methodology. Noise mitigation including noise barriers, traffic management and speed reductions have been incorporated into the highway design. This ensures that at most receptors, including the two Noise Important Areas, noise levels would reduce or have negligible effect as a result of the Project. The numbers of properties affected by the different noise changes has been assessed and it is concluded that the adverse effects are of negligible or low magnitude in most areas, with benefits in other areas within the Study Area. No significant effects were predicted.

14.13.38 Noise levels on other roads beyond the highway improvements could be changed by traffic changes resulting from the Project. Modelling indicated these noise changes would be insignificant.

Table 14.13.1: Summary of Effects

Receptor	Receptor Sensitivity	Description of Impact	Short / medium / long term / permanent	Magnitude of Impact	Residual Significance of Effect	Significant / not significant	Notes
Initial construction period (2024-2029)							
Properties adjacent to the works	Residential (high) and non-residential (various) NSRs	Construction noise during daytime and night-time	Short term	Medium. For whole construction period potential for adverse effects at approximately 37 properties	Moderate Adverse after mitigation, subject to further mitigation by the contractor	Significant	Mitigation through CoCP
Properties adjacent to construction traffic routes	Residential (high) and non-residential (various) NSRs	Construction traffic noise during daytime and night-time	Short term	Low	Minor	Not Significant	
First full year of operation (2029)							
Properties above LOAEL construction noise	The construction noise impacts in 2029 and beyond are included in the estimates for 2024 to 2029 above.						
Properties within LOAEL air noise contours	The air noise impacts in 2029 would be lower than those for 2032 reported below.						
Properties within LOAEL ground noise contours	The ground noise impacts in 2029 would be lower than those for 2032 reported below.						

Receptor	Receptor Sensitivity	Description of Impact	Short / medium / long term / permanent	Magnitude of Impact	Residual Significance of Effect	Significant / not significant	Notes
Interim assessment year (2032)							
Properties south of airport	Residential (high) and non-residential (various) NSRs	Air noise disturbance	Permanent	Day 1,700 to 4,800 people: negligible to medium. Night 100 to 200 people: negligible.	Minor beneficial (day). Negligible (night).	Not significant	
Population above LOAEL		Air noise disturbance	Permanent	Day 13,000 to 16,000 people: negligible. Night 21,000 to 28,000 people: negligible.	Negligible	Not significant	
North of airport and Smallfield, and west (day) West of runway (night)		Air noise disturbance	Permanent	Day 5,200 to 7,000 people: low. Night 300 to 500 people: low.	Minor adverse	Not significant	Homes within the $L_{eq\ 16\ hour}$ 54 dB contour will be eligible for the Outer Zone NIS.
West of runway at Ifield Road, Russ Hill and Partridge Lane. East of the runway at		Air noise disturbance	Permanent	210 people: medium.	Moderate adverse	Significant	All homes above SOAEL eligible for Inner Zone NIS.

Receptor	Receptor Sensitivity	Description of Impact	Short / medium / long term / permanent	Magnitude of Impact	Residual Significance of Effect	Significant / not significant	Notes
Balcombe Road and Peeks Brooke Lane.							
Community receptors	21 schools, one hospital, 18 places of worship and seven community buildings	Air noise disturbance	Permanent	Negligible/low	Negligible or minor	Not significant	A noise insulation scheme will be offered for any school adversely affected.
Properties in Charlwood, Charlwood Road, Povey Cross, Lowfield Heath and Rowley Farm	Residential (high) and non-residential (various) NSRs	Ground noise disturbance	Permanent	Approximately 17 properties; medium.	Moderate adverse	Significant	Noise bund and barrier minimise impacts to below SOAEL, eligible for Outer Zone NIS.
Charlwood, Charlwood Road, Lowfield Heath	Residential (high)	Ground noise disturbance	Permanent	Approximately 20 properties: medium.	Moderate adverse	Significant	All homes above SOAEL eligible for Inner Zone NIS.
Properties within LOAEL road traffic noise contours	Residential (high) and non-residential (various) NSRs	Road traffic noise disturbance from roads modified by the Project	Medium term	Negligible to low beneficial/adverse.	Negligible or minor	Not significant	Includes noise barriers.

Receptor	Receptor Sensitivity	Description of Impact	Short / medium / long term / permanent	Magnitude of Impact	Residual Significance of Effect	Significant / not significant	Notes
Properties within 50 m of non-Project road links	Residential (high) and non-residential (various) NSRs	Road traffic noise disturbance on unchanged roads	Medium term	Negligible to low noise changes.	Negligible or minor	Not Significant	
Design year (2038)							
Properties within LOAEL air noise contours	The air noise impacts in 2038 would be lower than those for 2032 reported above.						
Properties within LOAEL ground noise contours	The ground noise impacts in 2038 would be lower than those for 2032 reported above.						
Properties within LOAEL road traffic noise contours	Road traffic noise has been assessed 15 years after opening, in 2047, in accordance with the DMRB, see below.						
Year (2047)							
Properties within LOAEL road traffic noise contours	Residential (high) and non-residential (various) NSRs	Road traffic noise disturbance from roads modified by the Project	Permanent	Negligible	Negligible	Not significant	Includes noise barriers.

Receptor	Receptor Sensitivity	Description of Impact	Short / medium / long term / permanent	Magnitude of Impact	Residual Significance of Effect	Significant / not significant	Notes
Properties within 50 m of non-Project road links	Residential (high) and non-residential (various) NSRs	Road traffic noise disturbance on unchanged roads	Permanent	Negligible	Negligible or minor	Not Significant	

14.14. References

Legislation

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Civil Aviation Act 2012

Control of Pollution Act 1974

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Land Compensation Act 1973

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14.15. Glossary

Table 14.15.1: Glossary of Terms

Term	Description
AONB	Area of Outstanding Natural Beauty
APF	Aviation Policy Framework
APU	Auxiliary Power Unit
ATM	Air Traffic Movement
A-Weighting	Environmental noise measurements and levels are usually expressed using a variation of the decibel scale, which gives less weight to low frequencies and very high frequencies. This system was derived to correspond to the reduced sensitivity of the human hearing mechanism to these frequencies.
Background Noise	Background noise is the noise without the proposed changes in the use of the airport. The L_{Aeq} is used in the ground noise study parameter to indicate the ambient noise conditions that exist in the background noise.
BAU	Business as Usual
BNL	Basic Noise Level
BPM	Best Practicable Means
CAA	Civil Aviation Authority
CEA	Cumulative Effects Assessment
CoCP	Code of Construction Practice
CRTN	Calculation of Road Traffic Noise
DfT	Department for Transport
DMRB	Design Manual for Roads and Bridges
EAT	End around taxiway
EGR	Engine Ground Running
EIA	Environmental Impact Assessment
ERCD	Environmental Research and Consultancy Department
ES	Environmental Statement
FPT	Flight Performance Team
GATCOM	Gatwick Airport Consultative Committee
GPU	Ground Power Unit
ICAO	International Civil Aviation Organization
ICCAN	Independent Commission on Civil Aviation Noise
$L_{Aeq, 16 hours}$	The L_{Aeq} over the daytime and evening period 07:00 to 23:00 hours, for aircraft noise for an average summer day between 16 June and 15 September. In this report all noise levels are A-weighted and in places the A is omitted for simplicity written $L_{eq, 16 hour}$
$L_{Aeq, 8 hours}$	The L_{Aeq} over the night period 23:00 to 07:00 hours, for aircraft noise for an average summer night between 16 June and 15 September. In this report all noise levels are A-weighted and in places the A is omitted for simplicity written $L_{eq, 8 hour}$

Term	Description
$L_{Aeq, T}$ - Equivalent Continuous Sound Level	The L_{Aeq} level gives a single figure to describe a sound that varies over a given time period, T. It is the A-weighted steady sound level that would result in the same sound energy at the receiver as occurred in practice with the varying level. It is derived from the logarithmic summation of the sound signal and so unlike a conventional (linear) average it gives additional weighting to higher levels.
L_{max}	The L_{max} s is the highest value of the sound level over the specified period. It is sometimes referred to as 'peak' noise level. However, the term 'peak' has a special meaning in acoustics and the expression 'maximum' is preferable to avoid confusion. The 's' stands for slow response, which is the metric usually used for aircraft noise. In this report all L_{max} levels are A-weighted.
LOAEL	Low Observed Adverse Effect Level
N60 night	Numbers of aircraft during an average summer night above L_{max} 60 dB
N65 day	Numbers of aircraft during an average summer day above L_{max} 65 dB
NaTMAG	Noise and Track Monitoring Advisory Group
NIS	Noise Insulation Scheme
NOEL	No Observed Effect Level
NPPF	National Planning Policy Framework
NPRs	Noise Preferential Routes
NPS	National Policy Statement
NPSE	Noise Policy Statement for England
NPV	Net Present Value
NSR	Noise Sensitive Receptor
NTK	Noise and Track Keeping
Overflight	An aircraft overflying a receptor on the ground at a height of less than 7,000 ft above the ground and at an angle of at least 48.5 degrees from the horizontal, as defined by CAP1498.
PEIR	Preliminary Environmental Information Report
QC	Quota Count
Quiet 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
SID	Standard Instrument Departure
SOAEL	Significant Observed Adverse Effect Level
SONA	Survey of Noise Attitudes
Standard Mode	Year on year the proportion of aircraft taking off to the east and to the west varies according to wind conditions. Standard mode contours take the 20 rolling average runway modal split; in 2018 this was 75% west / 25% east for the L_{eq} period. At night a 10 year average is used, and in 2018 this was 76% west / 24% east.
TRL	Transport Research Laboratory
WebTAG	Web based Transport Appraisal Guidance: https://www.gov.uk/guidance/transport-analysis-guidance-webtag\
WHO	World Health Organization

Term	Description
ZoI	Zone of Influence