Heathrow

EASTERLY ALTERNATION INFRASTRUCTURE PROJECT

Environmental Impact Assessment
Environmental Statement, Volume II
Chapter 6: Air Quality

DOCUMENT REFERENCE: 19309-XX-EC-XXX-000012

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Heathrow

Tables

6. Air quality

6.1 Introduction

6.1.1. This chapter reports the outcome of the assessment of likely significant effects arising from the Proposed Development upon air quality. It assesses the likely significant effects of air quality emissions on human and ecological receptors.

6.1.2. This chapter (and its associated figures and appendices) is intended to be read as part of the wider Environmental Statement, with particular reference to **Chapter 3: Description of the Proposed Development**. Associated appendices are as follows:

- **Appendix 6.1: Air Quality Modelling Methodology**;
- **Appendix 6.2: Air Quality Detailed Results**;
- **Appendix 6.3: Air Quality Figures**; and
- **Appendix 6.4: Longford Monitoring Survey**.

6.1.3. Any potential significant effects on air quality will predominantly arise from aircraft and road traffic, with minor contributions from other sources. The focus of this chapter is therefore on these sources and the potential effects on human health and ecological receptors.

6.1.4. It is usual practice for air quality assessments to include impacts from dust and odour as required. These have been considered as part of the present assessment but scoped out from detailed assessment. Information on the matters scoped in and scoped out of this chapter is given in **Section 6.6**.

6.1.5. The Proposed Development does not involve an increase in aircraft movements or passenger throughout at the airport but it will lead to a change in aircraft movement patterns on the ground and in the air, during easterly operations only, which occur for approximately 30% of the time. The main effect in air quality terms would be an increase in the number of aircraft departing on the northern runway (09L) and arriving on the southern runway (09R) during easterly operations and an equivalent decrease in the number of aircraft departing on the southern runway (09R) and landing on the northern runway (09L) during easterly operations. The number of aircraft movements will be unchanged by the Proposed Development, and there will be no change during westerly operations which occur for approximately 70% of the time. Further information on the Proposed Development is provided in **Chapter 3: Description of the Proposed Development**.

6.1.6. The quantity of air pollutants emitted from aircraft may change slightly as a result of the Proposed Development, but the principal impacts will be associated with the change in the spatial distribution of emissions across the airfield. As flight paths remain unchanged, emissions from aircraft in flight would not change significantly. Sources other than aircraft, including landside road vehicles, airside vehicles and ground support equipment, and stationary combustion plant, will be unchanged.

6.1.7. The principal air pollutants of concern are nitrogen dioxide (NO_2), particulate matter less than 10 µm in diameter (PM_{10}) and particulate matter less than 2.5 µm in diameter ($PM_{2.5}$);

PM_{10} and $PM_{2.5}$ are collectively referred to as PM. NO_2 is formed in the air through a complex chemical process involving NO_2 and nitric oxide (NO), collectively called oxides of nitrogen or NOx, as well as other substances. Emissions are therefore presented as NOx, and concentrations of NO_2 are calculated from concentrations of NOx.

6.1.8. The assessment includes a sensitivity analysis of the location of the Rapid Access Taxiways.

6.2. Relevant legislation, policy and technical guidance

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

Legislation

6.2.2. A summary of the relevant legislation is provided in **Table 6.1**.

Table 6.1 Relevant legislation

Document / Reference	Summary
Environment Act (1995)[1]	Part IV of the Environment Act 1995 requires that Local Authorities periodically review air quality within their individual areas and assess whether prescribed air quality objectives are being achieved or are likely to be achieved within a specified period. This process of Local Air Quality Management (LAQM) is an integral part of delivering the UK Government's Air Quality Objectives (AQOs). Local Authorities must produce an Annual Status Report summarising the outcome of their Review and Assessment. Reviews and assessments of local air quality aim to identify areas where national policies to reduce vehicle and industrial emissions alone are unlikely to result in air quality meeting the UK Government's AQOs by the required dates. For the purposes of determining the focus of Review and Assessment, Local Authorities should have regard to those locations where members of the public are likely to be regularly present and are likely to be exposed over the averaging period of the objective. Where the assessment indicates that some or all of the objectives are not being achieved or are not likely to be achieved within a specified period, the Local Authority has a duty to declare an Air Quality Management Area (AQMA). The declaration of an AQMA requires the Local Authority to implement an Air Quality Action Plan, to reduce air pollution concentrations so that the required AQOs are met. Local authorities do not have a legal duty to achieve the objectives.

[1] HMSO (1995), *Environment Act* [online]. Available at: http://www.legislation.gov.uk/ukpga/1995/25/contents

Document / Reference	Summary
Air Quality (England) Regulations (2000)[2] and the Air Quality (England) (Amendment) Regulations (2002)[3]	The Air Quality (England) Regulations (2000) (SI 2000 No, 928) and the Air Quality (England) (Amendment) Regulations (2002) (SI 2002 No, 3043) specify the objectives to be met, and dates when they are to be met, by local authorities through the LAQM process defined in the Environment Act (1995) (as amended).
Air Quality Standards Regulations (2010)[4]	The Air Quality Standards Regulations 2010 (SI 2010 No 1001) came into force on 11 June 2010. They transpose European Union Directive 2008/50/EC[5] (and certain other European Directives) into UK legislation and are part of retained English law. The limit values in Directive 2008/50/EC are transposed into the Regulations with attainment dates in line with the Directive. The limit values in the Air Quality Standards Regulations 2010 are legally binding limits on concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. The limit values are based on the assessment of the effects of each pollutant on human health including the effects on sensitive groups or on ecosystems. The legal duty under the Air Quality Standards Regulations (2010) is on the Secretary of State to ensure the limit values are not exceeded. This is in contrast to the Air Quality (England) Regulations (2000) and the Air Quality (England) (Amendment) Regulations (2002), which set the objectives for local authorities to work to meet through the LAQM process. Limit values are therefore not the same as objectives in legal terms, although many are numerically the same. The Air Quality Standards Regulations 2010 (Regulation 2) define ambient air as: *"…outdoor air in the troposphere, excluding workplaces where members of the public do not have regular access."* The Air Quality Standards Regulations 2010 (Schedule 1, Part 1, Paragraph 2) prescribe locations where compliance with the limit value does not need to be assessed: *"Compliance with limit values directed at the protection of human health does not need to be assessed at the following locations—* *(a) any location situated within areas where members of the public do not have access and there is no fixed habitation;*

[2] HMSO, (2000). *The Air Quality (England) Regulations 2000 Statutory Instrument 928* [online]. Available at: http://www.legislation.gov.uk/uksi/2000/928/contents/made

[3] HMSO, (2002). *The Air Quality (England) (Amendment) Regulations 2002, Statutory Instrument 3043* [online]. Available at: https://www.legislation.gov.uk/uksi/2002/3043/contents/made

[4] HMSO, (2010). *The Air Quality Standards Regulations 2010 Statutory Instrument 1001* [online]. Available at: http://www.legislation.gov.uk/uksi/2010/1001/pdfs/uksi_20101001_en.pdf

[5] The European Parliament and the Council of the European Union (2008), Directive 2008/50/EC of the European Parliament and of the Council [online]. Available at: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32008L0050

Document / Reference	Summary
	(b) on factory premises or at industrial locations to which all relevant provisions concerning health and safety at work apply; *(c) on the carriageway of roads and on the central reservations of roads except where there is normally pedestrian access to the central reservation."*
Environment Act (2021)[6]	The UK's new legal framework for protection of the natural environment, the Environment Act (2021) passed into UK law in November 2021. The Environment Act gives the UK Government the power to set long-term, legally binding environmental targets. It also establishes an Office for Environmental Protection (OEP), responsible for holding the government to account and ensuring compliance with these targets.
The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023 (SI 2023 No. 96)[7]	The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023 sets two new targets, and two new interim targets, for $PM_{2.5}$ concentrations in England. One set of targets focuses on absolute concentrations. The long-term target is to achieve an annual mean $PM_{2.5}$ concentration of 10 µg/m^3 by the end of 2040, with the interim target being a value of 12 µg/m^3 by the start of 2028. The second set of targets relate to reducing overall population exposure to $PM_{2.5}$. By the end of 2040, overall population exposure to $PM_{2.5}$ should be reduced by 35% compared with 2018 levels, with the interim target being a reduction of 22% by the start of 2028.
The Renewable Transport Fuel Obligations (Sustainable Aviation Fuel) Order 2024 (draft)[8]	This draft statutory instrument has been approved by the House of Commons but not yet by the House of Lords and is intended to come into force on 01 January 2025. It will impose an obligation on suppliers of aviation turbine fuel to include sustainable aviation fuel (SAF) within their fuel, in increasing proportions year on year. By 2030, the proportion of SAF within aviation jet fuel must be at least 10.5%, and by 2040 the proportion must be at least 23.7%. The use of SAF may affect air quality in the vicinity of airport. Alternative fuels often emit lower levels of NOx than conventional oil-based fuels due to lower combustion temperatures. Sulphur emissions, and therefore secondary PM emissions, may also reduce through the use of SAF due to their non-oil origin.

Policy

6.2.3. A summary of relevant planning policy and guidance is provided in **Table 6.2**.

[6] Environment Act 2021 (2021) [online]. Available at: https://www.legislation.gov.uk/ukpga/2021/30/contents/enacted

[7] The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023 (SI 2023 No. 96) (2023) [online]. Available at: https://www.legislation.gov.uk/uksi/2023/96/contents/made

[8] Renewable Transport Fuel Obligations (Sustainable Aviation Fuel) Order 2024 (draft) [online]. Available at: https://www.legislation.gov.uk/ukdsi/2024/9780348262575/contents [Accessed: 24 September 2024]

Table 6.2 Relevant policy

Document / reference	Summary
National Planning Policies: General and air quality	
National Planning Policy Framework (NPPF)[9]	The National Planning Policy Framework (NPPF) sets out planning policy for England. It states that the purpose of the planning system is to contribute to the achievement of sustainable development, and that the planning system has three overarching objectives, one of which (Paragraph 8c) is an environmental objective: *"to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy".* To prevent unacceptable risks from air pollution, Paragraph 180 of the NPPF states that: *"Planning policies and decisions should contribute to and enhance the natural and local environment by … preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air quality".* Paragraph 191 of the NPPF states: *"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".* More specifically with regard to air quality, Paragraph 192 makes clear that: *"Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan".*

[9] Ministry of Housing, Communities and Local Government, (2023). *National Planning Policy Framework* [online]. Available at: https://www.gov.uk/government/publications/national-planning-policy-framework--2 https://www.gov.uk/government/publications/national-planning-policy-framework--2 [Accessed: 15 May 2024]

Document / reference	Summary
Planning Practice Guidance (2019)[10]	The NPPF is supported by Planning Practice Guidance (PPG), which includes guiding principles on how planning can take account of the impacts of new development on air quality. The PPG states that: *"[Defra] carries out an annual national assessment of air quality using modelling and monitoring to determine compliance with relevant Limit Values. It is important that the potential impact of new development on air quality is taken into account where the national assessment indicates that relevant limits have been exceeded or are near the limit, or where the need for emissions reductions has been identified".* The role of the local authorities through the LAQM regime is covered, with the PPG stating that a local authority Air Quality Action Plan *"identifies measures that will be introduced in pursuit of the objectives and can have implications for planning"*. In addition, the PPG makes clear that *"Odour and dust can also be a planning concern, for example, because of the effect on local amenity"*. Regarding the need for an air quality assessment, the PPG states that: *"Whether air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to have an adverse effect on air quality in areas where it is already known to be poor, particularly if it could affect the implementation of air quality strategies and action plans and/or breach legal obligations (including those relating to the conservation of habitats and species). Air quality may also be a material consideration if the proposed development would be particularly sensitive to poor air quality in its vicinity".* The PPG sets out the information that may be required in an air quality assessment, making clear that: *"Assessments need to be proportionate to the nature and scale of development proposed and the potential impacts (taking into account existing air quality conditions), and because of this are likely to be locationally specific".* The PPG also provides guidance on options for mitigating air quality impacts, as well as examples of the types of measures to be considered. It makes clear that: *"Mitigation options will need to be locationally specific, will depend on the proposed development and need to be proportionate to the likely impact. It is important that local planning authorities work with applicants to consider appropriate mitigation so as to ensure new development is appropriate for its location and unacceptable risks are prevented".*
The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (2007)[11]	The Air Quality Strategy for England, Scotland, Wales and Northern Ireland published by the Department for Environment, Food, and Rural Affairs (Defra) and Devolved Administrations, provides the policy framework for air quality management and assessment in the UK. It provides air quality standards and objectives for key air pollutants, which are designed to protect human health and the environment. It also sets out how the different sectors: industry, transport and local government, can contribute to achieving the air quality objectives.

[10] Ministry of Housing, Communities & Local Government, (2019). *Planning Practice Guidance* [online]. Available at https://www.gov.uk/government/collections/planning-practice-guidance

[11] Defra et al, (2007), The Air Quality Strategy for England, Scotland, Wales and Northern Ireland

Document / reference	Summary
	Local authorities are seen to play a particularly important role. The strategy describes the LAQM regime that has been established, whereby every authority has to carry out regular reviews and assessments of air quality in its area to identify whether the objectives have been, or will be, achieved at relevant locations, by the applicable date. If this is not the case, the local authority must declare an AQMA, and prepare an action plan which identifies appropriate measures that will be introduced in pursuit of the objectives.
Air Quality Strategy: framework for local authority delivery 2023[12]	The Air Quality Strategy: framework for local authority delivery 2023 sets out the strategic air quality framework for local authorities and other Air Quality Partners in England. It sets out their powers and responsibilities, and actions the government expects them to take. It does not replace other air quality guidance documents relevant to local authorities.
Clean Air Strategy 2019[13]	The Clean Air Strategy 2019 sets out a wide range of actions by which the UK Government, in partnership with the Governments of Scotland, Wales and Northern Ireland, will seek to reduce pollutant emissions and improve air quality. Actions are targeted at four main sources of emissions: Transport, Domestic, Farming and Industry.
Ten Point Plan for a Green Industrial Revolution (2020)[14]	The UK Government's Ten Point Plan for a Green Industrial Revolution (2020) is primarily focused on decarbonising the UK economy through measures such as cleaner energy production and increased electrification. Many of these policies also tend to improve air quality, notably Point 5: Green Public Transport, Cycling and Walking. Of particular relevance is Point 6: Jet Zero and Green Ships, which aims to encourage the use of Sustainable Aviation Fuels (SAF) . This led to the publication of the Supporting the transition to Jet Zero: Creating the UK SAF Mandate described below.
Environmental Improvement Plan 2023[15]	Defra published its 25 Year Environment Plan in 2018. The Environment Act (2021) requires Defra to review this Plan at least every five years. The Environmental Improvement Plan 2023 is the first revision. This outlines the progress made since 2018 and adds detail to the goals defined in the 2018 Plan, including that of achieving clean air. The Environmental Improvement Plan 2023 sets out the new air quality targets which have been set for concentrations of $PM_{2.5}$. These targets include the long-

[12] Defra, (2023). The Air Quality Strategy: Framework for Local Authority Delivery [online]. Available at: https://www.gov.uk/government/publications/the-air-quality-strategy-for-england/air-quality-strategy-framework-for-local-authority-delivery (Accessed 24 September 2024)

[13] Defra, (2019). Clean Air Strategy 2019 [online]. Available at: https://www.gov.uk/government/publications/clean-air-strategy-2019 (Accessed 24 September 2024)

[14] HM Government, (2020). *The Ten Point Plan for a Green Industrial Revolution* [online]. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/936567/10_POINT_PLAN_BOOKLET.pdf (Accessed 16 February 2023).

[15] Department for Environment, Food and Rural Affairs (Defra), (2023). *Environmental Improvement Plan 2023* [online]. Available at: www.gov.uk/government/publications/environmental-improvement-plan (Accessed: 29 February 2024).

Document / reference	Summary
	term targets in the Statutory Instrument 2023/96 (see above), and interim targets to be achieved by 2028. The 2023 Plan outlines the role of local authorities in helping it meet both its targets and existing commitments. It also outlines the respective roles of industry, agricultural sectors, and the Department for Transport (DfT) in providing the coordinated action required to meet both its new and pre-existing targets and commitments.
Supporting the transition to Jet Zero: Creating the UK SAF Mandate[16]	This sets out the Government's commitment to introduce a SAF Mandate from 2025, requiring at least 10% of UK aviation fuel to be from sustainable sources by 2030. The mandate will be implemented through the Renewable Transport Fuel Obligations (Sustainable Aviation Fuel) Order 2024 (see above), currently proceeding through Parliament.
Air Quality Plan for Nitrogen Dioxide (NO_2) in the UK[17] [18]	Defra has produced an air quality plan to tackle roadside NO_2 concentrations in the UK; a supplement to the 2017 Plan was published in October 2018 and sets out the steps the UK Government is taking in relation to a further 33 local authorities where shorter-term exceedances of the limit value were identified. Alongside a package of national measures, the 2017 Plan and the 2018 Supplement require those identified English Local Authorities (or the Greater London Authority (GLA) in the case of London Authorities) to produce local action plans and/or feasibility studies. These plans and feasibility studies must have regard to measures to achieve the statutory limit values within the shortest possible time, which may include the implementation of a Clean Air Zone (CAZ). The air quality assessment for the Easterly Alternation Infrastructure planning application has principally been carried out in relation to the air quality objectives, with consideration given to the limit values that are the focus of the Air Quality Plan.
National Planning Policies: Aviation	
Aviation Policy Framework (2013)[19]	The Aviation Policy Framework sets out the UK Government's high-level strategy and overall objectives for aviation and replaces the 2003 Air Transport White Paper. With regards to air quality, the policy is to seek improved international standards to reduce emissions from aircraft and vehicles, and to work with airports and local authorities to improve air quality, including encouraging transport operators to introduce less polluting vehicles. The

[16] Department for Transport, (2024). *Supporting the transition to Jet Zero: Creating the UK SAF Mandate* [online]. Available at: https://www.gov.uk/government/consultations/pathway-to-net-zero-aviation-developing-the-uk-sustainable-aviation-fuel-mandate (Accessed 24 September 2024)

[17] Defra, (2017). *Air quality plan for nitrogen dioxide (NO_2) in the UK* [online]. Available at: https://www.gov.uk/government/publications/air-quality-plan-for-nitrogen-dioxide-no2-in-uk-2017 (Accessed 24 September 2024)

[18] Defra. (2018). *Supplement to the UK plan for tackling roadside nitrogen dioxide concentrations* [online]. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/746100/air-quality-no2-plan-supplement.pdf (Accessed 24 September 2024)

[19] DfT, (2013). *Aviation policy framework* [online]. Available at: https://www.gov.uk/government/publications/aviation-policy-framework (Accessed: 29 February 2024)

Document / reference	Summary
	Framework places a particular importance on areas where the EU Limit Values and air quality objectives are exceeded but recognises that concentrations of nitrogen oxides (NOx) from aviation-related activities reduce rapidly beyond the immediate area of the runway, and places emphasis on reducing emissions associated with surface access. In particular, the preparation of Airport Surface Access Strategies (ASAS) is strongly encouraged, together with the development of targets to reduce the air quality impacts of surface access.
Airports National Policy Statement (NPS): New runway capacity and infrastructure at airports in the southeast of England[20] (updated June 2018)	The Airports NPS provides the primary basis for decision making on development consent applications for a Northwest Runway at Heathrow Airport, and will be an important and relevant consideration in respect of applications for new runway capacity and other airport infrastructure in London and the South east of England. It declares that, in regard to the Northwest Runway proposals: *"The Secretary of State will consider air quality impacts over the wider area likely to be affected, as well as in the vicinity of the scheme. In order to grant development consent, the Secretary of State will need to be satisfied that, with mitigation, the scheme would be compliant with legal obligations that provide for the protection of human health and the environment.* *Air quality considerations are likely to be particularly relevant where the proposed scheme:* *• is within or adjacent to Air Quality Management Areas, roads identified as being above limit values, or nature conservation sites (including Natura 2000 sites and Sites of Special Scientific Interest);* *• would have effects sufficient to bring about the need for new Air Quality Management Areas or change the size of an existing Air Quality Management Area, or bring about changes to exceedances of the limit values, or have the potential to have an impact on nature conservation sites; and* *• after taking into account mitigation, would lead to a significant air quality impact in relation to Environmental Impact Assessment and / or to a deterioration in air quality in a zone or agglomeration."* The Airports NPS does not affect Government policy on wider aviation issues, as set out in the 2013 Aviation Policy Framework and subsequent policy statements (para. 1.38, ANPS).
Aviation 2050 Consultation (2019)[21]	In 2018–2019, the UK Government consulted on its Green Paper, Aviation 2050. In relation to air quality, the consultation document proposed the following measures: Improving the monitoring of air pollution, including ultrafine particles (UFP), in order to improve understanding of aviation's impact on local air quality; Ensuring comprehensive information on aviation-related air quality issues is made available to better inform interested parties;

[20] *Airports National Policy Statement: new runway capacity and infrastructure at airports in the South East of England* (2018) [online]. Available at: https://www.gov.uk/government/publications/airports-national-policy-statement (Accessed 24 September 2024)

[21] DfT, (2018). *The future of UK aviation – the future of UK aviation: next steps towards an aviation strategy* [online]. Available at: https://www.gov.uk/government/calls-for-evidence/a-new-aviation-strategy-for-the-uk-call-for-evidence (Accessed 24 September 2024)

Document / reference	Summary
	Requiring all major airports to develop air quality plans to manage emissions within local air quality targets; Validation of air quality monitoring to ensure consistent and robust monitoring standards that enable the identification of long-term trends; and Supporting industry in the development of cleaner fuels to reduce the air quality impacts of aviation fuels. This does not represent adopted policy. The UK Government issued a response on certain aspects of the Aviation 2050 consultation, related to airspace change proposals, but other aspects were effectively superseded or subsumed by the *Flightpath to the Future* policy (see below).
Flightpath to the Future (2022)[22]	'Flightpath to the future' is described as a strategic framework for the aviation sector that supports DfT's vision for a modern, innovative and efficient sector over the next 10 years. It builds on the responses to the Aviation 2050 consultation. It sets out a ten-point plan to support growth in the aviation sector while *"continuing to lead the way globally on key issues such as decarbonisation, safety and security"* and bringing benefits to the UK and users. Among the ten points are: *"Put the sector on course to achieve Jet Zero by 2050... We will also continue to work with the sector to reduce the localised impacts of aviation from noise and air pollution."*
Jet Zero Strategy (2022)[23]	In 2022, the UK Government published the Jet Zero Strategy. Whilst focused on decarbonising the aviation industry, it recognises that SAF is one of the key technologies available to government and industry to achieve Jet Zero. In respect of SAF, the document identifies four Strategic Objectives as follows: A commitment to have a SAF mandate in place by 2025, reducing greenhouse gas emissions of aviation fuel by the equivalent of at least 10% SAF use by 2030; Working with the private sector to build a thriving domestic SAF industry, with a commitment to have at least five commercial scale UK plants under construction by 2025; Working in partnership with industry and investors to build long term supply; and Establishing world-class testing and certifying facilities for SAF in the UK. The Strategy also recognises the future, potential benefits of Zero emission flights (ZEF), and identifies six Strategic Objectives as follows: Grow UK share of the global aerospace manufacturing market as new forms of aircraft emerge; Facilitate collaboration between aviation, other transport modes and sectors of the economy on the adoption of hydrogen;

[22] DfT, (2022). *Flightpath to the future: a strategic framework for the aviation sector* [online]. Available at: https://www.gov.uk/government/publications/flightpath-to-the-future-a-strategic-framework-for-the-aviation-sector (Accessed: 29 February 2024)

[23] DfT, (2022). *Jet Zero Strategy: delivering net zero aviation by 2050* [online]. Available at: https://www.gov.uk/government/publications/jet-zero-strategy-delivering-net-zero-aviation-by-2050 (Accessed: 29 February 2024)

Document / reference	Summary
	Ensure parallel development of aircraft with the energy and ground infrastructure required for their cooperation; Ensure the aviation sector workforce is prepared for the introduction of new aircraft; Stimulate the future innovation by promoting diversity and accessibility in the sector; and Put in place the policy and regulatory system to enable zero emission aircraft to enter commercial service and deliver our aspiration of zero emission routes connecting different parts of the United Kingdom to be realised by 2030.
Local policies (London)	
The London Plan (2021)[24] **London Plan Guidance: Air Quality Neutral (2023)[25]** **London Plan Guidance: Air Quality Positive (2023)[26]**	The London Plan sets out an integrated economic, environmental, transport and social framework for the development of London over the next 20-25 years. The key policy relating to air quality is Policy SI 1 on Improving air quality, Part B1 of which sets out three key requirements for developments: *"Development proposals should not:* *a) lead to further deterioration of existing poor air quality* *b) create any new areas that exceed air quality limits, or delay the date at which compliance will be achieved in areas that are currently in exceedance of legal limits* *c) create unacceptable risk of high levels of exposure to poor air quality".* Policy SI 1 also states that "*development proposals must be at least Air Quality Neutral*" and that "*Masterplans and development briefs for large-scale development proposals subject to an Environmental Impact Assessment should consider how local air quality can be improved across the area of the proposal as part of an air quality positive approach.*" Separate London Plan Guidance documents give details of how air quality neutral and air quality positive should be demonstrated. Policy T8 on Aviation states: *"The environmental and health impacts of aviation must be fully acknowledged and aviation-related development proposals should include mitigation measures that fully meet their external and environmental costs, particularly in respect of noise, air quality and climate change. Any airport expansion scheme must be appropriately assessed and if required demonstrate that there is an overriding public interest or no suitable alternative solution with fewer environmental impacts"* *"Any airport expansion proposals should not worsen existing air quality or contribute to exceedance of air quality limits, nor should they seek to claim or utilise air quality improvements resulting from unrelated Mayoral, local or national policies and actions. Airport expansion should also incorporate air*

[24] Greater London Authority (GLA), (2021). *The London Plan: The Spatial Development Strategy for London* [online]. Available at: https://www.london.gov.uk/sites/default/files/the_london_plan_2021.pdf

[25] GLA, (2023). *London Plan Guidance: Air Quality Neutral*.

[26] GLA, (2023). *London Plan Guidance: Air Quality Positive*.

Document / reference	Summary
	quality positive principles to minimise operational and construction impacts." (paragraph 10.8.5)
London Environment Strategy (2018)[27]	The London Environment Strategy was published in May 2018. The strategy considers air quality in Chapter 4; the Mayor's main objective is to create a "zero emission London by 2050". Policy 4.2.1 aims to "*reduce emissions from London's road transport network by phasing out fossil fuelled vehicles, prioritising action on diesel, and enabling Londoners to switch to more sustainable forms of transport*". The strategy sets a target to achieve, by 2030, the guideline value for $PM_{2.5}$ which was set by the World Health Organization (WHO) in 2005. An implementation plan for the strategy has also been published which sets out what the Mayor committed to do between 2018 and 2023 to help achieve the ambitions in the strategy.
Air Quality Focus Areas[28]	The GLA has identified 160 air quality Focus Areas in London. These are locations that not only exceed the annual mean limit value for NO_2, but also have high levels of human exposure. They do not represent an exhaustive list of London's air quality hotspot locations, but locations where the GLA believes the problem to be most acute. They are also areas where the GLA considers there to be the most potential for air quality improvements and are, therefore, where the GLA and Transport for London (TfL) will focus actions to improve air quality. The Proposed Development is located within an air quality Focus Area.
Local policies (London Borough of Hillingdon)	
Hillingdon Local Plan: Part 1 - Strategic Policies[29]	This provides a framework for development in the London Borough of Hillingdon up to 2026. The Plan includes the two Strategic Objectives (SOs) related to air quality: *SO10: "Improve and protect air… quality…"; and* *SO11: "…minimise emissions of… local air quality pollutants from new development and transport".* The main Policy of relevance to air quality is Policy EM8 'Land, Water, Air and Noise', which states that: *"All development should not cause deterioration in the local air quality levels and should ensure the protection of both existing and new sensitive receptors.* *All major development within the Air Quality Management Area (AQMA) should demonstrate air quality neutrality (no worsening of impacts) where appropriate; actively contribute to the promotion of sustainable transport measures such as vehicle charging points and the increased provision for vehicles with cleaner transport fuels; deliver increased planting through soft landscaping and living*

[27] GLA, (2018). *London Environment Strategy* [online]. Available at: https://www.london.gov.uk/what-we-do/environment/london-environment-strategy (Accessed 24 September 2024)

[28] GLA. (2019). London Atmospheric Emissions Inventory (LAEI) 2019 Air Quality Focus Areas [online]. Available at: https://data.london.gov.uk/dataset/london-atmospheric-emissions-inventory--laei--2019-air-quality-focus-areas (Accessed 24 September 2024)

[29] London Borough of Hillingdon, (2012). *Hillingdon Local Plan: Part 1 - Strategic Policies (Adopted November 2012)*.

Document / reference	Summary
	walls and roofs; and provide a management plan for ensuring air quality impacts can be kept to a minimum. *The Council seeks to reduce the levels of pollutants referred to in the Government's National Air Quality Strategy and will have regard to the Mayor's Air Quality Strategy. London Boroughs should also take account of the findings of the Air Quality Review and Assessments and Action plans, in particular where Air Quality Management Areas have been designated.* *The Council has a network of Air Quality Monitoring stations but recognises that this can be widened to improve understanding of air quality impacts. The Council may therefore require new major development in an AQMA to fund additional air quality monitoring stations to assist in managing air quality improvements".* Regarding Heathrow Airport, Policy T4 states: *"Recognising the economic importance of the airport to the borough this Hillingdon Local Plan: Part 1-Strategic Policies will support the sustainable operation of Heathrow within its present boundaries and growth in the Heathrow Opportunity Area by facilitating improvements to public transport and cycle links, enhancing the public transport interchange to provide the opportunity for a modal shift from the use of private cars and from short haul air to sustainable transport modes and providing transport infrastructure to accommodate economic and housing growth whilst improving environmental conditions, for example noise and local air quality for local communities."*
London Borough of Hillingdon Local Plan Part 2 - Development Management Policies[30]	This delivers the detail of the strategic policies set out in the Local Plan Part 1: Strategic Policies. Together the documents form a comprehensive development strategy for the Borough up to 2026. The Local Plan Part 2 includes the following policies that relate to air quality and the Proposed Development: Policy DMEI 14 'Air Quality' states that: *"A) Development proposals should demonstrate appropriate reductions in emissions to sustain compliance with and contribute towards meeting EU limit values and national air quality objectives for pollutants.* *B) Development proposals should, as a minimum:* *i) be at least 'air quality neutral';* *ii) include sufficient mitigation to ensure there is no unacceptable risk from air pollution to sensitive receptors, both existing and new; and* *iii) actively contribute towards the improvement of air quality, especially within the Air Quality Management Area".* Policy DMT 1 'Managing Transport Impacts' states that *"…In order for developments to be acceptable they are required to… have no significant adverse transport or associated air quality… impacts on the local and wider environment, particularly on the strategic road network…"*; Policy DMT 2 'Highways Impacts' states that "Development proposals must ensure that… they do not contribute to the deterioration of air quality…"; and Policy DMAV 2: Heathrow Airport states that:

[30] London Borough of Hillingdon, (2020). *London Borough of Hillingdon Local Plan Part 2 - Development Management Policies. Adopted Version 16 January 2020*.

Document / reference	Summary
	"A) Development proposals within the Heathrow Airport boundary will only be supported where: *i) they relate directly to airport related use or development*;* *ii) there is no detrimental impact to the safe and efficient operation of local and strategic transport networks;* *iii) they comply with Policy DMEI 14: Air Quality;* *iv) there are no other significant adverse environmental impacts; where relevant, an environmental impact and/or transport assessment will be required with appropriate identification of mitigation measures; and* *v) they comply with all other relevant policies of the Local Plan."*
London Borough of Hillingdon Supplementary Planning Document (SPD): Planning Obligations[31]	This states that: *"Obligations may be sought to ensure no detrimental impacts on air quality and/or to ensure compliance with the objective of the AQMA. The following circumstances may establish a requirement for planning obligations:* *As a recommendation of an air quality assessment;* *To mitigate the impacts from emissions from new development where these cannot be resolved through other means such as planning conditions, travel plans or statutory licenses;* *To mitigate impacts on new development where floor space is to be occupied for significant parts of the day, such as residential, where located in an area of poor air quality; and* *To mitigate air quality impacts during the construction phase where these cannot be controlled through conditions or other statutory licenses."*
London Borough of Hillingdon Air Quality Action Plan, 2019–2024[32]	Outlines actions to be taken by the London Borough of Hillingdon (LBH) between 2019 and 2024 to improve air quality. It has seven broad themes: monitoring and other core statutory duties; emissions from developments and buildings; public health and awareness raising; delivery servicing and freight; borough fleet actions; localised solutions; and cleaner (road) transport. With regard to Heathrow Airport, the Action Plan states: *"The Council will continue to press the airport to reduce their emissions as quickly as possible. The Council remains firmly opposed to expansion at Heathrow, or any changes to operations, which increase the pollution emissions even further and impact on the already poor air quality levels experienced by local communities."*
London Borough of Hillingdon Strategic Climate Action Plan, 2021[33]	This strategy provides the framework for the London Borough of Hillingdon's response to climate change. It reaffirms the commitments already made, demonstrates the progress to date and sets out the actions the Council will take. The strategy identifies that mitigation for climate change can benefit local air quality and vice versa.

[31] London Borough of Hillingdon, (2014). *Supplementary Planning Document: Planning Obligations. July 2014*.

[32] London Borough of Hillingdon, (2019). *Air Quality Action Plan, 2019-2024*.

[33] London Borough of Hillingdon, (202121). Strategic Climate Action Plan. https://www.hillingdon.gov.uk/media/7171/Strategic-climate-action-plan/pdf/Climate_strategy_adopted_July_2021_1.pdf?m=1632473850913.

Technical guidance

6.2.4. A summary of relevant technical guidance is provided in **Table 6.3**.

Table 6.3 Relevant technical guidance

Document / reference	Summary
ICAO Airport Air Quality Manual[34]	The International Civil Aviation Organization (ICAO) has published the Airport Air Quality Manual which sets out guidance for the compilation of emissions inventories at airports. This guidance has been followed as far as practicable (the guidance does not address the compilation of emissions inventories for future years).
IAQM/EPUK Land-use Planning & Development Control: Planning for Air Quality[35]	The approach developed jointly by Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) has been used to describe the modelled air quality impacts and assess their significance. The approach identifies impacts at individual receptors based on both the percentage change in concentrations relative to the relevant air quality objective/target and the absolute concentration relative to the objective/target. The approach is discussed later in this chapter with regard to the determination of the significance of effects.
LAQM.PG22[36]**, LAQM.TG22**[37] **and LLAQM.TG19**[38]	Defra has published Policy Guidance (LAQM.PG22) and Technical Guidance (LAQM.TG22) to assist local authorities in the discharge of their Local Air Quality Management duties. Whilst not specifically intended to advise on assessments that support the development control process, it provides guidance on modelling approaches that are not covered elsewhere. GLA has published a London-specific version of this guidance (LLAQM.TG19).
Environment Agency: Air emissions risk assessment for your environmental permit[39]	Provides the Environment Agency's approach to assessing air quality impacts in applications for environmental permits. Although not designed for use in planning applications, the guidance on assessment of ecological impacts is commonly used in the absence of other guidance.

[34] International Civil Aviation Organization, (2020). *Airport Air Quality Manual*. Second Edition, 2020. Doc 9889.

[35] Moorcroft and Barrowcliffe *et al*., (2017). *Land-Use Planning & Development Control: Planning For Air Quality v1.2*. IAQM, London [online]. Available at: http://iaqm.co.uk/guidance/

[36] Defra, (2022). *Review & Assessment: Policy Guidance LAQM.PG22 August 2022* Version [online]. Available at: https://laqm.defra.gov.uk/wp-content/uploads/2023/11/LAQM-Policy-Guidance-2022.pdf

[37] Defra, (2022). *Review & Assessment: Technical Guidance LAQM.TG22 August 2022* Version [online]. Available at: https://laqm.defra.gov.uk/wp-content/uploads/2022/08/LAQM-TG22-August-22-v1.0.pdf

[38] GLA, (2019). *London Local Air Quality Management Technical Guidance 2019* [online]. Available at: https://www.london.gov.uk/sites/default/files/llaqm_technical_guidance_2019.pdf

[39] Environment Agency, (2023). *Air emissions risk assessment for your environmental permit* [online]. Available at: https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit

Assessment criteria

6.2.5. The regulations and policy summarised above set out the air quality objectives, limit values and targets against which the air pollutants have been assessed. These assessment criteria are detailed in this subsection. The Air quality assessment criteria for NO_2, PM_{10} and $PM_{2.5}$ are set out in **Table 6.4**.

Standards, objectives and targets

6.2.6. The UK Government has established a set of air quality standards and objectives to protect human health. The 'standards' are set as concentrations below which effects are unlikely even in sensitive population groups, or below which risks to public health would be exceedingly small. They are based purely upon the scientific and medical evidence of the effects of an individual pollutant. The 'objectives' set out the extent to which the UK Government expects the standards to be achieved by a certain date. They take account of economic efficiency, practicability, technical feasibility and timescale. The objectives for use by local authorities are prescribed within the Air Quality (England) Regulations (2000)[2] and the Air Quality (England) (Amendment) Regulations (2002)[3].

6.2.7. The UK-wide objectives for NO_2 and PM_{10} were to have been achieved by 2005 and 2004 respectively and continue to apply in all future years thereafter. Measurements across the UK have shown[37] that the 1-hour NO_2 objective is unlikely to be exceeded at roadside locations where the annual mean concentration is below 60 µg/m^3. While this is based primarily on roadside monitoring locations, monitoring data around Heathrow Airport has shown that the 1-hour mean NO_2 objective has been comfortably met at all monitoring locations for many years (see **Table 6.9**), and future exceedances are therefore highly unlikely. Therefore, 1-hour NO_2 concentrations will only be considered if the annual mean concentration is above 60 µg/m^3.

6.2.8. Measurements have also shown[37] that the 24-hour mean PM_{10} objective could be exceeded at roadside locations where the annual mean concentration is above 32 µg/m^3. The predicted annual mean PM_{10} concentrations are thus used as a proxy to determine the likelihood of an exceedance of the 24-hour mean PM_{10} objective. Where predicted annual mean concentrations are below 32 µg/m^3 it is unlikely that the 24-hour mean objective will be exceeded. While this is based primarily on roadside monitoring locations, monitoring data around Heathrow Airport has shown that the 24-hour mean PM_{10} objective has been comfortably met at all monitoring locations for many years (see **Table 6.9**), and future exceedances are therefore highly unlikely.

6.2.9. For $PM_{2.5}$, the objective set by Defra for local authorities is to work toward reducing concentrations without setting any specific numerical value. In the absence of a numerical objective, it is convention to assess local air quality impacts against the limit value (see **Paragraph 6.2.16**), originally set at 25 µg/m^3 and currently set at 20 µg/m^3.

6.2.10. Defra has also recently set two new targets, and two new interim targets, for $PM_{2.5}$ concentrations in England. One set of targets focuses on absolute concentrations. The long-term target is to achieve an annual mean $PM_{2.5}$ concentration of 10 µg/m^3 by the end of

2040, with the interim target being a value of 12 µg/m^3 by the start of 2028[40]. The second set of targets relate to reducing overall population exposure to $PM_{2.5}$. By the end of 2040, overall population exposure to $PM_{2.5}$ should be reduced by 35% compared with 2018 levels, with the interim target being a reduction of 22% by the start of 2028.

6.2.11. Defra will assess compliance with the population exposure targets by averaging concentrations measured at its own background monitoring stations. Furthermore, all four new targets provide metrics against which central UK Government can assess its own progress. While local authorities have an important role delivering the required improvements, these are expected to relate to controlling emissions and not to directly assessing $PM_{2.5}$ concentrations against the targets.

6.2.12. In March 2023, the Department for Levelling Up, Housing and Communities[41] explained that the new $PM_{2.5}$ targets will:

> *"need to be integrated into the planning system, and in setting out planning guidance for local authorities and businesses, we will consider the specific characteristics of $PM_{2.5}$. The guidance will be forthcoming in due course, until then we expect local authorities to continue to assess local air quality impacts in accordance with existing guidance."*

6.2.13. For the time being, therefore, no assessment is required, and indeed no robust assessment is possible, in relation to the new $PM_{2.5}$ targets and they are not considered further in this chapter.

6.2.14. As part of the London Environment Strategy[27], the GLA has set a target to achieve an annual mean $PM_{2.5}$ concentration of 10 µg/m^3 by 2030. This target was derived from an air quality guideline set by World Health Organisation (WHO) in 2005[42]. In 2021, WHO updated its guidelines, but the London Environment Strategy considers the 2005 guideline of 10 µg/m^3. While there is no explicit requirement to assess against the GLA target of 10 µg/m^3, it is nevertheless included within the assessment in this chapter.

Locations where objectives apply

6.2.15. The objectives apply at locations where members of the public are likely to be regularly present and are likely to be exposed over the averaging period of the objective. The GLA explains where these objectives will apply in London[38]. The annual mean objectives for NO_2 and PM_{10} are considered to apply at the façades of residential properties, schools, hospitals and care homes etc., the gardens of residential properties, school playgrounds and the grounds of hospitals and care homes. The 24-hour mean objective for PM_{10} is considered

[40] Meaning that it will be assessed using measurements from 2027. The 2040 target will be assessed using measurements from 2040. National targets are assessed against concentrations expressed to the nearest whole number, for example a concentration of 10.4 µg/m^3 would not exceed the 10 µg/m^3 target.

[41] DLUHC, (2023). '*Planning Newsletter*'. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1158088/Chief_Planners_Newsletter_May_2023.pdf (Accessed: 29 February 2024)

[42] WHO. (2005). *Air Quality Guidelines* [online]. Available at: https://iris.who.int/bitstream/handle/10665/107823/9789289021920-eng.pdf?sequence=1

to apply at the same locations as the annual mean objective, as well as at hotels. The 1-hour mean objective for NO_2 applies wherever members of the public might regularly spend 1 hour or more, including outdoor eating locations and pavements of busy shopping streets. Such locations are referred to as 'relevant receptors'.

Limit values

6.2.16. EU Directive 2008/50/EC sets limit values for NO_2, PM_{10} and $PM_{2.5}$, and is implemented in English law through the Air Quality Standards Regulations (2010). The limit values for NO_2 and PM_{10} are the same numerical concentrations as the UK objectives as shown in **Table 6.4** but achievement of the limit values is a national obligation rather than a local one and concentrations are reported to the nearest whole number. In the UK, only monitoring and modelling carried out by UK Central Government meets the specification required to assess compliance with the limit values. UK Central Government does not normally recognise local authority monitoring or local modelling studies when determining the likelihood of the limit values being exceeded, unless such studies have been audited and approved by Defra and DfT's Joint Air Quality Unit. .

Ecological sites

6.2.17. EU Directive 2008/50/EC and the Air Quality Standards Regulations (2010)[4] set a limit value for annual mean NOx of 30 µg/m^3. However, this does not apply in certain locations, including those within 20 km of an agglomeration or within 5 km of a major road. The limit value therefore does not apply anywhere within the air quality study area of this assessment.

6.2.18. Critical levels (CLes) and critical loads (CLos) are the ambient concentrations and deposition fluxes below which significant harmful effects to sensitive ecosystems are unlikely to occur. The CLe for NOx is set at the same concentration as the objective, namely 30 µg/m^3, but does not have the same spatial constraints on where it applies. Exceedances of the CLes and CLos are considered in the context of preventing harm to sites which are protected under the various designation frameworks outlined in **Table 6.1** and **Table 6.2**.

6.2.19. Critical loads for nitrogen and acid deposition onto ecological sites are given by the Air Pollution Information System (APIS)[43] for selected sites and habitats. These are generally site-specific as they depend on the habitats and species present.

Summary of assessment criteria

6.2.20. The relevant air quality criteria for the assessment are summarised in **Table 6.4**.

[43] JNCC et al., (2024). *Air Pollution Information System* [online]. Available at: https://www.apis.ac.uk/

Table 6.4 Air Quality Criteria for NO2, PM10 and PM2.5

Pollutant	Receptor Type	Time Period	Value
NO_2	Human health	1-hour Mean	200 µg/m^3 not to be exceeded more than 18 times a year [a]
		Annual Mean	40 µg/m^3
PM_{10}	Human health	24-hour Mean	50 µg/m^3 not to be exceeded more than 35 times a year
		Annual Mean	40 µg/m^3 [b]
$PM_{2.5}$	Human health	Annual Mean	20 µg/m^3 [c]
		Annual Mean	10 µg/m^3 by 2030
NOx	Ecological	Annual Mean	30 µg/m^3
Nitrogen deposition	Ecological	Annual Mean	Site-specific
Acid deposition	Ecological	Annual Mean	Site-specific

[a] A proxy value of 60 µg/m^3 as an annual mean will be used to assess the likelihood of the 1-hour mean NO_2 objective being exceeded (see **paragraph 6.2.7**).

[b] A proxy value of 32 µg/m^3 as an annual mean will be used to assess the likelihood of the 24-hour mean PM_{10} objective being exceeded (see **paragraph 6.2.8**).

[c] There is no numerical $PM_{2.5}$ objective for local authorities. Convention is to assess against the UK limit value which is currently 20 µg/m^3.

[d] Expressed to the nearest whole number. Defra has explained in the 2023 Environmental Improvement Plan[15] that local authority responsibilities in relation to these targets relate to controlling emissions and not determining concentrations.

6.3. Technical and public engagement

Introduction

6.3.1. This Section describes the outcome of, and response to, technical and public engagement undertaken by the Project Team in relation to the air quality assessment. This is in addition to the submission of a Scoping Report, requesting a Scoping Opinion from LBH which was submitted on 1 November 2023 (see **Appendix 1.5: Scoping Report**). A Scoping Opinion was provided on 01 February 2024 (see **Appendix 1.6: Scoping Opinion**). Information received in the Scoping Opinion (**Appendix 1.6**) has informed the scope of the air quality assessment and is summarised further below in **Table 6.14.**

6.3.2. **Table 6.5** provides a summary of the engagement activities undertaken in support of the preparation of this assessment.

Table 6.5 Summary of engagement undertaken

Organisation	dates and other forms of consultation	Summary of outcome of discussions
London Borough of Hillingdon	04 March 2024 (by Microsoft Teams)	Discussion around Scoping Opinion (**Appendix 1.6**). Presented overview of assessment approach and scope. Assessment of significance, air quality neutral/air quality positive and damage costs/mitigation costs to be discussed further. Construction traffic had been raised by Spelthorne Council. Health impacts on vulnerable groups to be considered; these are covered in **Chapter 9: Health**.
London Borough of Hillingdon	21 May 2024 (by Microsoft Teams)	Heathrow Airport presented a summary of the results of the air quality assessment, including assessment of significance, air quality neutral/air quality positive.
Council for the Independent Scrutiny of Heathrow Airport (CISHA)	25 June 2024	Heathrow Airport presented a summary of the results of the air quality assessment, including assessment of significance, air quality neutral/air quality positive. The audience included representatives of six local authorities.

6.4. Baseline conditions

Method of baseline data collection

Desk study

6.4.1. Baseline conditions and existing sources of emissions within the air quality Study Area (see **Paragraph 6.4.3 et seq.**) have been determined by collating information from a number of sources:

- Industrial sources that may affect the area have been identified using Defra's Pollutant Release and Transfer Register[44];
- Local sources and monitoring data have been taken from local authorities' Air Quality Review and Assessment reports (Buckinghamshire Council[45], London

[44] Defra, (2024). *UK Pollutant Release and Transfer Register* [online]. Available at: http://prtr.defra.gov.uk/map-search

[45] Buckinghamshire Council, (2021) *2021 Air Quality Annual Status Report (ASR)* [online]. Available: https://buckinghamshire-gov-uk.s3.amazonaws.com/documents/ASR_2021_Buckinghamshire_Council_002_cMIN4NS.pdf (Accessed 15 March 2024)

Borough of Hillingdon, 2020, 2021[46], 2022[47]; London Borough of Hounslow, 2021[48], 2022[49]; Spelthorne Borough Council, 2020[50], 2022[51]; Slough Borough Council, 2020[52]). Automatic monitoring data have been downloaded from the Automatic Urban and Rural Network (AURN) and Air Quality England (AQE) online databases using the R OpenAir package[53]. Where there are minor inconsistencies in the reported monitoring data, such as those that may be introduced by rounding errors for example, the OpenAir data is preferred as it entails less manual processing and provides greater precision;

- Background concentrations (intended to be representative of concentrations away from major roads or point sources) have been defined using the 2018-based national pollution maps published by Defra[54]. These cover the whole of the UK on a 1x1 km grid; and
- Any exceedances of the annual mean limit value for NO_2 in the air quality study area have been identified using the maps of roadside concentrations published by Defra[55], as well as from the nearby AURN monitoring sites (which operate to the required data quality standards). These maps are used by the UK Government, together with the results from the AURN, to identify and report exceedances of the limit value. The national maps of roadside PM_{10} and $PM_{2.5}$ concentrations, which are

[46] London Borough of Hillingdon, (2021). *Air Quality Annual Status Report for 2020* [online]. Available at: http://www.hillingdon-air.info/pdf/LB_Hillingdon_ASR_2020_final.pdf (Accessed: 29 February 2024)

[47] London Borough of Hillingdon, (2022). *Air Quality Annual Status Report for 2021* [online]. Available at: http://www.hillingdon-air.info/pdf/LB_Hillingdon_ASR_2022.pdf (Accessed: 29 February 2024)

[48] London Borough of Hounslow, (2021), Air Quality Annual Status Report for 2020 [online]. Available at: https://www.hounslow.gov.uk/downloads/file/3303/2020_annual_staus_report_published_2021 (Accessed: 29 February 2024)

[49] London Borough of Hounslow, (2022), Air Quality Annual Status Report for 2021 [online]. Available at: https://www.hounslow.gov.uk/downloads/file/3710/2021_annual_status_report_published_2022 (Accessed: 29 February 2024)

[50] Spelthorne Borough Council, (2020), 2020 Air Quality Annual Status Report (ASR) [online]. Available at: https://www.spelthorne.gov.uk/media/23036/Annual-Status-Report-2020/pdf/Spelthorne_ASR_2020_FINAL.pdf?m=637328279940200000 (Accessed: 29 February 2024)

[51] Spelthorne Borough Council, (2022), 2022 Air Quality Annual Status Report (ASR) [online]. Available at: https://www.spelthorne.gov.uk/media/25543/Annual-Status-Report-2022/pdf/Spelthorne_ASR_2022_FINAL.pdf?m=638162839741870000 (Accessed: 29 February 2024)

[52] Slough Borough Council, (2020), 2020 Air Quality Annual Status Report (ASR) [online]. Available at: https://www.slough.gov.uk/downloads/file/160/asr-2020 (Accessed: 29 February 2024)

[53] Carslaw D.C. & Ropkins K., (2012), openair — An R package for air quality data analysis, Environmental Modelling & Software, 27–28(0), 52–61. ISSN 1364-8152, doi:10.1016/j.envsoft.2011.09.008.

[54] Defra, (2020), 2020 NO_2 projections data (2018 reference year) [online]. Available at: https://uk-air.defra.gov.uk/library/no2ten/2020-no2-pm-projections-from-2018-data (Accessed: 25 January 2024).

[55] Defra, (2024). *UK Ambient Air Quality Interactive Map* [online]. Available at: https://uk-air.defra.gov.uk/data/gis-mapping

available for the years 2009 to 2019, show no exceedances of the limit values anywhere in the UK in 2019.

Surveys

6.4.2. To better understand the air quality conditions at locations most likely to be affected by the Proposed Development, an air quality monitoring survey using passive diffusion tubes has been carried out which commenced in July 2023 and is currently ongoing. Monitoring locations were selected to establish baseline conditions at the most affected receptors. Diffusion tubes were also co-located with the Green Gates continuous monitoring station. Further details, including the monitoring locations and results to date, are given in **Appendix 6.4**. The baseline monitoring data has been bias adjusted and annualised following Defra's Local Air Quality Management Technical Guidance LAQM.TG22[37].

Study area

6.4.3. Previous assessments of air quality at Heathrow Airport have shown that concentrations of air pollutants from the airfield (including aircraft) decrease to background levels within a short distance of the airfield boundary. Impacts from airport-related road traffic may be experienced at greater distances from the airport boundary alongside major roads, but the magnitude and distribution of road traffic are unchanged by the Proposed Development.

6.4.4. The study area for the air quality assessment is 9 km × 9 km region between 503000–512000 easting and 172000–181000 northing, shown in **Figure 6.1.1** in **Appendix 6.3**. This is the study area used in previous assessments of air quality around Heathrow, including the assessment carried out for the previous easterly alternation application[56]. Concentrations have been calculated at specific receptors in the study area which are intended to be representative of relevant exposure. Concentrations have also been calculated on a grid of receptors covering the study area; the grid of receptors allows contours of concentrations to be presented and can be used to determine the concentration at any desired location in the study area if it is not represented by a specific receptor.

6.4.5. The nature of the Proposed Development, as described in **paragraph 6.1.5**, means that its impacts are expected to be greatest in Longford, immediately north-west of the western end of the northern runway, with beneficial impacts expected in Stanwell to the south-west of the Airport. These will therefore be the key parts of the air quality study area that will be the focus of attention. A detailed study area has therefore been defined covering these areas. Within the detailed study area, concentrations have been modelled on a finer grid, to enable concentrations close to roads to be contoured accurately (see **Figure 6.1.1** in **Appendix 6.3**). In addition, a high density of specific receptors has been included within the detailed study area. (see **Figures 6.1.2** and **6.1.3** in **Appendix 6.3**). Other parts of the air quality study area are expected to experience smaller impacts (both adverse and beneficial).

[56] Heathrow Airport, (2013). *Environmental Statement: Enabling works to allow implementation of full runway alternation during easterly operations at Heathrow Airport. Chapter 7, Air Quality*. May 2013

6.4.6. Pollutant concentrations have been modelled at specific receptor locations and on grids across the air quality study area. These receptors are discussed in **Appendix 6.1** and the locations of specific receptors are provided in **Table 6.2.1** in **Appendix 6.2**. Specific receptors have been identified to represent a range of relevant exposure (as defined in **paragraph 6.2.15**), including worst-case locations (these being at the façades of the residential properties closest to the sources). In some cases, individual residential properties are represented by two specific receptors where one façade is closest to the airfield and a different façade is closest to a major road (these receptors are labelled 'a' and 'b' for the façades closest to the airfield and closest to a road respectively). In other cases, specific receptors are chosen to be representative of air quality conditions at a number of properties. Consideration has been given to how many sensitive locations each modelled receptor represents when considering the impacts of the Proposed Development and the overall significance of effects.

6.4.7. In addition, concentrations have been modelled at several automatic air quality monitoring stations and diffusion tube monitoring sites located in the study area in order to verify the model outputs (see **Appendix 6.1** for verification method).

6.4.8. Emissions have been calculated from aircraft on the airfield and up to an altitude of 3,000 feet (up to approximately 20 km from the airfield horizontally), from other sources on the airfield, and on a network of major roads covered by the Heathrow Highway Assignment and Surface Access Model (HHASAM). The modelled road network extends for at least 3 km from the airfield in each direction and is shown in **Figure 6.1.4** in **Appendix 6.3**.

6.4.9. Although emissions have been calculated from sources outside the study area for completeness, it is not necessary to calculate concentrations outside the study area. Aircraft outside the study area are at sufficient altitude that the resulting pollutant concentrations at ground level are insignificant (as can be seen from examination of the pollutant contour plots in **Figures 6.3** to **6.35** in **Appendix 6.3**). Emissions from road traffic outside the study area are identical in With and Without Development scenarios, and so do not affect impacts except in as much as they contribute to the background at locations where there are non-negligible changes due to the Proposed Development.

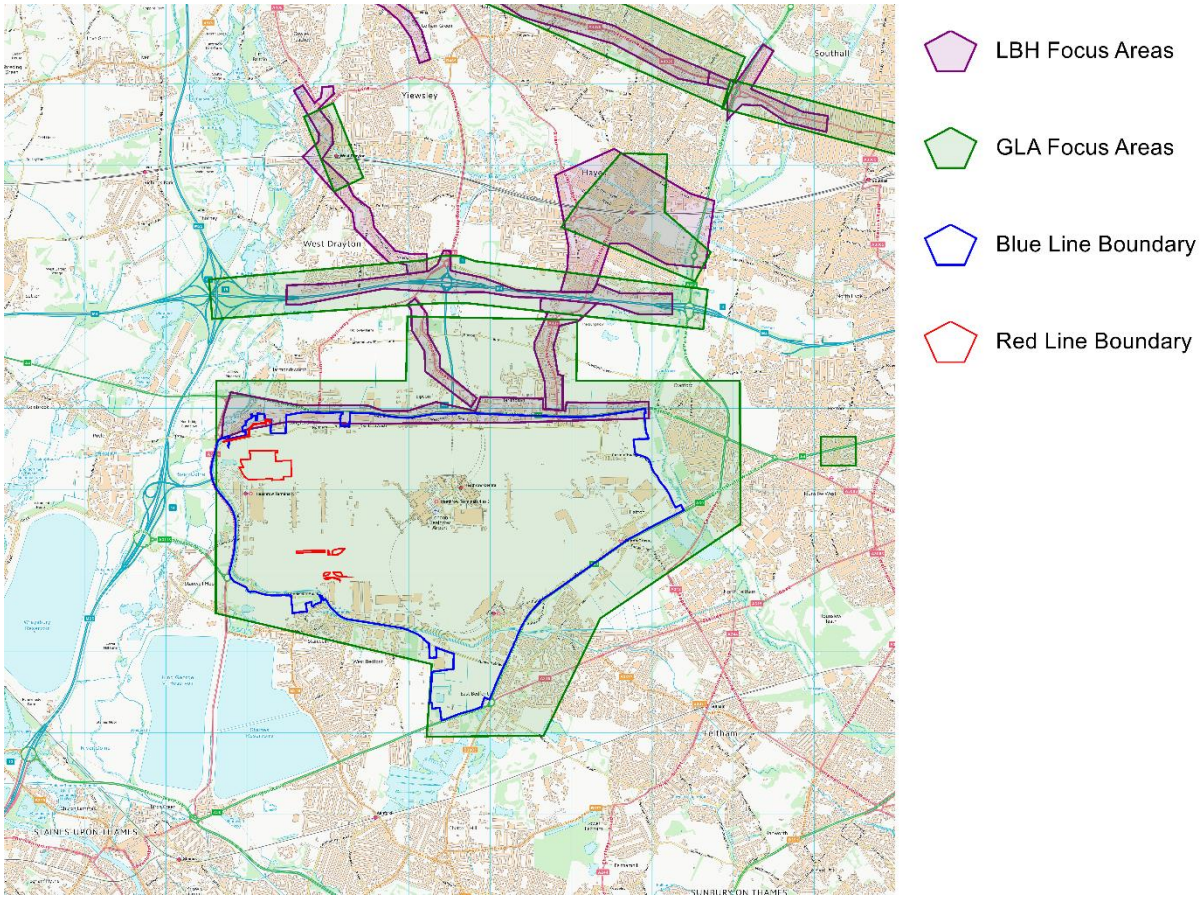
Current baseline

6.4.10. Heathrow Airport is located within the LBH, at the southern end of the Borough. Other local authority administrative areas which have the potential to be affected by the operation of the Airport include the London Borough of Hounslow (to the east and south-east of the airport), Spelthorne Borough Council (to the south and south-west of the airport) and Slough Borough Council (to the west of the airport).

6.4.11. Air quality has been an issue of concern in the Heathrow region for the last two decades and has been extensively examined using both ambient air quality monitoring and modelling studies. As well as Heathrow Airport, significant sources of air pollution in the region include the M4 and M25 motorways, traffic on other roads, and domestic, commercial and industrial activities. In 2003, LBH declared an AQMA covering the southern half of the Borough, which included the Airport itself, due to exceedances of the air quality objective for annual mean NO_2. Other AQMAs have been declared for areas in the vicinity of the Airport by South

Buckinghamshire District Council, London Borough of Ealing, London Borough of Hounslow, and Spelthorne Borough Council, all for annual mean NO_2.

6.4.12. The Proposed Development is located within the Heathrow air quality Focus Area. Focus Areas are declared by the GLA as locations in London that not only exceed the EU annual mean limit value for NO_2 but also have high levels of human exposure. There are 160 designated air quality Focus Areas as of the latest update. LBH has further refined the Focus Areas within its authority[32], with the A4 Corridor, Sipson, Harlington and M4 Corridor LBH Focus Areas closest to the location of the Proposed Development. The GLA and LBH air quality Focus Areas in the vicinity of Heathrow Airport are shown in **Graphic 6.1**.



Graphic 6.1 Air Quality Focus Areas

Industrial Sources

6.4.13. The Lakeside Energy from Waste (EfW) facility is located approximately 1,200 m north-west of Heathrow Airport and is a source of air quality emissions. The contribution from this facility will be taken into account within the detailed modelling. A search of the UK Pollutant Release and Transfer Register[44] has not identified any other significant industrial or waste management sources that are likely to affect air quality at the locations of sensitive receptors in the vicinity of the Proposed Development.

Local Air Quality Monitoring

6.4.14. There are fourteen continuous air quality monitoring sites within about 2 km of Heathrow Airport, monitoring a range of pollutants including NO_x ($NO + NO_2$), PM_{10}, $PM_{2.5}$ and ozone (O_3) (not all at each site). Of these, one (LHR2) is on the airfield (and therefore not representative of public exposure) and five are within about 300 m of the airport boundary. Two of these are operated by national Government as part of the AURN; the others are operated by the various local authorities, in some cases with funding from Heathrow Airport. Locations of continuous monitors close to Heathrow Airport are shown in **Figure 6.1** in **Appendix 6.3**.

6.4.15. In addition, there is a much larger number of sites using passive diffusion tube monitors to measure concentrations of NO_2, with diffusion tubes at some 45 locations within about 2 km of Heathrow Airport. These are operated by local authorities. These are also shown in **Figure 6.1** in **Appendix 6.3**.

6.4.16. Concentrations of NO_2, PM_{10} and $PM_{2.5}$ measured at the continuous monitors within about 2 km of Heathrow Airport are given in **Table 6.6** Annual average NO2 concentrations at selected continuous monitors (µg/m3) to **Table 6.10**. To present the monitoring data spatially, **Figures 6.2a** and **6.2b** in **Appendix 6.3** show the concentrations of NO_2 in 2019 and 2023 measured by continuous monitors and diffusion tubes.

6.4.17. The data show how air quality has improved over the monitoring period, with a substantial reduction in concentrations observed during the COVID-19 pandemic. Although concentrations have increased at some sites following the COVID-19 pandemic, in almost all cases, concentrations remain lower in 2023 than they were prior to the pandemic.

Table 6.6 Annual average NO2 concentrations at selected continuous monitors (µg/m3)

Site name	Type	Measured annual average NO_2 concentration ($\mu g/m^3$)								
		2015	2016	2017	2018	2019	2020	2021	2022	2023
T55 Heathrow Green Gates	Airport	32.2	34.2	31.9	30.5	30.6	19.2	19.6	26.0	20.8
HIL1 London Harmondsworth	Roadside	28.0	27.0	26.5	24.8	23.7	18.0	16.4	18.9	17.8 [a]
HIL London Hillingdon	Urban background	**51.9**	**51.7**	**53.1**	**46.4**	**44.7**	28.0	25.0	27.6	25.4
SIPS Hillingdon Sipson	Urban background	33.7	36.3	34.3	30.5	29.7	19.0	19.2	23.6	22.6 [a]
HRL London Harlington	Airport	31.9	34.5	31.5	30.3	30.7	20.1	20.2	23.5	21.9

Site name	Type	Measured annual average NO_2 concentration (µg/m^3)								
		2015	2016	2017	2018	2019	2020	2021	2022	2023
LHRBR Heathrow Bath Road	Roadside	-	-	-	-	**47.9** [a]	**43.1** [a]	32.2 [a]	36.5	35.8
LHR2 Heathrow LHR2	Airport	**44.2**	**47.8**	**48.4**	**43.3**	**42.5**	25.2	25.2	30.2	31.8
HI3 Hillingdon 3 Oxford Avenue	Urban centre	34.5	38.8	35.4	35.0	33.1	21.6	24.6	28.6	27.4
HIL5 Hillingdon Hayes	Roadside	**46.2**	**46.7**	**47.2**	**42.8**	**41.2**	30.9	33.9	34.0	33.5
HS2 Hounslow 2 Cranford	Urban background	30.2	30.8	29.9	24.2 [a]	26.9	24.8 [a]	-	-	-
HS7 Hounslow Hatton Cross	Background	29.7	31.6	33.3	28.1	27.9	17.5	18.0	20.4	19.2
HS9 Hounslow Feltham	Urban background	39.7	38.4	33.6	27.2	29.1	25.1	27.9	25.2	22.5
BAA_OAKS Heathrow Oaks Road	Urban background	27.4	31.4	25.7	27.8	26.3	16.8	18.7	20.0	20.0
SLH3 Slough Colnbrook Pippins	Suburban	28.6	29.0	25.3	21.8	24.5	16.3	17.8	21.1 [a]	-
SLH8 Slough Lakeside 2	Industrial	29.2	32.4	26.4	27.4	27.6	19.1	18.1	19.9	17.2
SLH11 Brands Hill London Road	Urban traffic	-	-	38.1 [a]	**41.9**	39.2	27.3	32.1	32.6	26.2
Air Quality Objective		**40**								

Exceedances of the air quality objective are shown in **bold**.

Years when the monitoring site was not operational are shown with dashes (-).

[a] Low data capture. HIL1 London Harmondsworth: 2023 - 74.8%. SIPS Hillingdon Sipson: 2023 - 74.7%. LHRBR Heathrow Bath Road: 2019 - 11.1%, 2020 - 21.7%, 2021 - 46.2%. HS2 Hounslow 2 Cranford: 2018 - 58.4%, 2020: 25.5%. SLH3 Slough Colnbrook Pippins: 2022: 19.5%. SLH11 Brands Hill London Road: 2017: 26.2%.

Table 6.7 1-hour mean NO2 concentrations, number of hours > 200 µg/m3

Site name	Type	Measured number of 1-hour NO_2 means greater than 200 µg/m^3								
		2015	2016	2017	2018	2019	2020	2021	2022	2023
T55 Heathrow Green Gates	Airport	0	0	0	0	0	0	0	0	0
HIL1 London Harmondsworth	Roadside	1	0	0	0	0	0	0	0	0 (75)
HIL London Hillingdon	Urban background	0	2	0	0	0	0	0	0	0
SIPS Hillingdon Sipson	Urban background	3	0	0 (140)	0	0	0	0	0	0 (94)
HRL London Harlington	Airport	0	0	0	0	0	0	0	0	0
LHRBR Heathrow Bath Road	Roadside	-	-	-	-	0 (102)	0 (116)	0 (101)	0	0
LHR2 Heathrow LHR2	Airport	2	8	12	0	0	0	0	0	0
HI3 Hillingdon 3 Oxford Avenue	Urban centre	2	0	1	0	0	0	0	0	2
HIL5 Hillingdon Hayes	Roadside	2	1	11	0	0	0	0	0	0 (134)
HS2 Hounslow 2 Cranford	Urban background	0	2	9	0 (84)	0	0 (96)	-	-	-
HS7 Hounslow Hatton Cross	Background	0	0 (134)	0 (138)	0	0 (105)	0	0	0	0
HS9 Hounslow Feltham	Urban background	0	0	0	0	0	0	0	0	0
BAA_OAKS Heathrow Oaks Road	Urban background	0	0	0	0	0 (111)	0	0	0	0
SLH3 Slough Colnbrook Pippins	Suburban	0	0	0	0	0	0	0	0 (76)	-
SLH8 Slough Lakeside 2	Industrial	0	0	0	0	0	0	0	0	0
SLH11 Brands Hill London Road	Urban traffic	-	-	0 (122)	0	0	0	0	0	0
Air Quality Objective		**18 (200)**								

Where the period of valid data is less than 85%, the 99.8th percentile of 1-hour means is provided in brackets. Years when the monitoring site was not operational are shown with dashes (-).

Table 6.8 Annual average PM10 concentrations at selected continuous monitors (µg/m3)

Site name	Type	Measured annual average PM_{10} concentration ($\mu g/m^3$)								
		2015	2016	2017	2018	2019	2020	2021	2022	2023
T55 Heathrow Green Gates	Airport	13.9	14.2	12.7	13.7	13.0	11.6	11.7	13.1	12.1
HIL1 London Harmondsworth	Roadside	21.8	23.0	23.1	18.1 [a]	15.0	15.5	13.6	15.6	13.2
HIL4 London Harmondsworth Osiris	Urban back-ground	16.8	15.9	14.3	16.5	14.5	14.4 [a]	12.5	13.9	12.2
HIL London Hillingdon	Urban back-ground	-	-	-	-	-	-	-	13.6 [a]	13.7
HRL London Harlington	Airport	16.0	15.4	14.7	15.5	15.1	13.6	12.6	13.3	11.9
LHRBR Heathrow Bath Road	Roadside	-	-	-	-	13.5	13.5	12.8 [a]	15.8 [a]	14.4 [a]
LHR2 Heathrow LHR2	Airport	13.1	14.6	15.2	14.2	13.4	11.4	11.4	12.9	12.5
HI3 Hillingdon 3 Oxford Avenue	Urban centre	18.5	19.8	19.1	23.6	23.5	22.9	19.6	21.9	25.6
HIL5 Hillingdon Hayes	Roadside	27.6	28.3	27.0	29.5	27.7	24.6	26.4	29.9	27.2
HS2 Hounslow 2 Cranford	Urban back-ground	16.4	17.0	17.3	14.9 [a]	16.7	18.1 [a]	-	-	-
HS7 Hounslow Hatton Cross	Background	17.6	18.4	18.0	20.8	19.6	18.4	19.4	23.1	19.9
HS9 Hounslow Feltham	Urban background	18.2	18.5	18.4	19.9	19.6	20.9	15.5	18.3	18.3
BAA_OAKS Heathrow Oaks	Urban back-ground	13.5	14.5	14.2	15.3	14.9	12.7	12.3	13.2	12.1

Site name	Type	Measured annual average PM_{10} concentration (µg/m^3)								
		2015	2016	2017	2018	2019	2020	2021	2022	2023
Road										
SLH3 Slough Colnbrook Pippins	Suburban	16.2	17.7	16.3	17.7	16.4	17.2	15.1	17.0 [a]	-
SLH6 Slough Colnbrook Pippins Osiris	Suburban	19.6	15.1	15.8	10.8	14.9	16.6 [a]	-	-	-
SLH5 Slough Colnbrook Lakeside Tan House Farm	Industrial	18.7	14.4	13.7	14.2	12.0 [a]	17.4 [a]	-	-	-
SLH8 Slough Lakeside 2	Industrial	13.9	15.1	14.0 [a]	13.7	15.0	14.0	12.4	14.5	12.6
SLH9 Slough Lakeside 2 Osiris	Industrial	-	11.0	16.8	14.2	14.0 [a]	16.7	11.6	18.3	13.8
SLH11 Brands Hill London Road	Urban traffic	-	-	24.2 [a]	28.7	28.0	25.4	24.4	23.1	20.4
Air Quality Objective		**40**								

Years when the monitoring site was not operational are shown with dashes.

[a] Low data capture. HIL1 London Harmondsworth: 2018 – 71.3%. HIL London Hillingdon: 2022 – 62.7%. HIL4 London Harmondsworth Osiris: 2020 – 53.4%. LHRBR Heathrow Bath Road: 2019 – 10.1%, 2020 - 21.7%, 2021 – 45.9%. HS2 Hounslow 2 Cranford: 2018 – 50.7%, 2020: 25.2%. SLH3 Slough Colnbrook Pippins: 2022: 19.5%. SLH6 Slough Colnbrook Pippins Osiris: 2019 – 49.3%, 2020 – 12.4%. SLH5 Slough Colnbrook Lakeside Tan House Farm: 2019 – 48.6%, 2020 – 12.5%. SLH8 Slough Lakeside 2: 2017 – 65.5%. SLH9 Slough Lakeside 2 Osiris: 2019 – 56.4%. SLH11 Brands Hill London Road: 2017: 30.9%.

Table 6.9 Measured 24-hour mean PM10 concentrations, number of days > 50 µg/m3

Site name	Type	Measured number of 24-hour PM_{10} means greater than 50 µg/m^3								
		2015	2016	2017	2018	2019	2020	2021	2022	2023
T55 Heathrow Green Gates	Airport	3	3	3	1	4	0	0	2	1
HIL1 London Harmondsworth	Roadside	5	9	7	1 (30)	0	0	0	0	0 (23)

Site name	Type	Measured number of 24-hour PM_{10} means greater than 50 µg/m^3								
		2015	2016	2017	2018	2019	2020	2021	2022	2023
HIL4 London Harmondsworth Osiris	Urban back-ground	3	0	3	0	1	0 (26)	1	0 (24)	0 (23)
HIL London Hillingdon	Urban back-ground	0	0	0	0	0	0	0	0 (23)	3
HRL London Harlington	Airport	3	4	3	1	6	1	0	2	0
LHRBR Heathrow Bath Road	Roadside	-	-	-	-	0 (24)	0 (26)	0 (23)	4	2
LHR2 Heathrow LHR2	Airport	3	4	7	1	6	0	0	2	1
HI3 Hillingdon 3 Oxford Avenue	Urban centre	4	12	4	2	4	7	0	1	5 (41)
HIL5 Hillingdon Hayes	Roadside	18	34	28	27	25	21	26	27	19
HS2 Hounslow 2 Cranford	Urban back-ground	4	8	5	0 (25)	7	0 (32)	-	-	-
HS7 Hounslow Hatton Cross	Background	3	6	3	2	7	4	2	2	1
HS9 Hounslow Feltham	Urban background	3	7	4	4 (34)	9	7	0	4	1
BAA_OAKS Heathrow Oaks Road	Urban back-ground	5	5	4	1	4 (30)	0	0	2	0
SLH3 Slough Colnbrook Pippins	Suburban	3	5	4	1	4	0	0	0 (28)	-
SLH6 Slough Colnbrook Pippins Osiris	Suburban	4 (33)	1	5	0 (19)	0 (28)	0 (32)	-	-	-
SLH5 Slough Colnbrook Lakeside Tan House Farm	Industrial	5	1	1	1	0 (22)	0 (33)	-	-	-
SLH8 Slough Lakeside 2	Industrial	1	3	3 (28)	1	3	0	0	1	0 (23)
SLH9 Slough Lakeside 2 Osiris	Industrial	2	5 (25)	10	1 (26)	1 (25)	5	2	7	0 (25)

Site name	Type	Measured number of 24-hour PM_{10} means greater than 50 µg/m^3								
		2015	2016	2017	2018	2019	2020	2021	2022	2023
SLH11 Brands Hill London Road	Urban traffic	-	-	5 (44)	28	25	18	16	14	3
Air Quality Objective		**50 (35)**								

Where the period of valid data is less than 85%, the 90th percentile of 24-hour means is provided in brackets.
Years when the monitoring site was not operational are shown with dashes (-).

Table 6.10 Annual average PM2.5 concentrations at selected continuous monitors (µg/m3)

Site name	Type	Measured annual average $PM_{2.5}$ concentration (µg/m^3)								
		2015	2016	2017	2018	2019	2020	2021	2022	2023
T55 Heathrow Green Gates	Airport	8.8	9.5	8.4	8.7	8.4	6.9	7.3	8.0	7.2
HIL4 London Harmondsworth Osiris	Urban background	6.7	6.1	6.8	5.9	5.3	5.8 [a]	5.9	6.9	6.0
HIL London Hillingdon	Urban background	-	-	-	-	-	-	-	7.2 [a]	7.7
HRL London Harlington	Airport	10.4	9.6	9.3	9.6	9.5	7.9	7.7	7.9	7.1
LHRBR Heathrow Bath Road	Roadside	-	-	-	-	9.0	8.1	7.8 [a]	9.2 [a]	8.4 [a]
LHR2 Heathrow LHR2	Airport	8.7	9.4	9.1	9.1	8.7	7.1	7.3	8.0	7.6
BAA_OAKS Heathrow Oaks Road	Urban background	9.1	9.5	9.2	9.7	9.5	7.2	7.5	7.8	7.2
SLH6 Slough Colnbrook Pippins Osiris	Suburban	7.0	6.5	7.1	6.5	6.9 [a]	7.0 [a]	-	-	-

Site name	Type	Measured annual average $PM_{2.5}$ concentration ($\mu g/m^3$)								
		2015	2016	2017	2018	2019	2020	2021	2022	2023
SLH5 Slough Colnbrook Lakeside Tan House Farm	Industrial	7.1	5.6	5.6	6.1	6.4 [a]	10.4 [a]	-	-	-
SLH9 Slough Lakeside 2 Osiris	Industrial	-	5.2	7.3	6.7	6.6 [a]	5.5	4.9	7.6	5.9
Air Quality Objective		**20 / 10[a]**								

[a] Low data capture. HIL4 London Harmondsworth Osiris: 2020 – 53.5%. HIL London Hillingdon: 2022 – 62.7%. LHRBR Heathrow Bath Road: 2019 – 10.1%, 2020 - 21.7%, 2021 – 45.9%. SLH6 Slough Colnbrook Pippins Osiris: 2019: 49.3%, 2020 – 12.4%. SLH5 Slough Colnbrook Lakeside Tan House Farm: 2019: 48.5%, 2020 – 12.5%. SLH9 Slough Lakeside 2 Osiris: 2019 - 56.7%.

[b] The 20 $\mu g/m^3$ $PM_{2.5}$ objective is not in Regulations and there is no requirement for local authorities to meet it. 10 $\mu g/m^3$ is the GLA target for annual mean $PM_{2.5}$; there is no requirement for local authorities to meet this.

Years when the monitoring site was not operational are shown with dashes (-).

Site Specific Monitoring Survey

6.4.18. The twelve-month period[57] mean NO_2 concentrations calculated from the data collected during the site-specific diffusion tube monitoring survey in Longford are shown in **Table 6.11** (after bias adjustment) and the locations are shown in **Figure 6.4.1** in **Appendix 6.4**; further details on the diffusion tube survey and results processing are provided in **Appendix 6.4**. As shown in **Table 6.11**, there are no exceedances of the annual mean NO_2 objective at any of the monitoring locations.

Table 6.11 Twelve-month period mean NO2 concentrations from Longford monitoring survey (µg/m3)

Site name	Type	Height (m)	Measured period mean NO_2 concentration ($\mu g/m^3$)
L1	Airport	2.4	17.6
L2	Roadside	2.0	16.9
L3	Roadside	2.1	16.9
L4	Roadside	2.3	25.1
L5	Kerbside	2.3	24.5

[57] July 2023–June 2024, except L7 which has been annualised to calendar year 2023.

Site name	Type	Height (m)	Measured period mean NO_2 concentration ($\mu g/m^3$)
L6	Roadside	1.9	19.4
L7	Airport	2.0	20.6 d
L8	Roadside	2.2	24.0
L9	Roadside	2.3	25.3
L10	Airport	2.2	223.
L11	Airport	3.7	22.8
Air Quality Objective			**40**

Exceedances of Limit Value

6.4.19. There are several AURN monitoring sites within the Greater London Urban Area that have measured exceedances of the annual mean NO_2 limit value[58]. Furthermore, Defra's modelled roadside annual mean NO_2 concentrations[55], which are used to identify and report exceedances of the limit value, identify exceedances of this limit value in 2019 along many roads in London, including the A4 and Southern Perimeter Road within the study area. The Greater London Urban Area has thus been reported as exceeding the limit value for annual mean NO_2 concentrations. However, Defra's predicted concentrations for 2028 do not identify any exceedances within the Heathrow study area and as such, there is considered to be no risk of a limit value exceedance in the vicinity of the Proposed Development by the time that it is operational in 2028.

6.4.20. Defra's Air Quality Plan[17] requires the GLA to prepare an action plan that will *"deliver compliance in the shortest time possible"*, and the 2015 Plan assumed that a Clean Air Zone (CAZ) was required. The GLA has already implemented a Low Emission Zone (LEZ) and Ultra-Low Emission Zone (ULEZ), thus the authority has effectively already implemented the required CAZ. These have been implemented as part of a package of measures including twelve Low Emission Bus Zones, Low Emission Neighbourhoods, the phasing out of diesel buses and taxis and other measures within the Mayor's Transport Strategy.

Background Concentrations

6.4.21. The Defra background maps provide estimates of concentrations of pollutants at background locations (away from major roads or point sources) on a 1 km grid square basis, derived from national-scale modelling. Maps are available for years 2018–2030. The maps were produced in 2019–2020 using 2018 baseline data, and therefore do not include any

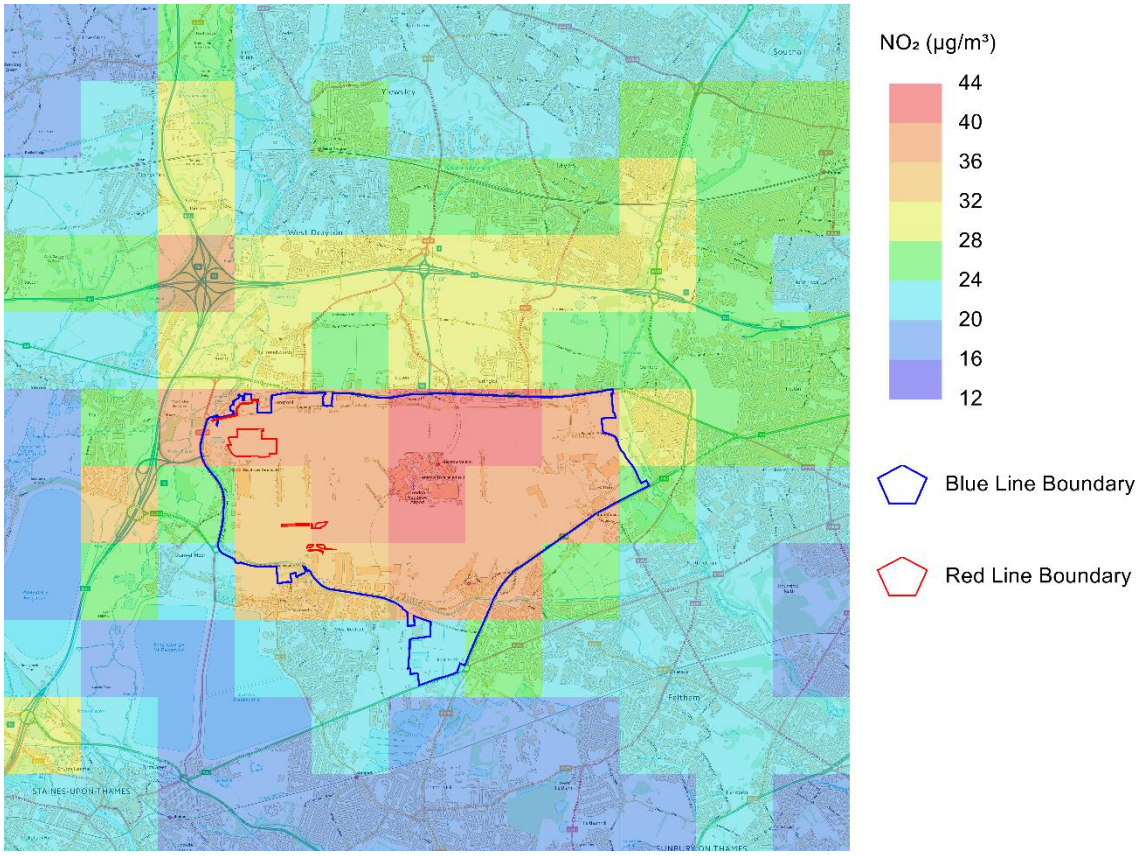
[58] Defra, (2024). *Defra AURN Archive* [online]. Available at: https://uk-air.defra.gov.uk/interactive-map?network=aurn

allowance for changes in activity due to the COVID-19 pandemic; they are therefore expected to be pessimistic and over-estimate background concentrations of air pollutants. Estimated background concentrations in the area around Heathrow Airport have been determined for 2019 (for comparison with monitoring data) and the opening year of the Proposed Development, 2028. The background concentrations are set out in **Table 6.12** and shown in **Graphic 6.2**. The concentrations shown in **Table 6.12** include the contributions from Heathrow Airport and major roads; for the detailed assessment, contributions from sources which have been modelled explicitly have been removed from the background concentrations to avoid double-counting.

6.4.22. Beyond the airfield, the background concentrations are all below the objectives, albeit with relatively high concentrations associated with the M4 and M25 motorways.

Table 6.12 Estimated annual mean background pollutant concentrations in 2019 and 2028 (µg/m3)

Year	NO_2	PM_{10}	$PM_{2.5}$
2019	17.3 - **41.0**	14.8 - 18.3	10.2 - 12.7
2028	13.1 - 37.1	13.6 - 16.9	9.3 - 11.5
Air Quality Objective	**40**	**40**	**20**



Graphic 6.2 Annual mean background NO2 concentrations from Defra maps for 2019 (µg/m3)

Baseline Dispersion Model Results

6.4.23. As air quality monitoring is not possible at all sensitive receptor locations, baseline concentrations of NO_2, PM_{10} and $PM_{2.5}$ have been modelled at each of the receptor locations (see **Table 6.2.1** in **Appendix 6.2** and **Figures 6.3.1** to **6.3.3** in **Appendix 6.3** for receptor locations) for the existing 2017, 2018 and 2019 baseline years, and are set out in **Tables 6.2.3** to **6.2.5** in **Appendix 6.2**, respectively. The comparison of modelled baseline concentrations and available monitoring data is presented in **Appendix 6.1**.

6.4.24. The modelled annual mean concentrations of NO_2 exceed the objective at one or two of the specific relevant receptors in each base year 2017–2019 but are close to the objective (above 36 µg/m^3) at between 13 and 16 receptors, at various locations around the perimeter of the airfield and alongside the M4 motorway. Concentrations are in the general range 20–40 µg/m^3, indicating that concentrations are sensitive to precise location and are strongly affected by local sources. Annual mean NO_2 concentrations are below 60 µg/m^3 at every receptor; it is, therefore, unlikely that the 1-hour mean NO_2 objective was exceeded[37].

6.4.25. The predicted annual mean concentrations of PM_{10} and $PM_{2.5}$ are below the objective in 2019 at all receptors and in each base year 2017–2019. Concentrations of PM_{10} are in the general range 15–20 µg/m^3, and concentrations of $PM_{2.5}$ are in the general range 8.5–10.5 µg/m^3, indicating that for these pollutants, the regional contribution is typically more important than local sources. The annual mean PM_{10} concentrations are below 32 µg/m^3 at every receptor; it is, therefore, unlikely that the 24-hour mean PM_{10} objective was exceeded[37].

6.4.26. The annual mean concentrations of $PM_{2.5}$ exceed the GLA target at a number of receptors alongside the M4 motorway, but not elsewhere.

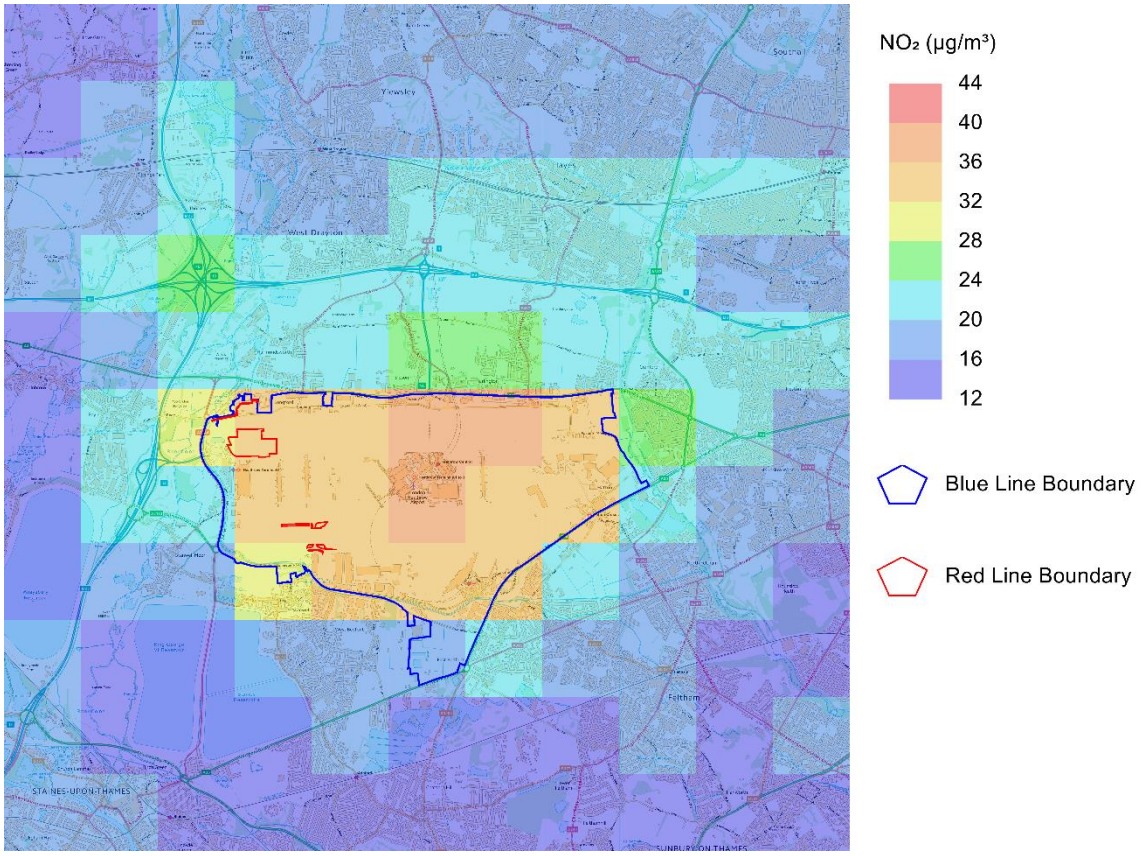
Future baseline

Local Air Quality Monitoring

6.4.27. In response to a variety of actions nationally, internationally and locally, a trend of reducing concentrations can be seen in the local authority monitoring data (**Table 6.6** above), which shows that annual mean NO_2 concentrations declined at all locations between 2015 and 2019, with an average linear regression trend of about 1 µg/m^3 per year. For PM_{10} and $PM_{2.5}$, the trend was less strong and more variable between sites, but still shows a reduction on average.

Background Concentrations

6.4.28. Background concentrations of NO_2, PM_{10} and $PM_{2.5}$ are expected to continue to decline in future. This can be seen in the Defra background maps[54], which show a reduction of around 4 µg/m^3 in annual mean NO_2 between 2019 and 2028, (the opening year of the Proposed Development) and smaller but consistent reductions in PM_{10} and $PM_{2.5}$ (**Table 6.12** above). Background NO_2 concentrations in 2028 are illustrated in **Graphic 6.3**, which show the reductions in concentrations compared with **Graphic 6.2** above.



Graphic 6.3 Annual mean background NO2 concentrations from Defra maps for 2028 (µg/m3)

Baseline Dispersion Model Results

6.4.29. Baseline concentrations of NO_2, PM_{10} and $PM_{2.5}$ have also been modelled at each of the receptor locations for the future (2028) baseline ("Without Development"). Without Development NO_2 concentrations are shown in **Tables 6.2.6** to **6.2.8** in **Appendix 6.2** for met years 2017 to 2019, respectively, and contour plots are shown in **Figure 6.3** to **6.5** in **Appendix 6.3**. PM_{10} concentrations are shown in **Tables 6.2.9** to **6.2.11** in **Appendix 6.2** for met years 2017 to 2019, respectively, and contour plots are shown in **Figures 6.6** to **6.8** in **Appendix 6.3**. $PM_{2.5}$ concentrations are shown in **Tables 6.2.12** to **6.2.14** in **Appendix 6.2** for met years 2017 to 2019, respectively, and contour plots are shown in **Figures 6.9** to **6.11** in **Appendix 6.3**.

6.4.30. The predicted annual mean concentrations of NO_2 in 2028 show that baseline concentrations at every receptor are predicted to be well below the objective. The maximum annual mean NO_2 concentration at any modelled relevant receptor[59] is 24.3 µg/m^3 or 61% of the objective at the Stanwell01 receptor, representing a property in Oaks Road, Stanwell. The contour plots show that exceedances of the objective are confined to parts of the airfield (where there is no public access and the objective therefore does not apply) and the

[59] Receptor Stanwell30 is spuriously located in the carriageway of a road and has been excluded from the results.

carriageways of major roads (where again the objective does not apply). The annual mean NO_2 concentrations are well below 60 µg/m^3 at every receptor in 2028; it is, therefore, unlikely that the 1-hour mean NO_2 objective will be exceeded[37].

6.4.31. The predicted annual mean concentrations of PM_{10} and $PM_{2.5}$ are below the objective in 2028 at all receptors. The greatest annual mean PM_{10} concentration at any of the modelled relevant receptors is 17.8 µg/m^3 at the M4_19 receptor, representing properties near the M4 motorway in Hayes. The annual mean PM_{10} concentrations are below 32 µg/m^3 and it is, therefore, unlikely that the 24-hour mean PM_{10} objective will be exceeded[37]. The contour plots show that PM_{10} concentrations above 32 µg/m^3 are confined to a very small area of the carriageway at the entrance to the Tunnel Road, where the objectives do not apply.

6.4.32. The annual mean concentrations of $PM_{2.5}$ are below the GLA target in 2028 at every modelled receptor. The greatest annual mean $PM_{2.5}$ concentration at any of the modelled relevant receptors is 9.2 µg/m^3 at the M4_19 receptor, representing properties near the M4 motorway in Hayes. The contour plots show that $PM_{2.5}$ concentrations above 10 µg/m^3 are confined to parts of the airfield and very close to major roads.

Summary of Baseline Conditions

6.4.33. Air quality around Heathrow Airport generally meets the air quality objectives, except close to the airfield and major roads where there are some exceedances in 2017–2019. In 2028, all relevant receptors around the Airport will meet the objectives and the GLA $PM_{2.5}$ target. In particular, at receptors in Longford, which are expected to experience the greatest negative impacts from the Proposed Development, the available information indicates that baseline concentrations of NO_2, PM_{10} and $PM_{2.5}$ are well within the air quality objectives, and baseline concentrations of $PM_{2.5}$ meet the Mayor of London's target[27].

6.5. Assessment methodology

6.5.1. The generic project-wide approach to the assessment methodology is set out in **Chapter 5: Approach to the Environmental Impact Assessment**, which has informed the approach used in this air quality assessment. The methodology used for assessing air quality effects is set out in the remainder of this section.

Assessment methodology

6.5.2. Full details of the assessment methodology are given in **Appendix 6.1**. Key points are summarised below.

Assessment scenarios

6.5.3. The following scenarios have been assessed:

- Three historical scenarios, for the years 2017, 2018 and 2019. These are used for model verification;
- 2025 "With Development" scenario, for assessment of construction traffic only;
- 2025 "Without Development" scenario, for assessment of construction traffic only;

- 2028 “With Development” scenario, assuming full alternation during easterly operations is implemented as part of the Proposed Development. The year 2028 is assumed to be the first year in which the new pattern of operations comes into effect; and
- 2028 “Without Development” scenario, assuming the current mode of easterly operations is retained.

6.5.4. In early 2020, activity in the UK was disrupted by the COVID-19 pandemic. As a result, concentrations of traffic-related air pollutants fell appreciably[60]. While the pandemic may cause long-lasting changes to travel activity patterns, it is reasonable to expect a return to more typical activity levels in the future. Thus, 2020 and 2021 are likely to present as an atypically low pollution year for pollutant concentrations close to roads and to Heathrow Airport.

6.5.5. It is not currently possible to make robust predictions of the rate at which travel activity patterns will return to historically-normal levels; or the extent of any long-lasting changes to travel behaviour. The most robust approach to making future-year projections is thus to base these on measurements made during pre-pandemic years. For these reasons, the historical scenarios have been based on 2017–2019 rather than more recent years which are likely to be atypical.

6.5.6. The future year (2025 and 2028) scenarios have been used to determine the effects of the Proposed Development and provide the basis for the assessment of significance.

6.5.7. It is best practice for air quality assessments that use dispersion modelling to either verify and, if necessary, adjust the model using monitoring data, or to use at least three years of meteorological data and to report modelled concentrations based on the year which gives the highest concentration at each receptor. The assessment of the operational phases uses several years of meteorological data, which ensures that normal year-to-year variation is captured, and the assessment is worst-case. For aircraft sources, there is a particular issue in that the direction in which aircraft land and take off is strongly related to the weather: they normally land and take off into the wind. This means that the location of emissions, as well as their dispersion, depends on the weather. For this reason, three years of meteorological data (‘met years’) have been used for the operational assessment modelling, namely 2017–2019 to align with the baseline modelling.

6.5.8. The three met years 2017, 2018 and 2019 capture a wide variation in the fraction of easterly operations. Wind roses for the three years are shown in **Graphic 6.1.1** in **Appendix 6.1**, which show that 2018 had a large fraction of easterly winds while 2017 had a low fraction of easterly winds. This is reflected in **Table 6.1.1** in **Appendix 6.1**, which shows that the fraction of aircraft movements taking off in an easterly direction was 19.3% in 2017, 35.4% in 2018 and 26.5% in 2019. The long-term average at Heathrow Airport is around 30%. It

[60] Defra Air Quality Expert Group, (2020). *Estimation of changes in air pollution emissions, concentrations and exposure during the COVID-19 outbreak in the UK- Rapid evidence review* [online].., Available at: https://uk-air.defra.gov.uk/assets/documents/reports/cat09/2007010844_Estimation_of_Changes_in_Air_Pollution_During_COVID-19_outbreak_in_the_UK.pdf (Accessed: 29 February 2024)

would therefore be expected that using the 2018 met year will represent a worst case in terms of the impacts of the Proposed Development at the receptors experiencing the greatest impacts of full runway alternation during easterly operations.

Emissions and Dispersion Modelling

6.5.9. The operational assessment involves the use of dispersion modelling techniques to quantify ground-level concentrations of air pollutants in the assessment years (2025 and 2028). The assessment compares the With Development scenario against the Without Development scenario, to determine the impacts arising from the Proposed Development. The assessment also compares both scenarios against the air quality objectives and targets. As ambient air quality is expected to continue improving into the future and owing to the progressive reduction in emissions from aircraft, it is anticipated that 2028 will represent a worst-case assessment of operational air quality impacts.

6.5.10. For each operational scenario, the calculation involves the quantification of emissions from all key sources based on forecast activity data (with output providing the magnitude, spatial distribution and temporal profile of emissions). Aircraft emissions are calculated on an hour-by-hour basis, and other sources are calculated as annual totals. Dispersion modelling is then used to calculate concentrations at key receptors. In addition, a forecast is made of the 'background' contribution in the assessment year (i.e. the contribution to concentrations from all sources not modelled explicitly).

6.5.11. The air quality assessment includes the pollutants NO_2, PM_{10}, $PM_{2.5}$ and nitrogen deposition. Concentrations of NO_2 are calculated from concentrations of NOx using the Defra NOx to NO_2 calculator[61]. Nitrogen deposition fluxes are calculated from NO_2 concentrations.

6.5.12. The air quality assessment leads directly to forecasts of annual mean concentrations of the identified pollutants. Shorter-period concentrations, which feature in some air quality objectives, are compared against proxy values which have been shown to correlate to the risk of exceedances of the short-term objectives (**Paragraphs 6.2.7** and **6.2.8**). Specifically, the 1-hour mean NO_2 objective is assessed by comparing the annual mean NO_2 concentration against a proxy value of 60 µg/m^3, and the 24-hour mean PM_{10} objective is assessed by comparing the annual mean PM_{10} concentration against a proxy value of 32 µg/m^3.

6.5.13. These steps enable total annual mean concentrations of the key pollutants to be calculated for both the With Development and Without Development scenarios, and hence the change in concentration due to the Proposed Development at the key receptors. The effect of the change is assessed at the key receptors, taking into account both the magnitude of the concentration change and the total predicted concentration (see **Paragraph 6.5.35**).

[61] Defra, (2020). *NOx to NO_2 Calculator*. https://laqm.defra.gov.uk/air-quality/air-quality-assessment/nox-to-no2-calculator/' Available at: https://laqm.defra.gov.uk/air-quality/air-quality-assessment/nox-to-no2-calculator/ (Accessed: 29 February 2024)

6.5.14. The methodologies used to carry out these calculations are summarised below. Full details are given in **Appendix 6.1**.

Emission source groups

6.5.15. Emission sources that are explicitly modelled for the operational assessment include:

- Aircraft main engines in the landing and take-off cycle on the ground and up to an altitude of 914 m (3,000 feet);
- Aircraft brake and tyre wear;
- Aircraft Auxiliary Power Units (APU);
- Aircraft handling emissions generated by ground support equipment;
- Airside traffic operating within the airport perimeter fence;
- Infrastructure or stationary sources such as power generating plant and heating / cooling plant for airport buildings;
- The contribution of the Lakeside Waste Management Facility;
- Road vehicles on airport landside roads and on the major road network around the airport, including airport car parks; and
- Other sources that contribute to the background concentrations.

6.5.16. Note that, apart from aircraft main engines, aircraft APUs during taxiing, and aircraft brake and tyre wear, all these sources will be identical between the “Without Development” and “With Development” scenarios.

Aircraft modelling

6.5.17. Aircraft emissions have been calculated in line with the recommendations of the International Civil Aviation Organization’s (ICAO) Airport Air Quality Manual[62] and current best practice for airport inventories and modelling studies. The ICAO Manual suggests three approaches, called simple, advanced and sophisticated. All three approaches are largely focused on historic inventories rather than future scenarios, and the sophisticated approach in particular requires extremely detailed data which is not available for future operations. Therefore, the air quality assessment is largely based on the advanced approach, but for some parts of the calculation, the simple or sophisticated approach is used where it is more appropriate. The approach taken for each part of the calculation is determined primarily by the availability of suitable data.

[62] International Civil Aviation Organization (ICAO), (2020). *Airport Air Quality Manual*. Doc 9889, *Second Edition* [online]. Available at: https://www.icao.int/publications/documents/9889_cons_en.pdf (Accessed: 29 February 2024)

6.5.18. Emission factors for aircraft engines have been taken from version 29B of the ICAO databank of engine certification data[63]. The ICAO databank includes manufacturers' measurements of non-volatile particulate matter (nvPM) for the most recent engines, and this has been used in preference to the First Order Approximation (FOA) method for calculating nvPM emissions set out in the ICAO Airport Air Quality Manual for those engines for which data are available. Volatile PM emissions are calculated using the FOA method.

6.5.19. The historical scenarios are based on actual aircraft and passenger data. The future scenarios use forecast aircraft and passenger data provided by specialist aviation forecasters.

6.5.20. Heathrow Airport activity is capped at 480,000 Air Transport Movements (ATMs) per year, though in practice it normally operates somewhat below the cap. The cap excludes a small number of movements, known as non-ATMs, such as positioning movements and private and official flights. For the present assessment, the total number of movements is assumed to be 480,000 per year as a realistic worst case, but a sensitivity scenario has also been included where total movements are uplifted by 0.4% to 481,920 movements per year to represent the maximum ATMs plus non-ATMs.

Road traffic modelling

6.5.21. Operational road vehicle emissions will be unchanged by the operation of the Proposed Development, but they contribute to the overall air pollutant concentrations at the assessed receptors and therefore affect the significance of any changes due to the Proposed Development. They therefore need to be included in the model. Road vehicle emissions are calculated using the Emissions Factors Toolkit (EFT) v11 and v12[64], issued by Defra[65]. The EFT includes emission factors and road vehicle fleet projections. For PM_{10} and $PM_{2.5}$, the emissions quantification includes not only exhaust emissions but also fugitive emissions from brake and tyre wear and from re-suspended road dust.

6.5.22. The Applicant maintains a model of road traffic flows on the road network around the airport, called the Heathrow Highway Assignment Surface Access Model (HHASAM). This is considered the best quality of road traffic data available, notwithstanding that the baseline predates the COVID-19 pandemic. A new forecast of road traffic in 2028 has been prepared to support the air quality assessment (see **Appendix 6.1**).

[63] European Union Aviation Safety Agency, (2023). *ICAO Aircraft Engine Emissions Databank* [online]. Available at: https://www.easa.europa.eu/en/domains/environment/icao-aircraft-engine-emissions-databank (Accessed: 29 February 2024)

[64] EFT v11 has been used to calculate vehicle emissions for 2017, and v12 has been used to calculate vehicle emissions for 2018, 2019 and 2028; EFT v11 only allows calculation of emissions up to 2030 within London and EFT v12 allows calculation of emissions from 2018 to 2050.

[65] Defra, (2024). *Local Air Quality Management (LAQM) Support Website* [online]. Available at: http://laqm.defra.gov.uk/

6.5.23. HHASAM includes both airport-related and non-airport traffic. The forecasts include traffic growth from non-airport activity, and therefore incorporate the cumulative impact of other plans, projects and developments.

6.5.24. For the construction traffic assessment, the same approach has been taken, but only those road links with significant construction traffic have been modelled. The assessment year for construction is 2025, the first possible year of construction activity, which is a conservative assumption as vehicle emission factors and background concentrations are expected to continue to decline beyond 2025 and air quality impacts would reduce. Construction traffic flows have been provided on a weekly basis for the duration of the construction works; for the air quality assessment, the greatest number of movements over any rolling 52-week period has been assumed as a worst case.

Atmospheric dispersion modelling

6.5.25. Dispersion modelling has been carried out using ADMS-6, ADMS-Airport and ADMS-Roads. ADMS-Airport has a specific module for handling the near-field dispersion and plume rise of exhaust plumes from moving jet aircraft. This model has been used for numerous airport air quality assessments following the *Project for the Sustainable Development of Heathrow*[66]. ADMS-Airport also includes the same representation of road traffic induced turbulence as in ADMS-Urban and ADMS-Roads, which have been shown to give a realistic assessment of near-road concentrations.

Calculation of population average concentrations

6.5.26. The Proposed Development will produce a mix of adverse and beneficial impacts (increases and decreases in pollutant concentrations) at different receptors. To quantify the balance of impacts, the population-average concentration changes have been calculated as follows:

- The change in pollutant concentration at each property with relevant exposure in the 9 km × 9 km study area has been determined from the gridded concentrations. This change may be positive (an increase in concentration) or negative (a decrease);
- The sum of the changes at all properties is added up; and
- The resulting sum is divided by the number of properties, to give a population-average change in concentration.

6.5.27. The population-average change in concentration may be positive (an increase, giving an overall adverse impact) or negative (a decrease, giving an overall beneficial impact), and this may be different for different pollutants.

6.5.28. This approach assumes a linear concentration-response relationship, which is a reasonable assumption for the relatively small changes being considered here.

[66] DfT, (2006). *Project for the Sustainable Development of Heathrow. Report of the Airport Air Quality Technical Panels.*

6.5.29. As well as providing an indication of the overall balance of adverse and beneficial impacts, the population-average changes in concentrations can be used in the Impact Pathway Approach (IPA) to appraising air quality impacts[67]. Briefly, in this procedure, the population-average change in concentration is calculated as above, concentration response functions are applied to determine impacts on various health, environmental and economic pathways, and each impact is monetised to assign a financial value to the Proposed Development.

Meteorology

6.5.30. Meteorological conditions, especially wind speed and direction, affect both the dispersion of air pollutants and the use of the runways, since aircraft normally take off and land into the wind. It is therefore necessary to ensure that when modelling aircraft emissions, the emissions calculation is aligned with the meteorological conditions used in the dispersion modelling.

6.5.31. Modelling for the future assessment year has been carried out using hourly meteorological data from the Heathrow Airport meteorological station for each of 2017, 2018 and 2019 (the three 'met years'). At each receptor, the modelled concentration from the year giving the highest concentration is considered in the assessment, to ensure that a worst-case assessment is carried out.

Significance criteria

6.5.32. The determination of significance is derived with reference to information about the nature of the development, the receptors that could be significantly affected and their sensitivity or value, together with the magnitudes of change that are likely to occur. **Section 5.8** of **Chapter 5: Approach to the EIA** provides detail on the standardised approach that this ES has taken to determining significance in this air quality assessment.

Sensitivity of receptors

6.5.33. All human receptors that are locations of relevant exposure (as defined in **paragraph 6.2.15**) are considered to be 'high sensitivity'. This includes all the specific receptors included in the modelling. All other receptors are considered to be 'not sensitive' as the air quality objectives do not apply at these locations.

6.5.34. Ecological receptors with a national or international designation (Special Protection Areas, Special Areas of Conservation, Ramsar sites, Sites of Special Scientific Interest, National Nature Reserves) are considered to be 'high sensitivity'. Ecological receptors with a local designation (Local Nature Reserves) are considered to be 'medium sensitivity'. Other ecological receptors are considered to be 'low sensitivity'.

[67] Defra (2023) *Air quality appraisal: impact pathways approach [online]. Available: https://www.gov.uk/government/publications/assess-the-impact-of-air-quality/air-quality-appraisal-impact-pathways-approach (Accessed 15 August 2024).*

Magnitude of impacts

6.5.35. There is no official guidance in the UK in relation to development control on how to describe air quality impacts and effects, nor how to assess their significance. The approach developed jointly by EPUK and the IAQM[35] has therefore been used. This is used ubiquitously for the evaluation of air quality in planning applications in the UK and is widely accepted by regulators. This includes defining descriptors of the impacts at individual receptors, which take account of the percentage change in concentrations relative to the relevant air quality objective, rounded to the nearest whole number, and the absolute concentration relative to the objective.

6.5.36. **Table 6.13** sets out how air quality impact descriptors have been determined within this assessment. For the assessment criterion the term Air Quality Assessment Level (AQAL) has been adopted, as it covers all pollutants (i.e. those with and without formal standards). Typically, the AQAL will be the air quality objective value. Note that impacts may be adverse or beneficial, depending on whether the change in concentration is positive or negative.

Table 6.13 Air quality impact descriptors

Long-term average concentration at receptor in assessment year[b,c]				**Change in concentration relative to AQAL[c]**				
% of AQAL	Annual Mean NO_2 ($\mu g/m^3$)	Annual Mean PM_{10} ($\mu g/m^3$)	Annual Mean $PM_{2.5}$ ($\mu g/m^3$)	0%	1%	2-5%	6-10%	>10%
75% or less of AQAL	Less than 30.2	Less than 30.2	Less than 17.5 (objective) or Less than 7.5 (GLA target)	Negligible	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	30.2 – 37.8	30.2 – 37.8	17.5 – 18.8 (objective) or 7.5 – 9.5 (GLA target)	Negligible	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	37.8 – 41.0	37.8 – 41.0	18.8 – 20.4 (objective) or 9.5 – 10.2 (GLA target)	Negligible	Slight	Moderate	Moderate	Substantial

Long-term average concentration at receptor in assessment year[b,c]				Change in concentration relative to AQAL[c]				
103-109% of AQAL	41.0 – 43.8	41.0 – 43.8	20.4 – 21.8 (objective) or 10.2 – 10.9 (GLA target)	Negligible	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	More than 43.8	More than 43.8	More than 21.8 (objective) or More than 10.9 (GLA target)	Negligible	Moderate	Substantial	Substantial	Substantial

[a] Values are rounded to the nearest whole number.

[b] This is the 'Without Development' concentration where there is a decrease in pollutant concentration and the 'With Development' concentration where there is an increase.

[c] AQAL = Air Quality Assessment Level, which may be an air quality objective, limit or target value, or an Environment Agency 'Environmental Assessment Level (EAL)'.

Defining likely significant effects

6.5.37. It is important to differentiate between the terms 'impact' and 'effect' with respect to the assessment of air quality. The term 'impact' is used to describe a change in pollutant concentration at a specific location. The term 'effect' is used to describe an environmental response resulting from an impact or set of impacts. Within this chapter, the air quality assessment has used published guidance and criteria to determine the likely air quality impacts at a number of sensitive locations (see **Table 6.13**). The overall significance of the air quality effects is then determined using professional judgement, giving consideration to various factors including the frequency, duration and magnitude of the predicted impacts, their relationship to appropriate air quality objectives, the number of receptors affected, and the sensitivity of the receptors.

Limitations and assumptions

6.5.38. No specific limitations or assumptions have been encountered that jeopardise the overall reliability of the air quality assessment. The assessment is based on a large quantity of data compiled from diverse sources, and inevitably the data will carry uncertainties. The aim of the air quality modelling is to provide a realistic worst-case where possible and make conservative assumptions where necessary to avoid the risk of underestimating impacts.

6.5.39. The exact location of the Rapid Access Taxiways is subject to minor adjustment before the layout is finalised. A sensitivity analysis has been carried out to determine the potential effects of changes to the locations of the Rapid Access Taxiways.

6.5.40. There are many components that contribute to the uncertainty of modelling predictions. The road traffic emissions dispersion modelling in this air quality assessment is dependent upon the traffic data that have been input, which will have inherent uncertainties associated with

them. There are then additional uncertainties, as models are required to simplify real-world conditions into a series of algorithms.

6.5.41. An important stage in the process is model verification, which involves comparing the model output with measured concentrations (see **Appendix 6.1**). As the model has been verified and adjusted, there can be confidence in the prediction of base year (2017, 2018 and 2019) concentrations. An evaluation of model performance, based on guidance provided in LAQM.TG22[37], is shown in **Appendix 6.1**.

6.5.42. Predicting pollutant concentrations in a future year will always be subject to greater uncertainty. For obvious reasons, the model cannot be verified in the future, and it is necessary to rely on a series of projections provided by DfT and Defra as to what will happen to traffic volumes, background pollutant concentrations and vehicle emissions. Historic versions of Defra's EFT tended to over-state emissions reductions into the future. However, analyses of the more recent versions of Defra's EFT carried out by Air Quality Consultants Limited (AQC)[68,69] suggest that, on balance, these versions are unlikely to over-state the rate at which NOx emissions decline in the future at an 'average' site in the UK. In practice, the balance of evidence suggests that NOx concentrations are now most likely to decline more quickly in the future, on average, than predicted by previous versions of the EFT, especially against a base year of 2016 or later. Whilst such an analysis has not been undertaken by AQC for EFT v12.0, it is considered that using EFT v12.0 for future-year forecasts in this report provides a robust assessment, given that the model has been verified against measurements made in 2017 (using emissions calculated with EFT v11), 2018 and 2019.

6.5.43. Forecasts of future-year concentrations are usually based on measurements made during a recent year. They then take account of projected changes over time to factors such as the composition of the vehicle fleet and the uptake of other new technologies, as well as population increases etc.

6.5.44. Changes were made to the LEZ and ULEZ in 2021, and the ULEZ was further expanded in 2023. The changes can be expected to significantly reduce NOx emissions in London. Defra's latest EFT (v12) is representative of London-specific policies, now accounting for the LEZ and ULEZ changes in 2021 and 2023.

Air Quality Neutral and Air Quality Positive

6.5.45. The Proposed Development does not include any new buildings and will not result in any changes to operational road traffic.

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[68] Air Quality Consultants Limited, (2020). *Performance of Defra's Emission Factor Toolkit 2013-2019* [online]. Available: https://www.aqconsultants.co.uk/CMSPages/GetFile.aspx?guid=7fba769d-f1df-49c4-a2e7-f3dd6f316ec1 (Accessed 11 March 2024).

[69] Air Quality Consultants Limited, (2020). *Comparison of EFT v10 with EFT v9* [online]. Available: https://www.aqconsultants.co.uk/CMSPages/GetFile.aspx?guid=9d6b50e1-3897-46cf-90f1-3669c6814f1d (Accessed 11 March 2024).

6.5.46. An Air Quality Positive Statement, which demonstrates how the Proposed Development has considered air quality throughout the design of the Proposed Development period and details relevant good practice measures adopted by the Proposed Development, is provided below. Since two of the four themes for Air Quality Positive ("building emissions" and "[surface] transport emissions") are not relevant to the Proposed Development, this Statement focuses on the "better design and reducing exposure" and "innovation and futureproofing" themes.

6.5.47. The key driver for the Proposed Development is to allow the implementation of Government policy to distribute noise more fairly around the Airport. The air quality implications of ending the Cranford Agreement and introducing alternation in easterly operations were considered in detail as part of the Adding Capacity at Heathrow Airport programme which led up to the Government ending the Cranford Agreement. For example, the 2007 Adding Capacity at Heathrow Airport Consultation Document [70] states (paragraph 3.141):

> *"Our modelling suggests that the loss of the Cranford agreement, in itself, would affect the distribution of NO_2 concentrations around the western end of the airport (by introducing easterly departures off the northern runway on 09L) – by up to 13 per cent at some receptors, and by up to five per cent at the eastern end of the airport."*

6.5.48. This demonstrates that the air quality impacts of the Proposed Development have been considered in detail throughout the lifetime of the proposals, more than 17 years. Following this public consultation, the then Government ended the Cranford Agreement in January 2009, with the aim of introducing easterly alternation to give affected communities predictable periods of relief from airport noise. The decision document[71] states (paragraphs 74–75):

> *"Ending the Cranford agreement would redistribute noise more fairly around the airport and remove around 10,500 people from the 57dBA contour, albeit at the expense of exposing smaller numbers (around 3,300) to higher levels of noise... [E]nding the Cranford agreement would also have the benefit of providing periods of respite during the day for all areas affected on both westerly and easterly operations.*
>
> *The Secretary of State has therefore decided in the interests of equity to confirm the provisional view set out in the consultation document."*

6.5.49. This quote captures the fundamental design objective for the Proposed Development, namely, to improve the environmental impacts of Heathrow Airport and improve environmental equity, albeit primarily in relation to noise rather than air quality. Air quality

[70] Department for Transport (2007) Adding Capacity At Heathrow Airport: Consultation Document. https://webarchive.nationalarchives.gov.uk/ukgwa/20080305165757/http://www.dft.gov.uk/162259/165220/302152/completecondoc.pdf

[71] Department for Transport (2009) Adding Capacity at Heathrow: Decisions Following Consultation. January 2009. https://webarchive.nationalarchives.gov.uk/ukgwa/20090511140819mp_/http://www.dft.gov.uk/pgr/aviation/heathrowconsultations/heathrowdecision/decisiondocument/decisiondoc

was a material consideration in the Government's decision to end the Cranford Agreement and support the introduction of full alternation in easterly operations.

6.5.50. With regard to using design to reduce exposure, it is acknowledged that the Proposed Development will increase concentrations of nitrogen dioxide at receptors in Longford. However, there will also be improvements to air quality in Stanwell and Stanwell Moor as a result of the Proposed Development. The previous application (41473/APP/2013/1288) to enable full alternation during easterly operations demonstrated[72] that the adverse impacts in Longford would be slightly greater than the beneficial impacts in Stanwell and Stanwell Moor but would affect fewer receptors. Since that assessment was carried out, background concentrations in Longford (as across London) have fallen markedly, as shown by monitoring data (see **paragraph 6.4.14** et seq.), and the risk of an exceedance of any objectives in Longford is now very low. During the design stages, therefore, the overall impact of the Proposed Development on air quality was expected to be broadly neutral.

6.5.51. During the design stage, consideration was given to the number and positioning of the new runway access taxiways. The air quality impacts of different options were considered and given due weight in the decision-making process. In terms of air quality, there was a slight preference for the new taxiways to be located to the east, but in view of the very low expected impacts, this was not a major factor. The preferred option, with two new taxiways, minimises delays and congestion around the runway end, and therefore minimises emissions.

6.5.52. With regard to innovation and futureproofing, Heathrow Airport has long worked to manage its air quality impacts. The current phase of this work comes under the Heathrow 2.0 umbrella, which sets out strategies and targets for reducing both air quality and carbon impacts. It includes a detailed Emissions Strategy and Action Plan[73],, which includes ten key performance indicators and 28 specific actions to manage and improve air quality. Some of the measures already introduced and ongoing include a NOx emissions element to aircraft landing charges, introduction of electric vehicles and plant to the ground support fleet and funding a network of air quality monitoring stations around the Airport.

6.6. Scope of the assessment

Introduction

6.6.1. The scope of this assessment has been established through a formal Scoping Opinion (**Appendix 1.6**) which was received from LBH on 01 February 2024 (dated 31 January 2024). Several scoping responses from consultees were provided alongside the Scoping Opinion (**Appendix 1.6**) (albeit they do not form part of the Scoping Opinion itself) which

[72] Heathrow Airport (2013) Environmental Statement: Enabling works to allow implementation of full runway alternation during easterly operations at Heathrow Airport. Chapter 7 Air Quality. May 2013.

[73] Heathrow Airport, (2018). *Emissions Strategy and Action Plan*.

have also been considered where appropriate in the ES and those relevant to air quality include:

- London Borough of Hounslow (dated 15 December 2023);
- Natural England (dated 08 December 2023);
- Spelthorne Borough Council (dated 02 January 2024); and
- Buckinghamshire Council (dated 5 January 2024).

Further information can be found in **Chapter 5: Approach to the EIA** and in **Table 6.14** below.

6.6.2. This section provides an update to the scope of the air quality assessment based on the most up-to-date information and the Scoping Opinion (**Appendix 1.6**). It reiterates the evidence base for scoping out elements following further iterative assessment and is summarised in **Table 6.16**.

Scoping Opinion

6.6.3. **Table 6.14** sets out the relevant Scoping Opinion (and scoping responses from consultees) comments received and how they have been addressed in this chapter.

Table 6.14 Scoping Opinion comments received from LBH with regard to air quality effects

Scoping Opinion	How is this addressed?
"The general approach to the assessment is broadly acceptable."	Noted. Please refer to **Section 6.5.**
7."Air quality impacts from the operations should be scoped into the ES."	Scoped in. Please refer to **Section 6.7**.
"A particular issue from the previous submission was the approach to forecasting within the ES. No baseline for the year of submission (2013) was provided, instead a forecasted air quality level for 2017 (assumed operations commencement) was provided. The evidence to support the optimistic trend between 2013 (eventually provided by the LPA) and 2017, the forecasted year presented in the submission, was lacking."	A baseline modelling assessment has not been provided for the 2024 calendar year. The modelled baseline relates to the years 2017, 2018 and 2019, the years before the COVID-19 pandemic, Air quality monitoring data have been presented for the most recent full calendar year of 2023 and project-specific baseline diffusion tube monitoring has been undertaken in order to provide a current measured baseline for affected receptors in Longford. The previous submission did not include diffusion tube monitoring in Longford.
"It is noted that the baseline assessment years of 2017, 18 and 19 will be used to develop the forecasted year on commencement (2028) but it must be stressed that this will need to be based on a reasonable worst case scenario. It is also important to be transparent about the method for forecasting. Finally, it will be necessary to ensure that the 2028 baseline	The 2028 baseline is based on a reasonable worst case scenario. The method used to forecast the 2028 baseline is presented in Section 6.4 of this chapter and **Appendix 6.1: Air Quality Modelling Methodology**.

Scoping Opinion	How is this addressed?
position is clear and open to scrutiny, this is particularly important regarding passenger forecasts for 2028."	
"Air quality status reports (ASR) for 2023 are now available and should be considered within the ES."	These reports have been referenced and the latest monitoring results presented in Section 6.7 of this chapter.
"Whilst additional air quality assessment has been undertaken in Longford using diffusion tubes, the reporting timeframe does not provide for a robust baseline. If this data is then used to extrapolate a 2028 baseline position for the assessment, then this will have to be precautionary, clearly set out, and with a robust sensitivity analysis."	These results have been used to aid understanding of current baseline only. No future predictions have been based on these results.
8 To agree the forecast baseline position prior to compiling the Environmental Statement.	Noted. Please refer to **Section 6.4**.
Concerns have been raised by Spelthorne Council and London Borough of Hounslow relating to the geographical scope of the air quality assessment. Whilst it is recognised and acknowledged that Longford would be a primary receptor due to increased take off traffic on 09L (Northern Runway) there will be change to overflight patterns on communities to the east and west. The impacted communities have not been set out in the Report or whether there is an expectation that they will be scoped into the assessment. The scope of modelling information referred to is therefore not possible to confirm at this stage. It should be acknowledged that this comment relates to both the benefits and disbenefits of the scheme. **9. To further discuss the geographical scope of the air quality assessment to ensure it is comprehensive.**"	The geographical scope is the same as used in numerous previous assessments of air quality around Heathrow Airport. The results of the assessment show that pollutant concentrations fall off rapidly with distance from the airfield, with due allowance for aircraft in the air, and impacts are insignificant outside the Air Quality Study Area. Please see **Section 6.4**.
"Consideration of the various air quality action plans from the impacted Authorities will be necessary. These have not been identified in the Report but will be an important element of understanding the air quality impacts."	Action Plans for all local authorities affected by the Proposed Development will be considered where appropriate. Please see **Section 6.7**.

Scoping Opinion	How is this addressed?
"It is noted in the Report that there is a lack of guidance on how to assess the significance of air quality impacts: There is no official guidance in the UK in relation to development control on how to assess the significance of air quality impacts. The approach developed jointly by EPUK and IAQM will therefore be used. The potential significance of effects will be determined by professional judgement, based on the frequency, duration and magnitude of predicted impacts and their relationship to appropriate air quality objectives. (5.5.25)" It should therefore be agreed how best to determine significance prior to undertaking the assessment. Air quality impacts should generally be considered in relation to existing concentrations (noting table 5.9) but also the wider context on health. It is not prudent to set a methodology that only considers changes to concentrations. Furthermore, planning policies in terms of the air pollution assessment are currently set against air quality neutral (or better) objectives and in turn, the assessment of significance needs to reflect this. It is therefore noted that table 5.9 is not compatible with assessing harm to air quality in line with LBH and GLA policies. "	The widely accepted and adopted guidance published by EPUK and the IAQM[35] has been used to establish the significance of effects (**Section 6.2**). This uses both changes in concentrations and the total resulting concentration to evaluate impacts. Pollutant concentrations are evaluated in relation to the established air quality objectives, which are health-based. Further discussions between the Applicant and LBH on the assessment of significance have taken place and the assessment has used the EPUK and IAQM impact descriptors, with professional judgement to then determine the significance (**Section 6.3**). All the data are presented to enable LBH to consider the impacts and draw alternative conclusions regarding significance.
Further, table 5.9 does not reflect the health impacts which is the real determinant when assessing air quality impacts. Noticeable spikes in air pollution can have detrimental impacts on the population even if the 'averaging' required for air quality monitoring remains relatively low."	Noted. Please see **Section 6.7**.
"Noting the comment above at 5.5.25 and given the air quality position on the previous application, it would be prudent to work with the LPA to ensure that the 'professional judgement' in determining significant effects is a collaborative exercise."	Summary results have been provided to LBH and discussions are continuing.
"**10. To work with the LPA and neighbouring authorities to determine the assessment of significance prior to developing the ES further.**"	Summary results have been provided to LBH and discussions with LBH and neighbouring authorities are continuing.
"It is noted that the Report concludes that air quality impacts from construction traffic are to be 'scoped out'. The transport commentary states: Daily HGV movements related to the construction phase would be very limited, construction is for a	Noted. Please see **Table 6.7**.

Scoping Opinion	How is this addressed?
short period on an existing busy road, and materials will be sourced locally where possible."	
"Busy roads are linked to areas of poor air quality and therefore any increase in movements has the potential for detrimental impacts. However, the Report does not identify where [construction Heavy Good Vehicles (HGVs) will travel] nor the expected quantum of HGVs relating to construction. Spelthorne Council has raised concerns over roads in their boundary that are at, or, exceeding air quality limit values. Consequently, any increase in movements in those areas are of particular concern. Notwithstanding the concerns raised by Spelthorne Council, it is still considered that there are no likely significant effects from construction traffic. This statement needs to be qualified with reference to Regulation 15(9) which allows for an alternative approach should more information come to light. A subsequent planning submission would be expected to be accompanied by a transport statement at the least which should reveal the extent of construction traffic. This could result in new likely significant effects being revealed and needing to be reported on in an amended ES. In any event, the air quality impacts of the construction will form part of the planning submission as this remains a material planning consideration even if not specifically scoped into the more substantial ES."	Construction-related HGV movements have been provided and are detailed in this assessment. The maximum number of daily HGV movements is above the screening threshold of 25 recommended by IAQM/EPUK guidance[35] (see **Table 6.3**) on some road links, and so has been scoped in.
"11. Construction traffic to be scoped out of the ES with respect to air quality impacts at this stage but it is recommended that HAL clarify construction arrangements and quantum of HGVs in particular at the earliest opportunity."	Construction-related HGV movements have been provided and are detailed in this assessment. The maximum number of daily HGV movements is above the screening threshold of 25 recommended by IAQM/EPUK guidance[35] (see **Table 6.3**) on some road links, and so has been scoped in.

Table 6.15 Supporting scoping responses received from other consultees with regard to air quality effects

Supporting scoping responses from consultees	How is this addressed?
London Borough of Hounslow scoping response (dated 15 December 2023)	
"[T]he EIA review should include references to the Hounslow Air Quality Action Plan 2023 and Annual Status Reports"	These have been referenced and the latest (2022) monitoring results presented. Please see **Section 6.4**.
"Graphic 5.1. should therefore be expanded to include a wider scope of study to understand impacts on air quality within Hounslow, noting that the locations cited within it are restricted to the immediate vicinity of Heathrow Airport... [W]e request that additional modelling is undertaken in Cranford and the immediate surrounds within Hounslow borough to understand the requisite mitigation to minimise air quality impacts in this area."	Three specific receptors have been included representing Bath Road and Waye Avenue in Cranford (receptor identifiers Perim01, Perim15 and Perim16). In addition, contour plots are included covering the whole of Cranford.
"[T]he aircraft terminals are to be configured so clarity required on whether it applies. For the avoidance of doubt, we would recommend that these are scoped in to ensure that the scheme can be determined in accordance with best practice."	There will be no change to the operation of the terminals as a result of the Proposed Development.
Natural England scoping response (dated 08 December 2023)	
"The ES should take account of the risks of air pollution and how these can be managed or reduced."	Impacts on designated ecological sites are included in the assessment in **Section 6.7**.
Spelthorne Borough Council scoping response (dated 02 January 2024)	
"Construction traffic may route through neighbouring boroughs. Whilst the applicant notes that the emissions from offsite construction traffic is expected to be a very low percentage of total traffic movements and considered insignificant in relation to the baseline, the significance will be dependant on where that traffic routes"	See response to similar comment from LBH above.
"There is little detailed information at this stage as to which communities will experience an increase in being overflown and when/ under what conditions. No information is given as to what happens to the aircraft approach on arrival and climb upon departure, and at what heights with the proposed development and what the predicted impacts on air quality will be resulting from this, please include this within the ES."	Aircraft have been modelled to an altitude of 3000 feet (914 m) above aerodrome level, as is usual practice. The assessment shows that air quality impacts from aircraft flying over receptors are negligible, with non-negligible impacts confined to locations very close to the airfield and due to aircraft on the ground. Please see **Section 6.7**.

Supporting scoping responses from consultees	How is this addressed?
"The Air Quality Assessment does not explain if a diurnal profile will be applied to account for variations in emissions throughout the day, this could be applicable to both aircraft and road emissions, or whether vehicle speeds will be reduced through junctions within the model."	Described in **Appendix 6.1**. Note that there will be no change to surface traffic as a result of the Proposed Development; however, road traffic has been modelled to ensure background concentrations are robustly assessed.
"No comment is given as to whether the terminals or other features of the landscape will be included in the air quality dispersion model topography?"	Topography has been considered in the modelling through the use of an appropriate surface roughness length; see **Appendix 6.1**.
"The Scoping Report states that the EIA will be based on the existing airspace design which, as identified in Section 2.1 is already established for the purposes of easterly operations. No consideration/assessment of worst case for each affected/overflown area in terms of future airspace change?"	Changes to the airspace design will be controlled through a separate application to the Civil Aviation Authority. The assessment shows that air quality impacts from aircraft flying over receptors are negligible, with non-negligible impacts confined to locations very close to the airfield and due to aircraft on the ground. Please see **Section 6.7**.
"[T]here could be a change in receptors in a future year considering Local Plans and also in combined impacts from committed development.	Contour plots are included covering the whole vicinity of the airfield experiencing the greatest impacts from the Proposed Development. Impacts are shown to be negligible everywhere except at certain specific receptors very close to the airfield. Impacts from committed developments are included in the forecast backgrounds. Please see **Section 6.7**.
"[F]uture impacts associated with for example the phasing in of PM2.5 targets are missed."	The assessment has considered known future $PM_{2.5}$ targets.
"Hillingdon's Air Quality Action Plan is not referenced."	Added reference in **Section 6.2**.
"SBC would have expected to see information on haul routes, site entrances and vehicle types and numbers and the relevant durations of such activity to be screened and assessed prior to scoping out the effects of construction traffic on local roads."	See response to similar comment from LBH above.
"[W]e would strongly encourage at least 6 months of monitoring [in Longford] to better capture cross seasonality in the data. The ES states that the focussed diffusion tube campaign sites will be divulged in the ES, it is not stated as to whether the applicant has consulted Local Authorities on the monitoring locations?"	Local authorities were not consulted about the exact monitoring locations, however, locations were chosen to represent worst-case locations of exposure in Longford. Over 6 months data has now been collected and the results are presented in **Section 6.2** of this chapter.

Supporting scoping responses from consultees	How is this addressed?
"The applicant should note that more recent air quality ASR data than that which is referenced is now available for Spelthorne."	This has been referenced and the latest (2022) monitoring results presented.
"There is not a lot of information given about the weight being given to between air quality versus noise impacts, it is expected that this will be fully explained in the ES as some procedures involving noise abatement during take off can alter aircraft emissions. Will this be included in the Aircraft main engines in the landing and take-off cycle on the ground and up to an altitude of 914 m (3000 feet) for air pollutant dispersion modelling purposes?"	A reasonable worst case for air quality has been assessed.
Buckinghamshire Council scoping response (dated 5 January 2024)	
"Any impact on local air quality within Buckinghamshire would be because of increased surface traffic at either the construction or operational phase."	There will be no change to surface traffic as a result of the Proposed Development. However, road traffic has been modelled to ensure background concentrations are robustly assessed.
The development screening criteria outlined in the IAQM Land-Use Planning & Development Control: Planning for Air Quality Guidance [should be used to determine if] an Air Quality Assessment is required."	Noted. IAQM guidance has been followed in the assessment.

Elements scoped out

6.6.4. The elements shown in **Table 6.16** are not considered likely to give rise to significant effects as a result of the Proposed Development and have therefore not been considered within this air quality assessment. These elements were scoped out in the Scoping Report (**Appendix 1.5**).

Table 6.16 Elements scoped out of the air quality assessment

Element scoped out	Justification
Construction phase emissions of dust and on-site exhaust gases	The Proposed Development is principally an operational change with limited physical works and is therefore not expected to significantly affect air quality during construction. Any increase in exhaust emissions from on-site plant and machinery would be very small and insignificant above the baseline, and the distance between on-site emission sources and receptors is also sufficient for effects to be not significant. The GLA Supplementary Planning Guidance (SPG) guidance on '*The Control of Dust and Emissions from Construction*

Element scoped out	Justification
	and Demolition'[74] states that impacts from construction plant and equipment on air pollutants are normally not significant, and controls under GLA requirements and guidance will ensure that this is the case. These construction phase emissions are short-term and temporary in nature and would not affect the ability of the local authorities to meet the air quality objectives; air quality effects with regard these activities have therefore been scoped out. Additionally, any construction works will also be at least 250 m from the nearest sensitive receptor; thus, according to the GLA guidance, there will be no significant effects associated with dust emissions. The planning application will be supported by a Construction Environmental Management Plan (CEMP) which considers measures to minimise impacts of emissions on air quality and amenity.
Operational phase emissions of odour	Heathrow receives a limited number of odour complaints each year. It is possible that a significant shift in the spatial distribution of aircraft emissions towards the western end of Runway 09L during easterly operation and less towards the western end of Runway 09R, may increase incidences of odours reported from Longford and reduce the same in Stanwell. However, odour from aircraft is mainly associated with low-thrust activities, which are focused on the central apron areas of the airfield and are therefore largely unaffected by the Proposed Development. The impacts of the Proposed Development on odour have therefore been scoped out. The Scoping Opinion did not raise any objection to this.
Assessment of ultrafine particulates (UFP)	Aircraft, and other airport-related combustion sources, give rise to emissions of UFP, i.e. particles which are below 100 nanometres in diameter. However, there is currently no robust manner by which to quantify UFP emissions from aircraft or other combustion sources, and it is not possible to quantify the impacts of these sources using traditional modelling approaches. In addition, there are no guidelines or standards against which to compare UFP concentrations. The issue of UFP was recently discussed at the Stansted Airport appeal (Ref. APP/C1570/W/20/3256619), where the Planning Inspector concluded that: "*there was no reliable methodology for assessing the quality of UFPs that would result from the development", but that "the Health Impact Assessment considered epidemiological research which includes the existing health effects of PM2.5 and thus UFPs as a subset; this concluded there would be no measurable adverse health outcomes per annum*". Similar conclusions were drawn in recent decisions regarding Bristol Airport (APP/D0121/W/20/3259234) and London City Airport (APP/G5750/W/23/3326646). For this reason, predictions of UFP concentrations are not included in the assessment. This intention was set out in the Scoping Report (**Appendix 1.5**) and the Scoping Opinion (**Appendix 1.6**) "*broadly agreed*" with the proposed approach.

[74] GLA (2014), The Control of Dust and Emissions from Construction and Demolition SPG [online]. Available: https://www.london.gov.uk/programmes-strategies/planning/implementing-london-plan/london-plan-guidance-and-spgs/control-dust-and [Accessed 17 October 2024].

Element scoped out	Justification
Assessment of ammonia	Ammonia (NH_3) is emitted by road traffic and may have adverse impacts on human health and nature conservation sites. However, the Proposed Development will not affect operational road traffic and therefore ammonia has been scoped out of the assessment. This intention was set out in the Scoping Report (**Appendix 1.5**) and the Scoping Opinion (**Appendix 1.6**) "*broadly agreed*" with the proposed approach.

Elements scoped in

6.6.5. The following elements are considered to have the potential to give rise to likely significant air quality effects during operation of the Proposed Development and have therefore been considered within this assessment:

- Impacts of change in NO_2, PM_{10} and $PM_{2.5}$ concentrations at relevant receptors as a result of changes to aircraft ground movements;
- Impacts of change in NO_2, PM_{10} and $PM_{2.5}$ concentrations at relevant receptors as a result of construction traffic; and
- Impacts of change in nitrogen deposition rates at relevant receptors as a result of changes to aircraft ground movements.

Sensitive receptors

6.6.6. The following sensitive receptors have been assessed:

- Specific receptors representing locations of relevant exposure (as defined in policy; see **Paragraph 6.2.15**), including residential properties and schools, that are expected to be most at risk of significant effects;
- A grid of receptors covering the whole study area, for the purposes of producing contour plots and determining impacts (if required) at locations where there is no specific receptor; and
- Specific receptors representing designated sites for the protection of nature, including South West London waterbodies, Staines Moor, Bedfont Lakes, Hounslow Heath, Pevensey Road and Cranebank.

6.6.7. The specific receptor locations are shown in **Figures 6.3.1** to **6.3.3** in **Appendix 6.3**.

Embedded environmental measures

6.6.8. The Proposed Development will incorporate a number of environmental measures to avoid or reduce likely significant effects. This approach is described in **Chapter 5: Approach to the EIA**.

6.6.9. This section describes the embedded environmental measures that Heathrow proposes to implement to manage the air quality effects of the Proposed Development, including those that are an inherent part of the design.

6.6.10. Embedded environmental measures that are particularly relevant to air quality are set out in **Table 6.17**.

Table 6.17 Embedded environmental measures

Environmental measure	Additional Reference
Construction of additional taxiways to facilitate access for departing aircraft to Runway 09L. The taxiways are designed to optimise performance of the airfield, reducing congestion and minimising emissions associated with idling and queueing aircraft.	N/A
The planning application will be supported by a Construction Environmental Management Plan (CEMP) which considers measures to minimise impacts of emissions on air quality and amenity	N/A

6.6.11. The air quality assessment has assumed these embedded environmental measures are in place, in other words only residual effects have been modelled.

6.7. Assessment of potential effects

Construction Phase

6.7.1. Predicted annual mean contributions of NO_2, PM_{10} and $PM_{2.5}$ from the peak number of construction traffic movements in 2025 for off-site receptors are set out in **Table 6.18**, **Table 6.19** and **Table 6.20**. Details of receptor locations are given in **Section 4.1** of **Appendix 6.1**. These tables describe the impacts at each receptor using the impact descriptors given in **Table 6.13**. Impacts have been calculated using the worst-case assumption that the existing baseline concentrations are 110% of the Air Quality Assessment Level (AQAL) (see **Table 6.13**). To account for the road-NOx contributions not having been verified, **Table 6.18** also shows how much the NOx contribution would need to be increased to achieve anything other than a *negligible* impact at a receptor at which the baseline concentration is 110% of the objective.

Table 6.18 Construction traffic: Predicted annual mean NO_2 contributions in 2025

Receptor	Contribution (µg/m^3)	% of AQAL	Impact Descriptor	Multiplication factor required to achieve non-negligible impact
R01	0.012	0.03%	Negligible	17
R02	0.010	0.02%	Negligible	21
R03	0.003	0.01%	Negligible	80
R04	0.004	0.01%	Negligible	45

6.7.2. As shown in **Table 6.18**, the annual mean NO_2 contributions are no more than 0.03% of the AQAL (40 µg/m^3) at all receptors. Therefore, regardless of the baseline concentrations the impacts are all described as *negligible*. The contributions at each receptor would need to be at least 17 times the modelled contribution to achieve anything other than a *negligible* impact at a receptor at which the baseline concentration is 110% of the objective.

Table 6.19 Construction traffic: Predicted annual mean PM10 contributions in 2025

Receptor	Contribution (µg/m^3)	% of AQAL	Impact Descriptor
R01	0.003	0.008	Negligible
R02	0.002	0.008	Negligible
R03	0.001	0.004	Negligible
R04	0.002	0.008	Negligible

Table 6.20 Construction traffic: Predicted annual mean PM2.5 contributions in 2025

Receptor	Contribution (µg/m^3)	% of AQAL	Impact Descriptor
R01	0.001	0.007	Negligible
R02	0.001	0.007	Negligible
R03	0.001	0.003	Negligible
R04	0.001	0.007	Negligible

6.7.3. As shown in **Table 6.19** and **Table 6.20**, the annual mean PM_{10} and $PM_{2.5}$ contributions are no more than 0.003% and 0.001% of the AQALs (32 µg/m^3 [75] and 20 µg/m^3 [76]), respectively, at all receptors. Therefore, regardless of the baseline concentrations the impacts are all described as *negligible*.

6.7.4. **Table 6.21** presents the same $PM_{2.5}$ concentrations as **Table 6.20** but assesses the contributions against the GLA target for this pollutant.

Table 6.21 Construction traffic: Predicted annual mean PM2.5 contributions in 2025 against the GLA Target

Receptor	Contribution (µg/m^3)	% of AQAL	Impact Descriptor
R01	0.001	0.014	Negligible
R02	0.001	0.013	Negligible
R03	0.001	0.007	Negligible
R04	0.001	0.014	Negligible

6.7.5. As shown in **Table 6.21**, the annual mean contributions of $PM_{2.5}$ are no more than 0.014% of the GLA target at all receptors. Therefore, regardless of the baseline concentrations the impacts are all described as *negligible*.

6.7.6. As such, it is judged that the air quality effects of emissions from traffic generated by the construction phase of the Proposed Development will be *Negligible* and **Not Significant**.

Operational phase

Emissions of NOx, PM_{10} and $PM_{2.5}$ in 2028

6.7.7. A summary of the predicted emissions for the 2028 With Development and Without Development scenarios for each pollutant is set out in **Table 6.22** to **Table 6.24**, and the differences between them are set out in **Table 6.25** to **Table 6.27**. The tabulation provides the emissions (tonnes/year) from each broad source category. Emissions from aircraft have been calculated for three met years (see **Paragraph 6.5.7**), and vary slightly between them, so separate tables have been provided for the three met years.

6.7.8. Emissions data should be used with caution, since they are not a direct measure of impact. Concentration results should be used for evaluating impacts. Emissions from aircraft have been calculated within a ceiling altitude of 914 m; emissions at altitude cannot be directly

[75] While the annual mean PM_{10} objective is 40 µg/m^3, 32 µg/m^3 is the annual mean concentration above which an exceedance of the 24-hour mean PM_{10} objective is possible, as outlined in LAQM.TG22.

[76] The 20 µg/m^3 $PM_{2.5}$ objective, which was to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it.

compared with those derived from solely ground-based sources as they have much less impact on ground-level receptors.

6.7.9. Overall modelled aircraft emissions of NOx increase by an average of 1.2 tonnes in the With Development scenario over the Without Development scenario in 2028 (averaged over three met years). The maximum increase in aircraft emissions is calculated using the 2018 met year where emissions increase by 1.6 tonnes from 4,342.7 tonnes per annum to 4,343.3 tonnes per annum[77], an increase of less than 0.1% of ground-level aircraft emissions. The increase is the net impact of changes in aircraft taxiing, including auxiliary power unit (APU) usage associated with reduced-engine taxi-in. Due to the redistribution of aircraft taxiing activity (more aircraft taxiing out to 09L, fewer taxiing out to 09R, fewer taxiing in from 09L and more taxiing in from 09R), the taxi-out emissions increase by 6.2 tonnes which is mostly balanced by a reduction of 5.0 tonnes in taxi-in emissions (averaged over three met years). Emissions of NOx from all other source categories remain unchanged.

6.7.10. Overall modelled aircraft emissions of PM_{10} change by less than 0.1 tonne between the Without Development and With Development scenarios. Likewise, emissions of $PM_{2.5}$ change by less than 0.1 tonne. The increase in emissions from taxi-out is matched by a reduction in emissions during taxi-in.

Table 6.22 Emissions to air (tonnes/year) for 2028 With Development and Without Development scenarios (2017 met year)

Source	NOx (t/y)		PM_{10} (t/y)		$PM_{2.5}$ (t/y)	
	Without Dev	With Dev	Without Dev	With Dev	Without Dev	With Dev
Aircraft	4251.4	4252.2	44.6	44.6	36.7	36.7
Ground level	1664.6	1665.5	32.2	32.2	24.3	24.3
Pushback	91.5	91.5	1.4	1.4	1.4	1.4
Taxi-out	266.1	270.6	4.2	4.3	4.2	4.3
Take-off roll	900.0	900.0	3.4	3.4	3.4	3.4
Landing roll	17.7	17.7	0.3	0.3	0.3	0.3
Taxi-in	162.8	159.2	2.5	2.5	2.5	2.5
APU	223.4	223.4	3.8	3.8	3.8	3.8
Brake	0.0	0.0	9.9	9.9	3.9	3.9
Tyre	0.0	0.0	6.6	6.6	4.6	4.6
Engine testing	3.1	3.1	0.0	0.0	0.0	0.0
Elevated	2586.7	2586.7	12.3	12.3	12.3	12.3

[77] All differences are calculated from unrounded numbers and may differ slightly from differences calculated from the rounded numbers presented in this report.

Source	NOx (t/y)		PM_{10} (t/y)		$PM_{2.5}$ (t/y)	
	Without Dev	With Dev	Without Dev	With Dev	Without Dev	With Dev
Initial climb	597.5	597.5	2.2	2.2	2.2	2.2
Climb out	1406.8	1406.8	5.0	5.0	5.0	5.0
Approach	582.4	582.4	5.1	5.1	5.1	5.1
GSE [a]	37.0	37.0	1.7	1.7	0.9	0.9
Stationary sources	291.4	291.4	3.1	3.1	3.1	3.1

a. Ground Support Equipment

Table 6.23 Emissions to air (tonnes/year) for 2028 With Development and Without Development scenarios (2018 met year)

Source	NOx (t/y)		PM_{10} (t/y)		$PM_{2.5}$ (t/y)	
	Without Dev	With Dev	Without Dev	With Dev	Without Dev	With Dev
Aircraft	4341.7	4343.3	44.7	44.7	36.8	36.8
Ground level	1699.9	1701.5	32.3	32.3	24.4	24.4
Pushback	92.3	92.3	1.4	1.4	1.4	1.4
Taxi-out	262.3	270.4	4.1	4.2	4.1	4.2
Take-off roll	924.3	924.3	3.4	3.4	3.4	3.4
Landing roll	17.8	17.8	0.3	0.3	0.3	0.3
Taxi-in	176.7	170.1	2.8	2.6	2.8	2.6
APU	223.4	223.4	3.8	3.8	3.8	3.8
Brake	0.0	0.0	9.9	9.9	3.9	3.9
Tyre	0.0	0.0	6.6	6.6	4.6	4.6
Engine testing	3.1	3.1	0.0	0.0	0.0	0.0
Elevated	2641.8	2641.8	12.3	12.3	12.3	12.3
Initial climb	612.7	612.7	2.2	2.2	2.2	2.2
Climb out	1441.4	1441.4	5.0	5.0	5.0	5.0
Approach	587.6	587.6	5.1	5.1	5.1	5.1
GSE	37.0	37.0	1.7	1.7	0.9	0.9
Stationary sources	291.4	291.4	3.1	3.1	3.1	3.1

Table 6.24 Emissions to air (tonnes/year) for 2028 With Development and Without Development scenarios (2019 met year)

Source	NOx (t/y)		PM_{10} (t/y)		$PM_{2.5}$ (t/y)	
	Without Dev	With Dev	Without Dev	With Dev	Without Dev	With Dev
Aircraft	4290.6	4291.7	44.6	44.6	36.7	36.7
Ground level	1680.8	1681.9	32.3	32.3	24.4	24.4
Pushback	92.0	92.0	1.4	1.4	1.4	1.4
Taxi-out	264.8	270.8	4.2	4.3	4.2	4.3
Take-off roll	910.7	910.7	3.4	3.4	3.4	3.4
Landing roll	17.8	17.8	0.3	0.3	0.3	0.3
Taxi-in	169.1	164.1	2.6	2.5	2.6	2.5
APU	223.4	223.4	3.8	3.8	3.8	3.8
Brake	0.0	0.0	9.9	9.9	3.9	3.9
Tyre	0.0	0.0	6.6	6.6	4.6	4.6
Engine testing	3.1	3.1	0.0	0.0	0.0	0.0
Elevated	2609.8	2609.8	12.3	12.3	12.3	12.3
Initial climb	604.3	604.3	2.2	2.2	2.2	2.2
Climb out	1420.0	1420.0	5.0	5.0	5.0	5.0
Approach	585.5	585.5	5.1	5.1	5.1	5.1
GSE	37.0	37.0	1.7	1.7	0.9	0.9
Stationary sources	291.4	291.4	3.1	3.1	3.1	3.1

Table 6.25 Difference in emissions to air between 2028 With Development and Without Development scenarios (2017 met year)

Source	Difference (t/y)			Percentage difference (%)		
	NOx	PM_{10}	$PM_{2.5}$	NOx	PM_{10}	$PM_{2.5}$
Aircraft	0.8	0.0	0.0	0.0%	0.0%	0.0%
Ground level	0.8	0.0	0.0	0.1%	0.0%	0.0%
Pushback	0.0	0.0	0.0	0.0%	0.0%	0.0%
Taxi-out	4.4	0.1	0.1	1.7%	1.5%	1.5%
Take-off roll	0.0	0.0	0.0	0.0%	0.0%	0.0%
Landing roll	0.0	0.0	0.0	0.0%	0.0%	0.0%
Taxi-in	-3.6	-0.1	-0.1	-2.2%	-2.7%	-2.7%
APU	0.0	0.0	0.0	0.0%	0.0%	0.0%
Brake	0.0	0.0	0.0	-	0.0%	0.0%
Tyre	0.0	0.0	0.0	-	0.0%	0.0%
Engine testing	0.0	0.0	0.0	0.0%	0.0%	0.0%
Elevated	0.0	0.0	0.0	0.0%	0.0%	0.0%
Initial climb	0.0	0.0	0.0	0.0%	0.0%	0.0%
Climb out	0.0	0.0	0.0	0.0%	0.0%	0.0%
Approach	0.0	0.0	0.0	0.0%	0.0%	0.0%

Table 6.26 Difference in emissions to air between 2028 With Development and Without Development scenarios (2018 met year)

Source	Difference (t/y)			Percentage difference (%)		
	NOx	PM_{10}	$PM_{2.5}$	NOx	PM_{10}	$PM_{2.5}$
Aircraft	1.6	0.0	0.0	0.0%	0.0%	0.0%
Ground level	1.6	0.0	0.0	0.1%	0.0%	0.0%
Pushback	0.0	0.0	0.0	0.0%	0.0%	0.0%
Taxi-out	8.1	0.1	0.1	3.1%	2.9%	2.9%
Take-off roll	0.0	0.0	0.0	0.0%	0.0%	0.0%
Landing roll	0.0	0.0	0.0	0.0%	0.0%	0.0%
Taxi-in	-6.6	-0.1	-0.1	-3.7%	-4.6%	-4.6%
APU	0.0	0.0	0.0	0.0%	0.0%	0.0%
Brake	0.0	0.0	0.0	-	0.0%	0.0%
Tyre	0.0	0.0	0.0	-	0.0%	0.0%
Engine testing	0.0	0.0	0.0	0.0%	0.0%	0.0%
Elevated	0.0	0.0	0.0	0.0%	0.0%	0.0%
Initial climb	0.0	0.0	0.0	0.0%	0.0%	0.0%
Climb out	0.0	0.0	0.0	0.0%	0.0%	0.0%
Approach	0.0	0.0	0.0	0.0%	0.0%	0.0%

Table 6.27 Difference in emissions to air between 2028 With Development and Without Development scenarios (2019 met year)

Source	Difference (t/y)			Percentage difference (%)		
	NOx	PM_{10}	$PM_{2.5}$	NOx	PM_{10}	$PM_{2.5}$
Aircraft	1.1	0.0	0.0	0.0%	0.0%	0.0%
Ground level	1.1	0.0	0.0	0.1%	0.0%	0.0%
Pushback	0.0	0.0	0.0	0.0%	0.0%	0.0%
Taxi-out	6.1	0.1	0.1	2.3%	2.1%	2.1%
Take-off roll	0.0	0.0	0.0	0.0%	0.0%	0.0%
Landing roll	0.0	0.0	0.0	0.0%	0.0%	0.0%
Taxi-in	-5.0	-0.1	-0.1	-2.9%	-3.6%	-3.6%
APU	0.0	0.0	0.0	0.0%	0.0%	0.0%
Brake	0.0	0.0	0.0	-	0.0%	0.0%
Tyre	0.0	0.0	0.0	-	0.0%	0.0%
Engine testing	0.0	0.0	0.0	0.0%	0.0%	0.0%
Elevated	0.0	0.0	0.0	0.0%	0.0%	0.0%
Initial climb	0.0	0.0	0.0	0.0%	0.0%	0.0%
Climb out	0.0	0.0	0.0	0.0%	0.0%	0.0%
Approach	0.0	0.0	0.0	0.0%	0.0%	0.0%

Concentrations: Human Health Receptors

6.7.11. Concentrations of NO_2, PM_{10} and $PM_{2.5}$ have been predicted at each relevant receptor location for the 2028 Without Development and With Development scenarios. Concentrations have been calculated for three met years (2017, 2018 and 2019; see **Paragraph 6.5.7**), and results are given for the worst met year unless otherwise indicated. The 2018 met year has the highest frequency of easterly winds, and at receptors in Longford, this met year generally produces the highest concentrations in the With Development Scenario and the largest changes due to the Proposed Development, although the greatest concentrations in the Without Development scenario in Longford are generally from the 2019 met year. At receptors in Stanwell, the 2018 met year generally produces the greatest concentrations in both With Development and Without Development scenarios, and the most number beneficial impacts, while the 2017 met year generally produces the least number of beneficial impacts.

6.7.12. The predicted concentrations of NO_2, PM_{10} and $PM_{2.5}$ at each relevant receptor location for the 2028 Without Development and With Development scenarios are set out in **Tables 6.2.6** to **6.2.8** for NO_2, **Tables 6.2.9** to **6.2.11** for PM_{10} and **Tables 6.2.12** to **6.2.14** for $PM_{2.5}$ in **Appendix 6.2** for each met year. It should be noted that in several cases, a single residential

property in Longford is represented by two receptors, to ensure that the maximum concentration at that property is assessed (see Appendix 6.2); elsewhere, a single receptor typically represents many properties. The annual mean NO_2 concentrations for the 2028 Without Development scenarios are shown as contour plots in **Figures 6.3** to **6.5** (**Appendix 6.3**) for each met year. Contours of concentrations for the With Development scenario, the change between With Development and Without Development scenarios, and zoomed in contours focused on Longford and Stanwell for each of those Figures are provided in **Figures 6.12** to **6.15** (**Appendix 6.3**) for the 2017 met year. Contours for the 2018 and 2019 met years are shown in **Figures 6.16** to **6.19** and **Figures 6.20** to **6.23** (**Appendix 6.3**), respectively.

NO_2 concentrations

6.7.13. The contour plots show that concentrations of NO_2 above the objective (40 µg/m^3) in the 2028 With Development scenario are confined to small parts of the airfield, where there is no public access and the objective therefore does not apply, and to the carriageways of major roads where again the objective does not apply. Away from the airfield and major roads, concentrations are well below the objective.

6.7.14. The highest predicted annual mean concentration of NO_2 in the 2028 With Development scenario at any relevant receptor is 23.4 µg/m^3 or 59% of the objective, at the Stanwell05 receptor, representing properties near the junction of Bedfont Road and Northumberland Close, where the decrease (beneficial impact) due to the Proposed Development is at least[78] 0.2 µg/m^3 or 0.2% of the objective (met year 2019). The impact here is described as 'negligible' under IAQM/EPUK criteria[35].

6.7.15. The greatest increment in annual mean concentration of NO_2 at any relevant receptor is 2.3 µg/m^3 or 5.7% of the objective, at the Longford001a receptor, representing the rear facade of 617 Bath Road, Longford (met year 2018). The maximum concentration at this receptor in the With Development scenario is 22.4 µg/m^3 or 56% of the objective (met year 2019). This impact is classified as 'slight adverse' under IAQM/EPUK criteria[35]. A total of four properties, represented by six receptors[79], also experience 'slight adverse' impacts. The impacts at these four properties are 'slight adverse' using the 2018 met year; using other met years, where the fraction of easterly winds is lower, the impacts at all receptors are classified as 'negligible'.

6.7.16. The impacts at all other relevant receptors are classified as 'negligible' using all three met years, because the change in annual mean NO_2 concentrations due to the Proposed

[78] For clarity, the decrease (beneficial impact) at this receptor is 0.2 µg/m^3 using the 2017 met year, 0.4 µg/m^3 using the 2018 met year and 0.3 µg/m^3 using the 2019 met year. Quoting 0.2 µg/m^3 is therefore the worst case because it represents the smallest beneficial impact of the three met years.

[79] Longford001a (rear façade of 617 Bath Road); Longford002b (front façade of 617 Bath Road); Longford003a (rear façade of 615 Bath Road); Longford004b (front façade of 615 Bath Road); Longford005a (rear façade of 613 Bath Road); and Longford007a (rear façade of 611 Bath Road).

Development is 5% (rounded) of the objective or less, and the total concentration is less than 75% of the objective.

6.7.17. **Figures 6.13**, **6.17** and **6.21** (**Appendix 6.3**) show contours of the change in NO_2 concentrations due to the Proposed Development. The change is positive (increase in concentrations) to the northwest of the airfield and negative (decrease in concentrations) to the southwest of the airfield. This is due to emissions from the take-off roll being moved from the southern runway to the northern runway during easterly operations as a result of the Proposed Development. However, there are positive changes at the eastern end of the northern runway and negative changes at the eastern end of the southern runway. This is due to emissions from the landing roll, which are moved from the northern runway to the southern runway as a result of the Proposed Development. The changes in take-off roll are much larger in magnitude than landing roll, but only occur at the start of the runway; departing aircraft lift off about halfway along the runway, and ground-level concentrations decline rapidly beyond that point. By contrast, arriving aircraft touch down several hundred metres along the runway, and remain on the runway for much of its length before turning off. The consequence of this is that at the eastern end of the runway, during easterly operations, concentrations are largely due to landing roll rather than take-off roll. This explains the pattern of contours observed in **Figures 6.13**, **6.17** and **6.21** (**Appendix 6.3**).

6.7.18. In view of the very small number of slight impacts, the overall residual effect of the Proposed Development on NO_2 concentrations is considered to be **Not Significant**.

6.7.19. As shown in **Figures 6.15**, **6.19** and **6.23** (**Appendix 6.3**), the Proposed Development results in small increases in NO_2 concentrations in Longford but small decreases in NO_2 concentrations in Stanwell and Stanwell Moor. The increases in Longford are slightly larger in magnitude than the decreases in Stanwell but affect a smaller number of properties. In terms of the population-average change in concentrations across the study area (see **paragraph 6.5.26**), the overall net effect is a small decrease in average exposure of 0.01 µg/m^3, representing a small beneficial residual effect, albeit one which is considered **Not Significant**.

PM concentrations

6.7.20. The overall picture for PM_{10} and $PM_{2.5}$ is the reverse of that for NO_2, because emissions of these pollutants are dominated by brake wear and tyre wear, which primarily happen on landing. The Proposed Development therefore results in a shift of PM emissions from the northern runway to the southern runway, and consequently lead to a small decrease in concentrations in Longford and a small increase in concentrations in Stanwell.

6.7.21. The annual mean PM_{10} concentrations for the 2028 Without Development scenarios are shown as contour plots in **Figures 6.6** to **6.8** (**Appendix 6.3**) for each met year. Contours of concentrations for the With Development scenario and the change between With Development and Without Development scenarios are provided in **Figures 6.24** to **6.29** for all met years.

6.7.22. The annual mean $PM_{2.5}$ concentrations for the 2028 Without Development scenarios are shown as contour plots in **Figures 6.9** to **6.11** (**Appendix 6.3**) for each met year. Contours of concentrations for the With Development scenario and the change between With

Development and Without Development scenarios are provided in **Figures 6.30** to **6.35** (**Appendix 6.3**) for all met years.

6.7.23. The PM contour plots show that concentrations of PM_{10} and $PM_{2.5}$ are below the respective annual mean objectives (40 µg/m^3 and 20 µg/m^3) in the 2028 With Development scenario across the air quality study area, and that annual mean concentrations of PM_{10} are below the proxy for the daily mean objective (32 µg/m^3; see **Paragraph 6.2.8**) everywhere, except for a very small area of carriageway at the entrance of Tunnel Road, where the objectives do not apply. Concentrations of $PM_{2.5}$ are below the GLA target of 10 µg/m^3 everywhere in the air quality study area except for locations very close to major roads and parts of the airfield.

6.7.24. The highest predicted annual mean concentration of PM_{10} in the 2028 With Development scenario at any relevant receptor is 17.8 µg/m^3 or 45% of the objective, at the M4_19 receptor, representing properties near the M4 motorway in Hayes, where the increase due to the Proposed Development is less than 0.1 µg/m^3 or less than 0.1% of the objective (met year 2017). The impact here is described as 'negligible' under IAQM/EPUK criteria[35].

6.7.25. The greatest increment in annual mean concentration of PM_{10} at any relevant receptor is 0.19 µg/m^3 or 0.5% of the objective, at the Stanwell13 receptor, representing a property on Oaks Road, Stanwell (met year 2018). The maximum concentration at this receptor in the With Development scenario is 14.9 µg/m^3 or 37% of the objective (met year 2018). The impact at all relevant receptors is classified as 'negligible' under IAQM/EPUK criteria[35], using all three met years.

6.7.26. The highest predicted annual mean concentration of $PM_{2.5}$ in the 2028 With Development scenario at any relevant receptor is 9.2 µg/m^3 or 46% of the objective, at the M4_19 receptor, representing properties near the M4 motorway in Hayes. However, the increase due to the Proposed Development is less than 0.1 µg/m^3 or less than 0.1% of the objective (met year 2019). The impact here is described as 'negligible' under IAQM/EPUK criteria[35].

6.7.27. The greatest increment in annual mean concentration of $PM_{2.5}$ at any relevant receptor is 0.1 µg/m^3 or 0.5% of the objective, at the Stanwell14 receptor, representing a property on Oaks Road, Stanwell (met year 2018). The maximum concentration at this receptor in the With Development scenario is 8.1 µg/m^3, 40% of the objective or 81% of the GLA target. The impact at all relevant receptors is classified as 'negligible' under IAQM/EPUK criteria[35], using all three met years.

6.7.28. **Figures 6.25**, **6.27**, **6.29**, **6.31**, **6.33** and **6.35** (**Appendix 6.3**) show contours of the change in PM_{10} and $PM_{2.5}$ concentrations due to the Proposed Development for the three met years. The general picture is that the change in concentrations along the length of the northern runway is negative, i.e. a decrease in concentrations, due to the contribution of brake wear and tyre wear being moved to the southern runway. However, there is a small area at the western end of the northern runway where the change is positive (an increase in concentrations) due to the main engine emissions from aircraft taking off. These changes are reversed on the southern runway.

6.7.29. Given that the impacts are negligible at all receptors, the overall residual effect of the Proposed Development on PM_{10} and $PM_{2.5}$ concentrations is considered to be **Not Significant**.

6.7.30. As shown in **Figures 6.25**, **6.27**, **6.29**, **6.31**, **6.33** and **6.35** (**Appendix 6.3**), the Proposed Development results in very small increases in PM concentrations in Stanwell and Stanwell Moor but very small decreases in PM concentrations in Longford. The increases in Stanwell are slightly larger in magnitude and affect a larger number of properties than the decreases in Longford. In terms of the population-average change in concentrations across the study area (see **paragraph 6.5.26**), the overall net effect is a small increase in average exposure of 0.002 µg/m^3, representing a small adverse effect, albeit one which is considered **Not Significant**.

Sensitivity Analysis: Number of Aircraft Movements

6.7.31. The results presented above are for 480,000 movements per year (the base scenario). As a sensitivity test, concentrations have been calculated at specific receptors for 481,920 movements per year which represents the movements cap plus non-ATM movements associated with positioning flights and private flights. This is very much worst-case as the airport does not operate at its 480,000 cap.

6.7.32. Compared with the base scenario, the sensitivity scenario increases annual mean NO_2 concentrations by a maximum of 0.03 µg/m^3 at any modelled receptor in both With Development and Without Development cases. The change in NO_2 concentrations due to the Proposed Development is less than 0.01 µg/m^3 greater in the sensitivity scenario than in the base scenario.

6.7.33. Compared with the base scenario, the sensitivity scenario increases annual mean PM_{10} concentrations by less than 0.003 µg/m^3 at any modelled receptor in both With Development and Without Development cases. The change in PM_{10} concentrations due to the Proposed Development is less than 0.001 µg/m^3 greater in the sensitivity scenario than in the base scenario.

6.7.34. Compared with the base scenario, the sensitivity scenario increases annual mean $PM_{2.5}$ concentrations by less than 0.002 µg/m^3 at any modelled receptor in both With Development and Without Development cases. The change in $PM_{2.5}$ concentrations due to the Proposed Development is less than 0.001 µg/m^3 greater in the sensitivity scenario than in the base scenario.

6.7.35. This sensitivity test therefore does not change the conclusions of the assessment, which remain robust.

Sensitivity Analysis: Location of Rapid Access Taxiways

6.7.36. The location of the new Rapid Access Taxiways onto Runway 09L is fixed within parameters, as some flexibility is required to cope with on-site constraints that may emerge during construction. Changes to the final locations of the Rapid Access Taxiways will affect the spatial distribution of taxi-out and take-off emissions, and therefore affect concentrations in Longford. A sensitivity analysis has therefore been carried out, in which the Rapid Access Taxiways may be located either 20 m west or east of their base-case locations.

6.7.37. Moving the taxiways 20 m is modelled to increase or decrease annual mean nitrogen dioxide concentrations by less than 0.1 µg/m^3 at any receptor. The greatest change is at the Longford001a receptor. In the worst case, the number of receptors experiencing ‘slight

adverse' impacts would increase from six receptors (representing four properties) in the base case to eight receptors representing five properties in the sensitivity case (using the 2018 met year). Using the 2017 or 2019 met years, all impacts remain negligible in the sensitivity case.

6.7.38. These changes in impacts are sufficiently small that they would not affect the conclusion of the assessment that the air quality effects of the Proposed Development are **Not Significant**.

Impacts at Ecological Receptors

6.7.39. The greatest change in nitrogen deposition as a result of the Proposed Development at any of the modelled ecological receptors is 0.3 kg/ha/y at the E19 receptor, representing the Colne Valley Biodiversity Site between the northern runway and the M25. The change in the acid deposition rate is 0.02 keq/ha/y. The habitat here is not known, so it has not been possible to identify critical loads for this site with confidence. Assuming the critical load for nitrogen is 10 kg/ha/y, typical of the scrub and woodland habitats most likely to be present, the impact here is 3% of the critical load. The acid deposition is at most 0.01% of any likely critical load. This is a local wildlife site, so Environment Agency guidance[39] states that impacts of less than 100% of the critical load can be considered insignificant without further assessment.

6.7.40. The only internationally designated site for nature conservation within the air quality study area is the South West London Waterbodies Special Area of Conservation (SAC). APIS[43] states that there is "*no comparable habitat with established [nitrogen] critical load estimate available*" for this site, and that it is not sensitive to acid deposition. Impacts on the site have therefore not been assessed. That said, the changes in nitrogen deposition as a result of the Proposed Development are very small and a mix of beneficial and adverse, ranging from a decrease of 0.05 kg/ha/y to an increase of 0.01 kg/ha/y.

6.7.41. There are two Sites of Special Scientific Interest (SSSIs) within the air quality study area. Parts of Staines Moor experience an increase in nitrogen deposition as a result of the Proposed Development of up to 0.02 kg/ha/y or 0.2% of the critical load of 10 kg/ha/y. The acid deposition rate is up to 0.001 keq/ha/y, or less than 0.01% of the critical load. Under Environment Agency guidance, these impacts are not significant as they are less than 1% of the critical load. Some parts of the Staines Moor SSSI experience beneficial impacts (reductions in deposition), although these are again not significant.

6.7.42. The Wraysbury & Hythe End Gravel Pits SSSI experiences an increase in nitrogen deposition of 0.004 kg/ha/y and an increase in acid deposition of 0.0003 keq/ha/y. These are both well under 0.1% of the critical loads and are therefore not significant.

6.7.43. No other designated sites have been identified that would experience significant effects. Please see **Section 12.7** of **Chapter 12: Biodiversity** for further clarification of air quality effects on flora and fauna from the Proposed Development.

6.7.44. The greatest change in annual mean NOx due to the Proposed Development is 5.1 µg/m^3 or 17% of the critical level at the E19 receptor, representing the Colne Valley Biodiversity Site between the northern runway and the M25. The South West London Waterbodies SAC experiences changes in NOx between a decrease of 0.7 µg/m^3 (2.5% of the critical level)

and an increase of 0.2 µg/m^3 (0.7% of the critical level). The Staines Moor SSSI experiences changes in NOx between a decrease of 0.03 µg/m^3 (0.1% of the critical level) and an increase of 0.2 µg/m^3 (0.8% of the critical level). The Wraysbury & Hythe End Gravel Pits SSSI experiences an increase in NOx of 0.06 µg/m^3 (0.2% of the critical level). None of the adverse impacts are significant under Environment Agency criteria.

Summary of Potential Effects

6.7.45. During the operational phase, 'Slight adverse' impacts are predicted at four properties for annual mean NO_2 for a single met year. Impacts at all other receptors are predicted to be 'negligible'. Impacts on annual mean PM_{10} and $PM_{2.5}$ are predicted to be 'negligible' at all receptors. No exceedances of any air quality objectives or the GLA $PM_{2.5}$ target are predicted as a result of the Proposed Development. There is likely to be a direct, permanent, long-term, negligible residual effect, which could be both adverse or positive depending on the location, on air quality following the implementation of embedded measures. The overall effect is therefore considered to be **Not Significant**.

6.7.46. During the construction phase, 'negligible' impacts are predicted at all receptors. No exceedances of any air quality objectives or the GLA $PM_{2.5}$ target are predicted as a result of the Proposed Development. There is likely to be a direct, temporary , long-term, negligible residual effect. The overall effect is therefore considered to be **Not Significant**.

6.7.47. No additional mitigation measures are considered to be required to manage the air quality effects of the Proposed Development, although mitigation measures already in place to manage air quality in the vicinity of Heathrow Airport (e.g. in Heathrow Airport's Emissions Strategy and Action Plan[73], the London Borough of Hillingdon's Air Quality Action Plan[32], and the action plans of other local authorities) should be continued.

6.7.48. This conclusion is reached using the professional judgement of the team carrying out the assessment, in accordance with the published guidance and the modelling results presented in this chapter and its appendices.

Cumulative effects

6.7.49. Cumulative effects have been included in both the With Development and Without Development scenarios. The contribution of other plans and projects to local air quality conditions is included in the road traffic data provided to inform the assessment, as well as being embedded within the Defra forecasts for background concentrations of air pollutants.

Opportunities for Environmental Enhancement

6.7.50. No opportunities for environmental enhancement with regard to air quality have been identified, albeit it is acknowledged that the Proposed Development leads to beneficial changes in air quality at some receptors and adverse changes at others. These changes are not considered significant.

6.8. Assessment Summary

6.8.1. **Table 6.28** provides a summary of the findings of the assessment:

Table 6.28 Assessment of potential effects, embedded environmental measures, residual effects and monitoring during operation

Activity	Summary of predicted effect	Receptor	Significance	Summary rationale
Change in concentrations of NO_2, PM_{10} and $PM_{2.5}$ due to construction traffic	Negligible	Air quality at relevant human receptors	Not significant	'Negligible' impacts are predicted all receptors for all pollutants.
Change in concentrations of NO_2, PM_{10} and $PM_{2.5}$ due to Proposed development during the operational phase	Negligible	Air quality at relevant human receptors	Not significant	'Slight adverse' impacts are predicted at four properties for annual mean NO_2. Impacts at all other receptors are predicted to be 'negligible'. Impacts on annual mean PM_{10} and $PM_{2.5}$ are predicted to be 'negligible' at all receptors. No exceedances of any air quality objectives or the GLA $PM_{2.5}$ target are predicted as a result of the Proposed Development. There are beneficial impacts for NO_2, PM_{10} and $PM_{2.5}$ and some receptors, albeit these are described as 'negligible'.
Change in NOx concentrations and nitrogen deposition due to Proposed development	Negligible	Air quality at relevant ecological receptors	Not significant	Predicted impacts at designated sites are within published criteria for being not significant