CITY AIRPORT DEVELOPMENT PROGRAMME
(CADP1) S73 APPLICATION

ENVIRONMENTAL STATEMENT

VOLUME 1: MAIN ES

DECEMBER 2022

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City Airport Development Programme (CADP1) S73 Application

Volume 1: Environmental Statement
Chapter 9: Air Quality

December 2022

9 Air Quality

9.1 Introduction

9.1.1 This chapter of the Environmental Statement (ES) describes the likely significant effects of the proposed development with respect to air quality, during both the construction and operational phases. The study has been carried out by Air Quality Consultants Ltd (AQC) on behalf of LCY.

9.1.2 This chapter should be read in conjunction with the following appendices:

- Appendix 9.1 – Issues related to UFPs;
- Appendix 9.2 – Receptor locations;
- Appendix 9.3 – Detailed modelling methodology;
- Appendix 9.4 – Detailed results; and
- Appendix 9.5 – Air Quality Positive Statement.

9.2 Legislative and Policy Context

9.2.1 Where UK legislation has retained EU law following the UK's withdrawal from the European Union, this is identified in the text that follows.

Legislation

Environment Act (1995)

9.2.2 Part IV of the Environment Act 1995 requires that Local Authorities periodically review air quality within their individual areas. This process of Local Air Quality Management (LAQM) is an integral part of delivering the Government's Air Quality Objectives (AQOs). Local Authorities must produce an Annual Status Report summarising the outcome of their Review and Assessment.

9.2.3 Review and assessments of local air quality aim to identify areas where national policies to reduce vehicle and industrial emissions are unlikely to result in air quality meeting the Government's AQOs by the required dates.

9.2.4 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.

9.2.5 Where the assessment indicates that some or all of the objectives may be potentially exceeded, 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.

Air Quality (England) Regulations (2000) and the Air Quality (England) (Amendment) Regulations (2002)

9.2.6 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)

9.2.7 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 into UK legislation and are part of retained 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 of sensitive groups or on ecosystems.

9.2.8 The legal duty under the Air Quality Standards Regulations (2010) is on the Secretary of State to ensure the limit values are met. This is in contrast to the Air Quality (England) Regulations (2000) and the Air Quality (England) (Amendment) Regulations (2002), which impose duties on local authorities to meet the objectives. Limit values are therefore not the same as objectives in legal terms, although many are numerically the same.

9.2.9 The Air Quality Standards Regulations 2010 define ambient air as:

"…outdoor air in the troposphere, excluding workplaces where members of the public do not have regular access."

9.2.10 The regulations 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;

(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)

9.2.11 The UK's new legal framework for protection of the natural environment, the Environment Act 2021, passed into UK law in November 2021. The Act gives the 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.

9.2.12 The Act requires the Government to set at least one long-term target (spanning a minimum of 15 years), supported by interim targets set in a five-year cycle, in each of four identified areas: Air Quality, Biodiversity, Water and Resource Efficiency and Waste Reduction. In 2022 the Government consulted on the following air quality targets for air quality ($PM_{2.5}$):

- Annual Mean Concentration Target ('concentration target'): a maximum concentration of 10 µg/m^3 to be met across England by 2040; and
- Population Exposure Reduction Target ('exposure target'): a 35% reduction in population exposure by 2040 (compared to a base year of 2018).

9.2.13 However, at the time of writing (December 2022) the proposed targets have not yet been either finalised or adopted by the Government.

National policy: Planning

National Planning Policy Framework (2021)

9.2.14 The National Planning Policy Framework (NPPF)[1] 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".

[1] MHC&LG (2021) National Planning Policy Framework. 20 July 2021.

9.2.15 To prevent unacceptable risks from air pollution, Paragraph 174 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".

9.2.16 Paragraph 185 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".

9.2.17 More specifically on air quality, Paragraph 186 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".

Planning Practice Guidance (2019)

9.2.18 The NPPF is supported by Planning Practice Guidance (PPG)[2], 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".

9.2.19 Regarding plan-making, the PPG states:

"It is important to take into account air quality management areas, Clean Air Zones and other areas including sensitive habitats or designated sites of importance for biodiversity where there could be specific requirements or limitations on new development because of air quality".

9.2.20 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".*

9.2.21 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".

9.2.22 The PPG sets out the information that may be required in an air quality assessment, making clear that:

[2] DLUHC (2019) Air quality. 1 November 2019.

"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".

9.2.23 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".

National Policy: Air Quality

Air Quality Strategy (2007)

9.2.24 The Air Quality Strategy[3] 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. Local authorities are seen to play a particularly important role. The strategy describes the Local Air Quality Management (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 authority must declare an Air Quality Management Area (AQMA), and prepare an action plan which identifies appropriate measures that will be introduced in pursuit of the objectives.

Reducing Emissions from Road Transport: Road to Zero Strategy (2018)

9.2.25 The Office for Low Emission Vehicles (OLEV) and Department for Transport (DfT) published a Policy Paper[4] in July 2018 outlining how the government will support the transition to zero tailpipe emission road transport and reduce tailpipe emissions from conventional vehicles during the transition. This paper affirms the Government's pledge to end the sale of new conventional petrol and diesel cars and vans by 2040, and states that the Government expects the majority of new cars and vans sold to be 100% zero tailpipe emission and all new cars and vans to have significant zero tailpipe emission capability by this year, and that by 2050 almost every car and van should have zero tailpipe emissions. It states that the Government wants to see at least 50%, and as many as 70%, of new car sales, and up to 40% of new van sales, being ultra-low emission by 2030.

9.2.26 The paper sets out a number of measures by which Government will support this transition but is clear that Government expects this transition to be industry and consumer led. The Government has since announced that the phase-out date for the sale of new petrol and diesel cars and vans will be brought forward to 2030 and that all new cars and vans must be fully zero emission at the tailpipe from 2035. If these ambitions are realised then road traffic-related NOx emissions can be expected to reduce significantly over the coming decades, likely beyond the scale of reductions forecast in the tools utilised in carrying out this air quality assessment.

Clean Air Strategy (2019)

9.2.27 The Clean Air Strategy[5] 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. Aviation is briefly discussed, but the Clean Air Strategy largely defers to the Aviation Strategy (discussed below) on this matter.

[3] Defra (2007) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland. 26 March 2011.
[4] DfT (2018) The Road to Zero: Next steps towards cleaner road transport and delivering our Industrial Strategy. 9 July 2018.
[5] Defra (2019) Clean Air Strategy 2019. 14 January 2019.

9.2.28 At this stage, the expected future benefits to air quality have not been quantified. This assessment uses the latest available forecast background concentrations, which do not take into account measures proposed within the Clean Air Strategy. This means the assessment is expected to be pessimistic.

Ten Point Plan (2020)

9.2.29 The Government's Ten Point Plan for a Green Industrial Revolution[6] 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.

9.2.30 Of particular relevance is Point 6: Jet Zero and Green Ships, which aims to encourage the use of SAF, and proposes to consult on a SAF mandate in 2021 with a mandate possibly starting in 2025.

National Policy: Aviation

Aviation Policy Framework (2013)

9.2.31 The Aviation Policy Framework[7] sets out the 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 Framework places a particular importance on areas where the EU Limit Values and air quality objectives are exceeded, but recognises that nitrogen oxides (NOx) concentrations 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 (ASASs) is strongly encouraged, together with the development of targets to reduce the air quality impacts of surface access.

Airports National Policy Statement (2018)

9.2.32 The Airports NPS[8] 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 Heathrow Airport 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."

9.2.33 The Airports NPS does not affect Government policy on wider aviation issues, as set out in the 2013 Aviation Policy Framework and the expected Aviation Strategy.

[6] BEIS (2020) The ten point plan for a green industrial revolution. 8 November 2020.
[7] DfT (2013) Aviation policy framework. 22 March 2013.
[8] DfT (2018) Airports National Policy Statement. 5 June 2018.

Beyond the horizon: The future of UK aviation: Making Best Use of Existing Runways (2019)

9.2.34 Beyond the Horizon - The Future of UK Aviation: Making Best Use of Existing Runways[9] confirms the Government's support for airports beyond Heathrow making best use of their existing runways, subject to consideration of economic and environmental impacts. It states (at paragraph 1.22/23):

"The government recognises the impact on communities living near airports and understands their concerns over local environmental issues, particularly noise, air quality and surface access. As airports look to make the best use of their existing runways, it is important that communities surrounding those airports share in the economic benefits of this, and that adverse impacts such as noise are mitigated where possible.

For the majority of local environmental concerns, the government expects these to be taken into account as part of existing local planning application processes."

Aviation 2050 Consultation (2019)

9.2.35 In 2018–2019, the Government consulted on its Green Paper, Aviation 2050[10]. In relation to air quality, the strategy proposes 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;
- 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.

9.2.36 This does not represent adopted policy. The 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)

9.2.37 '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:

"3. Support growth in airport capacity where it is justified, ensuring that capacity is used in a way that delivers for the UK – airport expansion has a key role to play in enhancing the UK's global connectivity and we remain supportive of sustainable airport growth...

4. 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)

9.2.38 In 2022 the Government published the Jet Zero Strategy[11]. Whilst focussed on decarbonising the aviation industry, it recognises that Sustainable Aviation Fuels (SAF) are 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;

[9] DfT (2018) Aviation strategy: making best use of existing runways. 5 June 2018.
[10] DfT (2018) Aviation 2050 — the future of UK aviation. 17 July 2022.
[11] DfT (2022) Jet Zero Strategy: Delivering net zero aviation by 2050. 2 August 2022.

- 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.

9.2.39 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;
- 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.

Regional (Greater London) policy

The London Plan (2021)

9.2.40 The London Plan[12] 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 SI1 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".

9.2.41 The Policy then details how developments should meet these requirements, stating:

"In order to meet the requirements in Part 1, as a minimum:

a) development proposals must be at least Air Quality Neutral

b) development proposals should use design solutions to prevent or minimise increased exposure to existing air pollution and make provision to address local problems of air quality in preference to post-design or retro-fitted mitigation measures

c) major development proposals must be submitted with an Air Quality Assessment. Air quality assessments should show how the development will meet the requirements of B1

d) development proposals in Air Quality Focus Areas or that are likely to be used by large numbers of people particularly vulnerable to poor air quality, such as children or older people should demonstrate that design measures have been used to minimise exposure".

9.2.42 Part C of the Policy introduces the concept of Air Quality Positive for large-scale development, stating:

"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. To achieve this, a statement should be submitted demonstrating:

1) how proposals have considered ways to maximise benefits to local air quality, and

[12] Mayor of London (2021) The London Plan 2021.

2) what measures or design features will be put in place to reduce exposure to pollution, and how they will achieve this."

9.2.43 Regarding construction and demolition impacts, Part D of Policy SI1 of the London Plan states:

"In order to reduce the impact on air quality during the construction and demolition phase development proposals must demonstrate how they plan to comply with the Non-Road Mobile Machinery Low Emission Zone and reduce emissions from the demolition and construction of buildings following best practice guidance".

9.2.44 Part E of Policy SI1 states the following regarding mitigation and offsetting of emissions:

"Development proposals should ensure that where emissions need to be reduced to meet the requirements of Air Quality Neutral or to make the impact of development on local air quality acceptable, this is done on-site. Where it can be demonstrated that emissions cannot be further reduced by on-site measures, off-site measures to improve local air quality may be acceptable, provided that equivalent air quality benefits can be demonstrated

9.2.45 The explanatory text around Policy SI1 of the London Plan states the following with regard to assessment criteria:

"The Mayor is committed to making air quality in London the best of any major world city, which means not only achieving compliance with legal limits for Nitrogen Dioxide as soon as possible and maintaining compliance where it is already achieved, but also achieving World Health Organisation targets for other pollutants such as Particulate Matter.

The aim of this policy is to ensure that new developments are designed and built, as far as is possible, to improve local air quality and reduce the extent to which the public are exposed to poor air quality. This means that new developments, as a minimum, must not cause new exceedances of legal air quality standards, or delay the date at which compliance will be achieved in areas that are currently in exceedance of legal limits. Where limit values are already met, or are predicted to be met at the time of completion, new developments must endeavour to maintain the best ambient air quality compatible with sustainable development principles.

Where this policy refers to 'existing poor air quality' this should be taken to include areas where legal limits for any pollutant, or World Health Organisation targets for Particulate Matter, are already exceeded and areas where current pollution levels are within 5 per cent of these limits[13]".

9.2.46 Policy T8 on Aviation, Part B 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".

9.2.47 Paragraph 10.8.5.further states

"any airport expansion proposals should not worsen existing air quality or contribute to exceedances of the 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 quality positive principles to minimise operational and construction impacts".

London Environment Strategy (2018)

9.2.48 The London Environment Strategy was published in May 2018[14]. 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 Organisation

[13] In this regard, the London Plan has incorrectly interpreted the EPUK/IAQM impact descriptors. Negligible impacts occur where the incremental change is less than 0.05 µg/m^3 (i.e. less than 0.5% of the Guideline) regardless of the absolute concentration.
[14] Mayor of London (2018) London Environment Strategy.

(WHO) in 2005. An implementation plan for the strategy has also been published which sets out what the Mayor will do between 2018 and 2023 to help achieve the ambitions in the strategy.

Air Quality Neutral (2021)

9.2.49 The GLA's London Plan Guidance (Air Quality Neutral)[15] sets out guidance on how an 'air quality neutral' assessment should be undertaken. It also provides a methodology for calculating an offsetting payment if a development is not 'air quality neutral' and it is not possible to identify or agree appropriate and adequate mitigation. The document is currently in consultation draft.

Air Quality Positive (2021)

9.2.50 The London Plan details expectations regarding 'Air Quality Positive' and can be summarised as follows:

- Air quality should be considered at an early stage in the project design;
- Existing good practice measures should be drawn together in a holistic fashion to identify which options deliver the greatest improvement to air quality, both in terms of on-site exposure and off-site impacts;
- A statement should be developed setting out how air quality can be improved across the proposed area of the development;
- These measures should be incorporated into the design; and
- Delivery of an air quality positive approach is project specific and relies on the opportunities on site or in the surrounding area to improve air quality.

9.2.51 The GLA has published a consultation draft of guidance[16] on how the requirements for Air Quality Positive development should be met. The consultation draft guidance has been followed when preparing this assessment.

Mayor's Transport Strategy (2018)

9.2.52 The Mayor's Transport Strategy[17] sets out the Mayor's policies and proposals to reshape transport in London over the next two decades. The Strategy focuses on reducing car dependency and increasing active sustainable travel, with the aim of improving air quality and creating healthier streets. It notes that development proposals should "*be designed so that walking and cycling are the most appealing choices for getting around locally*".

Local policy

9.2.53 The London Borough of Newham (LBN) published an updated Air Quality Action Plan[18] in November 2019. It presents modelled pollutant concentrations from the London Atmospheric Emissions Inventory (2016) and notes that:

- Nitrogen dioxide concentrations exceed the air quality objective in the locality of all major roads in the borough;
- PM_{10} concentrations exceed the objective around some major roads, with the most significant source of PM_{10} being road transport and other sources associated with central London; and
- Concentrations of $PM_{2.5}$ exceed the 2005 WHO guideline of 10 µg/m3 across the borough. Levels in the vicinity of major roads are higher, particularly in Stratford, Canning Town and at Prince Regent Lane.

9.2.54 The key 10 priorities identified in the Action Plan are:

- Enforcing the Non-Road Mobile Machinery (NRMM) Low Emission Zone;

[15] Mayor of London (2021) London Plan Guidance: Air Quality Neutral. Consultation draft, November 2021.
[16] Mayor of London (2021) London Plan Guidance: Air Quality Positive. Consultation draft, November 2021.
[17] Mayor of London (2018) Mayor's Transport Strategy. March 2018.
[18] LBN (2019) Air Quality Action Plan 2019 – 2024, 18 November 2019.

- Promoting and enforcing smoke control zones;
- Promoting and delivering energy efficiency retrofitting projects in workplaces and homes;
- Supporting alert services such as airTEXT and promoting the Mayor's air pollution forecasts;
- Reducing pollution in and around schools, and extending school audits;
- Installing Ultra Low Emission Vehicle infrastructure;
- Improving walking and cycling infrastructure;
- Regular car free days/temporary road closures in high footfall areas;
- Reducing emissions from Council fleets; and
- Ensuring Master planning and development areas are aligned with Air Quality Positive and Healthy Streets approaches.

Other Guidance

9.2.55 The Environment Agency has produced a horizontal guidance note (H4) on odour assessment and management[19] , which is designed for operators of Environment Agency-regulated processes. The H4 guidance document is primarily aimed at methods to control and manage the release of odours, but also contains a series of recommended assessment methods which can be used to assess potential odour impacts.

9.2.56 Guidance on odour assessments has also been published by the Institute of Air Quality Management (IAQM)[20]. The IAQM guidance sets out assessment methods which may be utilised in the assessment of odours for planning applications. The IAQM guidance endorses the use of multiple assessment tools for odours, stating that, "*best practice is to use a multi-tool approach where practicable*". This is in order to improve the robustness of the assessment conclusions. Some of the approaches outlined in the IAQM guidance have been adopted in this odour assessment.

9.2.57 The International Civil Aviation Organization (ICAO) has published the Airport Air Quality Manual[21] 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 in future years).

9.2.58 Defra has published Policy Guidance (LAQM.PG22)[22] and Technical Guidance (LAQM.TG22)[23] 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)[24].

9.2.59 With specific regard to construction NRMM emissions, IAQM guidance[25] states: "*experience of assessing the exhaust emissions from on-site plant (also known as non-road mobile machinery or NRMM) and site traffic suggests that they are unlikely to make a significant impact on local air quality, and in the vast majority of cases they will not need to be quantitatively assessed. For site plant and on-site traffic, consideration should be given to the number of plant/vehicles and their operating hours and locations to assess whether a significant effect is likely to occur*".

9.2.60 The approach developed jointly by Environmental Protection UK (EPUK) and IAQM[26] has been used to describe the modelled impacts. 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 the Chapter with regard to the determination of the significance of effects

[19] Environment Agency (2011) H4 Odour Management: How to comply with your environmental permit
[20] IAQM (2018) Guidance on the assessment of odour for planning. Version 1.1, July 2018.
[21] ICAO (2020) Airport Air Quality Manual. Doc 9889, Second edition.
[22] Defra (2022) Local Air Quality Management: Policy Guidance (PG22). August 2022.
[23] Defra (2022) Local Air Quality Management: Technical Guidance (TG22). August 2022.
[24] Mayor of London (2019) London Local Air Quality Management (LLAQM) Technical Guidance 2019
[25] IAQM (2016) Guidance on the assessment of dust from demolition and construction. Version 1.1
[26] Moorcroft and Barrowcliffe. et al. (2017) Land-use Planning & Development Control: Planning for Air Quality. Version 1.2, January 2017.

9.3 Assessment Criteria

Health-based criteria

9.3.1 The Government has established a set of air quality standards and objectives to protect human health. The Air Quality Strategy defines 'standards' as *"the concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. The standards are based on assessment of the effects of each pollutant on human health including the effects on sensitive subgroups or on ecosystems"*. 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 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) and the Air Quality (England) (Amendment) Regulations (2002).

9.3.2 The Air Quality Standards Regulations (2010)[27] set limit values for nitrogen dioxide, PM_{10} and $PM_{2.5}$, based on those in EU Directive 2008/50/EC[28]. Achievement of the limit values is a national obligation (on the Secretary of State) rather than a local one. In the UK, only monitoring and modelling carried out by UK Central Government meets the specification required to assess compliance with the limit values. 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 (JAQU).

9.3.3 The limit values for nitrogen dioxide and PM_{10} are numerically the same as the objectives for England. $PM_{2.5}$ has a UK limit value (20 µg/m^3) but no numerical objective is set within LAQM.TG22.

9.3.4 The GLA has set a target in its London Environment Strategy[14] 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 WHO in 2005. In 2021, WHO updated its guidelines, but the London Environment Strategy target still relates to the 2005 guideline of 10 µg/m^3.

9.3.5 The relevant air quality criteria for this assessment are provided in Table 9-1. For the purposes of this assessment, the $PM_{2.5}$ limit value of 20 µg/m^3 has been used as the primary metric (in accordance with the Air Quality Standards Regulations), with the GLA target of 10 µg/m^3 given consideration as a secondary metric.

Table 9-1: Air Quality Criteria

Pollutant	Time Period	Criterion	Type
Nitrogen dioxide	1-hour Mean	200 µg/m^3 not to be exceeded more than 18 times a year	Objective, limit value
	Annual Mean	40 µg/m^3	Objective, limit value
PM_{10}	24-hour Mean	50 µg/m^3 not to be exceeded more than 35 times a year	Objective, limit value
	Annual Mean	40 µg/m^3	Objective, limit value
$PM_{2.5}$	Annual Mean	20 µg/m^3	UK Limit value
	Annual Mean	10 µg/m^3	GLA target

9.3.6 Measurements across the UK have shown[23] that the 1-hour nitrogen dioxide objective is unlikely to be exceeded at roadside locations where the annual mean concentration is below 60 µg/m^3. Therefore, 1-hour nitrogen dioxide concentrations need only be considered if the annual mean concentration is above this level. Measurements have also shown[23] 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

[27] National Archives (2010) The Air Quality Standards Regulations 2010. Statutory Instrument 2010 No. 1001.
[28] The European Parliament and the Council of the European Union (2008) Directive 2008/50/EC of the European Parliament and of the Council.

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.

9.3.7 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[24]. The annual mean objectives for nitrogen dioxide and PM_{10} are considered to apply at the façades of residential properties, schools, hospitals and care homes. The objectives also apply at 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 to apply at the same locations as the annual mean objective, as well as at hotels. The 1-hour mean objective for nitrogen dioxide applies wherever members of the public might regularly spend one hour or more, including outdoor eating locations and pavements of busy shopping streets.

9.3.8 In March 2022, Defra began consultation on new targets for $PM_{2.5}$ concentrations in England. One proposed target is to achieve $PM_{2.5}$ concentration of 10 µg/m^3 at relevant national monitoring sites by 2040. This would be accompanied by a target to reduce overall population exposure to $PM_{2.5}$, which will be assessed by national government using its own measurements. If adopted, these targets will apply to national government. It is not yet clear how these will apply to local government or the obligations for local authorities. Policy Guidance[22]notes that "*whilst responsibility for meeting the $PM_{2.5}$ target sits with national government, local authorities have a role to play in delivering reductions in $PM_{2.5}$*", and reference is made to reducing emissions from local sources including traffic management, encouraging the uptake of cleaner vehicles and increased use of sustainable transport methods. The role of local authorities in contributing to national $PM_{2.5}$ targets will be set out in the revised Air Quality Strategy which is to be published before May 2023.

Criteria for the Assessment of Odours

9.3.9 In considering the potential for odour effects, an important distinction should be drawn between the occasional detection of an odour and a loss of amenity due to odour, the latter generally being associated with persistent and long-lived problems.

9.3.10 Guidance note H4 Odour Management[19], published by the Environment Agency, provides a useful approach to quantifying odour effects. Odour concentrations are measured in European odour units (ou_E/m^3). The odour concentration at the detection threshold is 1 ou_E/m^3.

9.3.11 Guidance Note H4 suggests that there is a likelihood of unacceptable odour pollution occurring where the 98th percentile of 1-hour mean odour concentrations exceeds 1.5 ou_E/m^3 for the most offensive odours, 3 ou_E/m^3 for moderately offensive odours and 6 ou_E/m^3 for less offensive odours.

9.3.12 The perception of the offensiveness of odours is highly subjective, but airport-related odours cannot reasonably be classified as most offensive (a category which includes decaying animal remains and septic effluent). For the purpose of this assessment it is assumed that airport-related odours fall within the less to moderately offensive categories (which includes breweries, livestock rearing and food processing).

9.4 Assessment Methodology

Consultation

9.4.1 The consultees that were contacted in preparing this Chapter, and the meetings that were held are summarised below:

- Greater London Authority – meeting on 10 June 2022;
- LBN meeting on 29 June 2022 to discuss air quality;
- LBN meeting on 14 September 2022 to discuss UFPs; and
- LBN meeting on 2 November 2022 to discuss future scenarios and UFPs.

Table 9-2: Consultation Responses Relevant to this Chapter

Consultee	Issues Raised	How/ Where Addressed
LBN	The Applicant is requested to provide clarity on what information will be included in the assessment of cumulative impacts on traffic (**AQ1**).	Information on cumulative traffic flows is set out in the Transport Assessment. The predicted future year traffic generation figures as set out in Tables 7.23 and 7.24 (of the TA) have been substituted for the origin and destination figures for LCY within TfL's 2031 LoHAm strategic highway model. This, therefore, provides a suitable indication of the likely future traffic flows on the local highway taking into account a wide range of committed and planned development incorporated within the 2031 LoHAM trip matrix.
LBN	Any assessment of the road traffic impacts on air quality within ecological sites will also need to consider ammonia (NH_3) (**AQ2**).	Impacts on ecological receptors are scoped out and explained in Table 9.3.
LBN	Additional information should be provided which should include a quantification, with justification, as to whether UFP due to aircraft emissions, are likely to decline or increase in the future, with a particular focus on sulphur content of fuel. The approach should be agreed with LBN (**AQ3**).	It is not clear as to how such information might assist LBN in determining the likely significant effects of the Proposed Amendments. Notwithstanding the above, information has been provided in the ES on the expected benefits of SAFs (with lower sulphur content) but any quantification would not be possible in terms of UFP emissions. Any such assessment would be predicated on (a) an assumption that UFP emissions are related (linearly or otherwise) to aircraft fuel consumption during different modes of the LTO cycle (which is not the case for other pollutant emissions) and (b) that emissions from non-combustion sources are inconsequential (which empirical evidence suggests they are not).
LBN	It is understood that IAQM is updating its guidance and it is important that the most recent guidance is used if available in time (**AQ4**).	Consideration will be given to the consequence of changes to the IAQM Construction Dust Guidance if the guidance is published before the ES is submitted.
LBN	It is also important that the construction traffic is not considered in isolation from the development traffic, and that the combined traffic levels are considered together on a year-by-year basis to ensure that the worst-case years are included in the assessment (**AQ5**).	The traffic flows used for each DC assessment year for (2025, 2027, 2029 and 2031) incorporate the estimated construction vehicle flows for the corresponding year (see Appendix 9.3). There are no intervening years where the total traffic flows (associated with both construction and operation) would be greater. Construction traffic emissions are not considered in isolation.
LBN	When the ES is submitted all model files should be provided to the local planning authority to enable a full audit of the modelling to be carried out (**AQ6**).	Model files that are not subject to Intellectual Property Rights (and specifically the airport emissions input files) can be provided on request.
LBN	Information should be provided on the receptors to be included in the ADMS models (**AQ7**).	The information is provided in Appendix 9.2
LBN	The future assessment years of 2025, 2027 and 2031 also seem appropriate, however an addition 'worst case' year may be required following the analysis of construction traffic/NRMM/ development traffic movements (**AQ8**).	The assessment scenarios considered are described in Section 9.4 and include a "worst case" construction year.
LBN	The traffic screening criteria is considered appropriate for human receptors, but for impacts on ecological receptors the criteria is different. If, effects on nature conservation sites are scoped in, these should be defined (**AQ9**).	Impacts on ecological receptors are scoped out and explained in Table 9.3.
LBN	It is not appropriate to use the modelled air quality data reported in the 2015 ES as Defra's and the local authority's data, the LAQM tools and guidance, and the ADMS model used have all been updated since 2015. It will be necessary to repeat the modelling using the most recent data and assessment tools and guidance (**AQ10**).	A revised modelling study has been completed for a 2019 baseline year, to consider Do Minimum (DM) and Development Case (DC) Scenarios in 2025, 2027, 2029 and 2031. The methodology is described in detail in Appendix 9.3.

LBN	The assessment should not look solely at the impact of the s73 proposals; the assessment should consider the combined impacts of the consented development and the s73 proposals. This will enable the impacts of the variation to be assessed to demonstrate that it causes no material change to the conclusions of the consented scheme. It will also ensure that consideration can be given to the mitigation of any identified significant impacts (**AQ11**).	As agreed with LBN in a meeting (02 November 2022) it is not possible to assess a future baseline that excludes CADP1 as some of the changes have already been implemented. It was agreed with LBN that a qualitative statement would be made to determine whether the Proposed Amendments would change the outcome of the 2015 ES. This can be found in Section 9.7 in discussing the overall significance of effects.
LBN	The ADMS model will be verified for the base year (2019), presumably following the Mayor of London's LLAQM.TG19 methodology, although this is not stated. The model verification should include all available monitoring data and if any monitoring sites are excluded, full justification for their exclusion should be provided (**AQ12**). The model verification should aim for an adjustment factor of 2 or less with all predicted concentrations within 10% of the measured concentrations (**AQ13**). In addition, future assessment years should consider the variation in annual meteorological datasets with the assessment process (**AQ14**).	LLAQM.TG19 does not address the issue of model verification. The verification will be based on guidance and performance criteria provided in LAQM.TG22. The assessment will consider multiple meteorological datasets, as described in Appendix 9.3
LBN	No reference has been made regarding assessing compliance with the mandatory limit values (including with the $PM_{2.5}$ limit value adopted in 2020), and if information is available, even in draft form, on the 2021 Environment Act $PM_{2.5}$ target. The objectives and limit values apply at different locations and should be included in the ES (**AQ15**). If information is available, even in draft form, on the 2021 Environment Act PM2.5 targets, the ES should include an assessment against these targets (**AQ16**).	Consideration will be given to compliance with the UK Limit Values (including the 2020 $PM_{2.5}$ Limit Value) at locations identified at risk in Defra's PCM model. However, it should be noted that this cannot be strictly done as JAQU only recognises monitoring or modelling studies that it has explicitly approved. The UK Government has delayed publication of the Environment Act $PM_{2.5}$ targets, and it is not known how any obligations on development control might be incorporated into a revised NPPF. It is not appropriate to include an assessment against new targets at this time.
LBN	Comparison of the predicted concentrations to the 2021 WHO guidelines and interim targets should be provided for all relevant pollutants (**AQ17**).	The 2021 WHO guidelines do not appear in any UK policy, guidance or legislation at the national, regional or local levels and will not be considered in the AQ Chapter for the determination of likely significant effects. At a meeting held with LBN and their consultants on 2 November 2022, it was agreed that consideration to the WHO 2021 guidelines would be provided in the Public Health & Wellbeing chapter of the ES.
LBN	No reference has been made to the IAQM odour guidance which recommends that several different assessment methods should be used to assess odour for planning purposes. Further details should be submitted to the local planning authority (**AQ18**).	Reference to this guidance has been included (Section 9.3).
LBN	The air quality assessment should provide a commentary on how climate change will impact on air quality in the future (**AQ19**).	This has been considered in the air quality assessment (Section 9.11)
LBN	It is recommended that baseline UFP monitoring is undertaken close to the receptors most likely to be affected (i.e. those closest to the runway and downwind most frequently) to assess whether there is potential for UFP to be a significant issue at relevant locations (**AQ20**).	A period of baseline monitoring will not assist in determining the likely significant effects of the Proposed Amendments, and there are no standards or guidelines against which data could be compared. A further justification is provided in this Chapter and Appendix 9.1. At a meeting with LBN (14 September 2022), it was agreed that a baseline UFP monitoring study was unlikely to be practical.
LBN	All guidance noted in the commentary should be referenced in the ES (**AQ21**).	All guidance is referenced.
LBN	Consideration should be given to the relevance of the following guidance documents (**AQ22**): ➢ Professional guidance published by IAQM on the assessment of odour for planning	Reference has been made to the IAQM guidance on odours for planning (see response to AQ18). Impacts on ecological receptors are currently scoped out pending a response from Natural England.

	➢ Professional guidance published by IAQM on the assessment of air quality impacts on designated nature conservation sites.	
LBN	It is recommended that any draft IAQM guidance is taken into consideration (**AQ23**).	It is not appropriate to take into account draft IAQM guidance. Revised IAQM guidance will be considered once it is finalised.
LBN	The Scoping Report refers to the receptors in general terms but does not identify where they will be or how many will be included. It states that the baseline study will determine the existing and new receptors introduced by committed / proposed development, likely to be affected by the s73 Proposals. These should be confirmed with the local planning authority prior to assessment of impacts (**AQ24**).	The receptors are described in detail in Appendix 9.2.
LBN	It is considered good practice to consult the local authority's air quality specialist to agree the methodology in detail (i.e. greater detail than is normal in a Scoping Report). This has not been mentioned in the Scoping Report. The Applicant should confirm any proposed consultation (**AQ25**).	Three meetings have been held with LBN and their consultants (as detailed above).
LBN	The Applicant should confirm if the following documents will be used in the assessment (**AQ26**): ➢ 2019 Clean Air Strategy; ➢ The Mayor of London's Environment Strategy; ➢ 2019 London Borough of Newham's Air Quality Action Plan 2019-2024.	All of these documents have been referenced in the assessment.

Scope of the Assessment

Technical Scope

9.4.2 The following topics have been scoped into the assessment:

- Operational air quality impacts on health-sensitive receptors associated with airside operations and surface access (including construction traffic in the DC scenarios), and specifically for nitrogen dioxide, PM_{10} and $PM_{2.5}$; and
- Odour impacts associated with airport operations.

9.4.3 Topics which have been scoped out are described in Table 9.3, together with an appropriate justification.

Table 9.3: Summary of Scoped Out Topics

Topic	Justification
NRMM Emissions During Construction	With specific regard to construction NRMM emissions, IAQM guidance[25] states (page 9): "*experience of assessing the exhaust emissions from on-site plant (also known as non-road mobile machinery or NRMM) and site traffic suggests that they are unlikely to make a significant impact on local air quality, and in the vast majority of cases they will not need to be quantitatively assessed. For site plant and on-site traffic, consideration should be given to the number of plant/vehicles and their operating hours and locations to assess whether a significant effect is likely to occur*" This approach is reflected in Defra guidance[23] which states (paragraph 7.30) that "*with suitable controls and site management, they [NRMM] are unlikely to make significant impact of local air quality*". The extent to which NRMM might impact on air quality is subject to the following considerations: ➢ Duration of works and associated phasing plans; ➢ Type and number of NRMM to be used on site; ➢ Operating hours of NRMM; ➢ Emissions standards to which NRMM will apply; ➢ Proximity of receptors to NRMM working areas; and ➢ Existing background pollutant concentrations. Construction activities are covered by the London NRMM Low Emission Zone (LEZ), meaning all construction equipment needs to meet Stage IIIB emission standards. Whilst there are sensitive

	receptors (residential properties) to the south of the construction works, particularly during those phases when the interim forecourt and new car parking facilities are constructed, all properties to the south are in the prevailing upwind direction and are shielded by the DLR elevated infrastructure. In view of these considerations, it is concluded that no further assessment impacts from construction NRMM is required.
Energy Centre Emissions	As set out in the revised Energy Strategy, the Proposed Development will provide a development-wide heat network supplied by Air Source Heat Pumps, and supplemented by Photovoltaic Panels (PV). There will be no on-site combustion plant or emissions associated with the Proposed Development.
Construction Dust	An Air Quality (Dust) Risk Assessment (AQDRA) serves to identify the level of risk associated with dust generation from construction works, which subsequently informs the mitigation measures and dust monitoring strategy necessary. Such a Risk Assessment was completed within the 2015 UES that was prepared to support the CADP1 planning application and the mitigation measures and monitoring recommended are adopted within the Air Quality Construction Management and Monitoring Strategy (AQCMMS) which was submitted to and approved by LBN in 2019 in accordance with Planning Condition 88. The AQDRA identified a medium risk of human health impacts during demolition, and a low risk of human health impacts for earthworks, construction and trackout. In terms of dust soiling, the AQDRA identified a high risk for demolition, earthworks and construction, and a medium risk for trackout. An appropriate set of mitigation measures was proposed within the AQCMMS. In terms of monitoring, a conservative approach was adopted, assuming a high risk throughout the duration of the works, and two continuous (Osiris) monitors were installed at locations agreed with LBN at the start of the works. These monitors will be recommissioned when CADP1 works recommence. There are no changes being sought as part of this S73 Application to the number of aircraft stands, runway, other infrastructure or the design and layout of the buildings as approved under the CADP1 permission and subsequently varied by several non-material amendment applications. There are no changes to the construction activities and methods envisaged and the revised construction phasing programme will not affect the outcome of the AQDRA, and there is no need for a further assessment to be carried out.
Designated Habitats	The nearest internationally designated site, which is identified by NE as being vulnerable to impacts from traffic emissions and recreational pressures, is Epping Forest Special Area of Conservation (EFSAC). Epping Forest contains Atlantic acidophilous beech forests which are an Annex 1 habitat. Although rare epiphytes (mosses and lichens) at the EFSAC have declined, largely as a result of air pollution, it remains important for a range of rare species, including the moss *Zygodon forsteri*. NE has issued formal advice concerning the handling of Habitats Regulations Assessment (HRA) in the vicinity of Epping Forest. This requires all residential development that falls within the 6.2km 'zone of influence' to be subject to a project-level HRA screening and where necessary, appropriate assessment. Were the reference to 'residential development' widened to include other types of development (including the Airport) this requirement would not apply, as the Airport falls outside this zone of influence as used in Newham planning policy (https://www.newham.gov.uk/planning-policy-local plan/11). Guidance from Joint Nature Conservation Committee (JNCC) sets a distance boundary beyond which plan HRAs need not consider their calculated effects on designated sites (https://data.jncc.gov.uk/data/6cce4f2e-e481-4ec2-b369-2b4026c88447/JNCC-Report-696-Main-FINAL-WEB.pdf). The technical report which underpins the JNCC guidance (https://data.jncc.gov.uk/data/6cce4f2e-e481-4ec2-b369-2b4026c88447/JNCC-Report-696-Technical-FINAL-WEB.pdf) explains the rationale for this, which applies equally to individual developments and distances from those developments. It is important to note that at Epping Forest (and other locations remote from the airport), the annual traffic impact of the proposed development is expected to be, at worst, neutral. This is because any traffic to and from the airport would otherwise be travelling to an alternative airport such as Stansted, Heathrow or Gatwick. In other words, if the airport's capacity and choice of routes were to be constrained, more people would choose to drive to other, potentially more distant airports. It is understood that Epping Forest District Council (EFDC) is proposing an Air Pollution Management Strategy (APMS) including the potential for a Clean Air Zone (CAZ) around the Forest. Therefore, any airport-derived traffic would be subject to restrictions imposed by these schemes. In view of the above, it can be concluded that there would be no net increase in traffic and related emissions on roads within 200m of the EFSAC boundary in the DC Scenario (CADP1 + proposed amendments) compared to the Do Minimum (DM) Scenario. As such, there would be no adverse effect on the integrity of EFSAC and the pollution-vulnerable epiphytes which are located there. Oxleas Woodlands SSSI consists of a series of woods (some Ancient Woodland) and meadows of approximately 133.5 hectares on the south and eastern side of Shooters Hill, in South-East London. It is bounded to the north by the A207, approximately 3km to the south of the airport. TfL's SATURN models, which have a dynamic reassignment function, suggests that in the future there will be a reduction in daily airport-derived traffic flows on the A207 through Oxleas Woodlands, albeit very small. As such, there will

	be no increase in air pollution (NOx and ammonia etc) at this SSSI and therefore no consequential impact on vegetation or other ecological receptors. Ingrebourne Marshes is a SSSI in Hornchurch in the London Borough of Havering, approximately 10km to the northeast of the Airport and 4km to the north of the A13 (the nearest major road). Ingrebourne Valley Local Nature Reserve includes a small part of the SSSI west of the River Ingrebourne. The Marshes run along both sides of the river, the northern portion next to Hornchurch Country Park and stretching south to Rainham. Due to its distance from the airport there is no likelihood that the proposed development would impact upon this site. The Inner Thames Marshes SSSI is approximately 7km to the east of the Airport. During the piling and decking works over KGV Dock (i.e .the first phase of CADP1, completed between 2018 and 2020), the contractors transferred approximately 20,000 tonnes of clean excavated material by barge to the Rainham Marshes Habitat Creation Scheme. Due to its distance from the airport and the fact that no additional material will be transported to Rainham Marshes during subsequent 'landside' stages of the CADP1 works, there is no likelihood that the proposed development would impact upon this feature, or the SSSI as a whole. No other statutory designated conservation sites are likely to be affected by traffic related emissions associated with the airport.
Ultra-Fine Particles (UFPs)	There are no national, regional or local polices that refer to the assessment of UFPs with regard to determining development proposals. There is currently no robust methodology to construct an airport emissions inventory for UFPs, and consequently it is not possible to predict UFP concentrations. In addition, there are currently no standards or guidelines in place against which measured or modelled UFP concentrations could be compared. Whilst the benefits of expanded monitoring networks are appreciated, there would be no advantage to undertaking a baseline survey at this time, as it could not assist in determining the likely significant effects of the proposed development. This approach was supported by the decisions of the Planning Inspectors in both the Bristol Airport and Stansted Airport 2021 Planning Inquiries[29,30], which found the corresponding ESs to be technically and procedurally robust, even though UFPs were scoped out on both occasions. The EIA Regulations acknowledge that it is not always possible to quantify all potentially significant effects and that professional judgement can instead be used. At para 6 of Schedule 4 (Information for Inclusion in Environmental Statements) it states that an ES should provide "*A description of the forecasting methods or evidence, used to identify and assess the significant effects on the environment, including details of difficulties (for example technical deficiencies or lack of knowledge) encountered compiling the required information and the main uncertainties involved*"[31]. The consideration of the impacts of UFPs falls squarely into this definition and, as such, has been assessed by qualitative means within the Public Health & Wellbeing chapter of this ES (Chapter 12). The qualitative assessment of UFPs has been informed by a literature review of recent published peer-reviewed research on UFPs. The review has regard to the strength of evidence, the quality of research (internal validity) and its application to the LCY context (external validity). The assessment considers the exposure pathway for UFPs and groups who may be particularly sensitive. The analysis characterises the magnitude of the change in UFPs resulting from the proposed development using a qualitative framework. A conclusion is reached on the population health implications, including in relation to any significant inequalities. A more detailed review of issues related to UFPs and airports is provided in Appendix 9.1.

9.4.4 An Air Quality Positive Statement has been produced and is provided in Appendix 9.5, following the consultation draft guidance issued by GLA. This is not discussed further in this Chapter.

Study Area

9.4.5 The study area is effectively defined by an approximately 1 km radius around the airport (beyond which any effects from airside emissions are unlikely to be discernible) and the extent of the road transport network considered within the Transport Assessment (Volume 4 of the ES). It is effectively unchanged from that used in

[29] Planning Inspectorate (2022) Appeal Decision. APP/D0121/W/20/3259234. 2 February 2022. https://acp.planninginspectorate.gov.uk/ViewDocument.aspx?fileid=46076498
[30] Planning Inspectorate (2021) Appeal Decision. APP/C1570/W/20/3256619. 21 June 2021. https://acp.planninginspectorate.gov.uk/ViewDocument.aspx?fileid=42975602
[31] National Archives (2017) The Town and Country Planning (Environmental Impact Assessment) Regulations 2017. Statutory Instrument 2017 No. 571. https://www.legislation.gov.uk/uksi/2017/571/contents

the 2015 UES, other than consideration has now been given to updated Defra predictions against the Limit Values, and so a slightly wider road network has been considered.

9.4.6 Guidance issued by EPUK/IAQM[36] sets out indicative criteria for when a detailed assessment of emissions associated with road traffic is likely to be required. In terms of changes to traffic flows, this sets a change of light duty vehicle (LDV) flows of more than 100 AADT within or adjacent to an AQMA, or more than 500 AADT elsewhere, and change of heavy duty vehicles (HDV) flows of more than 25 AADT within or adjacent to an AQMA, or more than 100 AADT elsewhere. However, the guidance also notes (paragraph 6.15) that *"where whole authority AQMAs are present and it is known that the affected roads have concentrations below 90% of the objective, the less stringent criteria are likely to be more appropriate."*

9.4.7 It is also relevant to note that the original EPUK/IAQM guidance on which these screening criteria are founded was published in 2015, and the tests upon which the criteria were derived pre-date this by another year. There is now convincing evidence that the introduction of Euro 6/VI emission standards has substantially reduced the emissions per vehicle-kilometre, and the criteria are extremely conservative, especially when applied to any year post-2025. The principle underlying the guidance is to ensure that any assessment should provide enough evidence that will lead to a sound conclusion on the presence, or otherwise, of a significant effect on air quality. The extent of the study area has been based on this principle.

Assessment Scenarios

9.4.8 The assessment has been carried out for a Baseline Year (2019), and three future years (2025, 2027 and 2031), for both the DC and DM scenarios. An additional assessment for 2029 is considered as this represents the worst case construction year as detailed in Chapter 6: Construction Programme and Management.

9.4.9 As described in Chapter 3: EIA Methodology and Chapter 4: Aviation Forecasts, two sensitivity tests have also been given consideration which using alternative forecasts and assessment years as follows:

- Slower Growth Scenario – representing a plausible but less likely scenario of reaching the new passenger cap of 9.0 mppa by 2033; and
- Faster Growth Scenario – representing a plausible but less likely rapid progression to 9.0 mppa by 2029.

9.4.10 The impacts in the Slower Growth Scenario are expected to be lower than in DC Scenario. This is because the slower rate of growth of the airport means that in any one year, road traffic emissions would be higher under the DC Scenario than in the Slower Growth Scenario. Road traffic emission factors and background concentrations are lower for comparable levels of Airport activity in the Slower Growth Scenario than the DC Scenario. The Slower Growth Scenario is therefore considered to be best case for air quality and accordingly emissions from road traffic have not been quantified and this scenario is not considered further in this chapter.

9.4.11 An assessment of the Faster Growth Scenario has been carried out in a fully quantitative manner as is described in Section 9.7 and detailed in Appendix 9.4.

9.4.12 The No-build sensitivity test does not need to be specifically considered as the impacts and subsequent effects would be the same as reported for the DM scenario as reported in this chapter

Baseline Characterisation

Monitoring

9.4.13 Information on existing air quality has been obtained by collating the results of monitoring carried out by the local authority and by the Airport. This covers both the study area and nearby sites, the latter being used to provide context for the assessment.

9.4.14 LCY operates an extensive network of monitoring sites within, and in the vicinity of, the Airport. Additional monitoring is undertaken by LBN and the neighbouring authorities (London Boroughs of Tower Hamlets and Greenwich).

9.4.15 A programme of ambient air quality monitoring was established by the Airport in 2006 (now referred to as the Air Quality Monitoring Strategy (AQMS)). In 2019, the AQMS included an automatic monitoring station situated on the roof of City Aviation House ('LCA-CAH') which measures concentrations of nitrogen dioxide and PM_{10}, an automatic monitoring station at Newham Dockside ("LCA-ND") which measures nitrogen dioxide, and an automatic monitoring station at KGV House ("LCA-KGV") which measures both PM_{10} and $PM_{2.5}$. The AQMS also includes a network of nitrogen dioxide diffusion tubes located around the Airport and close to local housing. It is important to note that not all of the diffusion tube sites represent relevant public exposure, and they have been included in the AQMP to provide a better understanding of the spatial distribution of nitrogen dioxide concentrations in the vicinity of the Airport. In particular, there is no relevant exposure in terms of the annual mean objective at the waterfront to the north of Royal Albert Dock (sites LCA04, LCA11, LCA14 and LCA17), or at the Jet Centre apron (LCA10).

Figure 9.1: Automatic Monitoring Stations in LCY Network (2019)

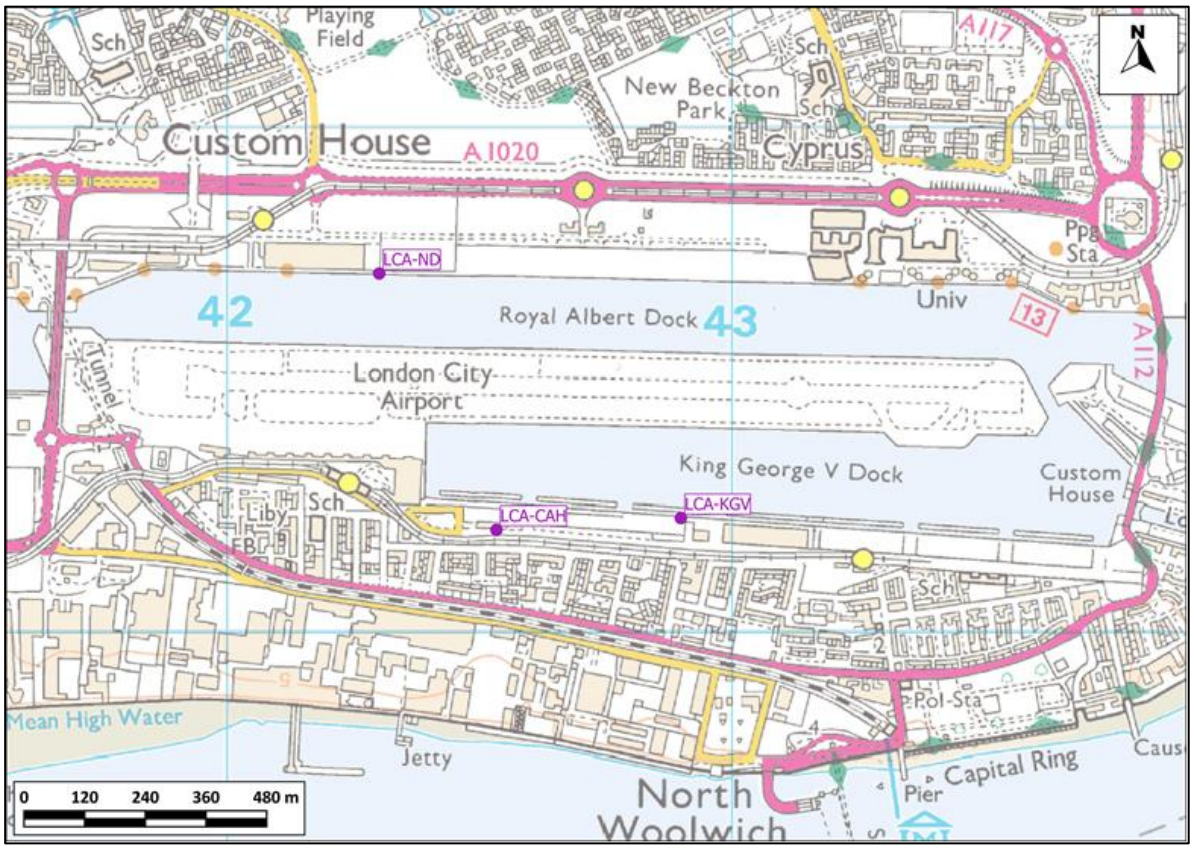

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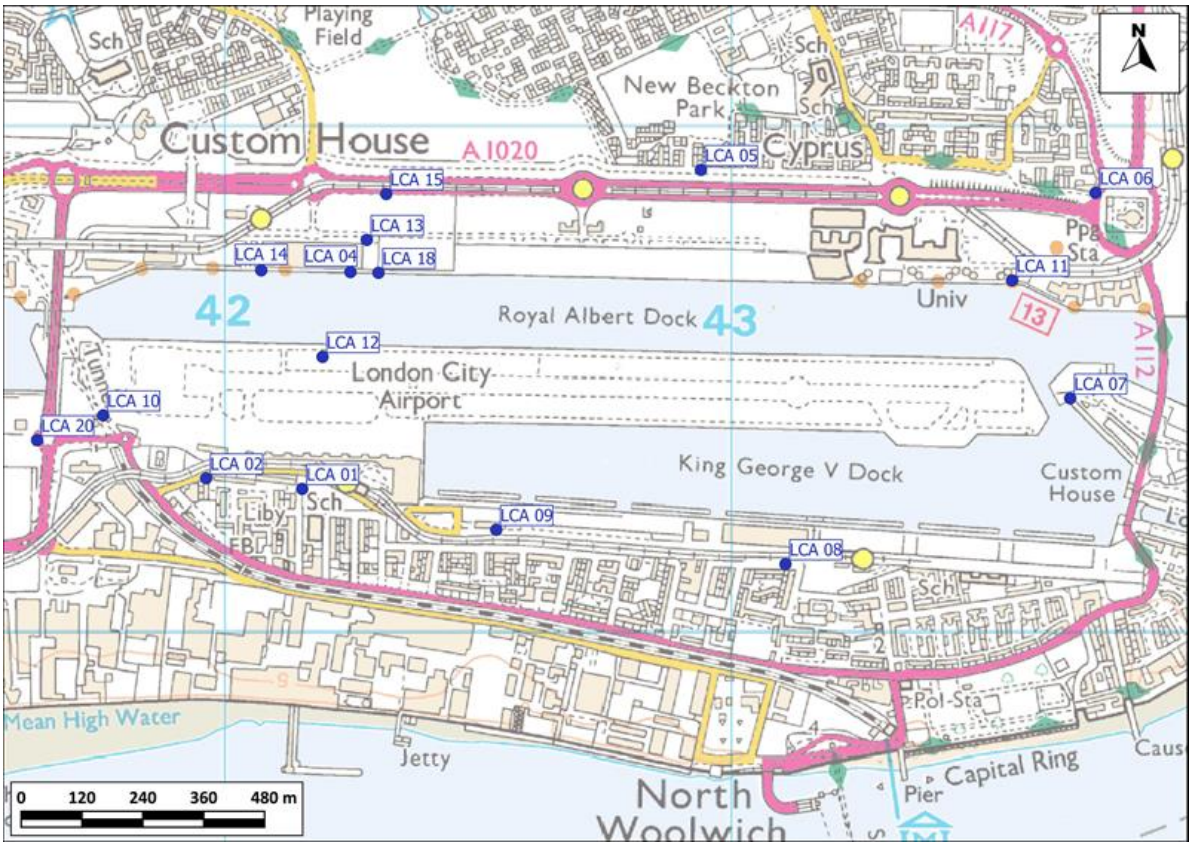
Figure 9.2: Diffusion Tube Monitoring Stations in LCY Network (2019)



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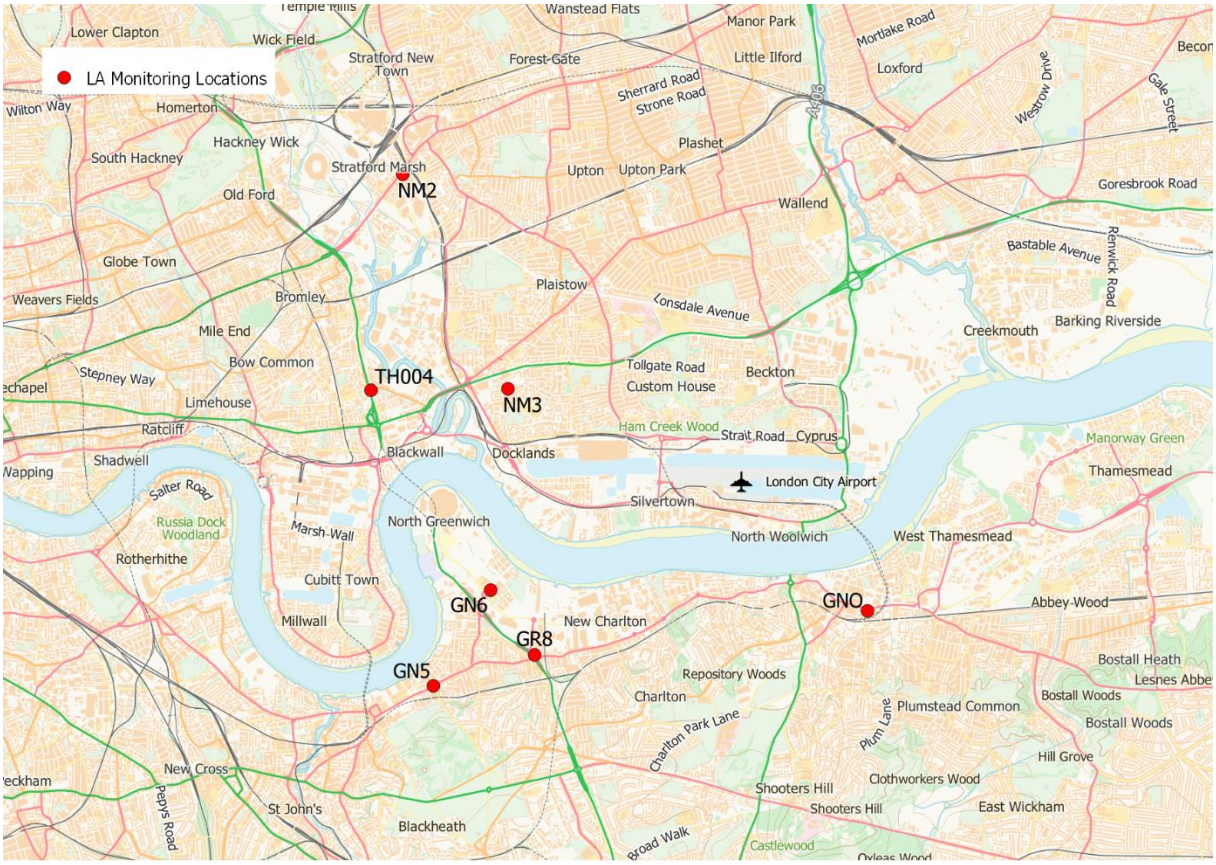
9.4.16 Automatic monitoring sites are also operated by LB Newham, LB Tower Hamlets and LB Greenwich. The locations of the sites in closest proximity to the Airport are illustrated in Figure 9.3.

Figure 9.3: Local Authority Monitoring Locations



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Desktop Baseline Analysis

9.4.17 Monitoring data has been supplemented by a range of other sources to fully understand the existing sources of emissions and baseline air quality conditions within the study area. These are summarised as follows:

- Local sources have been identified through examination of the Council's Air Quality Review and Assessment reports;
- Background concentrations have been defined using Defra's 2018-based background maps[32]. These cover the whole of the UK on a 1x1 km grid; and
- Whether or not there are any exceedances of the annual mean limit value for nitrogen dioxide in the study area has been identified using the maps of roadside concentrations published by Defra[33], as well as from any nearby Automatic Urban and Rural Network (AURN) monitoring sites (which operate to the required data quality standards). These are the maps used by the UK Government, together with the results from national AURN monitoring sites that operate to the required data quality standards, to identify and report exceedances of the limit value. The national maps of roadside PM_{10} and $PM_{2.5}$ concentrations, which are available for the years 2009 to 2019, show no exceedances of the limit values anywhere in the UK in 2019.

Method of Assessment

Sensitive Receptors

9.4.18 Sensitive receptors within the study area during the construction and operational phases are places where members of the public might be expected to be regularly present over the averaging periods of the

[32] Defra (no date) Background Mapping data for local authorities - 2018.
[33] Defra (no date) UK Ambient Air Quality Interactive Map. https://uk-air.defra.gov.uk/data/gis-mapping

objectives/limit values. For the annual mean and daily mean objectives/limit values, that are the principal focus of this assessment, sensitive receptors will generally be residential properties, schools, nursing homes etc.

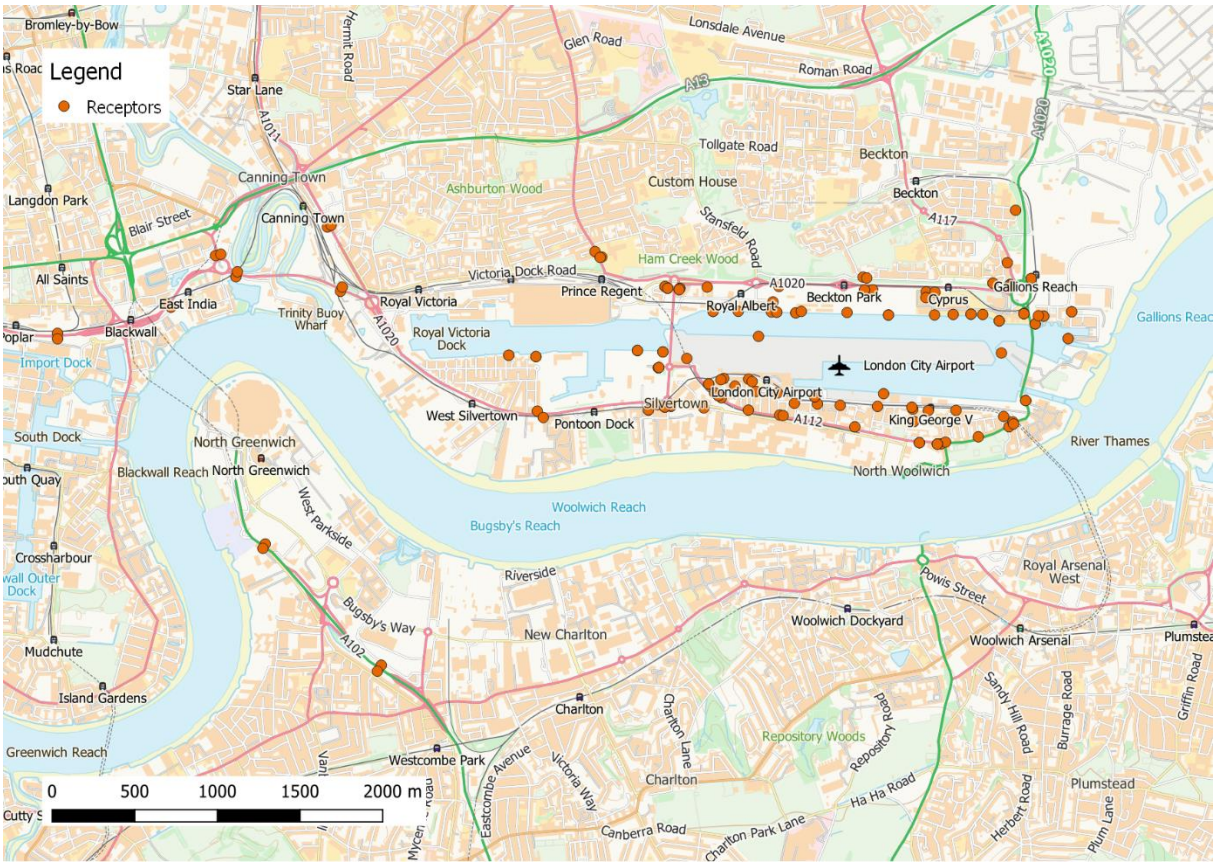
9.4.19 For the construction assessment, it has not been necessary to identify specific receptors, for reasons explained in Section 9.7. The assessment of impacts from the construction road traffic is included in the operational assessment, and therefore uses the same receptors as the operational assessment.

9.4.20 A total of 71 receptors have been selected for the operational assessment to represent locations of relevant exposure for comparison against the objectives. These have been selected to include existing residential properties within approximately 1 km of the Airport, and along the road network potentially affected by the proposed development. Where appropriate, these include additional receptors at height to account for blocks of flats. Cumulative schemes, as identified in Chapter 14: Cumulative Effects, have also been included where they would potentially be affected by changes in road traffic emissions. As the design details for some of these new developments are not yet finalised, it has been necessary to make assumptions regarding the likely heights of the buildings in the new developments.

9.4.21 A further sixteen receptor locations have been selected for the operational assessment to evaluate compliance against the limit value; these are located 4 m from roads which, according to Defra, exceeded the limit value in 2019. A further 22 receptors have been included to represent monitoring locations.

9.4.22 The operational receptor locations are shown in Figure 9.4 and detailed in Appendix 9.2.

Figure 9.4: Receptor Locations



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Modelling Methodology

9.4.23 A full description of the methodology used for calculating emissions and concentrations of pollutants is given in Appendix 9.3. A brief summary of the methodology is given here.

9.4.24 Pollutant emissions arise from a number of Airport-related sources, and the following were taken into consideration in this assessment and discussed in further detail in the subsequent sections:

- Aircraft main engines operating within the Landing and Take-off (LTO) Cycle, Auxiliary Power Units (APUs) and engine testing;
- Airside support vehicles and plant;
- Airport boiler plant;
- Fire training ground;
- Staff and passenger vehicle movements within the car parks; and
- Road traffic on Airport landside roads and on the local road network.

9.4.25 Emissions are calculated using a bottom-up approach, based on multiplying activity levels by appropriate emission factors. Data on aircraft activity levels are provided by York Aviation and data on road traffic are provided by Steer. Emission factors are from standard published sources.

9.4.26 Emissions are assigned to spatial elements based on published airport mapping and aerial views, and according to standard aviation operational practice (for example for runway assignments). The spatially-defined emissions are then entered into the dispersion modelling tool ADMS (or ADMS-Roads for road sources), which calculates concentrations of pollutants at receptors.

9.4.27 The resulting concentrations and deposition rates are assessed against the established assessment criteria. Impacts are evaluated using criteria from IAQM and EPUK[26]. The final evaluation of significance is based on professional judgement and expertise, in accordance with guidance from the IAQM.

Significance Criteria

9.4.28 The approach developed jointly by EPUK and IAQM[26] has been used in describing the modelled impacts. The approach identifies impacts at individual receptors based on the percentage change in concentrations relative to the relevant air quality objective and the absolute concentration relative to the objective.

9.4.29 Table 9-3 sets out the method for determining the impact descriptor for annual mean concentrations at individual receptors, having been adapted from the table presented in the guidance document. 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, as is the case for this assessment, the AQAL will be the air quality objective value or the GLA target. Note that impacts may be adverse or beneficial, depending on whether the change in concentration is positive or negative.

9.4.30 For the purpose of applying these impact descriptors, all health-based receptors are assumed to be of high sensitivity.

Table 9-3: Air Quality Impact Descriptors for Individual Receptors for All Pollutants [a]

Long-Term Average Concentration at Receptor in Assessment Year [b]	Change in Concentration Relative to AQAL [c]				
	0%	1%	2-5%	6-10%	>10%
75% or less of AQAL	Negligible	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Negligible	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Negligible	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Negligible	Moderate	Substantial	Substantial	Substantial

[a] Values are rounded to the nearest whole number.
[b] This is the DM concentration where there is a decrease in pollutant concentration and the DC concentration where there is an increase.

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

9.4.31 The overall significance of the air quality impacts is determined using professional judgement, taking account of the impact descriptors set out in Table 9-3. The likely significance of effects is based on the

frequency, duration and magnitude of the predicted impacts and their relationship to the relevant air quality objectives, taking into account the following factors:

- The existing and future air quality;
- The extent of current and future population exposure to the impacts;
- The influence and validity of any assumptions adopted when undertaking the prediction of impacts;
- The potential for cumulative impacts to occur. Several impacts that are described as "slight" individually could, taken together, be regarded as having a significant effect. Conversely, "moderate" or "substantial" impacts may be regarded as having no significant effect if confined to a very small area and where they are not obviously the cause of harm; and
- The judgement of significance relates to the consequences of the impacts. Will they have an effect on human health that could be considered as significant? In the majority of cases the impacts from an individual development will be insufficiently large to result in measurable changes in concentrations in health outcomes that could be regarded as significant by health care professionals.

Assumptions and Limitations

Limitations

9.4.32 There are many components that contribute to the uncertainty of modelling predictions. The dispersion model used in this assessment is dependent upon the activity 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.

9.4.33 An important stage in the process is model verification, which involves comparing the model output with measured concentrations. Because the model has been verified, there can be reasonable confidence in the prediction of base year (2019) concentrations. If more than five sites are used in the verification: LAQM.TG22 (Defra, 2021a) provides guidance on the evaluation of model performance. Based on the analysis shown above, the model performance is considered to be good.

9.4.34 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 projections provided by York Aviation, Steer, DfT and Defra as to what will happen to activity data, background pollutant concentrations and emissions.

9.4.35 With specific regard to traffic emissions, historic versions of Defra's Emission Factors Toolkit (EFT) tended to over-state emissions reductions into the future. However, analysis of the most recent versions of Defra's EFT carried out by AQC[34],[35] 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 most likely to decline more quickly in the future, on average, than predicted by the current EFT, especially against a base year of 2016 or later. Using EFT v11.1 for future-year forecasts in this report thus provides a robust assessment, given that the model has been verified against measurements made in 2019.

9.4.36 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. 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[36]. While the pandemic may cause long-lasting changes to travel activity patterns, it is reasonable to

[34] AQC (2020) Performance of Defra's Emission Factor Toolkit 2013-2019.
[35] AQC (2020) Comparison of EFT v10 with EFT v9.
[36] 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.

expect a return to more typical activity levels in the future. 2020 and 2021 therefore present atypically low pollution years for roadside pollutant concentrations.

9.4.37 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 2019, and to use activity forecasts made before the impact of the pandemic was understood, which is the approach that has been taken in this assessment.

9.4.38 Changes were made to the LEZ and the Ultra-Low Emission Zone (ULEZ) in 2021. The changes can be expected to significantly reduce NOx emissions in London. However, they are not reflected in Defra's latest EFT and thus have not been considered in this assessment. The assessment presented in this report is, therefore, very much conservative in this regard, and it is expected that background concentrations, baseline concentrations, and the impacts of the Proposed Amendments, will be lower than described in this Chapter.

9.4.39 This assessment has also considered the GLA target for $PM_{2.5}$. Whilst the overall approach is essentially unchanged from an assessment against the objectives, it must be recognised that there is increased uncertainty as the criterion is numerically reduced. By way of example a 0.5% increase in a PM_{10} concentration with regard to the objective is 0.2 µg/m^3, whereas a 0.5% increase in a $PM_{2.5}$ concentration with regard to the GLA target is just 0.05 µg/m^3. While such increases can be predicted (as the model will generate outputs to many decimal places), such small increases must be treated with increased caution.

Assumptions

9.4.40 It is necessary to make a number of assumptions when carrying out an air quality assessment. In order to account for some of the uncertainty in the approach, as described above, assumptions made have generally sought to reflect a realistic worst-case scenario. Key assumptions made in carrying out this assessment include:

- The amount, speed and phasing of growth in activity. Sensitivity scenarios have been considered to determine how this assumption will affect the conclusions of the assessment; and
- The choice of meteorological data is appropriate.

Air Quality Neutral

9.4.41 Compliance with 'air quality neutral' is founded on a comparison with emissions benchmarks that have been established for both building (energy) use and road transport (car and light van trips), in different areas of London. Developments that exceed the benchmarks are required to implement on-site or off-site mitigation to offset the excess emissions.

9.4.42 A detailed description of the approach taken is set out in Section 9.9.

9.5 Baseline Conditions

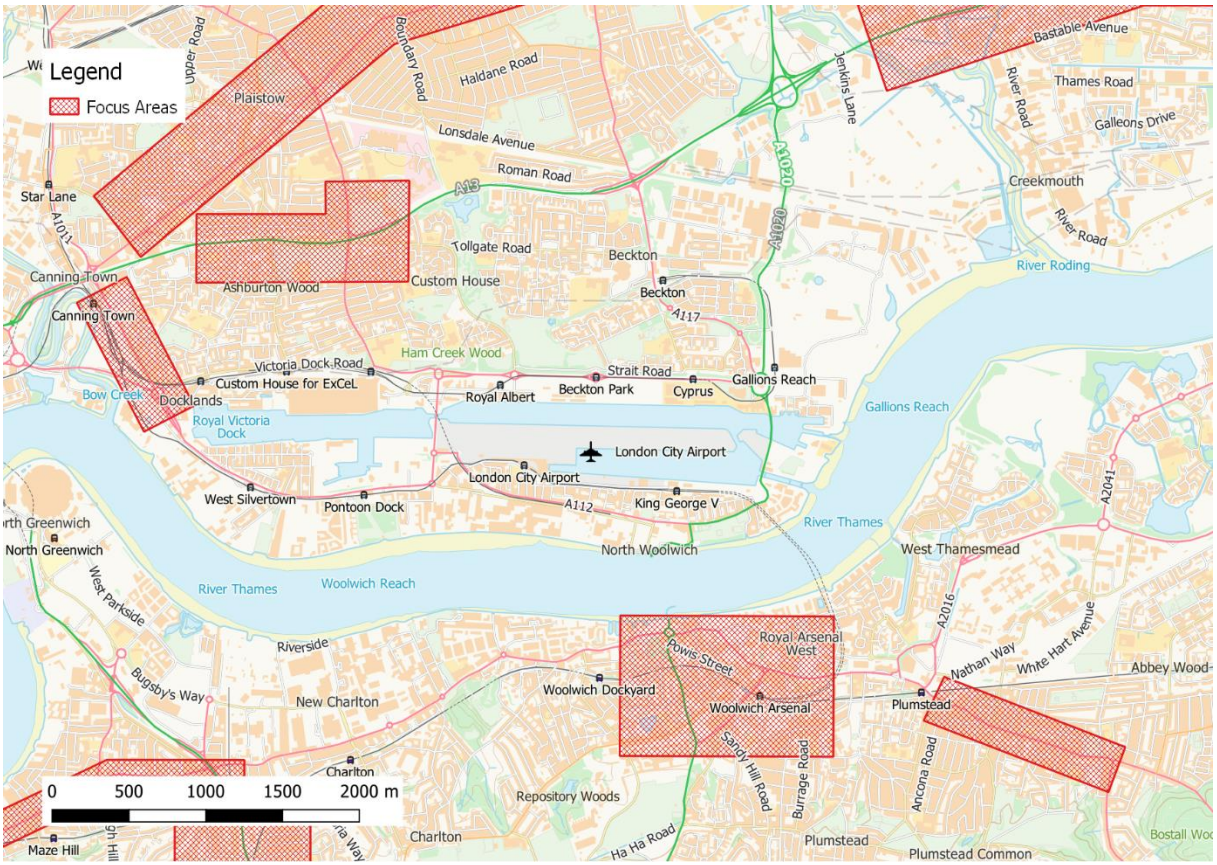
Existing Baseline

Summary of Baseline Data

9.5.1 LBN has investigated air quality within its area as part of its responsibilities under the LAQM regime and has identified road traffic as the primary source of poor air quality in the Borough. In 2002, the Council concluded that it would not meet the statutory objectives for two pollutants, nitrogen dioxide (annual mean) and PM_{10} (24 hour mean) and designated an Air Quality Management Area (AQMA) extending alongside the major roads in the Borough including North Woolwich Road, Connaught Crossing, Silvertown Way, Royal Albert Way and Royal Docks Road. The AQMA was subsequently extended to encompass the entire Borough in December 2019. By definition, the Airport lies within this AQMA.

9.5.2 The GLA has identified 187 air quality Focus Areas in London. These are locations that not only exceed the annual mean limit value for nitrogen dioxide, but also have high levels of human exposure. 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. There are two air quality Focus Areas located about 1 km from the Airport at their nearest points; “Woolwich and Woolwich Arsenal A205 Woolwich Rd/A206 Plumstead Rd” (directly to the south) and “Newham Way A13 and Prince Regent Lane” (to the north-west), while two more are within 2 km (“Canning Town Silvertown Way” and “Plumstead High Street (A206)”). The Focus Areas are shown in Figure 9.5.

Figure 9.5: Location of GLA Air Quality Focus Areas



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9.5.3 A summary of the data obtained from LCY and local authority monitoring data is provided below. Although monitoring has continued at all sites during 2020 and 2021, this review focuses on the period up to and including 2019 given the impact of the Covid-19 pandemic as described earlier.

9.5.4 A summary of the automatic data collected over the five-year period (2015-2019) is shown in Table 9-4 to Table 9-6, and the diffusion tube data are summarised in Table 9-7. Locations of the monitors are shown in Figure 9.1 and Figure 9.2.

Table 9-4: Summary of Nitrogen Dioxide Monitoring in LCY AQMP (2015-2019)

Site	2015	2016	2017	2018	2019
	Annual Mean				
LCA-CAH	29.6	27.8	30.4	29.2	26.0
LCA-ND	25.8	29.0	26.9	24.7	26.6
	No. Hours > 200 µg/m3				
LCA-CAH	0	0	0	0	0
LCA-ND	0	0	0	0	0

Table 9-5: Summary of PM_{10} Monitoring in LCY AQMP (2015-2019)

Site	2015	2016	2017	2018	2019
	Annual Mean (µg/m^3)				
LCA-CAH	20.3	20.3	19.2	20.0	21.4
LCA-KGV	-	-	-	-	16.6
	No. Days > 50 µg/m^3				
LCA-CAH	3	7	5	2	9
LCA-KGV	-	-	-	-	9

Table 9-6: Summary of $PM_{2.5}$ Monitoring in LCY AQMP (2015-2019)

Site	2015	2016	2017	2018	2019
	Annual Mean (µg/m3)				
LCA-KGV	-	-	-	-	10.6

Table 9-7: Summary of Nitrogen Dioxide Monitoring in LCY AQMP (2015-2019) – Annual Mean (µg/m^3)

Site	2015	2016	2017	2018	2019
LCA01	29.1	28.3	24.7	27.9	28.4
LCA02	31.3	31.2	28.0	28.8	31.0
LCA03	29.3	29.5	34.2	-	-
LCA04	30.6	30.4	30.2	26.2	27.6
LCA05	27.8	26.2	24.3	24.3	26.0
LCA06	31.2	28.8	25.7	27.2	26.9
LCA07	31.4	33.9	29.4	31.1	31.5
LCA08	21.1	23.4	18.8	24.6	25.3
LCA09	28.8	29.3	27.1	28.8	29.1
LCA10	34.0	34.7	28.6	33.0	32.8
LCA11	31.3	31.7	27.8	29.6	32.4
LCA12	28.5	28.9	31.8	23.8	28.5
LCA13	28.4	27.8	31.1	29.8	26.0
LCA14	31.1	31.9	28.9	30.9	32.5
LCA15	26.5	30.8	23.6	28.1	27.5
LCA16	32.4	33.7	-	-	-
LCA18	26.4	28.3	30.0	25.0	25.8
LCA19	30.5	34.9	-	-	-
LCA20	-	-	-	26.7	34.7

9.5.5 In summary:

- The annual mean nitrogen dioxide objective (40 µg/m^3) and 1-hour mean objective (no more than 18 exceedances of 200 µg/m^3) were not exceeded at LCA-CAH or LCA-ND in 2019 (or in any previous year since monitoring commenced in 2006);
- The annual mean PM_{10} objective (40 µg/m^3) and the daily mean objective (no more than 35 exceedances of 50 µg/m^3) was not exceeded at LCA-CAH or LCA-KGV in 2019 (or in any other year since monitoring commenced in 2006);
- The annual mean $PM_{2.5}$ objective was not exceeded at LCA-KGV in 2019. The GLA target (10 µg/m^3) was marginally exceeded (10.6 µg/m^3); and
- The annual mean nitrogen dioxide concentrations measured at the diffusion tube sites ranged from 25 to 35 µg/m^3 compared with the objective value of 40 µg/m^3. There were no measured exceedances of the air quality objective in 2019 (or in any other year since 2013). As measured concentrations are well below 60 µg/m^3, it is highly unlikely that the 1-hour mean objective was exceeded.

9.5.6 A summary of results from the seven local authority sites in closest proximity to the airport is provided in Table 9.8 to Table 9.10. There have been no reported exceedances of the 1-hour mean objective for nitrogen dioxide or the annual mean objective for PM_{10}, and these data are not shown.

Table 9.8: Annual Mean Nitrogen Dioxide Concentrations (µg/m3) at Local Authority Sites 2015 to 2019

Monitoring Site	Site Type	2015	2016	2017	2018	2019
Newham Cam Road	Roadside	38	42	38	29	29
Newham Wren Close	Background	30	33	30	28	28
Greenwich Burrage Grove	Roadside	35	39	35	35	33
Greenwich Woolwich Flyover	Roadside	66	64	65	57	52
Greenwich John Harrison Way	Roadside	N/A	N/A	N/A	N/A	33
Greenwich Trafalgar Road	Roadside	N/A	N/A	N/A	43	41
Tower Hamlets Blackwall	Roadside	58	N/A	56	51	47

Table 9.9: No. Days > 50µg/m^3 PM_{10} at Local Authority Sites 2015 to 2019

Monitoring Site	Site Type	2015	2016	2017	2018	2019
Greenwich Burrage Grove	Roadside	5	10	8	3	7
Greenwich Woolwich Flyover	Roadside	22	N/A	9	6	10
Greenwich John Harrison Way	Roadside	N/A	N/A	N/A	N/A	6
Greenwich Trafalgar Road	Roadside	N/A	N/A	N/A	4	12
Tower Hamlets Blackwall	Roadside	N/A	10	10	10	N/A

Table 9.10: Annual Mean $PM_{2.5}$ Concentrations (µg/m^3) at Local Authority Sites 2015 to 2019

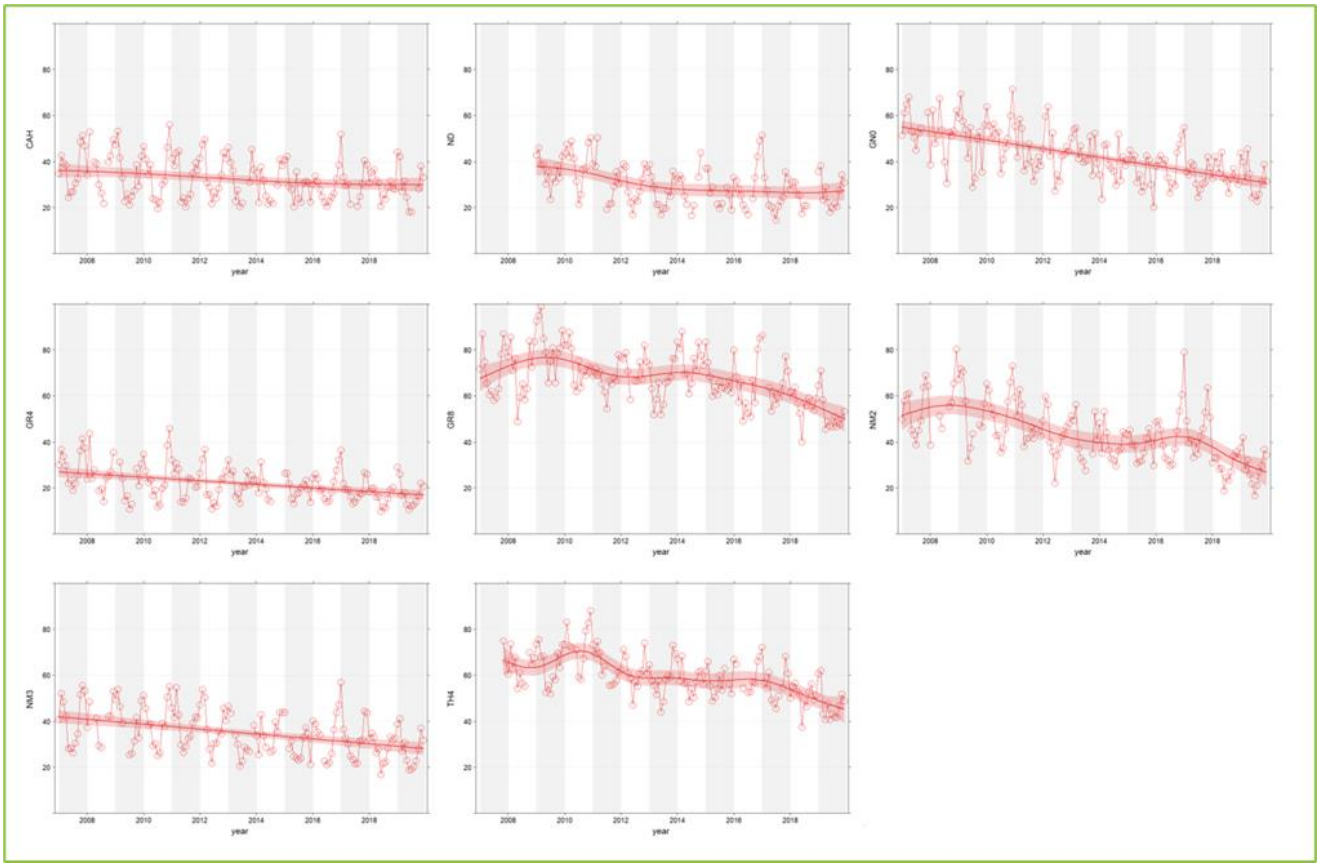
Monitoring Site	Site Type	2015	2016	2017	2018	2019
Greenwich Burrage Grove	Roadside	N/A	N/A	N/A	13	N/A
Greenwich John Harrison Way	Roadside	N/A	N/A	N/A	N/A	11

Trend Analysis

9.5.7 Figure 9.11 shows the smooth-trend analyses of 1-hour mean nitrogen dioxide concentrations for LCA-CAH, LCA-ND and six other nearby monitoring sites (Greenwich Burrage Grove, Greenwich Eltham, Greenwich Woolwich Flyover, Newham Cam Road, Newham Wren Close and Tower Hamlets Blackwall), over the period 2007 to 2019. There is a clear downward trend at all sites.

Figure 9.11: Smooth Trend Analysis, Hourly Nitrogen Dioxide Concentrations at City Aviation House, Newham Dockside and Other Monitoring Sites, 2007 – 2019

(Left to Right: City Aviation House, Newham Dockside, Greenwich Burrage Grove, Greenwich Eltham, Greenwich Woolwich Flyover, Newham Cam Road, Newham Wren Close, Tower Hamlets Blackwall)



9.5.8 A Theil-Sen analysis has been applied to the data to identify statistically significant trends, and the results are described in Table 9.11. There is a statistically significant downward trend in nitrogen dioxide concentrations at LCA-CAH, LCA-ND and all of the six local authority sites.

Table 9.11: Theil-Sen Analysis, Nitrogen Dioxide Concentrations at City Aviation House, Newham Dockside and Other Monitoring Sites, 2007 to 2019

Monitoring Site	Theil-Sen Analysis [a]	Statistically Significant Trend?
City Aviation House (LCA-CAH)	-0.63 [-1.01, -0.24]	Yes
Newham Dockside (LCA-ND) [b]	-1.15 [-1.65, -0.76]	Yes
Greenwich Burrage Grove	-1.92 [-2.33, -1.56]	Yes
Greenwich Eltham	-0.76 [-1.06, -0.47]	Yes
Greenwich Woolwich Flyover	-1.64 [-2.2, -1.16]	Yes
Newham Cam Road	-1.97 [-2.49, -1.5]	Yes
Newham Wren Close	-1.11 [-1.54, -0.69]	Yes
Tower Hamlets Blackwall	-1.6 [-2.01, -1.18]	Yes

a The first value is the slope. The numbers in brackets are the upper and lower 95th percentile confidence interval.
B Analysis carried out for 2009 to 2019 for this site.

Complaints

9.5.9 The airport operates an environmental complaint handling procedure by which anyone can contact the airport to register a complaint or request information about airport operations. Complaints or requests for information can be registered by telephone, post, email or via the airport website. Each complaint or request for information is registered by the airport, and then investigated and resolved where practical. All environmental complaints and enquiries are reported to LBN. In 2019, the airport received seven complaints from members of the public associated with airport odours. The majority of these were at locations within the airport boundary, but some were offsite, at residential properties and in the vicinity of the DLR station.

Future Baseline (DM Scenario)

9.5.10 Concentrations of annual mean nitrogen dioxide, PM_{10} and $PM_{2.5}$ have been predicted for all 120 receptors for all future assessment years (2025, 2027 and 2031) under the DM Scenario.

9.5.11 Predictions of the 98th percentile of 1-hour mean odour concentrations (ou_E/m^3) have also been made.

9.5.12 These concentrations are presented alongside the predictions for the DC scenario in Section 9.7.

9.6 Embedded Mitigation and Existing Controls

9.6.1 An Air Quality Management Strategy (2020-2023) (AQMS) has been submitted to, and approved by LBN in accordance with Condition 58 of the CADP1 consent. This sets out a series of measures that are designed to minimise the air quality impacts of airport operations. The AQMS includes measures to maximise the availability of Fixed Electrical Ground Power (FEGP), minimising Auxiliary Power Unit (APU) use, and introducing cleaner airside vehicles.

9.6.2 As part of the CADP1 development, LCY has phased out the use of diesel mobile ground power units (MGPUs) and replaced these with electric MGPUs, and has plans to install fixed electrical ground power (FEGP) on all new stands.

9.6.3 The Air Quality Construction Management and Monitoring Strategy (AQCMMS) was prepared by LCY to discharge a pre-commencement planning condition (Condition 88 - Construction Environmental Management Plan) and was approved by LBN in 2019.

9.6.4 LCY has undertaken/is undertaking the following:

- Committed through the CADP1 Section 106 (S106) to safeguard for 50 fast electrical charging points and 9 rapid charge points. These will be shared between cars and taxis (during daytime peak hours) and airport vehicles (in evening off-peak hours);
- Providing funding through the CADP1 (S106) for improvements to cyclist and pedestrians routes and working with LBN to create a connection between Hartmann Road and Connaught Road to connect the airport to the local cycle network;
- Providing funding through the CADP1 S106 for additional DLR station staff to ensure the DLR remains the best choice for getting to and from the airport; and
- The Airport Surface Access Strategy (2018-2025) has identified facilitating the Healthy Streets approach as a key priority.

9.6.5 For the assessment, the impact of the elimination of MGPUs has been taken into account. The impact of the introduction of FEGP has not been quantified as these have yet to be implemented, providing a conservative (pessimistic) assessment. The impacts of measures related to surface access are taken into account through their impact on the road traffic data (Chapter 10).

9.7 Assessment of Effects

Operational Phase Effects

Total Emissions

9.7.1 A summary of the 2019, 2025, 2027, 2029 and 2031 emissions (tonnes/year) is shown in Table 9-12 to Table 9-16 respectively. These show the emissions from different source categories.

9.7.2 Emissions data should be used with caution, since they are not a direct measure of impact. The emissions from landside road traffic depend on the modelled road network, so the absolute values should not be compared against other sources; they should only be compared between years and scenarios. Similarly, emissions from aircraft have been calculated within the Landing and Take-off (LTO) Cycle to a ceiling altitude

of 915 m (3,000ft). Emissions at altitude cannot be directly compared with those derived from solely ground-based sources.

9.7.3 Airport source NOx emissions increase by between 6% (2025) and 27% (2031) in the DC Scenario when compared to the equivalent years in the DM Scenario. This is in broad proportion to the increasing numbers of passengers and scheduled aircraft movements. The increase in airport source emissions from 2019 to 2031 is in part offset by a reduction in road traffic NOx emissions, but as stated above, this comparison is biased by the scale of the road network included in the assessment.

Table 9-12: Summary of Emissions, 2019

Source Category	NOx (t/y)	PM_{10} (t/y)	$PM_{2.5}$ (t/y)
Airport Sources			
Aircraft (LTO cycle plus APU and engine testing)	262.5	2.55	2.24
GSE	2.6	0.10	0.10
Stationary sources	0.3	0.02	0.02
Car Parks	0.2	0.02	0.02
Total Airport Related	265.7	2.68	2.37
Landside Road Traffic			
Road traffic on local road network in defined study area	56.5	5.82	3.44
Total emissions in assessment area	**322.2**	**8.50**	**5.81**

Table 9-13: Summary of Emissions, 2025 DM and DC Scenarios

Source Category	NOx (t/y)		PM_{10} (t/y)		$PM_{2.5}$ (t/y)	
	DM	DC	DM	DC	DM	DC
Airport Sources						
Aircraft (LTO cycle plus APU and engine testing)	270.4	285.8	2.52	2.62	2.21	2.28
GSE	1.2	1.3	0.07	0.07	0.07	0.07
Stationary sources	0.3	0.3	0.02	0.02	0.02	0.02
Car Parks	0.2	0.2	0.01	0.02	0.01	0.02
Total Airport Related	272.0	287.7	2.62	2.73	2.31	2.39
Landside Road Traffic						
Road traffic on local road network in defined study area	34.0	34.3	6.53	6.60	3.62	3.66
Total emissions in assessment area	**306.0**	**322.0**	**9.15**	**9.32**	**5.93**	**6.05**

Table 9-14: Summary of Emissions, 2027 DM and DC Scenarios

Source Category	NOx (t/y)		PM_{10} (t/y)		$PM_{2.5}$ (t/y)	
	DM	DC	DM	DC	DM	DC
Airport Sources						
Aircraft (LTO cycle plus APU and engine testing)	287.1	330.5	2.68	2.76	2.35	2.34
GSE	1.1	1.4	0.07	0.10	0.07	0.10
Stationary sources	0.3	0.4	0.02	0.02	0.02	0.02
Car Parks	0.1	0.2	0.01	0.02	0.01	0.02
Total Airport Related	288.6	332.5	2.79	2.90	2.45	2.47
Landside Road Traffic						
Road traffic on local road network in defined study area	29.8	30.2	6.61	6.68	3.65	3.69
Total emissions in assessment area	**318.4**	**362.6**	**9.40**	**9.58**	**6.11**	**6.16**

Table 9-15: Summary of Emissions, 2029 DM and DC Scenarios

Source Category	NOx (t/y)		PM_{10} (t/y)		$PM_{2.5}$ (t/y)	
	DM	DC	DM	DC	DM	DC
Airport Sources						
Aircraft (LTO cycle plus APU and engine testing)	316.0	357.9	2.86	2.94	2.47	2.47
GSE	1.1	1.4	0.09	0.11	0.09	0.11
Stationary sources	0.4	0.4	0.02	0.02	0.02	0.02
Car Parks	0.1	0.2	0.01	0.02	0.01	0.02
Total Airport Related	317.6	359.9	2.97	3.09	2.59	2.62
Landside Road Traffic						
Road traffic on local road network in defined study area	25.5	25.8	6.71	6.79	3.70	3.74
Total emissions in assessment area	**343.1**	**385.7**	**9.69**	**9.88**	**6.29**	**6.36**

Table 9-16: Summary of Emissions, 2031 DM and DC Scenarios

Source Category	NOx (t/y)		PM_{10} (t/y)		$PM_{2.5}$ (t/y)	
	DM	DC	DM	DC	DM	DC
Airport Sources						
Aircraft (LTO cycle plus APU and engine testing)	312.2	395.2	2.72	3.17	2.32	2.65
GSE	1.2	1.6	0.09	0.12	0.09	0.12
Stationary sources	0.4	0.5	0.02	0.02	0.02	0.02
Car Parks	0.1	0.2	0.01	0.02	0.01	0.02
Total Airport Related	313.9	397.4	2.84	3.33	2.44	2.81
Landside Road Traffic						
Road traffic on local road network in defined study area	23.1	23.3	6.75	6.81	3.71	3.75
Total emissions in assessment area	**336.9**	**420.8**	**9.58**	**10.14**	**6.15**	**6.55**

Predicted Concentrations

9.7.4 Concentrations of nitrogen dioxide, PM_{10} and $PM_{2.5}$ have been predicted for the baseline year (2019) and for each of the assessment years in both the DM and DC Scenarios (2025, 2027, 2029 and 2031). The predictions take into account the background pollutant concentrations derived from the Defra 1x1km maps (see Appendix 9.3), which show reducing levels in future years due at a range of policies and measures at the national, regional and local levels that will reduce emissions, principally from road traffic.

9.7.5 Predicted concentrations are detailed in Appendix 9.4 and are illustrated in the contour plots included in this section.

9.7.6 The contour plots presented show a ridge of relatively high (but still well below the objective) nitrogen dioxide concentrations straddling the River Thames to the southeast of the airport. This is unrelated to the airport and is a feature of the Defra background maps, which include a significant source of emissions (categorised as “Other”) in this grid square.

9.7.7 Future predictions of the 98th percentile of 1-hour mean odour concentrations (ou_E/m^3) have also been made.

2019 Baseline Year

9.7.8 The predicted concentrations of nitrogen dioxide, PM_{10} and $PM_{2.5}$ at each relevant receptor location for the 2019 Baseline Year are set out in Appendix 9.4. The annual mean nitrogen dioxide concentrations (in $\mu g/m^3$) are also illustrated in Figure 9.12.

9.7.9 Figure 9.12 shows that concentrations of nitrogen dioxide above the objective (40 $\mu g/m^3$) in 2019 are confined to small parts of the airfield, where there is no public access and the objective therefore does not apply (in accordance with the Air Quality Regulations and LLAQM.TG19). In the vicinity of the Airport, concentrations are well below the objective. The highest predicted concentration of annual mean nitrogen dioxide at any receptor with relevant human exposure is 33.8 $\mu g/m^3$ or 84% of the objective, at the R4 (Newland Street (opposite entrance to LCY car park)) receptor.

9.7.10 The greatest modelled annual mean nitrogen dioxide concentration at any of the receptors included for comparison against the Limit Value is 43.4 µg/m3 or 108% of the Limit Value at the A1261 Aspen Way west of the A1206 Cotton Street/Preston’s Road roundabout approximately 3.5km west of the airport.

9.7.11 The highest predicted concentration of PM_{10} is 20.2 $\mu g/m^3$ or 51% of the objective at the R60 receptor (Royal Docks Academy). The highest predicted concentration of PM2.5 is 13.2 $\mu g/m^3$ or 66% of the objective at the same receptor. There are no predicted exceedances of the objectives.

9.7.12 Predicted concentrations of $PM_{2.5}$ exceed the GLA target of 10 $\mu g/m^3$ at all receptors in 2019.

Figure 9.12: Annual mean nitrogen dioxide concentrations (µg/m³), 2019 Baseline Year

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2025 Assessment Year

9.7.10 The predicted concentrations of nitrogen dioxide, PM_{10} and $PM_{2.5}$ at each relevant receptor location for the 2025 DM and DC Scenarios are set out in Appendix 9.4. The annual mean nitrogen dioxide concentrations (in µg/m³) for the 2025 DC scenario are also illustrated in Figure 9.13.

9.7.11 Figure 9.13 shows that concentrations of nitrogen dioxide above the objective (40 µg/m³) in the 2025 DC scenario are confined to small parts of the airfield, where there is no public access and the objective therefore does not apply. Away from the airfield, concentrations are well below the objective.

9.7.12 The predicted annual mean concentrations of nitrogen dioxide in both the 2025 DM and DC scenarios are lower than in 2019 at all receptors. The highest predicted concentration in the DM scenario is 28.4 µg/m³ (71% of the objective) and for the DC scenario is 28.5 µg/m³ (71% of the objective), both occurring at the R4 (Newland Street (opposite entrance to LCY car park)) receptor The difference between the DM and DC scenarios is 0.1 µg/m³ or 0.2% of the objective. At all receptors, the magnitude of change in annual mean nitrogen dioxide concentrations between the DM and DC scenarios is less than 1% of the objective and the impacts are all **negligible**.

9.7.13 The highest modelled annual mean nitrogen dioxide concentration at any of the receptors included for comparison against the Limit Value is 32.6 µg/m³ or 82% of the Limit Value (for both the DM and DC scenarios) at the A102 Tunnel Avenue (LV13). The magnitude of change is 0.01 µg/m³ (less than 0.1% of the Limit Value) and the impact is **negligible**.

9.7.14 Predicted concentrations of PM_{10} and $PM_{2.5}$ are lower in both the 2025 DM and DC scenarios than in 2019 at all receptors. The highest predicted concentration of PM_{10} is 18.7 µg/m³ or 47% of the objective at the R60 (Royal Docks Academy) receptor, for both the DM and DC scenarios, where the increase between the scenarios is 0.01 µg/m³. The highest predicted concentration of $PM_{2.5}$ is 12.2 µg/m³ or 61% of the objective at

the same receptor, for both DM and DC scenarios. There are no predicted exceedances of the PM_{10} or $PM_{2.5}$ objectives, and all predicted impacts are **negligible**.

9.7.15 Predicted concentrations of $PM_{2.5}$ exceed the GLA target of 10 µg/m^3 at all receptors in both DM and DC Scenarios. The greatest change between the DM and DC scenarios is 0.02 µg/m^3 or 0.2% of the target, and all impacts are **negligible**.

Figure 9.13: Annual mean nitrogen dioxide concentrations (µg/m^3), 2025 DC scenario

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2027 Assessment Year

9.7.16 The predicted concentrations of nitrogen dioxide, PM_{10} and $PM_{2.5}$ at each relevant receptor location for the 2027 DM and DC scenarios are set out in Appendix 9.4. The annual mean nitrogen dioxide concentrations (in µg/m^3) for the 2027 DC scenario are also illustrated in Figure 9.14.

9.7.17 Figure 9.14 shows that concentrations of nitrogen dioxide above the objective (40 µg/m^3) are confined to small parts of the airfield where there is no public access and the objective therefore does not apply. Away from the airfield, concentrations are well below the objective.

9.7.18 The predicted annual mean concentrations of nitrogen dioxide in both the 2027 DM and DC scenarios are lower than in 2019 at all receptors. The highest predicted concentration in the DM scenario is 27.7 µg/m^3 (69% of the objective) and for the DC scenario is 28.0 µg/m^3 (70% of the objective), both occurring at the R4 (Newland Street (opposite entrance to LCY car park)) receptor. The difference between the DM and DC scenarios is 0.3 µg/m^3 or 1% of the objective. At all receptors, the magnitude of change in annual mean nitrogen dioxide concentrations between the DM and DC scenarios is, at most 2% (rounded) of the objective, and the impacts are all **negligible**.

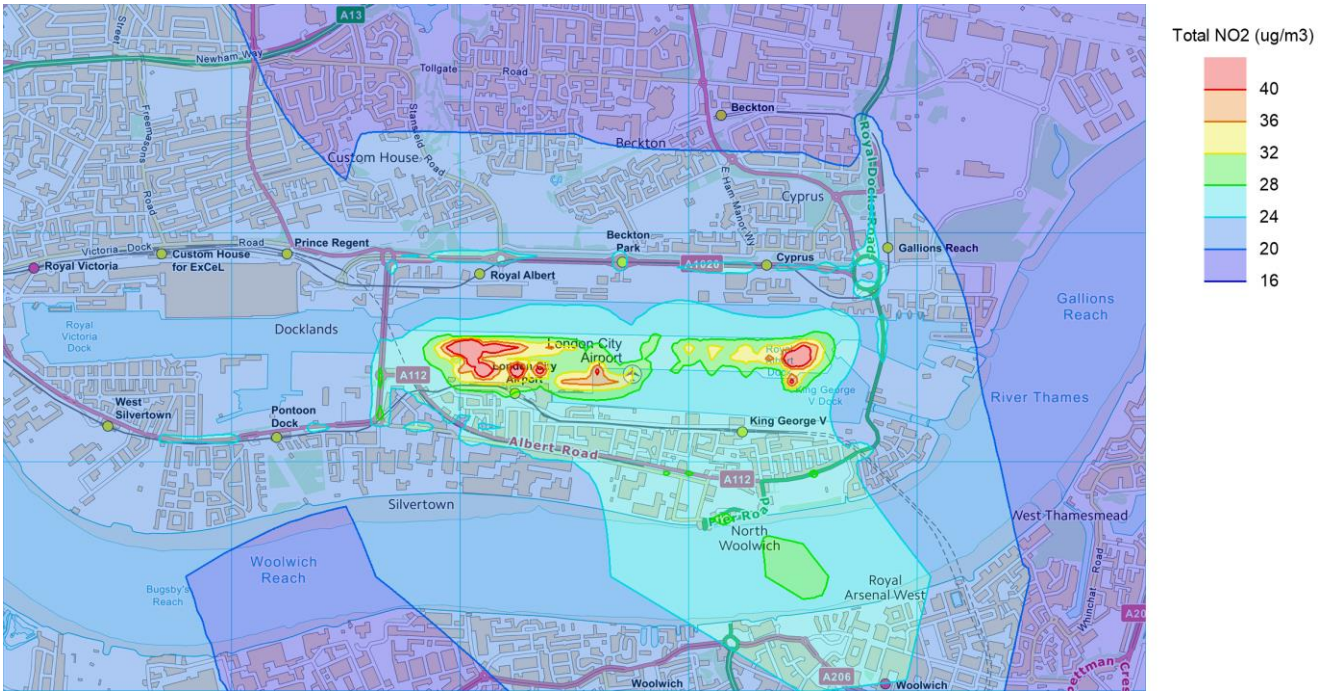
9.7.19 The highest modelled annual mean nitrogen dioxide concentration at any of the receptors included for comparison against the Limit Value is 30.6 µg/m^3 or 77% of the Limit Value (for both the DM and DC scenarios) at the A102 Tunnel Avenue (LV13). The magnitude of change is 0.02 µg/m^3, less than 0.1% of the Limit Value, and the impact is **negligible**.

9.7.20 Predicted concentrations of PM_{10} and $PM_{2.5}$ are lower in both the 2027 DM and DC scenarios than in 2019 at all receptors. The highest predicted concentration of PM_{10} is 18.7 µg/m^3 or 47% of the objective at the R60 (Royal Docks Academy) receptor, for both the DM and DC scenarios, where the increase between the scenarios is just 0.01 µg/m^3. The highest predicted concentration of $PM_{2.5}$ is 12.2 µg/m^3 or 61% of the objective

at the same receptor, for both the DM and DC scenarios. There are no predicted exceedances of the PM_{10} or $PM_{2.5}$ objectives, and all predicted impacts are **negligible**.

9.7.21 Predicted concentrations of $PM_{2.5}$ exceed the GLA target of 10 µg/m^3 at all receptors in both DM and DC scenarios. The greatest change between the DM and DC scenarios is 0.04 µg/m^3 or 0.4% of the target, and all impacts are **negligible**.

Figure 9.14: Annual mean nitrogen dioxide concentrations (µg/m^3), 2027 DC scenario



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2029 Assessment Year

9.7.22 The predicted concentrations of nitrogen dioxide, PM_{10} and $PM_{2.5}$ at each relevant receptor location for the 2029 DM and DC scenarios are set out in Appendix 9.4. The annual mean nitrogen dioxide concentrations (in µg/m^3) for the 2029 DC scenario are also illustrated in Figure 9.15.

9.7.23 Figure 9.15 shows that concentrations of nitrogen dioxide above the objective (40 µg/m^3) are confined to small parts of the airfield where there is no public access and the objective therefore does not apply. Away from the airfield, concentrations are well below the objective.

9.7.24 The predicted annual mean concentrations of nitrogen dioxide in both the 2029 DM and DC scenarios are lower than in 2019 at all human health receptors. The highest predicted concentration in the DM scenario is 27.1 µg/m^3 (68% of the objective) and for the DC scenario is 27.4 µg/m^3 68% of the objective), both occurring at the R4 (Newland Street (opposite entrance to LCY car park)) receptor. The difference between the DM and DC scenarios is 0.3 µg/m^3 or 1% of the objective. At all receptors, the magnitude of change in annual mean nitrogen dioxide concentrations between the DM and DC scenarios is, at most 2% (rounded) of the objective, and the impacts are all **negligible**.

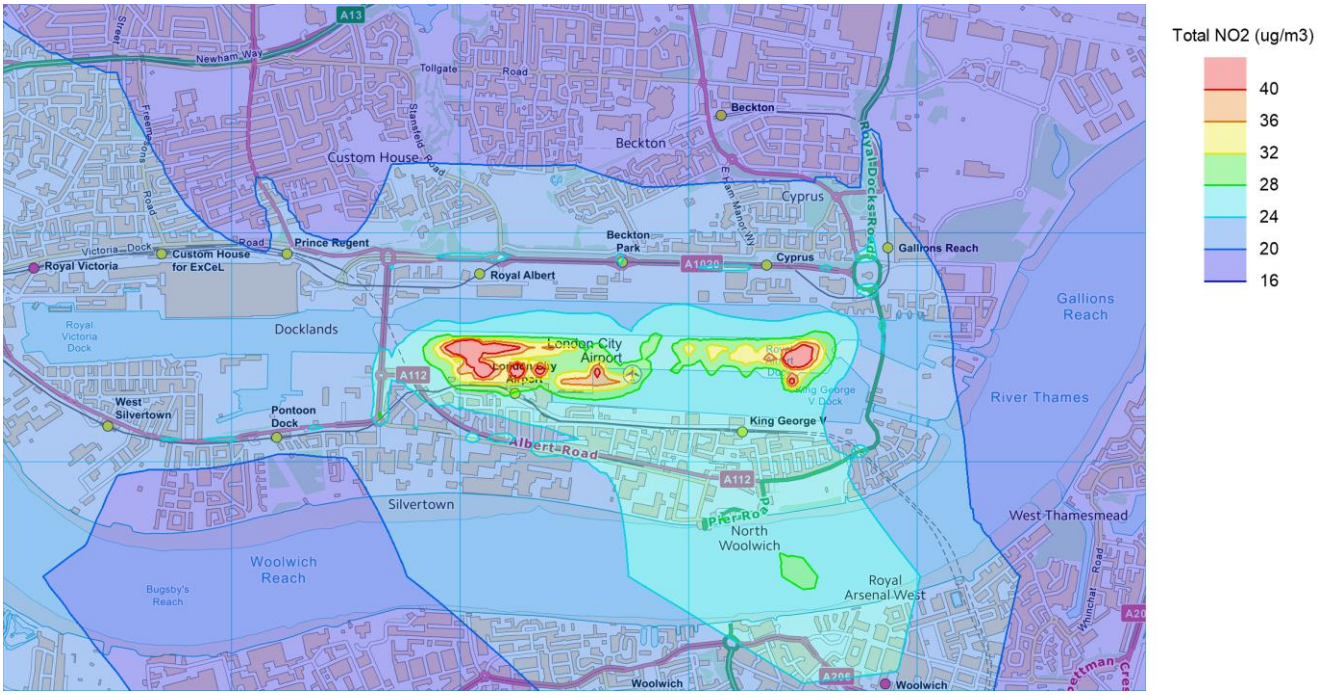
9.7.25 The highest modelled annual mean nitrogen dioxide concentration at any of the receptors included for comparison against the Limit Value is 28.4 µg/m^3 or 71% of the Limit Value at the A102 Tunnel Avenue (LV13) in both the DM and DC scenarios. The magnitude of change is just 0.02 µg/m^3, less than 0.1% of the Limit Value, and the impact is **negligible**.

9.7.26 Predicted concentrations of PM_{10} and $PM_{2.5}$ are lower in the 2029 DM and DC scenarios than in 2019 at all receptors. The highest predicted concentration of PM_{10} is 18.7 µg/m^3 or 47% of the objective at the R60 (Royal Docks Academy) receptor, for both the DM and DC scenarios. where the increase between the scenarios is just 0.01 µg/m^3. The highest predicted concentration of $PM_{2.5}$ is 12.2 µg/m^3 or 61% of the objective

at the same receptor for both scenarios. There are no predicted exceedances of the PM_{10} or $PM_{2.5}$ objectives, and all predicted impacts are **negligible**.

9.7.27 Predicted concentrations of $PM_{2.5}$ exceed the GLA target of 10 µg/m^3 at all receptors in both DM and DC scenarios. The greatest change between the DM and DC scenarios is 0.04 µg/m^3 or 0.4% of the target, and all impacts are **negligible**.

Figure 9.15: Annual mean nitrogen dioxide concentrations (µg/m^3), 2029 DC scenario



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2031 Assessment Year

9.7.28 The predicted concentrations of nitrogen dioxide, PM_{10} and $PM_{2.5}$ at each relevant receptor location for the 2031 DM and DC scenarios are set out in Appendix 9.4. The annual mean nitrogen dioxide concentrations (in µg/m^3) for the 2031 DC scenario are also illustrated in Figure 9.16.

9.7.29 Figure 9.16 shows that concentrations of nitrogen dioxide above the objective (40 µg/m^3) are confined to small parts of the airfield where there is no public access and the objective therefore does not apply. Away from the airfield, concentrations are well below the objective.

9.7.30 The predicted annual mean concentrations of nitrogen dioxide in both the 2031 DM and DC scenarios are lower than in 2019 at all human health receptors, by between approximately 5 µg/m^3 and 9 µg/m^3. The highest predicted concentration in the 2031 DM scenario is 26.7 µg/m^3 (67% of the objective) and for the DC scenario is 27.2 µg/m^3 (68% of the objective), both occurring at the R4 (Newland Street (opposite entrance to LCY car park)) receptor. The greatest difference between the DM and DC scenarios is 1.4 µg/m^3 or 3% of the objective, at the R2 (Camel Road) receptor, where the total concentration in the DM scenario is 25.4 µg/m^3 and in the DC scenario is 26.8 µg/m^3. The impacts are classified as **negligible** at all receptors.

9.7.31 The highest modelled annual mean nitrogen dioxide concentration at any of the receptors included for comparison against the Limit Value is 27.2 µg/m^3 or 68% of the Limit Value at the A102 Tunnel Avenue in both the 2031 DM and DC scenarios. The magnitude of change is just 0.03 µg/m^3 or less than 0.1% of the Limit Value, and the impact is **negligible**.

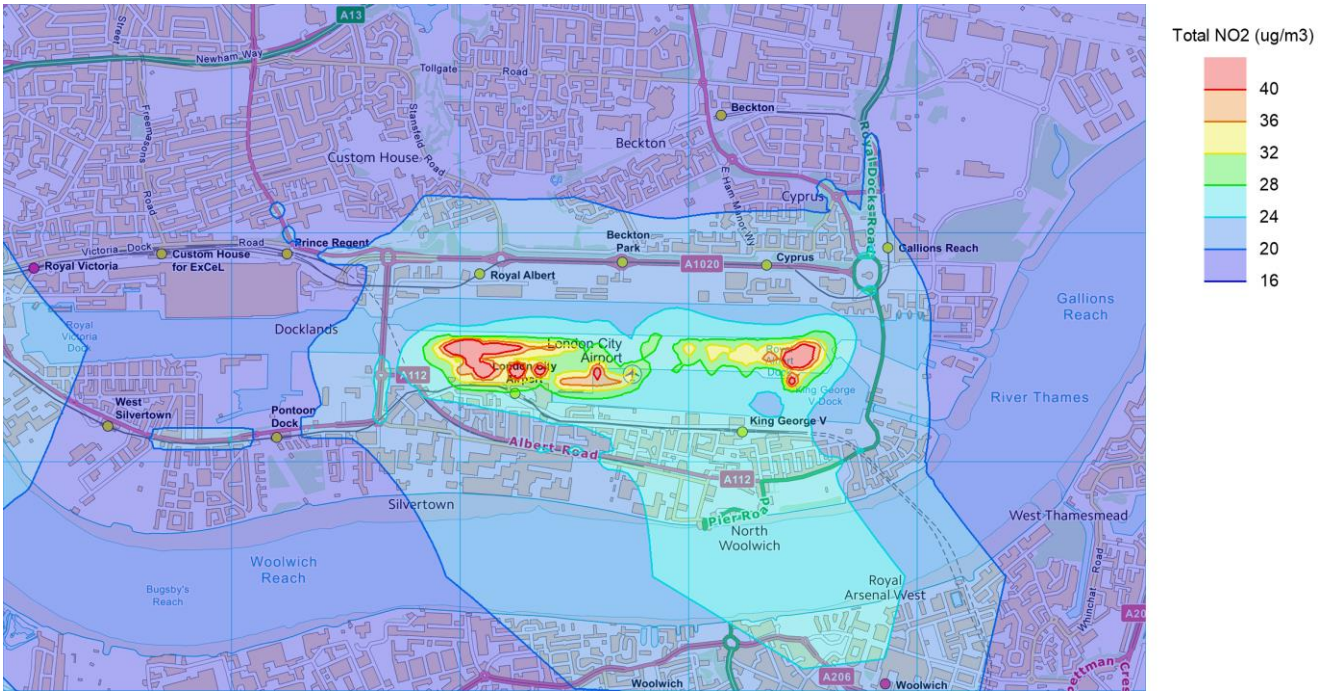
9.7.32 The predicted annual mean concentrations of PM_{10} in both the 2031 DM and DC scenarios are lower than in 2019 at all receptors, by between 1.2 µg/m^3 and 1.6 µg/m^3. The highest predicted PM_{10} concentration is 18.7 µg/m^3 or 47% of the objective, at the R60 (Royal Docks Academy) receptor, for both the DM and DC scenarios. The greatest difference between the DM and DC scenarios is 0.1 µg/m^3 or 0.2% of the objective, at

the R2 (Camel Road) receptor, where the total concentration in the DM scenario is 16.9 µg/m^3 and in the DC scenario is 17.0 µg/m^3. The impacts are classified as **negligible** at all receptors.

9.7.33 The predicted annual mean concentrations of $PM_{2.5}$ in both the 2031 DM and DC scenarios are lower than in 2019 at all receptors, by between 0.9 µg/m^3 and 1.1 µg/m^3. The highest predicted concentration in the 2031 DC scenario is 12.2 µg/m^3 or 61% of the objective, at the R60 (Royal Docks Academy) receptor, for both the DM and DC scenarios. The greatest difference between the DM and DC scenarios is 0.1 µg/m^3 or 0.4% of the objective, at the R2 (Camel Road) receptor, where the total concentration in the DM scenario is 11.2 µg/m^3, and in the DC scenario is 11.3 µg/m^3. The impacts are classified as **negligible** at all receptors.

9.7.34 Predicted concentrations of $PM_{2.5}$ exceed the GLA target of 10 µg/m^3 at all receptors in both DM and DC scenarios. The greatest change between the DM and DC scenarios is 0.1 µg/m^3 (or 0.07 µg/m^3 to 2 significant figures) or 0.7% of the target. Impacts on the target are **negligible** at all receptors except at R1 (Camel Road/Hartmann Road) and R2 (Camel Road/Parker Street), which experience **moderate adverse** impacts because the increment is 1% (when rounded) of the target.

Figure 9.16: Annual mean nitrogen dioxide concentrations (µg/m^3), 2031 DC scenario



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Overall Significance of Effects

9.7.35 The operational air quality effects in 2025, 2027, 2029 and 2031 are judged to be not significant. This professional judgement is made in accordance with the factors recommended by EPUK/IAQM (as described in Section 9.4). More specifically, the judgement that the effects will be not significant takes into account that concentrations are predicted to be below the objectives/limit values for all future years assessed, and that the impacts with regard to the objectives/limit values are all **negligible**. Whilst **moderate adverse** impacts are predicted against the GLA target for $PM_{2.5}$ in 2031 at two receptors, this is a consequence of the elevated background values and a rounding of the incremental change. $PM_{2.5}$ concentrations in 2031 are lower than in 2019 for both the DM and DC scenarios.

9.7.36 The assessment set out above has described the likely significant effects of the DC scenario against the DM scenario (future baseline + CADP1). A quantitative assessment against a future baseline without CADP1 is not possible or proportionate as the permission has already been implemented and the new infrastructure is being utilised.

9.7.37 In terms of the absolute concentrations in future years, this if fully described in the DC scenarios. However, as described in Section 9.4, the EPUK/IAQM guidance is founded on “impact descriptors” that

describe the magnitude of change at individual receptors in combination with the absolute concentrations. It is not straightforward to compare the outcomes of the 2015 UES and this Chapter for a number of reasons, principally that:

- The Principal Assessment Year in the 2015 UES was 2025, but it is now 2031;
- The fleet mixes for the Principal Assessment Year are different; and
- There have been many changes to the assessment methodology since the 2015 UES was completed.

9.7.38 Nonetheless, it is possible to draw a qualitative comparison as to whether there are new or materially different effects from those identified in the 2015 UES.

9.7.39 The 2015 UES predicted a **slight adverse** impact at one receptor (Newland Street) for annual mean nitrogen dioxide in 2025, with an absolute concentration of 23.3 µg/m^3. Based on the absolute concentrations that are less than 75% of the objective, it would require a substantial contribution from the Proposed Amendments to shift the descriptor to moderate adverse (see Table 9-3) and even if this occurred it would not change the overall conclusion. For similar reasons, the potential to shift **negligible** impacts to **slight adverse** is limited to a very small number of receptors, and again, this would not change the overall conclusion.

9.7.40 Predicted annual mean concentrations of PM_{10} and $PM_{2.5}$ were all well below the objectives in the 2015 UES, with the impacts all described as **negligible**. For the reasons set out above, there very limited potential for any impacts to be reclassified as **slight adverse**, and even if this occurred it would not change the overall conclusion.

9.7.41 It should also be borne in mind that concentrations and incremental changes predicted for 2025 in the UES would be expected to be lower in 2031.

9.7.42 It is concluded there are no new or materially different effects from those identified in the 2015 UES.

Odours

9.7.43 Odour modelling results indicate that the highest 98th percentile hourly mean odour concentration at any relevant receptor was 2.7 ou_E/m^3 in the baseline year of 2019. This concentration is below the value of 3 ou_E/m^3 at which moderately offensive odours may become unacceptable.

9.7.44 The greatest modelled odour concentration at any relevant receptor in each of the future years in the DC and DM scenarios is given in Table 9-17. It can be seen that in the future, odour concentrations decline, and this is particularly so in the DC scenario. At all receptors and in each future year, odour concentrations are lower in the DC Scenario than in the DM scenario, and the reduction is sharper in the DC scenario from 2027 onwards. These results may be attributed to the introduction of newer, cleaner aircraft in the DC scenario which outweighs the impact of greater aircraft activity. According to the ICAO Engine Emissions Databank[37], the PW1500G engine fitted to Airbus A220 aircraft and the PW1921G engine fitted to Embraer E190 E2 and E195 E2 aircraft have very low unburnt hydrocarbon emission rates at idle compared to other engines, just 0.1 g/kg compared to (for example) 4.3 g/kg for the CF34-10E engine fitted to the Embraer E190 E1.

9.7.45 Modelled odour concentrations remain below the threshold at which moderately offensive odours may become unacceptable for all DM and DC scenarios. It is therefore concluded that odour effects from the proposed development would not be significant.

[37] ICAO (2021). ICAO Aircraft Engine Emissions Databank, version 28c. https://www.easa.europa.eu/domains/environment/icao-aircraft-engine-emissions-databank

Table 9-17: Maximum 98th Percentile Hourly Mean Odour Concentrations (ouE/m^3)

	DM	DC
2025	2.6	2.5
2027	2.6	1.4
2029	2.2	1.3
2031	1.5	1.4

Sensitivity Tests

9.7.46 Emissions for the 2029 Faster Growth and 2033 Slower Growth Scenarios are summarised in Table 9-18 (with the 2031 DC Scenario for comparison). Road traffic emissions for the Slower Growth Scenario have not been calculated (see Paragraph 9.4.10), but are discussed qualitatively below.

Table 9-18: Summary of Emissions (t), Sensitivity Scenarios

Source Category	2031 DC	2029 Faster Growth	2033 Slower Growth
NOx			
Total Airport Related	397.4	396.0	397.0
Road traffic on local road network in defined study area	23.3	25.9	*
Total emissions in assessment area	420.8	421.9	397.0*
PM_{10}			
Total Airport Related	3.33	3.33	3.31
Road traffic on local road network in defined study area	6.81	6.81	*
Total emissions in assessment area	10.14	10.14	3.31*
$PM_{2.5}$			
Total Airport Related	2.81	2.81	2.79
Road traffic on local road network in defined study area	3.75	3.75	*
Total emissions in assessment area	6.55	6.56	2.79*

* Road traffic emissions not calculated

9.7.47 Impacts in the 2029 Faster Growth Scenario are potentially greater than in other scenarios, as the faster growth leads to higher Airport-related emissions before background concentrations have fallen as much as in the 2031 DC scenario. Road traffic NOx emissions in 2029 are slightly higher in the Faster Growth Scenario than in the 2031 DC Scenario, because emission factors will not have reduced as much by 2029 as 2031. Predicted emissions for the 2029 Faster Growth Scenario have been modelled and compared to the 2029 DM scenario already considered; the results are detailed in Appendix 9.4. At all receptors, concentrations of nitrogen dioxide, PM_{10} and $PM_{2.5}$ remain well below their respective Limit values/objectives, and impacts are all **negligible**. Concentrations of $PM_{2.5}$ are above the GLA target in both the Faster Growth and DM Scenarios in 2029, and impacts at three receptors (R1, R2 and R50a) are classified as **moderate adverse**; impacts at all other receptors are **negligible**.

9.8 Further Mitigation and Monitoring

9.8.1 The EPUK/IAQM guidance advises that good design and best practice measures should be considered, whether or not more specific mitigation is required. The proposed development incorporates a number of good design and best practice measures. Measures which have been accounted for in the assessment (embedded mitigation) are described in Section 9.6. Other measures which have not been quantified but which will tend to improve air quality are identified in the Air Quality Positive Statement (Appendix 9.5).

9.8.2 The assessment has demonstrated that the overall air quality effect of the Proposed Amendments will be not significant; the increased emissions associated with the Proposed Amendments will not have a

significant impact on local air quality. It is, therefore, not considered appropriate to propose further mitigation measures.

9.9 Air Quality Neutral

9.9.1 Air Quality Neutral is a term for developments that do not contribute to air pollution beyond allowable benchmarks that have been established for buildings and transport (car or light van trips), and as defined in GLA guidance

9.9.2 The revised energy strategy for the Proposed Amendments is founded on the use of air source heat pumps combined with photovoltaics. This will be achieved either through on-site plant or connection to a District Heat Network. As such, there will be no emissions associated with the energy strategy and, by definition, the Proposed Amendments meet the Building Emissions Benchmarks.

9.9.3 The Transport Emission Benchmarks (TEBs), as specified in the Air Quality Neutral documentation[38], are based on the number of trips generated by different land-use classes. The documentation provides no specific TEBs for airport operations. Whilst the Airport does include land uses such as offices, retail and restaurants/cafes, these are not used in a standard manner i.e. passengers do not drive to the Airport to specifically to access these facilities – they drive to the airport to use air travel. As such, the application of the TEBs to an airport is subject to some uncertainty.

9.9.4 The approach taken mirrors that in the 2015 UES and is a methodology that was agreed with LBN. Trip generation data are normally obtainable from the Transport Assessment, as this is the basis for the calculation of AADT data. However, a bespoke, first principle approach was used in this case, with the trip data derived from passenger profiles (provided by York Aviation) and staff numbers.

9.9.5 The derivation of the benchmarked trip rates is shown in Table 9-19. For Sui Generis use, a weighted trip rate has been derived from land use classes A1, A3, B1 and C1**.**

Table 9-19: Trip Benchmarks

Land Use	Trips/m^2/annum	Gross Internal Area (m^2)	Total Benchmarked Trips/annum
Retail (incl. storage)	216	3946	852336
Restaurants/cafes	170	2610	443700
Offices	16	10481	167696
Hotel	6.9	14000	96600
Sui Generis	50.2	16773	842005
Total Benchmark Trip Rate	2,402,337		

9.9.6 Vectos (the transport consultants for the 2015 UES) advised that CADP would add an additional 1,104,480 one-way trips per annum (once fully operational). Steer, have advised that the proposed development would add an additional 2,171,740 one-way trips per annum. This remains below the calculated TEB and accordingly the proposed development remains air quality neutral.

9.10 Effects of Climate Change on Air Quality

9.10.1 Air quality is predicted to improve in the future, owing to lower emissions from road vehicles and other combustion plant, as progressively lower emission technologies become available. The assessment, therefore, focuses on the near-term (years of peak construction and peak operational activity), but the outlook for the longer term is one of improvement, both in terms of local and regional air quality, but also in terms of emissions associated with the proposed development. Climate change is a long-term effect, and significant changes in climate are not expected by 2031. Climate change will, therefore, not affect the air quality model predictions set out in this Chapter. In the longer term (2050 – 2080) changes in climate might affect the need for heating and

[38] Air Quality Consultants (2020) Air Quality Neutral: Update to Benchmarks. J3231H/1/F1, March 2020. https://www.london.gov.uk/sites/default/files/aqn_update_to_benchmarks_report.pdf

cooling and, therefore, have an influence on the energy plant emissions associated with the proposed development, but significant effects are not expected as a result.

9.11 Residual Effects and Conclusions

9.13.1 The residual effects will be the same as those identified in Section 9.7. The overall effects of the Proposed Amendments will be '**not significant**'. The residual effects are summarised in Table 9-20.

Table 9-20: Summary of Residual Environmental Effects

Receptor	Sensitivity of receptor	Description of impact	Short / medium / long term	Magnitude of impact	Significance of effect	Significant / Not significant	Notes
Operational phase (including Construction Phase traffic)							
Human health receptors	High	Nitrogen dioxide, PM_{10} and $PM_{2.5}$	Long term	Negligible	Negligible	Not significant	N/A
Human receptors	High	Odour & amenity	Long term	Negligible	Negligible	Not significant	N/A

9.12 Assessment of Cumulative Effects

9.12.1 Schemes identified in Chapter 14: Cumulative Effects have been reviewed for their potential to have cumulative effects with regard to air quality. All cumulative schemes were assumed to be operational in 2015, representing a worst case in terms of future exposure.

9.12.2 Several schemes are large enough to require energy strategies. If these were based around combustion plant, there would be the potential for cumulative effects. However, as detailed in Appendix 9.3, none of the schemes identified will have significant cumulative effects, as they are based technologies that do not incorporate on-site combustion plant, or the air quality assessments submitted in support of the relevant planning applications have quantified the impacts..

9.12.3 Many schemes have the potential to increase road traffic on roads near the Airport. The expected increases in road traffic from these schemes has been included in the road traffic data for the DM and DC Scenarios used in the air quality assessment; as described in the Transport Assessment (table 7.23 and 7.24), and so has been explicitly considered. This provides a suitable indication of the likely traffic flows on the local road network taking into account a wide range of committed and planned developments within TfL's LoHAM trip matrix.