Report

London City Airport RNP AP Airspace Change Proposal

Air Quality Assessment

For London City Airport

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1 Introduction

1.1.1 London City Airport (LCY) is in the process of applying to the Civil Aviation Authority (CAA) for permission to change the airspace design around the airport. The process for Airspace Change Proposals (ACP) is set out in the CAA document CAP1616 and its appendices, in particular CAP1616i which sets out the requirements for environmental assessments. Stage 2 of the process previously set out a list of options for the proposed change. The application is currently at Stage 3 of the CAP1616 process, Consult/Engage, which requires a detailed assessment of the shortlisted options. Only a single option is being considered at Stage 3.

1.1.2 Chapter 7 of CAP1616i sets out the requirements for the air quality assessment. It requires certain information where there is the possibility of pollutants breaching legal limits and target values, noting that the Air Quality Strategy (Defra, 2007) published by the Department for Environment, Food, and Rural Affairs (Defra) and Devolved Administrations and the Air Quality Standards Regulations (2010) (as amended) set out the national Air Quality Objectives and limit and target values with which the UK must comply. It also specifies which years should be assessed.

1.1.3 Currently all aircraft must approach the runway at an angle of 5.5°. The ACP will allow Airbus A320neo aircraft (henceforth A32N) to approach at an angle of 4.49°; these aircraft are not able to safely approach at 5.5° and so are currently unable to use the airport. All other aircraft will continue to use 5.5° approach paths.

1.1.4 In terms of air quality, there are two principal effects of the proposed change:

- An increase in the number of A32N aircraft and a reduction in the number of Embraer E190 aircraft; and
- A change in the approach angle for A32N aircraft only.

1.1.5 There will be no change in passenger numbers in the two assessment years, 2027 and 2038. Because A32N aircraft carry more passengers than the E190 they will partly replace, there will be fewer aircraft movements for the same number of passengers.

1.1.6 This report presents the current-day air quality situation and the predicted air quality impacts of the ACP in two future assessment years, 2027 (the year of implementation with the airspace change proposal) and 2038 (12 years after implementation), as agreed with CAA. Impacts are assessed by considering both the total concentrations of key pollutants, and the change in concentrations of pollutants with the ACP (referred to in this report as the Do Something or DS scenario) compared to without the ACP (the Do Nothing or DN scenario).

1.1.7 The pollutants considered in this report are nitrogen dioxide (NO_2) and fine particulate matter (PM_{10} and $PM_{2.5}$), as these are the principal pollutants of concern in relation to aircraft emissions.

1.1.8 In 2022, LCY submitted a planning application under Section 73 of the Town and Country Planning Act (the S73 application or just S73) to increase the cap on passenger numbers to 9 million per year. The S73 application was accompanied by an Environmental Statement, chapter 9 of which set out details of an air quality assessment (LCY, 2022). The present assessment follows the S73 air quality assessment as far as possible.

2 Assessment Methodology

2.1 Assessment Criteria

2.1.1 CAP1616i notes that:

"The national Air Quality Objectives and Air Quality Standards Regulations limit and target values with which the UK must comply are summarised in the National air quality objectives of the Air Quality Strategy Volume 1 and Volume 2."

2.1.2 Details of these are given below, along with other relevant assessment criteria. The assessment criteria used in this assessment therefore include and go beyond those specified in CAP1616i.

Air Quality Objectives

2.1.3 The Government has established a set of air quality standards and objectives to protect human health. The 'standards' are based on assessment of the effects of each pollutant on human health, including the effects on sensitive sub-groups. The 'objectives' set out the extent to which the Government expects the standards to be achieved *taking account of practical considerations*. The objectives for use by local authorities are prescribed within the Air Quality (England) Regulations (2000) and the Air Quality (England) (Amendment) Regulations (2002).

2.1.4 The UK-wide objectives for nitrogen dioxide and PM_{10} were to have been achieved by 2005 and 2004 respectively, and continue to apply in all future years thereafter. Measurements across the UK have shown that the 1-hour mean nitrogen dioxide objective is unlikely to be exceeded at roadside locations where the annual mean concentration is below 60 µg/m^3 (Defra, 2022). Therefore, 1-hour nitrogen dioxide concentrations will only be considered if the annual mean concentration is above this level. Measurements have also shown 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 (Defra, 2022). The predicted annual mean PM_{10} concentrations are thus used as a proxy to determine the likelihood of an exceedance of the 24-hour mean PM_{10} objective. Where predicted annual mean concentrations are below 32 µg/m^3 it is unlikely that the 24-hour mean objective will be exceeded.

2.1.5 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 (GLA, 2019). 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 etc., the gardens of residential properties, school playgrounds and the grounds of hospitals and care homes. The 24-hour mean objective for PM_{10} is considered 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 1-hour or more, including outdoor eating locations and pavements of busy shopping streets.

2.1.6 For $PM_{2.5}$, the objective set by Defra for local authorities is to work toward reducing concentrations without setting any specific numerical value. In the absence of a numerical objective, it is convention to assess local air quality impacts against the limit value (see Paragraph 0), originally set at 25 µg/m^3 and currently set at 20 µg/m^3.

Government Targets

2.1.7 Defra has also set two new targets, and two new interim targets, for $PM_{2.5}$ concentrations in England. One set of targets focuses on absolute concentrations. The long-term target is to achieve an annual mean $PM_{2.5}$ concentration of 10 µg/m^3 by the end of 2040 (referred to as the annual mean concentration target or AMCT), with the interim target being a value of 10 µg/m³ by December 2030[1]. The second set of targets relate to reducing overall population exposure to $PM_{2.5}$. By the end of 2040, overall population exposure to $PM_{2.5}$ should be reduced by 35% compared with 2018 levels (referred to as the population exposure reduction target or PERT), with the interim target being a reduction of 30% by December 2030 (Table 2-1).

Table 2-1: Environment Act and Environmental Improvement Plan $PM_{2.5}$ Targets

Metric	Target	Target year
AMCT	Interim target: 10 µg/m³	2030
	Legally binding target: 10 µg/m³	2040
PERT	Interim target: 30% reduction in exposure compared to 2018	2030
	Legally binding target: 35% reduction in exposure compared to 2018	2040

2.1.8 In 2024 Defra published Interim Planning Guidance on the $PM_{2.5}$ targets (Defra, 2024). This states that:

"The purpose of the targets is to improve air quality by reducing levels of $PM_{2.5}$ across the country, therefore improving public health. While achievement of the targets will be assessed at relevant monitoring sites, the targets apply to ambient (outdoor) air throughout England. Applicants and Local Planning Authorities should therefore consider the impact of developments on air quality in all ambient air, whether a monitor is present or not."

2.1.9 In order to address the new targets it is not sufficient to assess solely whether a scheme is likely to lead to an exceedance of a legal limit. Instead, developments need to implement appropriate mitigation measures from the design stage, ensuring the minimum amount of pollution is emitted and that exposure is minimised.

2.1.10 Pending publication of the new guidance, Defra advises applicants to provide evidence that they have identified key sources of air pollution within the scheme and taken appropriate action to minimise emissions of $PM_{2.5}$ and its precursors as far as possible. More detailed assessment is expected for development closer to populations and/or having higher emissions. Defra has posed two questions to be used as prompts to support the interim assessment process:

"How has exposure to $PM_{2.5}$ been considered when selecting the development site?; and

What actions and/or mitigations have been considered to reduce $PM_{2.5}$ exposure for development users and nearby receptors (houses, hospitals, schools etc.) and to reduce emissions of $PM_{2.5}$ and its precursors?"

GLA Targets

2.1.11 The GLA has set a target to achieve an annual mean $PM_{2.5}$ concentration of 10 µg/m³ 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 (GLA, 2018a) considers the 2005 guideline of 10 µg/m³. While there is no explicit requirement to assess against the GLA target of 10 µg/m³, it has nevertheless been included within this assessment.

[1] The 2040 target will be assessed using measurements from 2040. National targets are assessed against concentrations expressed to the nearest whole number, for example a concentration of 10.4 µg/m³ would not exceed the 10 µg/m³ target.

Limit Values

2.1.12 EU Directive 2008/50/EC (The European Parliament and the Council of the European Union, 2008) sets limit values for nitrogen dioxide, PM_{10} and $PM_{2.5}$, and is implemented in UK law through the Air Quality Standards Regulations (2010)[2]. The limit values for nitrogen dioxide and PM_{10} are the same numerical concentrations as the UK objectives, but achievement of the limit values is a national obligation rather than a local one and concentrations are reported to the nearest whole number. In the UK, only monitoring and modelling carried out by UK Central Government meets the specification required to assess compliance with the limit values. 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).

Summary of Assessment Criteria

2.1.13 The relevant air quality criteria for this assessment are provided in Table 2-2.

Table 2-2: Air Quality Criteria for Nitrogen Dioxide, PM_{10} and $PM_{2.5}$

Pollutant	Time Period	Value
Nitrogen Dioxide	1-hour Mean	200 µg/m³ not to be exceeded more than 18 times a year
	Annual Mean	40 µg/m³
PM_{10}	24-hour Mean	50 µg/m³ not to be exceeded more than 35 times a year
	Annual Mean	40 µg/m³ [a]
$PM_{2.5}$	Annual Mean	20 µg/m³ [b]
	Annual Mean	10 µg/m³ by 2030

[a] A proxy value of 32 µg/m³ as an annual mean is used in this assessment to assess the likelihood of the 24-hour mean PM_{10} objective being exceeded. Measurements have shown that, above this concentration, exceedances of the 24-hour mean PM_{10} objective are possible (Defra, 2022).

[b] There is no numerical $PM_{2.5}$ objective for local authorities (see Paragraph 2.1.6). Convention is to assess against the UK limit value which is currently 20 µg/m³.

2.2 Baseline Characterisation

Monitoring

2.2.1 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.

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

[2] As amended through The Air Quality Standards (Amendment) Regulations 2016 and The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020.

2.2.3 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 2024, the AQMS included 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 (LCA04, LCA14 and LCA18), or at the Jet Centre apron (LCA10).

2.2.4 Automatic monitoring sites are also operated by the London Boroughs of Newham, Tower Hamlets and Greenwich.

Desktop Baseline Analysis

2.2.5 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:

- 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 2021-based background maps (Defra, 2025a). 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, PM_{10} and $PM_{2.5}$ in the study area has been identified using Defra's Compliance data (2025c).

2.3 Sensitive Receptors

2.3.1 Sensitive receptors within the study area are places where members of the public might be expected to be regularly present over the averaging periods of the 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.

2.3.2 A total of 77 receptors have been selected for the operational assessment to represent locations of relevant exposure for comparison against the objectives. These have been selected to represent residential properties within 1.5 km of the Airport runway. Where appropriate, these include additional receptors at height to account for blocks of flats. Of these, six have been included to account for new locations of exposure at proposed developments at Silvertown Quays, Barrier Park East, Minoco Wharf, Royals Business Park Hotels, North Side of Albert Dock, UEL, Gallions Roundabout, Gallions Quarter, Royal Albert Basin and Land at Gallions Reach. As the design details for many 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.

2.3.3 A further sixteen receptor locations have been selected for the operational assessment to evaluate compliance against the limit value. A further 22 receptors have been included to represent monitoring locations.

2.3.4 The receptor locations are shown in Figure 2-1 and detailed in Appendix A2.

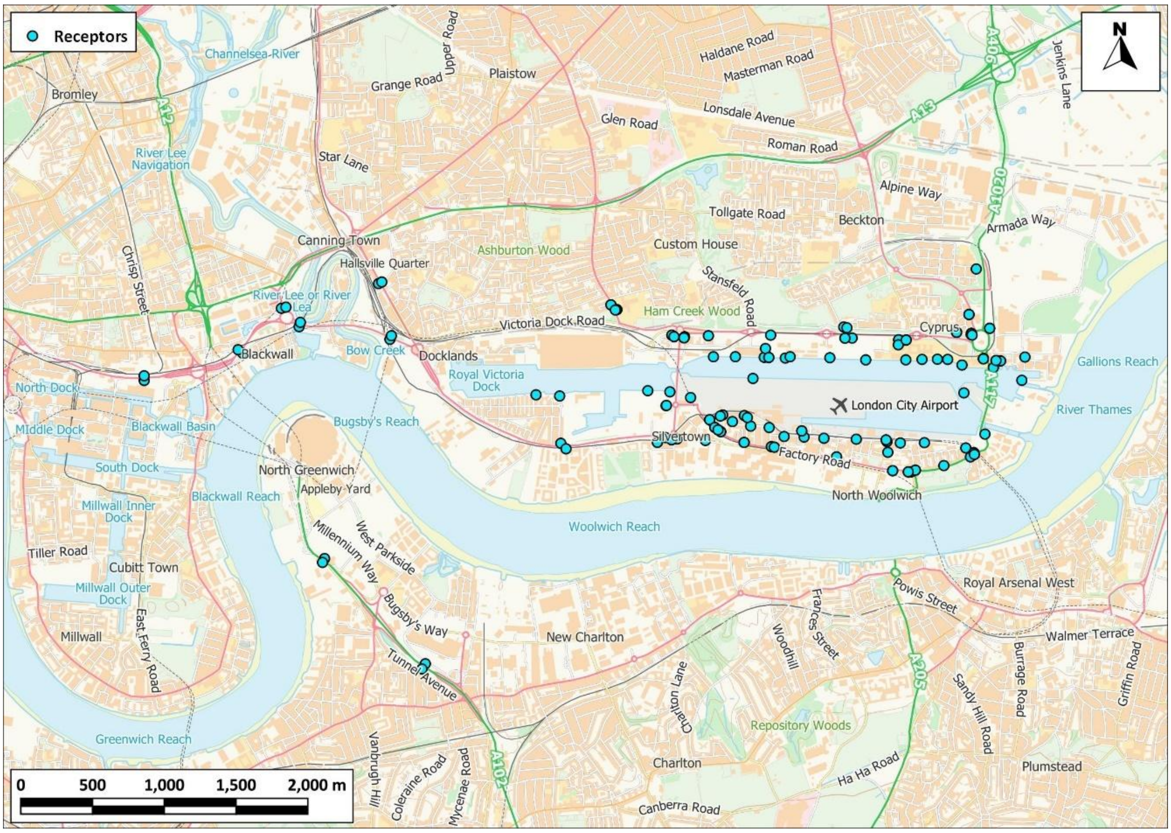

Figure 2-1: Receptor Locations

2.4 Study Area

2.4.1 The study area is effectively defined by an approximately 1 km radius around the runway (beyond which any effects from airside emissions are unlikely to be discernible). While there will be changes of emissions while aircraft are more than 1 km from the airport, at these distances aircraft will be at least 75 m above ground level and the contribution to ground-level concentrations is extremely small. Nonetheless, the contribution from aircraft up to 3000 feet (914 m) is included in the model.

2.5 Modelling Methodology

2.5.1 A full description of the methodology used for calculating emissions and concentrations of pollutants is given in Appendix A1. A brief summary of the methodology is given in this section.

2.5.2 Pollutant emissions arise from a variety of airport-related sources, with the following taken into consideration in this assessment:

- Aircraft main engines operating within the Landing and Take-off (LTO) Cycle;
- Aircraft Auxiliary Power Units (APUs); and
- Brake and tyre wear.

2.5.3 Emissions are calculated using a bottom-up approach, based on multiplying activity levels by appropriate emission factors. Data on forecast aircraft activity levels are provided by York Aviation. Emission factors are from standard published sources.

2.5.4 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-Airports, which calculates concentrations of pollutants at receptors.

2.5.5 The resulting concentrations and deposition rates are assessed against the established assessment criteria. Impacts are evaluated using criteria from IAQM and EPUK (Moorcroft and Barrowcliffe et al, 2017). The final evaluation of significance is based on professional judgement and expertise, in accordance with guidance from the IAQM.

2.6 Significance Criteria

2.6.1 The approach developed jointly by Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) (Moorcroft and Barrowcliffe et al, 2017) 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.

2.6.2 Table 2-3 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.

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

Table 2-3: 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 "Without Scheme" concentration where there is a decrease in pollutant concentration and the "With Scheme" concentration where there is an increase.

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

2.6.4 The overall significance of the air quality impacts is determined using professional judgement, taking account of the impact descriptors set out in Table 2-3. The potential 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.

2.7 Limitations

2.7.1 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 algorithm.

2.7.2 In the absence of updated road traffic data, the roads model from the recent Section 73 application (LCY, 2022) has been used. For the 2038 assessment year, the traffic model for 2031 was used (this was based on 9 million passengers per year, the same as the 2038 scenarios in this assessment). This will tend to overestimate concentrations, since emissions per trip are expected to fall between 2031 and 2038. The roads contribution is only relevant to this assessment inasmuch as it affects the total concentrations of pollutants, since it is assumed to be the same with or without the ACP (passenger numbers being the same in DN and DS scenarios).

2.7.3 Predicting pollutant concentrations in a future year will always be subject to uncertainty. For obvious reasons, the model cannot be verified in the future, and it is necessary to rely on projections as to what will happen to activity data, background pollutant concentrations and emission factors.

2.7.4 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.

2.8 Assumptions

2.8.1 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;
- how many movements will transfer from E190 to A32N aircraft; and
- the choice of meteorological data is appropriate.

3 Baseline Conditions

3.1 Existing Baseline

Summary of Baseline Data

3.1.1 As outlined in Section 2.2, LCY itself and Local Authorities in close proximity to LCY operate a variety of both automatic and diffusion tube air quality monitoring stations. A summary of the automatic data collected by LCY over the five-year period (2020-2024) is shown in Table 3-1 to Table 3-3, and the diffusion tube data are summarised in Table 3-4. Locations of the monitors run by LCY are shown in Figure 3-1 and Figure 3-2.

3.1.2 While 2020 results have been presented in this Section for completeness, they are not relied upon in any way as they will not be representative of typical air quality conditions due to the considerable impact of the Covid-19 pandemic on traffic volumes and thus pollutant concentrations.

Table 3-1: Summary of Continuous Nitrogen Dioxide Monitoring at LCY

Site	2020	2021	2022	2023	2024
	Annual Mean (µg/m^3)				
LCA-KGV	-	-	18.1	17.1	15.6
LCA-ND	19.7	20.6	22.1	17.1	14.8
	Number of Hours above 200 µg/m^3				
LCA-KGV	-	-	0	0	0
LCA-ND	0	0	11	0	0

Table 3-2: Summary of PM_{10} Monitoring at LCY

Site	2020	2021	2022	2023	2024
	Annual Mean (µg/m^3)				
LCA-KGV	15.1	14.6	14.6	13.0	11.9
	Number of Days above 50 µg/m^3				
LCA-KGV	6	3	5	2	0

Table 3-3: Summary of $PM_{2.5}$ Monitoring at LCY

Site	2020	2021	2022	2023	2024
	Annual Mean (µg/m^3)				
LCA-KGV	8.9	9.4	9.2	8.2	7.6

Table 3-4: Summary of Diffusion Tube Annual Mean Nitrogen Dioxide Monitoring at LCY (µg/m³)

Site	2020	2021	2022	2023	2024
LCA01	21.4	22.5	21.6	17.1	16.5
LCA02	21.8	21.6	22.7	17.7	17.6
LCA03	-	-	-	-	-
LCA04	22.8	24.9	24.0	18.5	16.8
LCA05	20.8	21.9	20.9	17.4	14.0
LCA06	23.8	23.2	19.7	15.5	14.1
LCA07	22.3	21.2	23.7	19.0	18.4
LCA08	19.0	22.8	-	-	-
LCA09	21.7	25.3	-	-	-
LCA10	23.4	26.0	25.6	20.3	19.4
LCA11	25.2	22.4	25.7	19.5	16.7
LCA12	21.6	25.5	23.4	17.3	17.2
LCA13	23.7	27.9	23.0	18.6	16.6
LCA14	26.2	23.9	26.7	19.3	17.3
LCA15	21.3	24.9	22.3	16.6	16.0
LCA16	-	-	-	-	-
LCA18	19.9	21.6	21.6	15.3	14.7
LCA19	-	-	-	-	-
LCA20	24.20	27.3	25.3	20.6	22.2
LCA21	-	20.3	18.7	13.8	13.4
LCA22	-	-	-	18.8	17.5

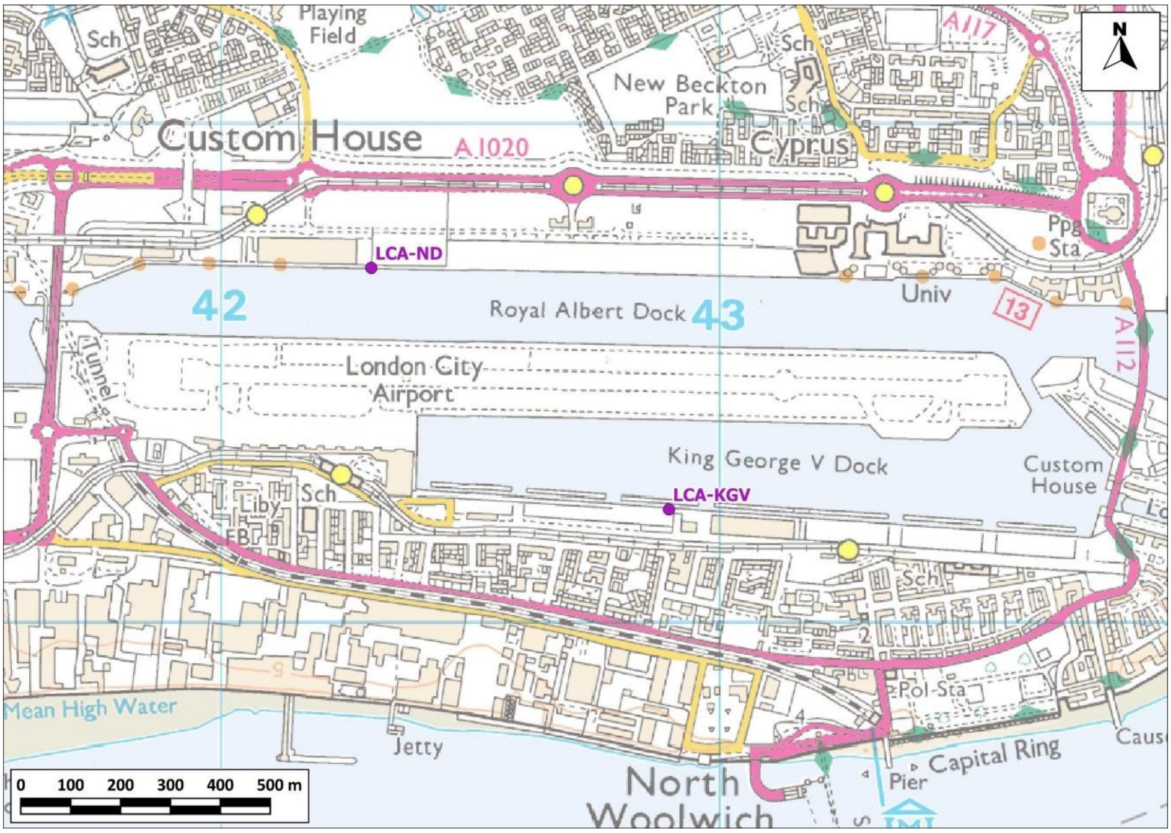

Figure 3-1: Automatic Monitoring Stations in LCY Network (2024)

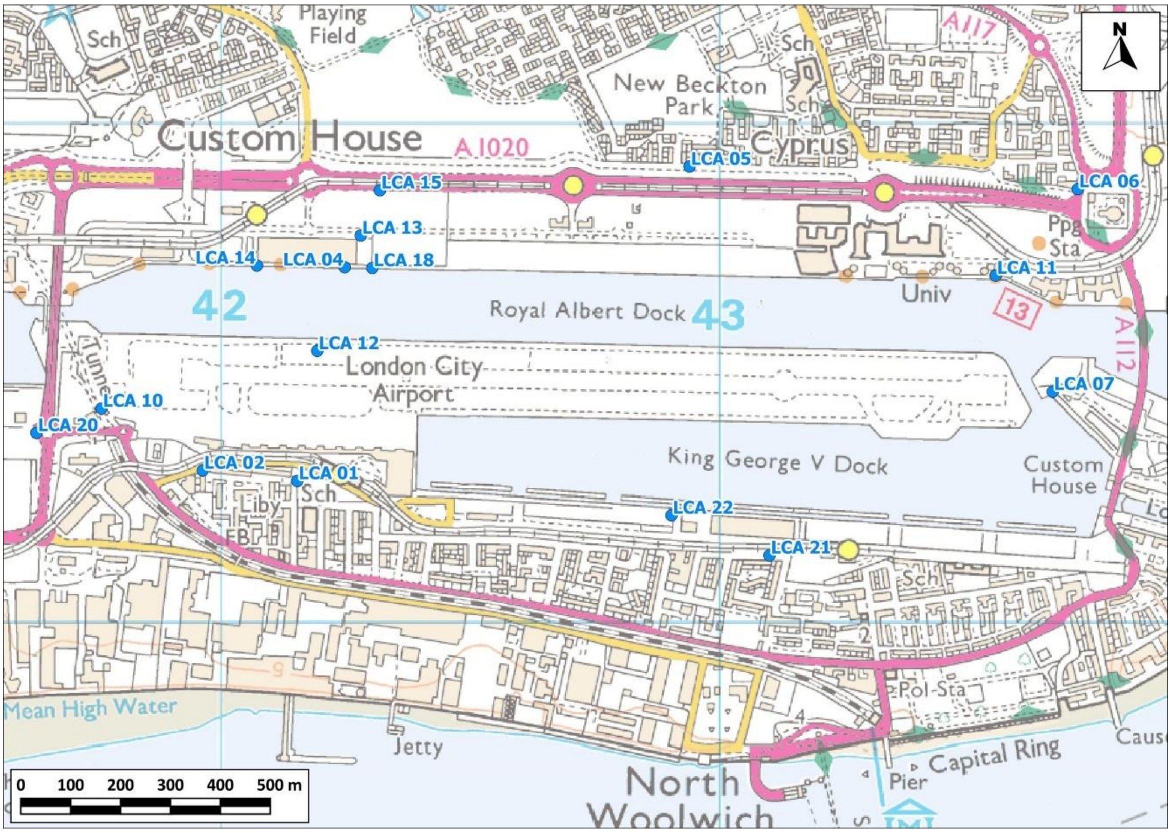

Figure 3-2: Diffusion Tube Monitoring Stations in LCY Network (2024)

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3.1.3 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-KGV or LCA-ND in 2024 (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-KGV or LCA-KGV in 2024 (or in any other year since monitoring commenced in 2006);
- The annual mean $PM_{2.5}$ objective and GLA target (10 µg/m^3) were not exceeded at LCA-KGV in 2024; and
- The annual mean nitrogen dioxide concentrations measured at the diffusion tube sites ranged from 14 to 22 µg/m^3 in 2024 compared with the objective value of 40 µg/m^3. There were no measured exceedances of the air quality objective in 2024 (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.

3.1.4 A summary of results from the seven local authority sites in closest proximity to the Airport is provided in Table 3.5 to Table 3.8. The locations of these monitors are shown in Figure 3-3. There have been no reported hours where nitrogen dioxide concentrations were above 200 µg/m^3 at any of the sites, and these data are not tabulated.

Table 3.5: Annual Mean Nitrogen Dioxide Concentrations (µg/m³) at Local Authority Sites [a]

Monitoring Site	Site Type	2020	2021	2022	2023	2024
Newham Cam Road NM2	Roadside	24	23	24	21	20.2
Newham Wren Close NM3	Background	20	21	22	20	16.7
Greenwich Burrage Grove GN0	Roadside	26	27	26	23	20.2
Greenwich Woolwich Flyover GR8	Roadside	**43**	40	40	33.1	33.9
Greenwich John Harrison Way GN6	Roadside	26	25	23	22	19.8
Greenwich Hoskins Street GN5	Roadside	34	33	32	30.9	28.5
Tower Hamlets Blackwall TH004	Roadside	39	37	28	28	30.6

[a] Exceedances of the objective are shown in bold.

Table 3.6: Annual Mean PM_{10} Concentrations (µg/m³) at Local Authority Sites

Monitoring Site	Site Type	2020	2021	2022	2023	2024
Newham Cam Road NM2	Roadside	18	17	16	14	14.3
Newham Wren Close NM3	Background	20	18	18	15	14.6
Greenwich Burrage Grove GN0	Roadside	15	13	14.3	13	13.5
Greenwich Woolwich Flyover GR8	Roadside	21	20	18	16.4	19.2
Greenwich John Harrison Way GN6	Roadside	19	20	19	16	16.3
Greenwich Hoskins Street GN5	Roadside	19	19	18.8	16	16.3
Tower Hamlets Blackwall TH004	Roadside	17	18	-	15	16.2

Table 3.7: Number of Days Over 50 µg/m³ PM_{10} at Local Authority Sites 2020 to 2024 [a]

Monitoring Site	Site Type	2020	2021	2022	2023	2024
Newham Cam Road NM2	Roadside	6	0	4	0	0
Newham Wren Close NM3	Background	6	2	4	0	0
Greenwich Burrage Grove GN0	Roadside	0	0	3 (24.9)	0	0
Greenwich Woolwich Flyover GR8	Roadside	5	5	5	2 (26.4)	2
Greenwich John Harrison Way GN6	Roadside	3	3	3	3	0
Greenwich Hoskins Street GN5	Roadside	6	2	4 (30.8)	1	0
Tower Hamlets Blackwall TH004	Roadside	4	0 (27.1)	-	1	0

[a] Values in brackets are 90.4th percentiles, which are presented where data capture is <85%.

Table 3.8: Annual Mean $PM_{2.5}$ Concentrations (µg/m³) at Local Authority Sites 2020 to 2024

Monitoring Site	Site Type	2020	2021	2022	2023	2024
Newham Cam Road NM2	Roadside	11	13	10	7	8.3
Newham Wren Close NM3	Background	12	14	11	9	9.1
Greenwich Burrage Grove GN0	Roadside	12	11	12	-	8.8
Greenwich Woolwich Flyover GR8	Roadside	10	11.5	12	-	9.0
Greenwich John Harrison Way GN6	Roadside	9	11	10	8.2	7.3
Greenwich Hoskins Street GN5	Roadside	8	7.7	8	6.5	6.9
Tower Hamlets Blackwall TH004	Roadside	9	11	8	9	9.8

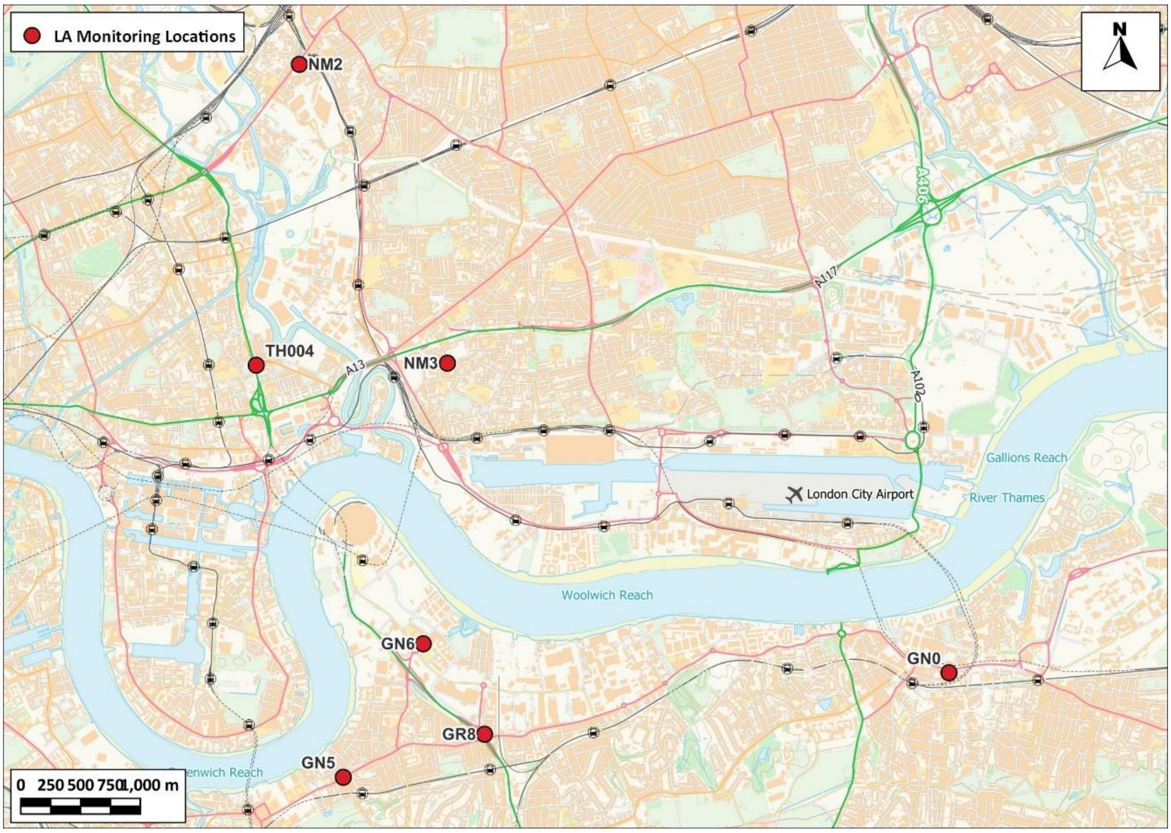

Figure 3-3: Local Authority Monitoring Locations

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3.2 Future Baseline

3.2.1 Concentrations of annual mean nitrogen dioxide, PM_{10} and $PM_{2.5}$ have been predicted for both future assessment years (2027 and 2038) under the DN scenario. These concentrations are presented alongside the results for the DS scenario in Section 4.

4 Assessment of Effects

4.1 Construction Phase Effects

4.1.1 This Airspace Change Proposal does not include any new infrastructure; it is therefore concluded that no further assessment impacts from construction is required.

4.2 Operational Phase Effects

4.2.1 All results are presented rounded to a number of significant figures. The number of significant figures is chosen to allow comparison between scenarios and receptors, and should not be taken as an indication of the accuracy of the modelling. Where results are presented as 0%, this should be interpreted as between -0.5% and +0.5%.

Total Emissions

4.2.2 A summary of the 2024, 2027 and 2038 aircraft emissions (in tonnes/year) is shown in Table 4-1. This shows aircraft emissions in the landing and take-off cycle below 3000 feet (914 m), including APU emissions, in 2027 and 2038 DN and DS scenarios as well as for 2024 to represent the current-day situation.

4.2.3 Emissions data should be used with caution, since they are not a direct measure of impact. The emissions from aircraft have been calculated within a ceiling altitude of 914 m; emissions at altitude cannot be directly compared with those derived from solely ground-based sources, as they will have very different effects at ground level where receptors may be exposed. Moreover, emissions are presented as NOx, a mixture of nitrogen dioxide (NO_2) and nitrous oxide (NO), whereas it is nitrogen dioxide that is associated with health effects and is subject to air quality objectives. The relation between NO_2 and NO is subject to complex atmospheric chemistry so NOx emissions are cannot readily be interpreted in terms of nitrogen dioxide concentrations.

4.2.4 Airport source NOx emissions decrease by between 7% (2027) and 14% (2038) in the DS scenario when compared to the equivalent years in the DN scenario. This is a reflection of the reduced number of aircraft movements carrying the same number of passengers; generally speaking, larger aircraft are more efficient per passenger. The percentage decreases in PM_{10} and $PM_{2.5}$ emissions are slightly greater.

Table 4-1: Summary of Aircraft Emissions (t/y)

Pollutant	2024	2027			2038		
		DN	DS	Change	DN	DS	Change
NOx (t/y)	187	206	192	-7%	388	334	-14%
PM_{10} (t/y)	2.13	2.29	2.10	-8%	3.38	2.76	-18%
$PM_{2.5}$ (t/y)	1.94	2.08	1.89	-9%	2.86	2.29	-20%

Concentrations

4.2.5 Concentrations of nitrogen dioxide, PM_{10} and $PM_{2.5}$ have been modelled for 2024 and for 2027 and 2038 DN and DS scenarios. Detailed results at each receptor are given in Appendix A3.

4.2.6 The contour plots presented below 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.

2024 Representing Current-Day Situation

4.2.7 The current-day situation is represented by the monitoring results presented in Section 3.1. This has been supplemented with modelling carried out on the same basis as the assessment years, and the results of this modelling are presented here.

4.2.8 The modelled concentrations of nitrogen dioxide, PM_{10} and $PM_{2.5}$ at each relevant receptor location for 2024 are set out in Appendix A3. The annual mean concentrations (in µg/m^3) for 2024 are also shown as isopleths in Figure 4-1 to Figure 4-3.

4.2.9 Figure 4-1 shows that concentrations of nitrogen dioxide above the objective (40 µg/m^3) in 2024 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. The highest predicted concentration in 2024 is 24.9 µg/m^3 or 62% of the objective, at the R1 (Camel Road/Parker Street) receptor.

4.2.10 Figure 4-2 and Figure 4-3 show that concentrations of PM_{10} and $PM_{2.5}$ are well below the respective objectives throughout the study area, and concentrations of $PM_{2.5}$ above the GLA target of 10 µg/m^3 are confined to parts of the airfield and the carriageways of some major roads. The highest predicted concentration of PM_{10} is 17.2 µg/m^3 or 43% of the objective at the R60 (Royal Docks Academy) receptor. The highest predicted concentration of $PM_{2.5}$ is 9.2 µg/m^3 or 46% of the objective at the R40a (Royals Business Park Hotel Site 2.2) receptor. There are no predicted exceedances of the PM_{10} or $PM_{2.5}$ objectives, or of the GLA target for $PM_{2.5}$ at relevant locations.

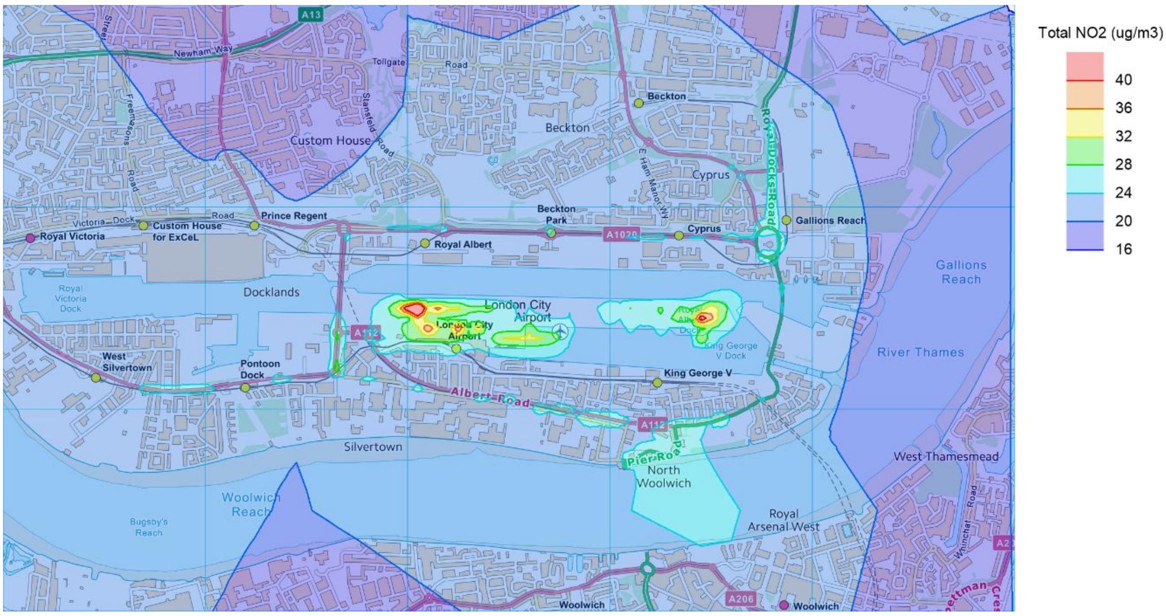

Figure 4-1: Annual mean nitrogen dioxide concentrations (µg/m^3), 2024

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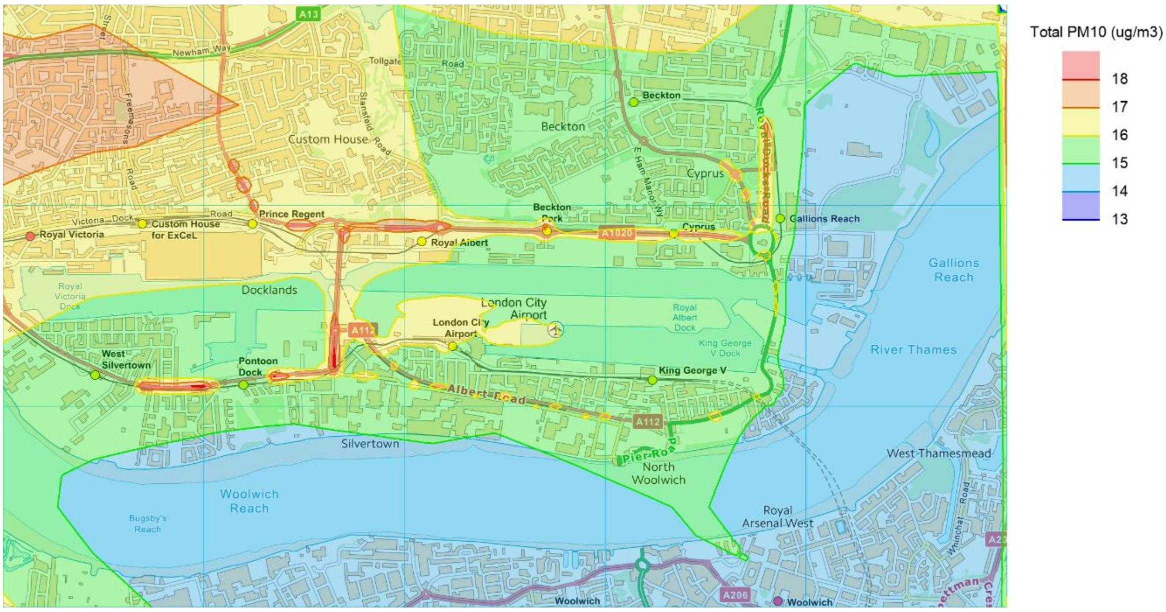

Figure 4-2: Annual mean PM_{10} concentrations (µg/m³), 2024

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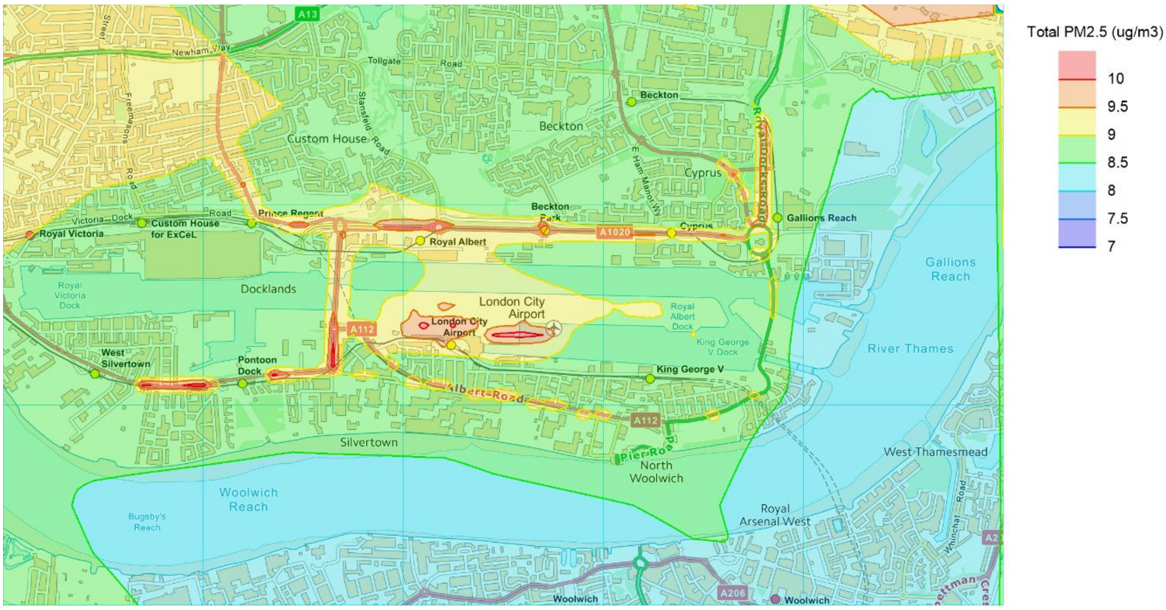

Figure 4-3: Annual mean $PM_{2.5}$ concentrations (µg/m³), 2024

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2027 Assessment Year

4.2.11 The predicted concentrations of nitrogen dioxide, PM_{10} and $PM_{2.5}$ at each relevant receptor location for the 2027 DN and DS scenarios are set out in Appendix A3. The annual mean concentrations (in µg/m³) for the 2027 DN and DS scenarios are also shown as isopleths in Figure 4-4 to Figure 4-9.

4.2.12 Figure 4-4 and Figure 4-5 show that concentrations of nitrogen dioxide above the objective (40 µg/m³) in 2027 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. The differences between DN and DS are very small, but DS concentrations can be seen to be slightly lower than DN.

4.2.13 The predicted annual mean concentrations of nitrogen dioxide in the 2027 DS scenario are lower than in DN at all human health receptors, by up to 0.1 µg/m³. The highest predicted concentration in the DS scenario is 23.7 µg/m³ or 59% of the objective, at the R2 (Camel Road/Parker Street) receptor, where the decrease due to the proposed change is 0.1 µg/m³, the greatest decrease at any modelled receptor. At all receptors, the magnitude of change in annual mean nitrogen dioxide concentrations due to the proposed amendments is less than 1% of the objective and the impacts, although beneficial, are negligible.

4.2.14 Figure 4-6 to Figure 4-9 show that concentrations of PM_{10} and $PM_{2.5}$ are well below the respective objectives throughout the study area, and concentrations of $PM_{2.5}$ above the GLA target of 10 µg/m³ are confined to parts of the airfield and the carriageways of some major roads. The predicted annual mean concentrations of PM_{10} and $PM_{2.5}$ are lower in the 2027 DS scenario than in DN at all human health receptors, by up to 0.01 µg/m³ for each pollutant. The highest predicted concentration of PM_{10} is 17.0 µg/m³ or 43% of the objective at the R60 (Royal Docks Academy) receptor, where the decrease due to the proposed change is less than 0.01 µg/m³. The highest predicted concentration of $PM_{2.5}$ is 9.0 µg/m³ or 45% of the objective at the R53a (Connaught Bridge Hotel) receptor. There are no predicted exceedances of the PM_{10} or $PM_{2.5}$ objectives, or of the GLA target for $PM_{2.5}$ at relevant locations, and all predicted impacts, although beneficial, are negligible.

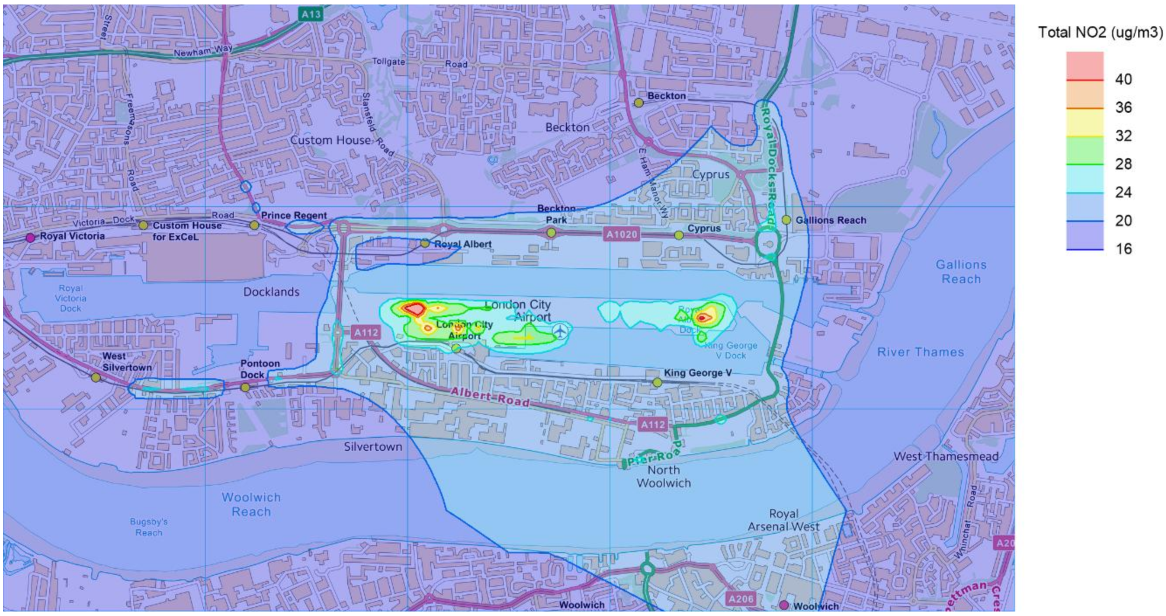

Figure 4-4: Annual mean nitrogen dioxide concentrations (µg/m³), 2027 DN scenario

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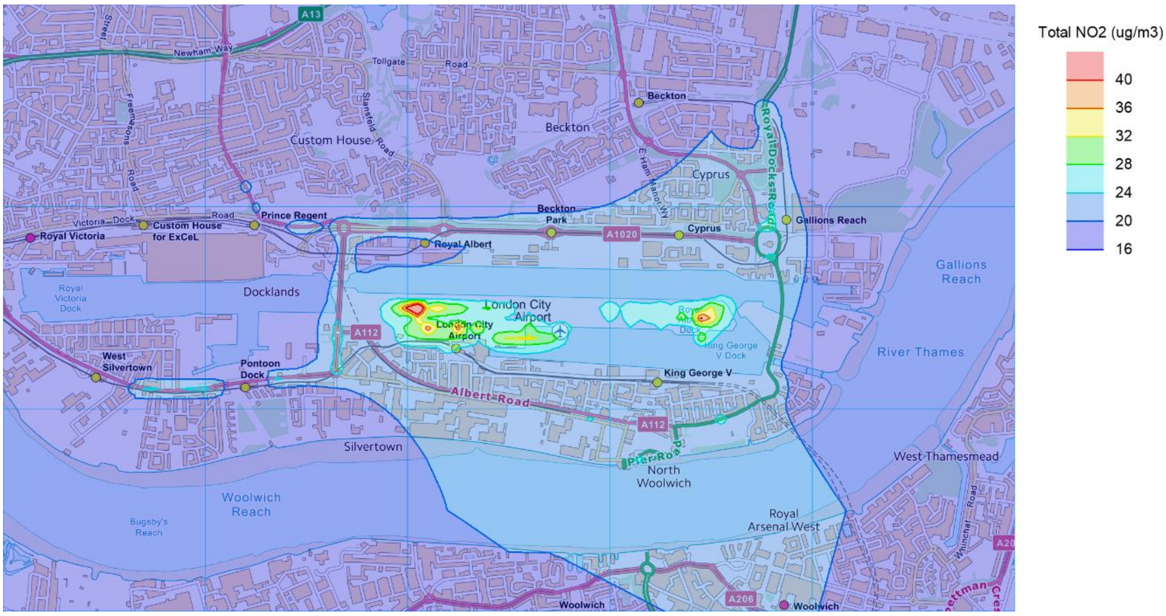

Figure 4-5: Annual mean nitrogen dioxide concentrations (µg/m³), 2027 DS scenario

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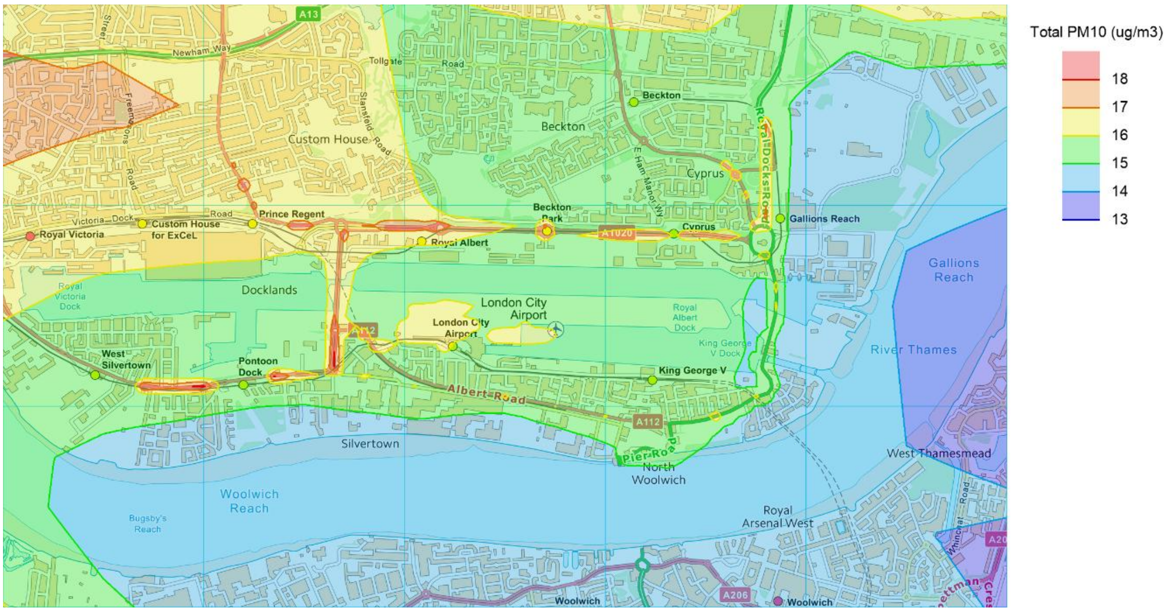

Figure 4-6: Annual mean PM_{10} concentrations (µg/m³), 2038 DN scenario

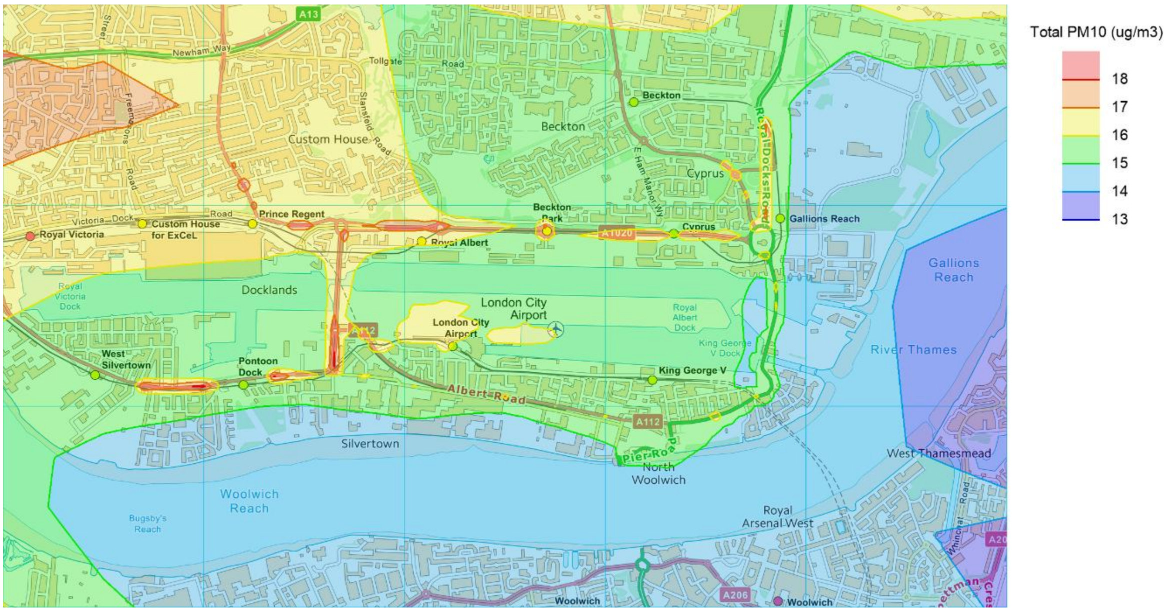

Figure 4-7: Annual mean PM_{10} concentrations (µg/m³), 2038 DS scenario

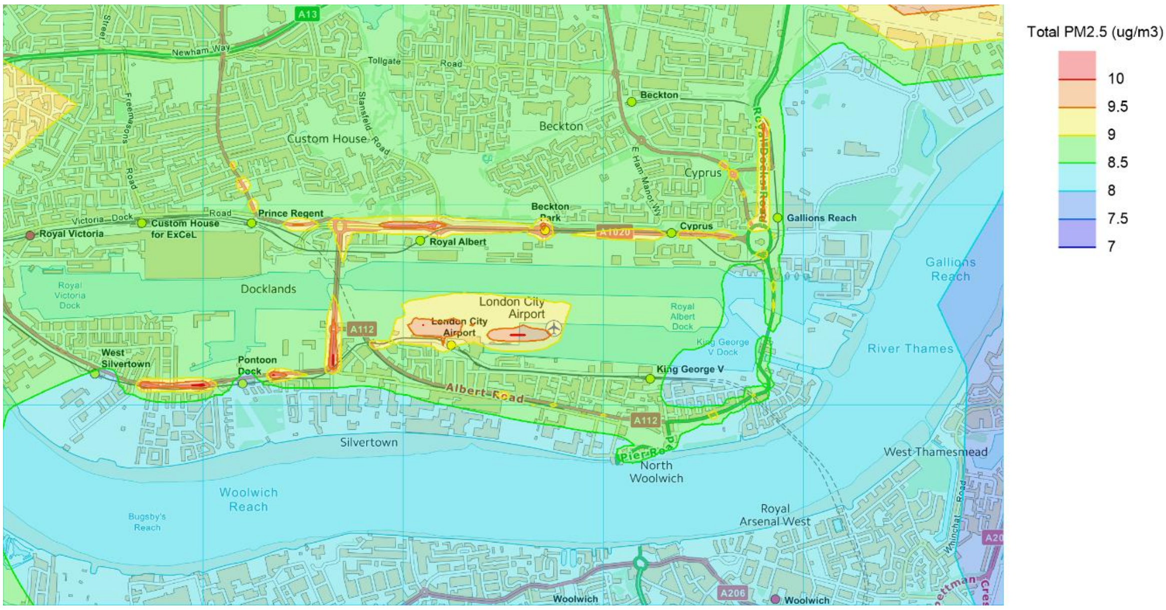

Figure 4-8: Annual mean $PM_{2.5}$ concentrations (µg/m³), 2038 DN scenario

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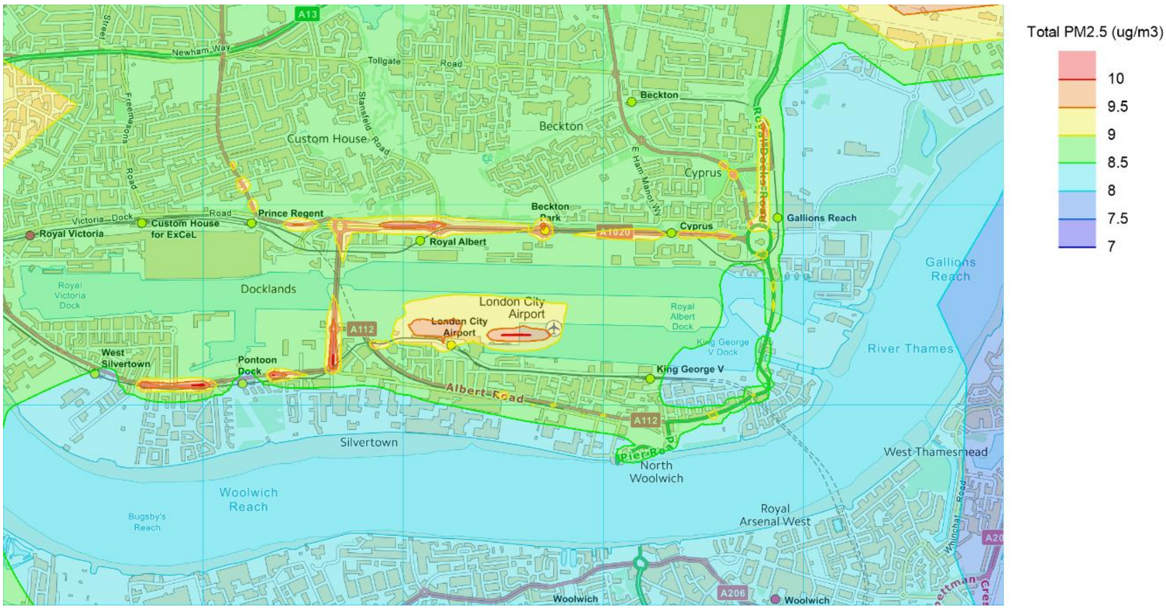

Figure 4-9: Annual mean $PM_{2.5}$ concentrations (µg/m³), 2038 DS scenario

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2038 Assessment Year

4.2.15 The predicted concentrations of nitrogen dioxide, PM_{10} and $PM_{2.5}$ at each relevant receptor location for the 2027 DN and DS scenarios are set out in Appendix A3. The annual mean nitrogen dioxide concentrations (in µg/m³) for the 2027 DN and DS scenarios are also shown as isopleths in Figure 4-10 and Figure 4-11.

4.2.16 Figure 4-10 and Figure 4-11 show that concentrations of nitrogen dioxide above the objective (40 µg/m³) in 2038 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. The differences between DN and DS are small, but DS concentrations can be seen to be slightly lower than DN.

4.2.17 The predicted annual mean concentrations of nitrogen dioxide in the 2038 DS scenario are lower than in DN at all human health receptors, by up to 1.2 µg/m^3. The highest predicted concentration in the DS scenario is 24.1 µg/m^3 or 60% of the objective, at the R2 (Camel Road/Parker Street) receptor, where the decrease due to the proposed change is 1.2 µg/m^3, the greatest decrease at any modelled receptor. At all receptors, the magnitude of change in annual mean nitrogen dioxide concentrations due to the proposed amendments is at most 3% of the objective and the impacts, although beneficial, are negligible.

4.2.18 Figure 4-12 to Figure 4-15 show that concentrations of PM_{10} and $PM_{2.5}$ are well below the respective objectives throughout the study area, and concentrations of $PM_{2.5}$ are everywhere below the GLA target of 10 µg/m^3. The predicted annual mean concentrations of PM_{10} and $PM_{2.5}$ are lower in the 2038 DS scenario than in DN at all human health receptors, by less than 0.1 µg/m^3 for each pollutant. The highest predicted concentration of PM_{10} is 16.6 µg/m^3 or 41% of the objective at the R60 (Royal Docks Academy) receptor, where the decrease due to the proposed change is less than 0.01 µg/m^3. The highest predicted concentration of $PM_{2.5}$ is 8.5 µg/m^3 or 43% of the objective at the R40a (Royals Business Park Hotel Site 2.2) receptor, where the decrease due to the proposed change is less than 0.01 µg/m^3. There are no predicted exceedances of the PM_{10} or $PM_{2.5}$ objectives, or of the GLA target for $PM_{2.5}$, and all predicted impacts, although beneficial, are negligible.

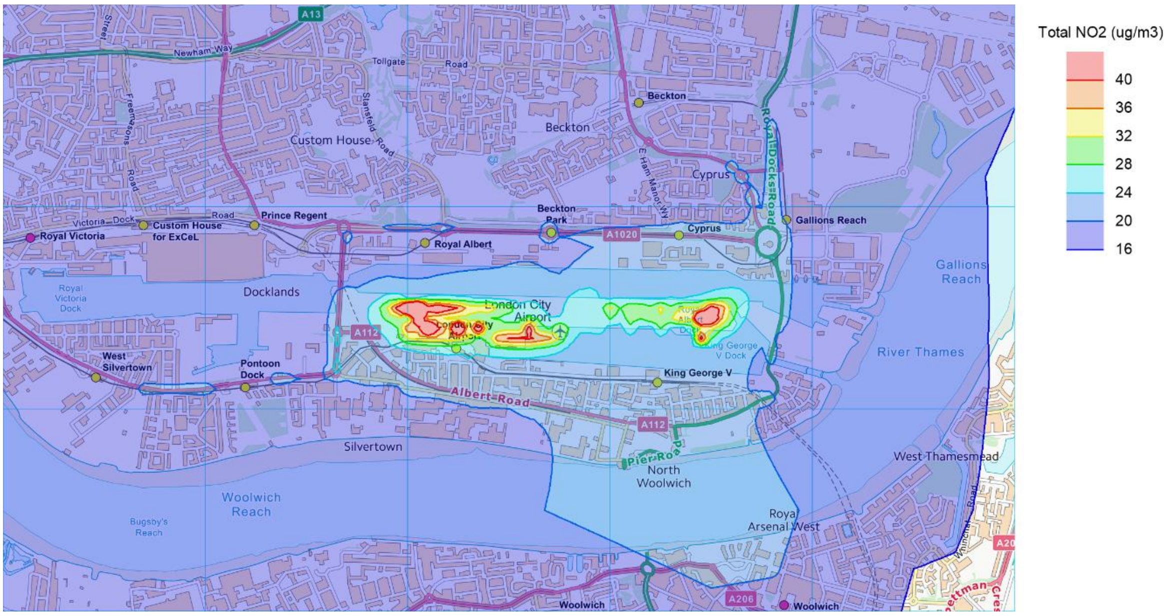

Figure 4-10: Annual mean nitrogen dioxide concentrations (μg/m³), 2038 DN scenario

Figure 4-11: Annual mean nitrogen dioxide concentrations (μg/m³), 2038 DS scenario

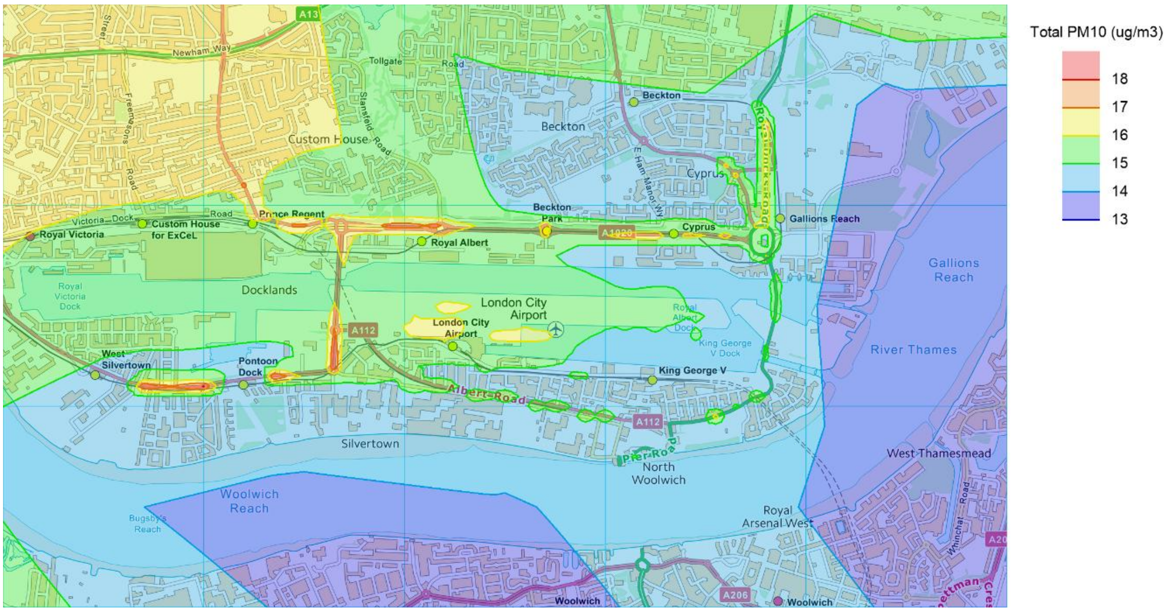

Figure 4-12: Annual mean PM_{10} concentrations (µg/m³), 2038 DN scenario

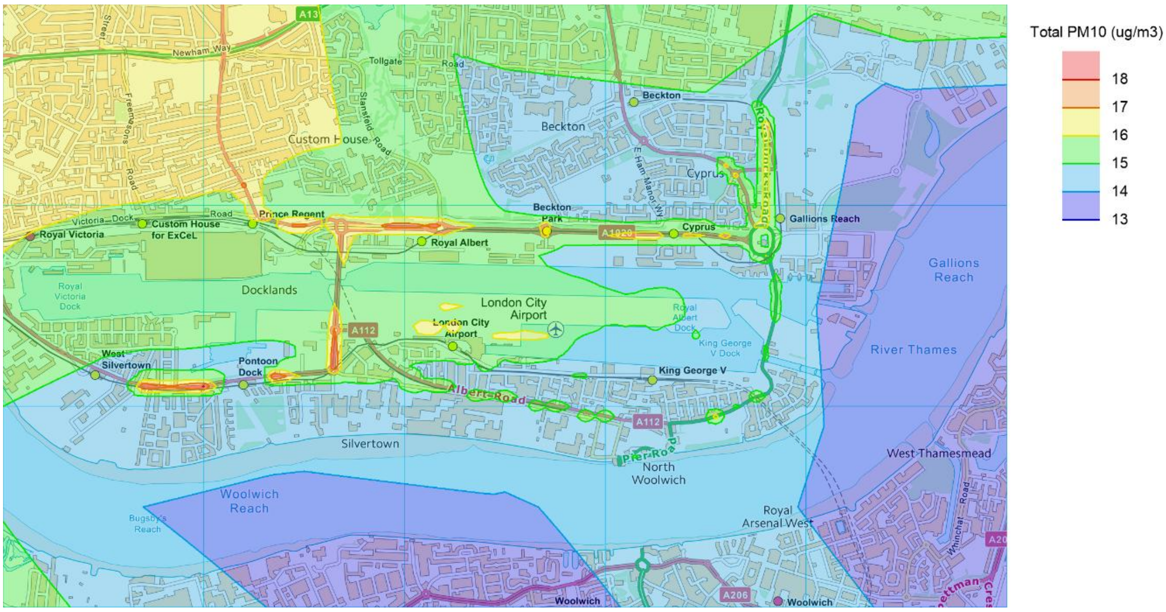

Figure 4-13: Annual mean PM_{10} concentrations (µg/m³), 2038 DS scenario

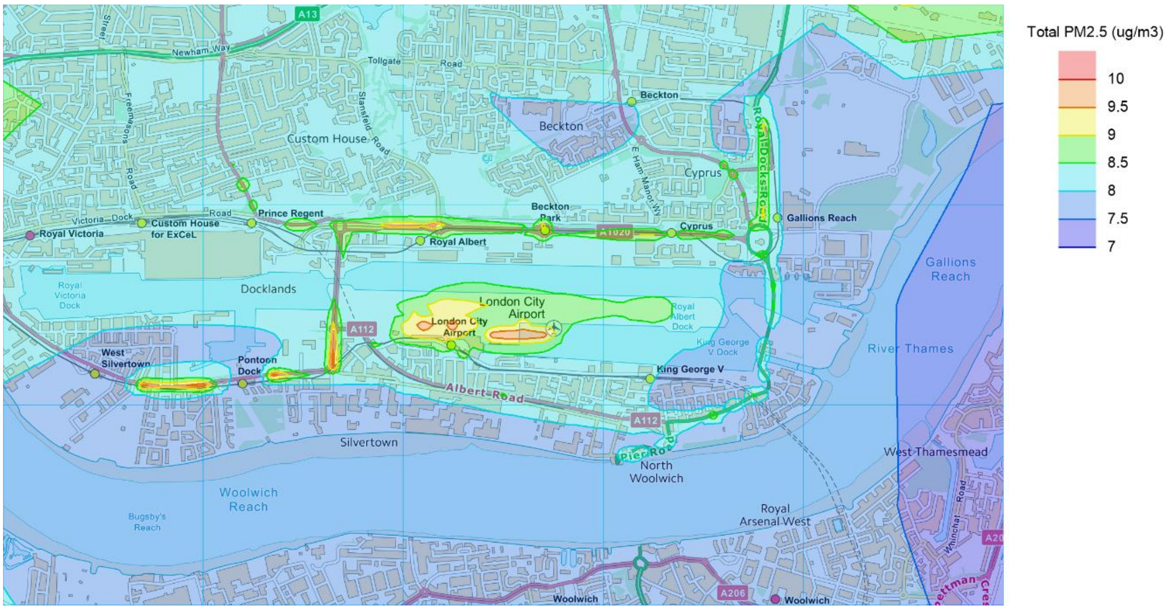

Figure 4-14: Annual mean $PM_{2.5}$ concentrations (µg/m³), 2038 DN scenario

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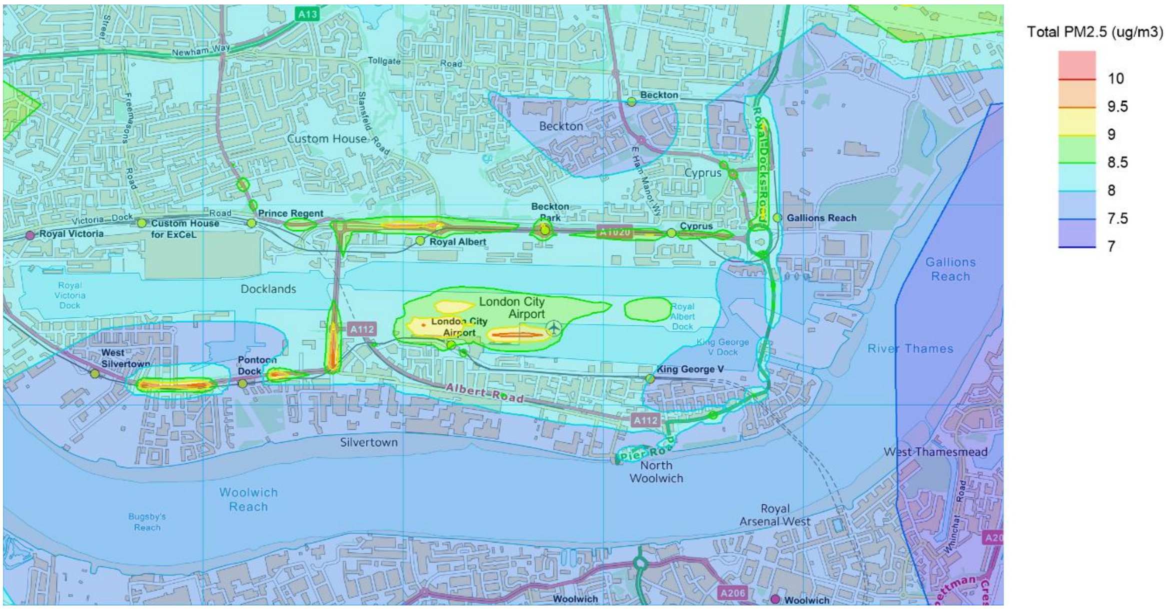

Figure 4-15: Annual mean $PM_{2.5}$ concentrations (µg/m³), 2038 DS scenario

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Assessment Against Limit Values

4.2.19 There are several AURN monitoring sites within the Greater London Urban Area that have measured exceedances of the annual mean nitrogen dioxide limit value in recent years (Defra, 2025a). Furthermore, Defra's roadside annual mean nitrogen dioxide concentrations (Defra, 2025c), which are used to identify and report exceedances of the limit value, have identified exceedances of this limit value in recent years along many roads in London. The Greater London Urban Area has thus been reported as exceeding the limit value for annual mean nitrogen dioxide concentrations in recent years. However, no exceedances of the limit value were observed in Greater London in 2024 and the area was declared compliant (Defra, 2025e). Moreover, Defra's predicted concentrations for 2027 (Defra, 2020) also do not identify any exceedances within the study area. As such, there is considered to be no risk of a limit value exceedance in the vicinity of the airport by the time the ACP is operational.

4.2.20 Moreover, the modelling presented above shows that there is no risk that the ACP will result in future non-compliance with the limit values, as it will reduce concentrations of relevant pollutants close to the airport.

4.2.21 Defra's Air Quality Plan requires the GLA to prepare an action plan that will "deliver compliance in the shortest time possible", and the 2015 Plan assumed that a CAZ was required. The GLA has already implemented an LEZ and a ULEZ, thus the authority has effectively already implemented the required CAZ. These have been implemented as part of a package of measures including 12 Low Emission Bus Zones, Low Emission Neighbourhoods, the phasing out of diesel buses and taxis and other measures within the Mayor's Transport Strategy.

5 Summary and Conclusions

5.1.1 The assessment set out above has described the likely significant effects of the Airspace Change Proposal through a comparison against the future baseline case. The change will enable the replacement of E190 movements with a smaller number of A32N movements, with the same number of passengers, which results in lower aircraft emissions compared to the future baseline (DN) scenario.

5.1.2 The model has shown that concentrations of nitrogen dioxide, PM_{10} and $PM_{2.5}$ will be well below their respective air quality objectives in both future assessment years and in both Do Something and Do Nothing scenarios. The DS scenarios result in slightly lower concentrations than the DN scenarios, for all pollutants, but the differences are small. The air quality impacts of the ACP, although slightly beneficial, are all negligible.

5.1.3 Considering the results of the model, it is concluded that the air quality impacts of the ACP, although slightly beneficial, are negligible and not significant. In particular, the ACP will not result in pollutants breaching legal limits or target values following the implementation of the ACP, or worsen an existing breach of legal limits or target values.

6 Appendices

A1 Detailed Assessment Methodology

A1.1 Overview

A1.1.1 The assessment has used the same methodology as was used in the air quality assessment (LCY, 2022) to support LCY's recent Section 73 (S73) application (Application Ref: 22/03045/VAR) to allow up to 9 million passengers per annum.

A1.1.2 The following sources do not differ between the DN and DS scenarios in 2027 or 2038, and have been carried forward from the modelling carried out for the S73:

- Ground support equipment;
- Heating plant;
- Aircraft engine testing; and
- Landside road traffic.

A1.1.3 Where appropriate, these have been scaled to the number of passengers currently forecast for the 2027 and 2038 scenarios.

A1.1.4 The road traffic contribution in the S73 model was adjusted according to a verification factor derived from a comparison of model results against monitoring data. For the present assessment, the same verification factor has been used to adjust the model. The aircraft contribution has not been adjusted.

A1.1.5 Background concentrations, that is the pollutant concentrations due to sources that have not been explicitly modelled, have been taken from the latest version of Defra's background maps.

A1.1.6 Full details of the calculation of the above sources is given in the documentation supporting the S73 application, available on Newham Council's planning portal at https://pa.newham.gov.uk/online-applications/applicationDetails.do?activeTab=documents&keyVal=RNYU92JY5NA00, and are not reproduced here.

A1.1.7 The methodology for calculating the aircraft contributions is also unchanged from the S73 model, but details are provided here since they are key to the present assessment.

A1.2 Air Quality Model

A1.2.1 The predictions of future air quality have been carried out using the ADMS-Airport software tool produced by CERC. This uses the same underlying dispersion model as the rest of the ADMS family, but with extensions to facilitate modelling aircraft sources. ADMS-Airport incorporates a jet module specifically designed to represent the dispersion of emissions from moving aircraft.

A1.2.2 The model requires the user to provide a variety of input data, which describe the pollutant emissions arising from the proposed development, the meteorological conditions, and how the pollutants are released to air.

A1.2.3 Pollutant emissions arise from a number of airport-related sources, and the following were taken into consideration in this assessment:

- aircraft main engines operating within the Landing and Take-off (LTO) Cycle;
- aircraft Auxiliary Power Units (APUs); and

- brake and tyre wear.

A1.2.4 The approach to quantifying emissions from the Airport sources has been based on methodologies used in many assessments of air quality at UK airports, and, as far as practicable, follows the advanced approach recommended by the International Civil Aviation Organisation (ICAO) in its Airport Air Quality Manual (2020). For all airside sources except aircraft brake and tyre wear, emissions of PM were assumed to represent both the PM_{10} and $PM_{2.5}$ fractions, based on the expected size distributions (i.e. most particulate is expected to be in the $PM_{2.5}$ size fraction).

A1.3 Aircraft Main Engine Emissions

A1.3.1 The emissions arising from each aircraft movement have been calculated as the sum of the emissions for each part ('mode') of the LTO cycle, i.e. approach, landing roll, taxi-in, warm-up, taxi-out, hold, take-off roll, and climb. Forecast movements and aircraft mix for all future scenarios were provided by York Aviation. A summary of the commercial aircraft data used in this assessment is provided in Table A1-1. Passenger numbers are 4.1 million in 2027 and 9.0 million in 2038, in both DN and DS scenarios.

Table A1-1: Commercial Aircraft Movements

Aircraft Type	2027		2038	
	DN	DS	DN	DS
Airbus A220-100 Passenger	7,000	7,000	20,100	13,900
Airbus A319	0	0	0	0
Airbus A320 neo	0	1,700	0	37,400
ATR 72	2,400	2,400	3,100	3,000
ATR42 /ATR72	0	0	0	0
Bombardier DHC8 Dash 8-400/8Q	3,800	3,800	0	0
Embraer 190	36,600	31,000	3,900	0
Embraer 190 E2	1,400	1,400	3,900	2,700
Embraer E195-E2	1,600	1,600	67,000	16,900
Total	52,800	48,900	98,000	73,900

A1.3.2 In addition, aircraft movements associated with the Jet Centre have been assumed to continue in the same numbers as 2024 in future years.

A1.3.3 All turbofan-type aircraft jet engines with a rated power greater than 26.7 kN are certified by ICAO for emissions of NOx, HC, Smoke Number and, for newer engines, non-volatile particulate matter (nvPM). Certification results are published in the ICAO Emissions Databank (ICAO, 2025). In addition, a database of emissions indices for all commercially operational turboprop aircraft engines is kept by the Swedish Defence Research Agency (FOI) (Swedish Defence Research Agency, 2021). These databases contain fuel flow rates in kg/s and emission indices of individual pollutants in grams of pollutant per kilogram of fuel used; multiplying the emission index by the fuel flow gives the emission factor in g/s. Data is given at four thrust settings, representative of different modes of the LTO cycle.

A1.3.4 For each type of aircraft, emissions per aircraft movement have been calculated using emission factors and times in mode, based on the following equation:

$$E_{ij} = \sum (TIM_{jk}*60) * (FF_{jk}) * (EI_{jk}) * (NE_j)$$

Where:

E_{ij} = Emissions of pollutant i in grams, produced by aircraft type j for each LTO cycle;

TIM_{jk} = Time-in-mode for mode k in minutes for aircraft type j;

FF_{jk} = Fuel flow for mode k in kg/sec for each engine on aircraft type j;

EI_{jk} = Emissions index for each pollutant i in grams per kilogram of fuel, in mode k, for each engine used on aircraft type j; and

NE_j = Number of engines on aircraft type j.

A1.3.5 Airframe/engine assignments were based on actual data for all aircraft. For those aircraft types which may be fitted with more than one type of engine, the most common engine in the Airport fleet was chosen. No improvement in emission rates has been assumed for future years.

A1.3.6 The approach used for the estimation of PM emissions arising from aircraft engines has undergone development in recent years. The ICAO Airport Air Quality Manual recommends the so-called First Order Approximation (FOA) version 4.0, but notes that nvPM measurements from the ICAO Databank should be used in preference to values estimated using FOA. This assessment therefore takes nvPM emission factors from the ICAO Databank where available, and uses FOA4.0 otherwise (for older engines). Volatile PM (vPM) emission factors are calculated using FOA4.0 for all engines.

A1.3.7 Emissions of PM from the turboprop and smaller (business) jet aircraft, where no Smoke Number indices are available, have been disregarded, but these are considered to be negligible.

A1.3.8 For certification purposes, ICAO has defined a 'reference' LTO cycle with four modal phases, extending to a ceiling height of 3,000 feet (914 metres). Emission factors are provided for 'take-off' (100% thrust), 'climb-out' (85% thrust), 'approach' (30% thrust) and 'idle' (7% thrust). In reality, aircraft rarely take-off at 100% thrust — the actual take-off thrust used being dependent on a combination of factors including take-off weight and weather conditions. Following discussion with LCY, and in consideration of the short runway, a take-off thrust of 100% was used for all aircraft departures. This is a conservative assumption.

A1.3.9 Take-off roll along the runway, and initial climb to 1500 ft (457.5 m) was assumed to be at 100% thrust setting. Climb-out after throttle back from 1500–3000 ft (457.5–914m) was assumed to be at 85% thrust.

A1.3.10 The majority of commercial jet aircraft operating at the Airport have reverse thrust capability, which may be deployed during the landing roll to increase the rate of deceleration. However, the Airport discourages the use of reverse thrust to reduce noise, and the airlines also try to avoid the use of reverse thrust above idle to minimise fuel consumption. As a result, only a very small number of aircraft movements at the Airport utilise reverse thrust above idle during landing. The assumption used in the modelling has therefore been that aircraft engine thrust is reduced to idle (7%) for the landing roll (i.e. from the point of touchdown on the runway to the start of taxi); emissions from the small number of aircraft using reverse thrust above idle has been discounted as they are expected to make an insignificant contribution to total runway emissions.

A1.3.11 Emission factors within the ICAO and FOI databases are usually stated for new engines. The Project for the Sustainable Development of Heathrow (PSDH) recommended adjustment factors to account for engine deterioration. However the ICAO Air Quality Manual recommends not making such adjustments, and this (more recent) advice has been adopted.

A1.3.12 Times-in-mode have been derived from information provided by LCY. Approach, landing roll, warm-up, hold, take-off roll and climb times were taken from S73 data; these are assumed to be unchanged in future scenarios. For taxi times, information has been derived from the Electronic Flight Progress System (EFPS) that monitors the time that aircraft operate engines on the ground from engine start-up to start-of-roll at departure, and following aircraft touch down until engine shut-down on stand, on arrival. Taxi times were derived from tables of average times between each group of stands and each runway end. A summary of these data is provided in Table A1-2 and Table A1-3.

Table A1-2: Summary of Times in Mode

Mode	Time (minutes)
Warm-Up	5.3
Hold	2.3
Take-Off Roll	0.4
Initial Climb	1.4
Climb Out	1.0
Descent	4.4
Approach	2.1
Landing Roll	0.7
APU	0.2

Table A1-3: Summary of Taxi Times

Runway	Stand group	Taxi-in time (minutes)	Taxi-out time (minutes)
09	3–10	4.3	4.1
09	12–JC	8.0	6.0
09	21–28	3.1	4.7
27	3–10	2.9	6.5
27	12–JC	4.1	9.0
27	21–28	2.8	5.7

A1.3.13 Emissions during climb-out and approach have been calculated to a ceiling height of 3000 feet (914 m).

A1.4 Brake and Tyre Wear

A1.4.1 An allowance has also been made for PM emissions arising from brake and tyre wear. The ICAO Airport Air Quality Manual does not offer a methodology for estimating brake and tyre wear emissions, so this assessment uses a methodology developed during the PSDH work (Curran, 2006).

A1.4.2 For brake wear, an emission factor of 2.53×10^{-7} kg PM_{10} per kg Maximum Take-off Weight (MTOW) was assumed.

A1.4.3 For tyre wear, the following relationship was used:

PM_{10} (kg) = 0.1 × 2.23 × 10^{-6} × (MTOW kg) – 0.0874 kg, where MTOW > 55,000 kg;

PM_{10} (kg) = 2.41 × (MTOW kg) / 55,000, where MTOW < 55,000 kg.

A1.4.4 The mean size of particles from attrition processes such as brake and tyre wear tends to be much higher than for combustion processes, so in this case setting $PM_{2.5}$ emission factors equal to PM_{10} emission factors is likely to be overestimate $PM_{2.5}$ emissions. For this assessment, the same assumption has been used as in modelling work for Heathrow Airport (Underwood et al., 2010), namely that $PM_{2.5}/PM_{10}$ ratios for road vehicles are appropriate. Emission factors from the EMEP/EEA air pollutant emission inventory guidebook 2019 (EEA, 2019) imply $PM_{2.5}/PM_{10}$ mass ratios of 0.4 for brake wear and 0.7 for tyre wear.

A1.5 Auxiliary Power Units

A1.5.1 Auxiliary Power Units (APUs) are used to provide power to larger aircraft when the main engines are not running. APUs are used to condition the aircraft cabin air when temperatures are uncomfortable, and are also required to start the main engines on some aircraft. APUs may also be used if there is an incompatibility between the aircraft system and the Fixed Electrical Ground Power (FEGP) or Mobile Ground Power Unit (MGPU) supplies, or if there is a technical fault.

A1.5.2 Operational and Safety Information Notice (OSIN 04/12), issued by the Airport, requires the use of FEGP or MGPU whenever available and serviceable. APUs are required to be shut down as soon as practicable following arrival and not restarted until 10 minutes prior to departure, except when the ambient air temperature is below +5 °C or above +20 °C. Operators wishing to use APU when these temperature thresholds are exceeded, or where there are technical faults, are required to contact Air Traffic Control (ATC) who maintain a log of such events. An analysis of records indicates that such events are very uncommon, representing only <1% of all aircraft movements.

A1.5.3 APU running times on arrival are dependent upon the availability of FEGP or MGPU; running times range from 1 to 5 minutes depending on how busy the Airport is. For the purpose of this assessment, a total APU running time of 13 minutes per LTO cycle has been assumed, which is likely to represent a worst case. Emissions for APUs have been calculated using the advanced approach as defined in the ICAO Airport Air Quality Manual, assuming a total running time of 13 minutes per LTO cycle (arrival + departure). This assigns different emission indices to different APU operating loads, i.e. start-up (no load), normal running (maximum Environmental Control System (ECS)), and high load (Main Engine Start (MES)). The assigned NOx, HC and PM emission rates are shown in Table A1-4.

Table A1-4: Summary of APU Emission Rates (g per LTO cycle)

Aircraft Group	NOx	PM	HC
Business jets/regional jets (seats < 100)	131	9.0	56
Smaller (100 ≤ seats < 200), newer types	140	6.5	45
Smaller (100 ≤ seats < 200), older types	140	11.6	13
Mid-range (200 ≤ seats < 300), all types	306	7.9	8
Larger (300 ≤ seats), older types	348	23.1	14
Larger (300 ≤ seats), newer types	549	5.2	10

A1.6 NOx to NO_2 Relationship

A1.6.1 Nitrogen dioxide (NO_2) concentrations have been calculated from the predicted NOx concentrations using the NO_2 from NOx calculator available on the Defra air quality website (Defra, 2020). For the purposes of the calculator, the contributions from the aircraft and other non-roads sources are included in the calculator's "background" input term.

A1.7 Spatial and Temporal Representation of Emissions

A1.7.1 Emissions occur at different locations and over different time periods. The spatial representation of sources has been undertaken using a combination of line, point, area and volume sources. Aircraft taxiing and holding emissions were represented as line sources based on schematic taxi routes between the stands and the runway. Emissions during take-off roll were distributed between the start-of-roll point on the runway and the estimated point of 'wheels-off'.

A1.7.2 Aircraft movements, including taxiing, take-off, initial climb, climb-out, approach and landing roll-out are all contained within an "airfile" in ADMS-Airport. This file contains information on the geometry of individual aircraft, the engine exhaust parameters (exit velocity, temperature and diameter), the geometry of the LTO cycle (e.g. taxiway start and end points, take-off start and end points, approach start and end points etc.), the times in mode, and the aircraft emissions.

A1.7.3 Each aircraft movement between spatial nodes is included as a separate line in the airfile. ADMS-Airport then treats each source as a series of fixed jet sources between each node point. Each line of the airfile is assigned an "NT number", which is the number of fixed jet sources along its length. For each part of the LTO cycle, there is a maximum jet source spacing, which is used to calculate NT, i.e. NT = (distance between aircraft start and end points) / (maximum jet-source spacing), rounded up. The ADMS-Airport User Guide includes recommended maximum jet source spacings, which depend on mode. The assessment model used either the maximum jet source spacings from the User Guide, or a smaller spacing to reflect the relatively short distances at the Airport. These are given in Table A1-5.

Table A1-5: Maximum Jet Source Spacings (m)

Mode	Maximum Jet Source Spacing Used in Assessment	ADMS-Airport User Guide Recommendation
Take off	150	200
Initial climb	300	300
Climb out	700	700
Approach	700	700
Landing Roll	200	400
Hold	400	400
Taxiing	200	400

A1.7.4 The emission rates contained within the airfile are annual average emission rates based on the number of movements of a particular aircraft or group of aircraft, assuming 100% usage of both Runway 09 and Runway 27. A time-varying emission file was then used to apportion the movements to the runways on an hour-by-hour basis, depending on wind direction.

A1.7.5 Dispersion of emissions has a slight dependence on hour of day, on average, since weather conditions tend to be different between night and day. A time-varying emission file was therefore used to reflect the different aircraft activity levels over the course of the week.

A1.7.6 Approach emissions modelled with a 4.49° path for A32N aircraft in the DS scenarios, and a 5.5° degree path for all other aircraft (there are no A32N aircraft in the DN scenarios).

A1.7.7 Emissions from airside ground activities, including the use of APUs and GSE, airside vehicle movements, aircraft ground runs, and aircraft main engine idling on stand (the time between engine start-up and start of taxi-out on departure) have been modelled as a series of volume sources, covering the main apron areas (for future scenarios, these are Stands 3-10, Stands 12-15 and Jet Centre, and Stands 21-28). GSE emissions are low-level and have therefore been modelled as volume sources with a depth of 3 m and a source centre height of 1.5 m. APU, aircraft ground running, and aircraft main engine idling emissions have an initial release height, as the jet engines/APU units are elevated on the aircraft fuselage, and the emissions are hot, giving them a degree of buoyancy. To account for this, APU and aircraft ground running emissions have been modelled as volume sources with a depth of 15 m and a source centre height of 7.5 m.

A1.7.8 Stand groups, taxi routes and hold points are shown in Figure A1-1 and Figure A1-2.

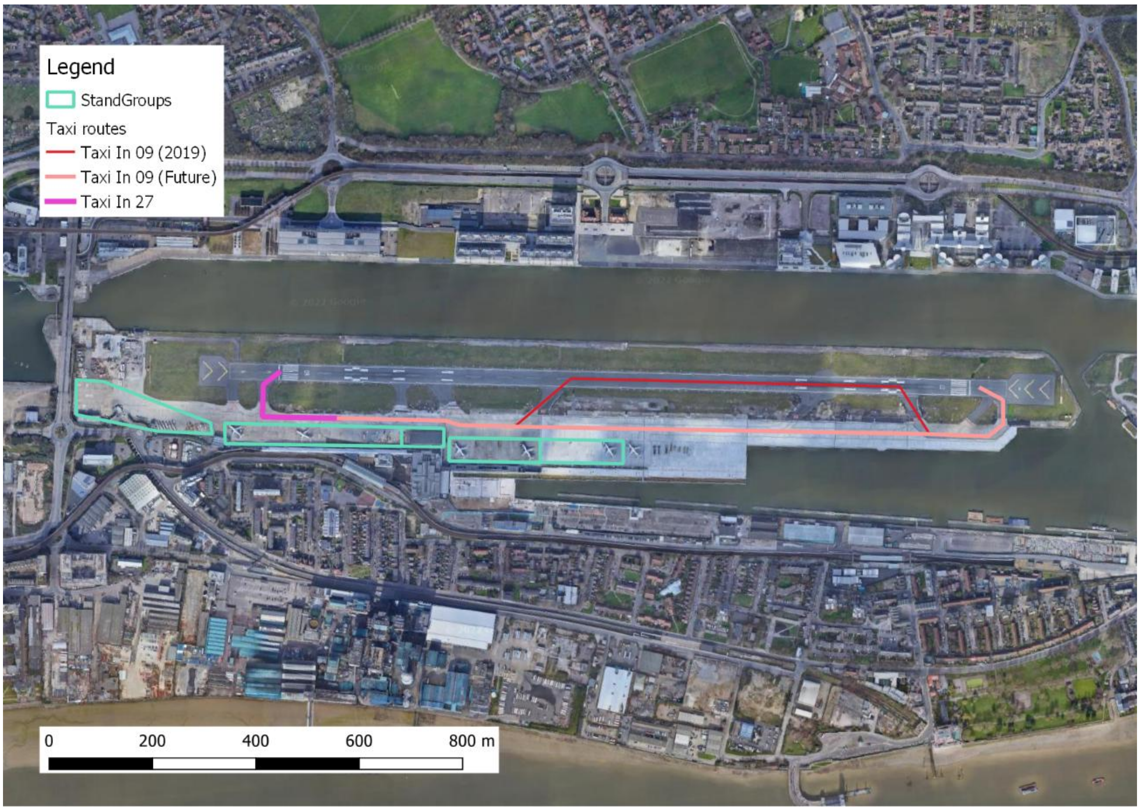

Figure A1-1: Modelled Stand Groups and Taxi-In Routes

Imagery ©2022 The GeoInformation Group

Figure A1-2: Modelled Stand Groups, Taxi-Out Routes and Hold Points

Imagery ©2022 The GeoInformation Group

A2 Receptor Locations

Table A2-1: Operational Receptor Locations For Assessment Against Objectives

Receptor ID	Description	X	Y	Z
R1	Camel Road/Hartmann Road	541982	180307	1.5
R2	Camel Road/Parker Street	542133	180303	1.5
R3	Parker Street (Portway Primary School)	542177	180229	1.5
R4	Newland Street (opposite entrance to LCY car park)	542549	180153	1.5
R5	Newland Street/Kennard Street	542687	180145	1.5
R6	Brixham Street/Dockland Street	543127	180121	1.5
R7	Platterns Court/Billingway Dock Head	543676	180077	1.5
R8	Albert Road/Woolwich Manor Way	543709	180015	1.5
R9	Robert Street adj Albert Road (north side)	543523	179954	1.5
R10	Collier Close adj Gallions Way Roundabout (eastern side)	543715	180875	1.5
R11	Yeoman Close adj Royal Albert Way	543612	180883	1.5
R12	Straight Road/Campton Close	542826	180920	1.5
R13	Mill Rd adj North Woolwich Road (west)	540854	180110	1.5
R14	Connaught Road/Leonard Street	542321	180086	1.5
R15	Gallions Primary School adjacent to Royal Docks Road	543749	181324	1.5
R16	Drew Road/Leonard Street	542306	180219	1.5
R17	Woolwich Manor Way (UEL)	543800	180701	1.5
R18	Woolwich Manor Way (UEL)	543650	180655	1.5, 20
R19	West Silvertown 1	540846	180439	1.5, 20
R20	West Silvertown 2	540681	180448	1.5, 20
R21	Flats on Drew Road	542050	180261	20
R22	Flats on Docklands Street	543133	180047	20, 40
R23	Gallions Quarter	543868	180637	1.5, 20

Receptor ID	Description	X	Y	Z
R24	Gallions Quarter	543919	180684	1.5, 20
R25	University of East London Student Accommodation	543478	180695	1.5, 10.5
R26	Felixstowe Court	543810	180174	1.5, 10.5
R27	Silvertown Quays 1	541614	180468	1.5, 20
R28	Silvertown Quays 2	541460	180476	1.5, 20
R29	Silvertown Quays; 30 m from Connaught Bridge	541587	180372	1.5, 10.5, 20
R30	Royal Albert Basin	544067	180548	1.5, 20
R31	Royal Albert Basin	544088	180710	1.5, 20
R32	North Side of Royal Albert Dock	542418	180704	1.5, 20
R33	North Side of Royal Albert Dock	542979	180691	1.5, 20
R34	North side of Royal Albert Dock (10m from Royal Albert Way)	542884	180843	1.5
R35	North Side of Royal Albert Dock	541917	180713	1.5, 20
R36	Barrier Park East	541583	180149	1.5, 20
R37	UNEX	541862	180129	1.5
R38	Royal Wharf	540890	180071	1.5
R39	Royals Business Park Hotel Site 2.3	541882	180859	1.5
R40	Royals Business Park Hotel Site 2.2	541716	180852	1.5, 20
R41	Fox & Connaught Hotel; Lynx Way	541627	180863	1.5, 13.5
R42	Children's Garden Nursery	543208	180831	1.5
R43	Children's Garden Nursery	543206	180796	1.5
R44	University of East London Student Accommodation	543258	180691	1.5
R45	University of East London Student Accommodation	543371	180694	1.5
R46	Claremont Close	543388	180114	1.5
R47	Oasis Academy	543220	180112	1.5
R48	Fernhill Street	542913	180138	1.5
R49	Newland Street/Lord Street	542410	180157	1.5
R50	Hotel	541891	180274	1.5, 20

Receptor ID	Description	X	Y	Z
R51	Albert Road	543732	180044	4.5
R52	Woolwich Manor Way	543799	180698	4.5, 20
R53	Connaught Bridge Hotel	541712	180845	1.5, 23
R54	Collier Close	543715	180875	1.5
R55	Trader Road	543698	181007	1.5
R56	Thames Road	541663	180140	4.5, 20, 40
R57	Thames Road	541626	180134	4.5, 20, 40
R58	Booth Road	541527	180116	4.5, 20
R59	Lynx Way Hotel	541643	180853	4.5, 15
R60	Royal Docks Academy	541244	181041	1.5
R61	Connaught Road	541927	180220	1.5
R62	Prince Regent Lane	541203	181074	4.5
R63	University	543261	180829	1.5
R64	Yeoman Close	543612	180883	1.5
R65	Connaught Road	541968	180190	1.5
R66	Albert Road	542131	180116	4.5
R67	Albert Road	542342	180083	1.5
R68	Albert Road	542776	180015	1.5
R69	Albert Road	543298	179912	1.5
R70	Albert Road	543325	179923	4.5
R71	Bargehouse Road	543736	180032	1.5
C1	Cumulative Scheme 2 (up to 5 F)	542834	180842	1.5
C2	Cumulative schemes 25 & 53	543887	180686	1.5
C3	Cumulative schemes 19 & 20 up to 11 floors	543843	180911	1.5, 15, 30
C4	Cumulative scheme 26 up to 13 floors	543167	179919	1.5, 15, 30
C5	Cumulative scheme 33 14 storeys	543275	179911	1.5, 15, 40
C6	Cumulative Scheme 22 (hotel 7 storey)	541949	180203	1.5, 10, 20

A3 Detailed Results

Table A3-1: Modelled Annual Mean Concentrations (µg/m³), 2024

Receptor ID	NO_2	PM_{10}	$PM_{2.5}$
R1	24.9	15.6	9.1
R2	24.8	15.8	9.1
R3	22.6	15.5	8.9
R4	24.8	15.1	8.6
R5	24.3	15.1	8.6
R6	22.5	15.3	8.7
R7	22.1	14.7	8.4
R8	23.6	15.4	8.8
R9	23.7	15.2	8.7
R10	23.3	15.6	8.9
R11	21.9	15.3	8.7
R12	21.7	15.7	9.0
R13	22.3	15.8	9.0
R14	22.4	16.0	9.1
R15	20.4	14.6	8.5
R16	22.4	15.6	9.0
R17	22.7	15.5	8.8
R18a	22.7	15.3	8.7
R18b	22.4	15.2	8.6
R19a	20.1	14.9	8.5
R19b	20.1	14.9	8.5
R20a	20.0	14.7	8.5
R20b	20.0	14.7	8.5
R21	22.3	15.3	8.8
R22a	22.2	15.3	8.7
R22b	22.1	15.2	8.7
R23a	22.5	15.6	8.8
R23b	21.7	15.3	8.7
R24a	21.8	15.4	8.7

Receptor ID	NO_2	PM_{10}	$PM_{2.5}$
R24b	21.5	15.3	8.7
R25a	21.9	15.5	8.8
R25b	21.8	15.5	8.8
R26a	22.4	15.0	8.6
R26b	21.4	14.6	8.4
R27a	23.3	15.0	8.6
R27b	22.6	14.8	8.5
R28a	20.7	15.8	8.8
R28b	20.6	15.8	8.7
R29a	23.0	14.9	8.6
R29b	22.7	14.8	8.6
R29cc	22.4	14.7	8.5
R30a	21.4	15.4	8.7
R30b	21.3	15.4	8.7
R31a	21.2	15.3	8.7
R31b	21.1	15.2	8.7
R32a	20.7	16.7	9.0
R32b	20.5	16.6	9.0
R33a	21.5	15.6	8.9
R33b	21.4	15.5	8.9
R34	22.2	15.9	9.1
R35a	21.0	16.2	8.9
R35b	20.8	16.2	8.9
R36a	23.5	15.3	8.8
R36b	21.7	14.7	8.5
R37	22.3	15.2	8.7
R38	21.8	15.6	8.9
R39	21.6	16.4	9.1
R40a	22.8	16.6	9.2
R40b	20.6	15.9	8.8
R41a	21.5	16.1	9.0
R41b	20.7	15.9	8.9

Receptor ID	NO_2	PM_{10}	$PM_{2.5}$
R42	21.9	15.8	9.0
R43	21.6	15.6	8.9
R44	21.7	15.5	8.9
R45	21.8	15.5	8.8
R46	21.7	15.4	8.7
R47	22.1	15.3	8.7
R48	23.3	15.2	8.7
R49	21.7	15.7	8.9
R50a	24.1	15.5	9.0
R50b	22.5	15.1	8.7
R51	22.5	14.9	8.6
R52a	22.4	15.4	8.7
R52b	21.8	15.2	8.6
R53a	22.7	16.5	9.2
R53b	20.5	15.9	8.8
R54	23.3	15.6	8.9
R55	21.8	15.2	8.8
R56a	22.5	15.0	8.7
R56b	21.7	14.8	8.5
R56c	21.4	14.7	8.5
R57a	22.4	15.0	8.6
R57b	21.6	14.7	8.5
R57c	21.4	14.7	8.5
R58a	22.0	14.8	8.6
R58b	21.6	14.6	8.5
R59a	21.4	16.1	9.0
R59b	20.7	15.9	8.9
R60	21.1	17.2	9.2
R61	23.4	15.6	9.0
R62	20.5	16.9	9.1
R63	22.0	15.8	9.0
R64	21.9	15.3	8.7

Receptor ID	NO_2	PM_{10}	$PM_{2.5}$
R65	23.1	15.6	9.0
R66	22.2	15.6	8.9
R67	22.4	16.0	9.1
R68	24.0	15.4	8.8
R69	23.2	15.8	9.0
R70	22.3	15.6	8.9
R71	23.5	15.4	8.8
C1	22.1	15.9	9.0
C2	22.1	15.4	8.7
C3a	22.8	15.5	8.9
C3b	21.2	15.0	8.6
C3c	20.8	14.9	8.5
C4a	22.8	15.6	8.9
C4b	21.9	15.3	8.7
C4c	21.8	15.2	8.7
C5a	22.7	15.7	9.0
C5b	21.7	15.3	8.8
C5c	21.5	15.3	8.7
C6a	23.2	15.6	9.0
C6b	22.2	15.2	8.7
C6c	21.9	15.1	8.7

Table A3-2: Predicted Impacts on Annual Mean Nitrogen Dioxide Concentrations (μg/m³), 2027

Receptor ID	2027 DN (μg/m³)	2027 DS (μg/m³)	Change (% of objective)	Impact
R1	24.9	23.8	-3%	Negligible
R2	25.4	24.1	-3%	Negligible
R3	21.7	21.1	-2%	Negligible
R4	23.3	23.0	-1%	Negligible
R5	22.6	22.2	-1%	Negligible
R6	20.5	20.4	0%	Negligible
R7	20.0	19.9	0%	Negligible

Receptor ID	2027 DN (µg/m³)	2027 DS (µg/m³)	Change (% of objective)	Impact
R8	20.9	20.9	0%	Negligible
R9	21.1	21.1	0%	Negligible
R10	20.9	20.8	0%	Negligible
R11	20.0	19.8	0%	Negligible
R12	19.3	19.1	0%	Negligible
R13	18.9	18.9	0%	Negligible
R14	19.8	19.6	-1%	Negligible
R15	17.9	17.8	0%	Negligible
R16	21.5	21.0	-1%	Negligible
R17	21.2	21.0	0%	Negligible
R18a	22.1	21.9	-1%	Negligible
R18b	21.6	21.3	-1%	Negligible
R19a	17.3	17.2	0%	Negligible
R19b	17.3	17.2	0%	Negligible
R20a	17.1	17.1	0%	Negligible
R20b	17.1	17.1	0%	Negligible
R21	20.9	20.5	-1%	Negligible
R22a	20.0	19.9	0%	Negligible
R22b	19.7	19.7	0%	Negligible
R23a	20.9	20.8	0%	Negligible
R23b	20.2	20.1	0%	Negligible
R24a	20.1	20.0	0%	Negligible
R24b	19.8	19.7	0%	Negligible
R25a	20.4	20.2	-1%	Negligible
R25b	20.3	20.1	-1%	Negligible
R26a	20.0	19.9	0%	Negligible
R26b	19.3	19.2	0%	Negligible
R27a	21.8	21.6	0%	Negligible
R27b	21.2	21.0	0%	Negligible
R28a	18.5	18.4	0%	Negligible
R28b	18.3	18.2	0%	Negligible

Receptor ID	2027 DN (µg/m³)	2027 DS (µg/m³)	Change (% of objective)	Impact
R29a	21.3	21.1	0%	Negligible
R29b	21.1	20.9	0%	Negligible
R29cc	20.8	20.6	0%	Negligible
R30a	19.1	19.1	0%	Negligible
R30b	19.1	19.0	0%	Negligible
R31a	19.1	19.0	0%	Negligible
R31b	19.0	18.9	0%	Negligible
R32a	18.7	18.3	-1%	Negligible
R32b	18.2	18.0	-1%	Negligible
R33a	21.3	21.0	-1%	Negligible
R33b	20.8	20.5	-1%	Negligible
R34	20.1	19.8	-1%	Negligible
R35a	18.9	18.6	-1%	Negligible
R35b	18.5	18.3	0%	Negligible
R36a	21.0	20.8	0%	Negligible
R36b	19.5	19.4	0%	Negligible
R37	20.1	19.9	-1%	Negligible
R38	18.5	18.4	0%	Negligible
R39	18.8	18.7	0%	Negligible
R40a	19.7	19.6	0%	Negligible
R40b	17.9	17.9	0%	Negligible
R41a	18.5	18.5	0%	Negligible
R41b	18.0	17.9	0%	Negligible
R42	20.3	20.1	0%	Negligible
R43	20.1	19.9	0%	Negligible
R44	20.5	20.3	-1%	Negligible
R45	20.3	20.1	0%	Negligible
R46	19.7	19.5	0%	Negligible
R47	20.1	20.0	0%	Negligible
R48	21.7	21.5	-1%	Negligible
R49	20.0	19.6	-1%	Negligible

Receptor ID	2027 DN (µg/m³)	2027 DS (µg/m³)	Change (% of objective)	Impact
R50a	22.6	22.1	-1%	Negligible
R50b	21.1	20.7	-1%	Negligible
R51	20.2	20.1	0%	Negligible
R52a	21.0	20.8	0%	Negligible
R52b	20.4	20.2	0%	Negligible
R53a	19.6	19.5	0%	Negligible
R53b	17.9	17.8	0%	Negligible
R54	20.9	20.7	0%	Negligible
R55	19.5	19.4	0%	Negligible
R56a	20.3	20.1	0%	Negligible
R56b	19.5	19.4	0%	Negligible
R56c	19.2	19.0	0%	Negligible
R57a	20.1	20.0	0%	Negligible
R57b	19.5	19.3	0%	Negligible
R57c	19.1	19.0	0%	Negligible
R58a	19.7	19.6	0%	Negligible
R58b	19.3	19.2	0%	Negligible
R59a	18.5	18.5	0%	Negligible
R59b	18.0	17.9	0%	Negligible
R60	17.5	17.5	0%	Negligible
R61	21.5	21.1	-1%	Negligible
R62	17.1	17.1	0%	Negligible
R63	20.2	20.0	0%	Negligible
R64	20.0	19.8	0%	Negligible
R65	21.0	20.7	-1%	Negligible
R66	20.1	19.8	-1%	Negligible
R67	19.8	19.5	-1%	Negligible
R68	21.5	21.3	0%	Negligible
R69	20.1	20.1	0%	Negligible
R70	19.7	19.6	0%	Negligible
R71	20.9	20.8	0%	Negligible

Receptor ID	2027 DN (µg/m³)	2027 DS (µg/m³)	Change (% of objective)	Impact
C1	19.9	19.6	-1%	Negligible
C2	20.4	20.3	0%	Negligible
C3a	20.4	20.2	0%	Negligible
C3b	19.2	19.1	0%	Negligible
C3c	18.9	18.8	0%	Negligible
C4a	20.0	19.9	0%	Negligible
C4b	19.5	19.4	0%	Negligible
C4c	19.4	19.3	0%	Negligible
C5a	19.8	19.7	0%	Negligible
C5b	19.2	19.1	0%	Negligible
C5c	19.0	19.0	0%	Negligible
C6a	21.2	20.8	-1%	Negligible
C6b	20.6	20.2	-1%	Negligible
C6c	20.1	19.8	-1%	Negligible

Table A3-3: Predicted Impacts on Annual Mean PM_{10} Concentrations (µg/m³), 2027

Receptor ID	2027 DN (µg/m³)	2027 DS (µg/m³)	Change (% of objective)	Impact
R1	15.0	14.9	0%	Negligible
R2	15.2	15.1	0%	Negligible
R3	14.9	14.9	0%	Negligible
R4	14.5	14.5	0%	Negligible
R5	14.6	14.5	0%	Negligible
R6	14.7	14.7	0%	Negligible
R7	14.1	14.1	0%	Negligible
R8	14.8	14.8	0%	Negligible
R9	14.5	14.5	0%	Negligible
R10	14.9	14.9	0%	Negligible
R11	14.6	14.6	0%	Negligible
R12	15.1	15.1	0%	Negligible
R13	15.3	15.3	0%	Negligible
R14	15.3	15.2	0%	Negligible

Receptor ID	2027 DN (µg/m³)	2027 DS (µg/m³)	Change (% of objective)	Impact
R15	13.9	13.9	0%	Negligible
R16	15.1	15.0	0%	Negligible
R17	14.8	14.8	0%	Negligible
R18a	14.6	14.6	0%	Negligible
R18b	14.6	14.6	0%	Negligible
R19a	14.3	14.3	0%	Negligible
R19b	14.3	14.3	0%	Negligible
R20a	14.0	14.0	0%	Negligible
R20b	14.0	14.0	0%	Negligible
R21	14.7	14.6	0%	Negligible
R22a	14.6	14.6	0%	Negligible
R22b	14.6	14.6	0%	Negligible
R23a	15.0	14.9	0%	Negligible
R23b	14.6	14.6	0%	Negligible
R24a	14.7	14.7	0%	Negligible
R24b	14.6	14.6	0%	Negligible
R25a	14.9	14.9	0%	Negligible
R25b	14.9	14.9	0%	Negligible
R26a	14.4	14.4	0%	Negligible
R26b	13.9	13.9	0%	Negligible
R27a	14.3	14.3	0%	Negligible
R27b	14.1	14.1	0%	Negligible
R28a	15.2	15.2	0%	Negligible
R28b	15.1	15.1	0%	Negligible
R29a	14.3	14.3	0%	Negligible
R29b	14.2	14.2	0%	Negligible
R29cc	14.1	14.1	0%	Negligible
R30a	14.8	14.8	0%	Negligible
R30b	14.7	14.7	0%	Negligible
R31a	14.6	14.6	0%	Negligible
R31b	14.6	14.6	0%	Negligible

Receptor ID	2027 DN (µg/m³)	2027 DS (µg/m³)	Change (% of objective)	Impact
R32a	16.1	16.1	0%	Negligible
R32b	16.0	16.0	0%	Negligible
R33a	15.0	15.0	0%	Negligible
R33b	14.9	14.9	0%	Negligible
R34	15.3	15.3	0%	Negligible
R35a	15.6	15.6	0%	Negligible
R35b	15.5	15.5	0%	Negligible
R36a	14.8	14.8	0%	Negligible
R36b	14.0	14.0	0%	Negligible
R37	14.6	14.5	0%	Negligible
R38	15.0	15.0	0%	Negligible
R39	15.8	15.8	0%	Negligible
R40a	16.0	16.0	0%	Negligible
R40b	15.3	15.2	0%	Negligible
R41a	15.5	15.4	0%	Negligible
R41b	15.2	15.2	0%	Negligible
R42	15.2	15.2	0%	Negligible
R43	15.0	15.0	0%	Negligible
R44	15.0	14.9	0%	Negligible
R45	14.9	14.9	0%	Negligible
R46	14.8	14.8	0%	Negligible
R47	14.7	14.7	0%	Negligible
R48	14.7	14.6	0%	Negligible
R49	15.1	15.1	0%	Negligible
R50a	14.8	14.8	0%	Negligible
R50b	14.5	14.5	0%	Negligible
R51	14.3	14.3	0%	Negligible
R52a	14.7	14.7	0%	Negligible
R52b	14.5	14.5	0%	Negligible
R53a	16.0	16.0	0%	Negligible
R53b	15.2	15.2	0%	Negligible

Receptor ID	2027 DN (µg/m³)	2027 DS (µg/m³)	Change (% of objective)	Impact
R54	14.9	14.9	0%	Negligible
R55	14.6	14.6	0%	Negligible
R56a	14.4	14.4	0%	Negligible
R56b	14.1	14.1	0%	Negligible
R56c	14.1	14.1	0%	Negligible
R57a	14.4	14.3	0%	Negligible
R57b	14.1	14.1	0%	Negligible
R57c	14.0	14.0	0%	Negligible
R58a	14.2	14.2	0%	Negligible
R58b	14.0	14.0	0%	Negligible
R59a	15.5	15.5	0%	Negligible
R59b	15.2	15.2	0%	Negligible
R60	16.6	16.6	0%	Negligible
R61	14.9	14.9	0%	Negligible
R62	16.2	16.2	0%	Negligible
R63	15.2	15.2	0%	Negligible
R64	14.6	14.6	0%	Negligible
R65	14.9	14.9	0%	Negligible
R66	14.9	14.9	0%	Negligible
R67	15.3	15.3	0%	Negligible
R68	14.7	14.6	0%	Negligible
R69	15.1	15.1	0%	Negligible
R70	15.0	15.0	0%	Negligible
R71	14.8	14.8	0%	Negligible
C1	15.3	15.3	0%	Negligible
C2	14.8	14.7	0%	Negligible
C3a	14.8	14.8	0%	Negligible
C3b	14.4	14.4	0%	Negligible
C3c	14.3	14.3	0%	Negligible
C4a	14.9	14.9	0%	Negligible
C4b	14.6	14.6	0%	Negligible

Receptor ID	2027 DN (µg/m³)	2027 DS (µg/m³)	Change (% of objective)	Impact
C4c	14.6	14.6	0%	Negligible
C5a	15.0	15.0	0%	Negligible
C5b	14.7	14.7	0%	Negligible
C5c	14.6	14.6	0%	Negligible
C6a	14.9	14.9	0%	Negligible
C6b	14.6	14.6	0%	Negligible
C6c	14.5	14.5	0%	Negligible

Table A3-4: Predicted Impacts on Annual Mean $PM_{2.5}$ (µg/m³), 2027

Receptor ID	2027 DN (µg/m³)	2027 DS (µg/m³)	Change (% of objective)	Impact
R1	8.4	8.3	0%	Negligible
R2	8.5	8.4	0%	Negligible
R3	8.2	8.2	0%	Negligible
R4	7.9	7.9	0%	Negligible
R5	8.0	7.9	0%	Negligible
R6	8.0	8.0	0%	Negligible
R7	7.7	7.7	0%	Negligible
R8	8.1	8.1	0%	Negligible
R9	8.0	8.0	0%	Negligible
R10	8.2	8.2	0%	Negligible
R11	8.0	8.0	0%	Negligible
R12	8.2	8.2	0%	Negligible
R13	8.3	8.3	0%	Negligible
R14	8.3	8.3	0%	Negligible
R15	7.7	7.7	0%	Negligible
R16	8.3	8.2	0%	Negligible
R17	8.0	8.0	0%	Negligible
R18a	7.9	7.9	0%	Negligible
R18b	7.9	7.9	0%	Negligible
R19a	7.8	7.8	0%	Negligible
R19b	7.8	7.8	0%	Negligible

Receptor ID	2027 DN (µg/m³)	2027 DS (µg/m³)	Change (% of objective)	Impact
R20a	7.7	7.7	0%	Negligible
R20b	7.7	7.7	0%	Negligible
R21	8.1	8.0	0%	Negligible
R22a	8.0	8.0	0%	Negligible
R22b	7.9	7.9	0%	Negligible
R23a	8.1	8.1	0%	Negligible
R23b	7.9	7.9	0%	Negligible
R24a	8.0	8.0	0%	Negligible
R24b	7.9	7.9	0%	Negligible
R25a	8.1	8.1	0%	Negligible
R25b	8.1	8.1	0%	Negligible
R26a	7.9	7.9	0%	Negligible
R26b	7.7	7.7	0%	Negligible
R27a	7.9	7.9	0%	Negligible
R27b	7.8	7.8	0%	Negligible
R28a	8.0	8.0	0%	Negligible
R28b	8.0	8.0	0%	Negligible
R29a	7.9	7.9	0%	Negligible
R29b	7.8	7.8	0%	Negligible
R29cc	7.8	7.8	0%	Negligible
R30a	8.0	8.0	0%	Negligible
R30b	7.9	7.9	0%	Negligible
R31a	7.9	7.9	0%	Negligible
R31b	7.9	7.9	0%	Negligible
R32a	8.3	8.3	0%	Negligible
R32b	8.3	8.3	0%	Negligible
R33a	8.2	8.2	0%	Negligible
R33b	8.2	8.1	0%	Negligible
R34	8.4	8.4	0%	Negligible
R35a	8.2	8.2	0%	Negligible
R35b	8.2	8.1	0%	Negligible

Receptor ID	2027 DN (µg/m³)	2027 DS (µg/m³)	Change (% of objective)	Impact
R36a	8.2	8.2	0%	Negligible
R36b	7.8	7.8	0%	Negligible
R37	8.0	8.0	0%	Negligible
R38	8.2	8.2	0%	Negligible
R39	8.4	8.4	0%	Negligible
R40a	8.5	8.5	0%	Negligible
R40b	8.1	8.1	0%	Negligible
R41a	8.2	8.2	0%	Negligible
R41b	8.1	8.1	0%	Negligible
R42	8.3	8.3	0%	Negligible
R43	8.2	8.2	0%	Negligible
R44	8.1	8.1	0%	Negligible
R45	8.1	8.1	0%	Negligible
R46	8.1	8.1	0%	Negligible
R47	8.0	8.0	0%	Negligible
R48	8.0	8.0	0%	Negligible
R49	8.2	8.2	0%	Negligible
R50a	8.2	8.2	0%	Negligible
R50b	8.0	8.0	0%	Negligible
R51	7.8	7.8	0%	Negligible
R52a	8.0	8.0	0%	Negligible
R52b	7.9	7.9	0%	Negligible
R53a	8.5	8.5	0%	Negligible
R53b	8.1	8.1	0%	Negligible
R54	8.2	8.2	0%	Negligible
R55	8.0	8.0	0%	Negligible
R56a	8.0	8.0	0%	Negligible
R56b	7.8	7.8	0%	Negligible
R56c	7.8	7.8	0%	Negligible
R57a	7.9	7.9	0%	Negligible
R57b	7.8	7.8	0%	Negligible

Receptor ID	2027 DN (µg/m³)	2027 DS (µg/m³)	Change (% of objective)	Impact
R57c	7.8	7.7	0%	Negligible
R58a	7.9	7.8	0%	Negligible
R58b	7.7	7.7	0%	Negligible
R59a	8.2	8.2	0%	Negligible
R59b	8.1	8.1	0%	Negligible
R60	8.5	8.5	0%	Negligible
R61	8.2	8.2	0%	Negligible
R62	8.3	8.3	0%	Negligible
R63	8.3	8.3	0%	Negligible
R64	8.0	8.0	0%	Negligible
R65	8.2	8.2	0%	Negligible
R66	8.2	8.1	0%	Negligible
R67	8.3	8.3	0%	Negligible
R68	8.0	8.0	0%	Negligible
R69	8.3	8.2	0%	Negligible
R70	8.2	8.2	0%	Negligible
R71	8.1	8.1	0%	Negligible
C1	8.4	8.3	0%	Negligible
C2	8.0	8.0	0%	Negligible
C3a	8.1	8.1	0%	Negligible
C3b	7.9	7.8	0%	Negligible
C3c	7.8	7.8	0%	Negligible
C4a	8.1	8.1	0%	Negligible
C4b	8.0	8.0	0%	Negligible
C4c	8.0	8.0	0%	Negligible
C5a	8.2	8.2	0%	Negligible
C5b	8.0	8.0	0%	Negligible
C5c	8.0	8.0	0%	Negligible
C6a	8.2	8.2	0%	Negligible
C6b	8.0	8.0	0%	Negligible
C6c	8.0	8.0	0%	Negligible

Table A3-5: Predicted Impacts on Annual Mean Nitrogen Dioxide Concentrations (µg/m³), 2038

Receptor ID	2038 DN (µg/m³)	2038 DS (µg/m³)	Change (% of objective)	Impact
R1	23.8	23.7	0%	Negligible
R2	23.9	23.7	0%	Negligible
R3	21.6	21.5	0%	Negligible
R4	23.8	23.7	0%	Negligible
R5	23.1	23.1	0%	Negligible
R6	21.4	21.3	0%	Negligible
R7	20.9	20.9	0%	Negligible
R8	22.3	22.2	0%	Negligible
R9	22.4	22.4	0%	Negligible
R10	22.0	21.9	0%	Negligible
R11	20.8	20.7	0%	Negligible
R12	20.5	20.5	0%	Negligible
R13	20.8	20.8	0%	Negligible
R14	21.1	21.0	0%	Negligible
R15	19.2	19.2	0%	Negligible
R16	21.4	21.3	0%	Negligible
R17	21.5	21.4	0%	Negligible
R18a	21.6	21.5	0%	Negligible
R18b	21.3	21.2	0%	Negligible
R19a	18.8	18.8	0%	Negligible
R19b	18.8	18.8	0%	Negligible
R20a	18.7	18.7	0%	Negligible
R20b	18.7	18.7	0%	Negligible
R21	21.1	21.1	0%	Negligible
R22a	21.1	21.0	0%	Negligible
R22b	20.9	20.9	0%	Negligible
R23a	21.3	21.2	0%	Negligible
R23b	20.6	20.5	0%	Negligible
R24a	20.7	20.6	0%	Negligible
R24b	20.4	20.3	0%	Negligible

Receptor ID	2038 DN (μg/m³)	2038 DS (μg/m³)	Change (% of objective)	Impact
R25a	20.7	20.7	0%	Negligible
R25b	20.7	20.6	0%	Negligible
R26a	21.1	21.0	0%	Negligible
R26b	20.2	20.2	0%	Negligible
R27a	22.1	22.0	0%	Negligible
R27b	21.5	21.4	0%	Negligible
R28a	19.5	19.5	0%	Negligible
R28b	19.4	19.4	0%	Negligible
R29a	21.8	21.8	0%	Negligible
R29b	21.5	21.5	0%	Negligible
R29cc	21.3	21.2	0%	Negligible
R30a	20.2	20.1	0%	Negligible
R30b	20.1	20.1	0%	Negligible
R31a	20.0	20.0	0%	Negligible
R31b	19.9	19.9	0%	Negligible
R32a	19.5	19.4	0%	Negligible
R32b	19.2	19.2	0%	Negligible
R33a	21.2	21.1	0%	Negligible
R33b	20.9	20.8	0%	Negligible
R34	21.1	21.0	0%	Negligible
R35a	19.7	19.7	0%	Negligible
R35b	19.5	19.5	0%	Negligible
R36a	22.1	22.1	0%	Negligible
R36b	20.4	20.4	0%	Negligible
R37	21.0	21.0	0%	Negligible
R38	20.3	20.2	0%	Negligible
R39	20.2	20.2	0%	Negligible
R40a	21.4	21.3	0%	Negligible
R40b	19.3	19.3	0%	Negligible
R41a	20.1	20.0	0%	Negligible
R41b	19.4	19.4	0%	Negligible

Receptor ID	2038 DN (µg/m³)	2038 DS (µg/m³)	Change (% of objective)	Impact
R42	21.0	21.0	0%	Negligible
R43	20.7	20.7	0%	Negligible
R44	20.8	20.7	0%	Negligible
R45	20.7	20.6	0%	Negligible
R46	20.5	20.5	0%	Negligible
R47	21.0	21.0	0%	Negligible
R48	22.3	22.2	0%	Negligible
R49	20.6	20.5	0%	Negligible
R50a	22.9	22.8	0%	Negligible
R50b	21.3	21.2	0%	Negligible
R51	21.3	21.3	0%	Negligible
R52a	21.3	21.2	0%	Negligible
R52b	20.6	20.6	0%	Negligible
R53a	21.3	21.2	0%	Negligible
R53b	19.2	19.2	0%	Negligible
R54	22.0	21.9	0%	Negligible
R55	20.6	20.5	0%	Negligible
R56a	21.2	21.2	0%	Negligible
R56b	20.4	20.4	0%	Negligible
R56c	20.2	20.2	0%	Negligible
R57a	21.1	21.1	0%	Negligible
R57b	20.4	20.4	0%	Negligible
R57c	20.2	20.1	0%	Negligible
R58a	20.8	20.7	0%	Negligible
R58b	20.3	20.3	0%	Negligible
R59a	20.1	20.0	0%	Negligible
R59b	19.4	19.3	0%	Negligible
R60	19.5	19.5	0%	Negligible
R61	22.1	22.1	0%	Negligible
R62	18.9	18.9	0%	Negligible
R63	21.0	20.9	0%	Negligible

Receptor ID	2038 DN (µg/m³)	2038 DS (µg/m³)	Change (% of objective)	Impact
R64	20.8	20.7	0%	Negligible
R65	21.8	21.8	0%	Negligible
R66	20.9	20.9	0%	Negligible
R67	21.0	21.0	0%	Negligible
R68	22.7	22.7	0%	Negligible
R69	21.8	21.8	0%	Negligible
R70	21.0	21.0	0%	Negligible
R71	22.2	22.2	0%	Negligible
C1	20.9	20.9	0%	Negligible
C2	20.9	20.9	0%	Negligible
C3a	21.5	21.4	0%	Negligible
C3b	20.1	20.0	0%	Negligible
C3c	19.8	19.7	0%	Negligible
C4a	21.5	21.4	0%	Negligible
C4b	20.7	20.7	0%	Negligible
C4c	20.6	20.6	0%	Negligible
C5a	21.3	21.3	0%	Negligible
C5b	20.4	20.4	0%	Negligible
C5c	20.3	20.3	0%	Negligible
C6a	21.9	21.9	0%	Negligible
C6b	21.1	21.0	0%	Negligible
C6c	20.7	20.7	0%	Negligible

Table A3-6: Predicted Impacts on Annual Mean PM_{10} Concentrations (µg/m³), 2038

Receptor ID	2038 DN (µg/m³)	2038 DS (µg/m³)	Change (% of objective)	Impact
R1	15.5	15.5	0%	Negligible
R2	15.6	15.6	0%	Negligible
R3	15.4	15.3	0%	Negligible
R4	14.9	14.9	0%	Negligible
R5	15.0	15.0	0%	Negligible
R6	15.1	15.1	0%	Negligible

Receptor ID	2038 DN (µg/m³)	2038 DS (µg/m³)	Change (% of objective)	Impact
R7	14.5	14.5	0%	Negligible
R8	15.2	15.2	0%	Negligible
R9	15.0	15.0	0%	Negligible
R10	15.4	15.4	0%	Negligible
R11	15.1	15.1	0%	Negligible
R12	15.6	15.6	0%	Negligible
R13	15.7	15.7	0%	Negligible
R14	15.8	15.8	0%	Negligible
R15	14.4	14.4	0%	Negligible
R16	15.5	15.5	0%	Negligible
R17	15.3	15.3	0%	Negligible
R18a	15.1	15.1	0%	Negligible
R18b	15.1	15.1	0%	Negligible
R19a	14.7	14.7	0%	Negligible
R19b	14.7	14.7	0%	Negligible
R20a	14.5	14.5	0%	Negligible
R20b	14.5	14.5	0%	Negligible
R21	15.1	15.1	0%	Negligible
R22a	15.1	15.1	0%	Negligible
R22b	15.0	15.0	0%	Negligible
R23a	15.4	15.4	0%	Negligible
R23b	15.1	15.1	0%	Negligible
R24a	15.2	15.2	0%	Negligible
R24b	15.1	15.1	0%	Negligible
R25a	15.3	15.3	0%	Negligible
R25b	15.3	15.3	0%	Negligible
R26a	14.8	14.8	0%	Negligible
R26b	14.4	14.4	0%	Negligible
R27a	14.8	14.8	0%	Negligible
R27b	14.6	14.6	0%	Negligible
R28a	15.6	15.6	0%	Negligible

Receptor ID	2038 DN (µg/m³)	2038 DS (µg/m³)	Change (% of objective)	Impact
R28b	15.6	15.6	0%	Negligible
R29a	14.7	14.7	0%	Negligible
R29b	14.7	14.7	0%	Negligible
R29cc	14.6	14.6	0%	Negligible
R30a	15.3	15.3	0%	Negligible
R30b	15.3	15.2	0%	Negligible
R31a	15.1	15.1	0%	Negligible
R31b	15.1	15.1	0%	Negligible
R32a	16.5	16.5	0%	Negligible
R32b	16.5	16.5	0%	Negligible
R33a	15.4	15.4	0%	Negligible
R33b	15.4	15.4	0%	Negligible
R34	15.8	15.8	0%	Negligible
R35a	16.0	16.0	0%	Negligible
R35b	16.0	16.0	0%	Negligible
R36a	15.2	15.2	0%	Negligible
R36b	14.5	14.5	0%	Negligible
R37	15.0	15.0	0%	Negligible
R38	15.5	15.5	0%	Negligible
R39	16.3	16.3	0%	Negligible
R40a	16.4	16.4	0%	Negligible
R40b	15.7	15.7	0%	Negligible
R41a	15.9	15.9	0%	Negligible
R41b	15.7	15.7	0%	Negligible
R42	15.7	15.6	0%	Negligible
R43	15.5	15.5	0%	Negligible
R44	15.4	15.4	0%	Negligible
R45	15.4	15.4	0%	Negligible
R46	15.2	15.2	0%	Negligible
R47	15.1	15.1	0%	Negligible
R48	15.0	15.0	0%	Negligible

Receptor ID	2038 DN (μg/m³)	2038 DS (μg/m³)	Change (% of objective)	Impact
R49	15.5	15.5	0%	Negligible
R50a	15.4	15.4	0%	Negligible
R50b	14.9	14.9	0%	Negligible
R51	14.8	14.8	0%	Negligible
R52a	15.2	15.2	0%	Negligible
R52b	15.0	15.0	0%	Negligible
R53a	16.4	16.4	0%	Negligible
R53b	15.7	15.7	0%	Negligible
R54	15.4	15.4	0%	Negligible
R55	15.1	15.1	0%	Negligible
R56a	14.9	14.9	0%	Negligible
R56b	14.6	14.6	0%	Negligible
R56c	14.6	14.6	0%	Negligible
R57a	14.8	14.8	0%	Negligible
R57b	14.6	14.6	0%	Negligible
R57c	14.5	14.5	0%	Negligible
R58a	14.6	14.6	0%	Negligible
R58b	14.4	14.4	0%	Negligible
R59a	15.9	15.9	0%	Negligible
R59b	15.7	15.7	0%	Negligible
R60	17.0	17.0	0%	Negligible
R61	15.4	15.4	0%	Negligible
R62	16.7	16.7	0%	Negligible
R63	15.6	15.6	0%	Negligible
R64	15.1	15.1	0%	Negligible
R65	15.4	15.4	0%	Negligible
R66	15.4	15.4	0%	Negligible
R67	15.8	15.8	0%	Negligible
R68	15.2	15.2	0%	Negligible
R69	15.7	15.6	0%	Negligible
R70	15.4	15.4	0%	Negligible

Receptor ID	2038 DN (µg/m³)	2038 DS (µg/m³)	Change (% of objective)	Impact
R71	15.2	15.2	0%	Negligible
C1	15.7	15.7	0%	Negligible
C2	15.2	15.2	0%	Negligible
C3a	15.3	15.3	0%	Negligible
C3b	14.9	14.9	0%	Negligible
C3c	14.8	14.8	0%	Negligible
C4a	15.5	15.5	0%	Negligible
C4b	15.1	15.1	0%	Negligible
C4c	15.1	15.1	0%	Negligible
C5a	15.5	15.5	0%	Negligible
C5b	15.2	15.2	0%	Negligible
C5c	15.1	15.1	0%	Negligible
C6a	15.4	15.4	0%	Negligible
C6b	15.0	15.0	0%	Negligible
C6c	15.0	15.0	0%	Negligible

Table A3-7: Predicted Impacts on Annual Mean $PM_{2.5}$ (µg/m³), 2038

Receptor ID	2038 DN (µg/m³)	2038 DS (µg/m³)	Change (% of objective)	Impact
R1	8.9	8.9	0%	Negligible
R2	9.0	8.9	0%	Negligible
R3	8.7	8.7	0%	Negligible
R4	8.4	8.4	0%	Negligible
R5	8.5	8.5	0%	Negligible
R6	8.5	8.5	0%	Negligible
R7	8.2	8.2	0%	Negligible
R8	8.6	8.6	0%	Negligible
R9	8.5	8.5	0%	Negligible
R10	8.7	8.7	0%	Negligible
R11	8.5	8.5	0%	Negligible
R12	8.8	8.8	0%	Negligible
R13	8.8	8.8	0%	Negligible

Receptor ID	2038 DN (µg/m³)	2038 DS (µg/m³)	Change (% of objective)	Impact
R14	8.9	8.9	0%	Negligible
R15	8.3	8.3	0%	Negligible
R16	8.8	8.8	0%	Negligible
R17	8.6	8.6	0%	Negligible
R18a	8.5	8.5	0%	Negligible
R18b	8.4	8.4	0%	Negligible
R19a	8.3	8.3	0%	Negligible
R19b	8.3	8.3	0%	Negligible
R20a	8.3	8.3	0%	Negligible
R20b	8.3	8.3	0%	Negligible
R21	8.6	8.6	0%	Negligible
R22a	8.5	8.5	0%	Negligible
R22b	8.5	8.5	0%	Negligible
R23a	8.6	8.6	0%	Negligible
R23b	8.5	8.5	0%	Negligible
R24a	8.5	8.5	0%	Negligible
R24b	8.5	8.5	0%	Negligible
R25a	8.6	8.6	0%	Negligible
R25b	8.6	8.6	0%	Negligible
R26a	8.4	8.4	0%	Negligible
R26b	8.2	8.2	0%	Negligible
R27a	8.4	8.4	0%	Negligible
R27b	8.3	8.3	0%	Negligible
R28a	8.6	8.6	0%	Negligible
R28b	8.5	8.5	0%	Negligible
R29a	8.4	8.4	0%	Negligible
R29b	8.4	8.4	0%	Negligible
R29cc	8.3	8.3	0%	Negligible
R30a	8.5	8.5	0%	Negligible
R30b	8.5	8.5	0%	Negligible
R31a	8.5	8.5	0%	Negligible

Receptor ID	2038 DN (µg/m³)	2038 DS (µg/m³)	Change (% of objective)	Impact
R31b	8.5	8.5	0%	Negligible
R32a	8.9	8.8	0%	Negligible
R32b	8.8	8.8	0%	Negligible
R33a	8.7	8.7	0%	Negligible
R33b	8.7	8.7	0%	Negligible
R34	8.9	8.9	0%	Negligible
R35a	8.7	8.7	0%	Negligible
R35b	8.7	8.7	0%	Negligible
R36a	8.7	8.7	0%	Negligible
R36b	8.3	8.3	0%	Negligible
R37	8.5	8.5	0%	Negligible
R38	8.7	8.7	0%	Negligible
R39	8.9	8.9	0%	Negligible
R40a	9.0	9.0	0%	Negligible
R40b	8.6	8.6	0%	Negligible
R41a	8.8	8.8	0%	Negligible
R41b	8.7	8.7	0%	Negligible
R42	8.8	8.8	0%	Negligible
R43	8.7	8.7	0%	Negligible
R44	8.7	8.7	0%	Negligible
R45	8.6	8.6	0%	Negligible
R46	8.5	8.5	0%	Negligible
R47	8.5	8.5	0%	Negligible
R48	8.5	8.5	0%	Negligible
R49	8.7	8.7	0%	Negligible
R50a	8.8	8.8	0%	Negligible
R50b	8.5	8.5	0%	Negligible
R51	8.4	8.4	0%	Negligible
R52a	8.5	8.5	0%	Negligible
R52b	8.4	8.4	0%	Negligible
R53a	9.0	9.0	0%	Negligible

Receptor ID	2038 DN (µg/m³)	2038 DS (µg/m³)	Change (% of objective)	Impact
R53b	8.6	8.6	0%	Negligible
R54	8.7	8.7	0%	Negligible
R55	8.5	8.5	0%	Negligible
R56a	8.5	8.5	0%	Negligible
R56b	8.3	8.3	0%	Negligible
R56c	8.3	8.3	0%	Negligible
R57a	8.5	8.5	0%	Negligible
R57b	8.3	8.3	0%	Negligible
R57c	8.3	8.3	0%	Negligible
R58a	8.4	8.4	0%	Negligible
R58b	8.3	8.3	0%	Negligible
R59a	8.8	8.8	0%	Negligible
R59b	8.7	8.7	0%	Negligible
R60	9.0	9.0	0%	Negligible
R61	8.8	8.8	0%	Negligible
R62	8.9	8.9	0%	Negligible
R63	8.8	8.8	0%	Negligible
R64	8.5	8.5	0%	Negligible
R65	8.8	8.8	0%	Negligible
R66	8.7	8.7	0%	Negligible
R67	8.9	8.9	0%	Negligible
R68	8.6	8.6	0%	Negligible
R69	8.8	8.8	0%	Negligible
R70	8.7	8.7	0%	Negligible
R71	8.6	8.6	0%	Negligible
C1	8.9	8.9	0%	Negligible
C2	8.5	8.5	0%	Negligible
C3a	8.7	8.7	0%	Negligible
C3b	8.4	8.4	0%	Negligible
C3c	8.3	8.3	0%	Negligible
C4a	8.7	8.7	0%	Negligible

Receptor ID	2038 DN (µg/m³)	2038 DS (µg/m³)	Change (% of objective)	Impact
C4b	8.5	8.5	0%	Negligible
C4c	8.5	8.5	0%	Negligible
C5a	8.7	8.7	0%	Negligible
C5b	8.6	8.5	0%	Negligible
C5c	8.5	8.5	0%	Negligible
C6a	8.8	8.8	0%	Negligible
C6b	8.5	8.5	0%	Negligible
C6c	8.5	8.5	0%	Negligible

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