Appendix Air Quality

Appendices – ES Chapter Burgess Business Park:
Air Quality Appendices

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Experts in air quality management & assessment

Document Control

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A1 Glossary

AADT	Annual Average Daily Traffic
ADMS-Roads	Atmospheric Dispersion Modelling System model for Roads
ADMS-5	Atmospheric Dispersion Modelling System model for point sources
AQC	Air Quality Consultants
AQAL	Air Quality Assessment Level
AQMA	Air Quality Management Area
AURN	Automatic Urban and Rural Network
BEB	Building Emissions Benchmark
CEMP	Construction Environmental Management Plan
CHP	Combined Heat and Power
CURED	Calculator Using Realistic Emissions for Diesels
DCLG	Department for Communities and Local Government
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DMP	Dust Management Plan
EFT	Emission Factor Toolkit
EPUK	Environmental Protection UK
Exceedance	A period of time when the concentration of a pollutant is greater than the appropriate air quality objective. This applies to specified locations with relevant exposure
EV	Electric Vehicle
Focus Area	Location that not only exceeds the EU annual mean limit value for NO_2 but also has a high level of human exposure
GIA	Gross Internal Floor Area
HDV	Heavy Duty Vehicles (> 3.5 tonnes)
HMSO	Her Majesty's Stationery Office
HGV	Heavy Goods Vehicle
IAQM	Institute of Air Quality Management

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kph	Kilometres Per hour
LAEI	London Atmospheric Emissions Inventory
LAQM	Local Air Quality Management
LDV	Light Duty Vehicles (<3.5 tonnes)
LEZ	Low Emission Zone
µg/m³	Microgrammes per cubic metre
MAQS	Mayor's Air Quality Strategy
NO	Nitric oxide
NO_2	Nitrogen dioxide
NOx	Nitrogen oxides (taken to be NO_2 + NO)
NPPF	National Planning Policy Framework
NRMM	Non-road Mobile Machinery
Objectives	A nationally defined set of health-based concentrations for nine pollutants, seven of which are incorporated in Regulations, setting out the extent to which the standards should be achieved by a defined date. There are also vegetation-based objectives for sulphur dioxide and nitrogen oxides
PHV	Private Hire Vehicle
PM_{10}	Small airborne particles, more specifically particulate matter less than 10 micrometres in aerodynamic diameter
$PM_{2.5}$	Small airborne particles less than 2.5 micrometres in aerodynamic diameter
PPG	Planning Practice Guidance
SCR	Selective Catalytic Reduction
SPG	Supplementary Planning Guidance
SPD	Supplementary Planning Document
Standards	A nationally defined set of concentrations for nine pollutants below which health effects do not occur or are minimal
T-Charge	Toxicity Charge
TEA	Triethanolamine – used to absorb nitrogen dioxide
TEB	Transport Emissions Benchmark
TfL	Transport for London

TRAVL	Trip Rate Assessment Valid for London
ULEZ	Ultra Low Emission Zone
ZEC	Zero Emission Capable

A2 Relevant Guidance and Policy

Legislation

Medium Combustion Plant (MCP) Directive

A2.1 The European Union regulates pollutant emissions from combustion plant with a rated input between 1 and 50 megawatts (MWth) in its Medium Combustion Plant (MCP) Directive[1]. The MCP Directive must be transposed into UK law by December 2017.

A2.2 The MCP Directive sets emission limits to be applied from December 2018 for new plant and from 2025 or 2030 for existing plant (depending on the rated input). Member States may choose to exempt existing plant that operate for fewer than 500 hours per year, but current indications are that the UK Government will not apply this exemption[2].

Clean Air Act 1993 & Environmental Protection Act

A2.3 Small combustion plant of less than 20 MW net rated thermal input are controlled under the Clean Air Act 1993[3]. This requires the local authority to approve the chimney height. Plant which are smaller than 366 kW have no such requirement. The local authority's approval will, therefore, not be required for the plant to be installed in the proposed development.

A2.4 Measures to ensure adequate dispersion of emissions from discharging stacks and vents are included in Technical Guidance Note D1 (Dispersion)[4], issued in support of the Environmental Protection Act[5].

National Planning policy

Air Quality Strategy

A2.5 The Air Quality Strategy[6] published by the Department for Environment, Food, and Rural Affairs (Defra) and Devolved Administrations, provides the policy framework for air quality management and assessment in the UK. It provides air quality standards and objectives for key air pollutants, which

[1] The European Parliament and the Council of the European Union (2015) Directive 2015/2193/EU of the European Parliament and of the Council, Available: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32015L2193.

[2] Department of Energy and Climate Change (2016) Consultation on further reforms to the Capacity Market, Available: https://www.gov.uk/government/consultations/consultation-on-reforms-to-the-capacity-market-march-2016.

[3] Clean Air Act 1993 (1993), HMSO, Available: http://www.legislation.gov.uk/ukpga/1993/11/contents

[4] Technical Guidance Note D1 (Dispersion) (1993), HMSO.

[5] Environmental Protection Act 1990 (1990), Available: http://www.legislation.gov.uk/ukpga/1990/43/contents

[6] Defra (2007) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, Defra.

are designed to protect human health and the environment. It also sets out how the different sectors: industry, transport and local government, can contribute to achieving the air quality objectives. Local authorities are seen to play a particularly important role. The strategy describes the Local Air Quality Management (LAQM) regime that has been established, whereby every authority has to carry out regular reviews and assessments of air quality in its area to identify whether the objectives have been, or will be, achieved at relevant locations, by the applicable date. If this is not the case, the authority must declare an Air Quality Management Area (AQMA), and prepare an action plan which identifies appropriate measures that will be introduced in pursuit of the objectives.

National Air Quality Plans

A2.6 Defra has produced Air Quality Plans to reduce nitrogen dioxide concentrations in major cities throughout the UK[7] . Following a High Court ruling in November 2016[8]. Defra undertook to replace these Plans with a new Plan by 31st July 2017. To this end, Defra began consultation on its draft new Plan[9] in May 2017. There is currently no practical way to take account of the effects of either of the existing Plans, or the draft new Plan, in relation to the assessment presented in chapter 9 of the ES. The assessment has principally been carried out in relation to the air quality objectives, rather than the EU limit values that are the focus of the draft new Plan.

National Planning Policy Framework

A2.7 The National Planning Policy Framework (NPPF)[10] sets out planning policy for England in one place. It places a general presumption in favour of sustainable development, stressing the importance of local development plans, and states that the planning system should perform an environmental role to minimise pollution. One of the twelve core planning principles notes that planning should "contribute to…reducing pollution". To prevent unacceptable risks from air pollution, planning decisions should ensure that new development is appropriate for its location. The NPPF states that the "effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account".

A2.8 More specifically the NPPF makes clear that:

"Planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the

[7] Defra (2015) Air quality in the UK: plan to reduce nitrogen dioxide emissions, [Online], Available: https://www.gov.uk/government/publications/air-quality-in-the-uk-plan-to-reduce-nitrogen-dioxide-emissions.

[8] Royal Courts of Justice (2016) ClientEarth v Secretary of State for the Environment Food and Rural Affairs [2016] EWHC 2740, [Online], Available: https://www.judiciary.gov.uk/wp-content/uploads/2016/11/clientearth-v-ssenviron-food-rural-affairs-judgment-021116.pdf.

[9] Defra (2017) Improving air quality in the UK: tackling nitrogen dioxide in our towns and cities. Draft UK Air Quality Plan for tackling nitrogen dioxide.

[10] National Planning Policy Framework (2012), DCLG.

cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan".

A2.9 The NPPF is now supported by Planning Practice Guidance (PPG)[11], which includes guiding principles on how planning can take account of the impacts of new development on air quality. The PPG states that "Defra carries out an annual national assessment of air quality using modelling and monitoring to determine compliance with EU Limit Values" and "It is important that the potential impact of new development on air quality is taken into account … where the national assessment indicates that relevant limits have been exceeded or are near the limit". The role of the local authorities is covered by the LAQM regime, with the PPG stating that local authority Air Quality Action Plans "identify measures that will be introduced in pursuit of the objectives". In addition, the PPG makes clear that "Odour and dust can also be a planning concern, for example, because of the effect on local amenity".

A2.10 The PPG states that:

"Whether or not air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to generate air quality impact in an area where air quality is known to be poor. They could also arise where the development is likely to adversely impact upon the implementation of air quality strategies and action plans and/or, in particular, lead to a breach of EU legislation (including that applicable to wildlife)".

A2.11 The PPG sets out the information that may be required in an air quality assessment, making clear that "Assessments should be proportional to the nature and scale of development proposed and the level of concern about air quality". It also provides guidance on options for mitigating air quality impacts, as well as examples of the types of measures to be considered. It makes clear that "Mitigation options where necessary, will depend on the proposed development and should be proportionate to the likely impact".

Regional Policies

The London Plan

A2.12 The London Plan[12] sets out the following points in relation to planning decisions:

"Development proposals should:

[11] DCLG (2017) Planning Practice Guidance, [Online], Available: http://planningguidance.planningportal.gov.uk/blog/guidance/.

[12] GLA (2016a) The London Plan: The Spatial Development Strategy for London Consolidated with Alterations Since 2011, Available: https://www.london.gov.uk/what-we-do/planning/london-plan/current-london-plan.

a) minimise increased exposure to existing poor air quality and make provision to address local problems of air quality (particularly within AQMAs or where development is likely to be used by large numbers of those particularly vulnerable to poor air quality, such as children or older people) such by design solutions, buffer zones or steps to promote greater use of sustainable transport modes through travel plans (see Policy 6.3);

b) promote sustainable design and construction to reduce emissions from the demolition and construction of buildings following the best practice guidance in the GLA and London Councils "The control, of dust and emissions form construction and demolition";

c) be at least "air quality neutral" and not lead to further deterioration of existing poor air quality (such as areas designated as Air Quality Management Areas (AQMAs));

d) ensure that where provision needs to made to reduce emissions from a development, these usually are made on site. Where it can be demonstrated that on-site provision is impractical or inappropriate, and that it is possible to put in place measures having clearly demonstrated equivalent air quality benefits, planning obligations or planning conditions should be used as appropriate to ensure this, whether on a scheme by scheme basis or through joint area-based approaches;

e) where the development requires a detailed air quality assessment and biomass boilers are included, the assessment should forecast pollutant concentrations. Permission should only be granted if no adverse air quality impacts from the biomass boiler are identified."

The Mayor's Air Quality Strategy

A2.13 The Mayor's Air Quality Strategy[13] commits to the continuation of measures identified in the 2002 MAQS, and sets out a series of additional measures, including:

Policy 1 – Encouraging smarter choices and sustainable travel;

- *Measures to reduce emissions from idling vehicles focusing on buses, taxis, coaches, taxis, PHVs and delivery vehicles;*
- *Using spatial planning powers to support a shift to public transport;*
- *Supporting car free developments.*

Policy 2 – Promoting technological change and cleaner vehicles:

- *Supporting the uptake of cleaner vehicles.*

Policy 4 – Reducing emissions from public transport:

[13] GLA (2010) Mayor's Air Quality Strategy: Cleaning the Air, Available: https://www.london.gov.uk/sites/default/files/Air_Quality_Strategy_v3.pdf.

- *Introducing age limits for taxis and PHVs.*

Policy 5 – Schemes that control emissions to air:

- *Implementing Phases 3 and 4 of the LEZ from January 2012*
- *Introducing a NOx emissions standard (Euro IV) into the LEZ for Heavy Goods Vehicles (HGVs), buses and coaches, from 2015.*

Policy 7 – Using the planning process to improve air quality:

- *Minimising increased exposure to poor air quality, particularly within AQMAs or where a development is likely to be used by a large number of people who are particularly vulnerable to air quality;*
- *Ensuring air quality benefits are realised through planning conditions and section 106 agreements and Community Infrastructure Levy.*

Policy 8 – Creating opportunities between low to zero carbon energy supply for London and air quality impacts:

- *Applying emissions limits for biomass boilers across London;*
- *Requiring an emissions assessment to be included at the planning application stage.*

Low Emission Zone (LEZ)

A2.14 A key measure to improve air quality in Greater London is the Low Emission Zone (LEZ). This entails charges for vehicles entering Greater London not meeting certain emissions criteria, and affects older, diesel-engined lorries, buses, coaches, large vans, minibuses and other specialist vehicles derived from lorries and vans. The LEZ was introduced on 4th February 2008, and was phased in through to January 2012. From January 2012 a standard of Euro IV was implemented for lorries and other specialist diesel vehicles over 3.5 tonnes, and buses and coaches over 5 tonnes. Cars and lighter Light Goods Vehicles (LGVs) are excluded. The third phase of the LEZ, which applies to larger vans, minibuses and other specialist diesel vehicles, was also implemented in January 2012. As set out in the 2010 MAQS, a NOx emissions standard (Euro IV) is included in the LEZ for HGVs, buses and coaches, from 2015.

Ultra Low Emission Zone (ULEZ)

A2.15 An Ultra Low Emission Zone (ULEZ) is to be introduced in London on 7 September 2020 (although TfL is currently consulting on bringing this forward to 8 April 2019). The ULEZ will operate 24 hours a day, 7 days a week in the same area as the current Congestion Charging zone. All cars, motorcycles, vans, minibuses and Heavy Goods Vehicles will need to meet exhaust emission standards (ULEZ standards) or pay an additional daily charge to travel within the zone. The ULEZ standards are Euro 3 for motorcycles; Euro 4 for petrol cars, vans and minibuses; Euro 6 for diesel cars, vans and minibuses; and Euro VI for HGVs, buses and coaches. The Mayor is also proposing to expand the ULEZ beyond central London in 2020.

Other Measures

A2.16 The Mayor has introduced an Emissions Surcharge (also known as the Toxicity Charge, or T-Charge) in October 2017, which adds an extra £10 charge for vehicles using the congestion charge zone that do not meet the Euro 4/IV emission standards. The Emissions Surcharge aims to discourage the use of older, more polluting vehicles driving into and within central London. It is the first step towards the introduction of the ULEZ.

A2.17 From 2018 all taxis presented for licencing for the first time must be zero emission capable (ZEC). This means they must be able to travel a certain distance in a mode which produces no air pollutants. From 2018 all private hire vehicles (PHVs) presented for licensing for the first time must meet Euro 6 emissions standards. From 1 January 2020, all newly manufactured PHVs presented for licensing for the first time must be ZEC (with a minimum zero emission range of 10 miles). The Mayor's aim is that the entire taxi and PHV fleet will be made up of ZEC vehicles by 2033.

A2.18 The Mayor has also proposed to make sure that TfL leads by example by cleaning up its bus fleet, implementing the following measures:

- TfL will procure only hybrid or zero emission double-decker buses from 2018;
- a commitment to providing 3,100 double decker hybrid buses by 2019 and 300 zero emission single-deck buses in central London by 2020;
- introducing 12 Low Emission Bus Zones by 2020;
- investing £50m in Bus Priority Schemes across London to reduce engine idling; and
- retrofitting older buses to reduce emissions (selective catalytic reduction (SCR) technology has already been fitted to 1,800 buses, cutting their NOx emissions by around 88%).

GLA SPG: Sustainable Design and Construction

A2.19 The GLA's SPG on Sustainable Design and Construction[14] provides details on delivering some of the priorities in the London Plan. Section 4.3 covers Air Pollution. It defines when developers will be required to submit an air quality assessment, explains how location and transport measures can minimise emissions to air, and provides emission standards for gas-fired boilers, Combined Heat and Power (CHP) and biomass plant. It also sets out, for the first time, guidance on how Policy

[14] GLA (2014) Sustainable Design and Construction Supplementary Planning Guidance, Available: https://www.london.gov.uk/what-we-do/planning/implementing-london-plan/supplementary-planning-guidance/sustainable-design-and.

7.14B(c) of the London Plan relating to 'air quality neutral' (see Paragraph A2.12, above) should be implemented.

GLA SPG: The Control of Dust and Emissions During Construction and Demolition

A2.20 The GLA's SPG on The Control of Dust and Emissions During Construction and Demolition[15] outlines a risk assessment based approach to considering the potential for dust generation from a construction site, and sets out what mitigation measures should be implemented to minimise the risk of construction dust impacts, dependent on the outcomes of the risk assessment. This guidance is largely based on the Institute of Air Quality Management's (IAQM's) guidance[16], and it states that "the latest version of the IAQM Guidance should be used".

Air Quality Focus Areas

A2.21 The GLA has identified 187 air quality Focus Areas in London. These are locations that not only exceed the EU annual mean limit value for nitrogen dioxide, but also have high levels of human exposure. They do not represent an exhaustive list of London's air quality hotspot locations, but locations where the GLA believes the problem to be most acute. They are also areas where the GLA considers there to be the most potential for air quality improvements and are, therefore, where the GLA and Transport for London (TfL) will focus actions to improve air quality. The proposed development is located close to an air quality Focus Area.

Local Policies

Southwark Transport Plan

A2.22 Southwark Transport Plan[17] sets out how the Council will improve travel to, within and from the Borough. Its aim is to facilitate transport in the Borough, encourage sustainable and active travel and manage environmental problems related to congestion, such as air quality. Encouraging sustainable travel and reducing the reliance on private vehicles are the two ways the Borough has chosen to improve air quality. Objective 8 of the plant is to reduce the impact of transport on the environment. Policies related to this objective seek reductions in levels of private motor vehicle traffic, promote the uptake of low emissions vehicles, and look at education and enforcement initiatives as ways of reducing the impact of motor vehicles.

[15] GLA (2014) The Control of Dust and Emissions from Construction and Demolition SPG, Available: https://www.london.gov.uk/what-we-do/planning/implementing-london-plan/supplementary-planning-guidance/control-dust-and.

[16] IAQM (2016) Guidance on the Assessment of Dust from Demolition and Construction v1.1, Available: http://iaqm.co.uk/guidance/.

[17] Southwark Council, Transport Plan

Saved Southwark Plan Policies

A2.23 The Saved Southwark Plan Policies[18] are those originally contained in the 2007 Southwark Plan that have been retained. Policy 3.6 on Air Quality states that:

"Planning permission will not be granted for development that would lead to a reduction in air quality."

New Southwark Plan (Proposed Submission Version)

A2.24 Southwark Council is currently in the process of adopting a new Local Plan[19]. A proposed submission version was published in November 2017, and will be under consultation beginning of 2018. Once adopted, it will replace the saved Southwark Plan policies[18] and the Core Strategy[20].

A2.25 Policy 66 on Air Quality states that:

"Development must achieve or exceed air quality neutral standards […] and address the impacts of poor air quality on building occupiers and public realm users by reducing exposure to and mitigating the effects of poor air quality. This must be achieved through design solutions that include orientation and layout of buildings […], ventilation systems, […] ultra-low NOx boilers where the development is not connected to a decentralised energy network, or appropriate abatement technologies to bring emissions within the equivalent of 'ultra-low' NOx boiler emissions levels where decentralised energy networks are implemented or utilised".

Southwark Core Strategy

A2.26 Southwark published their Core Strategy[20] in April 2011. This document sets out policies for sustainable planning in the Borough up to 2026. Strategic Policy 13 on High environment standards states that the Council will:

"Set high standards and support measures for reducing air […] pollution and avoid amenity and environmental problems that affect how we enjoy the environment in which we live and work"

Southwark SPD: Sustainable Design and Construction

A2.27 The Sustainable Design and Construction SPD[21] was published by Southwark in 2009. This document provides guidance on *"how new developments in Southwark should be designed and built so that it has a positive impact in the environment"*. This document puts great emphasize on air quality, for example by stating that *"the design of CHP/CCHP systems should minimise the impacts on air quality"*, or that *"mechanical systems should only be used as a complement to natural ventilation to ensure a constant standard of indoor air quality"* and *"where mechanical systems are used, careful consideration will need to be given to ensure air intakes are positioned appropriately"*. There is also mention of fuels used to power CHP's, which should be of high quality and result in low air pollution. It is also stated that CHP systems are preferred to individual boilers.

[18] Southwark Council (2013) Saved Southwark Plan Policies

[19] Southwark Council (2017), New Southwark Plan, Proposed Submission Version

[20] Southwark Council (2011) Core Strategy

[21] Southwark Council (2009) Sustainable design and construction – Supplementary planning document.

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Southwark Air Quality Strategy and Action Plan

A2.28 Southwark Council recently published their Air Quality Strategy and Action Plan[22]. This document sets out measures that the Council will put in place in the period 201-2022 to improve air quality in the Borough. This includes measures on air quality monitoring or travel for example, as well as measures which concern planning and policy. This includes Action 2.3 which states that *"planning applications* [will be] *assessed to ensure that all developments will meet the requirements of the local air quality technical guidance"*, and Action 5.4 which states that *"all manor developments* [are] *to achieve air quality neutral standards onsite"*. Construction dust is also mentioned in Action 6.6, which states that *"emissions from construction* [are to be[*minimised".*

Southwark Technical Guidance on Air Quality

A2.29 Southwark also recently published their Technical Guidance on Air Quality[23]. This document lists all the guidance and policy related to air quality that apply in Southwark, and list the requirements that the Council has for the assessment of air quality for all new developments. This has been taken into account when undertaking the assessment.

[22] Southwark Council (2017), Air Quality Strategy and Action Plan

[23] Southwark Council (2017), Technical Guidance on Air Quality

A3 Construction Dust Assessment Procedure

A3.1 The criteria developed by IAQM[16], upon which the GLA's guidance[14] is based, divide the activities on construction sites into four types to reflect their different potential impacts. These are:

- demolition;
- earthworks;
- construction; and
- trackout.

A3.2 The assessment procedure includes the four steps summarised below:

STEP 1: Screen the Need for a Detailed Assessment

A3.3 An assessment is required where there is a human receptor within 350 m of the boundary of the site and/or within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s), or where there is an ecological receptor within 50 m of the boundary of the site and/or within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).

A3.4 Where the need for a more detailed assessment is screened out, it can be concluded that the level of risk is *negligible* and that any effects will be 'not significant'. No mitigation measures beyond those required by legislation will be required.

STEP 2: Assess the Risk of Dust Impacts

A3.5 A site is allocated to a risk category based on two factors:

- the scale and nature of the works, which determines the potential dust emission magnitude (Step 2A); and
- the sensitivity of the area to dust effects (Step 2B).

A3.6 These two factors are combined in Step 2C, which is to determine the risk of dust impacts with no mitigation applied. The risk categories assigned to the site may be different for each of the four potential sources of dust (demolition, earthworks, construction and trackout).

Step 2A – Define the Potential Dust Emission Magnitude

A3.7 Dust emission magnitude is defined as either 'Small', 'Medium', or 'Large'. The IAQM guidance explains that this classification should be based on professional judgement, but provides the examples in Table A3.1.

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Table A3.1: Examples of How the Dust Emission Magnitude Class May be Defined

Class	Examples
	Demolition
Large	Total building volume >50,000 m^3, potentially dusty construction material (e.g. concrete), on site crushing and screening, demolition activities >20 m above ground level
Medium	Total building volume 20,000 m3 – 50,000 m^3, potentially dusty construction material, demolition activities 10-20 m above ground level
Small	Total building volume <20,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10 m above ground, demolition during wetter months
	Earthworks
Large	Total site area >10,000 m^2, potentially dusty soil type (e.g. clay, which will be prone to suspension when dry to due small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds >8 m in height, total material moved >100,000 tonnes
Medium	Total site area 2,500 m^2 – 10,000 m^2, moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 4 m – 8 m in height, total material moved 20,000 tonnes – 100,000 tonnes
Small	Total site area <2,500 m^2, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4 m in height, total material moved <10,000 tonnes, earthworks during wetter months
	Construction
Large	Total building volume >100,000 m^3, piling, on site concrete batching; sandblasting
Medium	Total building volume 25,000 m^3 – 100,000 m^3, potentially dusty construction material (e.g. concrete), piling, on site concrete batching
Small	Total building volume <25,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber)
	Trackout [a]
Large	>50 HDV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100 m
Medium	10-50 HDV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 m – 100 m
Small	<10 HDV (>3.5t) outward movements in any one day, surface material with low potential for dust release, unpaved road length <50 m

[a] These numbers are for vehicles that leave the site after moving over unpaved ground.

Step 2B – Define the Sensitivity of the Area

A3.8 The sensitivity of the area is defined taking account of a number of factors:

- the specific sensitivities of receptors in the area;
- the proximity and number of those receptors;
- in the case of PM_{10}, the local background concentration; and
- site-specific factors, such as whether there are natural shelters to reduce the risk of wind-blown dust.

A3.9 The first requirement is to determine the specific sensitivities of local receptors. The IAQM guidance recommends that this should be based on professional judgment, taking account of the principles in Table A3.2. These receptor sensitivities are then used in the matrices set out in Table A3.3, Table A3.4 and Table A3.5 to determine the sensitivity of the area. Finally, the sensitivity of the area is considered in relation to any other site-specific factors, such as the presence of natural shelters etc., and any required adjustments to the defined sensitivities are made.

Step 2C – Define the Risk of Impacts

A3.10 The dust emission magnitude determined at Step 2A is combined with the sensitivity of the area determined at Step 2B to determine the *risk* of impacts with no mitigation applied. The IAQM guidance provides the matrix in Table A3.6 as a method of assigning the level of risk for each activity.

STEP 3: Determine Site-specific Mitigation Requirements

A3.11 The IAQM guidance provides a suite of recommended and desirable mitigation measures which are organised according to whether the outcome of Step 2 indicates a low, medium, or high risk. The list provided in the IAQM guidance has been used as the basis for the requirements set out in Appendix A9.

STEP 4: Determine Significant Effects

A3.12 The IAQM guidance does not provide a method for assessing the significance of effects before mitigation, and advises that pre-mitigation significance should not be determined. With appropriate mitigation in place, the IAQM guidance is clear that the residual effect will normally be ‘not significant’.

A3.13 The IAQM guidance recognises that, even with a rigorous dust management plan in place, it is not possible to guarantee that the dust mitigation measures will be effective all of the time, for instance under adverse weather conditions. The local community may therefore experience occasional, short-term dust annoyance. The scale of this would not normally be considered sufficient to change the conclusion that the effects will be ‘not significant’.

Table A3.2: Principles to be Used When Defining Receptor Sensitivities

Class	Principles	Examples
Sensitivities of People to Dust Soiling Effects		
High	users can reasonably expect enjoyment of a high level of amenity; or the appearance, aesthetics or value of their property would be diminished by soiling; and the people or property would reasonably be expected a to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land	dwellings, museum and other culturally important collections, medium and long term car parks and car showrooms
Medium	users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or the appearance, aesthetics or value of their property could be diminished by soiling; or the people or property wouldn’t reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land	parks and places of work
Low	the enjoyment of amenity would not reasonably be expected; or there is property that would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; or there is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land	playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads
Sensitivities of People to the Health Effects of PM_{10}		
High	locations where members of the public may be exposed for eight hours or more in a day	residential properties, hospitals, schools and residential care homes
Medium	locations where the people exposed are workers, and where individuals may be exposed for eight hours or more in a day.	may include office and shop workers, but will generally not include workers occupationally exposed to PM_{10}
Low	locations where human exposure is transient	public footpaths, playing fields, parks and shopping streets
Sensitivities of Receptors to Ecological Effects		
High	locations with an international or national designation and the designated features may be affected by dust soiling; or locations where there is a community of a particularly dust sensitive species	Special Areas of Conservation with dust sensitive features
Medium	locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; or locations with a national designation where the features may be affected by dust deposition	Sites of Special Scientific Interest with dust sensitive features
Low	locations with a local designation where the features may be affected by dust deposition	Local Nature Reserves with dust sensitive features

Table A3.3: Sensitivity of the Area to Dust Soiling Effects on People and Property [24]

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

24 For demolition, earthworks and construction, distances are taken either from the dust source or from the boundary of the site. For trackout, distances are measured from the sides of roads used by construction traffic. Without mitigation, trackout may occur from roads up to 500 m from sites with a large dust emission magnitude, 200 m from sites with a medium dust emission magnitude and 50 m from sites with a small dust emission magnitude, as measured from the site exit. The impact declines with distance from the site, and it is only necessary to consider trackout impacts up to 50 m from the edge of the road.

Table A3.4: Sensitivity of the Area to Human Health Effects [24]

Receptor Sensitivity	Annual Mean PM_{10}	Number of Receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
High	>32 µg/m^3	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32 µg/m^3	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28 µg/m^3	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 µg/m^3	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>32 µg/m^3	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	28-32 µg/m^3	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	24-28 µg/m^3	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<24 µg/m^3	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Table A3.5: Sensitivity of the Area to Ecological Effects [24]

Receptor Sensitivity	Distance from the Source (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Table A3.6: Defining the Risk of Dust Impacts

Sensitivity of the Area	Dust Emission Magnitude		
	Large	Medium	Small
Demolition			
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible
Earthworks			
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible
Construction			
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible
Trackout			
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

A4 EPUK & IAQM Planning for Air Quality Guidance

A4.1 The guidance issued by EPUK and IAQM[25] is comprehensive in its explanation of the place of air quality in the planning regime. Key sections of the guidance not already mentioned above are set out below.

Air Quality as a Material Consideration

"Any air quality issue that relates to land use and its development is capable of being a material planning consideration. The weight, however, given to air quality in making a planning application decision, in addition to the policies in the local plan, will depend on such factors as:

- *the severity of the impacts on air quality;*
- *the air quality in the area surrounding the proposed development;*
- *the likely use of the development, i.e. the length of time people are likely to be exposed at that location; and*
- *the positive benefits provided through other material considerations".*

Recommended Best Practice

A4.2 The guidance goes into detail on how all development proposals can and should adopt good design principles that reduce emissions and contribute to better air quality management. It states:

"The basic concept is that good practice to reduce emissions and exposure is incorporated into all developments at the outset, at a scale commensurate with the emissions".

A4.3 The guidance sets out a number of good practice principles that should be applied to all developments that:

- include 10 or more dwellings;
- where the number of dwellings is not known, residential development is carried out on a site of more than 0.5 ha;
- provide more than 1,000 m^2 of commercial floorspace;
- are carried out on land of 1 ha or more.

A4.4 The good practice principles are that:

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

- New developments should not contravene the Council's Air Quality Action Plan, or render any of the measures unworkable;
- Wherever possible, new developments should not create a new "street canyon", as this inhibits pollution dispersion;
- Delivering sustainable development should be the key theme of any application;
- New development should be designed to minimise public exposure to pollution sources, e.g. by locating habitable rooms away from busy roads;
- The provision of at least 1 Electric Vehicle (EV) "rapid charge" point per 10 residential dwellings and/or 1000 m^2 of commercial floorspace. Where on-site parking is provided for residential dwellings, EV charging points for each parking space should be made available;
- Where development generates significant additional traffic, provision of a detailed travel plan (with provision to measure its implementation and effect) which sets out measures to encourage sustainable means of transport (public, cycling and walking) via subsidised or free-ticketing, improved links to bus stops, improved infrastructure and layouts to improve accessibility and safety;
- All gas-fired boilers to meet a minimum standard of <40 mgNOx/kWh;
- Where emissions are likely to impact on an AQMA, all gas-fired CHP plant to meet a minimum emissions standard of:
    - Spark ignition engine: 250 mgNOx/Nm^3;
    - Compression ignition engine: 400 mgNOx/Nm^3;
    - Gas turbine: 50 mgNOx/Nm^3.
- A presumption should be to use natural gas-fired installations. Where biomass is proposed within an urban area it is to meet minimum emissions standards of 275 mgNOx/Nm^3 and 25 mgPM/Nm^3.

A4.5 The guidance also outlines that offsetting emissions might be used as a mitigation measure for a proposed development. However, it states that:

"It is important that obligations to include offsetting are proportional to the nature and scale of development proposed and the level of concern about air quality; such offsetting can be based on a quantification of the emissions associated with the development. These emissions can be assigned a value, based on the "damage cost approach" used by Defra, and then applied as an indicator of the level of offsetting required, or as a financial obligation on the developer. Unless some form of benchmarking is applied, it is impractical to include building emissions in this approach, but if the boiler and CHP emissions are consistent with the standards as described above then this is not essential".

A4.6 The guidance offers a widely used approach for quantifying costs associated with pollutant emissions from transport. It also outlines the following typical measures that may be considered to offset emissions, stating that measures to offset emissions may also be applied as post assessment mitigation:

- Support and promotion of car clubs;
- Contributions to low emission vehicle refuelling infrastructure;
- Provision of incentives for the uptake of low emission vehicles;
- Financial support to low emission public transport options; and
- Improvements to cycling and walking infrastructures.

Screening

Impacts of the Local Area on the Development

"There may be a requirement to carry out an air quality assessment for the impacts of the local area's emissions on the proposed development itself, to assess the exposure that residents or users might experience. This will need to be a matter of judgement and should take into account:

- *the background and future baseline air quality and whether this will be likely to approach or exceed the values set by air quality objectives;*
- *the presence and location of Air Quality Management Areas as an indicator of local hotspots where the air quality objectives may be exceeded;*
- *the presence of a heavily trafficked road, with emissions that could give rise to sufficiently high concentrations of pollutants (in particular nitrogen dioxide), that would cause unacceptably high exposure for users of the new development; and*
- *the presence of a source of odour and/or dust that may affect amenity for future occupants of the development".*

Impacts of the Development on the Local Area

A4.7 The guidance sets out two stages of screening criteria that can be used to identify whether a detailed air quality assessment is required, in terms of the impact of the development on the local area. The first stage is that you should proceed to the second stage if any of the following apply:

- 10 or more residential units or a site area of more than 0.5 ha residential use; and/or
- more than 1,000 m^2 of floor space for all other uses or a site area greater than 1 ha.

A4.8 Coupled with any of the following:

- the development has more than 10 parking spaces; and/or
- the development will have a centralised energy facility or other centralised combustion process.

A4.9 If the above do not apply then the development can be screened out as not requiring a detailed air quality assessment of the impact of the development on the local area. If they do apply then you proceed to stage 2, which sets out indicative criteria for requiring an air quality assessment. The stage 2 criteria relating to vehicle emissions are set out below:

- the development will lead to a change in LDV flows of more than 100 AADT within or adjacent to an AQMA or more than 500 AADT elsewhere;
- the development will lead to a change in HDV flows of more than 25 AADT within or adjacent to an AQMA or more than 100 AADT elsewhere;
- the development will lead to a realigning of roads (i.e. changing the proximity of receptors to traffic lanes) where the change is 5m or more and the road is within an AQMA;
- the development will introduce a new junction or remove an existing junction near to relevant receptors, and the junction will cause traffic to significantly change vehicle acceleration/deceleration, e.g. traffic lights or roundabouts;
- the development will introduce or change a bus station where bus flows will change by more than 25 AADT within or adjacent to an AQMA or more than 100 AADT elsewhere;
- the development will have an underground car park with more than 100 movements per day (total in and out) with an extraction system that exhausts within 20 m of a relevant receptor; and

A4.10 The criteria are more stringent where the traffic impacts may arise on roads where concentrations are close to the objective. The presence of an AQMA is taken to indicate the possibility of being close to the objective, but where whole authority AQMAs are present and it is known that the affected roads have concentrations below 90% of the objective, the less stringent criteria are likely to be more appropriate.

A4.11 On combustion processes (including standby emergency generators and shipping) where there is a risk of impacts at relevant receptors, the guidance states that:

"Typically, any combustion plant where the single or combined NOx emission rate is less than 5 mg/sec is unlikely to give rise to impacts, provided that the emissions are released from a vent or stack in a location and at a height that provides adequate dispersion. As a guide, the 5 mg/s criterion equates to a 450 kW ultra-low NOx gas boiler or a 30kW CHP unit operating at <95mg/Nm^3.

In situations where the emissions are released close to buildings with relevant receptors, or where the dispersion of the plume may be adversely affected by the size and/or height of adjacent buildings

(including situations where the stack height is lower than the receptor) then consideration will need to be given to potential impacts at much lower emission rates.

Conversely, where existing nitrogen dioxide concentrations are low, and where the dispersion conditions are favourable, a much higher emission rate may be acceptable".

A4.12 Should none of the above apply then the development can be screened out as not requiring a detailed air quality assessment of the impact of the development on the local area, provided that professional judgement is applied; the guidance importantly states the following:

"The criteria provided are precautionary and should be treated as indicative. They are intended to function as a sensitive 'trigger' for initiating an assessment in cases where there is a possibility of significant effects arising on local air quality. This possibility will, self-evidently, not be realised in many cases. The criteria should not be applied rigidly; in some instances, it may be appropriate to amend them on the basis of professional judgement, bearing in mind that the objective is to identify situations where there is a possibility of a significant effect on local air quality".

A4.13 Even if a development cannot be screened out, the guidance is clear that a detailed assessment is not necessarily required:

"The use of a Simple Assessment may be appropriate, where it will clearly suffice for the purposes of reaching a conclusion on the significance of effects on local air quality. The principle underlying this guidance is that any assessment should provide enough evidence that will lead to a sound conclusion on the presence, or otherwise, of a significant effect on local air quality. A Simple Assessment will be appropriate, if it can provide this evidence. Similarly, it may be possible to conduct a quantitative assessment that does not require the use of a dispersion model run on a computer".

A4.14 The guidance also outlines what the content of the air quality assessment should include, and this has been adhered to in the production of this chapter.

Impact Descriptors and Assessment of Significance

A4.15 There is no official guidance in the UK in relation to development control on how to describe the nature of air quality impacts, nor how to assess their significance. The approach within the EPUK/IAQM guidance has, therefore, been used in this assessment. This approach involves a two stage process:

- a qualitative or quantitative description of the impacts on local air quality arising from the development; and
- a judgement on the overall significance of the effects of any impacts.

Impact Descriptors

A4.16 Impact description involves expressing the magnitude of incremental change as a proportion of a relevant assessment level and then examining this change in the context of the new total concentration and its relationship with the assessment criterion. Table A4.1 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 or 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. Note that impacts may be adverse or beneficial, depending on whether the change in concentration is positive or negative.

Table A4.1: 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, EU limit or target value, or an Environment Agency 'Environmental Assessment Level (EAL)'.

Assessment of Significance

A4.17 The guidance recommends that the assessment of significance should be based on professional judgement, with the overall air quality impact of the scheme described as either 'significant' or 'not significant'. In drawing this conclusion, the following factors should be taken into account:

- the existing and future air quality in the absence of the development;
- 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 and, in such circumstances, several impacts that are described as '*slight*' individually could, taken together, be regarded as having a significant effect for the purposes of air quality management in an area, especially where it is proving difficult to reduce concentrations of a pollutant. Conversely, a '*moderate*' or '*substantial*'

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impact may not have a significant effect if it is confined to a very small area and where it is not obviously the cause of harm to human health; and

- the judgement on 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 health outcomes that could be regarded as significant by health care professionals.

A4.18 The guidance is clear that other factors may be relevant in individual cases. It also states that the effect on the residents of any new development where the air quality is such that an air quality objective is not met will be judged as significant. For people working at new developments in this situation, the same will not be true as occupational exposure standards are different, although any assessment may wish to draw attention to the undesirability of the exposure.

A4.19 A judgement of the significance should be made by a competent professional who is suitably qualified. A summary of the professional experience of the staff contributing to this assessment is provided in Appendix A5.

A5 Professional Experience

Chris Whall, BSc (Hons) MSc CEnv MIEnvSc MIAQM

Mr Whall is a Director of Air Quality Consultants. He has 18 years' experience in environmental consulting with multi-sector EIA experience and technical expertise in air quality and emissions management, emissions quantification, ambient air quality monitoring and impact assessment. Mr Whall's work has included the provision of air quality advice and the delivery of impact assessments for UK and international developments including airports, road, rail, power stations, energy from waste, mining and other major regeneration schemes. He has contributed to the air quality components of major Environmental Statements for airports including Heathrow, Gatwick and Stansted in the UK and has provided strategic air quality advice to the European Investment Bank in relation to international airport expansion. Mr Whall also provided overall technical direction to the air quality team delivering the Environmental Statements for the Hinkley Point C nuclear power station Development Consent Order (DCO), on behalf of EDF Energy. Recently Mr Whall led the air quality assessment to support the ending of the Cranford Agreement at Heathrow Airport to introduce full runway alternation during easterly operation; he appeared as an Expert Witness on behalf of Heathrow Airport Limited at the Public Inquiry in 2015. For several years Mr Whall has been working with Heathrow Airport Limited in the development of its masterplan for a third runway and he led Heathrow's air quality submissions to the Airports Commission.

Penny Wilson, BSc (Hons) CSci MIEnvSc MIAQM

Ms Wilson is an Associate Director with AQC, with more than seventeen years' relevant experience in the field of air quality. She has been responsible for air quality assessments of a wide range of development projects, covering retail, housing, roads, ports, railways and airports. She has also prepared air quality review and assessment reports and air quality action plans for local authorities and appraised local authority assessments and air quality grant applications on behalf of the UK governments. Ms Wilson has arranged air quality and dust monitoring programmes and carried out dust and odour assessments. She has provided expert witness services for planning appeals and is Member of the Institute of Air Quality Management and a Chartered Scientist.

Pauline Jezequel, MSc MIEnvSc AMIAQM

Miss Jezequel is a Senior Consultant with AQC with seven years' relevant experience. Prior to joining AQC she worked as an air quality consultant at AECOM. She has also worked as an air quality controller at Bureau Veritas in France, undertaking a wide range of ambient and indoor air quality measurements for audit purposes. She now works in the field of air quality assessment, undertaking air quality impact assessments for a wide range of development projects in the UK and abroad, including for residential and commercial developments, transport schemes (rail, road and airport), waste facilities and industrial sites. Miss Jezequel has also undertaken a number of odour

surveys and assessments in the context of planning applications. She has experience in monitoring construction dust, as well as indoor pollutant levels for BREEAM purposes.

Full CVs are available at www.aqconsultants.co.uk.

A6 Modelling Methodology

Model Inputs

Road Traffic

A6.1 Predictions have been carried out using the ADMS-Roads dispersion model (v4.1). The model requires the user to provide various input data, including emissions from each section of road, and the road characteristics (including road width, street canyon width, street canyon height and porosity, where applicable). Vehicle emissions have been calculated based on vehicle flow, composition and speed data using the EFT (Version 7.0) published by Defra[26].

A6.2 Hourly sequential meteorological data from London City Airport for 2016 have been used in the model. The London City Airport meteorological monitoring station is located approximately 9.5 km to the northeast of the proposed development site. It is deemed to be the nearest monitoring station representative of meteorological conditions in the vicinity of the proposed development site; both the development site and the London City Airport meteorological monitoring station are located in the Greater London Area where they will be influenced by the effects of inland meteorology over urban topography.

A6.3 For the purposes of modelling, it has been assumed that most of the roads included in the model are within a street canyon formed by the buildings. These roads have a number of canyon-like features, which reduce dispersion of traffic emissions, and can lead to concentrations of pollutants being higher here than they would be in areas with greater dispersion. Most roads have, therefore, been modelled as street canyons using ADMS-Roads' advanced canyon module, with appropriate input parameters determined from plans and local mapping and photographs. The advanced canyon module has been used along with the urban canopy flow module, the input data for which have been published by Cambridge Environmental Research Consultants[27], who developed the ADMS models.

A6.4 AADT flows, diurnal flow profiles, speeds, and vehicle fleet composition data have been provided by Peter Brett Associates LLP, who have undertaken the transport assessment work for the proposed development. These have been derived from weekday counts, which may over-predict annual average flows. Traffic data for Camberwell Road, Denmark Hill, Peckham Road, Westminster Highway and St George's Way (roads only modelled for verification purposes) have been taken from the London Atmospheric Emissions Inventory (LAEI)[28]. Traffic speeds have been based on those provided by Peter Brett Associates LLP, with some having been adjusted based on professional judgement, taking account of the road layout, speed limits and the proximity to a junction. The traffic

[26] Defra (2017) Defra Air Quality Website, [Online], Available: http://laqm.defra.gov.uk/.

[27] CERC (2016) London Urban Canopy Data, Available: http://www.cerc.co.uk/IJARSG2016.

[28] GLA (2016) London Atmospheric Emissions Inventory (LAEI) 2013, Available: https://data.london.gov.uk/dataset/london-atmospheric-emissions-inventory-2013.

data used in this assessment are summarised in Table A6.1. Diurnal flow profiles for the traffic have been derived from the national diurnal profiles published by DfT[29].

Table A6.1: Summary of Traffic Data used in the Assessment

Road Link	2016		2021 (Without Scheme)		2021 (With Scheme)	
	AADT	%HDV	AADT	%HDV	AADT	%HDV
St George's Way	10,440	6.8	N/A	N/A	N/A	N/A
A202 Peckham Road Eastbound	9,931	12.5	N/A	N/A	N/A	N/A
A202 Peckham Road Westbound	9,932	12.5	N/A	N/A	N/A	N/A
Denmark Hill	21,402	16.1	N/A	N/A	N/A	N/A
Westminster Highway	19,350	8.4	N/A	N/A	N/A	N/A
Camberwell Road	16,731	22.2	N/A	N/A	N/A	N/A
Wells Way North	11,267	11.3	12320	11.3	12236	11.3
Parkhouse Street	3,666	12.2	4009	12.2	3651	12.2
Southampton Way West	10,997	8.8	12025	8.8	11790	8.8
Southampton Way Middle	8,067	8.8	8821	8.8	8606	8.7
Southampton Way East	8,347	9.1	9128	9.1	9021	9.1
Wells Way South	7,926	10.8	8667	10.8	8465	10.8

N/A = used for verification of the baseline traffic model only

A6.5 The LAEI traffic data include flows for electric vehicles, which generate no tailpipe emissions, but will generate some particulate matter through brake and tyre wear and resuspension. The EFT's default inputs do not allow for electric vehicles to be entered separately, thus they have not been included when calculating emissions. While this may mean that some brake and tyre wear and resuspension may be missed, this is unlikely to have significantly affected the predicted concentrations and will not have affected the conclusions of the assessment. This is because electric vehicle flows are extremely low in comparison to those of other vehicles.

A6.6 Figure A6.1 shows the road network included within the model and defines the study area.

[29] DfT (2017) DfT Automatic traffic Counters Table TRA0305-0307, Available: https://www.gov.uk/government/statistical-data-sets/tra03-motor-vehicle-flow.

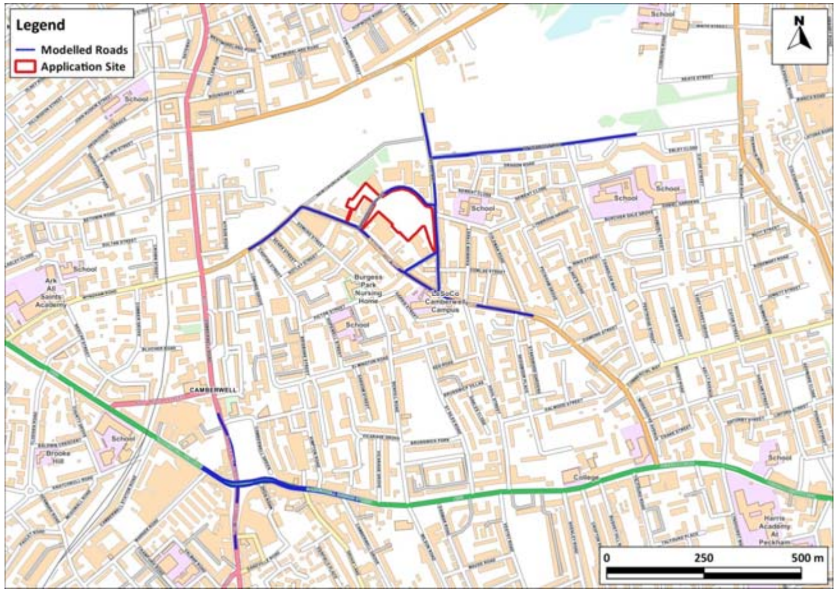

Figure A6.1: Modelled Road Network

Sensitivity Test for Nitrogen Oxides and Nitrogen Dioxide

A6.7 AQC has carried out a detailed analysis which showed that, where previous standards had limited on-road success in reducing nitrogen oxides emissions from diesel vehicles, the 'Euro VI' and 'Euro 6' standards are delivering real on-road improvements[30]. Furthermore, these improvements are expected to increase as the Euro 6 standard is fully implemented. Despite this, the detailed analysis suggested that, in addition to modelling using the EFT (V7.0), a sensitivity test using elevated nitrogen oxides emissions from certain diesel vehicles should be carried out. A worst-case sensitivity test has thus been carried out by applying the adjustments set out in Table A6.2 to the emission

[30] AQC (2016) Emissions of Nitrogen Oxides from Modern Diesel Vehicles, Available: http://www.aqconsultants.co.uk/getattachment/Resources/Download-Reports/Emissions-of-Nitrogen-Oxides-from-Modern-Diesel-Vehicles-210116.pdf.aspx.

factors used within the EFT[31], using AQC's CURED (V2A) tool[32]. The justifications for these adjustments are given in AQC[30]. Results are thus presented for two scenarios: first the 'official prediction', which uses the EFT with no adjustment, and second the 'worst-case sensitivity test', which applies the adjustments set out in Table A6.2. The results from this sensitivity test are likely to over-predict emissions from vehicles in the future and thus provide a reasonable worst-case upper-bound to the assessment.

Table A6.2: Summary of Adjustments Made to Defra's EFT (V7.0)

Vehicle Type		Adjustment Applied to Emission Factors
All Petrol Vehicles		No adjustment
Light Duty Diesel Vehicles	Euro 5 and earlier	No adjustment
	Euro 6	Increased by 78%
Heavy Duty Diesel Vehicles	Euro III and earlier	No adjustment
	Euro IV and V	Set to equal Euro III values
	Euro VI	Set to equal 20% of Euro III emissions [a]

[a] Taking account of the speed-emission curves for different Euro classes as explained in AQC (2016b).

Point Sources

A6.8 The impacts of emissions from the two proposed energy centres (Block B and Block I) have been predicted using the ADMS-5 dispersion model. ADMS-5 is a new generation model that incorporates a state-of-the-art understanding of the dispersion processes within the atmospheric boundary layer. The model has been run to predict the contribution of the proposed CHP's and boilers emissions to annual mean concentrations of nitrogen oxides and the 99.79^{th} percentile of 1-hour mean nitrogen oxides concentrations.

A6.9 Two gas-fired CHP plant will be installed in Block I. Each unit will have a net fuel input of 375.5 kW_{th} delivering 199 kW_{el} and 122 kW_{th} output. The CHP plant will conform to the Sustainable Design and Construction SPG (GLA, 2014a) requiring NOx emissions to be <95 mg/Nm^3 [33]. In addition, four gas-fired boilers will be installed in Block I, and each unit will have a net fuel input of 943 kW_{th} (calculated gross input of 1044 kW_{th}) delivering 927 kW_{th} output. In Block B, two gas-fired boiler will be installed, and. each unit will have a net fuel input of 235 kW_{th} (calculated gross input of 260 kW_{th})

[31] All adjustments were applied to the COPERT functions. Fleet compositions etc. were applied following the same methodology as used within the EFT.

[32] AQC (2016) CURED V2A, Available: http://www.aqconsultants.co.uk/getattachment/Resources/Download-Reports/CURED-V2A.zip.aspx.

[33] Maximum NOx emission rate permitted within the Sustainable Design and Construction SPG

delivering 231 kW_{th} output. The boiler plant will conform to the Sustainable Design and Construction SPG (GLA, 2014a) requiring NOx emissions to be <40 mg/kWh[34].

A6.10 Emissions will rise to roof level in dedicated flues. Fan assisted flues may be required to aid this. The modelling has assumed that CHP's and boilers will be in use 100 % of the time and at full load when operational.

A6.11 The exhaust volume flow rates for the natural gas-fired CHP and boiler plant have been calculated based on the complete combustion of the assumed natural gas composition in Table A6.3 and the following values:

- CHP's in Block I:
  - 100% load;
  - 120 ˚C exit temperature from the plant reducing to 100 ˚C at the point of release to the atmosphere; and
  - 0% excess air.
- Boiler in Block I:
  - 100% load;
  - 69 ˚C exit temperature;
  - 34% excess air in (set so that the calculated exhaust gas mass flow matched that on the technical datasheet for the plant); and
  - Condensing plant removing 53% of the water from the exhaust.
- Boilers in Block B:
  - 100% load;
  - 70 ˚C exit temperature;
  - 34% excess air in (set so that the calculated exhaust gas mass flow matched that on the technical datasheet for the plant); and
  - Condensing plant removing 53% of the water from the exhaust.

[34] Maximum NOx emission rate permitted within the Sustainable Design and Construction SPG (GLA, 2014a).

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Table A6.3: Typical Gas Fuel Composition

Component	Natural Gas
Methane	90.76%
Ethane	4.64%
Propane	1.22%
Carbon Monoxide	-
Hydrogen	-
Carbon Dioxide	1.07%
Nitrogen	2.32%
Net Calorific Value (LHV) (MJ/kg)	46.5
Gross Calorific Value (HHV) (MJ/kg)	51.5
HHV/LHV	1.11
Molecular Mass (g/mol)	17.61

A6.12 The emissions from the CHP's and boilers in Block I and the two boilers in Block B have been combined in the model into a single flues on each block; the emissions parameters employed in the modelling are set out in Table A6.4 and Table A6.5. Further details of the energy plant parameters are provided in Appendix A7.

Table A6.4: Plant Specifications and Modelled Emissions and Release Conditions (Block I)

Parameter	Value
CHP (x2)	
Flue Internal Diameter (m) [a]	0.143
Calculated Actual Exhaust Volume Flow (m^3/s) [b]	0.16049
Calculated Exit Velocity (m/s)	10.0
Specified NOx Emission Rate (mg/Nm^3)[c, d]	50 (modelled at 95)
Calculated NOx Emission Rate (g/s)	0.01125
Assumed Exhaust Temperature (°C)	120
Gas Boilers (3 x Hoval Ultragas 1000 Boilers)	
Calculated Flue Internal Diameter (m)	0.30[e]
Calculated Actual Exhaust Volume Flow (m^3/s) [c]	0.42228
Calculated Exit Velocity (m/s)	6.0
Specified NOx Emission Rate (mg/kWh)[d]	35 (modelled at 40)
Calculated Gross Fuel Input (kW)	1044
Calculated NOx Emission Rate (g/s)	0.01160
Specified Exhaust Temperature (°C)	69
Combined Flue Emissions	
Exit Velocity (m/s)	6.41
Flue Internal Diameter (m)	0.63
Actual Exhaust Volume Flow (m^3/s) [b]	2.0101
NOx Emission Rate (g/s)	0.0689
Exhaust Temperature (°C)	76.24
Flue Location (x,y)	532980, 177431
Modelled Flue Height (m)	44.9 m

[a] This is the internal flue diameter required to achieve an efflux velocity of 10 m/s, as required by the GLA's Sustainable Design and Construction SPG (GLA, 2014a).

[b] Not normalised.

[c] 'Normal' here refers to 5% O_2, 0˚C, 101.325 kPa and 0% H_2O. This emission rate equates to 125 mg/Nm^3 at 0% O_2.

[d] Emission rates of 95mg/Nm^3 for the CHP's and 40 mg/kWh (which correspond to the Sustainable Design and Construction SPG emission standard) were however used in the model.

[e] This is the internal flue diameter required to achieve an efflux velocity of 6 m/s.

Table A6.5: Plant Specifications and Modelled Emissions and Release Conditions (Block B)

Parameter	Value
Gas Boilers (2 x 200kW Boilers, assumed as Hoval Ultragas 250 Boilers)	
Calculated Flue Internal Diameter (m) [a]	0.15
Calculated Actual Exhaust Volume Flow (m^3/s) [b]	0.10554
Calculated Exit Velocity (m/s)	6.0
Assumed NOx Emission Rate (mg/kWh)	40
Calculated Gross Fuel Input (kW)	260
Calculated NOx Emission Rate (g/s)	0.00289
Assumed Exhaust Temperature (°C)	70
Combined Flue Emissions	
Exit Velocity (m/s)	6.0
Flue Internal Diameter (m)	0.21
Actual Exhaust Volume Flow (m^3/s) [b]	0.21108
NOx Emission Rate (g/s)	0.0058
Exhaust Temperature (°C)	70
Flue Location (x,y)	532880, 177480
Modelled Flue Height (m)	16.6

[a] This is the internal flue diameter required to achieve an efflux velocity of 6 m/s.

[b] Not normalised.

A6.13 Entrainment of the plume into the wake of the buildings (the so-called building downwash effect) has been taken into account in the model. The building dimensions and flue location have been obtained from drawings provided by HTA architects. The locations of the flues are shown in Figure A6.2 along with the modelled buildings and their heights. The flues have been modelled at a height of 44.9 m (1.9 m above the roof level) for Block I, and 16.6 m (0.6 m above roof level) for Block B.

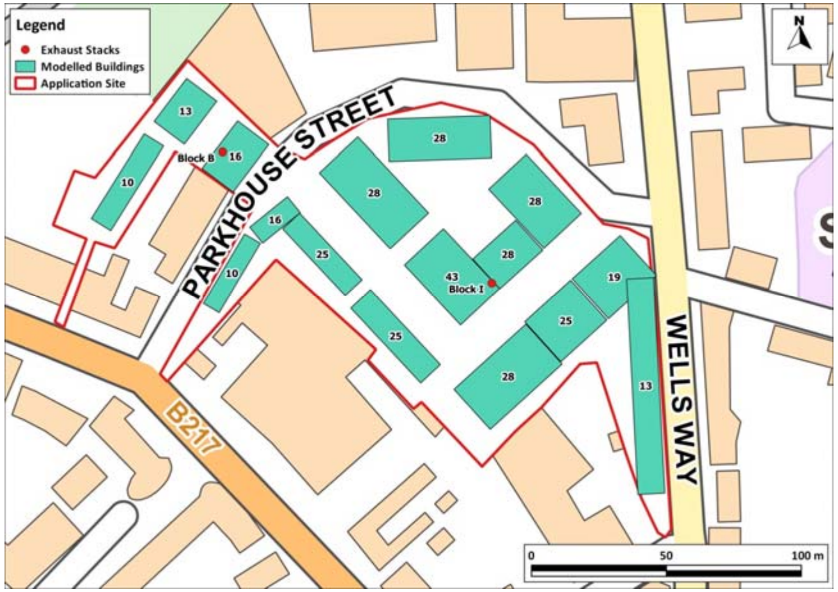

Figure A6.2: Flue Locations & Modelled Buildings

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A6.14 Hourly sequential meteorological data from London City Airport for 2016 have been used in the model, as described in paragraph A6.2.

Background Concentrations

A6.15 The background pollutant concentrations across the study area have been defined using the national pollution maps published by Defra[35]. These cover the whole country on a 1x1 km grid and are published for each year from 2013 until 2030. The background maps for 2016 have been calibrated against concurrent measurements from national monitoring sites[36]. The calibration factor calculated has also been applied to future year backgrounds. This has resulted in slightly higher predicted concentrations for the future assessment year than those derived from the Defra maps[37].

Background NO_2 Concentrations for Sensitivity Test

A6.16 The road-traffic components of nitrogen dioxide in the background maps have been uplifted in order to derive future year background nitrogen dioxide concentrations for use in the sensitivity test. Details of the approach are provided in the report prepared by AQC[37].

Model Verification

A6.17 In order to ensure that ADMS-Roads accurately predicts local concentrations, it is necessary to verify the model against local measurements. It is not practical, nor usual, to verify the ADMS-5 model, and, because ADMS-5 does not rely on estimated road-vehicle emission factors, the adjustment used for ADMS-Roads cannot be applied to ADMS-5. Predictions made using ADMS-5 have thus not been verified.

Nitrogen Dioxide

A6.18 Most nitrogen dioxide (NO_2) is produced in the atmosphere by reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of primary pollutant emissions of nitrogen oxides (NOx = NO + NO_2). The model has been run to predict the annual mean NOx concentrations during 2016 at the SDT 11 and SDT 55 diffusion tube monitoring sites. Concentrations have been modelled at 2.5 m, the height of the monitors.

A6.19 The model output of road-NOx (i.e. the component of total NOx coming from road traffic) has been compared with the 'measured' road-NOx. Measured road-NOx has been calculated from the measured NO_2 concentrations and the predicted background NO_2 concentration using the NOx from NO_2 calculator (Version 5.1) available on the Defra LAQM Support website[35].

A6.20 An adjustment factor has been determined as the slope of the best-fit line between the 'measured' road contribution and the model derived road contribution, forced through zero (Figure A6.3). The calculated adjustment factor of 1.847 has been applied to the modelled road-NOx concentration for each receptor to provide adjusted modelled road-NOx concentrations.

A6.21 The total nitrogen dioxide concentrations have then been determined by combining the adjusted modelled road-NOx concentrations with the predicted background NO_2 concentration within the NOx to NO_2 calculator. Figure A6.4 compares final adjusted modelled total NO_2 at each of the monitoring sites to measured total NO_2, and shows a close agreement.

[35] Defra (2017) Defra Air Quality Website, [Online], Available: http://laqm.defra.gov.uk/.

[36] AQC (2017) Calibrating Defra's Background NOx and NO2 Maps against 2016 Measurements, Available: http://www.aqconsultants.co.uk/AQC/media/Reports/2016-Background-Map-Calibration.pdf.

[37] AQC (2016) Adjusting Background NO2 Maps for CUREDV2A, Available: http://www.aqconsultants.co.uk/getattachment/Resources/Download-Reports/Adjusting-Background-NO2-Maps-for-CURED-September-2016.pdf.aspx.

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A6.22 The results imply that the model has under predicted the road-NOx contribution. This is a common experience with this and most other road traffic emissions dispersion models.

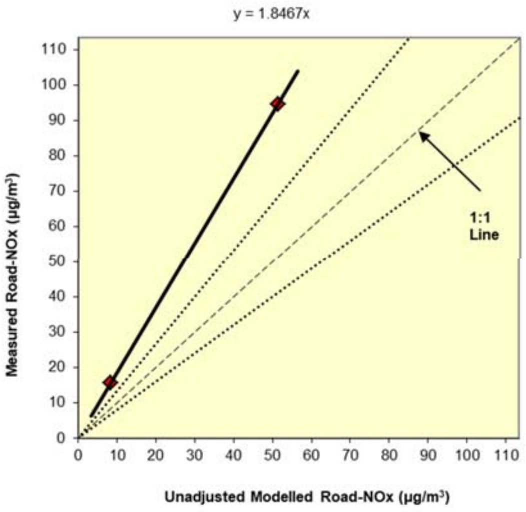

Figure A6.3: Comparison of Measured Road NOx to Unadjusted Modelled Road NOx Concentrations. The dashed lines show ± 25%.

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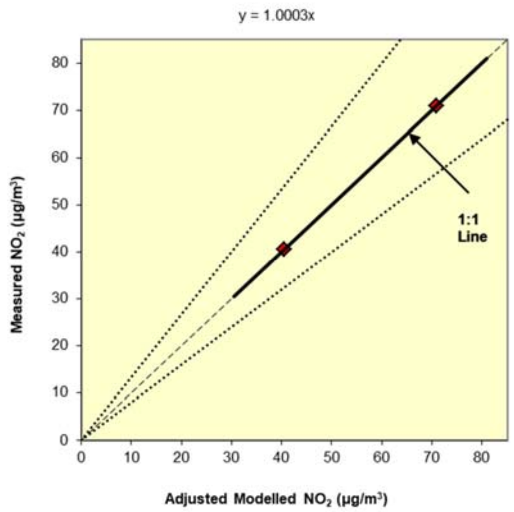

Figure A6.4: Comparison of Measured Total NO_2 to Final Adjusted Modelled Total NO_2 Concentrations. The dashed lines show ± 25%.

Model Verification for NOx and NO_2 Sensitivity Test

A6.23 The approach set out above has been repeated using the predicted road-NOx and background concentrations specific to the sensitivity test. This has resulted in an adjustment factor of 1.525, which has been applied to all modelled road-NOx concentrations within the sensitivity test.

PM_{10} and $PM_{2.5}$

A6.24 There are no nearby PM_{10} or $PM_{2.5}$ monitors. It has therefore not been possible to verify the model for PM_{10} or $PM_{2.5}$. The model outputs of road-PM_{10} and road-$PM_{2.5}$ have therefore been adjusted by applying the adjustment factor calculated for road NOx.

Model Post-processing

Road Traffic

A6.25 The model predicts road-NOx concentrations at each receptor location. These concentrations have been adjusted using the adjustment factor set out above, which, along with the background NO_2, has been processed through the NOx to NO_2 calculator available on the Defra LAQM Support website[35]. The traffic mix within the calculator has been set to "All London traffic", which is considered suitable for the study area. The calculator predicts the component of NO_2 based on the adjusted road-NOx and the background NO_2.

Point Sources

A6.26 Emissions from the CHP and boiler plant will be predominantly in the form of nitrogen oxides (NOx). ADMS-5 has been run to predict the contribution of the proposed Energy Centres emissions to annual mean concentrations of nitrogen oxides and to the 99.79th percentile of 1-hour mean nitrogen oxides concentrations.

A6.27 Where annual mean objectives need to be assessed the following post-processing has been carried out:

- Nitrogen dioxide– the approach recommended by the Environment Agency (Environment Agency, 2005) has been used to predict annual mean nitrogen dioxide concentrations = *annual mean nitrogen oxides x 0.7.*
- In order to predict total annual mean concentrations, the concentration predicted from the local roads and local background has been added to this process contribution.

A7 Energy Plant Specifications

A7.1 The proposed development will be provided with heat, hot water and some electricity using two natural gas-fired CHP unit and six natural gas-fired boilers to be located in Blocks I and B. Specifications for these plant are shown in Table A7.1and the restrictions set out must be adhered to in order for the air quality assessment results to remain valid.

Table A7.1: Energy Plant Specifications

Parameter	Value	Restriction
CHP's x 2 (Block I)		
Gross Peak Fuel Input (kW)	416 (x2)	Max
Hours of Use per Annum	8,760	Max
Annual Fuel Input (kWh/annum)	3,642,873 (x2)	Max
Exhaust Temperature (°C)	120	Min
Flue Internal Diameter (m)	0.20[b]	Max
Efflux Velocity (m/s)	10.0	Min
Unit NOx Emission Rate (mg/Nm^3) [a]	125	Max
Boilers x 4 (Block I)		
Gross Peak Fuel Input (kW)	4177	Max
Hours of Use per Annum	8,760	Max
Annual Fuel Input (kWh/annum)	36,596,412	Max
Exhaust Temperature (°C)	69	Min
Flue Internal Diameter (m)	0.30[b]	Max
Efflux Velocity (m/s)	6.0	Min
Unit NOx Emission Rate (mg/kWh)	40	Max
Condensing	Yes	-
Boilers x 2 (Block B)		
Gross Peak Fuel Input (kW)	520	Max
Hours of Use per Annum	8,760	Max
Annual Fuel Input (kWh/annum)	4,559,998	Max
Exhaust Temperature (°C)	70	Min
Flue Internal Diameter (m)	0.15[b]	Max
Efflux Velocity (m/s)	6.0	Min
Unit NOx Emission Rate (mg/kWh)	40	Max
Condensing	Yes	-

[a] 'Normal' here refers to 0% O_2, 0˚C, 101.325 kPa and 0% H_2O.

[b] Diameter for the common flue for the two CHP's; four Boilers or two boilers.

A7.2 To further emphasise the restrictions set out in Table A7.1, in order to ensure that the final plant design does not lead to impacts greater than those modelled, it must adhere to the following minimum specifications:

- the CHP must be designed such that it will operate with a minimum efflux velocity of 10 m/s to allow for good initial dispersion of emissions;
- a boiler system (Block I) to be comprised of units totalling a maximum of 4177 kW fuel input must share a common flue outlet with a maximum internal diameter of 0.3 m at the exit point, terminating at least 1 m above the roof level;
- a boiler system (Block B) to be comprised of units totalling a maximum of 520 kW fuel input must share a common flue outlet with a maximum internal diameter of 0.15 m at the exit point, terminating at least 0.6 m above the roof level;
- all stacks should discharge vertically upwards and be unimpeded by any fixture on top of the stack (e.g., rain cowls or 'Chinaman's Hats');
- the system must be designed to conform to the requirements of the GLA's guidance on sustainable design and construction[14]. The gas boilers must conform to a maximum NOx emission of <40 mg/kWh, while the spark ignition CHP must have a maximum NOx emission of 95 mg/Nm^3 (normalised conditions[38]), as the scheme is in a Band B area. The SPG makes clear that the emission standards are 'end-of-pipe' concentrations expressed at specific reference conditions for temperature, pressure, oxygen and moisture content. Compliance with these standards will be confirmed prior to occupation, based on:
  - monitoring undertaken on the actual installed plant; or
  - manufacturer guaranteed performance levels supported by type approval monitoring undertaken by the equipment supplier.
- in order to attain these values, relevant catalyst or alternative abatement will be required.

A7.3 If the design of the energy centre deviates significantly from the modelled specification, additional future modelling may be required in order to ensure that there are no significant adverse air quality impacts.

A7.4 The GLA's Sustainable Design and Construction SPG[14] also states that the measures set out in Technical Guidance Note D1 (Dispersion)[4] should also be adhered to in order to ensure adequate dispersion of emissions from discharging stacks and vents. These include the following, most of which are complied with for the proposed scheme:

- Discharges should be vertically upwards and unimpeded by cowls or any other fixtures on top of the stack. However, the use of coning or of flame traps at the tops of stacks is acceptable. In the case of discharge stacks (whether single or multiple stack) with shrouds or casings around the stack(s), the stack(s) alone should extend above the shroud or

[38] At 273K, 101.3kPa, 5% O2, dry gas, as specified in the Sustainable Design and Construction SPG for band B developments.

casing. This extension should be at least 50% of the shroud or casing's greatest lateral dimension;

- Irrespective of the pollutant discharge, there are minimum discharge stack heights based on the heat release and the discharge momentum. These can be calculated following calculations set out in the guidance note, but the absolute minimum value is 1 m;
- No discharge stack should be less than 3 m above the ground or any adjacent area to which there is general access. For example, roof areas and elevated walkways;
- A discharge stack should never be less than the height of any building within a distance of 5 times the stack height; and
- A discharge stack should be at least 3 m above any opening windows or ventilation air inlets within a distance of 5 times the stack height.

A8 'Air Quality Neutral'

A8.1 The GLA's SPG on Sustainable Design and Construction[14], and its accompanying Air Quality Neutral methodology report[39], provide an approach to assessing whether a development is air quality neutral. The approach is to compare the expected emissions from the building energy use and the car use associated with the proposed development against defined emissions benchmarks for buildings and transport in London.

A8.2 The benchmarks for heating and energy plant (termed 'Building Emissions Benchmarks' or 'BEBs') are set out in Table A8.1, while the 'Transport Emissions Benchmarks' ('TEBs') are set out in Table A8.2. In order to assess against the TEBs, it is necessary to combine the expected trip generation from the development with estimates of average trip length and average emission per vehicle. So as to ensure a consistent methodology, the report which accompanies the SPG (AQC, 2014) recommends that the information in Table A8.3 and Table A8.4 (upon which the TEBs are based) is used. Similarly, the information in Table A8.5 may be used if site-specific information are not available[39]. For use classes other than A1, B1 and B3, trip lengths and average emissions per vehicle are not provided, thus the trip rates in Table A8.6 alone may be used to consider the air quality neutrality of a development. These have been derived from the Trip Rate Assessment Valid for London (TRAVL) database.

[39] AQC (2014) Air Quality Neutral Planning Support Update: GLA 80371, Available: http://www.aqconsultants.co.uk/getattachment/Resources/Download-Reports/GLA-AQ-Neutral-Policy-Final-Report-April-2014.pdf.aspx.

Table A8.1: Building Emissions Benchmarks (g/m^2 of Gross Internal Floor Area)

Land Use Class	NOx	PM_{10}
Class A1	22.6	1.29
Class A3 - A5	75.2	4.32
Class A2 and Class B1	30.8	1.77
Class B2 - B7	36.6	2.95
Class B8	23.6	1.90
Class C1	70.9	4.07
Class C2	68.5	5.97
Class C3	26.2	2.28
D1 (a)	43.0	2.47
D1 (b)	75.0	4.30
Class D1 (c -h)	31.0	1.78
Class D2 (a-d)	90.3	5.18
Class D2 (e)	284	16.3

Table A8.2: Transport Emissions Benchmarks

Land use	CAZ [a]	Inner [b]	Outer [b]
NOx (g/m^2/annum)			
Retail (A1)	169	219	249
Office (B1)	1.27	11.4	68.5
NOx (g/dwelling/annum)			
Residential (C3)	234	558	1553
PM_{10} (g/m^2/annum)			
Retail (A1)	29.3	39.3	42.9
Office (B1)	0.22	2.05	11.8
PM_{10} (g/dwelling/annum)			
Residential (C3,C4)	40.7	100	267

[a] Central Activity Zone.

[b] Inner London and Outer London as defined in the LAEI (GLA, 2016b).

Table A8.3: Average Distance Travelled by Car per Trip

Land use	Distance (km)		
	CAZ	Inner	Outer
Retail (A1)	9.3	5.9	5.4
Office (B1)	3.0	7.7	10.8
Residential (C3)	4.3	3.7	11.4

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Table A8.4: Average Road Traffic Emission Factors in London in 2010

Pollutant	g/vehicle-km		
	CAZ	Inner	Outer
NOx	0.4224	0.370	0.353
PM_{10}	0.0733	0.0665	0.0606

Table A8.5: Average Emissions from Heating and Cooling Plant in Buildings in London in 2010

	Gas (kg/kWh)		Oil (kg/kWh)	
	NOx	PM_{10}	NOx	PM_{10}
Domestic	0.0000785	0.00000181	0.000369	0.000080
Industrial/Commercial	0.000194	0.00000314	0.000369	0.000080

Table A8.6: Average Number of Light Vehicle Trips per Annum for Different Development Categories

Land use	Number of Trips (trips/m^2/annum)		
	CAZ	Inner	Outer
A1	43	100	131
A3	153	137	170
A4	2.0	8.0	-
A5	-	32.4	590
B1	1	4	18
B2	-	15.6	18.3
B8	-	5.5	6.5
C1	1.9	5.0	6.9
C2	-	3.8	19.5
D1	0.07	65.1	46.1
D2	5.0	22.5	49.0
Number of Trips (trips/dwelling/annum)			
C3	129	407	386

A9 Construction Mitigation

A9.1 The following is a set of best-practice measures from the GLA guidance[15] that should be incorporated into the specification for the works. These measures should be written into a Dust Management Plan. Some of the measures may only be necessary during specific phases of work, or during activities with a high potential to produce dust, and the list should be refined and expanded upon in liaison with the construction contractor when producing the Dust Management Plan.

Site Management

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site;
- develop a Dust Management Plan (DMP);
- display the name and contact details of person(s) accountable for air quality pollutant emissions and dust issues on the site boundary;
- display the head or regional office contact information;
- record and respond to all dust and air quality pollutant emissions complaints;
- make a complaints log available to the local authority when asked;
- carry out regular site inspections to monitor compliance with air quality and dust control procedures, record inspection results, and make an inspection log available to the Local Authority when asked;
- increase the frequency of site inspections by those accountable for dust and air quality pollutant emissions issues when activities with a high potential to produce dust and emissions are being carried out and during prolonged dry or windy conditions;
- record any exceptional incidents that cause dust and air quality pollutant emissions, either on or off the site, and ensure that the action taken to resolve the situation is recorded in the log book; and
- hold regular liaison meetings with other high risk construction sites within 500 m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/deliveries which might be using the same strategic road network routes.

Preparing and Maintaining the Site

- Plan the site layout so that machinery and dust-causing activities are located away from receptors, as far as is possible;
- erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site;

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- fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period;
- install green walls, screens or other green infrastructure to minimise the impact of dust and pollution;
- avoid site runoff of water or mud;
- keep site fencing, barriers and scaffolding clean using wet methods;
- remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below;
- cover, seed, or fence stockpiles to prevent wind whipping;
- carry out regular dust soiling checks of buildings within 100 m of site boundary and provide cleaning if necessary;
- provide showers and ensure a change of shoes and clothes are required before going off-site to reduce transport of dust;
- put in place real-time dust and air quality pollutant monitors across the site and ensure they are checked regularly;
- agree monitoring locations with the Local Authority; and
- where possible, commence baseline monitoring at least three months before work begins.

Operating Vehicle/Machinery and Sustainable Travel

- Ensure all on-road vehicles comply with the requirements of the London Low Emission Zone;
- ensure all Non-road Mobile Machinery (NRMM) comply with the standards set within the GLA's Control of Dust and Emissions During Construction and Demolition SPG. This outlines that, from 1st September 2015, all NRMM of net power 37 kW to 560 kW used on the site of a major development in Greater London must meet Stage IIIA of EU Directive 97/68/EC (Directive 97/68/EC of the European Parliament and of the Council, 1997) and its subsequent amendments as a minimum. From 1st September 2020 NRMM used on any site within Greater London will be required to meet Stage IIIB of the Directive as a minimum.
- ensure all vehicles switch off engines when stationary – no idling vehicles;
- avoid the use of diesel- or petrol-powered generators and use mains electricity or battery-powered equipment where practicable;
- impose and signpost a maximum-speed-limit of 10 mph on surfaced haul routes and work areas (if long haul routes are required these speeds may be increased with suitable

additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the Local Authority, where appropriate);

- produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials; and
- implement a Travel Plan that supports and encourages sustainable staff travel (public transport, cycling, walking, and car-sharing).

Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems;
- ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using recycled water where possible and appropriate;
- use enclosed chutes, conveyors and covered skips;
- minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate; and
- ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

Waste Management

- Reuse and recycle waste to reduce dust from waste materials; and
- avoid bonfires and burning of waste materials.

Measures Specific to Demolition

- Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust);
- ensure water suppression is used during demolition operations;
- avoid explosive blasting, using appropriate manual or mechanical alternatives; and
- bag and remove any biological debris or damp down such material before demolition.

Measures Specific to Earthworks

- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable;

- use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable; and
- only remove the cover from small areas during work, not all at once.

Measures Specific to Construction

- Avoid scabbling (roughening of concrete surfaces), if possible;
- ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place;
- ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery; and
- for smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.

Measures Specific to Trackout

- Regularly use a water-assisted dust sweeper on the access and local roads, as necessary, to remove any material tracked out of the site;
- avoid dry sweeping of large areas;
- ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport;
- inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable;
- record all inspections of haul routes and any subsequent action in a site log book;
- install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems or mobile water bowsers, and regularly cleaned;
- implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable);
- ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits;
- access gates should be located at least 10 m from receptors, where possible; and
- apply dust suppressants to locations where a large volume of vehicles enter and exit the construction site.