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Air Quality Assessment Report WSP Parsons Brinckerhoff

July 2016

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5-17 HAVERSTOCK HILL, CAMDEN

AIR QUALITY ASSESSMENT REPORT

JULY 2016

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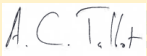
Signature		 Digitally signed by Talbot, Andy Date: 2016.07.06 10:25:32 +01'00'	
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1 EXECUTIVE SUMMARY

1.1.1 WSP | Parsons Brinckerhoff has been commissioned by Cambridge Gate Properties to undertake an air quality assessment to support the planning application for the Proposed Development at 5 – 17 Haverstock Hill, Camden.

1.1.2 This report presents the findings of the assessment, which addresses the potential air quality impacts during both the construction and operational phases of the Proposed Development. For both phases the type, source and significance of potential impacts were identified, and the measures that should be employed to minimise these proposed. The methodology followed in this study was discussed and agreed with the Environmental Health Officer of London Borough of Camden.

1.1.3 The assessment of construction phase impacts associated with fugitive dust and particulate matter (PM_{10}) emissions has been undertaken in line with the relevant Institute of Air Quality Management (IAQM) guidance. This identified that the Proposed Development is considered to be a Medium Risk Site for dust deposition and Low Risk Site for PM_{10} concentrations. However, through good site practice and the implementation of suitable mitigation measures, the effect of dust and PM_{10} releases would be significantly reduced. The residual effects of the construction phase on air quality are considered to be negligible.

1.1.4 An assessment for the operational phase was undertaken at existing and proposed receptor locations. The majority of the existing receptors in the vicinity of the Proposed Development would experience exceedances in annual mean NO_2 with and without the Proposed Development, which would in-itself contribute less than 0.1µg/m^3 to annual mean ambient concentrations. Any impact would be negligible. Exceedances for annual mean NO_2 have been predicted at both commercial and residential locations within the Application Site, and therefore mitigation will be required to protect the health of future occupants from exceedances of the annual mean NO_2 objective

1.1.5 Mechanical ventilation is proposed for the Proposed Development, with air intakes located above the finished floors and away from the main roads where possible for ensuring the future users will not be exposed to concentrations which exceed any of the relevant air quality objectives.

1.1.6 The results of the Air Quality Neutral assessment indicated that, the Proposed Development is compliant and is better than ‘air quality neutral’.

1.1.7 With the application of the appropriate mitigation measures (as outlined), the development proposals would comply with national and local policy for air quality.

2 INTRODUCTION

2.1.1 WSP | Parsons Brinckerhoff has been commissioned by Cambridge Gate Properties to carry out an assessment of the potential air quality impacts arising from the Proposed Development at 5 – 17 Haverstock Hill, Camden, hereafter referred to as the 'Proposed Development' or 'Application Site'.

2.1.2 The Application Site lies within the administrative boundary of London Borough of Camden (LBC) and is situated in an area that is predominantly residential. It is bordered to the south by Adelaide Road, to the north by Haverstock Hill, and is directly adjacent to the Chalk Farm Underground Station. The site location is shown in **Figure 1**.

2.1.3 The Proposed Development is for redevelopment of the site to provide 77 residential units (use class C3 comprising 8 x studios, 18 x 1 bedroom, 32 x 2 bedroom and 19x 3 bedroom in two blocks (one 7 storey and one 6 storey with set back 7th floor). The proposals include the re-provision of 284sqm retail floorspace (use class A1 – A5) at ground floor level on Adelaide Road. The Proposed Development would replace the current property which is a 6 storey purpose built brick building for the storage of vehicles with 10 staggered floor levels inside the property. The property is currently vacant (since summer 2014). For assessment purposes, the year of opening, following completion of the construction phase, has been assumed as 2019.

2.1.4 It is considered that the Proposed Development may have a temporary impact on local air quality during the construction phase, with demolition, excavation and the storage of materials at the site posing the greatest risk with respect to the occurrence of 'nuisance dust'.

2.1.5 The exposure of future residents of the Proposed Development to potentially elevated pollutant concentrations has been considered due to its location within an Air Quality Management (AQMA).

2.1.6 The air quality neutrality of the Proposed Development has been determined in accordance with the Greater London Authority's (GLA) requirement.

2.1.7 This report presents the findings of the assessment of the potential air quality impacts of the Proposed Development during both its construction and operational phases. For both phases, the type, source and significance of potential impacts are identified, and mitigation measures should be employed to minimise these, where appropriate.

2.1.8 A glossary of terms used in this report is provided in **Appendix A**.

3 LEGISLATION, POLICY & GUIDANCE

3.1 AIR QUALITY LEGISLATION

3.1.1 The Government's policy on air quality within the UK is set out in the Air Quality Strategy for England, Scotland, Wales and Northern Ireland (AQS) published in July 2007[1]. The AQS provides a framework for reducing air pollution in the UK with the aim of meeting the requirements of European Union legislation and international commitments.

3.1.2 The AQS also sets standards and objectives for nine key air pollutants to protect public health, vegetation and ecosystems. These are benzene (C_6H_6), 1,3 butadiene (C_4H_6), carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), particulate matter (PM_{10} and $PM_{2.5}$), sulphur dioxide (SO_2), ozone (O_3), and polycyclic aromatic hydrocarbons (PAHs). The standards and objectives for the pollutants considered in this assessment are given in **Appendix B**.

3.1.3 The air quality standards are levels recommended by the Expert Panel on Air Quality Standards (EPAQS) and the World Health Organisation (WHO) with regards to current scientific knowledge about the effects of each pollutant on health and the environment.

3.1.4 The air quality objectives are medium-term policy based targets set by the Government which take into account economic efficiency, practicability, technical feasibility and timescale. Some objectives are equal to the EPAQS recommended standards or WHO guideline limits, whereas others involve a margin of tolerance, i.e. a limited number of permitted exceedances of the standard over a given period.

3.1.5 For some pollutants, (e.g. NO_2), there is both a long-term (annual mean) standard and a short-term standard. In the case of NO_2, the short-term standard is for a 1-hour averaging period, whereas for PM_{10} it is for a 24-hour averaging period. These periods reflect the varying impacts on health of differing exposures to pollutants, for example temporary exposure on the pavement adjacent to a busy road, compared with the exposure of residential properties adjacent to a road.

3.1.6 The AQS contains a framework for considering the effects of a finer group of particles known as '$PM_{2.5}$' as there is increasing evidence that this size of particles can be more closely associated with observed adverse health effects than PM_{10}.

AIR QUALITY REGULATIONS

3.1.7 Many of the objectives in the AQS have been made statutory in England with the Air Quality (England) Regulations 2000[2] and the Air Quality (England) (Amendment) Regulations 2002[3] for the purpose of Local Air Quality Management (LAQM).

3.1.8 These Regulations require that likely exceedances of the AQS objectives are assessed in relation to:

"…the quality of air at locations which are situated outside of buildings or other natural or man-made structures, above or below ground, and where members of the public are regularly present…"

[1] Department for Environment, Food and Rural Affairs (DEFRA) and the Devolved Administrations (2007). The Air QualityStrategy for England, Scotland, Wales and Northern Ireland (Volumes 1 and 2)

[2] The Air Quality (England) Regulations 2000 - Statutory Instrument 2000 No.928

[3] The Air Quality (England) (Amendment) Regulations 2002- Statutory Instrument 2002 No.3043

3.1.9 The Air Quality Standards Regulations 2010[4] transpose the European Union Ambient Air Quality Directive (2008/50/EC)[5] into law in England. This Directive sets legally binding limit values for concentrations in outdoor air of major air pollutants that impact public health such as PM_{10}, $PM_{2.5}$ and NO_2. The limit values for NO_2 are the same concentration levels as the AQS objectives, but applied from 2010. The limit values for PM_{10} and $PM_{2.5}$ are also the same concentration levels as the AQS objectives, but apply from 2005 for PM_{10} and will apply from 2015 for $PM_{2.5}$. It should be noted that currently there is no requirement for local authorities to assess $PM_{2.5}$ concentrations as part of their statutory obligations.

3.1.10 The 2010 Regulations also incorporate the European Union's 4th Air Quality Daughter Directive (2004/107/EC)[6], which sets targets for levels in outdoor air of certain toxic heavy metals and PAHs.

ENVIRONMENTAL PROTECTION ACT 1990 - CONTROL OF DUST AND PARTICULATES ASSOCIATED WITH CONSTRUCTION

3.1.11 Section 79 of the Environmental Protection Act 1990 gives the following definitions of statutory nuisance relevant to dust and particles:

"Any dust, steam, smell or other effluvia arising from industrial, trade or business premises or smoke, fumes or gases emitted from premises so as to be prejudicial to health or a nuisance"; and

"Any accumulation or deposit which is prejudicial to health or a nuisance"

3.1.12 Following this, Section 80 says that where a statutory nuisance is shown to exist, the local authority must serve an abatement notice. Failure to comply with an abatement notice is an offence and if necessary, the local authority may abate the nuisance and recover expenses.

3.1.13 There are no statutory limit values for dust deposition above which 'nuisance' is deemed to exist. Nuisance is a subjective concept and its perception is highly dependent upon the existing conditions and the change which has occurred.

ENVIRONMENT ACT 1995

3.1.14 Under Part IV of the Environment Act 1995, local authorities must review and document local air quality within their area by way of staged appraisals and respond accordingly, with the aim of meeting the air quality objectives defined in the Regulations. Where the objectives are not likely to be achieved, an authority is required to designate an Air Quality Management Area (AQMA). For each AQMA the local authority is required to draw up an Air Quality Action Plan (AQAP) to secure improvements in air quality and show how it intends to work towards achieving air quality standards in the future.

[4] The Air Quality Standards Regulations 2010 - Statutory Instrument 2010 No. 1001

[5] Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe

[6] Directive 2004/107/EC of the European Parliament and of the Council of 15 December 2004 relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air.

3.2 PLANNING POLICY

NATIONAL PLANNING POLICY

NATIONAL PLANNING POLICY FRAMEWORK

3.2.1 The Government's overall planning policies for England are described in the National Planning Policy Framework[7]. This document also outlines the means by which Government intends to apply these policies at various levels to achieve its aim of contributing to sustainable development. The Framework acknowledges the importance of appropriate and robust planning at a local level and thus promotes opportunities for communities to engage in plan making at a neighbourhood level. The core underpinning principle of the framework is the presumption in favour of sustainable development, defined as:

"Development that meets the needs of the present without compromising the ability of future generations to meet their own needs"

3.2.2 One of the 12 core planning principles in the NPPF is that planning should 'contribute to conserving and enhancing the natural environment and reducing pollution.'

3.2.3 In relation to air quality, the following paragraphs in the document are relevant:

- Paragraph 109, which *states – "The planning system should contribute to and enhance the natural and local environment by:…preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water, or noise pollution.."*;
- Paragraph 110, which *states – "In preparing plans to meet development needs, the aim should be to minimise pollution and other adverse effects on the local and natural environment. Plans should allocate land with the least environmental or amenity value, where consistent with other policies in this Framework."*;
- Paragraph 122, which states – "*…local planning authorities should focus on whether the development itself is an acceptable use of the land, and the impact of the use, rather than the control of processes or emissions themselves where these are subject to approval under pollution control regimes. Local planning authorities should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities";*
- Paragraph 124, which states – "*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 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"; and*
- Paragraph 203, which states – *"Local Planning authorities should consider where otherwise unacceptable development could be made acceptable though the use of conditions or planning obligations. Planning obligations should only be used where it is not possible to address unacceptable impacts through a planning condition."*

[7] Department for Communities and Local Government (2012). National Planning Policy Framework.

REGIONAL PLANNING POLICY

THE MAYOR'S AIR QUALITY STRATEGY FOR LONDON

3.2.4 In 2010 the GLA/Mayor of London published a new Mayor's Air Quality Strategy for London[8]. This strategy is focused on improving London's air quality. It also explains the current air quality experienced across London and gives predictions of future levels of pollution. The sources are outlined and a comprehensive set of policies and proposals are set out that will improve air quality in the London Boroughs.

3.2.5 The Strategy sets out a framework for delivering improvements to London's air quality and includes measures aimed at reducing emissions from transport, homes, offices and new developments, promoting smarter more sustainable travel, as well as raising awareness of air quality issues.

3.2.6 The Strategy includes a policy which states: *"New developments in London shall as a minimum be 'air quality neutral' through the adoption of best practice in the management and mitigation of emissions"*.

3.2.7 The London Plan, chapter 7: London's Living Places and Spaces, Policy 7.14 (Improving Air Quality) of the London Plan[9] is specific to the improvement of air quality and states that development proposals should:

- *"minimise increased exposure to existing poor air quality and make provision to address local problems of air quality(particularly within AQMAs), and 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 as by design solutions, buffer zones or steps to promote greater use of sustainable transport modes through travel plans"*;
- *"promote sustainable design and construction in order 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 from construction and demolition'"*;
- *"be at least 'air quality neutral' and not lead to further deterioration of existing poor air quality"*;
- *"ensure that where provision needs to be made to reduce emissions from a development, this is usually made on site"*; and
- *"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."*

LOCAL PLANNING POLICY

CAMDEN CORE STRATEGY 2010 – 2025

3.2.8 In this document[10], Policy CS16 *(Improving Camden's health and well-being)* and policy DP32 *(Air quality and Camden's Clear Zone)* of Camden Development Policies sets out the approach to air quality in the borough, and states that Camden will:

"…recognise the impact of poor air quality on health and implement Camden's Air Quality Action Plan which aims to reduce air pollution level."

[8] Mayor of London: Cleaning London's air, The Mayor's Air Quality Strategy (December 2010)

[9] Mayor of London) The London Plan (March 2016

[10] London Borough of Camden (2010) Camden Core Strategy 2010-2025

3.2.9 Policy CS11 (*Promoting sustainable and efficient travel)* aims to improve Camden's air quality through transport measures.

CLEAN AIR ACTION PLAN 2013 – 2015

3.2.10 This [11] details a variety of actions to reduce the key pollutants in Camden – nitrogen dioxide NO2 and particulate matter (PM_{10}) from traffic, boilers and other sources. There are three main sections with the plan for combating pollutants emissions: *"reducing transport emissions, reducing emissions associated with new development, reducing emission from gas boilers and industrial processes, raising awareness and lobbying and partnership working. "*

CAMDEN PLANNING GUIDANCE 6- AMENITY

3.2.11 This document[12] is a guidance which supports the policies in Camden's Local Development Framework (LDF). This includes policy DP32- Air Quality and Camden's Clear Zones which states that:

- *" all* developments *are to limit their impact on local air quality";* and
- *"..overarching aim for Camden Borough Council is for new development to be 'air quality neutral' and not lead to further deterioration of existing poor air quality*"; and
- ".. *(developers) are required to include mitigation and offsetting measures to deal with any negative air quality impacts associated with development proposals."*

3.3 GUIDANCE

3.3.1 A summary of the publications referred to in the undertaking of this assessment is provided below.

LONDON LOCAL AIR QUALITY MANAGEMENT

3.3.2 The GLA has published technical guidance to be used by London Boroughs in LAQM. This guidance, referred to as LLAQM.TG(16)[13], has been used where appropriate in the assessment presented herein. The Department for Environment, Food and Rural Affairs (DEFRA) LAQM.TG(16) guidance, which is aimed at non-London local authorities, has also been used where appropriate[14].

LAND-USE PLANNING & DEVELOPMENT CONTROL: PLANNING FOR AIR QUALITY

3.3.3 This air quality guidance produced by Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM)[15] offers comprehensive advice on: when an air quality assessment may be required; what should be included in an assessment; how to determine the significance of any air quality impacts associated with a development; and, the possible mitigation measures which may be implemented to minimise these impacts.

[11] London Borough of Camden (2013) Camden's Clean Air Action Plan 2013 – 2015

[12] London Borough of Camden (2010) Camden Planning Guidance 6- Amenity London Borough of Camden (2013)

[13] GLA (2016) London Local Air Quality Management (LLAQM)Technical Guidance LLAQM.TG(16)

[14] DEFRA (2016) Local Air Quality Management Review and Assessment Technical Guidance LAQM.TG(16)

[15] Environmental Protection UK and Institute for Air Quality Management (2010). Land-Use Planning & Development Control: Planning for Air Quality (May 2015 Update)

GUIDANCE ON THE ASSESSMENT OF DUST FROM DEMOLITION AND CONSTRUCTION

3.3.4 This document[16] published by the IAQM was produced to provide guidance to developers, consultants and environmental health officers on how to assess the impacts arising from construction activities. The emphasis of the methodology is on classifying sites according to the risk of impacts (in terms of dust nuisance, PM_{10} impacts on public exposure and impact upon sensitive ecological receptors) and to identify mitigation measures appropriate to the level of risk identified.

NATIONAL PLANNING PRACTICE GUIDANCE – AIR QUALITY

3.3.5 This guidance[17] provides a number of guiding principles on how the planning process can take into account the impact of new development on air quality, and explains how much detail air quality assessments need to include for Proposed Developments, and how impacts on air quality can be mitigated. It also provides information on how air quality is taken into account by Local Authorities in both the wider planning context of Local Plans and neighbourhood planning, and in individual cases where air quality is a consideration in a planning decision.

LONDON COUNCILS GUIDANCE FOR AIR QUALITY ASSESSMENTS

3.3.6 The London Councils have published guidance[18] for undertaking air quality assessments in the London Boroughs, the majority of which have declared AQMAs. The guidance sets out suggested methods for undertaking such an assessment within the London area and provides a methodology to assist in determining the impacts of a development proposal on air quality. The main message of the document is, as above, that the factor of greatest importance will generally be the difference in air quality as a result of the Proposed Development.

MAYOR OF LONDON'S SUPPLEMENTARY PLANNING GUIDANCE FOR THE CONTROL OF DUST AND EMISSIONS DURING CONSTRUCTION AND DEMOLITION

3.3.7 This Supplementary Planning Guidance[19] (SPG) builds on the voluntary guidance published in 2006 by the London Councils to establish best practice in mitigating impacts on air quality during construction and demolition work. The SPG incorporates more detailed guidance and best practice, and seeks to address emissions from Non-Road Mobile Machinery (NRMM) through the use of a Low Emission Zone, which was introduced in September 2015. In this zone, NRMM (with net power 37kW to 560kW) have to meet standards that are based on EU Directive 97/68/EC and its subsequent amendments. These state that:

"*NRMM used on the site of any major development within Greater London will be required to meet Stage IIIA of the Directive as a minimum; and*

NRMM used on any site with the Central Activity Zone or Canary Wharf will be required to meet Stage IIIB of the Directive as a minimum."

[16] Institute of Air Quality Management (February 2014): Guidance on the Assessment of Dust from Demolition and Construction

[17] Department of Communities and Local Government (DCLG) (March 2014) National Planning Practice Guidance

[18] London Councils (January 2007): Air Quality and Planning Guidance – Revised version

[19] Mayor of London (July 2014): The control of dust and emissions during construction and demolition – Supplementary Planning Guidance.

3.3.8 The SPG provides a methodology for assessing the potential impact of construction and demolition activities on air quality following the same procedure as set out in the IAQM guidance. It then identifies the relevant controls and mitigation measures that should be put in place to minimise any adverse impacts, which need to be set out, in draft, in an air quality assessment report submitted with the planning application, and then formalised post submission as an Air Quality and Dust Management Plan. Details of site air quality monitoring protocols are also provided with varying requirements depending on the size of the site and the potential risk of adverse impacts.

GREATER LONDON AUTHORITY: SUSTAINABLE DESIGN AND CONSTRUCTION SUPPLEMENTARY PLANNING GUIDANCE

3.3.9 In 2014 the GLA published its Sustainable Design and Construction SPG[20]. Section 4.3 of this SPG provides guidance on the when a developer will be required to undertake an air quality assessment, looks at how design and transport measures can be used to minimise emissions to air, and sets out emissions standards for combustion plant. The SPG also contains guidance on assessing the air quality neutrality of a Proposed Development in order to comply with the London Plan and the Mayor's Air Quality Strategy. Benchmarks for both transport and buildings NO_x and PM_{10} emissions are provided within the SPG.

AIR QUALITY NEUTRAL PLANNING SUPPORT

3.3.10 Updated in April 2014, the Air Quality Neutral Planning Support guidance[21] has been produced to provide guidance on the methodology for assessing the air quality neutrality of Proposed Developments in London.

ENVIRONMENT AGENCY: RISK ASSESSMENTS FOR SPECIFIC ACTIVITIES: ENVIRONMENTAL PERMITS

3.3.11 The Air Emissions section[22] of this Environment Agency Guidance has been referred to in the assessment of emissions to air from the proposed energy centre.

[20] Greater London Authority (2014). Sustainable Design and Construction Supplementary Planning Guidance.

[21] AQC and ENVIRON UK Ltd (2014). Air Quality Neutral Planning Support.

[22] https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit (March 2016)

4 METHODOLOGY

4.1 SCOPE

4.1.1 The scope of the assessment has been determined in the following way:

- Consultation with the Environmental Health Officer (EHO) of LBC to discuss the availability and location of local monitoring data, to agree the scope of the assessment and the methodology to be applied;
- Review of LBC's latest review and assessment reports[23] and air quality data for the area surrounding the site, including data from LBC, DEFRA[24], the Environment Agency (EA)[25] and the London Air websites[26];
- Desk study to confirm the locations of nearby existing receptors that may be sensitive to changes in local air quality and dust deposition and a review of the design details provided by the Project Architect (Piercy and Co.) for the Proposed Development to establish the locations of new sensitive receptors;
- Review of the traffic data provided by the Project Transport Consultant (Steer Davies Gleeve), which have been used as an input to the air quality assessment; and
- Review of the emission data for the proposed energy centre as supplied by the Sustainability and Energy Consultant (Chapman BDSP). The emission data have been used as an input into the air quality assessment.

4.1.2 The scope of the assessment includes consideration of the potential impacts on local air quality resulting from:

- Dust and particulate matter generated by on-site activities during the construction phase;
- Pollutant concentrations (namely NO_2 and particulate matter) as a result of exhaust emissions arising from construction traffic and plant; and
- Increases in pollutant concentrations (NO_2) as a result of the energy centre emissions resulting from the operation of the existing energy centre associated with the Proposed Development.

4.1.3 The assessment methodology has been agreed with the EHO at LBC[27], this includes consideration of the potential exposure of future users of the Proposed Development to local air pollutant concentrations that may be elevated above objective limits.

[23] London Borough of Camden Air Quality Progress Report, 2014

[24] DEFRA Local Air Quality Management (LAQM) Support Pages. Available at: http://laqm.defra.gov.uk/ Accessed on 26/10/2015

[25] Environment Agency Website. Available at http://www.environmentagency.gov.uk/homeandleisure/37793.aspx. Accessed on 23/11/2015

[26] London Air Website. Available at: http://www.londonair.org.uk/LondonAir/Default.aspx. Accessed on 23/11/2015

[27] Email from Amy Farthing (LBC) 16th November 2015

INSIGNIFICANT EFFECTS

4.1.4 There are no designated ecological sites within 50m of the Application Site boundary or within 50m of roads likely to be used by construction traffic; consequently, an assessment of the impact of the construction phase on ecological sites has been scoped out of this assessment.

4.2 METHODOLOGY

CONSTRUCTION PHASE

4.2.1 An assessment of the likely significant impacts on local air quality due to the generation and dispersion of dust and PM_{10} during the construction phase has been undertaken using: the relevant assessment methodology published by the IAQM and GLA; the available information for this phase of the Proposed Development provided by the Client and Project Team; and, professional judgement.

4.2.2 The IAQM/GLA assessment is undertaken where there are: 'human receptors' within 350m of the site boundary, or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s); and/or 'ecological receptors' within 50m of the site boundary, or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s). It is within these distances that the impacts of dust soiling and increased PM_{10} in the ambient air will have the greatest impact on local air quality at sensitive receptors.

4.2.3 The IAQM/GLA methodology assesses the risk of potential dust and PM_{10} impacts from the following four sources: demolition; earthworks; general construction activities and track-out. It takes into account the nature and scale of the activities undertaken for each source and the sensitivity of the area to an increase in dust and PM_{10} levels to assign a level of risk. Risks are described in terms of there being a low, medium or high risk of dust impacts. Once the level of risk has been ascertained, then site specific mitigation proportionate to the level of risk is identified, and the significance of residual effects determined. A summary of the IAQM assessment methodology is provided in **Appendix C**.

4.2.4 In addition to impacts on local air quality due to on-site construction activities, exhaust emissions from construction vehicles and plant may have an impact on local air quality adjacent to the routes used by these vehicles to access the Application Site and in the vicinity of the Application Site itself. As information on the number of vehicles and plant associated with the each part of the construction phase is not available at the time of writing, a qualitative assessment of their impact on local air quality has been undertaken using professional judgement and by considering the following:

- → The number and type of construction traffic and plant likely to be generated by this phase of the Proposed Development;
- → The number and proximity of sensitive receptors to the Application Site and along the likely routes to be used by construction vehicles; and
- → The likely duration of the construction phase and the nature of the construction activities undertaken.

OPERATIONAL PHASE

4.2.5 Of the pollutants included in the AQS, NO_2, PM_{10} and $PM_{2.5}$ concentrations have been considered in the new exposure assessment as road traffic is a major source of these pollutants. NO_2 is the main consideration relating to emissions from the proposed on-site energy centre.

MODELLING OF ROAD TRAFFIC EMISSIONS

4.2.6 For the prediction of concentrations from emissions arising from road traffic, the advanced dispersion model ADMS-Roads (version 4) has been used. This model uses detailed information regarding traffic flows on the local road network, surface roughness, and local meteorological conditions to predict pollutant concentrations.

4.2.7 A summary of the traffic data and pollutant emission factors used in the assessment can be found in **Appendix D**. It includes details of Annual Average Daily Traffic flows (AADT), vehicle speeds (kph) and the percentage of Heavy Duty Vehicles (HDVs) for the local road network.

4.2.8 Meteorological data, such as wind speed and direction, is used by the model to determine pollutant transportation and levels of dilution by the wind. Meteorological data used in the model was obtained from the Met Office observing station at London City Airport. This station is considered to provide data representative of the meteorological conditions at the Proposed Development site. The windrose for London City Airport is shown in **Appendix G**.

4.2.9 For the assessment, the 2014 'baseline' scenario was modelled and it was also used for model verification.

4.2.10 2014 is the most recent year for which monitoring data and meteorological data are available to enable verification of the model results. Future scenarios have not been included in this assessment as - according to the Project Transport Consultant - there will no capacity for general traffic growth in the vicinity of the Application Site, and the Proposed Development will be 'car free'.

4.2.11 Vehicle emission factors for use in the assessment have been obtained using the Emission Factor Toolkit (EFT) version 6.0.2[28] (published in November 2014) available on the DEFRA website [29]. The EFT allows for the calculation of emission factors arising from road traffic for all years between 2008 and 2030.

SELECTION OF BACKGROUND CONCENTRATIONS

4.2.12 Background concentrations of pollutants included within the AQS have been mapped at a grid resolution of 1x1km for the whole of the UK. For NO_2, PM_{10} and $PM_{2.5}$, estimated concentrations are available for all years between 2010 and 2030. Inherent within the background maps is the assumption that background concentrations will improve (i.e. reduce) over time. However, many local authorities are finding that the results of their local monitoring do not always support this assumption, with many areas showing that pollutant concentrations have remained fairly stable over recent years. For the purposes of the assessment, 2014 background concentrations have therefore been adopted for all assessment scenarios. This approach was agreed in consultation with the EHO of LBC. Further details on the background concentrations are provided in Section Four of this report.

ADMS-ROADS MODEL VERIFICATION

4.2.13 The ADMS-Roads dispersion model has been validated for modelling of road sources and is considered to be fit for purpose.

[28] Emission Factor Toolkit. Available at http://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html

[29] http://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html

4.2.14 Model validation undertaken by the software developer will not have included validation in the vicinity of the Proposed Development. To determine the performance of the model at a local level, a comparison of modelled results with local monitoring data at relevant locations was undertaken. This process of verification aims to minimise modelling uncertainty and systematic error by correcting modelled results by an adjustment factor to gain greater confidence in the final results.

4.2.15 Suitable local monitoring data for the purpose of model verification is available for concentrations of NO_2 at the locations shown in **Table 1**.

Table 1 Local monitoring data sources suitable for model verification

ID	Location & Site Classification	O.S. Grid Reference	2014 Monitored NO_2 Concentrations ($\mu g/m^3$)
CA16	Kentish Town Road, Roadside	529013, 185102	57.8
CA23	Camden Road, Roadside	529173, 184129	72.2

4.2.16 Model verification has been undertaken following the methodology specified in Chapter 7 of LAQM.TG(16) using the NO_x to NO_2 calculator (version 4.1, released in June 2014) available from the DEFRA website[30] to calculate the roadside NO_x component of the annual mean NO_2 concentrations measured at the monitoring site listed in the table above. Details of the verification calculations are presented in **Appendix E**.

4.2.17 A factor of 3.2 was obtained during the verification process and this factor has been applied to the modelled road-NO_x component at each receptor to adjust for model underestimation of actual concentration. Following adjustment, the modelled road-NO_x concentrations were converted to annual mean NO_2 concentrations using the methodology given in LAQM.TG(16) and the NO_x to NO_2 calculator.

4.2.18 Suitable local monitoring data are not available for PM_{10} and $PM_{2.5}$, and as such, the predicted road-PM_{10} and $PM_{2.5}$ components at each receptor have been adjusted using the factor calculated for road-NO_x described above. This approach is consistent with guidance given in LAQM.TG(16). The total annual mean PM_{10} concentrations also used to calculate the number of exceedances of the 24-hour mean objective for direct comparison with the relevant AQS objective, following the methodology given in LAQM.TG(16).

MODELLING OF EMISSIONS GENERATED BY THE OPERATION OF THE PROPOSED ENERGY CENTRE

4.2.19 For the prediction of impacts due to emissions arising from the operation of the proposed energy centre, which are emitted from stationary point sources, the air pollutant dispersion model ADMS 5.1 has been used. This model uses detailed information regarding the pollutant releases, local building effects and local meteorological conditions to predict pollution concentrations at specific locations selected by the user. A summary of the stack parameters and emissions data used in the assessment is provided in **Appendix F**. The key pollutant emitted from the proposed energy centre is NO_x.

4.2.20 The same meteorological data used in the modelling of traffic emissions was used in the modelling of emissions from the proposed energy centre.

4.2.21 The boilers and CHP data had been provided by the Project Mechanical Engineer:

[30] http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NO_xNO_2calc

- The proposed energy centre consists, 4 Fleet Vertical F100V-200 modular boilers (N+1 arrangement, only 3 will run simultaneously) and a Dach Pro 20 CHP unit;
- Both CHP modular boiler units will run approximately 3650 hours annually, from 06:00-10:00 and 18:00-22:00 every day (10 hours daily).
- Same operational times have been applied throughout the year, in the absence of any further details.

4.2.22 Modelled building parameters included in the model can be found in **Appendix F**.

4.2.23 The Environment Agency has published a guidance note[31] on conversion ratios for NO_x to NO_2 arising from stack emissions which states that 35% and 70% of the modelled NO_x values should be used for short-term and long-term average concentrations respectively. These conversion rates have been applied to the output of the ADMS 5.1 model.

4.2.24 The total NO_2 concentration (Predicted Environmental Concentration (PEC)) at each receptor has been calculated as the Process Contribution (PC) plus background concentration.

4.2.25 ADMS 5.1 has been independently validated for modelling dispersion from point sources and is widely used for EIA and in regulatory assessments. Unlike road sources it is not common practice to undertake local model verification as this would require the source(s) under consideration to exist and be in operation, and a comprehensive array of monitoring equipment in the surrounding area (as is the case with model validation).

COMBINED RESULTS OF MODELLING EMISSIONS FROM ROAD TRAFFIC AND THE PROPOSED ENERGY CENTRE AND

4.2.26 Predicted annual mean NO_2 concentration contributions arising from the road traffic and the proposed energy centre emissions were combined with the local background concentrations to obtain total estimates of annual mean NO_2 concentrations. The maximum annual mean predicted concentrations for the receptors in each model can be added to provide the long-term impact. This is because they are averaged over the entire year and are therefore, not temporally defined (i.e. they do not occur at a specific point in time).

4.2.27 Detailed assessment of short term effects is often complex as the maximum contribution from each source may be separated both temporally and spatially, such that the addition of two 'worst case' concentrations together may not represent a likely event. Therefore, it is not possible to sum the predicted maximum hourly average concentrations at each receptor for the two models as the maximum concentrations are unlikely to occur in the same hour for each of the sources, and would therefore result in overestimation of the likely hourly mean concentrations at receptors locations.

4.2.28 LAQM.TG(16) advises that exceedances of the 1 hour mean NO_2 objective are unlikely to occur where annual mean concentrations are below 60µg/m^3, and it provides guidance on the approach that should be taken if either measured or predicted annual mean NO_2 concentrations are 60µg/m^3 or above. Whilst it is noted that this relationship was derived from studies of road transport emissions, in the absence of more appropriate guidance regarding point source or combined emissions, this relationship has been used in this assessment to determine the likelihood of exceedances of the 1 hour objective.

4.2.29 Predicted concentrations have been compared against the relevant current statutory standards and objectives set out in **Appendix B**.

[31] Environment Agency's advice note for conversion ratios for NOx and NO2. Available at http://www.environment-agency.gov.uk/static/documents/Conversion_ratios_for_NOx_and_NO2_.pdf

4.3 SELECTION OF SENSITIVE RECEPTORS

4.3.1 Sensitive locations are places where the public or sensitive ecological habitats may be exposed to pollutants resulting from activities associated with the Proposed Development. These will include locations sensitive to an increase in dust deposition and PM_{10} exposure as a result of on-site construction activities, and locations sensitive to exposure to gaseous pollutants emitted from the proposed energy centre and from the exhausts of construction and operational traffic associated with the Proposed Development.

4.3.2 In terms of locations that are sensitive to gaseous pollutants emitted from engine exhausts (road vehicles and construction plant) and energy centre flues, these will include places where members of the public are likely to be regularly present over the period of time prescribed in the AQS.

4.3.3 For instance, on a footpath where exposure will be transient (for the duration of passage along that path) comparison with a short-term standard (i.e. 15 minute mean or 1 hour mean) may be relevant. In a school or adjacent to a private dwelling, where exposure may be for longer periods, comparison with a long-term standard (such as 24 hour mean or annual mean) may be more appropriate. Box 1.1 of LAQM.TG(16) provides examples of the locations where the air quality objectives should/should not apply, and is reproduced below as **Table 2**.

Table 2 Examples of where the air quality objectives should/should not apply

AVERAGING PERIOD	OBJECTIVES SHOULD APPLY AT:	OBJECTIVES SHOULD GENERALLY NOT APPLY AT:
Annual mean	All locations where members of the public might be regularly exposed. Building facades of residential properties, schools, hospitals, care homes etc.	Building facades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the building façade), or any other locations where public exposure is expected to be short term.
24-hour mean	All locations where the annual mean objective would apply, together with hotels. Gardens of residential properties.[1]	Kerbside sites (as opposed to locations at the building façade), or any other locations where public exposure is expected to be short term.
1-hour mean	All locations where the annual mean and 24 - hour mean objectives apply. Kerbside sites (for example, pavements of busy shopping streets) Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more. Any outdoor locations where members of the public might reasonably expected to spend one hour or longer.	Kerbside sites where the public would not be expected to have regular access.
15-min mean	All locations where members of the public might reasonably be exposed for a period of 15 minutes or longer.	

[1].Such locations should represent parts of the garden where relevant public exposure is likely, for example where there are seating or play areas. It is unlikely that relevant public exposure would occur at the extremities of the garden boundary, or in front gardens, although local judgement should always be applied.

4.3.4 To complete the assessment of operational phase impacts, a number of 'receptors' representative of locations of relevant public exposure were identified at which pollution concentrations were predicted. Locations that are the most likely to experience a change in NO_2 concentrations as a result of emissions from the energy centre has been considered in this assessment. To complete the exposure assessment, pollution concentrations were also predicted at a number of locations across the Proposed Development site.

4.3.5 The locations of the assessment receptors are shown on **Figure 2** and listed in **Table 3**.

Table 3 Receptor locations used in the assessment

RECEPTOR NUMBER	RECEPTOR NAME	RECEPTOR TYPE	GRID REFERENCE (M)	HEIGHT ABOVE GROUND LEVEL (M)
E1	Adelaide Road	Commercial	528173, 184388	1.5, 4.5, 7.5
E2	Adelaide Road	Residential	528109, 184387	1.5, 4.5
E3	Adelaide Road	Residential	528031, 184383	1.5, 4.5, 7.5
E4	Haverstock Hill	School	528122, 184457	1.5, 4.5

Receptor Number	Receptor Name	Receptor Type	Grid Reference (m)	Height Above Ground Level (m)
E5	Haverstock Hill	Residential	528152, 184433	1.5, 4.5, 7.5
E6	Haverstock Hill	Residential	528203, 184406	1.5, 4.5, 7.5
E7	Camden Lock Hotel	Commercial	528220, 184384	1.5, 4.5, 7.5, 10.5
E8	Chalk Farm Road	Residential	528232, 184385	1.5, 4.5, 7.5
N1	Site – Haverstock Hill façade	Residential	528099, 184448	1.5, 4.8, 8.1, 11.4, 14.7, 18.0, 21.3
N2	Site – Haverstock Hill façade	Residential	528107, 184442	1.5, 4.8, 8.1, 11.4, 14.7, 18.0, 21.3
N3	Site – Haverstock Hill façade	Residential	528124, 184429	1.5, 4.8, 8.1, 11.4, 14.7, 18.0, 21.3
N4	Site – Adelaide Road façade	Residential/ retail on ground floor	528100, 184405	1.5, 4.8, 8.1, 11.4, 14.7, 18.0
N5	Site – Adelaide Road façade	Residential/ retail on ground floor	528063, 184405	1.5, 4.8, 8.1, 11.4, 14.7, 18.0
N6	Site – façade opposite to Eton Place	Residential	528072, 184421	2.3, 5.4, 8.6, 11.7, 14.9
N7	Site – façade opposite to Eton Place	Residential	528084, 184436	2.3, 5.4, 8.6, 11.7, 14.9
N8	Site – façade opposite to Eton Place	Residential	528092, 184447	4.8, 8.1, 11.4, 14.7, 18.0, 21.3

4.4 SIGNIFICANCE CRITERIA

CONSTRUCTION PHASE

4.4.1 The IAQM methodology concerning construction phase impacts recommends that significance is only determined after consideration of mitigation. For almost all construction activities, the application of effective mitigation should prevent any significant effect occurring and therefore the residual effect will normally be negligible – i.e. not significant. For the assessment of the impact of emissions from plant and construction vehicles accessing and leaving the Application Site on local air quality, the significance of residual effect have been determined using professional judgement.

OPERATIONAL PHASE

4.4.2 In determining both the significance of new exposure to air pollution and the levels of mitigation required for the Proposed Development, consideration was given to the Air Pollution Exposure Criteria (APEC) published in the London Councils guidance for air quality assessments and shown in **Table 4**.

Table 4: London Councils Air Pollution Exposure Criteria

APEC Level	Applicable Range Annual average NO_2	Applicable Range PM_{10}	Recommendation
A	>5% below national objective	Annual Mean >5% below national objective 24 hour mean >1 day less than the national objective	No air quality grounds for refusal; however mitigation of any emissions should be considered.
B	Between 5% below or above national objective	Annual Mean Between 5% below or above national objective 24 hour mean Between 1 day above or below the national objective	May not be sufficient air quality grounds for refusal, however appropriate mitigation must be considered e.g., maximise distance from pollution source, proven ventilation systems, parking considerations, winter gardens, internal layout considered and internal pollutant emissions minimised.
C	>5% above national objective	Annual Mean >5% above national objective 24 hour mean >1 day more than the national objective	Refusal on air quality grounds should be anticipated, unless the Local Authority has a specific policy enabling such land use and ensure best endeavours to reduce exposure are incorporated. Worker exposure in commercial/industrial land uses should be considered further. Mitigation measures must be presented with air quality assessment, detailing anticipated outcomes of mitigation measures.

4.4.3 To address the Mayor's Air Quality Neutral policy, and in line with the 2014 Sustainable Design and Construction SPG, NO_x and PM_{10} emissions from the buildings and transport elements of the Proposed Development were calculated and compared to the benchmarks set out below.

4.4.4 Where the benchmark is exceeded, mitigation is required, either locally or by way of off-setting emissions.

4.4.5 One Building Emission Benchmark (BEB) category has been used as per current guidance (only NO_x, as PM_{10} is not anticipated to be emitted from CHP and domestic-type gas boilers) for the relevant land-use classes.

4.4.6 The Proposed Development is 'car free' and therefore Transport Emissions Benchmark is not applicable for this assessment.

4.4.7 The benchmarks applicable to the Proposed Development are expressed in terms of g/m^2/annum, and are provided in **Table 5**.

Table 5 Selected Building Emission Benchmarks

BENCHMARK CATEGORY	NO_x BENCHMARK	PM_{10} BENCHMARK
Building Emissions	218.1 kgNO_x/annum	N/A

4.5 LIMITATIONS & ASSUMPTIONS

4.5.1 There are uncertainties associated with both measured and predicted concentrations. The models (ADMS-Roads and ADMS 5.1) used in this assessment rely on input data (including projected traffic flows and stack emission parameters), which also have uncertainties associated with them. The models simplify complex physical systems into a range of algorithms. In addition, local micro-climatic conditions may affect the concentrations of pollutants that the models will not take into account.

4.5.2 In order to reduce the uncertainty associated with the ADMS-Roads predictions, model verification has been carried out following guidance set out in LAQM.TG(16), which recommends the use of roadside monitoring for this process. As the model has been verified against 2014 measured concentrations and has been adjusted to take account of the under-prediction, there can be reasonable confidence in the predicted concentrations.

4.5.3 Both nearby buildings and complex topography can have a significant effect on the dispersion characteristics of the plumes from the stacks being assessed. ADMS 5.1 has algorithms which attempt to take account of these impacts. Buildings can cause the plume to come to ground much closer to the stack than otherwise expected, causing higher pollutant concentrations. Plumes can also impact on hillsides under certain weather conditions, or within a basin or hollow which may result in pollutants being trapped for low level discharges.

4.5.4 It has been assumed that the both CHP modular boiler units will all operate approximately 3650 hours annually, as advised by the Project Sustainability and Energy Consultant.

5 BASELINE CONDITIONS

5.1 LBC'S REVIEW & ASSESSMENT OF AIR QUALITY

5.1.1 As part of its review and assessment work, LBC has designated an AQMA which covers its entire administrative area. This AQMA was designated due to exceedances of the AQS objectives for NO_2, and PM_{10}, brought about by road transport emissions; however, in recent years there have been no exceedances of the PM_{10} objectives within the Borough. The Application Site within the AQMA.

5.2 LOCAL EMISSION SOURCES

5.2.1 The Application Site is located in an area where air quality is mainly influenced by emissions from road transport on Haverstock Hill and Adelaide Road.

5.2.2 There are no known industrial pollution sources in the immediate vicinity of the site that will significantly influence the local air quality.

5.3 BACKGROUND AIR QUALITY DATA

5.3.1 **Table 6** shows the NO_2, PM_{10} and $PM_{2.5}$ DEFRA background concentrations that were used in the assessment. As the monitoring sites operated by LBC are located far away from the Proposed Development, the background data DEFRA are considered to be reasonably representative.

Table 6 2014 DEFRA Background Concentrations used in the Assessment (µg/m^3)

X, Y COORDINATES	NO_2 (µG/M^3)	PM_{10} (µG/M^3)	$PM_{2.5}$ (µG/M^3)
528500, 184500	33.6	22.9	15.6

5.3.2 The estimated background concentrations of NO_2, PM_{10} and $PM_{2.5}$ are below the relevant annual mean objectives (Appendix B).

5.4 LOCAL AUTHORITY AIR QUALITY MONITORING DATA

5.4.1 The closest monitoring locations to the Application Site are Kentish Town Road and Camden Road (both used for ADMS-Roads model verification). Other notable sites which are further away are Swiss Cottage, Chetwynd Road and Euston Road. **Table 7** and **Table 8** present summaries of the NO_2 and PM_{10} monitoring data and the locations are shown in **Figure 3.**

Table 7 LBC Monitoring Data

Site ID	Site Type	X, Y	Distance to site	Annual Mean (µg/m^3)					Number of Exceedances of 1-Hour Mean = 200 µg/m^3				
				2010	2011	2012	2013	2014	2010	2011	2012	2013	2014
CA23 Camden Road	R	529173 184129	1.1km	**84.0**	**72.2**	**67.4**	**77.9**	**72.2**	-	-	-	-	-
CA16 Kentish Town Road	R	529013 185102	1.1km	**74.0**	**57.2**	**59.0**	**65.3**	**57.8**	**-**	**-**	**-**	**-**	-
CD1 Swiss Cottage	Auto K	526633 184392	1.5km	**82.0**	**71.0**	**70.0**	**63.0**	**66.0**	**126**	**76**	**41**	**42**	**66**
CA24 Chetwynd Road	R	528722 185950	1.6km	**68**	**44.1**	**43.7**	**47.8**	**44.8**	**-**	**-**	**-**	**-**	-

Notes:
K = kerbside, R= roadside
Bold= exceedances
Sources: LAQN website http://www.londonair.org.uk/LondonAir/Default.aspx (accessed 15/02/16) and 2015 Updating and Screening Assessment for London Borough of Camden

Table 8 Automatic monitor ambient PM_{10} concentrations in LBC

Site ID	Site Type	X, Y	Distance to site	Annual Mean (µg/m^3)					Number of Exceedances of 24-Hour Mean = 50 µg/m^3				
				2010	2011	2012	2013	2014	2010	2011	2012	2013	2014
CD1 Swiss Cottage	K	526633 184392	1.5km	26	27	23	21	22	-	31	20	7	-
CD9 Euston Road	R	529878 182648	2.5km	-	-	-	-	29	-	-	-	-	-

Notes:
K = kerbside
Bold= exceedances
Sources: LAQN website http://www.londonair.org.uk/LondonAir/Default.aspx (accessed 15/02/16) and 2015 Updating and Screening Assessment for London Borough of Camden

5.4.2 All of the sites are situated adjacent to heavily trafficked roads and as such represent worst-case locations. There have been consistent exceedances of the annual mean NO_2 objective of 40µg/m^3 at all locations for the last five years. Exceedances the hourly mean NO_2 objective have been recorded at Swiss Cottage between 2010 and 2014.

5.4.3 The PM_{10} objectives have been met at both kerbside and roadside monitoring stations.

5.4.4 The current baseline condition indicates the NO_2 levels are in excess in all the monitoring sites, and therefore exceedances will be likely to experience at the Application Site. PM_{10} concentrations are well below the objective at the above monitoring locations and therefore, elevated PM_{10} level will be unlikely.

6 ASSESSMENT OF IMPACTS

6.1 CONSTRUCTION PHASE

DUST AND PM_{10} ARISING FROM ON-SITE ACTIVITIES

6.1.1 During the construction phase, there will be a number of activities which have the potential to generate and/or re-suspend dust and PM_{10}.

6.1.2 Dust comprises particles typically in the size range 1-75 micrometres (µm) in aerodynamic diameter and is created through the action of crushing and abrasive forces on materials. The larger dust particles fall out of the atmosphere quickly after initial release and therefore tend to be deposited in close proximity to the source of emission. Dust therefore, is unlikely to cause long-term or widespread changes to local air quality; however, its deposition on property and cars can cause 'soiling' and discolouration. This may result in complaints of nuisance through amenity loss or perceived damage caused, which is usually temporary.

6.1.3 The smaller particles of dust (typically less than 10µm in aerodynamic diameter) are known as particulate matter (PM_{10}) and represent only a small proportion of total dust released. As these particles are at the smaller end of the size range of dust particles they remain suspended in the atmosphere for a longer period of time than the larger dust particles, and can therefore be transported by wind over a wider area. PM_{10} is small enough to be drawn into the lungs during breathing, which in sensitive members of the public could have a potential impact on health. Therefore, standards and objectives for PM_{10} are defined in the AQS and Regulations, and the impact of this phase on PM_{10} concentrations is referred to below as the impact on 'human health'.

6.1.4 Significant increases in dust deposition levels and particulate matter concentrations can also affect sensitive vegetation by blocking stomata, reducing photosynthesis and plant growth.

6.1.5 Construction activities that have the potential to generate and/or re-suspend dust and PM_{10}. include:

- Site clearance and preparation including demolition activities;
- Preparation of temporary access/egress to the Application Site and haulage routes;
- Limited earthworks;
- Materials handling, storage, stockpiling, spillage and disposal;
- Movement of vehicles and construction traffic within the Application Site (including excavators and lorries);
- Exhaust emissions from site plant, especially when used at the extremes of their capacity and during mechanical breakdown;
- Construction of buildings, roads and areas of hardstanding alongside fabrication processes;
- Internal and external finishing and refurbishment; and
- Site preparation and restoration after completion.

6.1.6 The majority of the releases are likely to occur during the 'working week'. However, for some potential release sources (e.g. exposed soil produced from significant earthwork activities) in the absence of dust control mitigation measures, dust generation has the potential to occur 24 hours per day over the period during which such activities are to take place.

ASSESSMENT OF POTENTIAL DUST EMISSION MAGNITUDE

6.1.7 The IAQM assessment methodology has been used to determine the potential dust emission magnitude for the following four different dust and PM_{10} sources: demolition; earthworks; construction; and, trackout. The findings of the assessment are presented below.

DEMOLITION

6.1.8 Total volume of buildings to be demolished on site is between 20,000 and 50,000m^3, with construction material that is predominantly concrete and masonry, which has a high potential for releasing dust. There will be on-site crushing and screening and demolition will be occurring between 10 and 20m above ground. Therefore, the potential dust emission magnitude is considered to be **medium** for demolition activities.

EARTHWORKS

6.1.9 The total area of the Application Site is 2,070m^2, which falls within the IAQM range for small sites (<2,500m^2), the soil type is a predominantly clay, and therefore potentially dusty (especially in dry conditions). Therefore, the potential dust emission magnitude is considered to be **small** for earthwork activities.

CONSTRUCTION

6.1.10 The total volume of buildings to be constructed on the Application Site will be between the IAQM range of 25,000m^3 and 100,000m^3, with potentially dusty construction materials being used. Therefore, the potential dust emission magnitude is considered to be **medium** for construction activities.

TRACKOUT

6.1.11 Due to the small size of the area, it is estimated that there will be less than 25 HDV (>3.5t) outward movements in any one day travelling on moderately dusty surface materials (which is within the IAQM range of 10 and 50 HDV movements). Therefore, the potential dust emission magnitude is considered to be **medium** for trackout.

6.1.12 **Table 9** provides a summary of the potential dust emission magnitude determined for each construction activity considered.

Table 9 Potential Dust Emission Magnitude

ACTIVITY	DUST EMISSION MAGNITUDE
Demolition	Medium
Earthworks	Small
Construction Activities	Medium
Trackout	Medium

ASSESSMENT OF SENSITIVITY OF THE STUDY AREA

6.1.13 A windrose generated using the meteorological data used for the dispersion modelling of operational phase impacts is provided in **Appendix H.** This shows that the prevailing wind direction is from the south west, with smaller components from the east and west. Therefore, receptors located to north east, south and north, and to a lesser extent, the southwest of the Application Site are more likely to be affected by dust and particulate matter emitted and re-suspended during the construction phase.

6.1.14 Depending on wind speed and turbulence, it is likely that the majority of dust would be deposited in the area immediately surrounding the source. The IAQM guidance provides advice on how the proximity and number of receptors of different sensitivity within the study area can be used to determine the overall sensitivity of the study area. This is reproduced in **Appendix C**.

6.1.15 There are more than 200 residential receptors within 350m of the Application Site as it is situated in an urban area of London that is predominantly residential. Of these, there are up to five residential receptors within 20m from the Application Site boundary, and up to 100 within 50m from the boundary. A Nursery School is located approximately 20m south of the Application Site, and a GP surgery is located 285m south east (along Malden Road). The annual mean PM_{10} background concentration in the vicinity of the Application Site is 22.9µg/m^3. There are approximately 30 sensitive receptors (mostly residential, including a nursery) within 20m of likely construction traffic routes within 200m of the site access.

6.1.16 Taking the above into account and following the IAQM assessment methodology, the sensitivity of the area to changes in dust and PM_{10} has been derived for each of the construction activities considered. The results are shown in **Table 10**.

Table 10: Sensitivity of the Study Area

Potential Impact	Sensitivity of the Surrounding Area			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Medium	Medium	Medium	High
Human Health	Low	Low	Low	Low

RISK OF IMPACTS

6.1.17 The predicted dust emission magnitude has been combined with the defined sensitivity of the area to determine the risk of impacts during the construction phase, prior to mitigation. **Table 11** below provides a summary of the risk of dust impacts. The risk category identified for each construction phase activity has been used to determine the level of mitigation required.

Table 11 Summary Dust Risk Table to Define Site Specific Mitigation

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Medium Risk	Low Risk	Medium Risk	Medium Risk
Human Health	Low Risk	Low Risk	Low Risk	Low Risk

CONSTRUCTION VEHICLES & PLANT

6.1.18 The greatest impact on air quality due to emissions from vehicles and plant associated with the construction phase will be in the areas immediately adjacent to the site access. It is anticipated that construction traffic will access the site via Haverstock Hill or Adelaide Road. Due to the size of the Application Site, it is considered likely that the construction traffic will not be in excess of 25 HDV movements per day during the peak period, which is low in comparison to the existing traffic flows on these roads.

6.1.19 Final details of the exact plant and equipment likely to be used on the Application Site will be determined by the appointed contractor, it is considered likely to comprise dump trucks, tracked excavators, diesel generators, crane, piling rigs, compressors and trucks. The number of plant and their location within the Application Site are likely to be variable over the construction period.

6.1.20 Due to the proximity of sensitive receptors to the roads and site likely to be used by construction vehicles, and the likely numbers of construction vehicles and plant to be used, the impacts are considered to be **negligible.**

6.2 OPERATION PHASE

6.2.1 From the information supplied by the Project Transport Consultant, future scenarios have not been included in this assessment as there will no capacity for general traffic growth in the vicinity of the Application Site, and the Proposed Development will be 'car free'; therefore, the 2014 baseline conditions are considered to be reasonably representative of 2019 conditions when the Proposed Development is operational.

6.2.2 Full results of the dispersion modelling are presented in **Appendix H** and a summary is provided below.

ANNUAL MEAN NO_2 CONCENTRATIONS

6.2.3 The AQS objective for annual mean NO_2 concentrations is 40µg/m^3. Exceedances have been predicted at majority of the existing receptors, and the highest concentration is 51.5µg/m^3 at existing receptor E8.0 (residential property at Chalk Farm Road). However, as can be seen from the assessment results in **Appendix H** the energy centre PC in all cases is less 0.1µg/m^3 and therefore any impacts at existing receptors would be negligible.

6.2.4 In 2019 opening year, the highest concentration predicted within the Proposed Development is 41.8µg/m^3 at the new receptor N4.0 (retail unit on ground floor, Adelaide Road façade). According to the London Councils' APEC levels, the new receptors fall within APEC A or B categories.

HOURLY MEAN NO_2 CONCENTRATIONS

6.2.5 The annual mean NO_2 concentrations predicted by the model at all receptors were well below 60µg/m^3; therefore, there is unlikely to be a breach of the hourly mean NO_2 AQS objective.

ANNUAL MEAN PM_{10} CONCENTRATIONS

6.2.6 The AQS objective for annual mean PM_{10} concentrations is 40µg/m^3. The highest predicted concentration is 24.9µg/m^3, at receptor 80 (residential property at Chalk Farm Road)

6.2.7 The highest concentration predicted within the Proposed Development site is 24µg/m^3 at receptor N4.0 (retail unit on ground floor, Adelaide road façade). All receptors falls within the London Council's APEC A category

DAILY MEAN PM_{10} CONCENTRATIONS

6.2.8 The AQS objective for 24 hourly mean PM_{10} concentrations is 50µg/m^3 to be exceeded no more than 35 times a year. The results indicate that both existing receptors and future users of the Proposed Development will not be exposed to daily mean PM_{10} concentrations which exceed this objective. A maximum of 13 days are predicted to exceed 50µg/m^3.

ANNUAL MEAN $PM_{2.5}$ CONCENTRATIONS

6.2.9 The AQS objective for annual mean $PM_{2.5}$ concentrations is a concentration of 25µg/m^3. At existing receptor E5.0 (residential property at E8.0) would experience the highest predicted concentration which is 16.9µg/m^3.

6.2.10 The highest concentration predicted at the proposed receptors is 16.3µg/m^3 at Receptor N4.0 (residential property at ground floor, Adelaide Road façade).

AIR QUALITY NEUTRAL ASSESSMENT

6.2.11 The air quality neutral assessment took into account figures pertaining to gross floor area and proposed energy centre in respect of the Proposed Development. These figures were provided by the Project Architect and Mechanical Engineer. These are presented in **Table 12**.

Table 12 Parameters Used in Air Quality Neutral Assessment Calculations

PARAMETER	PROPOSED DEVELOPMENT VALUES
Gross Floor Area	C3 residential- 8,133m^2, providing 77 units Retail- 284m^2

6.2.12 Building NO_x emissions are below the BEB; therefore, the Proposed Development is better than 'air quality neutral'. A summary of the findings of this assessment are presented in **Table 13**. As the Proposed Development is 'car free' it can be considered to be air quality neutral in relation to transport emissions.

Table 13 Summary of Air Quality Neutral Assessment Results

CATEGORY	PARAMETER	NO_x (KG/ANNUM)
Building Emissions	Benchmark	219.5
	Proposed Development	63.1
	Difference	*156.4*

7 MITIGATION & RESIDUAL EFFECTS

7.1 CONSTRUCTION PHASE

MITIGATION

7.1.1 Based on the assessment results, the mitigation measures which are recommended to be implemented to eliminate the identified risk of dust impacts associated with the various activities of the construction phase of the Proposed Development are listed below.

GENERAL COMMUNICATION

- The name and contact details of person(s) accountable for air quality and dust issues should be displayed on the site boundary. This may be the environment manager/engineer or the site manager. The head or regional office contact information should also be displayed.

GENERAL DUST MANAGEMENT

- A Dust Management Plan (DMP), which may include measures to control other emissions, in addition to the dust and PM_{10} mitigation measures given in this report, should be developed and implemented, and approved by the Local Authority. In London, additional measures may be required to ensure compliance with the Mayor of London's guidance. The DMP may include a requirement for monitoring of dust deposition, dust flux, real-time PM_{10} continuous monitoring and/or visual inspections.

SITE MANAGEMENT

- All dust and air quality complaints should be recorded and causes identified. Appropriate remedial action should be taken in a timely manner with a record kept of actions taken including of any additional measures put in-place to avoid reoccurrence;
- The complaints log should be made available to the local authority on request; and
- Any exceptional incidents that cause dust and/or air emissions, either on- or offsite should be recorded, and the action taken to resolve the situation recorded in the log book.

MONITORING

- Regular site inspections to monitor compliance with the DMP should be carried out, inspection results recorded, and an inspection log made available to the local authority when asked;
- The frequency of site inspections should be increased when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions; and
- Dust deposition, dust flux, or real-time PM_{10} continuous monitoring locations should be agreed with the Local Authority. Where possible baseline monitoring should start at least three months before work commences on site or, if it a large site, before work on a phase commences.

PREPARING AND MAINTAINING THE SITE

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

- Where practicable, fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period;
- 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 appropriately; and
- Where practicable, cover, seed or fence stockpiles to prevent wind whipping.

OPERATING VEHICLE/MACHINERY AND SUSTAINABLE TRAVEL

- Ensure all on-road vehicles comply with the requirements of the London Low Emission Zone and the London NRMM standards, where applicable;
- Ensure all vehicle operators 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; and
- A Construction Logistics Plan should be produced to manage the sustainable delivery of goods and materials.

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 non-potable water where possible and appropriate;
- Use covered skips;
- Minimise drop heights from 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.

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); and
- Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.

MEASURES SPECIFIC TO EARTHWORKS

- Stockpile surface areas should be minimised (subject to health and safety and visual constraints regarding slope gradients and visual intrusion) to reduce area of surfaces exposed to wind pick-up;
- Where practicable, windbreak netting/screening should be positioned around material stockpiles and vehicle loading/unloading areas, as well as exposed excavation and material handling operations, to provide a physical barrier between the Application Site and the surroundings;
- Where practicable, stockpiles of soils and materials should be located as far as possible from sensitive properties, taking account of the prevailing wind direction; and

- During dry or windy weather, material stockpiles and exposed surfaces should be dampened down using a water spray to minimise the potential for wind pick-up.

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;
- For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust; and
- All construction plant and equipment should be maintained in good working order and not left running when not in use.

MEASURES SPECIFIC TO TRACKOUT

- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being in frequent use;
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport;
- Record all inspections of haul routes and any subsequent action in a site log book; and
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).

RESIDUAL EFFECTS

7.1.2 The residual effects of dust and PM_{10} generated by construction activities following the application of the mitigation measures described above and good site practice is considered to be **negligible**.

7.1.3 The residual effects of emissions to air from construction vehicles and plant on local air quality is considered to be **negligible**.

7.2 OPERATION PHASE

MITIGATION

7.2.1 From the information provided by the Project Mechanical Engineer, mechanical ventilation is proposed, with intakes at approximately 2.7m above the finished floor level in each apartment. Furthermore, intakes will also be located away from the main roads wherever possible.

RESIDUAL EFFECTS

7.2.2 The change in NO_2 concentrations attributable to energy centre emissions associated with the operation phase of the Proposed Development (i.e. impacts on local air quality) is **negligible.**

8 CONCLUSIONS

8.1.1 A qualitative assessment of the potential impacts on local air quality from construction activities has been carried out for this phase of the Proposed Development using the IAQM methodology. This assessment identified that the Proposed Development is considered to be a Medium Risk Site for dust deposition and Low Risk Site PM_{10} concentrations. However, through good site practice and the implementation of suitable mitigation measures, the effect of dust and PM_{10} releases would be significantly reduced. The residual effects of dust and PM_{10} generated by construction activities on air quality are therefore considered to be negligible. The residual effects of emissions to air from construction vehicles and plant on local air quality is considered to be negligible.

8.1.2 An assessment for the operational phase was undertaken at existing and proposed receptor locations. The majority of the existing receptors in the vicinity of the Proposed Development would experience exceedances in annual mean NO_2 with and without the Proposed Development, which would in-itself contribute less than 0.1µg/m^3 to annual mean ambient concentrations. Any impact would be negligible. Exceedances for annual mean NO_2 have been predicted at both commercial and residential locations within the Application Site, and therefore mitigation will be required to protect the health of future occupants from exceedances of the annual mean NO_2 objective.

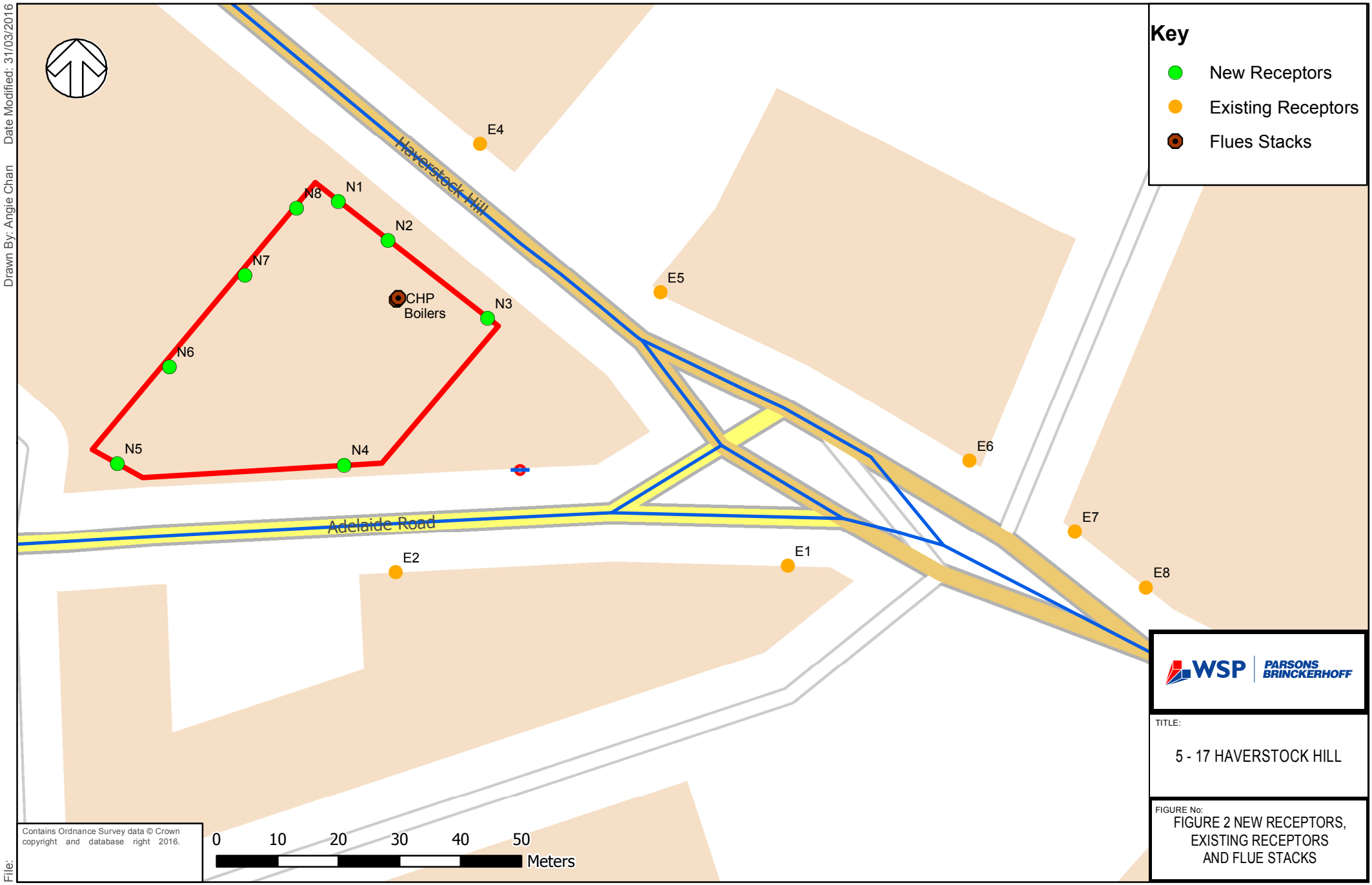
8.1.3 Mechanical ventilation is proposed for the Proposed Development, with air intakes located above the finished floors and away from the main roads where possible for ensuring the future users will not be exposed to concentrations which exceed any of the relevant air quality objectives.

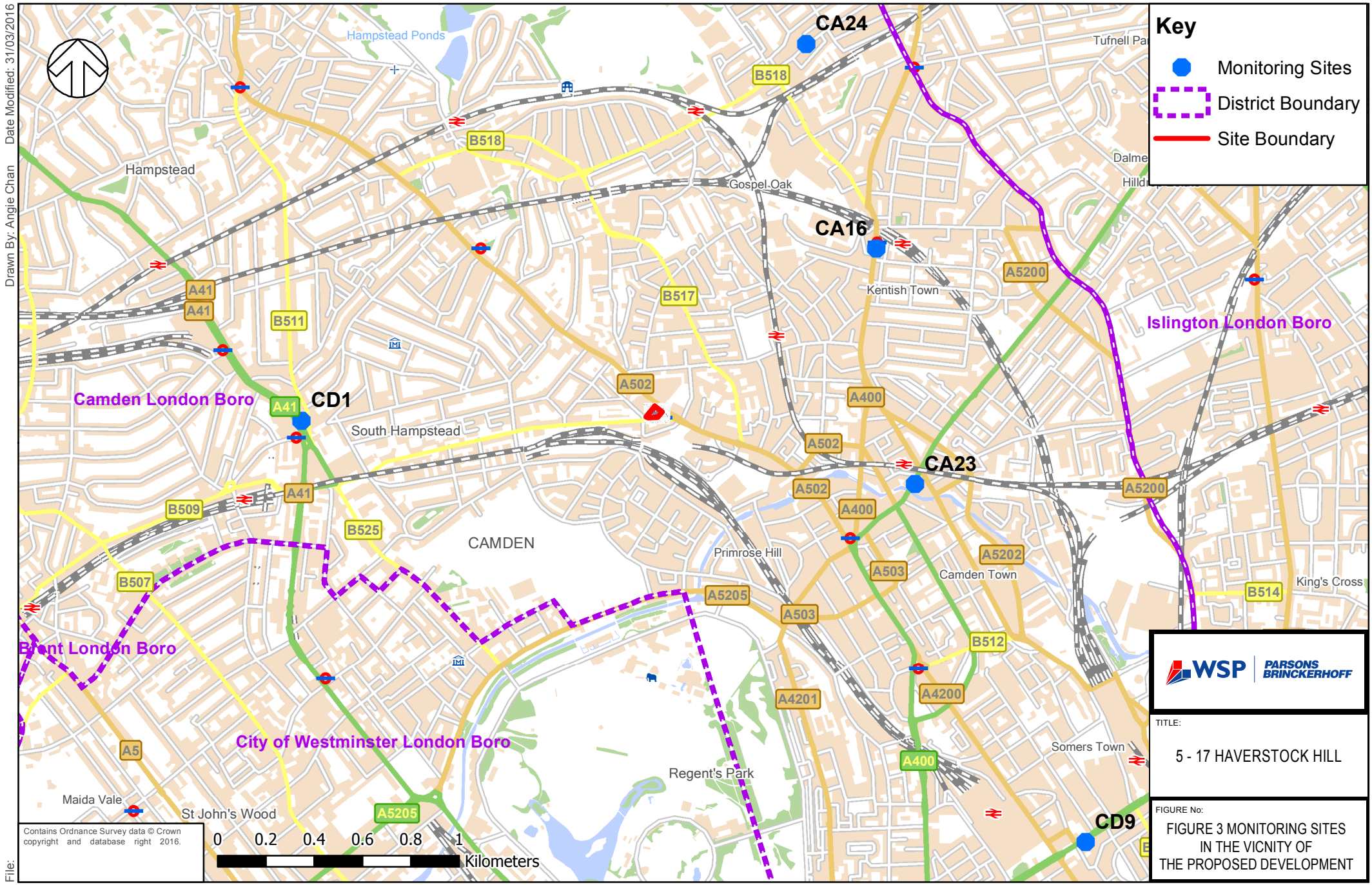
8.1.4 The results of the Air Quality Neutral assessment indicated that, the Proposed Development is compliant and is better than ‘air quality neutral’.

8.1.5 With the application of the appropriate mitigation measures (as outlined), the development proposals would comply with national and local policy for air quality.

FIGURES & APPENDICES


Key
Site Boundary
Verification Sites
Modelled Roads
Maitland Park
B517
Parkhill Road
Prince Of Wales Road
Prince Of Wales Road
Leighton Road
A502
B509
A400
A502
A502
A5202
A400
A400
A5202
A503
A503
A400
Agar Grove
Randolph Street
Pratt Street
Primrose Hill Road
1
2
3
4
5
6
7
8
9
10
11
12
14
16
18
19
20
21
22
23
24
26
27
28
30
33
34
35
37
39
0
0.1
0.2
0.3
0.4
0.5
Kilometres
Contains Ordnance Survey data © Crown copyright and database right 2016.
WSP
PARSONS BRINCKERHOFF
TITLE:
5 - 17 HAVERSTOCK HILL
FIGURE No:
FIGURE 1 MODELLED ROADS AND VERIFICATION SITES
Drawn By: Angie Chan
Date Modified: 31/03/2016
File:


Key
New Receptors
Existing Receptors
Flues Stacks
Haverstock Hill
Adelaide Road
N1
N2
N3
N4
N5
N6
N7
N8
CHP
Boilers
E1
E2
E4
E5
E6
E7
E8
0
10
20
30
40
50
Meters
Contains Ordnance Survey data © Crown copyright and database right 2016.
WSP
PARSONS BRINCKERHOFF
TITLE:
5 - 17 HAVERSTOCK HILL
FIGURE No:
FIGURE 2 NEW RECEPTORS, EXISTING RECEPTORS AND FLUE STACKS
Drawn By: Angie Chan
Date Modified: 31/03/2016
File:


Key
Monitoring Sites
District Boundary
Site Boundary
CA24
CA16
CA23
CD1
CD9
Hampstead Ponds
Hampstead
Gospel Oak
Kentish Town
South Hampstead
CAMDEN
Primrose Hill
Camden Town
King's Cross
Somers Town
Regent's Park
Maida Vale
St John's Wood
Islington London Boro
Camden London Boro
Brent London Boro
City of Westminster London Boro
B518
B517
B511
B509
B525
B507
A41
A502
A400
A5200
A5202
A503
A5205
B512
B514
A4201
A4200
A5
Contains Ordnance Survey data © Crown copyright and database right 2016.
0 0.2 0.4 0.6 0.8 1
Kilometers
WSP | PARSONS BRINCKERHOFF
TITLE:
5 - 17 HAVERSTOCK HILL
FIGURE No:
FIGURE 3 MONITORING SITES IN THE VICNITY OF THE PROPOSED DEVELOPMENT
Date Modified: 31/03/2016
Drawn By: Angie Chan
File:

Appendix A

GLOSSARY

TERM	DEFINITION
AADT Annual Average Daily Traffic	A daily total traffic flow (24 hrs), expressed as a mean daily flow across all 365 days of the year.
Adjustment	Application of a correction factor to modeled results to account for uncertainties in the model
Accuracy	A measure of how well a set of data fits the true value.
Air quality objective	Policy target generally expressed as a maximum ambient concentration to be achieved, either without exception or with a permitted number of exceedances within a specific timescale (see also air quality standard).
Air quality standard	The concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. The standards are based on the assessment of the effects of each pollutant on human health including the effects on sensitive sub groups (see also air quality objective).
Ambient air	Outdoor air in the troposphere, excluding workplace air.
Annual mean	The average (mean) of the concentrations measured for each pollutant for one year.
AQMA	Air Quality Management Area.
Conservative	Tending to over-predict the impact rather than under-predict.
Data capture	The percentage of all the possible measurements for a given period that were validly measured.
DEFRA	Department for Environment, Food and Rural Affairs.
DfT	Department for Transport.
Emission rate	The quantity of a pollutant released from a source over a given period of time.
Exceedance	A period of time where the concentrations of a pollutant is greater than the appropriate air quality standard.
Fugitive emissions	Emissions arising from the passage of vehicles that do not arise from the exhaust system.
HGV	Heavy Goods Vehicle.
LAQM	Local Air Quality Management.
Model adjustment	Following model verification, the process by which modelled results are amended. This corrects for systematic error.
NO_2	Nitrogen dioxide.

NO_x	Nitrogen oxides.
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10 micrometres.
Road link	A length of road which is considered to have the same flow of traffic along it. Usually, a link is the road from one junction to the next.
µg/m^3 micrograms per cubic metre	A measure of concentration in terms of mass per unit volume. A concentration of 1ug/m^3 means that one cubic metre of air contains one microgram (millionth of a gram) of pollutant.
Uncertainty	A measure, associated with the result of a measurement, which characterizes the range of values within which the true value is expected to lie. Uncertainty is usually expressed as the range within which the true value is expected to lie with a 95% probability, where standard statistical and other procedures have been used to evaluate this figure. Uncertainty is more clearly defined than the closely related parameter 'accuracy', and has replaced it on recent European legislation.
Verification (modelling)	Comparison of modelled results versus any local monitoring data at relevant locations.

Appendix B

RELEVANT UK AIR QUALITY STRATEGY OBJECTIVES

AIR QUALITY OBJECTIVES CURRENTLY INCLUDED IN THE AIR QUALITY REGULATIONS 2000 AND (AMENDMENT) REGULATIONS 2002

Pollutant	**Applies to**	***Standard***		***Objective***		**EU Limit Values**
		Concentration	***Measured as***	***Annual exceedances allowed***		
Nitrogen dioxide (NO_2)	All UK	200µg/m^3	1 hour mean	18	31.12.2005	01.01.2010
	All UK	40µg/m^3	annual mean	-	31.12.2005	
Particulate Matter (PM_{10}) (gravimetric)[1]	All UK	40µg/m^3	annual mean	-	31.12.2004	01.01.2005
	All UK	50µg/m^3	24 hour mean	35	31.12.2004	01.01.2005
Particulate Matter ($PM_{2.5}$) (gravimetric)[1]	UK (except Scotland)	25µg/m^3	Annual mean	-	1.1.2010	1.1.2015

EXPLANATION

µg/m^3 = microgram per cubic metre;
[1] Measured using the European gravimetric transfer sampler or equivalent.

Appendix C

SUMMARY OF IAQM CONSTRUCTION PHASE IMPACT ASSESSMENT PROCEDURE

STEP 1 – SCREEN THE NEED FOR A DETAILED ASSESSMENT

An assessment will normally be required where there is:

- A 'human receptor' within:
  - 350m of the boundary of the site; or
  - 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s).
- Am 'ecological receptor' within:
  - 50m of the boundary of the site; or
  - 50m of the road(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s).

STEP 2A – DEFINE THE POTENTIAL DUST EMISSION MAGNITUDE

The following are examples of how the potential dust emission magnitude for different activities can be defined. (Note that not all the criteria need to be met for a particular class).

1) 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 m^3 – 50 000m^3, potentially dusty construction material, demolition activities 10-20 m above ground level; and
- Small: Total building volume <20 000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10m above ground, demolition during wetter months.

2) Earthworks

- Large: Total site area >10,000 m^2, potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to 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; and,
- 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.

3) Construction Activities

- Large: Total building volume >100,000 m^3, on site concrete batching, sandblasting
- Medium: Total building volume 25,000 m^3 – 100,000 m^3, potentially dusty construction material (e.g. concrete), on site concrete batching; and
- Small: Total building volume <25,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber).

4) Trackout

- Large: >50 HDV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100m;
- Medium: 10-50 HDV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50m – 100m; and
- Small / Medium: <10 HDV (>3.5t) outward movements in any one day, surface material with low potential for dust release, unpaved road length <50m.

STEP 2B – DEFINE THE SENSITIVITY OF THE AREA

The tables below presents the IAQM assessment methodology determines the sensitivity of the area can be determined for dust soiling, human health and ecological impacts respectively. The IAQM guidance also provides examples of the sensitivity of different types of receptors to dust soiling, health effects and PM10 effects to help with determining the area sensitivity to construction phase impacts.

Table 2Ba: Sensitivity of the Area to Dust Soiling Effects

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

Table 2Bb: Sensitivity of the Area to Human Health Impacts

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

Receptor Sensitivity	Annual Mean PM_{10} Concentration ($\mu g/m^3$)	Number of Receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
Medium	-	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

STEP 2C – DEFINE THE RISK OF IMPACTS

The dust emissions magnitude determined at Step 2A should be combined with the sensitivity of the area determined at Step 2B to determine the risk of impacts with no mitigation applied. For those cases where the risk category is 'negligible' no mitigation measures beyond those required by legislation will be required.

Table 2Ca: Risk of Dust Impacts

Sensitivity of surrounding 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 and 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

STEP 3 –SITE SPECIFIC MITIGATION

Having determined the risk categories for each of the four activities it is possible to determine the site-specific measures to be adopted. These measures will be related to whether the site is considered to be a low, medium or high risk site. The IAQM guidance details the mitigation measures required for high, medium and low risk sites as determined in Step 2C.

STEP 4 – DETERMINE SIGNIFICANT EFFECTS

Once the risk of dust impacts has been determined in Step 2C and the appropriate dust mitigation measures identified in Step 3, the final step is to determine whether there are significant effects arising from the construction phase.

STEP 5 – PREPARE THE DUST ASSESSMENT REPORT

Appendix D

TRAFFIC DATA

Road ID	Road Link	Speed (kph)	AADT	%HDVs	NO_x Emission Rate (g/km/s)	PM_{10} Emission Rate (g/km/s)	$PM_{2.5}$ Emission Rate (g/km/s)
0	Adelaide Road split approach	16	9271	6.4	0.109650	0.005121	0.003335
1	Adelaide Road	32	9271	6.4	0.074900	0.004679	0.002914
2	Adelaide Road crossing	16	9271	6.4	0.109650	0.005121	0.003335
3	Adelaide Road	32	9271	6.4	0.074900	0.004679	0.002914
4	Haverstock Hill split traffic light (west bound)	32	4067	8.1	0.035910	0.002132	0.001327
5	Haverstock Hill split traffic light (east bound)	32	3424	8.1	0.030233	0.001795	0.001117
6	Haverstock Hill approach	16	7491	8.1	0.098609	0.004311	0.002809
7	Haverstock Hill	32	7491	8.1	0.066143	0.003927	0.002444
8	Chalk Farm Road approach	16	17198	8.1	0.226383	0.009898	0.006449
9	Kentish Town Road traffic light	16	20170	4.2	0.203671	0.010536	0.006855
10	Kentish Town Road traffic light	16	20170	4.2	0.203671	0.010536	0.006855
11	Kentish Town Road traffic light	16	20170	4.2	0.203671	0.010536	0.006855
12	Fortress Road traffic light	16	10811	9.4	0.153355	0.006413	0.004180
13	Fortress Road traffic light	16	10811	9.4	0.153355	0.006413	0.004180
14	Kentish Town Road	32	20170	4.2	0.143358	0.009668	0.006031
15	Kentish Town Road	32	20170	4.2	0.143358	0.009668	0.006031
16	Fortress Road	32	10811	9.4	0.101660	0.005829	0.003625
17	Fortress Road	32	10811	9.4	0.101660	0.005829	0.003625
18	Camden Road traffic light	16	29680	3.8	0.290367	0.015341	0.009981
19	Camden Road traffic light	16	29680	3.8	0.290367	0.015341	0.009981
20	Camden Road traffic light	16	29680	3.8	0.290367	0.015341	0.009981
21	Camden Road	48	29680	3.8	0.163009	0.013566	0.008295
22	Camden Road	40	29680	3.8	0.180743	0.013769	0.008487
23	Camden Road	48	29680	3.8	0.163009	0.013566	0.008295
24	Camden Street traffic light	16	17594	3.2	0.163828	0.008950	0.005822
25	Camden Street approach	16	17594	3.2	0.163828	0.008950	0.005822
26	Camden Street	48	17594	3.2	0.093405	0.007928	0.004850
27	Camden Street	48	17594	3.2	0.093405	0.007928	0.004850
28	Royal College Street traffic light	16	10904	3.0	0.099819	0.005517	0.003588
29	Royal College Street	32	10904	3.0	0.071722	0.005076	0.003169
30	Royal College Street	32	10904	3.0	0.071722	0.005076	0.003169
31	Adelaide Road split approach (east bound)	16	4667	6.4	0.055198	0.002578	0.001679

Road ID	Road Link	Speed (kph)	AADT	%HDVs	NO_x Emission Rate (g/km/s)	PM_{10} Emission Rate (g/km/s)	$PM_{2.5}$ Emission Rate (g/km/s)
32	Adelaide Road split approach (west bound)	16	4604	6.4	0.054453	0.002543	0.001656
33	Royal College Street	32	10904	3.0	0.071722	0.005076	0.003169
34	Royal College Street crossing	16	10904	3.0	0.099819	0.005517	0.003588
35	Royal College Street	32	10904	3.0	0.071722	0.005076	0.003169
36	Kentish Town Road approach	16	20170	4.2	0.203671	0.010536	0.006855
37	Chalk Farm Road	32	17198	8.1	0.151849	0.009015	0.005610

Appendix E

ADMS-ROADS MODEL VERIFICATION

The comparison of modelled concentrations with local monitored concentrations is a process termed 'verification'. Model verification investigates the discrepancies between modelled and measured concentrations, which can arise due to the presence of inaccuracies and/or uncertainties in model input data, modelling and monitoring data assumptions. The following are examples of potential causes of such discrepancy:

a) Estimates of background pollutant concentrations;

b) Meteorological data uncertainties;

c) Traffic data uncertainties;

d) Model input parameters, such as 'roughness length'; and

e) Overall limitations of the dispersion model.

Comparison of monitored and modelled road NO_x concentrations is given in Table E1.

An adjustment factor of 3.2 was derived which shows the model results were under-estimating current conditions when compared to the measured conditions. Modelled annual mean road NO_x concentrations have therefore been adjusted (multiplied) by 3.2 before calculation of total annual mean NO_2.

Table E1 – Comparison of Road Contributed NO_x

SITE ID	2014 MONITORED TOTAL NO_2	BACKGROUND NO_2	2014 MONITORED ROAD-NOX CONTRIBUTION (FROM NOX:NO_2 CALCULATOR)	2014 MODELLED ROAD-NOX CONTRIBUTION	RATIO
Camden Road	72.2	35.5	104.8	34.7	3.0
Kentish Town Road	57.8	32.3	65.7	16.3	4.0

Appendix F

BUILDING AND STACK PARAMETERS FOR MODELLING

BUILDING PARAMETERS

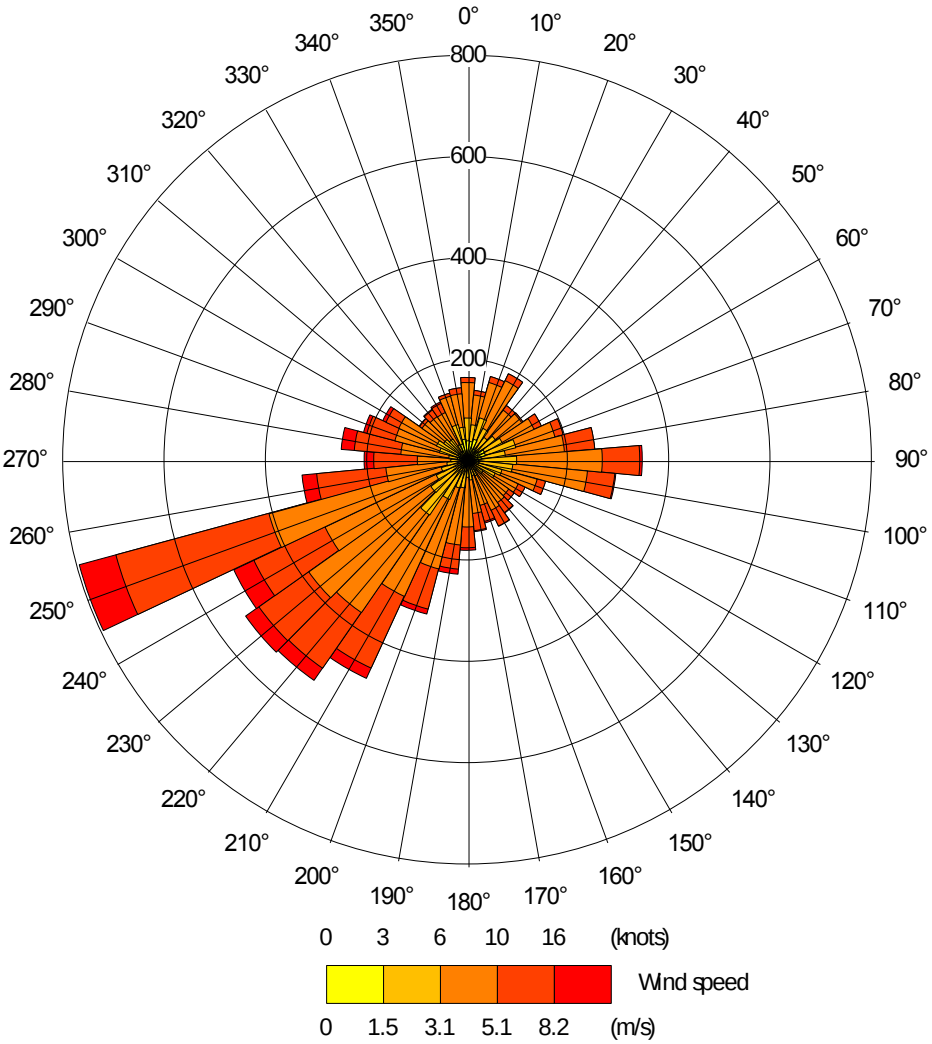
Building	Description	Centre Point Grid Ref. (m)	Height (m)	Length (m)	Width (m)	Angle (^{0})
Block 1	Located northeast of the Application Site	528107,184435	25.2	9.5	38.3	39.7
Block 2	Located northwest of the Application Site	528082,184426	16.9	29.5	8.5	39.7
Block 3	Located northeast of the Application Site	528102,184429	25.2	18.0	5.0	129.6
Block 4.1	Located in the centre of the Application Site	528093,184428	12.5	5.4	7.5	134.6
Block 4.2	Located in the centre of the Application Site	528088,184419	12.5	8.6	7	359.0
Block 5	Located to the south of Application Site	528099,184409	21.9	12.4	9.9	86.4
Block 6	Located to the south of Application Site	528081,184407	21.9	8.1	23.7	357.1
Block 7	Located to the southwest of the Application Site	528065,184409	21.0	5.3	7.6	123.6

STACK PARAMETERS

Stack	X	Y	Height (m)	Diameter (m)	velocity (m/s)	temperature (^{o}C)	NOx emissions (g/s)
Modular boiler	528109	184432	26.2	0.25	1.5	60	0.004
CHP	528109	184432	26.2	0.1	5.0	160	0.0004

Appendix G

WINDROSE FOR LONDON CITY AIRPORT 2014


0°
10°
20°
30°
40°
50°
60°
70°
80°
90°
100°
110°
120°
130°
140°
150°
160°
170°
180°
190°
200°
210°
220°
230°
240°
250°
260°
270°
280°
290°
300°
310°
320°
330°
340°
350°
800
600
400
200
0 3 6 10 16 (knots)
Wind speed
0 1.5 3.1 5.1 8.2 (m/s)

Appendix H

ASSESSMENT RESULTS

Operation Phase – NO_2 annual mean results ($\mu g/m^3$)

Receptor Number	X	Y	Height Above Ground (m)	2014 Total Annual Mean NO_2 Concentrations	APEC	PC
E1.0	528173	184388	1.5	**42.3**	-	0.007
E1.1	528173	184388	4.5	**40.2**	-	0.007
E1.2	528173	184388	7.5	37.7	-	0.007
E2.0	528109	184387	1.5	**41.7**	-	0.021
E2.1	528109	184387	4.5	39.5	-	0.021
E3.0	528031	184383	1.5	**42.4**	-	0.007
E3.1	528031	184383	4.5	39.7	-	0.007
E3.2	528031	184383	7.5	36.8	-	0.007
E4.0	528122	184457	1.5	**41.6**	-	0.098
E4.1	528122	184457	4.5	39.3	-	0.098
E5.0	528152	184433	1.5	**44.4**	-	0.035
E5.1	528152	184433	4.5	**41.1**	-	0.035
E5.2	528152	184433	7.5	37.6	-	0.035
E6.0	528203	184406	1.5	**43.0**	-	0.007
E6.1	528203	184406	4.5	**40.8**	-	0.007
E6.2	528203	184406	7.5	38.0	-	0.007
E7.0	528220	184394	1.5	**47.8**	-	0.007
E7.1	528220	184394	4.5	**43.6**	-	0.007
E7.2	528220	184394	7.5	38.8	-	0.007
E7.3	528220	184394	10.5	36.2	-	0.007
E8.0	528232	184385	1.5	**51.5**	-	0.007
E8.1	528232	184385	4.5	**45.4**	-	0.007
E8.2	528232	184385	7.5	38.9	-	0.007
N1.0	528099	184448	1.5	39.0	B	0.196
N1.1	528099	184448	4.8	37.9	B	0.196
N1.2	528099	184448	8.1	36.5	A	0.196
N1.3	528099	184448	11.4	35.6	A	0.196
N1.4	528099	184448	14.7	35.0	A	0.196
N1.5	528099	184448	18.0	34.6	A	0.196
N1.6	528099	184448	21.3	34.3	A	0.196
N2.0	528107	184442	1.5	39.4	B	0.203
N2.1	528107	184442	4.8	38.2	B	0.203
N2.2	528107	184442	8.1	36.7	A	0.203
N2.3	528107	184442	11.4	35.7	A	0.203
N2.4	528107	184442	14.7	35.0	A	0.203
N2.5	528107	184442	18.0	34.6	A	0.203
N2.6	528107	184442	21.3	34.3	A	0.203
N3.0	528124	184429	1.5	**41.0**	B	0.154
N3.1	528124	184429	4.8	39.2	B	0.154
N3.2	528124	184429	8.1	37.1	A	0.154
N3.3	528124	184429	11.4	35.8	A	0.154
N3.4	528124	184429	14.7	35.0	A	0.154
N3.5	528124	184429	18.0	34.6	A	0.154
N3.6	528124	184429	21.3	34.3	A	0.154
N4.0	528100	184405	1.5	**41.8**	B	0.000
N4.1	528100	184405	4.8	39.5	B	0.000

Receptor Number	X	Y	Height Above Ground (m)	2014 Total Annual Mean NO_2 Concentrations	APEC	PC
N4.2	528100	184405	8.1	37.1	A	0.000
N4.3	528100	184405	11.4	35.8	A	0.000
N4.4	528100	184405	14.7	35.1	A	0.000
N4.5	528100	184405	18.0	34.6	A	0.000
N5.0	528063	184405	1.5	**41.2**	B	0.042
N5.1	528063	184405	4.8	39.2	B	0.042
N5.2	528063	184405	8.1	37.0	A	0.042
N5.3	528063	184405	11.4	35.7	A	0.042
N5.4	528063	184405	14.7	35.0	A	0.042
N5.5	528063	184405	18.0	34.6	A	0.049
N6.1	528072	184421	2.3	38.1	B	0.098
N6.2	528072	184421	5.4	37.4	A	0.098
N6.3	528072	184421	8.6	36.5	A	0.098
N6.4	528072	184421	11.7	35.7	A	0.098
N6.5	528072	184421	14.9	35.1	A	0.098
N7.1	528084	184436	2.3	37.6	A	0.133
N7.2	528084	184436	5.4	37.1	A	0.133
N7.3	528084	184436	8.6	36.3	A	0.133
N7.4	528084	184436	11.7	35.6	A	0.133
N7.5	528084	184436	14.9	35.1	A	0.133
N8.1	528092	184447	4.8	37.5	A	0.175
N8.2	528092	184447	8.1	36.5	A	0.175
N8.3	528092	184447	11.4	35.61	A	0.175
N8.4	528092	184447	14.7	35.0	A	0.175
N8.5	528092	184447	18.0	34.6	A	0.175
N8.6	528092	184447	21.3	34.3	A	0.175

OPERATION PHASE – PM_{10} and $PM_{2.5}$ Results ($\mu g/m^3$)

Receptor Number	X	Y	Height Above Ground (m)	2014 PM_{10} Annual Mean Concentration	APEC	Daily PM_{10} (Days of Exceedances)	2014 $PM_{2.5}$ Annual Mean Concentrations
E1.0	528173	184388	1.5	24.0	-	11	16.3
E1.1	528173	184388	4.5	23.7	-	10	16.1
E1.2	528173	184388	7.5	23.4	-	9	15.9
E2.0	528109	184387	1.5	24.0	-	11	16.3
E2.1	528109	184387	4.5	23.7	-	10	16.1
E3.0	528031	184383	1.5	24.0	-	11	16.3
E3.1	528031	184383	4.5	23.6	-	10	16.1
E3.2	528031	184383	7.5	23.3	-	9	15.9
E4.0	528122	184457	1.5	24.0	-	11	16.3
E4.1	528122	184457	4.5	23.6	-	10	16.1
E5.0	528152	184433	1.5	24.2	-	11	16.4
E5.1	528152	184433	4.5	23.8	-	10	16.2
E5.2	528152	184433	7.5	23.4	-	9	15.9
E6.0	528203	184406	1.5	24.0	-	11	16.3
E6.1	528203	184406	4.5	23.7	-	10	16.2
E6.2	528203	184406	7.5	23.4	-	9	16.0
E7.0	528220	184394	1.5	24.5	-	12	16.6
E7.1	528220	184394	4.5	24.0	-	11	16.4
E7.2	528220	184394	7.5	23.5	-	10	16.0
E7.3	528220	184394	10.5	23.2	-	9	15.8
E8.0	528232	184385	1.5	24.9	-	13	16.9
E8.1	528232	184385	4.5	24.2	-	11	16.5
E8.2	528232	184385	7.5	23.5	-	10	16.0
N1.0	528099	184448	1.5	23.6	A	10	16.1
N1.1	528099	184448	4.8	23.5	A	10	16.0
N1.2	528099	184448	8.1	23.3	A	9	15.9
N1.3	528099	184448	11.4	23.2	A	9	15.8
N1.4	528099	184448	14.7	23.1	A	9	15.7
N1.5	528099	184448	18.0	23.1	A	9	15.7
N1.6	528099	184448	21.3	23.0	A	9	15.7
N2.0	528107	184442	1.5	23.7	A	10	16.1
N2.1	528107	184442	4.8	23.5	A	10	16.0
N2.2	528107	184442	8.1	23.3	A	9	15.9
N2.3	528107	184442	11.4	23.2	A	9	15.8
N2.4	528107	184442	14.7	23.1	A	9	15.7
N2.5	528107	184442	18.0	23.1	A	9	15.7
N2.6	528107	184442	21.3	23.0	A	9	15.7
N3.0	528124	184429	1.5	23.8	A	10	16.2
N3.1	528124	184429	4.8	23.6	A	10	16.1
N3.2	528124	184429	8.1	23.3	A	9	15.9
N3.3	528124	184429	11.4	23.2	A	9	15.8
N3.4	528124	184429	14.7	23.1	A	9	15.7
N3.5	528124	184429	18.0	23.1	A	9	15.7
N3.6	528124	184429	21.3	23.0	A	9	15.7
N4.0	528100	184405	1.5	24.0	A	11	16.3
N4.1	528100	184405	4.8	23.7	A	10	16.1

Receptor Number	X	Y	Height Above Ground (m)	2014 PM_{10} Annual Mean Concentration	APEC	Daily PM_{10} (Days of Exceedances)	2014 $PM_{2.5}$ Annual Mean Concentrations
N4.2	528100	184405	8.1	23.3	A	9	15.9
N4.3	528100	184405	11.4	23.2	A	9	15.8
N4.4	528100	184405	14.7	23.1	A	9	15.7
N4.5	528100	184405	18.0	23.1	A	9	15.7
N5.0	528063	184405	1.5	23.9	A	10	16.2
N5.1	528063	184405	4.8	23.6	A	10	16.1
N5.2	528063	184405	8.1	23.3	A	9	15.9
N5.3	528063	184405	11.4	23.2	A	9	15.8
N5.4	528063	184405	14.7	23.1	A	9	15.7
N5.5	528063	184405	18.0	23.1	A	9	15.7
N6.1	528072	184421	2.3	23.5	A	10	16.0
N6.2	528072	184421	5.4	23.4	A	9	15.9
N6.3	528072	184421	8.6	23.3	A	9	15.9
N6.4	528072	184421	11.7	23.2	A	9	15.8
N6.5	528072	184421	14.9	23.1	A	9	15.7
N7.1	528084	184436	2.3	23.4	A	9	16.0
N7.2	528084	184436	5.4	23.3	A	9	15.9
N7.3	528084	184436	8.6	23.3	A	9	15.9
N7.4	528084	184436	11.7	23.2	A	9	15.8
N7.5	528084	184436	14.9	23.1	A	9	15.7
N8.1	528092	184447	4.8	23.4	A	9	15.9
N8.2	528092	184447	8.1	23.3	A	9	15.9
N8.3	528092	184447	11.4	23.2	A	9	15.8
N8.4	528092	184447	14.7	23.1	A	9	15.7
N8.5	528092	184447	18.0	23.1	A	9	15.7
N8.6	528092	184447	21.3	23.0	A	9	15.7