AGAR GROVE

AIR QUALITY REPORT

DECEMBER 2013

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Agar Grove, Camden

Air Quality Assessment

On behalf of **London Borough of Camden**

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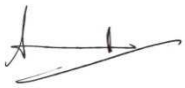
Approved by:	Anthony Russell	Partner		December 2013
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1 Introduction

1.1 Proposed Development

1.1.1 The London Borough of Camden (LBC) has commissioned Peter Brett Associates LLP (PBA) to undertake an air quality assessment in support of the planning application for the proposed redevelopment of the Agar Grove Estate in Camden.

1.1.2 Agar Grove Estate was constructed by the London Borough of Camden in the 1960s and comprises 249 residential units; two small retail units; and community facilities. The Estate consists of a series of low / medium rise blocks of flats and an 18 storey tower (Lulworth House) along with areas of open space and surface car-parking. The site is centrally located in the borough to the east of Camden town centre in a predominantly residential area which comprises a mix of period housing; post-war municipal estates; 20th century in-fill; and some remnants of light-industrial activity.

1.1.3 The Estate is bordered to the north by Agar Grove beyond which sits an area of mid-to-late 19th century high-quality terraces and villas focused around Camden Square. To the east lies Camley Street which is occupied by low rise light-industrial units. Beyond Camley Street lies the mainline railway into St Pancras and then the 1960s Benson and Forsyth Maiden Lane Estate which is also undergoing refurbishment as part of the Council's estate programme. Further to the south-east is the Kings Cross development area. To the south is the London Overground railway line beyond which sits a pocket of low rise late 20th century housing. To the west is a predominantly residential area heading back towards Camden town.

1.1.4 The Agar Estate Regeneration project forms part of Camden's 'Community Investment Programme' (CIP) which aims to generate investment, deliver new homes and regenerate neighbourhoods. A detailed description of the application proposals is provided in the Design and Access Statement which, in broad terms, comprises:

- Demolition of the existing low-rise blocks (with the exception of the children's centre) and comprehensive refurbishment of Lulworth House
- Creation of 493 new homes [net increase of 244 units] including a mix of social rent, shared-ownership and private units designed to meet current housing needs and space standards (including a single decant for the majority of existing tenants)
- Replacement community and retail facilities along with new small-scale business space; and
- Landscaped open and amenity spaces to support the development and contribute towards the creation of a high-quality environment.

1.1.5 LBC has declared a borough wide Air Quality Management Area (AQMA) for both nitrogen dioxide and fine particulate matter (PM_{10}). Adjacent to the main roads in the borough, nitrogen dioxide concentrations are in excess of the annual mean objective.

1.2 Scope

1.2.1 This report describes existing air quality within the study area, considers the suitability of the site for residential development, and assesses the impact of the construction activities on air quality in the surrounding area. The site will not generate any additional traffic, and therefore the effect of development related traffic has been scoped out of the assessment. The main air pollutants of concern related to construction are dust and fine particulate matter (PM_{10}), whilst for existing road traffic they are nitrogen dioxide and fine particulate matter (PM_{10}).

1.2.2 The assessment has been prepared taking into account all relevant local and national guidance and regulations.

2 Legislation and Policy

2.1 The Air Quality Strategy

2.1.1 The Air Quality Strategy (2007) establishes the policy framework for ambient air quality management and assessment in the UK. The primary objective is to ensure that everyone can enjoy a level of ambient air quality which poses no significant risk to health or quality of life. The Strategy sets out the National Air Quality Objectives (NAQOs) and Government policy on achieving these objectives.

2.1.2 Part IV of the Environment Act 1995 introduced a system of Local Air Quality Management (LAQM). This requires local authorities to regularly and systematically review and assess air quality within their boundary, and appraise development and transport plans against these assessments. The relevant NAQOs for LAQM are prescribed in the Air Quality (England) Regulations 2000 and the Air Quality (Amendment) (England) Regulations 2002.

2.1.3 Where an objective is unlikely to be met, the local authority must designate an Air Quality Management Area (AQMA) and draw up an Air Quality Action Plan (AQAP) setting out the measures it intends to introduce in pursuit of the objectives within its AQMA.

2.1.4 The Local Air Quality Management Technical Guidance 2009 (LAQM.TG(09))[1] issued by the Department for Environment, Food and Rural Affairs (Defra) for Local Authorities provides advice as to where the NAQOs apply. These include outdoor locations where members of the public are likely to be regularly present for the averaging period of the objective (which vary from 15 minutes to a year). Thus, for example, annual mean objectives apply at the façades of residential properties, whilst the 24-hour objective (for PM_{10}) would also apply within the garden. They do not apply to occupational, indoor or in-vehicle exposure

2.2 EU Limit Values

2.2.1 The Air Quality Standards Regulations 2010 implements the European Union's Directive on ambient air quality and cleaner air for Europe (2008/50/EC), and includes limit values for NO_2. These limit values are numerically the same as the NAQO values but differ in terms of compliance dates, locations where they apply and the legal responsibility for ensuring that they are complied with. The compliance date for the NO_2 EU Limit Value was 1 January 2010, five years later than the date for the NAQO.

2.2.2 Directive 2008/50/EC consolidated the previous framework directive on ambient air quality assessment and management and its first three daughter directives. The limit values remained unchanged, but it now allows Member States a time extension for compliance, subject to European Commission (EC) approval.

2.2.3 The UK has a time extension for compliance of the daily PM_{10} limit value in London until the end of 2011. Despite many areas of the UK not being compliant with the annual average NO_2 limit value, the UK has decided not to seek an extension to the compliance date for this pollutant. This was on the basis that it could not be guaranteed that the UK would be compliant by the latest date allowable under the Directive (1 January 2015).

2.2.4 The Directive limit values are applicable at all locations except:

- Where members of the public do not have access and there is no fixed habitation;
- On factory premises or at industrial installations to which all relevant provisions concerning health and safety at work apply; and

[1] Defra, 2009, Local Air Quality Management Technical Guidance LAQM.TG(09).

- On the carriageway of roads; and on the central reservations of roads except where there is normally pedestrian access.

2.3 Planning Policy

National Policy

2.3.1 The National Planning Policy Framework was published in March 2012. This sets out the Government's planning policies for England and how they are expected to be applied. In relation to conserving and enhancing the natural environment, paragraph 109 states that:

"*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 or land instability."*

2.3.2 Paragraph 124, also states that:

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

2.3.3 Paragraph 203 goes on to say:

"Local planning authorities should consider whether otherwise unacceptable development could be made acceptable through 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."

The London Plan

2.3.4 The London Plan[2] provides strategic planning guidance for Greater London. Each Borough's development plans must be in 'general conformity' with it.

2.3.5 The plan includes Policy 7.14 (Improving Air Quality) which states that development proposals should:

- Promote sustainable design and construction to reduce emissions from the demolition and construction of buildings following the best practice guidance in the GLA and London Councils;
- Where biomass boilers are included, set out a detailed air quality assessment that should forecast pollutant concentrations. Permission should only be granted if no adverse impacts from biomass are identified; and
- Aim to be 'air quality neutral' and not lead to further deterioration of existing poor air quality (such as areas designated as AQMAs).

2.3.6 Boroughs and others with relevant responsibilities should also have policies that:

- Seek reductions in levels of pollutants referred to in the Government's National Air Quality Strategy having regard to the Mayor's Air Quality Strategy; and

[2] Available at: www.london.gov.uk/priorities/planning/londonplan

- Take account of the findings of the Air Quality Review and Assessments and Action Plans, in particular where AQMAs have been designated.

2.3.7 The Mayor will work with strategic partners to ensure the spatial, transport and design policies of the London Plan support his Air Quality Strategy.

2.3.8 Draft Supplementary Planning Guidance (SPG) on Sustainable Design and Construction has been published for consultation in July 2013 as part of the Implementation Framework for the London Plan[3]. For air pollution, the Mayor's Priorities are stated as:

- Developers are to design their schemes so that they are at least 'air quality neutral'.
- Developments should be designed to minimise the generation of air pollution.
- Developments should be designed to minimise and mitigate against increased exposure to poor air quality.
- Developers should select plant that meets the standards for emissions from combined heat and power and biomass plants set out in Appendix 7 (of the document).
- Developers and contractors should follow the guidance set out in the emerging Minimising dust and emissions from construction and demolition SPG when constructing their development.

2.3.9 The draft Sustainable Design and Construction SPG requires that air quality assessments are prepared for major developments where the development:

- is located within an AQMA;
- is likely to result in a new air pollution exceedence;
- is likely to exacerbate an existing air pollution exceedence;
- is located within 150 metres of a sensitive receptor (schools, hospitals, care homes, nurseries);
- will bring sensitive receptors into an area of poor air quality; and
- includes biomass boilers and/or combined heat and power.

2.3.10 For major developments that meet the above criteria, an air quality assessment is required to be submitted with the planning application and include:

- a review of air quality around the development site using existing air quality monitoring and/or modelling data;
- air quality dispersion modelling data carried out in accordance with the London Councils Air Quality and Planning Guidance;
- an indication of the number of people (receptors) which will be exposed to poor air quality as a result of the development, and show their location on a map;
- an assessment of the impact on air quality during the construction phase and detailed mitigation methods for controlling dust and pollution emissions in line with the emerging revised SPG on *The control of dust and emissions from construction and demolition*; and

[3] Available at: www.london.gov.uk/priorities/planning/consultations/draft-sustainable-design-and-construction

- an outline and justification of mitigation measures associated with the design, location and operation of the development in order to reduce air pollution and exposure to poor air quality.

2.3.11 The draft Sustainable Design and Construction SPG provides guidance on:

- Minimising air quality emissions from location, transport, construction and demolition, and design and occupation;
- Protecting internal air quality;
- What is meant by 'air quality neutral';
- Emissions standards for combustion plant; and
- Offsetting provisions.

2.3.12 'Air quality neutral' is meant to apply across all developments in London, not per development, and emission benchmarks have been proposed in terms of buildings' operation and transport emissions. It is understood that the benchmark should be capable of being met without the need for significant additional mitigation. The emission benchmarks are summarised in **Appendix C** along with emissions standards for combustion plant for smaller developments. If the particular combustion equipment is not known at the time of the planning application, developers would be required to provide a written statement of their commitment and ability to meet the emissions standards within their Air Quality Assessments.

2.3.13 Where developments do not meet the air quality neutral benchmarks, it is suggested that appropriate on-site mitigation measures will be required to off-set any excess in emissions. Measures could include:

- green planting/walls and screens;
- upgrade or abatement work to combustion plant;
- retro-fitting abatement technology for vehicles and flues; and
- exposure reduction.

2.3.14 In addition, a draft SPG on The Control of Dust and Emissions During Construction and Demolition has been published in September 2013 for consultation as part of the Implementation Framework for the London Plan[4]. The draft SPG provides guidance for:

- the preparation of an Air Quality Statement for construction and demolition activities, including air quality (dust) risk assessments;
- the stages of development the Air Quality Statement is to cover, that is for demolition, earthwork, construction stages and trackout (vehicles leaving the site) stages of the works;
- the identification of the potential scale (large, medium, small) of dust emissions for each stage of work;

[4] Available at: www.london.gov.uk/priorities/planning/consultations/draft-the-control-of-dust-and-emissions-during-construction-and-demolition

- the identification of the level of risk due to the scale of dust emissions on health, soiling (dirt) and the natural environment, depending on activities, their intensity and the sensitivity of receptors;
- best practice methods for controlling dust on-site and to prevent trackout;
- recommendations for monitoring; and
- early notification of new 2015 and 2020 standards for non-road mobile machinery.

2.3.15 If adopted, the draft SPG would require an Air Quality Statement to be submitted at the time of a planning application; with a detailed dust risk assessment prepared at the time of detailed construction and logistics planning for the site, and submitted prior to the commencement of works.

Mayor's Air Quality Strategy

2.3.16 The Mayor's Air Quality Strategy[5] (2010) sets out policies to improve air quality in London and includes the following measures:

- Ensuring that public transport becomes cleaner;
- Reducing traffic growth by improving public transport and encouraging developers to make easy access to public transport in new developments;
- Introduction of Phase 3 of the Low Emission Zone (LEZ) in 2012 to cover PM_{10} emissions from minibuses and heavier Light Goods Vehicles (LGVs), and a LEZ nitrogen oxides (NO_x) standard from 2015.

2.3.17 Policy 7 on 'Using the planning process to improve air quality' aims to ensure that no new development has a negative impact on air quality in London. It states that the Mayor will use his planning powers to:

- Develop a check list to guide boroughs and developers in the assessment of potential emissions from new developments;
- Minimise increased exposure to existing poor air quality, particularly in AQMAs and where developments are to be used by large numbers of vulnerable people;
- Ensure air quality benefits are realised through planning conditions and Section 106 agreements; and
- A package of non-transport policy measures is also proposed to reduce localised pollution sources.

Local Policy

2.3.18 The Camden Core Strategy[6] was adopted in November 2010. It contains Policy CS16 Improving Camden's Health and Well-being, which states:

"*The Council will seek to improve health and well-being in Camden. We will:*

[5] Available at: www.london.gov.uk/sites/default/files/Air%20Quality%20Strategy%20v3.pdf

[6] Available at: www.camden.gov.uk/ccm/navigation/environment/planning-and-built-environment/planning-policy/local-development-framework--ldf-/core-strategy/

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

2.3.19 The Camden Development Polices 2010-2025 document[7], adopted in 2010, forms part of the Local Development Framework and sets out the local development policies for the borough. Policy DP32 Air quality and Camden's Clear Zone, states:

"The Council will require air quality assessments where development could potentially cause significant harm to air quality. Mitigation measures will be expected in developments that are located in areas of poor air quality."

2.3.20 In addition, Camden adopted the Camden Planning Guidance document CPG6[8] on Amenity in September 2011. This document is a formal Supplementary Planning Document supporting the policies of the Core Strategy and Development Policies. Chapter two provides guidance on amenity issues relating to air quality. It highlights that Camden has declared a whole borough AQMA for nitrogen dioxide and PM_{10}, and that all developments are required to limit their impact on local air quality. It sets out when an air quality assessment will be required, what an assessment should cover, and measures which may be introduced where a development is shown to negatively impact on air quality.

Camden Air Quality Action Plan

2.3.21 The London Borough of Camden has prepared a revised and updated Air Quality Action Plan covering the period 2013 – 2015. The draft plan sets out the measures to be implemented to improve air quality within the borough. The AQAP sets out the sources of emissions within the borough and identifies road transport and gas boilers as the largest contributors to both NO_x and PM_{10}.

2.3.22 The AQAP includes a range of measures relating to five themes:

- Reducing transport emissions;
- Reducing emissions associated with new development;
- Reducing emissions from gas boilers and industrial processes;
- Air quality awareness raising initiatives; and
- Lobbying and partnership working.

2.3.23 The measures relating to new developments include the requirement for an air quality assessment where a development may have a negative impact on air quality, reductions in emissions from construction sites, the reduction of transport and gas boiler emissions, and controlling emissions from biomass heating.

[7] Available at: http://camden.gov.uk/ccm/content/environment/planning-and-built-environment/two/planning-policy/local-development-framework/development-policies.en

[8] Available at: www.camden.gov.uk/ccm/content/environment/planning-and-built-environment/two/planning-policy/supplementary-planning-documents/camden-planning-guidance.en

3 Methodology

3.1 General

3.1.1 The methodology for the assessment is based on the requirements of the LBC Supplementary Planning Document, Amenity Policy CPG6. In addition, consideration has been given to the draft SPG on Sustainable Design and Construction published in support of the London Plan. Given the nature of the application proposals a "basic" assessment has been carried out in line with LB Camden requirements, however, this is supplemented by consideration of likely construction impacts and detailed dispersion modelling to determine air quality for future residents of the proposed development.

3.2 Existing Conditions

3.2.1 Information on existing air quality has been obtained by collating the results of monitoring carried out by the London Borough of Camden. Background concentrations for the site have been defined using the national pollution maps published by Defra. These cover the whole country on a 1x1 km grid[9].

3.3 Construction Impacts

Construction

3.3.1 During demolition and construction the main potential effects are dust annoyance and locally elevated concentrations of PM_{10}. The suspension of particles in the air is dependent on surface characteristics, weather conditions and on-site activities. Impacts have the potential to occur when dust generating activities coincide with dry, windy conditions, and where sensitive receptors are located downwind of the dust source.

3.3.2 Separation distance is also an important factor. Large dust particles (greater than 30µm), responsible for most dust annoyance, will largely deposit within 100m of sources. Intermediate particles (10-30µm) can travel 200-500m. Consequently, significant dust annoyance is usually limited to within a few hundred metres of its source. Smaller particles (less than 10µm) are deposited slowly and may travel up to 1km; however, the impact on the short-term concentrations of PM_{10} occurs over a shorter distance. This is due to the rapid decrease in concentrations with distance from the source due to dispersion.

3.3.3 A Design Manual for Roads and Bridges (DMRB) Scoping Assessment has been carried out to determine whether construction traffic impacts are likely to be significant.

3.3.4 The Greater London Authority (GLA, 2006) provides guidelines to determine the likely level of risk construction and demolition impacts will have on local dust complaints and PM_{10} concentrations. Sites are categorised into low, medium and high risk (**Table 3.1**) based on the size of the development, and potential for impacts at sensitive receptors, and the appropriate level of mitigation consequently required; by applying the recommended mitigation, the site is reduced to a low risk site.

3.3.5 The sensitivity of the study area to construction dust impacts is defined based on the examples provided within the Institute of Air Quality Management (IAQM, 2012) guidance (**Table 3.2**), taking into account professional judgement.

[9] http://laqm.defra.gov.uk/maps/maps2010.html

3.3.6 Consideration was also given to wind and rainfall data. A wind rose from the London City Airport weather station for 2012 was used along with average rainfall data (1981-2010) obtained from the Met Office website.

Table 3.1: Risk Criteria for Control of Dust and Emissions from Construction

Risk	Criteria
High	Development of over 15,000 square metres Development of over 150 properties Potential for emissions and dust to have significant impact on sensitive receptors
Medium	Development of between 1,000 and 15,000 square metres Development of between 10 to 150 properties Potential for emissions and dust to have an intermittent or likely impact on sensitive receptors
Low	Development of up to 1,000 square metres Development of one property and up to a maximum of ten Potential for emissions and dust to have an infrequent impact on sensitive receptors

Table 3.2: Area Sensitivity Definitions

Sensitivity	Health Receptors	Ecological Receptors
Very High	More than 100 dwellings within 20m. PM_{10} concentrations exceed the daily mean objective. Contamination present. Very sensitive receptors (schools / hospitals). Construction activities in one area for more than one year.	European Designated Site
High	10 – 100 dwellings within 20m. PM_{10} concentrations approach the daily mean objective.	Nationally Designated Site
Medium	Less than 10 dwellings within 20m. PM_{10} concentrations below the daily mean objective.	Locally Designated Site
Low	No dwellings within 20m. PM_{10} concentrations well below the daily mean objective.	No designation

Significance Criteria

3.3.7 The construction impact significance criteria are based on:

- Guidance on the Assessment of the Impacts of Construction on Air Quality and the Determination of their Significance, IAQM 2012;

- The control of dust and emissions from construction and demolition Best Practice Guidance, GLA 2006;
- Particulate Matter in the United Kingdom, Air Quality Expert Group, 2005; and
- Air Quality (England) Regulations, 2000 and Air Quality (England) (Amendment) Regulations 2002.

3.3.8 The significance criteria take account of the risk of impact and the likely magnitude (taking into account the scale and nature of the works, the proximity of sensitive receptors, and existing conditions in the area) and the sensitivity of the receptors (as defined by the IAQM guidance). The significance criteria also assume that mitigation appropriate to the level of risk (defined in the mitigation section, based on the GLA 2006 guidance) is put into place.

3.3.9 **Table 3.3** presents the significance criteria used to assess the construction impacts.

Table 3.3: Construction Phase Significance Criteria

Sensitivity of Area	Risk of site giving rise to dust effects		
	High	Medium	Low
Without Mitigation			
Very High	Substantial Adverse	Moderate Adverse	Moderate Adverse
High	Moderate Adverse	Moderate Adverse	Slight Adverse
Medium	Moderate Adverse	Slight Adverse	Negligible
Low	Negligible	Negligible	Negligible
With Mitigation			
Very High	Slight Adverse	Slight Adverse	Negligible
High	Slight Adverse	Negligible	Negligible
Medium	Negligible	Negligible	Negligible
Low	Negligible	Negligible	Negligible

3.4 Road Traffic and Rail Impacts

Sensitive Locations

3.4.1 Relevant sensitive locations are places where members of the public might be expected to be regularly present over the averaging period of the objectives. For the annual mean and daily mean objectives that are the focus of this assessment, sensitive receptors will generally be residential properties, schools, nursing homes, etc. When identifying these receptors, particular attention has been paid to assessing impacts close to junctions, where traffic may become congested, and where there is a combined effect of several road links / railway lines.

3.4.2 For this assessment, the receptors include the proposed new residential properties. Concentrations of nitrogen dioxide and PM_{10} have been predicted across the proposed redevelopment site, as shown in **Figure 1**. Receptors were modelled at a height of 1.5m representing ground floor exposure, or at 4.5m representing first floor exposure where no residential properties are proposed at ground floor.

3.4.3 Concentrations have been also been predicted at the closest roadside diffusion tube to the site (located in Camden Road, approximately 300m west of the site), in order to verify the modelled results (see **Appendix D** for further details on the verification method).

Impact Predictions

3.4.4 Predictions have been carried out using the ADMS-Roads dispersion model (v3.1.4). The model requires the user to provide various input data, including the Annual Average Daily Traffic (AADT) flow, the proportion of heavy duty vehicles (HDVs), road characteristics (including road width and street canyon height, where applicable), and the vehicle speed. It also requires meteorological data. The model has been run using 2012 meteorological data from the London City Airport monitoring station, which is considered suitable for this area.

3.4.5 Annual Average Daily Traffic (AADT) flows, and the proportions of Heavy Duty Vehicles (HDVs), for roads adjacent to the site have been provided by the project transport consultants (PBA) for 2023, which were calculated from counts carried out for the project. Traffic speeds were based on local speed restrictions, taking into account congestion and proximity to a junction. Traffic data used in this assessment are summarised in **Appendix E**.

3.4.6 Emissions were calculated for 2016 (which is the anticipated first year of occupation of any of the redeveloped properties) using the recently released Emission Factor Toolkit (EFT) v5.2c, which utilises NO_x emission factors taken from the European Environment Agency COPERT 4 (v8.1) emission tool. The 2023 traffic data were entered into the EFT, along with speed data to provide emission rates for each of the road links entered into the model.

3.4.7 Rail lines bound the southern boundary of the site, and lie within 100m of the eastern boundary. The LAEI include emissions for these railway lines which have been converted into emission rates in g/km/s, and input into the model as line sources. Emissions data for the rail sources are also presented in **Appendix E**.

Assessment Criteria

3.4.8 The NAQOs for NO_2 and PM_{10} set out in the Air Quality Regulations (England) 2000 and the Air Quality (England) (Amendment) Regulations 2002, are shown in **Table 3.4**.

Table 3.4: Nitrogen Dioxide and PM_{10} Objectives

Pollutant	Time Period	Objective
Nitrogen dioxide (NO_2)	1-hour mean	200µg/m^3 not to be exceeded more than 18 times a year
	Annual mean	40µg/m^3
Particulate matter (PM_{10})	24-hour mean	50µg/m^3 not to be exceeded more than 35 times a year
	Annual mean	40µg/m^3

3.4.9 The objectives for nitrogen dioxide and PM_{10} were to have been achieved by 2005 and 2004, respectively, and continue to apply in all future years thereafter. Analysis of long term monitoring data suggests that if the annual mean nitrogen dioxide concentration is less than 60µg/m^3 then the one-hour mean nitrogen dioxide objective is unlikely to be exceeded where road transport is the main source of pollution. This concentration has been used to screen whether the one-hour mean objective is likely to be achieved[10].

[10] Defra, 2009. Local Air Quality Management Technical Guidance LAQM.TG(09).

Significance

3.4.10 There is no official guidance in the UK on how to assess the significance of air quality impacts of existing sources on a new development. The approach developed by the Institute of Air Quality Management[11], and incorporated in Environmental Protection UK's guidance document on planning and air quality[12], has therefore been used.

3.4.11 This guidance states that the assessment of significance should be based on professional judgement, taking into account the factors set out in **Table 3.5**, with the overall air quality impact of the scheme described as either 'insignificant', 'minor', 'moderate' or 'major'.

Table 3.5: Factors to be taken into Account in Assigning Significance

Factors to be taken into account in assigning significance
Number of people affected by increase and/or decreases in concentrations and a judgement on the overall balance.
Where new exposure is being introduced into an existing area of poor air quality, then the number of people exposed to levels above the objective or limit value will be relevant.
Uncertainty, including the extent to which worst-case assumptions have been made.
The extent to which an objective or limit value is exceeded e.g. an annual mean NO_2 of 41µg/m^3 should attract less significance than an annual mean of 51µg/m^3.

[11] Institute of Air Quality Management, 2009. Position on the Description of Air Quality Impacts and the Assessment of their Significance, November 2009. The IAQM is the professional body for air quality practitioners in the UK.

[12] EPUK, 2010. Development Control: Planning for Air Quality (2010 Update)

4 Existing Air Quality

4.1 LAQM

4.1.1 LBC has investigated air quality within its area as part of its responsibilities under the LAQM regime. A borough wide AQMA has been declared for exceedences of both nitrogen dioxide and PM_{10} objectives.

4.1.2 The draft 2013 Progress Report for the borough confirmed that exceedences of the annual mean NO_2 objective continues at roadside sites, with some also likely to be exceeding the hourly mean objective as well.

4.2 Monitoring

4.2.1 LBC operated four automatic monitoring stations within its area during 2012, however, none are located in close proximity to the proposed redevelopment site. The Borough also deploys nitrogen dioxide diffusion tubes, prepared and analysed by Gradko Environment (50% TEA and acetone method), at a number of locations. Data for those monitors located within approximately 1.2km of the site are presented in **Table 4.1**.

Table 4.1: Measured Nitrogen Dioxide Concentrations, 2008 - 2012

Location	Site Type	Annual Mean (µg/m^3)				
		2008	2009	2010	2011	2012
Camden Road (CA20)	Roadside	**66.5**	**73.0**	**84.0**	**72.2**	**67.4**
Kentish Town Road (CA15)	Roadside	**61.8**	**68.3**	**74.0**	**57.2**	**59.0**
Brill Place (CA16)	Roadside	**49.0**	**51.9**	**54.0**	**50.8**	**50.0**
Objective		**40**				

Data provided by the LB Camden. Data are bias adjusted using national bias adjustment factors.
Data taken from the LBC draft 2013 Progress Report

4.2.2 The data indicate that alongside the road network, the annual mean nitrogen dioxide objective is exceeded. There is no clear trend in the measured concentrations, although concentrations appear to have peaked in 2010, and subsequently reduced fairly significantly (average of 15% for the 3 sites presented).

4.2.3 There is no PM_{10} monitoring carried out in close proximity to the site, however, measured concentrations in 2012 were well below the relevant objectives, even at roadside monitoring sites**.**

4.3 Background Concentrations

4.3.1 A comparison of measured and mapped background nitrogen dioxide concentrations at three monitoring sites classified as urban background is presented in **Table 4.2**.

Table 4.2: Measured and Estimated Background Concentrations in 2012 (µg/m^3).

Site	NO_2		
	Measured	Mapped	Ratio
CA6	39.2	48.6	0.81
CA7	28.9	33.0	0.88
CA10	40.1	51.0	0.79
Average Ratio			0.82

4.3.2 The data suggest that the Defra background maps are over-estimating nitrogen dioxide concentrations by, on average, 17.6%. Based on the above comparison, it is considered appropriate to adjust the mapped nitrogen dioxide concentrations using the average ratio calculated to better reflect the measured data.

4.3.3 There are no background PM_{10} monitoring data with which to make a comparison, and therefore the mapped backgrounds have been utilised. The background concentrations for the development site utilised in the assessment are presented in **Table 4.3.** The background concentrations are all below the relevant objectives.

Table 4.3: Background Concentrations Used in the Assessment (µg/m^3).

Year	NO_2 (Adjusted)	PM_{10}
2012	31.9	21.8
2016	28.1	20.7
Objectives	**40**	**40**

5 Impact Assessment

5.1 Construction Effects

5.1.1 The main potential effects during construction are dust deposition and elevated PM_{10} concentrations. The following activities have the potential to cause emissions of dust:

- Site preparation including delivery of construction material, erection of fences and barriers;
- Demolition of existing buildings on site;
- Earthworks including digging foundations and landscaping;
- Materials handling such as storage of material in stockpiles and spillage;
- Movement of construction traffic including haulage, vehicles and plant movements;
- Construction and fabrication of units; and
- Disposal of waste materials off-site.

5.1.2 Typically the main cause of unmitigated dust generation on construction sites is from demolition and vehicles using unpaved haul roads, and off-site from the suspension of dust from mud deposited on local roads by construction traffic. The main determinants of unmitigated dust annoyance are the weather and the distance to the nearest receptor.

5.1.3 The development proposals include the demolition of the majority of existing properties on site (excluding Lulworth House and the Children's Centre), and the construction of up to approximately 500 new properties over a number of phases. Based on the GLA criteria (**Table 3.1**), the site is considered to be high risk, however each phase of development is considered to be of medium risk. The study area is considered to be of medium sensitivity (**Table 3.2**), due to background PM_{10} concentrations being well below the objectives and the existence of a number of existing properties in close proximity to the site boundary.

5.1.4 The wind rose for London City Airport weather station for 2012 (**Figure 2**) shows that the dominant wind directions are from the southwest. Winds from the southwest occur for approximately 51% of the time. Properties close to the site downwind of the dominant winds are most likely to be affected by construction dust impacts. The Children's Centre is upwind of the demolition and construction activities for the majority of the time, whilst the residential properties on the eastern boundary of the site (L&Q Housing), which will remain occupied, are also downwind. Properties in Wrotham Road and Agar Place to the west of the site are upwind of the site for the majority of time, and therefore are unlikely to experience significant effects.

5.1.5 Wind speeds of moderate strength (3m/s) or greater are required to suspend dust in the air. For approximately 34% of the time the wind speed was less than moderate, below which dust is unlikely to become suspended in the air.

5.1.6 A daily rainfall of 0.2mm is considered sufficient to prevent fugitive dust generation. Analysis of rainfall data for the area around the site shows that, over the 30 year period from 1981 to 2010, an average of 41 - 44% of days were 'wet days' (i.e. within rainfall over 0.2mm) when there will be natural dust suppression.

5.1.7 For the majority of the time there will be little potential for dust generation even with no mitigation in place because:

- On approximately 41 - 44% of days the rainfall is greater than 0.2mm when there will be natural dust suppression to minimise emissions of dust;
- In winter months surfaces tend to stay damp for significant periods of time; and
- 34% of the time winds are typically less than moderate strength and would not suspend dust in the air from stockpile and open surfaces.

5.1.8 There may, however, be periods when sufficient dust is generated to cause annoyance. This is more likely in the summer months, when higher temperatures evaporate surface moisture more readily.

5.1.9 Based on **Table 3.3**, the risk of adverse dust effects is considered to be negligible following the application of mitigation appropriate to medium - high risk sites (set out in the Mitigation section). These measures should be applied rigorously when demolition and construction activities take place in close proximity to the Children's Centre, the existing residential properties immediately to the east and west of the site, and also when activities take place in close proximity to those new properties which are occupied during the earlier phases of the development, and those properties which remain occupied.

5.1.10 It is predicted that the construction phase will generate less than 60 Heavy Duty Vehicles (HDVs). This is below the threshold set out in the DMRB guidance, of 200 HDVs, and therefore air quality impacts associated with construction traffic emissions are considered negligible.

5.2 Road and Rail Traffic Impacts

5.2.1 The impact of emissions from existing traffic and railway emissions on air quality for residents of the proposed development in the first year of occupation (2016) has been predicted; a conservative assessment has been carried out utilising traffic flows for 2023 and emissions factors / backgrounds for 2016. Rail emissions have been assumed to remain static (see **Appendix E** for further details).

5.2.2 Predicted concentrations at the ten modelled receptors are presented in **Table 5.1**. Concentrations were predicted at a height of 1.5m at all receptors, apart from Receptors PR1 and PR5, where there is no proposed residential exposure at ground floor and concentrations were predicted at a height of 4.5m, representing residential exposure at first floor level.

5.2.3 Predicted concentrations are below the objectives at all receptor locations in 2016. Air quality is thus acceptable for future residents of the site.

Table 5.1: Predicted Concentrations of Nitrogen Dioxide and PM_{10} for Receptors within the Development.

Receptor	NO_2	PM_{10} [a]	
	Annual Mean (µg/m^3)	Annual Mean (µg/m^3)	Number of Days >50µg/m^3
PR1	35.4	21.5	5
PR2	36.4	21.6	6
PR3	36.7	21.6	6
PR4	34.3	21.3	5
PR5	35.2	21.3	5
PR6	31.6	20.9	5
PR7	31.3	20.9	5
PR8	31.4	20.9	5
PR9	31.4	21.0	5
PR10	32.7	21.2	5
Objectives	**40**	**40**	**35**

Exceedences of the objective are highlighted in bold.
[a] The numbers of days with PM_{10} concentrations greater than 50µg/m^3 have been estimated from the relationship with the annual mean concentration described in Defra, 2009.

5.3 Uncertainty

5.3.1 There are many components that contribute to the uncertainty in predicted concentrations. The model used in this assessment is dependent upon the traffic data that have been input which will have inherent uncertainties associated with them. There is then additional uncertainty as the model is required to simplify real-world conditions into a series of algorithms.

5.3.2 A disparity between the national road transport emission projections and measured annual mean concentrations of nitrogen oxides and NO_2 has been identified in recent years[13]. Whilst projections suggest that both annual mean nitrogen oxides and nitrogen dioxide concentrations from road traffic emissions should have fallen by around 15-25% over the past 6 to 8 years, at many monitoring sites levels have remained relatively stable, or have even shown a slight increase. Monitoring data compiled for this assessment indicate that roadside nitrogen dioxide concentrations have fallen by on average 15% in proximity to the site since 2010, and are back to levels measured in 2008.

5.3.3 The proposed development will not be fully occupied until at least 2023. In order to take account of uncertainties in future year vehicle emission factors, traffic data for 2023 have been combined with emission factors and background concentrations for 2016, the first year of occupation of the first phase of development (Block A). This is considered to provide a reasonable prediction of concentrations on site once the development is complete.

5.4 Impact Significance

5.4.1 Without mitigation in place, demolition and construction activities are judged to have the potential for minor adverse impacts in the surrounding area. Mitigation measures for High Risk sites are therefore recommended (**Section 6**); with these measures in place, the impacts are judged to be negligible and thus the effect is insignificant.

[13] Carslaw, D, Beevers, S, Westmoreland, E and Williams, M, 2011. Trends in NO_x and NO_2 emissions and ambient measurements in the UK. Available at: http://uk-air.defra.gov.uk/library/reports?report_id=645

5.4.2 The impact of road and traffic on air quality for residents of the development has been determined, and is judged to be insignificant. This judgement is made in accordance with the methodology set out in **paragraph 3.4.10**, and takes account of the factors set out in **Table 3.5**, in particular that the predicted concentrations at all receptors are below the relevant objectives when the development is complete.

6 Mitigation

6.1 Construction

6.1.1 The construction effects identified can be minimised through the use of the recommended mitigation measure. The following mitigation measures are recommended for inclusion within a Construction Environmental Management Plan (CEMP) to be agreed with the local authority, consistent with measures for High Risk sites set out in the GLA Best Practice Guidance.

6.1.2 Dust control measures should be rigorously applied close to the boundaries of development activity (particularly adjacent to the Children's Centre and existing / occupied properties adjacent to and within the site boundary) in order to reduce the risk of dust impacts and public exposure to elevated PM_{10} concentrations:

Site Preparation:

- Erect solid barriers to site boundary;
- No bonfires on site;
- Plan site layout – machinery and dust causing activities should be located away from sensitive receptors; and
- Identify responsible person in charge.

Construction Traffic:

- No idling vehicles;
- Vehicles should be cleaned and wheels washed before leaving the site;
- All loads entering and leaving the site must be covered.
- There should be no runoff of water or mud from the site; and
- All non-road mobile machinery to use ultra-low sulphur tax exempt diesel where available.

Demolition Works:

- Cutting equipment to use water as dust suppressant;
- Cover skips and minimise drop heights; and
- Wrap buildings to be demolished.

Site Activities:

- Minimise dust generating activities, using water as a dust suppressant where appropriate;
- Enclose stockpiles or keep them securely sheeted; and
- Ensure any concrete crusher / batcher has permit to operate.

6.2 Operation

6.2.1 The assessment has demonstrated that air quality would be acceptable for all future residents. Additional mitigation is not considered necessary.

7 Conclusions

7.1.1 The air quality impacts associated with the construction and operation of the proposed redevelopment at Agar Grove, Camden have been assessed. The site lies within the borough wide AQMA declared by the London Borough of Camden for exceedences of the nitrogen dioxide and PM_{10} objectives.

7.1.2 The construction works have the potential to create dust. During construction it will therefore be necessary to apply a package of mitigation measures to minimise the risk of elevated PM_{10} concentrations and dust nuisance in the surrounding area. With the proposed measures in place, construction dust impacts are judged to be insignificant. Construction traffic emissions are unlikely to have a insignificant effect on air quality within the surrounding area.

7.1.3 Concentrations of nitrogen dioxide and PM_{10} have been predicted for a number of worst-case locations representing proposed properties adjacent to the road and rail network. Predicted concentrations are below the relevant objectives and air quality is thus considered acceptable for all future residents of the site.

Appendix A Glossary

AADT	Annual Average Daily Traffic
AQMA	Air Quality Management Area
Diffusion Tube	A passive sampler used for collecting NO_2 in the air
HDV	Heavy Duty Vehicle; a vehicle with a gross vehicle weight greater than 3.5 tonnes Includes HGVs and buses
LAQM	Local Air Quality Management
LDV	Light Duty Vehicle
NAQO	National Air Quality Objective as set out in the Air Quality Strategy and the Air Quality Regulations
NO_2	Nitrogen dioxide
NO_x	Nitrogen oxides, generally considered to be nitric oxide and NO_2. Its main source is from combustion of fossil fuels, including petrol and diesel used in road vehicles
PM_{10}	Small airborne particles less than 10μm in diameter
Receptor	A location where the effects of pollution may occur
TEA	Triethanolamine

Appendix B References

Carslaw, D., Beevers, S., Westmoreland, E. and Williams, M. (2011). *Trends in NO_x and NO_2 emissions and ambient measurements in the UK*. Available: http://uk-air.defra.gov.uk/library/reports?report_id=645.

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Department of the Environment, Food and Rural Affairs (Defra) in partnership with the Scottish Executive, The National Assembly for Wales and the Department of the Environment for Northern Ireland (2009). *Local Air Quality Management Technical Guidance, LAQM.TG(09).* HMSO, London.

Department of the Environment, Transport and the Regions (DETR, 2007) in Partnership with the Welsh Office, Scottish Office and Department of the Environment for Northern Ireland (2007). *The Air Quality Strategy for England, Scotland, Wales, Northern Ireland*, HMSO, London.

Greater London Authority (2006) The Control of Dust and Emissions from Construction and Demolition: Best Practice Guidance, Greater London Authority, London

Institute of Air Quality Management (2012) Guidance on the Assessment of the Impacts of Construction on Air Quality and the Determination of their Significance, IAQM, London

Environmental Act 1995, Part IV.

Statutory Instrument 2000, No 921, *The Air Quality (England) Regulations 2000*, HMSO, London.

Statutory Instrument 2002, No 3034, *The Air Quality (England) (Amendment) Regulations 2002*, HMSO, London.

Statutory Instrument 2007, No. 64, *The Air Quality Standards Regulations 2007*, HMSO, London

Appendix C Draft SPG Emissions Standards

C.1 Air Quality Neutral Emissions Benchmarks for Buildings

C.1.1 The following table provides the Building Emissions Benchmarks based on the gross floor area for each type of development class.

Land Use Class	NO_x (g/m^2)	PM_{10} (g/m^2)
Class A1	14.4	1.57
Class A3 – A5	47.9	5.23
Class A2 and Class B1	19.6	2.15
Class B2 – B7	29.6	4.29
Class B8	19.1	2.76
Class C1	45.2	4.93
Class C2	150	11.5
Class C3	57.3	4.38
Class D1 (a)	27.4	2.99
Class D1 (b)	47.9	5.22
Class D1 (c – h)	19.7	2.15
Class D2 (a – d)	57.5	6.28
Class D2 (e)	181	19.8

C.2 Air Quality Neutral Emissions Benchmarks for Transport

C.2.1 The following table provides the Transport Emissions Benchmarks based on the gross floor area and the location of the development.

Land Use	Central Area Zone	Inner	Outer
NO_x (g/m^2/annum)			
Retail (A1)	152	194	206
Office (B1)	1.14	10.1	56.5
NO_x (g/dwelling/annum)			
Residential (C3)	212	496	1278
PM_{10} (g/m^2/annum)			

Land Use	Central Area Zone	Inner	Outer
Retail (A1)	14.7	35.1	35.4
Office (B1)	0.11	1.83	9.72
PM_{10} (g/dwelling/annum)			
Residential (C3, C4)	20.4	89.6	220

C.3 Emissions Benchmarks for Solid Biomass and CHP Plant

C.3.1 Emission benchmarks are set for equipment based on the location of the development in terms of background pollutant concentrations.

Band	Baseline Annual Mean NO_2 and PM_{10}	Baseline 24-Hour Mean PM_{10}
Band A	> 5% below national objective	> 1-day less than national objective
Band B	Between 5% below or above national objective	1 day below or above national objective

C.3.2 The following emissions standards are for plant in the 50kW_{th} - 20MW_{th} thermal input range.

Combustion Appliance	Pollutant	Emission Standard (mg/Nm^3)	Indicative Emission Factor	Likely Technique Required to Meet Emission Standard
Band A				
Spark Ignition Engine (natural gas/ biogas)	NO_x	250	0.7g/kWh	Advanced lean burn operation or NSCR
Compression Ignition Engine (diesel/ biodiesel)	NO_x	400	1.1g/kWh	SCR
Gas Turbine	NO_x	50	0.4g/kWh	Standard technology
Solid biomass boiler (including CHP applications)	NO_x PM_{10}	275 50	100g/GJ 20g/GJ	Staged combustion and automatic control. Cyclone/ multicyclone
All (stack release < 1MW)	NO_x	10m/s	-	Stack diameter
All (stack release > 1MW)	NO_x	15m/s	-	Stack diameter
Band B				

Combustion Appliance	Pollutant	Emission Standard (mg/Nm^3)	Indicative Emission Factor	Likely Technique Required to Meet Emission Standard
Spark Ignition Engine (natural gas/ biogas)	NO_x	150	0.3g/kWh	SCR or NSCR
Compression Ignition Engine (diesel/ biodiesel)	NO_x	400	1.1g/kWh	SCR
Gas Turbine	NO_x	50	0.4g/kWh	Standard technology
Solid biomass boiler (including CHP applications)	NO_x PM_{10}	180 15	70g/GJ 6g/GJ	Staged combustion, automatic control and/or SCR Fabric/ceramic filter
All (stack release < 1MW)	NO_x	10m/s	-	Stack diameter
All (stack release > 1MW)	NO_x	15m/s	-	Stack diameter

C.4 Emission Benchmarks for Individual/Communal Gas Fired Boilers

C.4.1 NO_x emissions from gas fired boilers should be below 40mg/kWh.

Appendix D Model Verification

Nitrogen Dioxide

Most nitrogen dioxide is produce in the atmosphere by the reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of primary pollutant emission of nitrogen oxides (NO_x = NO + NO_2). The model has been run to predict the 2012 annual mean road-NO_x contribution at the diffusion tube located on Camden Road, approximately 300m from the site.

The model output of road-NO_x has been compared with the 'measured' road-NO_x, which was determined from the measured nitrogen dioxide concentration using the NO_x from NO_2 calculator and the adjusted background NO_2 concentration from the Defra background map.

An adjustment factor was determined as follows:

- Measured NO_2: 67.4µg/m^3
- Measured road-NO_x: 99.0µg/m^3
- Modelled road-NO_x = 68.4µg/m^3
- Road-NO_x adjustment factor: 99.0/68.4 = 1.449

This factor implies that the model is slightly under-predicting the road-NO_x contribution. This is a common experience with this and most other models.

PM_{10}

There is no monitoring of PM_{10} carried out in close proximity to the proposed development and it has therefore not been possible to verify the model outputs of PM_{10}. The adjustment factor calculated for nitrogen dioxide has therefore been applied to the modelled road-PM_{10} concentrations

Appendix E Traffic and Rail Data

Road Link	2012		2023	
	AADT	%HDV	AADT	%HDV
Data from Traffic Counts				
Agar Grove	11,412	8.1%	12,240	8.1%
St Pancras Way south of Agar Grove	14,490	7.0%	15,541	7.0%
LAEI data				
Randolph Street	1,676	3.6%	1,798	3.6%
St Pancras Way north of Agar Grove	12,084	6.6%	12,961	6.6%
St Pancras Way north of Camden Rd	6,991	5.0%	7,498	5.0%
Royal College St north of Camden Rd	7,964	6.8%	8,542	6.8%
Royal College St south of Camden Rd	18,893	13.3%	20,264	13.3%
Camden Rd west of Camden St	31,744	10.2%	34,047	10.2%
Camden Rd west of Royal College St	30,877	7.8%	33,117	7.8%
Camden Rd west of St Pancras Way	35,185	8.4%	37,738	8.4%
Camden Rd east of St Pancras Way	30,896	7.7%	33,138	7.7%
Camden St north of Camden Rd	19,207	9.4%	20,601	9.4%
Camden St south of Camden Rd	21,006	3.2%	22,530	3.2%

LAEI 2011 data have been factored to 2023 using the same factor applied to 2012 count data.

Rail line	NO_x Emissions (g/km/s)	PM_{10} Emissions (g/km/s)
Between Kentish Town and London St. Pancras (within 100m of eastern boundary)	0.202	0.004
Between Camden Road and Camden Rd. E. Jn. (along southern boundary of site) – North London Line	0.022	0.001
Between Camden Rd. E. Jn. And Caledonian Rd Barnsbury	0.153	0.003
Between Camden Rd. E. Jn. and Kings X Freight Jn.	0.044	0.001

Rail emissions data have been taken from the LAEI. The North London Line is being promoted as part of the High Speed 2 route. Trains associated with HS2 will be electrically powered and therefore there will be no additional emissions associated with these proposals.

Appendix F Figures

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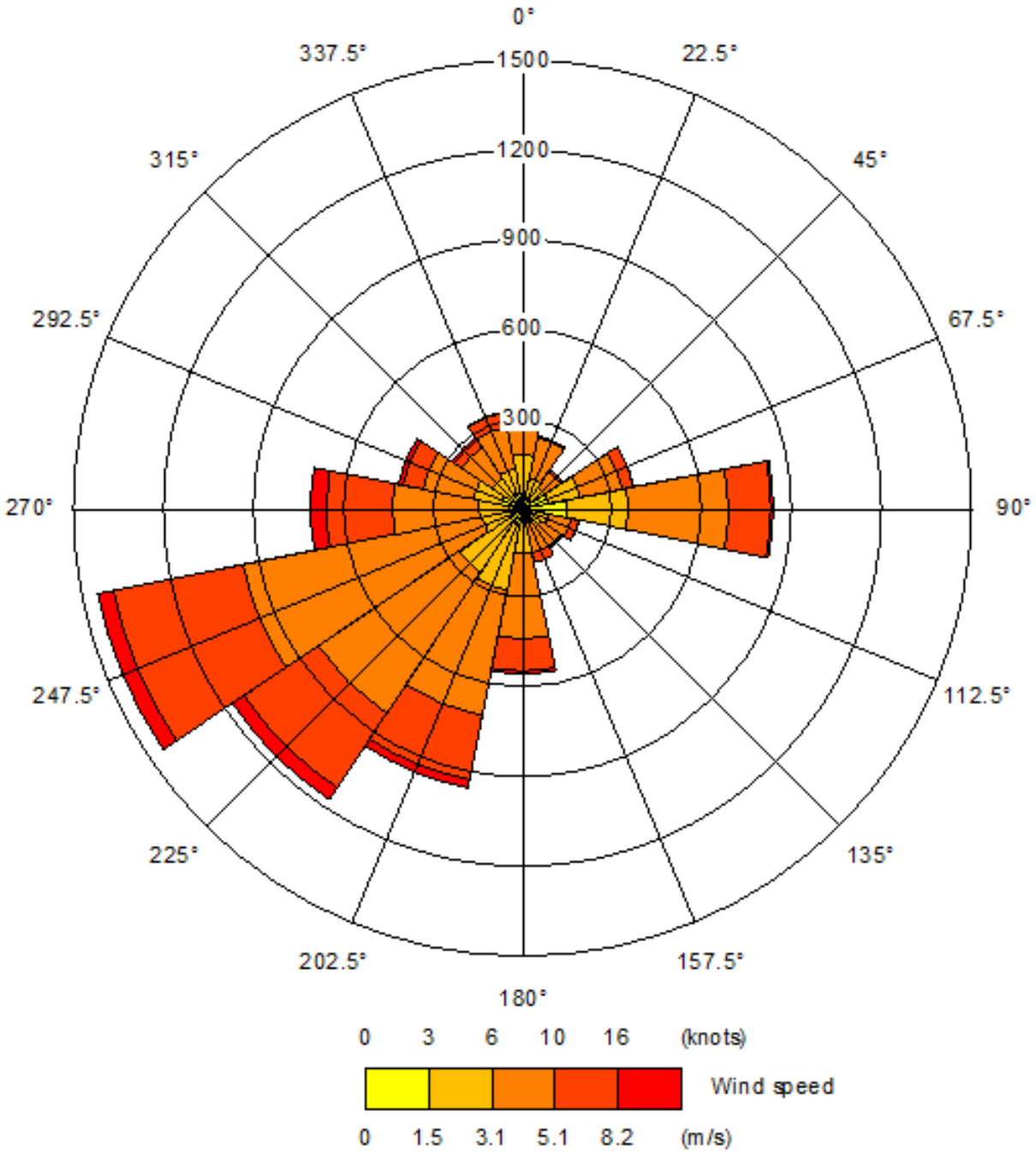
London Borough of Camden

Agar Grove, Camden

Receptor Locations

Date	Dec 2013
Scale	N.T.S.
Drawn By	DW
Checked By	GH
Figure Number	Figure 1



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Client
London Borough of Camden

Agar Grove, Camden

London City Airport Wind Rose 2012

Date	September 2013
Scale	N.T.S.
Drawn By	DW
Checked By	GH
Figure Number	**Figure 2**