Air Quality Assessment: 80 Guilford Street, Bloomsbury

Russell Building and Developments Limited

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Table of Contents

List of Appendices

List of Tables

1. INTRODUCTION

Hawkins Environmental Limited has been instructed to undertake an air quality assessment for the redevelopment of 80 Guilford Street, Bloomsbury, situated within the London Borough of Camden. The site currently comprises a five storey terraced property containing sixteen bedsitting rooms. The proposals will see the conversion of the existing building structure into five self-contained apartments.

During the planning process, it has been identified that air quality could pose a constraint upon the redevelopment of the site. Consequently, this assessment has been completed in order to determine whether the proposed development achieves compliance with the National Air Quality Objectives, as well as national and local planning policy. This assessment has been undertaken in accordance with the Department of Environment, Food and Rural Affairs' (Defra) current Technical Guidance on Local Air Quality Management (LAQM) and addresses the effects of air pollutant emissions from traffic using the adjacent roads, and emissions associated with the development of the site.

This report assesses the overall levels of hydrocarbons, nitrogen dioxide (NO_2) and particulates (PM_{10} and $PM_{2.5}$) in the vicinity of the site. A glossary of terms is detailed in **Appendix 1** and a site plan is displayed in **Appendix 2.** The constraints which existing air quality may have on the proposed development have been considered and forms part of this assessment. However, the impacts of the development on the air quality of surrounding properties have also been considered.

2. LEGISLATION AND POLICY

2.1. National Air Quality Strategy

In 1997 the United Kingdom National Air Quality Strategy (NAQS) was published[1] and this document, for the first time in history, set out an analysis of the magnitude and potential health and environmental problems associated with air pollutant emissions, particularly those emanating from road traffic.

It proposed a schedule of air quality objectives, which were to be met for various pollutants in the years up to 2005. In setting these objectives, due account was taken of health and socio-economic cost-benefit factors, together with consideration of the practical and pragmatic aspects of whether targets would be achievable. Whilst it was identified in the Strategy that the objectives for benzene, butadiene, lead and carbon monoxide could be achieved as a result of improvement measures already put in place, complying with targets for NO_2 and PM_{10} would be more difficult. In considering what additional measures would have to be introduced to counter these apparent shortfalls, the Government voiced the following thought: *"changes in planning and transport policies (are needed) which would reduce the need to travel and reliance on the car"*. With regard to the necessity for encouraging a shift away from private car usage, the Strategy commented, in terms of the new package approach to transport funding, *"As a general rule, traffic demand management and restraint measures should be included and this, together with proposals to promote and enhance other modes of transport, should aim to achieve modal shifts away from the private car"*.

The Environment Act 1995, specifically sections 82-84, requires that local authorities should carry out reviews of air quality within their administrative areas and, where it is assessed that the air quality objectives may not be complied with in the future, an Air Quality Management Area must be declared. The local authority must then formulate an action plan, setting out the measures that will be employed to achieve compliance with the objectives.

A review of the UK Air Quality Strategy was undertaken in 1998 and a consultation document was published in January 1999, outlining proposals for amending the Strategy. In August 1999, in response to the consultation, the Government then published a draft Air Quality Strategy for England, Scotland, Wales and Northern Ireland. The Air Quality Regulations (England) 2000 enacted in April 2000, and the Air Quality (England) (Amendment) Regulations 2002 gives legal force to the air quality standards set out in the Strategy. A new strategy was released in July 2007 with various amendments to the air quality objectives[2]. The proposals, in brief, consisted of recommendations to adopt the provisions of the EU Air Quality Daughter Directives.

The 2008 EU Ambient Air Quality Directive (2008/50/EC)[3] sets legally binding limits for concentrations in outdoor air of major air pollutants that impact public health such as particulate matter (PM_{10} and $PM_{2.5}$) and nitrogen dioxide (NO_2). The 2008 directive replaced nearly all the previous EU air quality legislation and was made law in England through the Air Quality Standards Regulations 2010[4]. The 2010 Regulations includes a number of Standards or Limit Values, which are concentrations of various pollutants below which health effects

[1] The United Kingdom National Air Quality Strategy, CM3587, Department of the Environment, 1997.
[2] The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, Department for Environment, Food and Rural Affairs in partnership with the Scottish Executive, Welsh Assembly Government and Department of the Environment Northern Ireland, July 2007.
[3] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:152:0001:0044:EN:PDF
4 http://www.legislation.gov.uk/uksi/2010/1001/contents/made

are unlikely even in sensitive population groups, or below which risks to public health would be exceedingly small. They are based purely upon the scientific and medical evidence of the effects of a particular pollutant. As well as Limit Values, there are a number of National Air Quality Objectives (NAQO) which set out the extent to which the Government expects the standards to be achieved by a certain date. They take account of the costs, benefits, feasibility and practicality of achieving the standards.

The NAQOs only apply where members of the public are likely to be regularly present for the averaging time of the objective (i.e. where people will be exposed to pollutants). The annual mean objectives apply to all locations where members of the public might be regularly exposed; these include building facades of residential properties, schools, hospitals, care homes etc. The 24 hour mean objective applies to all locations where the annual mean objective would apply, together with hotels and gardens of residential properties. The 1 hour mean objective also applies at these locations as well as at any outdoor location where a member of the public might reasonably be expected to stay for 1 hour or more, such as shopping streets, parks and sports grounds, as well as bus stations and railway stations that are not fully enclosed.

Given the significant influence that motor vehicle exhausts exert on air quality in the UK and the apparent links between elevated levels of certain air pollutants and premature mortality, it is clear that current and emerging Government policy is geared towards several essential objectives, which are:

- continued action to reduce pollutant emissions from vehicles across the EU, which can be exemplified by the plethora of Directives concerning limitation of motor vehicle emissions since the 1970's and specific targeted initiatives such as the Auto-Oil Study programme;
- concerted action at a National level to reduce private car trips in urban and inter-urban uses and encourage use of alternative forms of transportation;
- action at a local level to manage transportation and air quality in order to reduce the number of car trips in urban areas specifically and to aim for compliance with the National Air Quality Standards by the appointed dates; and
- to ensure that Local Authorities in the execution of their development control responsibilities take account of the consequent air quality impacts.

It is evident that continued growth in private car ownership and usage will continue to result in further deterioration of air quality in urban areas and increasing emissions of greenhouse gases. Whilst current technological improvements have successfully reduced emissions, additional measures will be required in order to prevent re-growth of emissions, both to meet ambient air quality targets in urban areas and to offer an alternative to the car for urban journeys. Consequently, where new development can be located in relatively close proximity to public transport and local services, a contribution to the UK's target of reducing emissions will have been made.

Levels of lead and sulphur dioxide are also controlled by the National Air Quality Objectives. Lead levels have reduced significantly since its reduced use as a fuel additive, and the abolition of four-star petrol in January 2000 means that the amount of lead in petrol is reduced to a negligible level. Sulphur dioxide (SO_2) is predominantly associated with emissions from industrial processes, and, accordingly, when assessing the effects of traffic neither SO_2 or lead need be assessed.

2.2. The National Planning Policy Framework

In March 2012, the National Planning Policy Framework[5] (NPPF) was published to replace the thousands of pages of national planning policy guidance, including guidance on air quality. The intention was to let councils decide their own priorities though their Local Plans and reduce the amount of "red tape" to enable growth and development. Amongst hundreds of other documents, the NPPF replaces the 2004 document *Planning Policy Statement 23 (PPS 23) 'Planning and Pollution Control'* [6] published by the Office for the Deputy Prime Minister, which is now officially withdrawn as official government guidance. PPS 23 provided planning policy on all types of pollution control, including air quality.

The NPPF includes 12 core planning principles which include:

- *"Always seek to secure high quality design and a good standard of amenity for all existing and future occupants of buildings;*
- *Take account of the different roles and character of different areas, promoting the vitality of the main urban areas, protecting the Green Belts around them, recognising the intrinsic beauty of the countryside; and*
- *Contribute to conserving and enhancing the natural environmental and reducing pollution"*

It also states that the planning system "*should contribute to enhance the natural environment, by... preventing both new and existing development from contributing to or being put at risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution…To prevent unacceptable risks from pollution, planning policies and decisions should ensure that new development is appropriate for its location*".

The NPPF briefly talks specifically about air quality stating 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. The Mayor's Air Quality Strategy

In December 2010, the Mayor of London's Air Quality Strategy was published by the Greater London Authority[7]. The strategy sets out a framework for delivering improvements to London's air quality and includes measures aimed at reducing emissions from all types of new development, as well as raising awareness of air quality issues and its impacts on health.

2.4. The London Plan

The London Plan[8], published in July 2011, provides an overall strategic plan for London, and it sets out a fully integrated economic, environmental, transport and social framework for the development of the capital to 2031.

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[5] http://www.communities.gov.uk/documents/planningandbuilding/pdf/2116950.pdf
[6] Planning Policy Statement 23: Planning & Pollution Control (2004). Office for the Deputy Prime Minister .
[7] Clearing the Air – The Mayor's Air Quality Strategy; the Greater London Authority, December 2010.
[8] The London Plan - Spatial Development Strategy for Greater London (July 2011), Mayor of London.

The Plan brings together the Mayor's strategies, including policy on a range on environmental issues, such as climate change, air quality, noise and waste. London Boroughs' local plans need to be in general conformity with the London Plan, and its policies guide decisions on planning applications by councils and the Mayor.

Policy 7.14 specifically relates to air quality and states:

"Development proposals should:

a) *minimise increased exposure to existing poor air quality and make provision to address local problems of air quality (particularly within Air Quality Management Areas (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...;*

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

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

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

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

2.5. Local Policy

The London Borough of Camden's Development Policies 2010-2025[9] document states in Policy DP32 Air Quality that *"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... The Council will take into account impact on air quality when assessing development proposals. Regard will be paid to Camden's Air Quality Action Plan and to Cleaning London's Air: The Mayor's Air Quality Strategy."*

[9] Camden Local Development Framework - Camden Development Policies - Adoption version 2010

3. ASSESSMENT CRITERIA

3.1. Developmental Constraints

The Limit Values and National Air Quality Objectives[10] (NAQO's) are derived from air quality standards set to protect health and are set out Schedule 2 of the Air Quality Standards Regulations 2010. The Limit Values address social and economic factors as well as the health standards.

For the purposes of this development proposal, the National Air Quality Objectives and their Limit Values will form the basis of the air quality assessment. The NAQO's are based on an assessment of the effects of each pollutant on public health. Therefore, they are a good indicator in assessing whether, under normal circumstances, the air quality in the vicinity of a development is likely to be detrimental to human health. In determining whether air pollutant levels may constrain development, the results of the study have been compared against the acceptability criteria. The Air Quality Standards are displayed in **Table 3.1** below.

Table 3.1: Air Quality Standards

Pollutant	Averaging Period	NAQO Limit Value
Sulphur Dioxide	One Hour	350 µg/m^3 Not to be exceeded more than 24 times per calendar year
	One Day	150 µg/m^3 Not to be exceeded more than 3 times per calendar year
Nitrogen Dioxide	One Hour	200 µg/m^3 Not to be exceeded more than 18 times per calendar year
	Calendar Year	40 µg/m^3
Benzene	Calendar Year	5 µg/m^3
Lead	Calendar Year	0.5 µg/m^3
PM_{10}	One Day	50 µg/m^3 Not to be exceeded more than 35 times per calendar year
	Calendar Year	40 µg/m^3
$PM_{2.5}$	Calendar Year	25 µg/m^3
Carbon Monoxide	Maximum daily running 8 hour mean	10 mg/m^3

[10] http://www.legislation.gov.uk/uksi/2010/1001/contents/made

3.2. Operational Impact Assessment

To determine the impact of the proposed development on surrounding sensitive receptors, the impact magnitude has been derived from various guidance, including the Environmental Protection UK guidance document *'Development Control: Planning for Air Quality'* which was updated in 2010[11]. **Table 3.2** identifies the criteria adopted for the assessment, which is used to describe the magnitude of change. The magnitude of change can then be used to derive the descriptor used to describe the impact, as shown in **Table 3.3.**

Table 3.2: Magnitude for Changes in Pollutant Concentration as a Percentage of the Assessment Level

Magnitude of Change	Annual Mean of NO_2 or PM_{10}	
	Percentage Change	Absolute Change
Large	Increase/Decrease >10%	Increase/Decrease >4 µg/m³
Medium	Increase/Decrease 5 – 10%	Increase/Decrease 2 - 4 µg/m³
Small	Increase/Decrease 1 – 5%	Increase/Decrease 0.4 - 2 µg/m³
Imperceptible	Increase/Decrease <1%	Increase/Decrease <0.4 µg/m³

Table 3.3: Air Quality Impact Descriptor for Changes to Annual Mean NO_2 Concentrations at Receptor

Absolute Concentration In Relation to Objective/Limit Value	Change in Concentration*		
	Small	Medium	Large
Increase with Scheme			
Above Objective/Limit Value With Scheme (>40 µg/m³)	Slight Adverse	Moderate Adverse	Substantial Adverse
Just Below Objective/Limit Value With Scheme (36-40 µg/m³)	Slight Adverse	Moderate Adverse	Moderate Adverse
Below Objective/Limit Value With Scheme (30-36 µg/m³)	Negligible	Slight Adverse	Slight Adverse
Well Below Objective/Limit Value With Scheme (<30 µg/m³)	Negligible	Negligible	Slight Adverse
Decrease with Scheme			
Above Objective/Limit Value Without Scheme (>40 µg/m³)	Slight Beneficial	Moderate Beneficial	Substantial Beneficial
Just Below Objective/Limit Value Without Scheme (36-40 µg/m³)	Slight Beneficial	Moderate Beneficial	Moderate Beneficial
Below Objective/Limit Value Without Scheme (30-36 µg/m³)	Negligible	Slight Beneficial	Slight Beneficial
Well Below Objective/Limit Value Without Scheme (<30 µg/m³)	Negligible	Negligible	Slight Beneficial

*= An imperceptible change would always be described as negligible

[11] http://www.environmental-protection.org.uk/assets/library/documents/Air_Quality_Guidance_2010_(final2).pdf

3.3. Construction Impact Assessment

The Institute of Air Quality Management published in 2012[12] a complex risk based assessment methodology to determine the significance of an air quality impact arising from the construction of a new development, based on the magnitude of change. The methodology provides a four Step approach to determining the significance:

STEP 1 is to screen the requirement for a more detailed assessment. No further assessment is required if there are no receptors within a certain distance of the works.

STEP 2 is to assess the risk of dust effects. This is determined by:

- the scale and nature of the works, which determines the risk of dust arising; and
- the proximity of sensitive receptors.

Risks are described in terms of there being a low, medium or high risk of dust effects for each of the four separate potential activities (demolition, earthworks, construction and trackout). Where there are low, medium or high risks of effects then site-specific mitigation will be required, proportionate to the level of risk (separate guidance is provided on mitigation measures).

Table 3.4, **Table 3.5**, **Table 3.6** and **Table 3.7** determine the risk category for demolition, earthworks, construction and trackout activities respectively. **Table 3.8** gives examples of the Dust Emission Class, although the guidance states that other criteria may also be justified.

Table 3.4: Risk Category from Demolition Activities

Distance to nearest receptor (m)		Dust Emission Class		
Dust Soiling and PM_{10}	Ecological	Large	Medium	Small
<20	-	High Risk Site	High Risk Site	Medium Risk Site
20-100	<20	High Risk Site	Medium Risk Site	Low Risk Site
100-200	20-40	Medium Risk Site	Low Risk Site	Low Risk Site
200-350	40-100	Medium Risk Site	Low Risk Site	Negligible

[12] Guidance on the Assessment of the Impacts of Construction on Air Quality and the Determination of their Significance, The Institute of Air Quality Management, January 2012.

Table 3.5: Risk Category from Earthworks Activities

Distance to nearest receptor (m)		Dust Emission Class		
Dust Soiling and PM_{10}	Ecological	Large	Medium	Small
<20	-	High Risk Site	High Risk Site	Medium Risk Site
20-50	-	High Risk Site	Medium Risk Site	Low Risk Site
50-100	<20	Medium Risk Site	Medium Risk Site	Low Risk Site
100-200	20-40	Medium Risk Site	Low Risk Site	Negligible
200-350	40-100	Low Risk Site	Low Risk Site	Negligible

Table 3.6: Risk Category from Construction Activities

Distance to nearest receptor (m)		Dust Emission Class		
Dust Soiling and PM_{10}	Ecological	Large	Medium	Small
<20	-	High Risk Site	High Risk Site	Medium Risk Site
20-50	-	High Risk Site	Medium Risk Site	Low Risk Site
50-100	<20	Medium Risk Site	Medium Risk Site	Low Risk Site
100-200	20-40	Medium Risk Site	Low Risk Site	Negligible
200-350	40-100	Low Risk Site	Low Risk Site	Negligible

Table 3.7: Risk Category from Trackout Activities

Distance to nearest receptor (m)		Dust Emission Class		
Dust Soiling and PM_{10}	Ecological	Large	Medium	Small
<20	-	High Risk Site	Medium Risk Site	Medium Risk Site
20-50	<20	Medium Risk Site	Medium Risk Site	Low Risk Site
50-100	20-100	Low Risk Site	Low Risk Site	Negligible

Table 3.8: Typical Dust Emission Class Criteria

Activity	Dust Emission Class		
	Large	**Medium**	**Small**
Demolition	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;	Total building volume 20,000 m^3 – 50,000m^3, potentially dusty construction material, demolition activities 10-20 m above ground level;	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;
Earthworks	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;	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;	Total site area <2,500 m^2, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4 m in height, total material moved <10,000 tonnes, earthworks during wetter months;
Construction	Total building volume >100000 m^3, piling, on site concrete batching; sandblasting;	Total building volume 25,000 m^3 – 100,000 m^3, potentially dusty construction material (e.g. concrete), piling, on site concrete batching;	Total building volume <25,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber);
Trackout	>100 HDV (>3.5t) trips in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100 m;	25-100 HDV (>3.5t) trips in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 m – 100 m;	<25 HDV (>3.5t) trips in any one day, surface material with low potential for dust release, unpaved road length <50 m;

STEP 3 is to determine the site-specific mitigation for each of the four potential activities used in STEP 2. This will be based on risk of dust impacts identified in STEP 2. Where a local authority has issued guidance on measures to be adopted at demolition / construction sites, these should also be taken into account.

STEP 4 is to assess the significance of the dust effects, generally undertaken after applying the site-specific mitigation. This will be based on professional judgement taking account of the risk of effects from Step 2 and of other factors that might affect the risk of dust effects arising (such as contamination or particularly sensitive receptors nearby), even after any site-specific mitigation has been implemented. The overall significance of dust effects should be described using terminology typically used in Environmental Impact Assessment (for example ‘moderate adverse’).

4. MODELLING AND INPUT DATA

4.1. The Design Manual for Roads and Bridges

In the UK, the Department for Environment, Food & Rural Affairs (Defra) provides guidance on the most appropriate methods to estimate pollutant concentrations for use in Local Air Quality Management (LAQM). Defra regularly updates its Technical Guidance, with the latest LAQM Technical Guidance TG(09) published in February 2009[13].

The methodology in TG(09) directs air quality professionals to a number of tools published by Defra to predict and manage air quality. One of the main tools is the calculation procedure contained within the Design Manual for Roads and Bridges (DMRB)[14]. DMRB Volume 11, Section 3, Part 1, describes the so-called 'DMRB Screening Method'.

The methodology is provided in spreadsheet format and is designed to estimate pollutant concentrations at specific locations from the associated road network.

The methodology has undergone a number of significant revisions over the period 2002-2007 with the latest version becoming available in July 2007. The methodology provides estimates of air pollutant concentrations that in general provide very good agreement with measured data and pollutant concentration levels predicted utilising more detailed dispersion models.

Where local information is available on traffic composition the method allows for the division of traffic into a range of classes. Within these classes it is assumed that the distribution of vehicles according to fuel type, emission standard and engine size, would conform to national average statistics.

An atmospheric dispersion equation was derived from calculations using an atmospheric dispersion model developed by TRL. The rate at which exhaust pollutants disperse depends on the atmospheric conditions; and the speed and direction of the wind being of particular importance. In deriving the dispersion equation a wind speed of 2m/s was assumed and no weighting for wind direction assumed.

A comparison of modelled with measured pollutant concentration values showed that overall there was good agreement at the majority of the AURN and HA monitoring sites providing further confidence in the model.

The model does not take account of annualised meteorological data, height of source or receiver nor is it able to model canyon effects. Nevertheless, it is useful as a screening tool and in particular for comparing the effects of various road traffic conditions where the road is in close proximity to receptor location.

Annex 3 of TG(09) provides detailed guidance on the modelling of air pollutants and in particular highlights a procedure to validate models, including DMRB. The procedure discusses the comparison of modelled results against measured levels, either from diffusion tubes (for NO_2) or continuous monitors (for NO_2 or PM_{10}).

Model verification and subsequent adjustment for oxides of nitrogen is undertaken based upon NO_X as most models (including DMRB) predict NO_2 based upon its relationship to NO_x. Consequently, the verification

[13] Part IV of the Environment Act 1995, Local Air Quality Management Technical Guidance (TG09), Defra, February 2009.
[14] Design Manual for Roads & Bridges, spreadsheet version 1.03c, Highways Agency, July 2007.

process requires conversion to NO_x of any measurements of NO_2 in order to compare against modelled levels of NO_x.

Defra has published in 2009 a methodology to calculate NO_x from NO_2 and as part of its LAQM toolkit[15]. The calculation method allows local authorities and air quality consultants to derive NO_2 and NO_x wherever NO_x is predicted by modelling emissions from roads e.g. using the DMRB (version 1.03c, July 2007) methodology. The calculation method incorporates the impact of expected changes in the fraction of NO_x emitted as NO_2 (f – NO_2) and changes in regional concentrations of NO_x, NO_2 and O_3.

Background concentrations for various pollutants are published and updated regularly by Defra, so it is possible to calculate the contribution of NO_x from road traffic at a particular location. If the ratio of the monitored road traffic contribution to the modelled road traffic contribution of NO_x is calculated, this factor can be applied to the component derived from road traffic emissions for any predictions of NO_x in the area. Therefore, it is possible to validate the model such that predictions should be within 10% of air quality measurements.

4.2. Traffic Data

Traffic flow data used in the predictions has been taken from the Department for Transport traffic count database for 2010, then factored to represent 2013 data, the proposed opening year of the development. The traffic information is detailed in **Table 4.1** below. It has not been possible to obtain traffic flow data for Guilford Street, however given the low flows observed on the road, a worst case traffic flow of 5000 AADT has been used for 2013.

Table 4.1: Traffic Flow Data

Road	Year	AADT	% HGV
Russell Square	2010	23,240	4.3%
Russell Square	2013	24,302	4.3%

4.3. Background Concentration of Air Pollutants

Background concentrations of air pollutants for the modelling were obtained from the UK National Air Quality Information Archive, in accordance with Local Air Quality Management Technical Guidance TG(09). **Table 4.2** identifies the background concentrations used in the DMRB model for the grid reference 530500,182500 for the proposed year of occupation. For the verification (see **Section 5.3**), a NO_2 background concentration of 46.43 $\mu g/m^3$ and a NO_x background concentration of 88.88 $\mu g/m^3$ was used from grid reference 530500,182500 for 2010. In order to avoid 'double counting', all road sources within the grid square identified were removed from the total background as they have been explicitly modelled as part of the do-minimum and do-something scenarios.

[15] http://laqm.defra.gov.uk/tools-monitoring-data/no-calculator.html

Table 4.2: Background Concentrations of Pollutants

Year	Benzene µg/m^3	CO mg/m^3	NO_x µg/m^3	NO_2 µg/m^3	PM_{10} µg/m^3	$PM_{2.5}$ µg/m^3
2013	1.14	0.30	79.90	42.66	22.73	15.90

Presently, DMRB does not predict the concentration of $PM_{2.5}$ as part of the methodology, therefore the future concentration of $PM_{2.5}$ will be calculated using the typical ratio between the background concentrations of PM_{10} and $PM_{2.5}$; the ratio for this grid reference is 0.70.

5. BASELINE CONDITIONS

5.1. Air Quality Review and Assessment

As previously indicated, Local Authorities have been required to carry out a review of local air quality within their boundaries to assess areas that may fail to achieve the NAQO's. Where these objectives are unlikely to be achieved, local authorities must designate these areas as Air Quality Management Areas (AQMA's) and prepare a written action plan to achieve the NAQO's.

The review of air quality takes on several prescribed stages, of which each stage is reported. In the London Borough of Camden's first round of review and assessment, they concluded that it was necessary to declare the whole borough as an Air Quality Management Area (AQMA) for the long term objective for nitrogen dioxide (NO_2) and the short and long term objectives for particulate matter (PM_{10}). Their latest air quality reports show gradual improvements in air quality, but they still have exceedances of the limit values.

5.2. Local Air Quality Monitoring

The London Borough of Camden conducts air quality monitoring a few hundred metres to the west of the site, at Russell Square, referred to as there Bloomsbury monitoring site. The site houses a continuous analyser which recorded an annual mean of 55 $\mu g/m^3$ of NO_2 in 2010[16]. For the same year, the annual mean of PM_{10} was 18 $\mu g/m^3$ and the daily mean of 50 $\mu g/m^3$ was exceeded on two days in 2010. The monitoring location is 27m from the kerb of the closest road.

5.3. Verification

As stated in **Section 5.2**, the London Borough of Camden conducts air quality monitoring a few hundred metres to the west of the site, at Russell Square. It has been possible to verify the air pollutant model in accordance with LAQM Technical Guidance (09) using the data from the continuous analyser, as detailed in **Table 5.1.** This exercise resulted in a difference between the modelled and monitored results of -4% which indicates that the DMRB model is slightly under predicting; consequently, an adjustment factor for the road contribution of NO_X of 1.58 was used.

Table 5.1: NO_2 Annual Mean Verification for 2010

Location	Monitored		Modelled		% Difference (total)
	Total NO_2 $\mu g/m^3$	Road NO_X $\mu g/m^3$	Total NO_2 $\mu g/m^3$	Road NO_X $\mu g/m^3$	
Bloomsbury	55.0	15.46	53.04	9.77	-4

[16] 2010 Air Quality Progress Report for the London Borough of Camden

5.4. Predicted Pollutant Concentrations

To characterise the air quality at the residential development adjacent to roads, predictions of air pollutant concentrations at the development site have been made for the proposed occupation date of 2013 using the Design Manual for Roads and Bridges (DMRB Version 1.03c July 2007) prediction methodology. Concentrations have been calculated for the closest point on the development site to the main roads. The results of these predictions can be seen in **Table 5.2**.

Table 5.2: Predicted Air Quality Concentrations 2013 – Development Site

Pollutant	Criteria	80 Guilford Street	NAQO
NO_2 (µg/m³)	Annual mean	45.09	**40**
Benzene (µg/m³)	Annual mean	1.17	**5**
PM_{10} (µg/m³)	Annual mean	23.14	**40**
	Days >50 µg/m³	8.38	**35**
$PM_{2.5}$ (µg/m³)	Annual mean	16.20	**25**
CO (mg/m³)	Annual mean	0.32	**10**

If pollutant concentrations in **Table 5.2** are compared to the National Air Quality Objectives, it can be seen that concentrations of all pollutants are below the Air Quality Objectives, with the exception of NO_2, which marginally exceeds the annual mean objective.

5.5. NO_2 1-hour Exposure Assessment

According to research conducted in 2003[17], there is only a risk that the NO_2 1-hour objective (200 µg/m³) could be exceeded if the annual mean nitrogen dioxide concentration is greater than 60 µg/m³. At the development site, the worst case annual mean is 45.09 µg/m³, therefore hourly exceedances are not expected.

5.6. Industrial Emissions

There are no sites within 1 km of the proposed development site that are on the Environment Agency's Public Register as regulated industrial processes with environmental permits, for example under the EU Directive on Integrated Pollution Prevention and Control (IPPC) (2008/1/EC).

Within 500 metres of the proposed development site, there are two premises that are regulated by the London Borough of Camden as Part B processes under the Local Air Pollution Prevention and Control regime (LAPPC), They are both dry cleaners, situated at 148 Southampton Row (Capri Cleaners, 220m south of the development

[17] Analysis of Relationship between 1-Hour and Annual Mean Nitrogen Dioxide at UK Roadside and Kerbside Monitoring Sites, Laxen and Marner, 2003.

site) and 13 Theobalds Road (Matthew Daniel Dry Cleaners Ltd, 465m southeast of the development site).

6. OPERATIONAL IMPACT ASSESSMENT

6.1. Air Quality Impact Assessment

To assess the impact of a proposed development on local air quality, it is necessary to first use Environmental Protection UK's Guidance on Air Quality Assessments for Planning Applications[18]. EPUK's Guidance suggests that it is only necessary to conduct a detailed assessment of the effects of a proposed development if the development is likely to give rise to significant changes in air pollutant concentrations.

EPUK gives a number of suggested scenarios when changes in air pollution could occur, for example the installation of CHP plants or biomass boilers, or the construction of a large car park; however at this site the only impact is likely from any increased vehicle movements associated with the proposed development. EPUK suggests that a full air quality impact assessment is only required when local traffic movements (either AADT or peak flows) are expected to change by over +/- 10%, or when vehicle speeds are expected to change significantly, and only when a road has traffic flows greater than 10,000 AADT.

At this particular development, it is proposed to convert sixteen bedsitting rooms into five self-contained apartments. Given that the development is located close to central London and the lack of additional parting associated with the proposed development, plus there is a reduction from sixteen dwellings to five, it is not anticipated that the development would bring any more additional vehicle movements to the area and therefore, the change in traffic movements will represent an increase of much less than 1% onto the local traffic network, if at all. As such, a full air quality impact assessment is not required and it is anticipated that under EPUK's assessment criteria, the impact of the proposed development on the air quality of the area is likely to be *"negligible"*.

[18] Environmental Protection UK (EPUK), 2010: Development Control: Planning for Air Quality

7. CONSTRUCTION IMPACT ASSESSMENT

7.1. Overview

The main air quality impacts that may arise during construction activities are:

- Dust deposition, resulting in the soling of surfaces;
- Visible dust plumes; and
- An increase in concentrations of airborne particles (e.g. PM_{10}, $PM_{2.5}$) and nitrogen dioxide due to exhaust emissions from site plant and traffic that can impact adversely on human health.

The most common impacts are dust soiling and increased ambient PM_{10} concentrations due to dust arising from the site. Most of this PM_{10} is likely to be in the $PM_{2.5\text{-}10}$ fraction, known as coarse particles.

7.2. Construction Dust

It is very difficult to quantify emissions of dust from construction activities. It is therefore common practise to provide a qualitative assessment of potential impacts. The Institute of Air Quality Management's *Guidance on the Assessment of the Impacts of Construction on Air Quality and the Determination of their Significance (January 2012)* contains a complex methodology for determining the significance of construction impacts on air quality. **Table 7.1** summarises the steps taken in a construction dust risk assessment for the proposed development site.

Table 7.1: Construction Dust Risk Assessment

Assessment Step 1 - Screen the Requirement for a More Detailed Assessment	
There are existing receptors within 350m of the boundary of the development site and within 100m of the route used by construction vehicles on the public highway.	
Summary:	*A detailed assessment is required to determine potential dust impacts.*
Assessment Step 2 – Assess the Risk of Dust Effects	
Demolition	The development consists of the conversion of an existing building; therefore no demolition is required. There is therefore no requirement to define a Dust Emission Class.
Summary:	*Demolition phase Risk category is Not Applicable*
Earthworks	The development consists of the conversion of an existing building; therefore no earthworks are required. There is therefore no requirement to define a Dust Emission Class.
Summary:	*Earthworks phase Risk category is Not Applicable*
Construction	The building volume is small and most construction works will take place within the existing structure; therefore there is a low potential for dust to be emitted to the local environs. As a consequence, the Dust Emission Class for construction activities on the site has determined to be "Small". The closest receptors are less than 20m from the site boundary. There are no sensitive ecological sites within 350m of the site.

***Summary**:* *Earthworks phase Risk category is Medium Risk Site*

Trackout

The development consists of the conversion of an existing building; therefore no trackout is required. There is therefore no requirement to define a Dust Emission Class.

***Summary**:* *Trackout phase Risk category is Not Applicable*

Risk Category Summary Tables

Source	Dust Soiling & PM_{10} Effects	Ecological Effects
Demolition	Not Applicable	None
Earthworks	Not Applicable	None
Construction	Medium Risk Site	None
Trackout	Not Applicable	None

Assessment Step 3 – Identify the Need for Site Specific Additional Mitigation

Stage 2 determines that the site is a "Medium Risk Site" in respect of general construction activities. The development site is only designated a "Medium Risk Site" due to the proximity of sensitive receptors; since the proposed construction works will be mainly internal, it is not anticipated that much significant dust will escape into the environs of the proposed development site. However, implementation of the following Best Practice Measures[19] will help reduce the impact of construction activities to an acceptable level:

Site Planning

- Erect solid barriers to site boundary;
- No bonfires; and
- Plan site layout – ensure machinery and dust causing activates are located away from sensitive receptors.

Construction Traffic

- All vehicles to switch off engines – no idling;
- Effective vehicle cleaning and specific wheel-washing on leaving the site;
- All loads entering and leaving the site should be covered;
- No site runoff of water or mud;
- All non road mobile machinery to use ultra low sulphur tax-exempt diesel where available; and
- On-road vehicles to comply with the requirements of the Low-Emission Zone (LEZ) as a minimum.

Demolition Works

[19] The Control of Dust and Emissions from Construction and Demolition: Best Practice Guidance (2006), Mayor of London.

- Use water as dust suppressant;
- Cutting equipment to use water as suppressant or suitable local exhaust ventilation systems;
- Securely cover skips and minimise drop heights;
- Wrap buildings to be demolished.

Site Activities

- Minimise dust generating activities;
- Use water as dust suppressant where applicable; and
- Enclose stockpiles or keep them securely sheeted.

With the above mitigation measures enforced, the likelihood of nuisance dust episodes occurring at nearby receptors are considered low. Monitoring is not recommended at this stage; however continuous visual assessment of the site should be undertaken and a complaints log maintained in order to determine the origin of a particular dust nuisance.

Assessment Step 4 – Define Post Mitigation Effects and their Significance

The sensitivity of the area would be defined as 'medium'. Whilst is it is a densely populated area, PM_{10} concentrations are low in the area. There are no local sites of ecological interest.

The significance of effects for the development site with mitigation in place is therefore 'negligible', as follows:

Source	Dust Soiling & PM_{10} Effects	Ecological Effects
Demolition	Not Applicable	Not Applicable
Earthworks	Not Applicable	Not Applicable
Construction	Negligible	Not Applicable
Trackout	Not Applicable	Not Applicable
Overall Significance	Negligible	Not Applicable

8. MITIGATION

As a consequence of the proposed development, there will not be a significant increase in pollutant concentrations and therefore mitigation is not seen to be necessary, other than those routinely used to control construction dust, as detailed in the previous section. However, the National Air Quality Objective for NO_2 is exceeded at the development site with a concentration of 45.09 µg/m^3; therefore, whenever possible, mitigation should be implemented to reduce the exposure from NO_2 to future occupiers of the proposed development.

It is common when there is an exceedance of an objective due to pollution from road traffic to install a closed circulating ventilation system, taking clean air from another part of the development where the air is below the objective level and use this air to ventilate the dwellings. However, as it can be seen from **Section 4.3** of this report, the background concentrations of NO_2 are 42.66 µg/m^3 in the vicinity of the proposed development; therefore all air in the area, including those away from main roads, exceed the National Air Quality Objectives and therefore mitigation is not possible.

However, the London Plan states that developments should "*minimise increased exposure to existing poor air quality".* National and international air quality policy is based around limiting the number of people exposed to poor air quality; therefore it is necessary to consider the change in land use as a result of the proposed development. The site currently comprises sixteen bedsitting rooms. The proposals will see the conversion of the existing building structure into five self-contained apartments, comprising 2x two-bedroom apartments and 3x one-bedroom apartments. Considering single occupancy in the sixteen existing bedsits, it is assumed that the existing population of the development is sixteen; however, assuming an occupancy rate of three people in each two-bedroom apartment and an occupancy rate of two in the one-bedroom apartments, this results in a proposed population for the development of twelve. Therefore, the proposed development will actually result in fewer people being exposed to poor air quality.

9. CONCLUSIONS

DMRB calculations have predicted that the NAQO's will not be exceeded at the development site, with the exception of NO_2, which where a level marginally over the NAQO is predicted. Unfortunately, since the background concentrations exceed the NAQO in the vicinity of the development site, it is not possible to mitigate the effects of NO_2 by taking cleaner air from elsewhere on site. However, it has been shown that the proposed development will result in a smaller population than the existing land use and therefore the proposed development will result in fewer people being exposed to levels of nitrogen dioxide in excess of the NAQO. Additionally, it has been shown that the development related traffic generation onto the local traffic network will have a *"Negligible"* impact on air quality for occupiers of existing local residential property.

Appendix 1
Glossary of Terms

Appendix 1: Glossary of Terms

1,3-butadiene: Is a Volatile Organic Compound (VOC) emitted into the atmosphere principally from fuel combustion of petrol and diesel vehicles. Possible chronic health effects include cancer, central nervous system disorders, liver and kidney damage, reproductive disorders, and birth defects.

Air Quality Standard/Air Quality Objective: The concentrations of pollutants in the atmosphere, which can broadly be taken to achieve a certain level of environmental quality. The standards are based on assessment of the effects of each pollutant on human health including the effects on sensitive sub groups.

Annual mean: The average of the concentrations measured for each pollutant for one year. In the case of the Air Quality Objectives this is for a calendar year.

Air Quality Management Area (AQMA): An area that a local authority has designated for action, based upon predicted exceedences of Air Quality Objectives.

Benzene: A VOC which is a minor constituent of petrol. The main sources of benzene in the atmosphere in Europe are the distribution and combustion of petrol. Of these, combustion by petrol vehicles is the single biggest source (70% of total emissions).

Concentration: The amount of a (polluting) substance in a volume (of air), typically expressed as a mass of pollutant per unit volume of air (for example, microgrammes per cubic metre, $\mu g/m^3$) or a volume of gaseous pollutant per unit volume of air (parts per million, ppm).

Exceedance: A period of time where the concentration of a pollutant is greater than the appropriate Air Quality Objective.

Nitrogen Oxides: Nitric oxide (NO) is mainly derived from road transport emissions and other combustion processes such as the electricity supply industry. NO is not considered to be harmful to health. However, once released to the atmosphere, NO is usually very rapidly oxidised to nitrogen dioxide (NO_2), which is harmful to health. NO_2 and NO are both oxides of nitrogen and together are referred to as nitrogen oxides (NO_x).

Particulate Matter: Fine Particles are composed of a wide range of materials arising from a variety of sources including combustion sources (mainly road traffic), and coarse particles, suspended soils and dust from construction work. Particles are measured in a number of different size fractions according to their mean aerodynamic diameter. Most monitoring is currently focused on PM_{10} (less than 10 microns in diameter), but the finer fractions such as $PM_{2.5}$ (less than 2.5 microns in diameter) is becoming of increasing interest in terms of health effects.

$\mu g/m^3$ microgrammes per cubic metre of air: A measure of concentration in terms of mass per unit volume. A concentration of 1 $\mu g/m^3$ means that one cubic metre of air contains one microgram (millionth of a gram) of pollutant.

Appendix 2
Site Plan

Appendix 2: Site Plan