New Oxford Street Limited

21 - 31 New Oxford Street

Air Quality Assessment

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Contents

		Page
1	**Introduction**	**1**
2	**Air Quality Legislation**	**1**
2.1	European Air Quality Management	1
2.2	Environment Act 1995	1
2.3	Air Quality Objectives and Limit Values	2
2.4	Dust Nuisance	2
3	**Policy**	**3**
3.1	National Planning Policy	3
3.2	Regional Planning Policy	4
3.3	Local Planning Policy	5
3.4	Other Relevant Policy and Guidance	6
4	**Assessment Methodology**	**7**
4.1	Method of Baseline Assessment	7
4.2	Method of Construction Assessment	7
4.3	Method of Operational Assessment	9
4.4	Limitations and Assumptions	12
4.5	Assessment of Significance	13
5	**Existing Air Quality**	**14**
5.1	Air Pollution Sources	14
6	**Construction Assessment**	**21**
6.1	Need for Assessment	21
6.2	Risk of Dust Arising from the Works	21
6.3	Risk of Effects and Significance	21
7	**Operational Assessment**	**22**
7.1	Operational Assessment of Traffic	22
7.2	Operational Assessment of On-site Boiler	23
8	**Effects of Existing Air Quality on Future Residents**	**24**
9	**Assessment of Significance**	**25**
9.2	Assessment Against the Air Quality Neutral Benchmarks	26
10	**Conclusions**	**26**

Appendices

Appendix A

Planning Practice Guidance

Appendix B

Construction Dust Assessment Methodology

Appendix C

EPUK Significance Criteria

1 Introduction

Ove Arup and Partners Limited (Arup) has been commissioned to undertake an air quality assessment to assess the likely significant effects of the proposed development at 21-31 New Oxford Street in terms of air quality. The site proposed for development lies between Museum Street, New Oxford Street and High Holborn in the Camden area of London.

This report outlines the current regulatory system relevant to air quality assessment and management, the assessment methodology, the baseline conditions at the site and surroundings, the likely significant effects relating to air quality and the mitigation measures required to prevent, reduce or offset any significant adverse effects.

2 Air Quality Legislation

2.1 European Air Quality Management

In 1996 the European Commission published the Air Quality Framework Directive on ambient air quality assessment and management (96/62/EC). This Directive defined the policy framework for 12 air pollutants known to have harmful effects on human health and the environment. Limit values (pollutant concentrations not to be exceeded by a certain date) for each specified pollutant are set through a series of Daughter Directives, including Directive 1999/30/EC (the 1st Daughter Directive) which sets limit values for sulphur dioxide (SO_2), nitrogen dioxide (NO_2) and oxides of nitrogen (NO_X), particulate matter (PM_{10}) and lead in ambient air.

In May 2008 the Directive 2008/50/EC on ambient air quality and cleaner air for Europe came into force. This Directive consolidates the above (apart from the 4th Daughter Directive, which will be brought within the new Directive at a later date), provides a new regulatory framework for $PM_{2.5}$ and makes provision for extended compliance deadlines for NO_2 and PM_{10}.

The Directives were transposed into legislation in England by the Air Quality Standards Regulations 2010. The Secretary of State for the Environment has the duty of ensuring the air quality limit values are complied with.

2.2 Environment Act 1995

Part IV of the Environment Act 1995 places a duty on the Secretary of State for the Environment to develop, implement and maintain an Air Quality Strategy with the aim of reducing atmospheric emissions and improving air quality. The Air Quality Strategy for England, Scotland, Wales and Northern Ireland provides the framework for ensuring the air quality limit values are complied with based on a combination of international, national and local measures to reduce emissions and improve air quality. This includes the statutory duty, also under Part IV of the Environment Act 1995, for local authorities to undergo a process of local air quality management.

2.3 Air Quality Objectives and Limit Values

Air quality limit values and objectives are quality standards for clean air. Some pollutants have standards expressed as annual average concentrations due to the chronic way in which they affect health or the natural environment (i.e. effects occur after a prolonged period of exposure to elevated concentrations) and others have standards expressed as 24-hour, one-hour or 15-minute average concentrations due to the acute way in which they affect health or the natural environment (i.e. after a relatively short period of exposure). Some pollutants have standards expressed in terms of both long-term and short-term concentrations. Table 1 sets out these EU air quality limit values and national air quality objectives for the pollutants currently of greatest concern for this development, NO_2, PM_{10}, $PM_{2.5}$.

In the majority of cases the air quality limit values and air quality objectives have the same pollutant concentration threshold and date for compliance. The key difference is that the Secretary of State for the Environment is required under European Law to ensure the air quality limit values are complied with whereas local authorities (including the Mayor of London) are only obliged under national legislation to undertake best efforts to comply with the air quality objectives. To assist local authorities in demonstrating best efforts, the Environment Act 1995 requires that when carrying out their local air quality management functions, local authorities shall have regard to guidance issued by the Secretary of State.

Table 1: Air Quality Objectives

Pollutant	Averaging Period	Limit Value/ Objective	Date for Compliance	Basis
Nitrogen Dioxide (NO_2)	1 hour mean	200µg/m^3, not to be exceeded more than 18 times a year	31 Dec 2005	UK
			1 Jan 2010	EU
	Annual mean	40µg/m^3	31 Dec 2005	UK
			1 Jan 2010	EU
Fine Particulates (PM_{10}) Measurement Technique: Gravimetric	Daily Mean	50µg/m^3, not to be exceeded more than 35 times a year	31 Dec 2004	UK
			None specified	EU
	Annual Mean	40µg/m^3	31 Dec 2004	UK
			None specified	EU
Very Fine Particulates ($PM_{2.5}$)	Annual Mean	25µg/m^3	1st January 2015	UK/EU

2.4 Dust Nuisance

Dust is the generic term used in the British Standard document BS 6069 (Part Two) to describe particulate matter in the size range 1–75µm in diameter. Dust nuisance is the result of the perception of the soiling of surfaces by excessive rates of dust deposition. Under provisions in the Environmental Protection Act 1990[1], dust nuisance is defined as a statutory nuisance.

[1] Environmental Protection Act 1990, Chapter 43, Part III Statutory Nuisances and Clean Air

There are currently no standards or guidelines for dust nuisance in the UK, nor are formal dust deposition standards specified. This reflects the uncertainties in dust monitoring technology and the highly subjective relationship between deposition events, surface soiling and the perception of such events as a nuisance. In law, complaints about excessive dust deposition would have to be investigated by the local authority and any complaint upheld for a statutory nuisance to occur. However, dust deposition is generally managed by suitable on-site practices and mitigation rather than by the determination of statutory nuisance and/or prosecution or enforcement notice(s).

3 Policy

National, regional and local planning policy relevant to air quality and the proposed site have been identified. These policies have been obtained from the following sources:

- The Department for Communities and Local Government website[2];
- The Greater London Authority website [3] and
- Camden Council website[4]

3.1 National Planning Policy

3.1.1 National Planning Policy Framework (2012)

The National Planning Policy Framework (NPPF) was published in March 2012 with the purpose of planning to achieve sustainable development. Paragraph 124 of the NPPF, on air quality, 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."*

3.1.2 Planning Practice Guidance

As part of the NPPF, Planning Practice Guidance on various topics was recently published[5]. In relation to air quality, the guidance refers to the significance of air quality assessments to determine the impacts of proposed developments in the area and describes the role of local and neighbourhood plans with regard to air

[2] Department for Communities and Local Government, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6077/2116950.pdf, Accessed February 2013
[3] Greater London Authority, http://www.london.gov.uk/, Accessed January 2014
[4] Camden Council http://www.camden.gov.uk/ccm/navigation/environment/green-camden/air-quality/ [April 2014]
[5] Department for communities and local government (2014) Planning Practice Guidance: Air Quality

quality. It also provides a flowchart method (provided in Appendix A) to assist local authorities in determining how considerations of air quality fit into the development management process.

3.1.3 Local Air Quality Management Policy Guidance (2009)

Policy guidance note LAQM.PG(09)[6] provides additional guidance on the links between transport and air quality. LAQM.PG(09) describes how road transport contributes to local air pollution and how transport measures may bring improvements in air quality. Key transport related Government initiatives are set out, including regulatory measures and standards to reduce vehicle emissions and improve fuels, tax-based measures and the development of an integrated transport strategy.

LAQM.PG(09) also provides guidance on the links between air quality and the land use planning system. The guidance advises that air quality considerations should be integrated within the planning process at the earliest stage and is intended to aid local authorities in developing action plans to deal with specific air quality problems and create strategies to improve air quality. It summarises the main ways in which land use planning system can help deliver compliance with the air quality objectives.

3.2 Regional Planning Policy

3.2.1 The London Plan – Spatial Development Strategy for Greater London (2011)

The adopted London Plan[7] forms part of the development strategy for the Greater London area until 2031 and integrates all economic, environmental, transport and social frameworks. Revised Minor Alterations[8] to the London Plan were published in October 2013 for consistency with the NPPF. Some changes were made with regard to air quality including the removal of the term 'air quality neutral'. Further alterations[9] to the London Plan were published for consultation in January 2014; however these do not affect policies relating to air quality.

Specifically for new development proposals, the adopted London Plan tackles the issue of air quality by proposing the following measures:

- minimise increased exposure of poor air quality by the promotion of sustainable modes of transport;
- promote the use of sustainable design and construction methods in accordance to the Greater London Authority Best Practice Guidance;
- ensure provisions are made to reduce emissions from a development on-site; and

[6] Defra, Local Air Quality Management Policy Guidance PG(09), February 2009
[7] Greater London Authority, The London Plan: Spatial Development Strategy for Greater London, 2011
[8] Greater London Authority, Revised Early Minor Alterations to the London Plan, October 2013
[9] Greater London Authority, Draft Further Alteration to the London Plan, January 2014

- if the development includes the use of a biomass boiler, pollutant concentrations should be forecast and planning permission given only if there are no adverse air quality effects identified.

3.2.2 The Mayor's Air Quality Strategy (2010)

The Mayor's Air Quality Strategy[10] (AQS) aims to improve air quality within London by targeting the reduction of emissions related to transport and construction. The main source of emissions is road traffic and the main focus of the Strategy is therefore on reducing traffic-related emissions, primarily through the promotion of cleaner vehicles and technologies.

Some of the initiatives proposed are the following:

- Targeted measures for areas with poor air quality;
- Ensure air quality benefits are realised through planning conditions and section 106 agreements; and
- Use of the planning system for reducing emissions from new developments.

3.2.3 Sustainable Design and Construction SPG (2014)

The Sustainable Design and Construction Supplementary Planning Guidance[11] (SPG) was published in April 2014 by Greater London Authority. Section 4.3 of the guidance focuses on air pollution and provides guidance on when assessments should be undertaken and how intelligent design can help minimise the effect of a development on local air quality.

The primary way in which the guidance aims to minimise air quality impacts is by setting an air quality neutral policy for buildings and transport[12], as well as emissions standards for combustion plant[13]. The air quality neutral policy sets benchmarks against which the annual emissions of NOx and PM_{10} from boilers and traffic associated with a proposed development should be assessed.

3.3 Local Planning Policy

3.3.1 Camden's Clean Air Action Plan (2013)

Camden's Clean Air Action Plan 2013-2015[14] contains a variety of actions to help reduce NO_2 and PM_{10} concentrations in the borough. The key objectives of the plan are listed as follows:

- Encourage reductions in fossil fuel use, the adoption of clean fuels and technology and promote energy efficiency.

[10] Greater London Authority, Cleaning London's Air: The Mayor's Air Quality Strategy, 2010.
[11] Greater London Authority (2014) *Sustainable Design and Construction: Supplementary Planning Guidance*
[12] Air Quality Consultants (2013) *Air Quality Neutral Planning Support*
[13] AMEC (2013) *Greater London Authority Air Quality Support: Biomass and CHP Emission Standards*
[14] Camden Council, Camden's Clean Air Action Plan 2013-2015 http://www.camden.gov.uk/ccm/content/environment/air-quality-and-pollution/air-quality/twocolumn/policies-reports-and-research.en?page=3 [April 2014]

- Raise awareness about air quality in Camden and promote lifestyle changes which can help reduce levels of air pollution and exposure to air pollution.
- Improve the health and well-being of the local population
- Work in partnership with national and regional bodies, and with local public and private organisations, to foster improvements in air quality.
- Lead by example and reduce NO_2 and PM_{10} emissions associated with the Council's own buildings and transport services.
- Ensure actions which serve to reduce NO_2 and PM_{10} emissions complement actions to mitigate CO_2 emissions, and vice-versa.

3.4 Other Relevant Policy and Guidance

3.4.1 Institute of Air Quality Management Guidance (2014)

The Institute of Air Quality Management (IAQM) guidance[15] was produced in consultation with industry specialists and gives guidance to development consultants and environmental health officers on how to assess air quality impacts from construction. The IAQM guidance provides a method for classifying the significance of effect from construction activities based on 'dust classes' (high, medium or low) and proximity of the site to the closest receptors. It also suggests criteria for the classification of dust classes to be used along with professional judgement. The guidance recommends that once the significance of effect from construction is identified, the appropriate mitigation measures are implemented.

3.4.2 Environmental Protection UK Guidance (2010)

The 2010 Environmental Protection UK (EPUK) guidance note Development Control: Planning for Air Quality[16] responds to the need for closer integration between air quality and development control. It provides a framework for air quality considerations within local development control processes, promoting a consistent approach to the treatment of air quality issues within development control decisions.

This document updates the guidance originally published by EPUK (formerly known as the National Society for Clean Air and Environmental Protection) in November 2004 (and subsequently revised in September 2006). The guidance has been widely used by local authorities, air quality consultants and developers.

The guidance includes a method for assessing the significance of the impacts of development proposals in terms of air quality and how to make recommendations relevant to the development control process in light of this assessment. The need for early and effective dialogue between the developer and local authority is identified to allow air quality concerns to be addressed as early in the development control process as possible. The guidance also provides some clarification as to when air quality constitutes a material consideration in the planning decision process.

[15] IAQM (2014) Guidance on the Assessment of Dust from Demolition and Construction

[16] Environmental Protection UK (2010) Development Control: Planning for Air Quality

4 Assessment Methodology

The overall approach to the air quality assessment comprises:

- A review of the existing air quality conditions at the Site;
- An assessment of the potential changes in air quality arising from the construction and operation of the Development; and
- Formulation of mitigation measures, where appropriate, to ensure any adverse effects on air quality are minimised.

4.1 Method of Baseline Assessment

Existing or baseline ambient air quality refers to the concentrations of relevant substances that are already present in the environment – these are present from various sources, such as industrial processes, commercial and domestic activities, agriculture, traffic and natural sources.

The following data sources have been used in this assessment to ascertain the baseline conditions:

- The London Borough of Camden air quality review and assessment and local air quality monitoring data[17];
- The Department for Transport (DfT) website[18];
- The Environment Agency (EA) website[19]; and
- The Department for Environment, Food and Rural Affairs (Defra) website[20].

Using these data sources, a description of the existing ambient air quality conditions at and around the site is presented later in section 5.

4.2 Method of Construction Assessment

The construction effects have been assessed using the qualitative approach described in the IAQM guidance[21]. This guidance applies to the assessment of dust from construction/demolition activities.

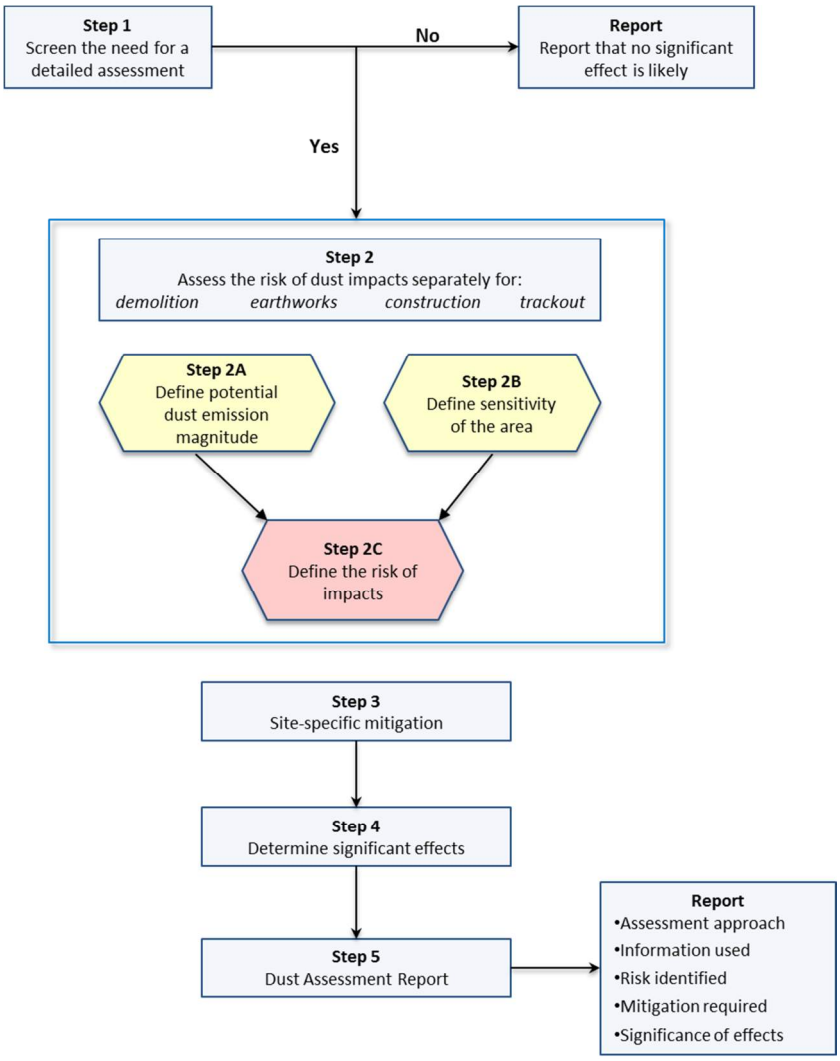
The IAQM guidance considers the potential for dust emissions from dust-generating activities, such as demolition of existing structures, earthworks, construction of new structures and trackout. Earthworks refer to the processes of soil stripping, ground levelling, excavation and land capping. Trackout is the transport of dust and dirt from the construction and/or demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network. This arises when vehicles leave the construction site with dusty

[17] 2013 Air Quality Progress Report for the London Borough of Camden, 10 July 2013 http://www.camden.gov.uk/ccm/content/environment/air-quality-and-pollution/air-quality/twocolumn/policies-reports-and-research.en?page=2 [April 2014]
[18] Department for Transport, http://www.dft.gov.uk/traffic-counts/area.php, Accessed February 2013
[19] Environment Agency, http://maps.environment-agency.gov.uk/wiyby/dataSearchController?topic=pollution&lang=_e Accessed February 2013
[20] Defra, http://laqm.defra.gov.uk/tools.html, Accessed February 2013
[21] IAQM (2014) Guidance on the Assessment of Dust from Demolition and Construction

materials, which may then spill onto the road, or when they travel over muddy ground on site and then transfer dust and dirt onto the road network.

There are five steps in the assessment process described in the IAQM guidance. These are summarised in the diagram below and a further description is provided in the following sections.

Figure 1 IAQM Dust Assessment Methodology



4.2.1 Step 1: Screen Need for Assessment

The first step is the initial screening for the need of a detailed assessment. According to the IAQM guidance, an assessment is required where there are sensitive receptors within 350m of the site boundary (for ecological receptors that is 50m) and/or within 50m of the route(s) used by the construction vehicles on the public highway and up to 500m from site entrance(s).

4.2.2 Step 2: Assess the Risk of Dust Arising from the Works

This step is split into three sections as follows:

1) Define the potential dust emission magnitude;
2) Define the sensitivity of the area; and
3) Define the risk of impacts.

Each of the dust-generating activities is given a dust emission magnitude depending on the scale and nature of the works (step 2A) based on the criteria shown in Appendix B.

The sensitivity of the surrounding area is then determined (step 2B) for each dust effect from the above dust-generating activities, based on the proximity and number of receptors, their sensitivity to dust, the local PM_{10} background concentrations and any other site-specific factors. Tables in Appendix B show the criteria for defining the sensitivity of the area to different dust effects.

The overall risk of the impacts for each activity is then determined (step 2C) prior to the application of any mitigation measures (Appendix B) and an overall risk for the site derived.

4.2.3 Step 3: Determine Site Specific Mitigation (if Required)

Once each of the activities is assigned a risk rating, appropriate mitigation measures are identified.

4.2.4 Step 4: Determine any significant Residual Effects

Once the risk of dust impacts has been determined and the appropriate dust mitigation measures identified, the final step is to determine whether there are any residual significant effects.

The guidance notes that, with the implementation of effective site-specific mitigation measures the impact of environmental effect will not be significant in most cases.

4.2.5 Step 5: Prepare a Dust Assessment Report

The last step of the assessment is the preparation of a Dust Assessment Report (which is presented in section 6 of this assessment).

4.3 Method of Operational Assessment

The development has the potential to impact on existing air quality as a result of road traffic exhaust emissions, such as NO_2 and PM_{10}, associated with vehicles travelling to and from the site during the operational phase as well as the installation of combustion plant, such as boilers, in the proposed development.

4.3.1 Road Traffic

A screening assessment of the changes to road traffic as a result of the proposed development was therefore undertaken using the criteria contained within the Design Manual for Roads and Bridges (DMRB) and EPUK guidance documents[16]

to determine the potential for trips generated by the development to affect local air quality.

The (Design Manual for Roads and Bridges) DMRB provides the following criteria for determination of road links potentially affected by changes in traffic flow:

- Daily Annual Average Daily Traffic (AADT) flows change by 1,000 or more;
- Daily Heavy Duty Vehicles (HDV) AADT flows change by 200 or more;
- Daily average speed changes by 10km/hr or more; or,
- Peak hour speed changes by 20km/hr or more.

The EPUK guidance document states the following criteria to help establish when an air quality assessment is likely to be considered necessary:

- Proposals that will generate or increase traffic congestion, where 'congestion' manifests itself as an increase in periods with stop start driving;
- Proposals that will give rise to a significant change in either traffic volumes, typically a change in AADT or peak traffic flows of greater than ±5% or ±10%, depending on local circumstances (a change of ±5% will be appropriate for traffic flows within an AQMA), or in vehicle speed (typically of more than ±10km/hr), or both, usually on a road with more than 10,000 AADT (5,000 if 'narrow and congested');
- Proposals that would significantly alter the traffic composition on local roads, for instance, increase the number of HDVs by 200 movements or more per day; or,
- Proposals that include significant new car parking, which may be taken to be more than 100 spaces outside and AQMA or 50 spaces inside an AQMA.

Should these criteria not be met, then the DMRB and EPUK guidance documents consider air quality impacts associated with a scheme to be negligible and no further assessment is required.

Should screening of the traffic data indicate that any of the above criteria are met, then potential impacts at sensitive receptor locations can be assessed by calculating the predicted change in NO_2 and PM_{10} concentrations as a result of the proposed development. The significance of predicted impacts can then be determined in accordance with the methodology outlined in the EPUK guidance.

4.3.2 Combustion Plant

Operational air quality impacts from the on-site boilers have been assessed using the ADMS-5 atmospheric dispersion model. The inputs to the model are:

- Meteorological data;
- Boiler emissions;
- Buildings that may affect dispersion (Proposed renovated building and buildings in the vicinity); and
- Other model specific parameters.

4.3.3 Meteorological Data

Hourly sequential meteorological data for the nearest suitable meteorological station, at London City Airport, were obtained for 2010, 2011 and 2012. The London City meteorological station is located approximately 12km to the east of the proposed development. The meteorological data provided information on hourly wind speed and direction and the extent of cloud cover which was input to the dispersion model.

4.3.4 Boiler Assumptions

The following table outlines the input parameters relating to the on-site boiler that have been used in the model; many of which are based on preliminary design assumptions.

Table 2: Boiler Assumptions

Parameter	Input	Units
Gas Fired Condensing Boiler		
Total fuel input rating	700	kW
Number of units	2	
Boiler fuel type	Natural Gas	
Stack height	52	m
Stack diameter	425	mm
Outlet temperature	69	^{o}C
Standard emission rate nitrogen oxides	40	mg/kWh
Exhaust velocity	10	m/s
Exhaust volume flow rate	0.236	m^3/s
NO_x exhaust emission rate	0.0156	g/s

It should be noted that the boilers to be installed as part of the proposed development comply with emission standards for combustion plant set out in the Sustainable Design and Construction SPG[11]. As the boiler units are gas fired, an assessment of PM_{10} emissions has not been carried out as emissions would be negligible.

4.3.5 Building Assumptions

The following table outlines the assumptions in terms of input parameters relating to the proposed development building itself and buildings in the immediate vicinity which have been used in the model. These are based on preliminary design details provided by the architect.

Table 3: Building Assumptions

Building	Centre Coordinates	Length (m)	Width (m)	Height (m)	Orientation from North
21 -31 New Oxford Street	530240, 181435	75	61	51.6	340°
103 New Oxford Street	530255, 181510	91	47	43.2	80°
Commonwealth House	530310, 181461	58	35	44.3	45°
191 High Holborn	530347, 181437	37	37	31.6	45°
Post Office	530286, 181374	70	23	20.1	45°
Travelodge	530195, 181388	47	21	70.1	340°
Entertainment Building (West Central St)	530176, 181439	35	37	70.1	340°

* These buildings are triangular, quadrilateral or square, but only rectangular or circular can be selected in ADMS-5

4.3.6 NO_x to NO_2 Conversion

The model predicts NOx concentrations which comprise principally nitric oxide (NO) and a small percentage of NO_2. The emitted NO reacts with oxidants in the air, mainly ozone (O_3), to form more NO_2. Air quality standards for the protection of human health are based on NO_2 and not total NOx or NO. A suitable NOx to NO_2 conversion needs to be applied to the modelled NOx concentrations.

This assessment has followed the methodology set out by the Environment Agency[22] which states that 70% of long-term (annual mean) and 35% of short-term (hourly mean) NOx concentrations will convert to NO_2 as a worst case scenario.

4.3.7 Other Model Parameters

The extent of mechanical turbulence (and hence, mixing) in the atmosphere is affected by the roughness of the surface (i.e. ground) over which the air is passing. Typical surface roughness values range from 1.5 m (for cities, forests and industrial) to 0.001 m (for water or sandy deserts). In this assessment, the general land-use in the local study area can be best described as a large urban area with a corresponding surface roughness of 1.5 m.

4.4 Limitations and Assumptions

There are a number of limitations and uncertainties associated with modelling predictions. The dispersion model is required to simplify real world conditions based upon a series of algorithms and is dependant of input data.

[22] Environment Agency, Air Quality Modelling and Assessment Unit, Conversion ratios for NOx and NO_2

Regarding the aspects of the assessment which do not rely on the dispersion modelling, the conclusions are reliant upon information provided by the applicant, the validity of national guidance and screening tools, and on the professional judgement of the consultants.

4.5 Assessment of Significance

The Environmental Protection UK (EPUK) Guidance[23] provides an approach to describing the significance of the impacts predicted from air quality modelling, specifically for the pollutants NO_2 and PM_{10}. In this case, only an assessment of NO_2 has been undertaken. The approach takes into account the absolute change (in $\mu g/m^3$) in the annual mean NO_2 concentrations between a without development and with development scenario to determine the magnitude of change. The magnitude is then used to determine the impact descriptor, also taking into account the predicted concentrations in relation to the relevant objective or limit value.

The impact descriptor is then used in the assessment of significance. The guidance provides a set of factors that determine the significance of a proposal in terms of air quality. The guidance notes that these factors should be considered, before a suitably qualified professional can determine, with sufficient justification, whether the overall significance of a potential development should be termed as *insignificant*, *minor*, *moderate* or *major*. This method allows for professional judgment to be made on a case by case basis, which is important as rigorous application of just a numerical or prescriptive approach can result in anomalous assessment conclusions. Appendix C outlines the process of determining the significance of the proposed development using the EPUK guidance.

The guidance also sets a second approach to the assessment of significance, using a flowchart (shown in Appendix C) to determine the priority of air quality in the planning process. This approach assumes that air quality impacts have been assessed quantitatively and follows the flowchart through a series of questions with closed yes/no answers.

4.5.1 Assessment Against the Air Quality Neutral Benchmarks

As discussed in section 3.2.3, the SPG on sustainable design and construction sets an 'air quality neutral' policy for buildings and transport, through the use of emissions benchmarks. As stated in the SPG, *"developments that do not exceed these benchmarks will be considered to avoid any increase in NOx and PM emissions across London as a whole and therefore be air quality neutral"*.

In relation to emissions from buildings, Building Emission Benchmarks (BEBs) have been set for NOx and PM_{10} according to the land-use classes of the development. The air quality assessment has been developed in parallel with the Transport Assessment and as such finalised data is not yet available to allow the benchmarks to be tested. However, further assessment of the potential for air quality impacts as a result of operational traffic is given in section 7.1.

[23] Environmental Protection UK (2010). Development Control: Planning for Air Quality

In order to calculate the emissions from the proposed development and apply the BEBs, the following information was required:

- Gross floor area (m^2) (for land-use classes); and
- On-site emissions of NOx associated with building use (kg/annum).

As discussed above, as the boilers are gas fired, an assessment of PM_{10} emissions is not required.

NOx emissions (kg/annum) for each land-use class in the proposed development need to be calculated and summed to give the Total Building Emission (TBE). As the proposed development will include a centralised boiler system of two units, NOx emissions have been applied to the whole development. The BEBs for the proposed development are then calculated using the GFA and subtracted from the TBE for the development. Should the outcome be negative, then the emissions from the proposed development are within the benchmark, thus no mitigation or offsetting would be required. If the outcome is positive, on or off-site mitigation or offsetting will be required and enforced in the form of a Section 106 agreement or Community Infrastructure Levy.

5 Existing Air Quality

5.1 Air Pollution Sources

5.1.1 Industrial Sources

Industrial air pollution sources are regulated through a system of operating permits or authorisations, requiring stringent emission limits to be met and ensuring that any releases are minimised or rendered harmless. Regulated (or prescribed) industrial processes are classified as Part A or Part B processes. Part A processes are regulated through the Pollution Prevention and Control (PPC) system (EC Directive 96/91/EC on Pollution Prevention and Control originally implemented into law via the Pollution Prevention and Control Act (1999)) which was superseded in 2007[24] and updated in 2010. Generally, the larger, more polluting processes are regulated by the Environment Agency (EA) and smaller, less polluting ones by the local authorities. Local authorities tend also to regulate only for emissions to air whereas the EA regulate emissions to air, water and land.

There are several processes regulated under Part A within the vicinity of the proposed development, which relate to water or waste disposal only. There are no processes regulated for emissions to air. There are also several Part B processes within the vicinity of the site[25]. Due to the type and size of the Part B processes it is not anticipated that these would have a significant effect on ambient air quality at the proposed development. Furthermore, emissions associated with these processes are included in the Defra background air pollution maps which are discussed later in this section.

[24] Environmental Permitting (England and Wales) Regulations 2010 (SI 675).
[25] http://maps.camden.gov.uk/airquality/ [assessed May 2014]

5.1.2 Road Traffic

In recent decades, transport atmospheric emissions, on a national basis, have grown to match or exceed other sources in respect of many pollutants, particularly in urban areas. In this area, vehicle emissions are likely to be the dominant source of air pollutants in the vicinity of the proposed development site. The main pollutants associated with road traffic are:

- Nitrogen dioxide (NO_2);
- Fine particulate matter (PM_{10}).

The proposed site is bound by New Oxford Street to the north, High Holborn to the south-east and Museum Street to the west. High Holborn is a major A road, as are Bloomsbury Way to the north and Shaftesbury Avenue to the west. The Department for Transport undertake traffic counts throughout the UK, which include locations along these roads. Annual average flows from 2012 are listed in the following table.

Emissions from traffic using these roads significantly influences pollutant concentrations in the vicinity of the proposed site.

Table 4: Annual Average Daily Traffic Flows for 2012

Traffic Count Location	OS Grid Ref	Distance of Traffic Count Location from Site	Annual Average Traffic Flows for all Motor Vehicles
A40 High Holborn	530289, 181427	0m to the south	15070
A40 Bloomsbury Way	530300, 181560	80m to the north	12535
A40 New Oxford Street	530100, 181450	95m to the west	12535
A401 Shaftesbury Avenue	530110, 181400	115m to the west	5584
A401 Bloomsbury Street	530080, 181400	140m to the west	12668
A40 High Holborn	530420, 181550	110m to the north-west	2526

5.1.3 Local Authority Review and Assessment

As required under the Environment Act 1995, local authorities are required to review and assess air quality with respect to the objectives for seven pollutants specified in the Government's National Air Quality Strategy (NAQS). Local authorities are required to carry out an Updating and Screening Assessment (USA) of their area every three years. If the USA identifies potential areas likely to exceed air quality objectives, then a detailed assessment of those areas is required. Where objectives are not predicted to be met, local authorities must declare the area as an AQMA. In addition, local authorities are required to produce an Air Quality Action Plan (AQAP) which includes measures to improve air quality within the AQMA.

The first round of review and assessment was undertaken by Camden Council in 1998. As a result the whole borough was declared an AQMA for NO_2 and PM_{10} in 2000. Camden Council has subsequently completed five rounds of review and assessment. The outcome of these assessments did not identify any requirements to progress to detailed assessment. The latest progress report from 2012 indicates that the concentrations of NO_2 continue to exceed the short term and long term air quality objectives at all of the monitoring sites and therefore the AQMA declaration remains valid. Camden have recently updated their AQAP in 2013.

5.1.4 Local Air Quality Monitoring

Air Quality Monitoring is undertaken across Camden using both automatic and passive monitoring methods. As the proposed site is located in south Camden, close to the boundary with Westminster, Westminster City Council air quality data was also reviewed to determine if there were any monitoring points in the vicinity of the site. Telephone conversation with the EHO at Westminster City Council on 8th April confirmed that there was no monitoring data in north Westminster. Figure 2 presents the locations of automatic air quality monitoring in the area of the proposed development. Figure 3 presents the locations of passive diffusion tube monitoring in the area of the proposed development.

Automatic monitoring

Automatic monitoring is undertaken by Camden Council at a total of four monitoring sites, three of which are within 1.5km of the proposed development.

Figure 2: Local Authority Automatic Air Quality Monitoring

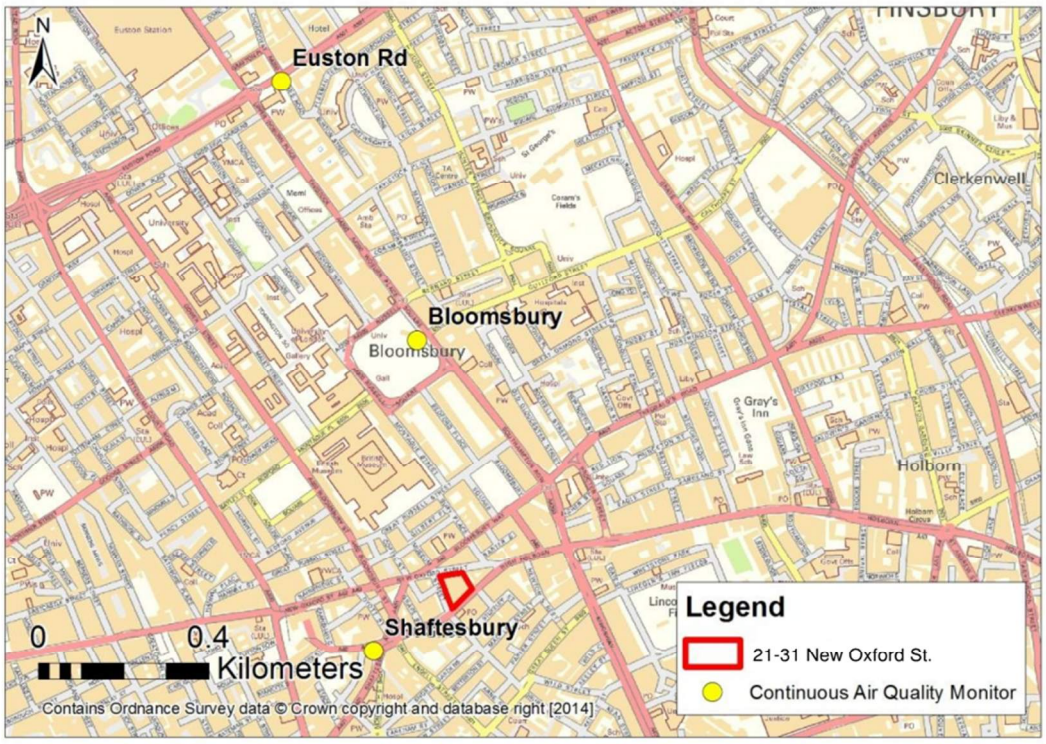


Table 5: Automatic Monitoring Stations

Site Ref	Site Name	OS Grid Ref	Site Type	Distance from Site	Pollutant Measured
1	London Bloomsbury	530120, 182034	Urban Underground	550m to the north	NOx, PM_{10}, SO_2, O_3
2	Shaftesbury Avenue	530060, 181290	Roadside	250m to the south-west	NOx, PM_{10}
3	Euston Road	529878, 182648	Roadside	1.2km to the north	NOx, PM_{10}

* owned by Defra and forms part of the UK Automatic Urban and Rural Network (AURN)

Results from 2010 to 2012 indicate that annual mean concentrations of NO_2 are above the annual mean NO_2 objective of 40µg/m^3 at several monitoring stations within the vicinity of the site. Significant exceedences occur at roadside sites, however concentrations are also elevated at the urban background site (London Bloomsbury). Exceedences of the hourly mean NO_2 objective have been recorded at the roadside sites and are particularly elevated at Euston Road.

Results from 2010 to 2012 indicate that annual mean concentrations of PM_{10} are well below the annual mean PM_{10} objective of 40µg/m^3. The daily mean objective of 50µg/m^3 has not been exceeded more than 35 times a year between 2010 and 2012. No monitoring of $PM_{2.5}$ is available within the vicinity of the proposed site.

Monitored data from Shaftesbury Avenue is likely to be most representative of the proposed site due to its close proximity to the site.

Table 6: Results of automatic monitoring for NO_2, exceedences of the annual mean NO_2 objective are highlighted as **bold**

Site Name	Site Type	2010	2011	2012
London Bloomsbury	Data Capture (%)	97	97	97
	Annual Mean NO_2 Concentration (µg/m^3)	**55**	**50**	**55**
	Number of Hours >200µg/m^3	1	0	1
Shaftesbury Avenue	Data Capture (%)	89	89	89
	Annual Mean NO_2 Concentration (µg/m^3)	**89**	**76**	**71**
	Number of Hours >200µg/m^3	**21**	15	12
Euston Road	Data Capture (%)	88	88	88
	Annual Mean NO_2 Concentration (µg/m^3)	**-**	**122**	**106**
	Number of Hours >200µg/m^3	-	**726**	**295**

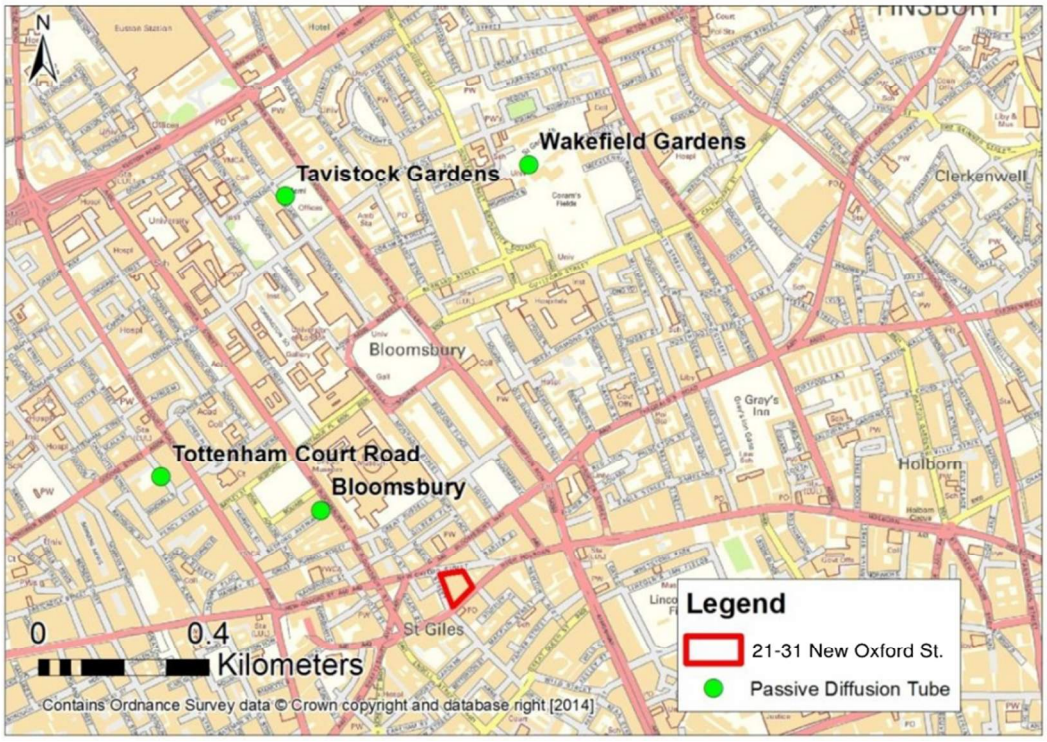
Table 7: Results of automatic monitoring for PM_{10}

Site Name	Site Type	2010	2011	2012
London Bloomsbury	Data Capture (%)		97	
	Annual Mean PM_{10} Concentration ($\mu g/m^3$)	18	22	19
	Number of Days >50$\mu g/m^3$	2	17	10
Shaftesbury Avenue	Data Capture (%)		92	
	Annual Mean PM_{10} concentration ($\mu g/m^3$)	29	32	29
	Number of Days >50$\mu g/m^3$	29	27	18

Passive Monitoring

Camden Council monitors NO_2 using a network of 14 diffusion tubes locations across the Borough. Those that are located within 1km of the development are listed in Table 8.

Figure 3: Local Authority Diffusion Tube Locations



Passive diffusion tube monitoring undertaken between 2010 and 2012 indicates consistent exceedences of the annual mean NO_2 objective at the roadside and kerbside monitoring locations along Bloomsbury Street and Tottenham Court Road. Exceedences of the annual mean NO_2 objective have also been recorded at the urban background monitoring locations. All locations presented are within vicinity of the major roads surrounding the proposed development. Monitored

data from the Bloomsbury Street diffusion tube location is likely to be most representative of the proposed site due to the proximity to the site.

Table 8: Details and Monitoring Data from NO_2 Diffusion Tube Monitoring Locations, exceedences of the annual mean NO_2 objective are highlighted as **bold**

Site Name	OS Grid Ref	Site Type	Distance from Site	Annual mean NO_2 concentration ($\mu g/m^3$)		
				2010*	2011**	2012***
Bloomsbury Street	529962, 181620	Roadside	275m to the north-west	**41**[a)]	**76.7**	**71.7**
Tottenham Court Road	529568, 181728	Kerbside	735m to the north-west	**92**	**91.7**	**83.3**
Tavistock Gardens	529880, 182334	Urban Background	920m to the north	**52**	**47.6**	**40.2**
Wakefield Gardens	530430, 182430	Urban Background	940m to the north-east	34	**45.6**	39.3

a) This is an anomalous result, no detail is given by Camden Council however recorded data for 2008 and 2009 is consistent with data recorded for 2011 and 2012.

*bias adjustment factor[26] of 0.88 for 2010

* bias adjustment factor of 0.91 for 2011

* bias adjustment factor of 0.87 for 2012

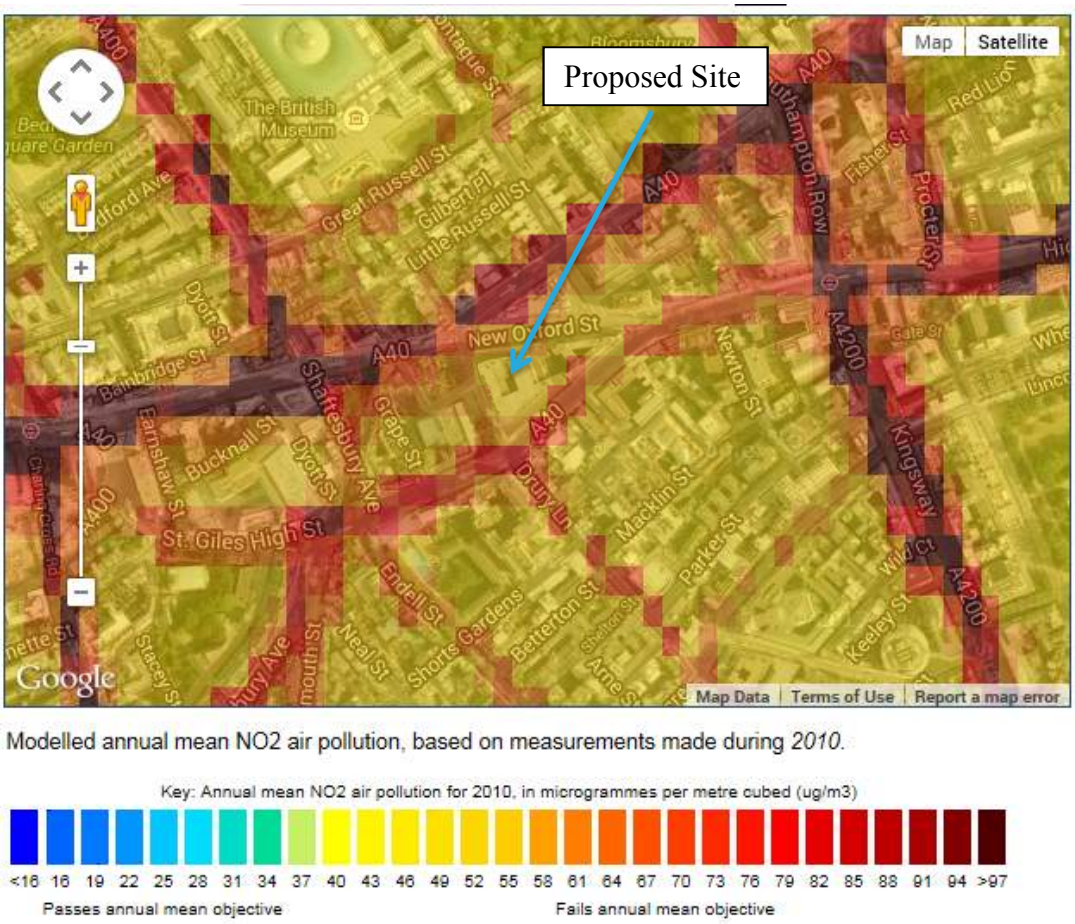
5.1.5 London Air Quality Network

The London Air Quality Network has mapped modelled annual mean NO_2 concentrations[27] across the whole of London based on measured data during 2010. Figure 4 presents the area surrounding the proposed development for 2010 which is the most recent data available. This indicates that the entire area is above the annual mean NO_2 objective ($40\mu g/m^3$) with significantly elevated levels at the roadside.

[26] The bias adjustment factor allows for the systematic over or under reading of NO_2 concentrations monitored with diffusion tubes compared with automatic monitoring. Factors can be determined following a local study that has co-located diffusion tubes with an automatic monitor or from the national database of co-location studies. The bias adjustment factor is applied to annual mean NO_2 concentrations recorded by diffusion tubes.

[27] http://www.londonair.org.uk/london/asp/annualmaps.asp?species=NO2&LayerStrength=50&lat=51.5008010864&lon=-0.124632000923&zoom=14, Accessed April 2014

Figure 4: London Air Quality Network Modelled Annual Mean NO_2 Concentrations (2010)



5.1.6 Background Pollutant Concentrations

The Defra website[20] includes estimated background air pollution data for NO_X, NO_2, PM_{10} and $PM_{2.5}$ for each 1km by 1km OS grid square. Estimated pollutant concentrations for 2013 at the OS grid squares in which the site lies are shown in Table 9 following table. The annual mean PM_{10} background concentrations are predicted to be well below the annual mean objective (40µg/m^3), however annual mean NO_2 background concentrations exceed the annual mean NO_2 objective.

Table 9: Annual Mean Background Pollutant Concentrations at the Proposed Development, 2013

Grid Square Centroid OS Coordinates				
Pollutant	**529500, 181500**	**529500, 182500**	**530500, 181500**	**530500, 182500**
Nitrogen Oxides (NO_X)	113.1	98.5	112.2	91.2
Nitrogen Dioxide (NO_2)	54.1	49.4	54.7	47.1
Particulate Matter (PM_{10})	23.9	23.5	23.7	23.0
Fine Particulate Matter ($PM_{2.5}$)	17.1	16.6	16.9	16.2

6 Construction Assessment

6.1 Need for Assessment

An assessment is required due to the presence of sensitive receptors within 350m of the proposed site and within 50m of the likely construction traffic routes. There are no designated sites of ecological importance within 50m of the proposed site therefore this element of the assessment is not considered further.

6.2 Risk of Dust Arising from the Works

The IAQM guidance takes into consideration four dust-generating activities; demolition, earthworks, construction and trackout. Due to the nature of the development, no earthworks will be undertaken as the substructure and foundations are to be retained in place. The top floors of the current building will be demolished and additional floors constructed.

Dust emission magnitudes have been assigned to each of the three activities anticipated for the proposed site in Table 10, following criteria set out in Table B1 of Appendix B.

Table 10: Dust Emission Magnitude for Construction Activities

Activity	Dust Emission Magnitude	Reasoning
Demolition	Large	The approximate volume of building to be demolished is >50,000m^3 and demolition will occur at height.
Construction	Large	Total building volume to be constructed will be >100,000m^3; Piling will be undertaken on site
Trackout	Medium	The Construction Management Plan indicates that even at peak times during the construction period, HDV trips to and from site are likely to be less than 25 per day; and HDV will not need to travel on any unpaved roads.

6.3 Risk of Effects and Significance

The sensitivity of the area has been assessed using the criteria in Table B2 of Appendix B. The results were then used to assess the overall sensitivity of the area to dust impacts. The overall sensitivity has been defined as shown in Table 11. There is an overall High sensitivity of the area for dust soiling effects on people and property and human health effects. These sensitivities have been determined based upon criteria set out in Table B3 of Appendix B.

Table 11: Sensitivity of the surrounding area

Potential Impact	Distance to Closest Sensitive Receptor	Sensitivity of the surrounding area		
		Demolition	Construction	Trackout
Dust soiling	<50m	Low	Low	Low
Human Health	<50m	Medium	Medium	Medium

Using the criteria set out in Table B6 in Appendix B, the impacts on the area without mitigation are defined.

Table 12: Summary of Dust Risk to Define Site Specific Mitigation

Source	Dust soiling	Human Health
Demolition	Medium	High
Construction	Low	Medium
Trackout	Low	Medium

The risk of a site giving rise to dust effects can be greatly reduced or eliminated by applying site specific mitigation measures for high risk sites outlined in the IAQM guidance[15]. These measures include but are not limited to general best practice measures such as erecting hoarding around dusty activities or the site boundary, carrying out regular site inspections with regard to dust and ensuring all vehicles travelling to and from site are switched off when stationery, no idling. These measures should be included in the Construction Environmental Management Plan (CEMP) for the site.

7 Operational Assessment

7.1 Operational Assessment of Traffic

Any additional vehicle movements associated with the operation of the proposed development will generate exhaust emissions, such as NO_2 and PM_{10}, on the local and regional road networks. The Air Quality Assessment has been developed in parallel with the Transport Assessment for the development and as such finalised data was not available at the time of assessment. However, it is understood that there will be an average of 50 delivery trips per day and only two disabled car parking spaces are proposed on site. In addition, the development has excellent public transport links with nearby London Underground stations, a number of bus routes and Barclays cycle hire docking stations in the vicinity.

Based on the above information, the proposed development is not anticipated to result in a change in AADT flows of more than 1,000, produce over 200 HDV movements per day or significantly affect average speeds on the local road network. Additionally, it is unlikely that the proposed development will generate or increase traffic congestion, significantly alter the traffic composition on local roads or include significant new car parking. As such, potential air quality impacts associated with operational phase road vehicle exhaust emissions are predicted to be negligible, in accordance with the DMRB and EPUK screening criteria shown in Section 4.3.1.

7.2 Operational Assessment of On-site Boiler

7.2.1 Maximum Ground Level Concentrations

The maximum predicted process contribution from the boilers at ground level is presented in Table 13 for all meteorological years. The results indicate that interannual variability between the meteorological years assessed is low between 2012 and 2011, but slightly higher when comparing to 2010. 2010 meteorological data produced the highest ground level concentrations. The maximum point of impact for annual mean ground level concentrations occurs to the south of the site (NGR 530258, 181386) along High Holborn.

The maximum process contribution to annual mean NO_2 concentrations is predicted to be 0.2 $\mu g/m^3$ (0.5 % of the annual mean NO_2 objective), therefore following the EPUK guidance, the magnitude of forecast change is imperceptible. The maximum process contribution to hourly mean NO_2 concentrations is predicted to be 0.6 $\mu g/m^3$ (0.3% of the hourly mean NO_2 objective). The magnitude of forecast change is therefore also imperceptible.

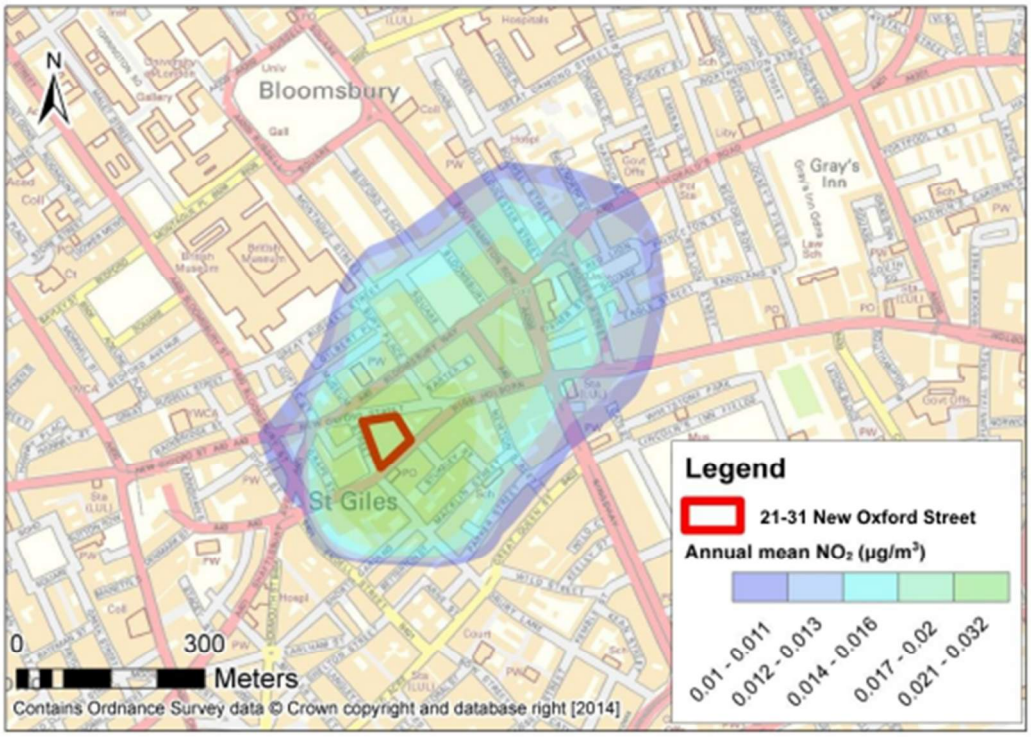
Table 13: Modelled Process Contribution to NO_2 Concentrations for all Meteorological Years Assessed.

	Process Contribution (µg/m^3)	
Meteorological Year	**Annual Mean NO_2**	**Hourly Mean NO_2 (99.8th Percentile)**
2010	0.2	0.6
2011	0.1	0.6
2012	0.1	0.6

At the area of maximum impact, background levels of annual mean NO_2 are 54.7µg/m^3. Therefore, NO_2 concentrations already exceed the annual mean objective (40µg/m^3). In comparison to the background concentrations, the process contribution from the on-site boiler is very small, and as the magnitude of forecast change of annual mean NO_2 is predicted to be imperceptible, the significance of effects at ground level will be negligible.

The spatial distribution of annual mean NO_2 concentrations for 2010 meteorological data are presented in Figure 5.

Figure 5: Annual Mean NO_2 Concentrations (2010)



8 Effects of Existing Air Quality on Future Residents

As discussed in the assessment of existing air quality, the area in which the proposed site lies exceeds the annual mean NO_2 objective and has the potential to exceed the hourly mean NO_2 objective. The inclusion of affordable housing within the proposed site introduces new exposure to an area which already

exceeds objectives. As such, mechanical ventilation has been included within the design as well as outdoor amenity areas being glazed to offer nominal protection from exposure to polluted ambient air. Mechanical ventilation will be provided to the apartments to provide outside air without the need for opening windows. This will operate at an enhanced rate when necessary to control summer overheating. Air intake will be taken from Dunns Passage or from roof level and the mechanical ventilation system will include a high efficiency heat recovery system to minimise energy demands. Mechanical ventilation and the use of glazed amenity space aims to reduce the exposure of residents to elevated pollutant concentrations.

9 Assessment of Significance

9.1.1 EPUK flowchart to determine the priority of air quality in the planning process

Using the EPUK flowchart method, the following is noted:

- The annual mean NO_2 objective is exceeded;
- The development does not lead to a significant worsening of this exceedence;
- The effect of the proposed development on local air quality is negligible;
- The proposed development is not judged to interfere with the implementation of any local plans and strategies.
- The proposed development introduces residential properties into an area which already exceeds the annual mean NO_2 objective.

Based on the above, air quality is considered to be a *high priority* in the planning process primarily due to the introduction of residential exposure into an area of existing poor air quality. Mechanical ventilation has been included in the design to mitigate the potential exposure of future residents.

9.1.2 EPUK factor to judge significance

Considering the significance of the air quality impacts according to the criteria set out in the guidance, the following points are noted:

- The development lies within an AQMA and local monitoring data indicates the annual mean NO_2 objective is exceeded;
- The overall magnitude of change in pollutant concentrations from the operation of boilers is imperceptible;
- The proposed development will not result in a significant increase in vehicle movements across the local road network as car parking on-site is limited to two disabled bays and public transport links within the vicinity of the development are excellent;
- New residential exposure is being introduced in the area by the proposed development; however dwellings will be mechanically ventilated;
- Amenity space such as winter gardens will be glazed to provide nominal protection; and

- The development does not interfere with the implementation of measures outlined in the AQAP.

Based on the above, the air quality is judged to be a *minor* consideration in the case of this development proposal for NO_2.

9.2 Assessment Against the Air Quality Neutral Benchmarks

The BEB and TBE have been calculated for the proposed development to determine if the development is considered air quality neutral.

Table 14: Building Emission Benchmarks

Land-use	GFA (m^2)	Building Emissions Benchmarks NOx ($gNOx/m^2/annum$)	Benchmarked Emissions ($kg/NOx/annum$)
Retail	4,514	22.6	102.0
Office	35,568	30.8	1095.5
Residential	3,530	26.2	92.5
	Building Emissions Benchmark		**1290**

The TBE have been derived following the assumption that the boilers are in operation continuously and the emission rate for NOx is as set out in Table 2 (0.016 g/s). As a result, the TBE for the development is 504.6 kgNOx/annum. This is a conservative assumption as it is unlikely that the boilers would be in operation continuously.

It can be observed that the TBE is well within the BEB for the proposed development, as such the development is considered to be 'air quality neutral' and no mitigation is required.

10 Conclusions

Ove Arup and Partners Limited (Arup) has been commissioned to undertake an air quality assessment as part of the planning application for the development of the building known as 21 -31 New Oxford Street, in central London. The scheme includes refurbishment of the existing commercial building and additional residential accommodation. The air quality assessment includes an assessment of existing air quality in the area and the impact of proposed development during the construction and operational phase.

The entire borough of Camden has been designated as an air quality management area for nitrogen dioxide and PM_{10} through the local air quality management regime. The latest progress report from 2012 indicated that concentrations of NO_2 continue to exceed the objectives at all monitoring sites, however concentrations of PM_{10} are well within the objectives. Camden have produced an action plan (2013 – 2015) setting out the steps the Council will take to work towards improving air quality.

Effects on local air quality in the construction phase have been assessed as negligible providing mitigation measures are included within the Construction Environmental Management Plan (CEMP) and implemented successfully.

The assessment considered the operational impact of emissions from boilers on local air quality which are to be installed within the proposed development. An assessment of emissions from the boilers has been undertaken using the atmospheric dispersion model ADMS V5. Nitrogen dioxide concentrations were assessed in the surrounding area of the proposed development.

At the area of maximum impact from the boiler, background levels of annual mean NO_2 are high and already exceed the annual mean objective. The process contribution from the on-site boilers is very small, as changes to annual NO_2 concentrations are predicted to be imperceptible. Emissions from the proposed development have also been assessed as 'air quality neutral' following supplementary planning guidance from the Greater London Authority.

Due to the excellent public transport links offered and the fact that on-site car parking is limited to two disabled bays, additional traffic movements associated with the operation of the development are not anticipated to be significant and the effect on local air quality will be negligible.

Based on the EPUK flowchart, air quality is considered to be a *high priority* in the planning process primarily due to the introduction of residential exposure into an area of existing poor air quality. However, mechanical ventilation has been included in the design to mitigate the potential exposure of future residents. Therefore, considering the significance of the air quality impacts according to the criteria set out in the EPUK guidance, the following points are noted:

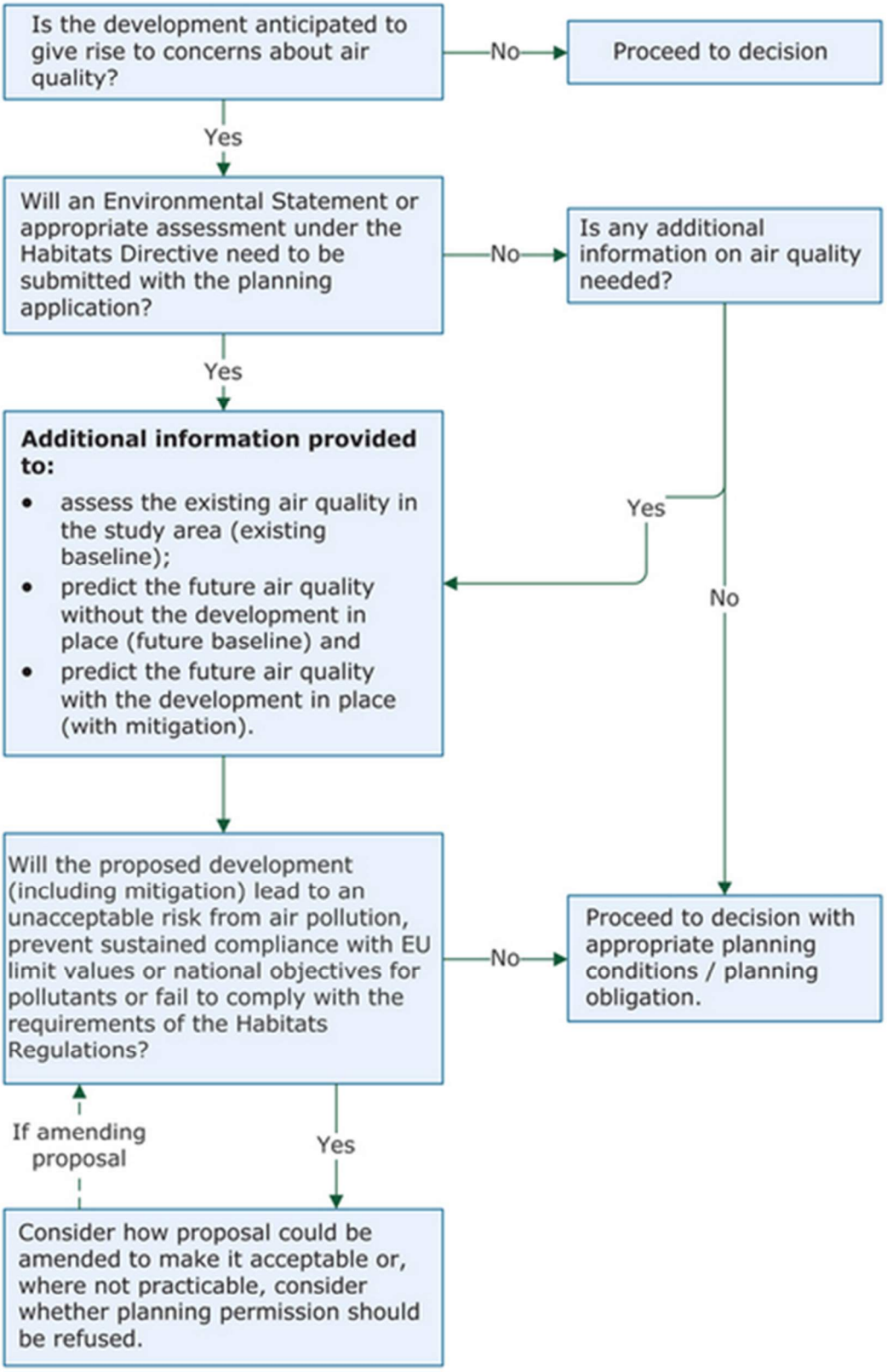
- The development lies within an AQMA and local monitoring data indicates the annual mean NO_2 objective is exceeded;
- The overall magnitude of change in pollutant concentrations from the operation of boilers is imperceptible;
- The proposed development will not result in a significant increase in vehicle movements across the local road network as car parking on-site is limited to two disabled bays and public transport links within the vicinity of the development are excellent;
- New residential exposure is being introduced in the area by the proposed development; however dwellings will be mechanically ventilated; and
- Amenity space such as winter gardens will be glazed to provide nominal protection; and
- The development does not interfere with the implementation of measures outlined in the AQAP.

Based on the above, the air quality is judged to be a *minor* consideration in the case of this development proposal for NO_2.

Appendix A

Planning Practice Guidance

A1 PPG Flowchart Method



Appendix B

Construction Dust Assessment Methodology

B1 Construction Dust Methodology

Table B1: Dust Emission Magnitude

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

Table B2: Area Sensitivity

Define sensitivity of the area			
Sensitivity of Surrounding Area	**Examples**		
	Sensitivity of People to Dust Soiling Effects	**Sensitivities of People to the Health Effects of PM_{10}**	**Ecological Receptors**
Low	• Enjoyment of amenity would not reasonably be expected; • There is property that would not reasonably be expected to be diminished in appearance, aesthetics or values by soiling; • There is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land; • Indicative examples include playing fields, farmland (unless commercially sensitive horticulture), footpaths, short term car parks and roads.	• Locations where human exposure is transient; • Indicative examples public footpaths, playing fields, parks and shopping streets.	• Locations with a local designation where the features may be affected by dust deposition; • Indicative examples include local Nature Reserve with dust sensitive features.
Medium	• Users would expect to enjoy a reasonably level of amenity, but would not reasonably expect to enjoy the same levels of amenity as in their home; • The appearance, aesthetics or value of their property could be diminished by soiling; • Indicative examples include parks and places of work.	• Locations where people exposed are workers, and exposure is over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives a relevant locations would be one where individuals may be exposed for eight hours or more in a day); • Indicative examples may include offices and shops, but will generally not include workers occupationally exposed to PM10 as potential is covered by Health and Safety at Work legislation.	• Locations where there are particularly important plant species, where its dust sensitivity is uncertain or unknown; • Locations with a natural designation where the features may be affected by dust deposition indicative examples include a Site of Special Scientific Interest (SSSI) with dust sensitive features.

Define sensitivity of the area			
Sensitivity of Surrounding Area	**Examples**		
	Sensitivity of People to Dust Soiling Effects	**Sensitivities of People to the Health Effects of PM_{10}**	**Ecological Receptors**
High	• Users can reasonably expect a enjoyment of a high level of amenity the appearance, aesthetics or values of their property would be diminished by soiling; and the people or property would reasonably be expected to be present continuously, or at least regularly for extended periods as part of the normal pattern of use of the land; • Indicative examples include dwellings, museum and other culturally important collections, medium and long term car parks and car showrooms.	• Locations where members of the public are exposed over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives a relevant locations would be one where individuals may be exposed for eight hours or more in a day); • Indicative examples include residential properties. Hospitals and schools and residential care homes should also be considered as having equal sensitivity to residential areas.	• Locations where an international or national designation and the designated features may be affected by dust soiling; • Locations where there is a community of particularly dust sensitive species such as vascular species included in the Red Data List for Great Britain; • An indicative example is a Special Area of Conservation (SAC) designated for acid heathlands adjacent to the demolition of a large site containing concrete (alkali) buildings or for the presence of lichen.

Table B3: Sensitivity of the area to dust soiling effects on people and property

Sensitivity of the area to dust soiling effects on people and property					
Receptor sensitivity	**Number of receptors**	**Distance from the source (m)**			
		< 20	**< 50**	**< 100**	**< 350**
High	>100	High	High	Medium	Low
	10 – 100	High	Medium	Low	Low
	< 10	Medium	Low	Low	Low
Medium	> 1	Medium	Low	Low	Low
Low	> 1	Low	Low	Low	Low

Table B4: Sensitivity of the area to human health impacts

Sensitivity of the area to human health impacts						
Background PM_{10} concentrations (annual mean)	**Number of receptors**	**Distance from the source (m)**				
		< 20	**< 50**	**< 100**	**< 200**	**< 350**
High receptor sensitivity						
> 32µg/m^3	> 100	High	High	High	Medium	Low
	10 – 100			Medium	Low	
	< 10		Medium	Low		
28 – 32µg/m^3	> 100	High	High	Medium	Low	Low
	10 – 100		Medium	Low		
	< 10					
24 – 28µg/m^3	> 100	High	Medium	Low	Low	Low
	10 – 100					
	< 10	Medium	Low			
< 24µg/m^3	> 100	Medium	Low	Low	Low	Low
	10 – 100	Low				
	< 10					
Medium receptor sensitivity						
–	> 10	High	Medium	Low	Low	Low
	< 10	Medium	Low			
Low receptor sensitivity						
–	> 1	Low	Low	Low	Low	Low

Table B5: Sensitivity of the area to ecological Receptors

Sensitivity of the area to ecological Receptors		
Receptor sensitivity	**Distance from the source (m)**	
	< 20	**< 50**
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Table B6: Risk of Dust Impacts

Risk of dust impacts			
Sensitivity of area	**Dust emission magnitude**		
	Large	**Medium**	**Small**
Demolition			
High	High risk site	Medium risk site	Medium risk site
Medium	High risk site	Medium risk site	Low risk site
Low	Medium risk site	Low risk site	Negligible
Earthworks			
High	High risk site	Medium risk site	Low risk site
Medium	Medium risk site	Medium risk site	Low risk site
Low	Low risk site	Low risk site	Negligible
Construction			
High	High risk site	Medium risk site	Low risk site
Medium	Medium risk site	Medium risk site	Low risk site
Low	Low risk site	Low risk site	Negligible
Trackout			
High	High risk site	Medium risk site	Low risk site
Medium	Medium risk site	Low risk site	Negligible
Low	Low risk site	Low risk site	Negligible

Appendix C

EPUK Significance Criteria

EPUK Classification of Magnitude of Change	
Magnitude of Change	**Change in Annual Mean NO_2Concentrations ($\mu g/m^3$)**
Large	> 4.0
Medium	2.0 – 4.0
Small	0.4 – 2.0
Imperceptible	< 0.4

EPUK Impact Descriptors for NO_2 Annual Mean Concentrations			
Absolute Concentration in Relation to Objective/Limit Value	**Change in Concentration**		
	Small	**Medium**	**Large**
Increase with Scheme			
Above Objective/Limit Value with Scheme (40 $\mu g/m^3$)	Slight Adverse	Moderate Adverse	Substantial Adverse
Just Below Objective/Limit Value with Scheme (36 - 40 $\mu g/m^3$)	Slight Adverse	Moderate Adverse	Moderate Adverse
Below Objective/Limit Value with Scheme (30 - 36 $\mu g/m^3$)	Negligible	Slight Adverse	Slight Adverse
Well Below Objective/Limit Value with Scheme (<30 $\mu g/m^3$)	Negligible	Negligible	Slight Adverse
Decrease with Scheme			
Above Objective/Limit Value without Scheme (40 $\mu g/m^3$)	Slight Beneficial	Moderate Beneficial	Substantial Beneficial
Just Below Objective/Limit Value without Scheme (36 - 40 $\mu g/m^3$)	Slight Beneficial	Moderate Beneficial	Moderate Beneficial
Below Objective/Limit Value without Scheme (30 - 36 $\mu g/m^3$)	Negligible	Slight Beneficial	Slight Beneficial
Well Below Objective/Limit Value without Scheme (<30 $\mu g/m^3$)	Negligible	Negligible	Slight Beneficial

EPUK Factors to Judge Significance

- Number of people affected by slight, moderate or major air quality impacts and a judgment 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.
- The magnitudes of the changes and the descriptions of the impacts at the receptors.
- Whether or not an exceedence of an objective or limit value is predicted to arise in the study area, where none existed before, or an exceedence area is substantially increased.
- Whether or not the study area exceeds an objective or limit value and this exceedence is removed, or the exceedence area is reduced.
- Uncertainty, including the extent to which worst case assumptions have been made.
- The extent to which an objective or limit value is exceeded; eg. an annual mean NO_2 of 41$\mu g/m^3$ should attract less significance than an annual mean of 51$\mu g/m^3$.

EPUK Flowchart