Linden Wates
(West Hampstead) Limited

Air Quality Impact Assessment for a Proposed Residential Development Adjacent to the Former Reservoir on Gondar Gardens, West Hampstead

November 2013

REPORT TITLE: **AIR QUALITY IMPACT ASSESSMENT FOR A PROPOSED RESIDENTIAL DEVELOPMENT ADJACENT TO THE FORMER RESERVOIR ON GONDAR GARDENS, WEST HAMPSTEAD**

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CLIENT: **Linden Wates (West Hampstead) Limited**
Linden House
Linden Square
Harefield
Middlesex
UB9 6TQ

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1. INTRODUCTION & PROPOSED DEVELOPMENT

RSK Environment Limited (RSK) was instructed by Linden Wates (West Hampstead) Limited to undertake an assessment of potential air quality impacts associated with a proposed residential development adjacent to the former subterranean reservoir on Gondar Gardens, West Hampstead, London.

In January 2011 RSK produced an air quality assessment report to support a planning application for a partially subterranean residential scheme within the former reservoir site on Gondar Gardens (RSK report reference 440277-01; 24th January 2011).

This scheme was not approved by the local planning authority, the London Borough of Camden (LB Camden), and a revised residential scheme situated on the frontage of the reservoir was developed by Linden Wates (West Hampstead) Limited.

The scheme has again been revised, principally involving changes in the front elevation, with the number of units remaining the same, with the intention of a new application for planning consent being submitted in November 2013.

The following report, which has been prepared in support of the planning application for the revised reservoir frontage scheme in November 2013, presents the findings of an assessment of existing 'baseline' air quality conditions and the predicted impacts of air quality on the scheme, and of the scheme on local air quality.

Traffic generation associated with the proposed development is likely to be unchanged compared with the previous scheme, and will be trivial in comparison with existing traffic flows on the local road network, and therefore the potential impact of increased traffic (emissions) due to the scheme was not modelled. It has been advised that the proposed development includes only 20 vehicle parking spaces, and therefore the development has little potential to generate significant additional road traffic emissions.

No on site CHP (combined heat and power) unit is proposed for the development, therefore combustion point source emissions were not quantitatively assessed/modelled.

The proposed development site falls within the administrative boundary of LB Camden, and its location adjacent to the reservoir is illustrated In Figure 1, below. The development site is approximately rectangular in shape, at what would be considered an urban background location, approximately 500 m east of the A5 Shoot Up Hill and 800 m west of the A41 Finchley Road.

The proposals are to develop 28 residential units over six levels (including basement and lower ground levels) on the frontage to the reservoir along Gondar Gardens.

The proposed development would cover an area of approximately 2800 m^2 and will meet level 4 of the Code for Sustainable Homes (CSH). Pending planning approval from LB Camden, it is proposed that the site would be completed and occupied by the end of 2016. Figure 2 below shows the proposed

ground floor plan and Figure 3 illustrates a cross section of the proposed development. Covered parking for 20 cars will be provided in the basement level.

As part of the proposed development the existing reservoir roof and internal structures would be removed and regraded/landscaped and, together with the remaining grassland at the rear of the site, would become an enhanced wildlife/nature conservation area.

Figure 1.1: Location of Former Reservoir, Gondar Gardens

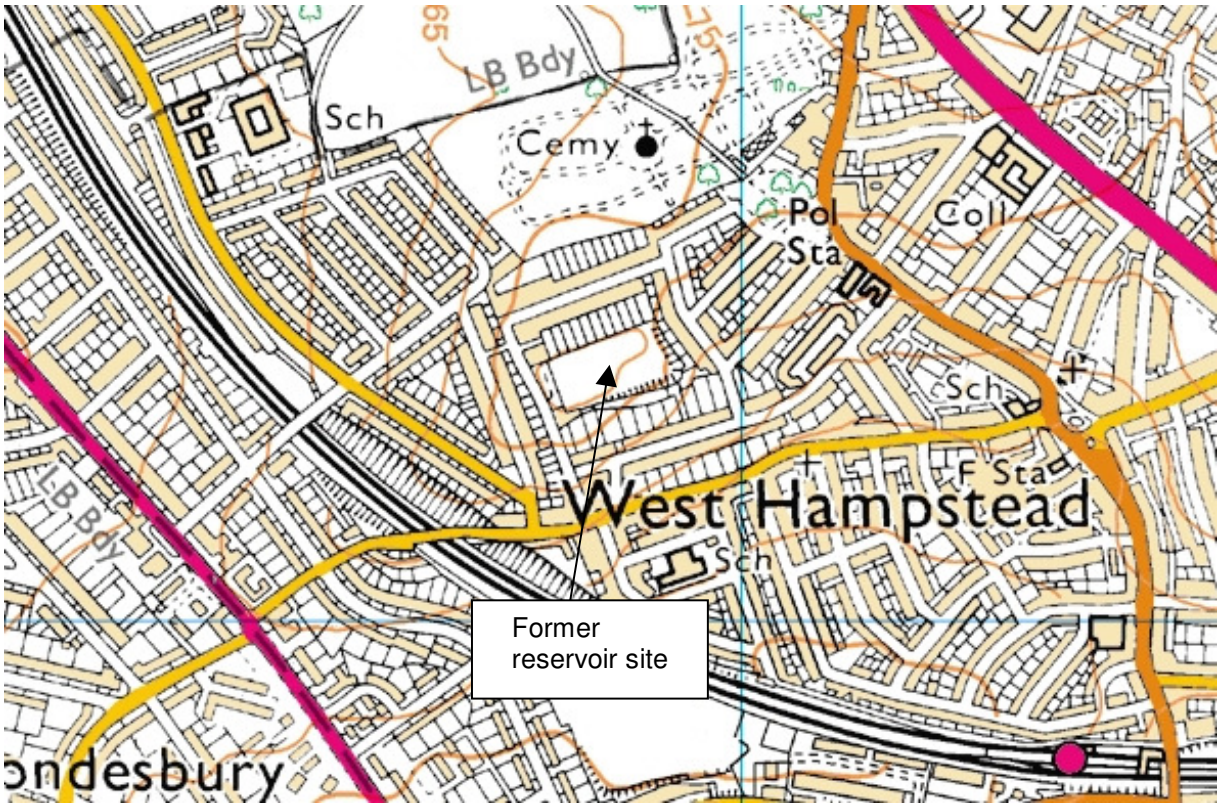
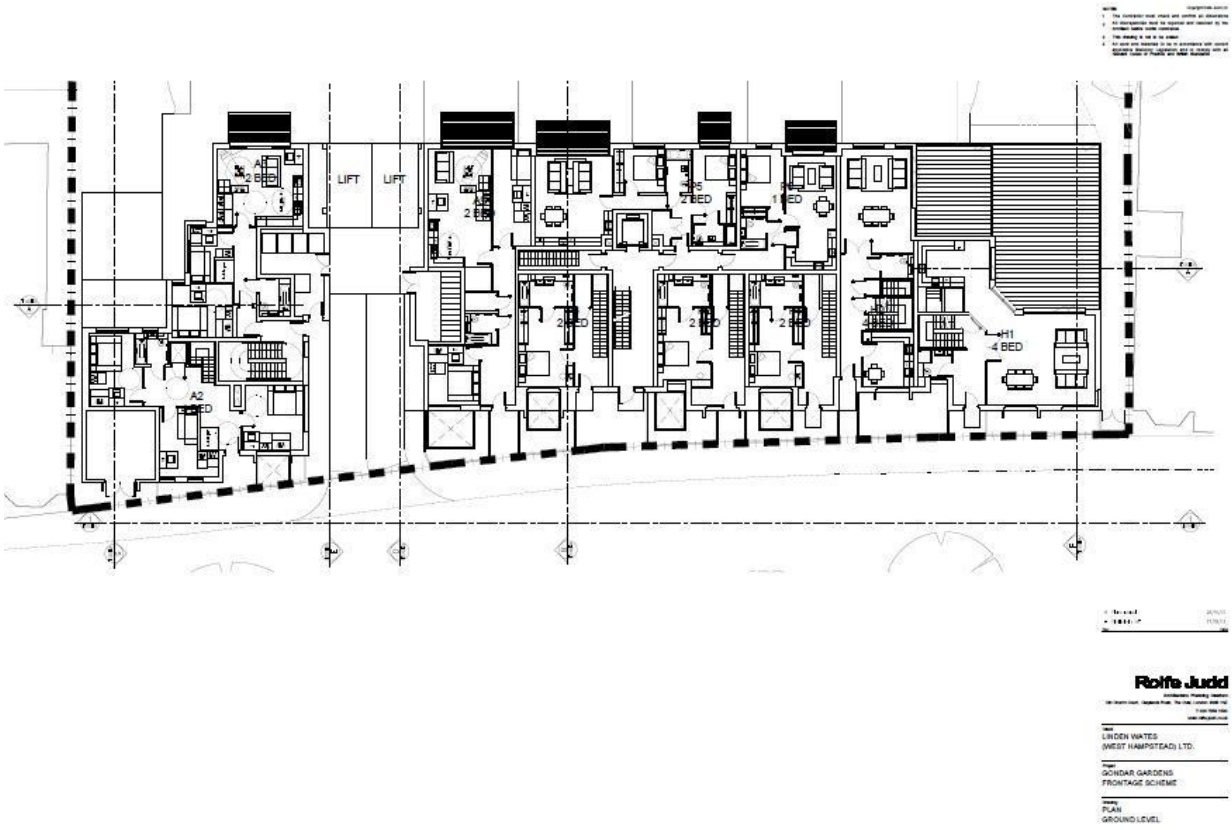


Figure 1.2: Proposed Ground Floor Plan



2. AIR QUALITY LEGISLATION, POLICY & GUIDANCE

2.1 Local Air Quality Management

UK air quality policy is published under the umbrella of the Environment Act 1995, Part IV and specifically Section 80, the National Air Quality Strategy (NAQS). The latest Air Quality Strategy for England, Scotland, Wales and Northern Ireland – Working Together for Clean Air, published in July 2007, sets air quality standards and objectives for ten key air pollutants to be achieved between 2003 and 2020.

The EU Air Quality Framework Directive (1996) established a framework under which the EU could set limit or target values for specified pollutants. The Directive identified 12 pollutants for which limit or target values have been, or will be set in subsequent Daughter Directives. The Framework and Daughter directives were consolidated by Directive 2008/50/EC on Ambient Air Quality And Cleaner Air for Europe, which retains the existing air quality standards and introduces new objectives for fine particulates ($PM_{2.5}$).

The air quality standards in the United Kingdom are derived from European Commission (EC) Directives and are adopted into English law via the Air Quality (England) Regulations 2000 and Air Quality (England) (Amendment) Regulations 2002. The Air Quality Limit Values Regulations 2003 and subsequent amendments implement the EU Air Quality Framework Directive into English law. 2008/50/EC was translated into UK law in 2010 via the Air Quality Standards Regulations 2010.The objectives relevant to the proposed development are summarised below in Table 1.

These objectives are to be used in the review and assessment of air quality by local authorities under Section 82 of the Environment Act (1995). If exceedances are measured or predicted through the review and assessment process, the local authority must declare an Air Quality Management Area (AQMA) under Section 83 of the Act, and produce an Air Quality Action Plan to outline how air quality is to be improved to meet the objectives under Section 84 of the Act.

Table 2 National Air Quality Objectives

Substance	Averaging period	Exceedences allowed per year	Ground level concentration ($\mu g\ m^{-3}$)	Target date
Nitrogen dioxide (NO_2)	1 year	-	40	31.12.05
	1 hour	18	200	31.12.05
Sulphur dioxide (SO_2)	15 minute	35	266	31.12.05
	1 hour	24	350	31.12.04
	24 hours	3	125	31.12.04
Ozone (O_3)	8 hour	10	100	31.12.05
Particles (PM_{10})	1 year	-	40	31.12.04
	24 hours	35	50	31.12.04
Particles ($PM_{2.5}$)(1)	1 year	-	25	2020
	1 year	15% reduction in urban background concentration	N/A	2010-2020

Substance	Averaging period	Exceedences allowed per year	Ground level concentration (µg m^{-3})	Target date
Carbon monoxide (CO)	8 hour(2)	-	10,000	31.12.03
1,3 Butadiene	1 year(2)	-	2.25	31.12.03
Benzene	1 year(2)	-	16.25	31.12.03
	1 year	-	5	31.12.10
PAH	1 year	-	0.00025	31.12.10
Lead	1 year	-	0.25	31.12.08

Note: (1) = new targets; (2) = running average

2.2 Planning Policy

The land use planning process is a key means of improving air quality, particularly in the long term, through the strategic location and design of new developments. Any air quality concern that relates to land use and its development can, depending on the details of the proposed development, be a material consideration in the determination of planning applications.

2.3 National Planning Policy Framework

In March 2012 The National Planning Policy Framework (NPPF) was published, superseding the bulk of previous Planning Policy Statements with immediate effect. The National Planning Policy Framework was intended to simplify the planning system and includes a presumption in favour of sustainable development.

Section 11 of the NPPF deals with Conserving and Enhancing the Natural Environment, and states that the intention is that the planning system should prevent '*development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability*' and goes on to state that '*new development* [should be] *appropriate for its location' and 'the effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development toadverse effects from pollution, should be taken into account*.'

With specific regard to air quality, the NPPF states that:

> *'Planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan'.*

2.4 Local Planning Policy Context

The Camden Local Development Framework (LDF) has replaced the the former Unitary Development Plan (UDP), and includes a number of policies relevant to local air quality.

Development Policy DP22. *Promoting Sustainable Design and Construction* requires development to incorporate sustainable design and construction measures, including specifying minimum BREEAM and Code for Sustainable homes standards, and a requirement for 'reducing air pollution'.

DP26 *Managing the impact of development on occupiers and neighbours* states that consent will only be granted for development that does not cause harm to amenity, including by odour, fumes and dust, and consideration wil be given to the inclusion of appropriate attenuation measures.

DP32. *Air quality and Camden's Clear Zone* seeks to improve the local environment by reducing air pollution. DP 32 states 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 also only grant planning permission for development in the Clear Zone region that significantly increases travel demand where it considers that appropriate measures to minimise the transport impact of development are incorporated.' The 'Clear Zone' was established by the City of London, City of Westminster and Camden Council to promote integrated transport; 'urban renaissance' and regeneration. The Clear Zone covers a defined area close to and south of Euston Road. The Gondar Gardens site is not within the 'Clear Zone'.

3. ASSESSMENT METHODOLOGY & SIGNIFICANCE CRITERIA

3.1 Outline Methodology

The approach adopted for assessing the air quality impacts on and of the proposed development was discussed with London Borough of Camden, and may be summarised as follows:

- Characterisation of existing 'Baseline' air quality, and the potential for this to affect future users of the development;
- Qualitative assessment of potential air quality impacts from demolition and construction operations; and,
- Qualitative assessment of potential air quality impacts on and of the development, once occupied[1].

3.2 Baseline air quality

Existing and future air quality may influence the design and layout of the development.

It is likely that the principal source of air pollution affecting the development will be emissions from road traffic on the busy A5 Shoot Up Hill and the A41 Finchley High Road, as well as diffuse emissions from the local road network. The key air pollutants from such sources are nitrogen dioxide (NO_2) and particulate matter of size less than 10 µm (PM_{10}).

'Current' air quality in the area was characterised using publicly available data, comprising the following sources:

- Local authority Review and Assessment reports;
- Data from local (council run) air quality monitoring programmes;
- Data from national (DEFRA) air monitoring networks; and,
- Data from estimated background air quality maps on a 1 x 1 km grid, sponsored by DEFRA.

[1] It is anticipated that, pending planning approval, the scheme will be completed and occupied by the end of 2016

3.3 Demolition/Construction Impact assessment

A quantitative impact assessment of construction activities is virtually impossible due to the sporadic and constantly changing nature of construction-related activities, as well as the difficulty in accurately representing such activities in predictive models.

A qualitative consideration of the likely impacts of the construction phase was therefore undertaken, focusing on the likely key aspects affecting air quality during construction and demolition and demonstrating that effective mitigation measures and sound environmental management techniques will be in place for the construction works.

The Institute of Air Quality Management (IAQM) has published a guidance document[2] for the assessment of construction phase air quality impacts of construction sites. The level of mitigation required is specified on the basis of the risk category.

In order to assess the potential impacts, construction activities are divided into four categories, as follows:

- Demolition;
- Earthworks;
- Construction; and,
- Trackout of material onto local roads

For each activity, the risk of dust annoyance and/or health or ecological impacts is determined using three risk categories: low, medium and high risk. The risk category is different for each of the four activities.

3.3.1 Demolition

The risk category for demolition is varied for each site in terms of timing, building type, duration and scale. Examples of the potential dust emission classes are provided in the Guidance as follows:

- **Large:** Total building volume >50000m^3, potentially dusty construction material, on-site crushing and screening, demolition activities >20m above ground level;
- **Medium:** Total building volume 20000m^3 - 50000m^3, potentially dusty construction material, demolition activities 10m - 20m above ground level; and,

[2] IAQM (2012). Guidance on the Assessment of the Impacts of Construction on Air Quality and the Determination of their Significance.

- **Small:** Total building volume <20000m^3, construction material with low potential for dust release, demolition activities <10m above ground, demolition during wetter months.

The matrix to determine the demolition risk category, based on the distance to the nearest receptors and the dust emission class, is presented in Table 3.1 below.

Table 3.1: Risk Category from Demolition Activities

Distance to Nearest Receptor (m)(1)		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

Note: (1) These distances are from the dust emission source. Where this is unknown, then the distance should be from the site boundary.

3.3.2 Earthworks

The risk category for earthworks is varied for each site in terms of timing, geology, topography and duration. Examples of the potential dust emission classes are provided In the Guidance as follows:

- **Large:** Total site area >10000m^2, potentially dusty soil type (e.g. clay), >10 heavy earth moving vehicles active at any one time, formation of bunds >8m in height, total material moved >100000 tonnes;

- **Medium:** Total site area 2500 - 10000m^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 20000 - 100000 tonnes; and,

- **Small:** Total site area < 2500m^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 <10000 tonnes, earthworks during wetter months.

A matrix to determine the earthworks risk category is the presented as Table 3.2 below.

Table 3.2: Risk Category from Earthworks Activities

Distance to Nearest Receptor (m)[(1)]		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	Low 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

3.3.3 Construction

The risk category for construction is varied for each site in terms of timing, building type, duration, and scale. Examples of the potential dust emissions classes are provided In the Guidance as follows:

- **Large:** Total building volume >100000m^3, piling, on site concrete batching;
- **Medium:** Total building volume 25000 – 100000m^3, potentially dusty construction material (e.g. concrete), piling, on site concrete batching; and,
- **Small:** Total building volume <25000m^3, construction material with low potential for dust release (e.g. metal cladding or timber).

The matrix to determine the construction risk category is the same as that identified in Table 3.2 above.

3.3.4 Trackout

Factors which determine the magnitude class of trackout activities are vehicle size, vehicle speed, vehicle number, geology and duration. Examples of the potential dust emissions classes are provided In the Guidance as follows:

- **Large:** >100 HDV (Heavy Duty Vehicle) (3.5t) trips in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100m;
- **Medium:** 25 – 100 HDV (>3.5t) trips in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 – 100m; and,
- **Small:** <25 HDV (<3.5t) trips in any one day, surface material with low potential for dust release, unpaved road length <50m.

A matrix to determine the trackout risk category is the presented in Table 3.3 below

Table 3.3: Risk Category from Trackout

Distance to Nearest Receptor (m)(1)		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

Note: (1) For trackout the distance is from the roads used by construction traffic.

3.3.5 Identification of Effects and Significance of the Construction Activities

Example criteria to identify the sensitivity of the surrounding area are provided in the IAQM guidance document and are summarised in Table 3.4: Sensitivity of the Area Surrounding the Site

below.

Table 3.4: Sensitivity of the Area Surrounding the Site

Sensitivity of Area	Human Receptors	Ecological Receptors(1)
Very High	Very densely populated area; >100 dwellings within 20m; Local PM_{10} concentrations exceed the objective; Contaminated building present; Very sensitive receptors (e.g. oncology units); Works continuing in one area of the site for more than 1 year	European Designated site.
High	Densely populated area; 10 - 100 dwellings within 20m; Local PM_{10} concentrations close to the objective (annual mean 36 - 40µg/m^3); Commercially sensitive horticultural land within 20m.	Nationally Designated site
Medium	Suburban or edge of town area; <10 dwellings within 20m; Local PM_{10} concentrations below the objective (annual mean 30 - 36µg/m^3)	Locally designated area
Low	Rural or industrial area; No receptor within 20m; Local PM_{10} concentrations well below the objective (<75%) Wooded area between site and receptors	No designations

Note: (1) Only if there are habitats that might be sensitive to dust.

The criteria for assessment of the significance of impacts for each of the four construction activities, before applying mitigation measures, are summarised in Table 3.5 below.

Table 3.5: Significance of Effects for Each Activity (Before Mitigation)

Sensitivity of surrounding area	Risk of site giving rise to dust effects		
	High	Medium	Low
Very High	Substantial adverse	Moderate adverse	Moderate adverse
High	Moderate adverse	Moderate adverse	Slight adverse
Medium	Moderate adverse	Slight adverse	Negligible
Low	Slight adverse	Negligible	Negligible

The criteria for significance of impacts for each of the four construction activities, assuming the effective application of mitigation measures, are summarised in Table 3.6 below.

Table 3.6: Table 3.6: Significance of Effects for Each Activity (With Mitigation)

Sensitivity of surrounding area	Risk of site giving rise to dust effects		
	High	Medium	Low
Very High	Slight adverse	Slight adverse	Negligible
High	Slight adverse	Negligible	Negligible
Medium	Negligible	Negligible	Negligible
Low	Negligible	Negligible	Negligible

3.4 Operational Significance

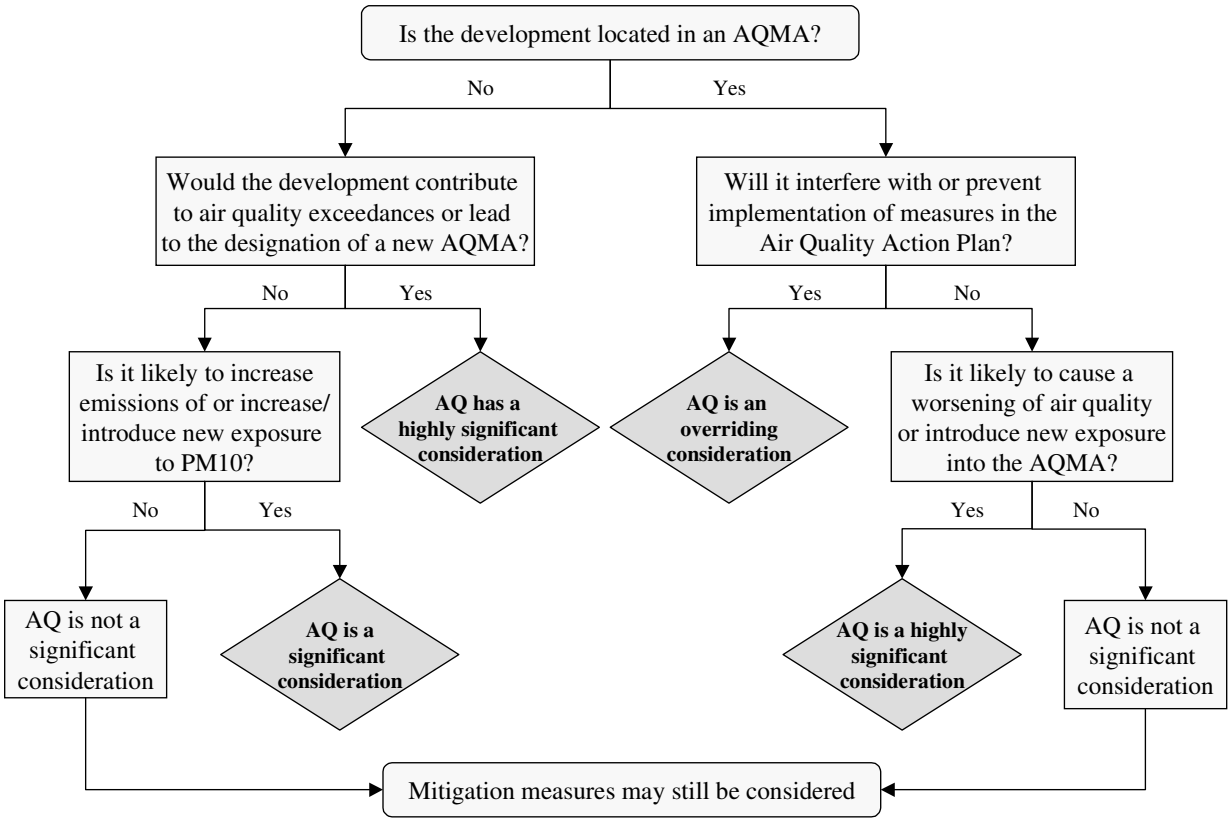
The London Air Pollution Planning and the Local Environment (APPLE) Working Group issued a guidance document on air quality and planning issues for developments. The revised version of this document (January 2007) was endorsed by the London Councils Transport and Environment Committee (TEC) on 17th October 2007.

The guidance identifies that air quality can be a material consideration in the planning process. **Only zero-emission developments are unlikely to have any impact on local or global air quality** and therefore mitigation should be a consideration for **all** developments.

Figure 4 and Table 3 outline the suggested approach for determining the significance of impacts and level of mitigation required to minimise exposure to air pollution.

Figure 3.1: Determining Significant Impacts on Air Quality

Note: Where significant is used, it will be based on the professional judgement of the Local Authority officer.



In determining both the significance of exposure to air pollution and the levels of mitigation required, consideration should be given to the following Air Pollution Exposure Criteria (APEC) illustrated in Table 3.7

Table 3.7: Air Pollution Exposure Criteria (APEC)

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

Note: Applicable ranges assume downward pollutant trend has been established.

4. BASELINE AIR QUALITY

4.1 Emissions Sources and Key Air Pollutants

In recent decades, transport-related emissions have become one of the main sources of air pollution in urban areas. The principal pollutants relevant to this assessment are considered to be NO_2 and PM_{10}, two key parameters released by vehicular combustion processes or subsequently generated by vehicle emissions in the atmosphere through chemical reactions, and which are generally considered to have the greatest potential to result in human health impacts.

4.2 Review of LB Camden Local Air Quality Management Studies

LB Camden has declared an Air Quality Management Area (AQMA) for both NO_2 and $PM_{10,}$ covering the entire borough.

The site at Gondar Gardens is within the declared AQMA, therefore current air quality in the environs of the site may be expected to have the potential to expose future residents of the proposed development to concentrations of relevant pollutants in excess of the Air Quality Standards.

However, LB Camden's 2009 Updating and Screening Assessment (USA) notes that 'The north of the borough, in contrast is less congested, and there are more open spaces and parks, of which particular areas [Hampstead Heath Woods, approximately 2 km north-east of Gondar Gardens] have been designated as Sites of Special Scientific Interest (SSSI). Air pollution in these areas is generally lower resulting in improved air quality.' Gondar Gardens is located towards the north of LB Camden, and is close to areas of open space, so is likely to experience better air quality than southern areas of the borough.

4.3 Air Quality Monitoring Data

LB Camden operates automatic air quality monitors at three locations in the borough, however two of these, at London Bloomsbury and Shaftsbury Avenue are distant from the site in the southern portion of the borough and are unlikely to be representative of air quality at Gondar Gardens. The third LB Camden monitor is at a location roadside to the A41 Finchley Road, Swiss Cottage, approximately 2.75 km from Gondar Gardens.

Neighbouring London Borough of Brent operates a number of automatic air quality monitors, and one of these, Brent St Marys Primary School, is approximately 3.5 km from Gondar Gardens. This site is now closed and monitoring data are only available to 2009.

The most recent available Results for the two nearby automatic air quality monitors are presented in Table 4.1, below.

Table 4.1: Air Quality Monitoring Data from Local Monitoring Stations

Monitor location	Classification	Year	Annual mean,			
			NO_x g/m^3	NO_2 µg/m^3	PM_{10} µg/m^3	$PM_{2.5}$ µg/m^3
Camden, Swiss Cottage	Roadside (R)	2012	182	70	23	13
Brent, St Marys Primary School	Urban background (UB)	2009	56	36	21	Not measured

The development site on Gondar Gardens is at an urban background location, and therefore the Swiss Cottage roadside site is unlikely to be representative. However, air quality at the proposed development site may be expected to be broadly similar to that experienced at the St Marys Primary School urban background monitoring station. It can be inferred from the local trends of these particular air pollutants, that pollutant levels from this site would be likely to have declined since the last available data were recorded in 2009.

LB Camden also measures nitrogen dioxide using passive diffusion tubes at a number of locations throughout the borough, however these are in the main, in the southern portion of the borough. The diffusion tube sited at Frognal Way is at an urban background location in the northern part of the borough, approximately 1.5 km east of Gondar Gardens and at a location likely to be broadly similar to Gondar Gardens. Diffusion tube results for 2010, 2011 and 2012 at the Frognal Way site are presented in Table 4.2, below.

Table 4.2: Nitrogen Dioxide Monitoring Data from Local Diffusion Tubes

Tube reference	Location	Bias-adjusted annual mean NO_2 concentrations, µg/m^3		
		2010	2011	2012
CA7	Frognal Way	29	31.5	28.9

4.4 DEFRA UK Air Information Resource (AIR) Data

Estimated background air quality data are available from DEFRA's UK AIR (Air information Resource) website (formerly the UK Air Quality Archive) and can be used to establish likely background air quality conditions at the proposed development site. The UK AIR provides estimated annual average concentrations of oxides of nitrogen (NO_x), NO_2 and PM_{10} (and other pollutants) on a 1km^2 grid basis across the UK.

Table 4.3 below presents estimated annual average NO_x, NO_2 and PM_{10} concentrations for the grid square containing the Gondar Gardens site, in 2013and 2016, the intended opening year of the development.

Table 4.3: UK AIR Estimated Annual Average Background Pollutant Concentrations

Assessment Year	Estimated Annual Average Pollutant Concentrations from the UK AIR		
	Annual Average NO_X ($\mu g/m^3$)	Annual Average NO_2 ($\mu g/m^3$)	Annual Average PM_{10} ($\mu g/m^3$)
2013	51.2	30.0	18.9
2016	45.3	27.3	18.3
Air Quality Objective	30	40	40

The air quality objective for NO_X is for the protection of vegetation and ecosystems. The data obtained from UK AIR website (http://uk-air.defra.gov.uk/) are for grid reference: 524500, 185500. The approximate centre of the reservoir on Gondar Gardens is at: 524845, 185300.

The UK AIR estimates of background concentrations of PM_{10} and NO_2 are below relevant human health air quality objectives and generally decrease over time, however evidence has come to light that this predicted decrease may not occur in the short to medium term.

5. IMPACT PREDICTION

5.1 Demolition/Remediation & Construction Phase

The existing reservoir roof and internal structures will be removed prior to landscaping the land to the rear of the proposed residential units, and therefore partial demolition, earth moving and new construction are proposed.

Atmospheric emissions from demolition and construction activities will depend on a combination of the potential for emissions (the type of activity) and the effectiveness of control measures. In general terms, there are two sources of emissions that need to be controlled to minimise the potential for adverse environmental effects:

- Exhaust emissions from site plant, equipment and vehicles; and,
- Fugitive dust emissions from site activities.

5.1.1 Exhaust Emissions from Plant and Vehicles

The operation of vehicles and equipment powered by internal combustion engines results in the emission of exhaust gases containing, amongst other pollutants, NO_X, PM_{10}, Volatile Organic Compounds (VOCs), and carbon monoxide (CO). The quantities emitted depend on factors such as engine type, service history, pattern of usage and fuel composition. The operation of site equipment, vehicles and machinery will result in emissions to atmosphere of exhaust gases, but such emissions are unlikely to be significant, particularly in comparison to existing concentrations of vehicle exhaust pollutants in the vicinity of the development site[3].

Construction traffic will comprise haulage vehicles, construction vehicles and vehicles used for employee trips to and from work. However, in the context of the scale of the proposed development, the volume of traffic associated with the demolition/construction phase is not anticipated to be significant. Movements of heavy vehicles (>3.5t) in and out of the site are expected to below 25 per day.

5.1.2 Fugitive Dust Emissions

Fugitive dust emissions arising from demolition/construction activities are likely to be variable in nature and will depend upon type and extent of the activity, soil conditions (soil type and moisture), road surface conditions and weather conditions. Soils are inevitably drier during the summer, and periods of dry weather combined with higher than average winds have the potential to generate the most dust.

Demolition/construction related activities that are considered to be the most significant potential sources of fugitive dust emissions are:

- Demolition activities, due to the breaking up and size reduction of concrete, stone and compacted aggregates;

- Earth moving, due to the excavation, handling, storage and disposal of soil and subsoil materials;

- Construction aggregate usage, due to the transport, unloading, storage and use of dry and dusty materials (such as cement and sand);

- Movement of heavy site vehicles on dry untreated or hard surfaced haul routes; and,

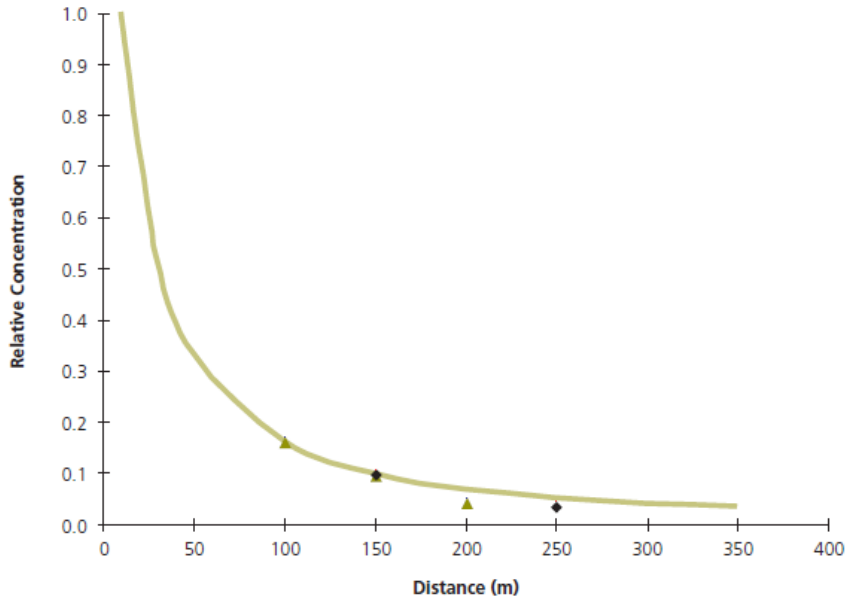
- Movement of vehicles over surfaces where muddy materials have been transferred off site (for example, on to public highways).

Fugitive dust arising from demolition/construction activities is generally of a particle size greater than the PM_{10} fraction, which has a greater potential to impact upon human health. Appropriate dust control/mitigation measures are highly effective for the dust generating activities identified above, and adverse effects can correspondingly be greatly reduced or eliminated.

Airborne dust has a limited ability to remain in the air, and readily drops from suspension as a deposit. United States Environmental Protection Agency (US EPA) research suggests that the potential for dust effects is greatest within 90 m of construction activities.

The previous (2003) Local Air Quality Management Technical Guidance document (LAQM.TG(03)) identified that PM_{10} concentrations fall-off rapidly with distance from source. Figure 5.1 shows the decrease in PM_{10} concentration from source for a typical wind speed of 6 m/s. At 50 m from source, the PM_{10} concentration is predicted to be approximately 30% of that at the point of generation.

Figure 5.1: Modelled Fall-Off in PM_{10} Concentrations with Distance from Source



5.1.3 Significance of Demolition/Construction Activities

The significance of construction stage fugitive dust emissions is assessed with reference to the IAQM guidance criteria outlined in Section 3. The overall dust emission classes before mitigation are assessed on the basis of the guidance outlined and professional judgement to be as follows:

- **Demolition – Medium** (20,000-50,000m^3 of buildings being demolished, demolition activities <10m above ground, potential for dusty material from on site crushing and screening);
- **Earthworks – Medium** (2,800m^2 of total site area, <5 earthmoving equipments on site and <10,000tonnes of material moved);
- **Construction –Medium** (25,000-100,000m^3 volume of buildings to be built and the potential for dusty construction materials on site); and
- **Trackout – Small** (<25 HDV trips per day, <50m of unpaved road length within the site).

The risk categories for the four construction activities are classified according to the criteria set out in Tables 3.1, 3.2, and 3.3, and summarised in **Error! Reference source not found.**.

Table 5.1: Summary of Risk Categories of the Site

Construction Activities	Dust Emissions Class	Nearest Receptor	Notes
Demolition	Medium	**<20m**	**High Risk**
Earthworks	Medium	**<20m**	**High Risk**
Construction	Medium	**<20m**	**High Risk**
Trackout	Small	**<20m**	**Medium Risk**

Due to the urban location of the site, its proximity to nearby residential properties and the proposed demolition and construction activities, the site can be described as 'High Risk' for the demolition, earthworks and construction activities, and 'Medium Risk' trackout. This is assessed before any mitigation. Mitigation measures will help further reduce the impacts of demolition/construction activities at the development site and are discussed in more detail in Section 6.

5.1.4 Sensitivity of the Area Surrounding the Site

Criteria for the assessment of the surrounding environment are suggested in the IAQM guidance, and reproduced in Table 3.4

The area surrounding the site is largely residential and urban and there are likely to be of the order of 10-100 residential receptors within 20m of the site boundary.

A search of the DEFRA Magic website suggests there are no designated ecological sites in close proximity of the site, therefore ecological impacts are not considered relevant.

Available monitoring data along with estimated annual background concentrations for PM_{10} are below, and not close to exceeding the annual mean objective of 40µg/m^3, therefore the 'High' sensitivity category would be most appropriate.

5.1.5 Evaluation of Significance

The significance of impact of construction activities before mitigation is evaluated based on risk categories of each activity established in 5.1.3. From the Risk Categories identified and the sensitivity of the receptors (High sensitivity, as identified in Section 5.1.4), the significance of construction phase impacts before mitigation has been assessed as 'Moderate adverse' as identified in Table 5.3 below. Mitigation measures to reduce construction phase impacts are discussed in Section 6.

Table 5.2: Significance of Impacts of Construction Activities (Before Mitigation)

Source	Significance of Impacts	Evaluation of Impacts
Demolition	Moderate Adverse	High Risk Site, and High sensitivity of surrounding area
Earthworks	Moderate Adverse	High Risk Site, and High sensitivity of surrounding area
Construction	Moderate Adverse	High Risk Site and High sensitivity of surrounding area
Trackout	Moderate Adverse	Medium Risk Site, and High sensitivity of surrounding area
Overall Significance	**Moderate Adverse**	

5.2 Operational Phase - Exposure

The development site is not roadside to a major road and may be considered an urban background location.

Nevertheless, pollutant concentrations are likely to be elevated and, on the basis of air quality monitoring results from similar urban background locations discussed in Section 4.3, the site is likely to have experienced annual mean NO_2 concentrations in the range 29 µg/m^3 to 36 µg/m^3 and PM_{10} of approximately 21 µg/m^3, placing it in London Councils' APEC A or B for NO_2 and A for PM_{10}, for which air quality would not normally be expected to be a grounds for planning refusal.

It is widely recognised that ambient concentrations of NO_x, NO_2 and PM_{10} are not decreasing as was previously expected, but are often relatively stable. Therefore for a conservative assessment, it is assumed that the proposed development is likely to experience similar air quality in its opening year as the site has in 2009.

5.3 Operational Phase - Impacts

The development units are intended to be highly energy efficient, achieving Code for Sustainable Homes (CSH) level 4.

The proposed number of units is small (28) and therefore the proposed development will not generate significant road traffic/emissions. It is understood that maximum traffic generation is predicted by the traffic consultants for the scheme, to be of the order of 80 vehicle movements per day (5-8 vehicle movements in peak hours). Such an increase is not considered significant and therefore no further assessment of the potential impact of traffic emissions has been undertaken.

Table 5.4 reproduces guidance published by Environmental Protection UK concerning when a quantitative air quality assessment is likely to be required, and evaluates the proposed development in relation to each criterion.

Table 5.3: Significance of the Potential Operation Phase Impacts with Reference To Criteria Identified by Envrironmental Protection UK

Environmental Protection UK Criteria for Identifying Whether an Air Quality Assessment is Necessary	Evaluation of in relation to the proposed Re-development Site	Is a Detailed Air Quality Assessment likely to be Required?
Proposals that will give rise to a significant change in either traffic volumes, typically a change in annual average daily traffic (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 ±10 kph), or both, usually on a road with more than 10,000 AADT (5,000 if 'narrow and congested');	Increase in traffic is likely to be trivial n relation to existing traffic. - Vehicle speed is unlikely to change significantly (more than ±10 kph),though no speed data are available.	No
Proposals that would significantly alter the traffic composition on local roads, for instance, increase the number of HDVs by say 200 movements or more per day, due to the development of a bus station or an HGV park (professional judgement will be required, taking account of the total vehicle flow as well as the change);	The development is residential and significant HDV movements are not anticipated.	No
Proposals that include significant new car parking, which may be taken to be more than 100 spaces outside an AQMA or 50 spaces inside an AQMA. Account should also be taken of car park turnover, i.e. the difference between short-term and long-term parking, which will affect the traffic flows into and out of the car park. This should also include proposals for new coach or lorry parks. These criteria are designed to trigger the requirement for the assessment of traffic on the local roads. It may also be appropriate to assess the emissions from within the car park itself;	Approximately 20 car parking spacing are proposed at basement level	No
Developments which may significantly affect nitrogen deposition to sensitive habitats;	No significant nitrogen deposition to sensitive habitats is anticipated.	No

Environmental Protection UK Criteria for Identifying Whether an Air Quality Assessment is Necessary	Evaluation of in relation to the proposed Re-development Site	Is a Detailed Air Quality Assessment likely to be Required?
Introduction of new exposure close to existing sources of air pollutants, including road traffic, industrial operations, agricultural operations etc;	The proposed development is residential however monitored and estimated concentrations of NO_2 and PM_{10} are below annual mean objectives.	No
Consideration should be given to the impacts of centralised boilers or CHP plant burning other fuels (e.g. gas or oil) within or close to an AQMA. Proposals that include biomass boilers or biomass-fuelled CHP plant (there is no established criterion for the size of plant that might require assessment. Reference should be made to Environmental Protection UK's guidance on biomass);	No significant stationary combustion sources are proposed.	No
Proposals that could give rise to potentially significant impacts during construction for nearby sensitive locations, e.g. residential areas, areas with parked cars and commercial operations that may be sensitive to dust;	Proposed site considered to be 'High Risk' due to location and proximity to receptors. Assessed in section 5.	Yes
Large, long-term construction sites that would generate large HGV flows (>200 movements per day) over a period of a year or more.	Limit earthworks and construction, therefore Unlikely to generate a significant increase HDV traffic.	No
Proposals that will generate or increase traffic congestion, where 'congestion' manifests itself as an increase in periods with stop start driving;	No increase in congestion is anticipated.	No

Unlike the approved 16-unit reservoir scheme, no on site CHP (combined heat and power) unit is proposed for the new frontage development. It is understood that the residential units will have highly efficient, low NO_x gas condensing boilers. Solar photovoltaic (PV) panels are proposed. Significant building emissions are not therefore expected.

6. MITIGATION MEASURES

6.1 Construction phase

The dust emitting activities outlined in Section 5.1 can be effectively controlled by appropriate dust control/mitigation measures and any adverse effects can be greatly reduced or eliminated. Effective dust mitigation measures prevent dust becoming airborne or contain dust within enclosures to prevent dispersion beyond the emission source.

Prior to commencement of demolition/construction activities, agreement on the scope of an Environmental Management Plan (EMP) for the demolition/construction phase should be reached with LB Camden to ensure that the potential for adverse environmental effects on local receptors is minimised.

The EMP should include, among others, measures to control traffic routing, site access points and methods for controlling dust and general pollution nuisance from site operations. Controls should be applied throughout the demolition/construction period to ensure that dust emissions are mitigated. It is not anticipated that the EMP would be submitted in support of the application for planning permission, but its submission may be required by LB Camden as a planning condition.

Appropriate mitigation measures are anticipated to include:

- No fires to be permitted on site;
- Regular cleaning of hard-surfaced site entrance roads;
- Ensuring that dusty materials are stored and handled appropriately (e.g. wind shielding or complete enclosure, storage is away from site boundaries, drop heights of materials are minimised, water sprays are used where practicable to reduce dust emissions);
- Ensuring that dusty materials are transported appropriately (e.g. sheeting of vehicles carrying spoil and other dusty materials);
- Restricting vehicle speeds on haul roads and other unsurfaced areas of the site;
- Hoardings and gates to prevent dust breakout; and,
- Visual monitoring is included within site management practices to inform site management of the success of dust control measures used.

Furthermore, site-specific mitigation measures according to London Councils Best Practice Guidance should be implemented. Such measures are likely to include, but not necessarily be limited to:

- The identification of a responsible person on site for air quality;
- No idling vehicles;

- Wheel washing facilities;
- The use of damping on exposed friable surfaces;
- Planning of the site layout to locate dust activity away from sensitive receptors and minimise the movement of construction traffic around the site;
- Trained manager on site during working times to maintain logbook and site inspections and all site personnel to be fully trained;
- No site runoff of water/mud;
- If a concrete crusher is to be used, ensuring this has a permit to operate;
- Minimising earth-moving works other dust generating activities on dry windy days; and,

If contaminated soils are present, further dust control measures may be appropriate to limit emissions of these materials.

Overall, demolition/construction effects on air quality will be minimised through the implementation of mitigation measures through the EMP. This should significantly reduce the amount of dust that escapes the site boundary and additional dust measures may be employed where demolition/construction activities are in very close proximity to sensitive receptors. Any demolition/construction effects on air quality will be temporary (i.e. during the demolition/construction period only).

6.2 Operational phase

Guidance to mitigate air pollution exposure resulting from development is given by APPLE and the London Councils (Air Quality & Planning Guidance, 2007) and the Mayor of London (Sustainable Design and Construction, supplementary planning guidance issued in May 2006).

Mechanical ventilation will be employed to supply air to the individual dwellings. Heat Recovery will be incorporated into the Mechanical Ventilation.

The following mitigation measures are proposed:

- The proposed development is located at an urban background location, and will not expose future residents to poor air quality;
- The site is well served by public transport (rail and bus), and includes provision of cycle storage for each unit, minimising the need for private car use by future residents;
- Less than one car parking space per residential unit is provided, discouraging private car use by future residents;

- The development is intended to achieve Code for Sustainable Homes (CSH) Level 4 and will employ a number of measures aimed at reducing energy consumption and on/off site emissions, including:

    - The use of accredited/enhanced construction detail to minimise building emissions/ improve building fabric energy efficiency;

    - The use of renewable energy technologies, such as solar PV, to reduce CO_2 emissions;

    - The use of energy efficient space and security lighting/light fittings;

    - The utilisation of rainwater harvesting and sustainable urban drainage system(s); and,

    - The use of low NOx condensing gas boilers.

7. INTERPRETATION OF PREDICTED RESIDUAL IMPACTS WITH APPLE GUIDANCE

7.1 APPLE guidance

Referring to the APPLE guidance (Figure 4 and Table 3):

- The proposed development is located within an AQMA but is at an urban background location and is likely to experience air quality classifying it as APEC A or B in the anticipated opening year.

- The development is not predicted to interfere with or prevent implementation of measures in an Air Quality Management/Action Plan; and

- The development is unlikely to cause a significant worsening of air quality and includes a number of mitigation measures to minimise emissions.

- Although within the AQMA, the site is unlikely to experience air quality not meeting the objectives for LAQM, therefore the development is unlikely to introduce further exposure to poor air quality.

Therefore air quality is considered 'not a significant consideration' for the development scheme. Nevertheless, a number of measures aimed at minimising the development's energy demand and emissions to air are proposed, as outlined above in Section 6.2.

8. CONCLUSIONS

An air quality assessment has been prepared for a proposed residential development, including qualitative assessment of exposure and demolition/construction impacts.

The proposed development is at an urban background location and, based on monitoring data at other urban background locations in LB Camden, it is considered likely that the proposed development will not experience exceedence of the air quality objectives for LAQM in the anticipated opening year and will not therefore increase exposure of future residents to poor air quality.

The development is for a small number (28) of residential units and includes less than one vehicle parking space per unit and will not therefore generate significant road traffic. In discussion with LB Camden, it was considered unnecessary to model increased road traffic emissions associated with the development.

Domestic emissions from the development will be minimised by a number of features of the development including:

- The development will be sustainable, achieving CSH level 4;
- The use of accredited/enhanced construction detail to minimise building emissions/ improve building fabric energy efficiency;
- The use of renewable energy technologies, such as solar PV, to reduce CO_2 emissions;
- The use of energy efficient space and security lighting/light fittings;
- The utilisation of rainwater harvesting and sustainable urban drainage system(s); and,
- The use of low NOx condensing gas boilers.

Dust generation onsite during demolition/construction will be effectively controlled by the employment of an Environmental Management Plan. It is anticipated that a requirement for such a plan could be set as a planning condition.

Interpretation of the assessment results in light of APPLE guidance suggests that air quality is a low priority consideration for the proposed development. Nevertheless, appropriate mitigation will be put in place, as outlined above.

The development is not considered likely to result in increased exposure to existing poor air quality, and is intended to be highly sustainable, with measures to minimise its impact on air quality. Therefore it is considered that the development should not be opposed on air quality grounds.