ELYSIAN

RESIDENCES

13-15a Alderton Hill, Loughton

Air Quality Assessment

July 2018

wsp

13-15A ALDERTON HILL, LOUGHTON

AIR QUALITY ASSESSMENT

Elysian Loughton Site Limited

Confidential

Project no: 70034379
Date: July 2018

WSP
6 Devonshire Square
4th Floor
London
EC2M 4YE

Tel: +44 (020) 7337 1700
Fax: +44 (020) 7337 1701
www.wsp.com

QUALITY MANAGEMENT

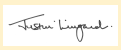
ISSUE/REVISION	FIRST ISSUE	REVISION 1	REVISION 2	REVISION 3
Remarks	Draft	Draft	Final	Final
Date	July 2017	September 2017	September 2017	July 2018
Prepared by	Tom Reade	Jorge Gomez	Jorge Gomez	Justin Lingard
Signature				 Lingard, Justin 2018.07.19 15:42:14 +01'00'
Checked by	Andy Talbot	Andy Talbot	Andy Talbot	Andy Talbot
Signature				 Talbot, Andy 2018.07.19 16:31:19 +01'00'
Authorised by	Andy Talbot	Andy Talbot	Andy Talbot	Andy Talbot
Signature				 Talbot, Andy 2018.07.19 16:31:43 +01'00'
Project number	70034379	70034379	70034379	70034379
Report number	01	01	01	01
File reference	\\uk.wspgroup.com\Central Data\Projects\700343xx\70034379 - Loughton Care Home\04 Design and Analysis\Air Quality\11 Report	\\uk.wspgroup.com\Central Data\Projects\700343xx\70034379 - Loughton Care Home\04 Design and Analysis\Air Quality\11 Report	\\uk.wspgroup.com\Central Data\Projects\700343xx\70034379 - Loughton Care Home\04 Design and Analysis\Air Quality\11 Report	\\uk.wspgroup.com\Central Data\Projects\700343xx\70034379 - Loughton Care Home\04 Design and Analysis\Air Quality\11 Report

TABLE OF CONTENTS

TABLES

APPENDICES

EXECUTIVE SUMMARY

An air quality assessment has been undertaken by WSP to support the planning application by Elysian Loughton Site Limited for 13-15A Alderton Hill, Loughton. The application is for the redevelopment of the site to create a new elderly housing development with integrated care facilities (use class C2) with supporting amenity facilities, landscaping, parking and associated ground works (the 'Proposed Development').

The air quality assessment has taken account of relevant legislation, policy and guidance. Baseline local air quality conditions have been reviewed and established as generally good. The impacts on local air quality due to emissions to air from activities during the construction and operational phases have been assessed. Mitigation has been recommended where appropriate.

The findings of the assessment are as follows:

1. The construction phase will result in pollutant emissions from activities at the Application Site and construction traffic. Without mitigation there will be low to medium risks to amenity at neighbouring premises due to dust soiling and human health due to fine particles known as PM_{10}. With appropriate industry best practice mitigation these risks will be minimised and the residual effects are not significant. Similarly, the residual effects of emissions of oxides of nitrogen (NOx) and PM_{10} from construction vehicles and plant on local air quality are not significant.
2. Once operational, the Proposed Development will give rise to additional traffic on the local road network. The changes in traffic have been screened according to established guidelines and do not meet the indicative requirements for air quality assessment. Air quality impacts due to operational traffic have been scoped out as insignificant.
3. Once operational, on-site natural gas boiler plant will emit NOx via a high level stack into the ambient air. A highly conservative assessment has been undertaken indicating negligible impacts at neighbouring receptors in-terms of the process contributions to annual mean nitrogen dioxide (NO_2) concentrations. Ambient annual mean NO_2 concentrations are nominally affected. The process contributions to 1-hour mean NO_2 concentrations have been determined to be insignificant and ambient concentrations remain well below the objective threshold. The residual effects on local air quality are not significant.
4. The Proposed Development includes an emergency standby power diesel generator installed to provide a secondary life-safety electrical supply, and will only run in emergency conditions when there is a power cut on the primary supply. A qualitative assessment has been undertaken and it is considered that a significant effect on local air quality is very unlikely. Nevertheless, to keep emissions of NOx and particulate matter from the generator to a practicable minimum, the plant should be certified to at least EU Stage IV emissions standards for non-road mobile machinery.

It is concluded that the air quality assessment demonstrates that the Proposed Development complies with national, regional and local policy for air quality.

1 INTRODUCTION

1.1.1 An air quality assessment has been undertaken by WSP to support the planning application by Elysian Loughton Site Limited for 13-15A Alderton Hill, Loughton (hereafter 'the Application Site'). The application is for the redevelopment of the site to create a new elderly housing development with integrated care facilities (use class C2) with supporting amenity facilities, landscaping, parking and associated ground works (hereafter the 'Proposed Development').

1.1.2 The Application Site lies within the administrative boundary of Epping Forest District Council (EFDC). The Application Site is located in an existing residential setting, and to south is a train line operated by London Underground. The proposals for the Application Site include a new C2 elderly housing development with integrated care facilities. An on-site energy centre is proposed including natural gas fired boiler units and an emergency backup electrical generator.

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

1.1.4 This report also considers the potential exposure of future residents of the Proposed Development.

1.1.5 A glossary of terms used in this report is provided in **Appendix A**. The Application Site is illustrated in **Figure 1**.

2 LEGISLATION, POLICY & GUIDANCE

2.1 AIR QUALITY LEGISLATION & POLICY

UK AIR QUALITY STRATEGY

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

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

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

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

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

2.1.6 The AQS contains a framework for considering the effects of a finer group of particles known as '$PM_{2.5}$' as there is increasing evidence that this size of particles can be more closely associated with observed adverse health effects than PM_{10}. Local Authorities are required to work towards reducing emissions/concentrations of particulate matter within their administrative area. However, there is no statutory objective given in the AQS for $PM_{2.5}$ at this time.

AIR QUALITY REGULATIONS

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

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

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

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

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

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

2.1.9 The Air Quality Standards (Amendment) Regulations 2016[4] transpose the European Union Ambient Air Quality Directive (2008/50/EC) into law in England. This Directive sets legally binding limit values for concentrations in outdoor air of major air pollutants that impact public health such as PM_{10}, $PM_{2.5}$ and NO_2. The limit values for NO_2 and PM_{10} are the same concentration levels as the relevant. AQS objectives and the limit value for $PM_{2.5}$ is a concentration of 25µg/m^3.

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

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

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

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

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

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

ENVIRONMENT ACT 1995

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

2.2 PLANNING POLICY

NATIONAL PLANNING POLICY

NATIONAL PLANNING POLICY FRAMEWORK

2.2.1 The Government's overall planning policies for England are described in the National Planning Policy Framework[5]. The core underpinning principle of the Framework is the presumption in favour of sustainable development, defined as:

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

[4] The Air Quality Standards (Amendment) Regulations 2016- Statutory Instrument 2016 No. 1184

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

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

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

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

LOCAL PLANNING POLICY

EPPING FOREST DISTRICT COUNCIL ADOPTED LOCAL PLAN

2.2.4 In this document[6], Policy RP5A states:

"The Council will not grant planning permission for:

- *Developments where it could cause excessive noise, vibration, or air, ground water or light pollution for neighbouring land uses, protected wildlife species and habitats; or*
- *Sensitive development such as housing (or other forms of residential occupations, including mobiles homes and caravans) hospitals or schools which could be subject to either excessive noise from adjoining land uses or traffic (road, rails and air), or other forms of adverse environmental conditions such as air pollution.*

Except where it is possible to mitigate the adverse effects by the imposition of appropriate conditions."

[6] Epping Forest District Council Local Plan (1998) and Alterations (2006). Published February 2008.

2.2.5 Epping Forest District Council have published a new local plan[7] outlining the Council's aspirations up to 2033. Draft Policy DM 22 (Air Quality) states:

"A. The Council will seek to ensure that the District is protected from the impacts of air pollution. Potential air pollution risks will need to be properly considered and adequate mitigation included in the design of new development to ensure neither future, nor existing residents, workers, visitors, or environmental receptors including the Epping Forest SAC are adversely impacted as a result of the development.

B. Mitigation measures required will be determined by the scale of development, its location, the potential to cause air pollution, and the presence of sensitive receptors in the locality.

C. Larger proposals or those that have potential to produce air pollution, will be required to undertake an air quality assessment that identifies the potential impact of the development, together with, where appropriate, contributions towards air quality monitoring. Assessments shall identify mitigation that will address any deterioration in air quality as a result of the development, having taken into account other permitted developments, and these measures shall be incorporated into the development proposals. This will include an assessment of emissions (including from traffic generation) and calculation of the cost of the development to the environment. All assessments for air quality shall be undertaken by competent persons."

2.3 GUIDANCE

LOCAL AIR QUALITY MANAGEMENT REVIEW AND ASSESSMENT TECHNICAL GUIDANCE

2.3.1 The Department for Environment, Food and Rural Affairs (Defra) has published technical guidance for use by local authorities outside of their London Boroughs in their review and assessment work[8]. This guidance, referred to in this document as LAQM.TG16, has been used with respect to the methodology used in the assessment of operational phase impacts.

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

2.3.2 Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) have published guidance[9] that offers comprehensive advice on: when an air quality assessment may be required; what should be included in an assessment; how to determine the significance of any air quality impacts associated with a development; and, the possible mitigation measures that may be implemented to minimise these impacts.

GUIDANCE ON THE ASSESSMENT OF DUST FROM DEMOLITION AND CONSTRUCTION

2.3.3 This document[10] published by the IAQM was produced to provide guidance to developers, consultants and environmental health officers on how to assess the impacts arising from

[7] Epping Forest District Council (2017). Epping Forest District Council's Local Plan (Submission Version December 2017). Available at: http://www.efdclocalplan.org/wp-content/uploads/2018/03/EB114-Epping-Forest-District-Local-Plan-Submission-Version-2017.pdf.

[8] DEFRA (2016) Part IV The Environment Act 1995 and Environment (Northern Ireland) Order 2002 Part III, Local Air Quality Management Technical Guidance LAQM.TG16

[9] Environmental Protection UK and Institute of Air Quality Management (Version 1.2 Updated January 2017). Land Use Planning & Development Control: Planning for Air Quality

[10] Institute of Air Quality Management (Version 1.1 Updated June 2016). Guidance on the Assessment of Dust from Demolition and Construction

construction activities. The emphasis of the methodology is on classifying sites according to the risk of impacts (in terms of dust nuisance, PM_{10} impacts on public exposure and impact upon sensitive ecological receptors) and to identify mitigation measures appropriate to the level of risk identified.

NATIONAL PLANNING PRACTICE GUIDANCE – AIR QUALITY

2.3.4 This guidance[11] provides a number of guiding principles on how the planning process can take into account the impact of new development on air quality, and explains how much detail air quality assessments need to include for proposed developments, and how impacts on air quality can be mitigated. It also provides information on how air quality is taken into account by Local Authorities in both the wider planning context of Local Plans and neighbourhood planning, and in individual cases where air quality is a consideration in a planning decision.

ENVIRONMENT AGENCY: RISK ASSESSMENTS FOR SPECIFIC ACTIVITIES: ENVIRONMENTAL PERMITS

2.3.5 The Air Emissions section[12] of this Environment Agency Guidance has been referred to in the assessment of emissions to air from the proposed energy centre.

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

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

3 SCOPE & METHODOLOGY

3.1 SCOPE

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

- à Consultation with the Environmental Health Officer (EHO) at EFDC to agree the scope of the assessment and the methodology to be applied; and
- à Review of EFDC's latest review and assessment reports[13] and air quality data for the area surrounding the Application Site, including data from EFDC, Defra[14], the Environment Agency (EA)[15], the Essex Air quality Network[16] and the London Atmospheric Emissions Inventory (LAEI)[17], which extends to the vicinity of the Application Site;
- à Desk study to confirm the locations of nearby existing receptors that may be sensitive to changes in local air quality, and a review of the masterplan for the Proposed Development to establish the location of new sensitive receptors;
- à Review of the traffic data provided by WSP (Transport Consultant); and
- à Review of the emission data for the proposed energy centre as supplied by Hoare Lea (Energy Consultant).

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

- à Dust and particulate matter generated by on-site activities during the construction phase;
- à Increases in pollutant concentrations as a result of exhaust emissions arising from construction traffic and plant;
- à Changes in pollutant concentrations as a result of exhaust emissions arising from operational traffic associated with the Proposed Development; and
- à Increases in pollutant concentrations as a result of emissions to air from the on-site energy centre in-combination with other sources.

3.1.3 In addition, the potential exposure of future residents of the Proposed Development to poor air quality has been considered.

3.2 METHODOLOGY

CONSTRUCTION PHASE

3.2.1 Dust comprises particles typically in the size range 1-75 micrometres (µm) in aerodynamic diameter and is created through the action of crushing and abrasive forces on materials. The

[13] Epping Forest District Council. Annual Summary Report (2016).

[14] DEFRA Local Air Quality Management (LAQM) Support Pages. Available at: http://laqm.defra.gov.uk/. Accessed on 10.07.2017

[15] http://maps.environmentagency.gov.uk/wiyby/wiybyController?x=357683&y=355134&scale=1&layerGroups=default&ep=map&textonly=off&lang=_e&topic=airpollution. Accessed on 10.07.2017

[16] Essex Air Quality Network. Available at: http://www.essexair.org.uk/. Accessed on 10.07.2017

[17] The Greater London Authority (GLA), London Atmospheric Emissions Inventory (LAEI). Available at: https://data.london.gov.uk/air-quality/. Accessed on 10.07.2017

larger dust particles fall out of the atmosphere quickly after initial release and therefore tend to be deposited in close proximity to the source of emission. Dust therefore, is unlikely to cause long-term or widespread changes to local air quality; however, its deposition on property and cars can cause 'soiling' and discolouration. This may result in complaints of nuisance through amenity loss or perceived damage caused, which is usually temporary.

3.2.2 The smaller particles of dust (less than 10µm in aerodynamic diameter) are known as particulate matter (PM_{10}) and represent only a small proportion of total dust released; this includes a finer fraction, known as $PM_{2.5}$ (with an aerodynamic diameter less than 2.5µm). As these particles are at the smaller end of the size range of dust particles they remain suspended in the atmosphere for a longer period of time than the larger dust particles, and can therefore be transported by wind over a wider area. PM_{10} and $PM_{2.5}$ are small enough to be drawn into the lungs during breathing, which in sensitive members of the public could have a potential impact on health.

3.2.3 An assessment of the likely significant impacts on local air quality due to the generation and dispersion of dust and PM_{10} during the construction phase has been undertaken with reference to IAQM guidance, the available information for this phase of the Proposed Development provided by the Client and Project Team, and professional judgement.

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

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

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

OPERATIONAL PHASE

3.2.6 Of the pollutants included in the AQS, concentrations of NO_2 and particulate matter (PM_{10} and $PM_{2.5}$) have been considered in this assessment as these are the main pollutants of concern in urban locations. Road traffic emissions are a key source of these pollutants with relatively nominal contributions of other AQS pollutants. Emissions from heating and energy plant can also substantially contribute to ambient concentrations of these pollutants.

ROAD TRAFFIC SOURCES

3.2.7 The EPUK/IAQM planning guidance gives the following indicative criteria for determining when an air quality assessment may be required:

- A change of light duty vehicle (LDV) flows of:

- more than 100 annual average daily traffic (AADT) flows within or adjacent to an AQMA; and
- more than 500 AADT elsewhere.

- A change of heavy duty vehicle (HDV) flows of:
  - more than 25 AADT within or adjacent to an AQMA; and
  - more than 100 AADT elsewhere.

3.2.8 Furthermore, the traffic data has been screened against the criteria in the Design Manual for Roads and Bridges to determine whether a an assessment is required to consider the impact of the Proposed Development on the Epping Forest Special Area of Conservation (SAC) and Site of Scientific Special Interest (SSSI). The criteria are:

- Road alignment will change by 5 m or more; or
- Daily traffic flows will change by 1,000 AADT or more; or
- HDV flows will change by 200 AADT or more; or
- Daily average speed will change by 10 km/hr or more; or
- Peak hour speed will change by 20 km/hr or more.

3.2.9 **Table 1** gives the additional traffic flows generated by the Proposed Development at the point of access/egress. It is clear that none of the criteria indicating the need for assessment are met. Air quality impacts to changes in traffic have therefore been scoped out of the assessment.

Table 1: Changes in Two-Way AADT Flows

PARAMETER	CHANGE	MEETS EPUK/IAQM CRITERION?	MEETS DMRB CRITERION?
Total AADT	195	-	No
LDV	189	No	-
HDV	6 (3.1%)	No	No

ON-SITE COMBUSTION SOURCES

3.2.10 The Energy Centre Consultant has advised that 3 natural gas boiler units will be installed on-site. For assessment purposes it has been assumed that the 2 of the 3 boilers are operating at 100% load at any one time with 1 unit as back-up. In reality, continuous boiler operations are unlikely and so this is a worst-case assumption. The combined NOx emission rate is 26.1mg/s which exceeds the threshold of 5mg/s in EPUK/IAQM guidance indicating the need for assessment.

3.2.11 An emergency standby power (ESP) diesel generator will also be installed to provide a secondary life-safety electrical supply, and will only run in emergency conditions when there is a power cut on the primary supply. The flue for the generator will run in the same riser as the boiler flue, to the same height. Operational information and emissions data for the ESP diesel generator were not available to enable quantitative assessment. A qualitative assessment of the potential impacts on long- and short- term NO_2, PM_{10} and $PM_{2.5}$ concentrations has therefore been undertaken.

3.2.12 Impacts due to the emissions arising from the operation of the proposed on-site boiler plant have been assessed using advanced dispersion model ADMS 5.2 (v5.2.0.0). The model uses detailed information regarding the pollutant releases, local building effects and local meteorological conditions to predict pollution concentrations at specific locations selected by the user. The locations of the flue stack and modelled buildings are shown in **Figure 2**. Details of assumptions for model parameters are provided **Appendix D**.

3.2.13 The process contribution (PC) of emissions to air from the gas fired boilers to total annual mean NO_x concentrations has been predicted by ADMS 5.2, along with the 99.79th percentile of hourly mean concentrations. The predicted NO_x PCs have been converted to NO_2 assuming 70% for long-term emissions and 35% for short-term emissions, as set out in a guidance note published by the Environment Agency[18].

3.2.14 The total NO_2 concentrations - or the predicted environmental concentration (PEC) - at each receptor point is calculated as follows:

- à Long-term: PEC = PC + Background Concentration
- à Short-term: $PEC_{short\ term} = PC_{short\ term} + (2 \times Background_{long\ term})$.

3.2.15 For this assessment the LAEI modelled concentrations for 2013 have been assumed as the 'background' component[19]. This approach ensures that all other existing sources in the local and wider area are accounted for in the assessment.

3.2.16 The $PEC_{short\ term}$ is comparable with the objective level of 200µg/m^3 expressed as the 99.79th percentile of hourly mean concentrations. Concentrations that exceed 200µg/m^3 indicate non-compliance with the 1-hour objective (i.e. that there are more than 18 hours in the year where the 1-hour mean concentration exceeds 200µg/m^3).

3.2.17 The predicted concentrations have been compared against the relevant AQS objective levels as set out in **Appendix B**.

3.2.18 SENSITIVE RECEPTORS

3.2.19 Defra provides guidance in locations where air quality objectives should apply (**Table 2**). This guidance has been used in the selection of receptors with likely relevant exposure to pollutant concentrations.

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

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

[18] Environment Agency'. Air Quality Modelling and Assessment Units, 'Conversions Ratios for NO_x and NO_2'

[19] The LAEI model output is over a regular receptor grid with 20 x 20 m resolution.

	expected to spend one hour or more. Any outdoor locations where members of the public might reasonably expected to spend one hour or longer.	
15-minute mean	All locations where members of the public might reasonably be exposed for a period of 15 minutes or longer.	

3.2.20 Specific receptor locations have not been modelling in this assessment. Instead, concentrations have been predicted over a regular receptor grid at 20 x 20 m resolution to enable combination with baseline data from the LAEI model. The grids have been modelled at 1.5m and 15m height to reflect concentrations at ground level at average breathing height and at 4th floor level at the Proposed Development.

3.2.21 **Figure 2** shows the extent of the receptor grid.

3.3 SIGNIFICANCE CRITERIA

CONSTRUCTION PHASE

3.3.1 For the construction stage, IAQM guidance regarding determination of a significant effect has been followed, where:

- *"IAQM recommends that significance is only assigned to the effect after considering the construction activity with mitigation. It is, therefore, important that the mitigation measures are defined in a form suitable for implementation by way of a planning condition or legal obligation within a section 106 agreement, and are included in a DMP or a more general Code of Construction Practice or Construction Environmental Management Plan."*
- *"For almost all construction activity, the aim should be to prevent significant effects on receptors through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be 'not significant'."*

OPERATIONAL PHASE

3.3.2 The Environment Agency's Air Emissions risk assessment guidance sets out the levels at which process contributions (contributions to concentrations from energy centre emissions) can be screened out as being insignificant. The process contribution (PC) can be considered insignificant if:

- The long-term PC is <1% of the long-term environmental standard (for NO_2 <0.4µg/m^3);
- The short-term PC is <10% of the short-term environmental standard (for NO_2 <20µg/m^3).

3.3.3 Where the PC exceeds these thresholds, it is necessary to compare the PEC against the relevant statutory and guideline air quality standards, by combining the PC with appropriate baseline data.

3.3.4 Impacts have been described in accordance with EPUK & IAQM guidance, impact descriptors are given in **Table 3**). This guidance has been followed to determine whether or not local air quality impacts are likely to give rise to a significant effect, which may be adverse or beneficial.

Table 3: Impact Descriptors for Individual Receptors

Long term average concentration at receptors in assessment year	% Change in Concentration Relative to Air Quality Assessment Level (AQAL)			
	1	2-5	6-10	>10
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76-94% AQAL	Negligible	Slight	Moderate	Moderate

LONG TERM AVERAGE CONCENTRATION AT RECEPTORS IN ASSESSMENT YEAR	% CHANGE IN CONCENTRATION RELATIVE TO AIR QUALITY ASSESSMENT LEVEL (AQAL)			
	1	2-5	6-10	>10
95-102% of AQAL	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial

Notes
AQAL = Air Quality Assessment Level, which for this assessment related to the UK Air Quality Strategy objectives.

Where the %change in concentrations is <0.5%, the change is described as 'Negligible' regardless of the concentration.

When defining the concentration as a percentage of the AQAL, 'without scheme' concentration should be used where there is a decrease in pollutant concentration and the 'with scheme;' concentration where there is an increase.

Where concentrations increase, the impact is described as adverse, and where it decreases as beneficial.

3.3.5 In determining whether or not an effect is significant the following have been considered:

- The magnitude of each change in ambient pollutant concentration at each receptor (i.e. the impact as given by the impact descriptors);
- The existing and future air quality in the absence of the Proposed Development;
- The extent of current population exposure to the impacts; and
- The influence and validity of any assumptions adopted when undertaking the prediction of impacts.

3.4 LIMITATIONS & ASSUMPTIONS

3.4.1 As suitable information for the construction phase of the Proposed Development was not available professional judgement has been used in the completion of this part of the assessment.

3.4.2 It is assumed that the traffic data provided by the Transport Consultant are both reasonable and accurate.

3.4.3 There are uncertainties associated with both measured and predicted concentrations. The model (ADMS 5.2) used in this assessment relies on input data, which also have uncertainties associated with them. The model itself simplifies complex physical systems into a range of algorithms. In addition, local micro-climatic conditions that the models will not take into account as they are beyond the resolution of the model algorithms may affect the concentrations of pollutants.

3.4.4 It has been assumed that baseline local air quality for the operational phase assessment is no better than in 2013. This is a conservative assumption as DEFRA and GLA predicts concentrations in future years to be lower.

3.4.5 It is assumed that the energy centre data provided by the Energy Consultant are both reasonable and accurate. In the absence of detailed information, it has been assumed that two boilers will operate 24 hours per day, 365 days per year at 100% load. This is a highly conservative assumption as in reality boilers are only likely to be operational for limited periods each day.

3.4.6 Due to insufficient available detail it has not been possible to quantify the potential impacts from the ESP diesel generator. Instead, a qualitative assessment has been undertaken based on the limited available details and professional judgement.

4 BASELINE CONDITIONS

4.1 EFDC'S REVIEW & ASSESSMENT OF AIR QUALITY

4.1.1 EFDC has declared one AQMA in the district for exceedances of the NO_2 annual mean objective at the junction of Theydon Road and Epping High Road, Epping. The Application Site is not within or near an AQMA.

4.1.2 EFDC has five measures aimed at improving air quality within its jurisdiction, these are:

- à Environmental permitting inspections;
- à Enhanced particulate controls on biomass boilers;
- à Update the Essex Air website regularly;
- à Fleet vehicle standards for CO_2 (i.e. promoting low emission transport); and
- à Natural capital asset check with a focus on air quality.

4.2 LOCAL EMISSION SOURCES

4.2.1 The Application Site is located in an area where air quality is mainly influenced by emissions from road traffic on nearby roads including Alderton Hill and Roding Road. There is a train line located to the south of the Proposed Development; however this line is electrified and is operated by London Underground for the Central Line.

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

4.3 LOCAL AUTHORITY AIR QUALITY MONITORING DATA

4.3.1 EFDC has NO_2 monitoring data for 25 locations between 2011 and 2015. Five of these sites are within Loughton, all at roadside along the A121. These sites are shown in **Figure 3**. The annual mean concentrations are presented in **Table 4**.

Table 4: Local Authority Air Quality Monitoring Data

ID	Site Name	Site Type	Annual Mean NO_2 Concentration (µg/m^3)				
			2011	2012	2013	2014	2015
1	Chigwell: Hainault Road	Kerbside	35	34	36	35	39
2	Epping: 15 High Street	Urban Background	28	30	30	31	25
3	Epping: Bell Vue	Roadside	**64**	**57**	**65**	**63**	**45**
4	Epping: Ladbrokes	Roadside	37	38	35	36	34
5	Epping: Superdrug	Roadside	39	**43**	**43**	**42**	36
6	Hastingwood: Canes Cottages	Urban Background	27	28	28	26	16
7	Loughton: 2 Church Hill	Roadside	36	38	38	35	28
8	Loughton: 72 Church Hill	Roadside	29	30	29	28	26
9	Loughton: 249 High Road	Roadside	38	36	38	38	32
10	Loughton: 252 High Road	Roadside	**40**	39	**40**	38	34

ID	Site Name	Site Type	Annual Mean NO_2 Concentration ($\mu g/m^3$)				
			2011	2012	2013	2014	2015
11	Loughton: Goldings Hill	Roadside	36	35	38	37	**45**
12	North Weald: Tempest Mead	Urban Background	0	0	0	20	19
13	Roydon: High Street	Roadside	24	25	29	25	22
14	Roydon: Netherhall Lane	Urban Background	20	17	21	21	21
15	Sewardstone: Albion Terrace	Roadside	32	39	**40**	33	27
16	Waltham Abbey: 13 The Elms	Urban Background	31	34	36	32	32
17	Waltham Abbey: 15 The Elms	Urban Background	34	34	35	30	30
18	Waltham Abbey: Abbeyview	Urban Background	33	32	32	28	23
19	Waltham Abbey: Burrows Chase	Urban Background	29	28	31	27	25
20	Waltham Abbey: Hayden Road	Urban Background	30	32	34	31	29
21	Waltham Abbey: Howse Road	Urban Background	30	32	33	29	29
22	Waltham Abbey: Lodge Lane	Roadside	38	37	32	30	28
23	Waltham Abbey: Roundhills	Urban Background	0	0	0	34	24
24	Ongar: Marks Avenue	Urban Background	0	0	0	19	19
25	North Weald: Pike Way	Urban Background	0	0	0	19	18

4.3.2 In general, concentrations are compliant with the AQS objective between 2011 and 2015. There are a small number of exceedances measured across the five year monitoring period at sites 3, 5, 10, 11 and 15. In 2015, only two sites (sites 3 and 11) remain above the AQS objective for NO_2, these locations are defined as 'roadside' where elevated concentrations might be expected.

4.3.3 The closest diffusion tube monitoring locations to the Application Site are 7, 8, 9, 10 and 11, all of which are defined as 'roadside' locations. Measured NO_2 concentrations at sites 7, 8 and 9 are well below the AQS objective between 2011 and 2015. Site 10 exceeds the AQS objective in 2011 and 2013 but is well below the objective in 2012, 2014 and 2015. Site 11 is below the AQS objective between 2011 and 2014; however in 2015 it measured an annual mean NO_2 concentration of $45\mu g/m^3$ which exceeds the AQS objective.

4.4 LAEI BASELINE CONCENTRATIONS

4.4.1 The LAEI provides modelled air pollutant concentrations across Greater London and much of the surrounding area bounded by the M25, including Loughton. Annual mean pollutant concentrations are estimated for the years 2013, 2020, 2025 and 2030.

4.4.2 **Figure 4A**, **Figure 4B** and **Figure 4C** shows baseline annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations respectively for 2013. With the exception of the A121 High Road, where annual mean NO_2 concentrations at roadside are most likely to have been just above the AQS $40\mu g/m^3$ objective, concentrations of all pollutants away from the kerbside are likely to been below AQS objectives. Concentrations of all pollutants in the immediate vicinity of the Application Site are shown as relatively low and well below AQS objectives.

4.4.3 The LAEI models for future year include assumptions regarding emissions reductions that are expected to be brought about by legislation, policy and technological improvements. **Figure 4D**, **Figure 4E** indicates that by 2020 baseline NO_2 concentrations will have reduced slightly, most noticeably at roadside on the A121 High Road where exceedances of the AQS objective for annual mean NO_2 are only likely very close to kerbside in the vicinity of a few road junctions including with Old Station Road. Figures for PM_{10} and $PM_{2.5}$ in 2020 are not provided as there are no discernible differences in the illustrations to those given by **Figure 4B** and **Figure 4C**.

5 ASSESSMENT OF IMPACTS

5.1 CONSTRUCTION PHASE

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

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

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

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

ASSESSMENT OF POTENTIAL DUST EMISSION MAGNITUDE

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

DEMOLITION

5.1.4 Total volume of buildings to be demolished on site is estimated to be between 20,000m^3 and 50,000m^3, with potentially dusty construction material, and with demolition activities occurring between 10 and 20m above ground level. Therefore, the potential dust emission magnitude is considered to be **medium** for demolition activities.

EARTHWORKS

5.1.5 The total area of the Application Site is more than 10,000m^2, the soil type is clay and therefore potentially dusty, and the total material that will be moved is estimated to be less than 100,000 tonnes. It is also estimated that more than 10 heavy earth moving vehicles will be active at any one time. Therefore, the potential dust emission magnitude is considered to be **medium** for earthwork activities

CONSTRUCTION

5.1.6 The total volume of buildings to be constructed on the Application Site is will be less than 25,000m^3 with construction materials being used having a low potential for releasing dust. Therefore, the potential dust emission magnitude is considered to be **small** for construction activities.

TRACKOUT

5.1.7 Information on the number of HDVs associated with this phase of the Proposed Development is not available and therefore professional judgement has been used. It has been assumed that given the size of the development area there are likely to be between 10 and 50 HDV outward movements in any one day, travelling over unpaved roads within the Application Site of between 50-100m. It is considered that the potential dust emission magnitude of is **medium** for trackout.

5.1.8 **Table 5** provides a summary of the potential dust emission magnitude determined for each construction activity considered.

Table 5: Potential Dust Emission Magnitude

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

ASSESSMENT OF SENSITIVITY OF THE STUDY AREA

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

5.1.10 Under low wind speed conditions, it is likely that the majority of dust would be deposited in the area immediately surrounding the source. In the vicinity of the Application Site and along the roads likely to be used by construction traffic there are a number of existing residential dwellings.

5.1.11 There are no ecological receptors within 50m of the Application Site or within 50m of roads to be used by construction vehicles, up to 500m from the Application Site access, therefore ecological receptors have not been considered further in this assessment.

5.1.12 Taking the above into account and following the IAQM assessment methodology, the sensitivity of the area to changes in dust and PM_{10} has been derived for each of the construction activities considered. The results are shown in **Table 6**.

Table 6: Sensitivity of the Study Area

POTENTIAL IMPACT	SENSITIVITY OF THE SURROUNDING AREA			
	DEMOLITION	EARTHWORKS	CONSTRUCTION	TRACKOUT
Dust Soiling	Medium	Medium	Medium	Medium
Human Health	Low	Low	Low	Low
Ecological	N/A	N/A	N/A	N/A

5.1.13 The sensitivity of the surrounding area is considered to be of medium sensitivity.

RISK OF IMPACTS

5.1.14 The predicted dust emission magnitude has been combined with the defined sensitivity of the area to determine the risk of impacts during the construction phase, prior to mitigation. **Table 7** below provides a summary of the risk of dust impacts for the Proposed Development. The risk category identified for each construction activity has been used to determine the level of mitigation required.

Table 7: Summary Dust Risk Table to Define Site Specific Mitigation

POTENTIAL IMPACT	RISK			
	DEMOLITION	EARTHWORKS	CONSTRUCTION	TRACKOUT
Dust Soiling	Medium Risk	Medium Risk	Low Risk	Low Risk
Human Health	Low Risk	Low Risk	Negligible	Medium Risk
Ecological	N/A	N/A	N/A	N/A

CONSTRUCTION VEHICLES & PLANT

5.1.15 The greatest impact on air quality due to emissions from vehicles and plant associated with the construction phase will be in the areas immediately adjacent to the Application Site access. It is anticipated that construction traffic will access the Application Site via Alderton Hill. Due to the size of the Application Site, it is considered likely that the construction traffic will be low in comparison to the existing traffic flows on these roads.

5.1.16 Final details of the exact plant and equipment likely to be used during the construction phase will be determined by the appointed contractor, it is considered likely to comprise dump trucks, tracked excavators, diesel generators, asphalt spreaders, rollers, compressors and trucks. The number of plant and their location are likely to be variable over the construction period.

5.1.17 Based on the current local air quality in the area, the proximity of sensitive receptors to the roads likely to be used by construction vehicles, the impacts are therefore considered to range from slight adverse to negligible without the implementation of mitigation.

5.2 OPERATIONAL PHASE

BOILER EMISSIONS

5.2.1 The dispersion of NOx emissions from boiler operation has been modelled to determine annual and 1-hour (99.79th percentile) mean concentrations of NO_2 at 1.5m as average breathing height at ground floor level and at 15m as representing exposure at 4th floor level at the Proposed Development.

5.2.2 It is important to note that the modelling assumptions are highly conservative with the assumption that 2 boilers will be in continuous operation at 100% load. In reality it is very likely that there will be substantial periods during most days when one or both boilers will not be operating and emissions will cease or be much reduced. The impacts predicted in this assessment must be considered to be very much worst-case.

5.2.3 The results of the modelling have been interpolated to a 5 x 5 m receptor grid resolution using the Kriging method as incorporated in the ADMS Mapper tool. Gridded PC's of annual mean NO_2 concentrations are illustrated in **Figure 5**. 1-hour mean (99.79th percentile) concentrations are illustrated in **Figure 6**. Gridded PEC's of annual mean NO_2 are illustrated in **Figure 7**.

5.2.4 The highest annual mean PC's occur in the immediate vicinity of the Proposed Development. The maximum concentration of 1.33µg/m^3 occurs at 15m height at the north façade of building 1 (**Figure 5**). The annual mean PC's at Roding Valley High School on Alderton Road is less than 0.1µg/m^3 indicating negligible impact according to EPUK & IAQM guidance. The annual mean PC's is less than 0.3µg/m^3 at residential properties on Alterton Road. The maximum PC beyond the boundary of the Application Site is 0.75µg/m^3; this occurs to the southwest, in the vicinity of the railway where there is no relevant exposure.

5.2.5 1-hour mean PC's, which are illustrated in **Figure 6**, are less than 10% of the 200µg/m^3 objective threshold at all locations and as such, following EA guidance, can be considered to be insignificant. The maximum $PEC_{short\ term}$ is 89.3µg/m^3, which is well below the objective threshold.

5.2.6 **Figure 7** illustrates that total annual mean NO_2 concentrations at all relevant receptor locations remain below the AQS objective level with the Proposed Development with very little change from baseline conditions. Where PC's are indicated to be 1 or 2% of the AQS objective the total annual mean NO_2 concentrations remain below 30µg/m^3 (assuming 2013 baseline conditions) and so any impacts are negligible.

5.2.7 It is considered highly unlikely that the impacts of emissions from boiler operations will give rise to a significant effect.

ESP DIESEL GENERATOR EMISSIONS

5.2.8 The ESP diesel generator will only be used in emergency conditions when there is a power cut on the primary supply. Such events are not routine or predictable.

5.2.9 Emissions from the diesel generator will be of NOx, PM_{10} and $PM_{2.5}$. The exhaust gases will be released at the same high level point as the exhaust from the boiler flues (shown in **Figure 2**). The ESP generator exhaust gas is likely to be substantially hotter than that from the boilers. This will result in a more buoyant plume which will enhance initial dispersion. The efflux velocity from the ESP generator exhaust is also likely to be greater than that for the boilers which will also enhance initial dispersion.

5.2.10 When operational, the generator could emit more NOx than the two boiler units operating together at 100% load over the same time period; however, given the likely infrequency of operations it is considered very likely that impacts on annual mean concentrations of all pollutants will be negligible. The greatest risk of adverse impact will be in relation to 1-hour mean NO_2 concentrations; however, given the likely low 1-hour mean concentrations at the Application Site and in the surrounding area it is considered that the risk of an adverse impact occurring is low and no greater than when the Proposed Development is in the construction phase with non-road mobile machinery will also be in operation. A significant effect on local air quality is considered very unlikely.

6 MITIGATION & RESIDUAL EFFECTS

6.1 CONSTRUCTION PHASE

6.1.1 Based on the assessment results, mitigation will be required. Recommended mitigation measures which are in accordance with industry best practice are given below.

GENERAL COMMUNICATION

- à A stakeholder communications plan that includes community engagement before work commences on site should be developed and implemented.
- à The name and contact details of person(s) accountable for air quality and dust issues should be displayed on the site boundary. This may be the environment manager/engineer or the site manager. The head or regional office contact information should also be displayed.

GENERAL DUST MANAGEMENT

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

SITE MANAGEMENT

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

MONITORING

- à Daily on-site and off-site inspections should be undertaken, where receptors (including roads) are nearby to monitor dust. The inspection results should be recorded and made available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of site boundary, with cleaning to be provided if necessary.
- à Regular site inspections to monitor compliance with the DMP should be carried out, inspection results recorded, and an inspection log made available to the local authority when asked.
- à The frequency of site inspections should be increased when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
- à Dust deposition, dust flux, or real-time PM_{10} continuous monitoring locations should be agreed with the Local Authority. Where possible baseline monitoring should start at least three months before work commences on site or, if it a large site, before work on a phase commences.

PREPARING AND MAINTAINING THE SITE

- à Plan the site layout so that machinery and dust causing activities are located away from receptors, as far as is practicable.

- Where practicable, erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
- Where practicable, fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.
- Avoid site runoff of water or mud.
- Keep site fencing, barriers and scaffolding clean using wet methods.
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover appropriately.
- Where practicable, cover, seed or fence stockpiles to prevent wind whipping. Operating vehicle/machinery and sustainable travel
- Ensure all vehicle operators switch off engines when stationary - no idling vehicles.
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.
- A Construction Logistics Plan should be produced to manage the sustainable delivery of goods and materials.

OPERATIONS

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
- Use enclosed chutes and conveyors and covered skips.
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
- Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

WASTE MANAGEMENT

- Avoid bonfires and burning of waste materials.

MEASURES SPECIFIC TO DEMOLITION

- Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.
- Avoid explosive blasting, using appropriate manual or mechanical alternatives.
- Bag and remove any biological debris or damp down such material before demolition.

MEASURES SPECIFIC TO EARTHWORKS

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

- à Where practicable, stockpiles of soils and materials should be located as far as possible from sensitive properties, taking account of the prevailing wind direction.
- à During dry or windy weather, material stockpiles and exposed surfaces should be dampened down using a water spray to minimise the potential for wind pick-up.

MEASURES SPECIFIC TO CONSTRUCTION

- à Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
- à For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.
- à All construction plant and equipment should be maintained in good working order and not left running when not in use.

MEASURES SPECIFIC TO TRACKOUT

- à Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being in frequent use.
- à Avoid dry sweeping of large areas.
- à Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- à Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
- à Record all inspections of haul routes and any subsequent action in a site log book.
- à Where practicable, hard surfaced haul routes should be installed, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
- à Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
- à Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
- à Access gates to be located at least 10m from receptors where possible.

RESIDUAL EFFECTS

6.1.2 The residual effects of dust and PM_{10} generated by construction activities following the application of the mitigation measures described above and good site practice is not significant.

6.1.3 The residual effects of emissions to air from construction vehicles and plant on local air quality are not significant.

6.2 OPERATIONAL PHASE

MITIGATION

6.2.1 The changes in NOx concentrations attributable to the energy centre gas boilers are negligible and no specific mitigation should be required.

6.2.2 To keep emissions of NOx and particulate matter from the ESP diesel generator to a practicable minimum, the plant should be certified to at least EU Stage IV emissions standards for non-road mobile machinery.

RESIDUAL EFFECTS

6.2.3 The residual effects of the operational phase of the Proposed Development on local air quality are not significant.

7 CONCLUSIONS

7.1.1 An air quality assessment for the Proposed Development has been undertaken for the Proposed Development. The assessment has taken account of relevant legislation, policy and guidance. Baseline local air quality conditions have been reviewed and established as generally good. The impacts on local air quality due to emissions to air from activities during the construction and operational phases have been assessed. Mitigation has been recommended where appropriate.

7.1.2 The findings of the assessment are as follows:

1. The construction phase will result in pollutant emissions from activities at the Application Site and construction traffic. Without mitigation there will be low to medium risks to amenity at neighbouring premises due to dust soiling and human health due to PM_{10}. With appropriate industry best practice mitigation these risks will be minimised and the residual effects are not significant. Similarly, the residual effects of emissions of NOx and PM_{10} from construction vehicles and plant on local air quality are not significant.
2. Once operational, the Proposed Development will give rise to additional traffic on the local road network. The changes in traffic have been screened according to established guidelines and do not meet the indicative requirements for air quality assessment. Air quality impacts due to operational traffic have been scoped out as insignificant.
3. Once operational, on-site natural gas boiler plant will emit NOx via a high level stack into the ambient air. A highly conservative assessment has been undertaken indicating negligible impacts at neighbouring receptors in-terms of PC's to annual mean NO_2 concentrations. Ambient annual mean NO_2 concentrations are nominally affected. The PC's to 1-hour mean NO_2 concentrations have been determined to be insignificant and ambient concentrations remain well below the objective threshold. The residual effects on local air quality are not significant.
4. The Proposed Development includes an emergency standby power diesel generator installed to provide a secondary life-safety electrical supply, and will only run in emergency conditions when there is a power cut on the primary supply. A qualitative assessment has been undertaken and it is considered that a significant effect on local air quality is very unlikely. Nevertheless, to keep emissions of NOx and particulate matter from the generator to a practicable minimum, the plant should be certified to at least EU Stage IV emissions standards for non-road mobile machinery.

7.1.3 It is concluded that the air quality assessment demonstrates that the Proposed Development complies with national, regional and local policy for air quality.

FIGURES & APPENDICES

Appendix A

GLOSSARY

TERM	DEFINITION
AADT Annual Average Daily Traffic	A daily total traffic flow (24 hrs), expressed as a mean daily flow across all 365 days of the year.
Accuracy	A measure of how well a set of data fits the true value.
Air quality objective	Policy target generally expressed as a maximum ambient concentration to be achieved, either without exception or with a permitted number of exceedances within a specific timescale (see also air quality standard).
Air quality standard	The concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. The standards are based on the assessment of the effects of each pollutant on human health including the effects on sensitive sub groups (see also air quality objective).
Ambient air	Outdoor air in the troposphere, excluding workplace air.
Annual mean	The average (mean) of the concentrations measured for each pollutant for one year.
AQMA	Air Quality Management Area.
DEFRA	Department for Environment, Food and Rural Affairs.
Dust	Dust comprises particles typically in the size range 1-75 micrometres (µm) in aerodynamic diameter and is created through the action of crushing and abrasive forces on materials
Exceedance	A period of time where the concentrations of a pollutant is greater than the appropriate air quality standard.
HDV/HGV	Heavy Duty Vehicle/Heavy Goods Vehicle.
LAQM	Local Air Quality Management.
NO_2	Nitrogen dioxide.
NO_x	Nitrogen oxides.
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10 micrometres.
$PM_{2.5}$	Particulate matter with an aerodynamic diameter of less than 2.5 micrometres.
Trackout	The transport of dust and dirt from the construction / demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network. This arises when heavy duty vehicles (HDVs) leave the construction / demolition site with dusty materials, which may then spill onto the road, and/or when HDVs transfer dust and dirt onto the road having travelled over muddy ground on site.
µg/m^3 (micrograms per cubic metre)	A measure of concentration in terms of mass per unit volume. A concentration of 1µg/m^3 means that one cubic metre of air contains one microgram (millionth of a gram) of pollutant.

Appendix B

RELEVANT UK AIR QUALITY STRATEGY OBJECTIVES

National Air Quality Objectives and European Directive Limit Values for the protection of human health						
Pollutant	Applies to	Objective	Measured as	Date to be achieved by and maintained thereafter	European Obligations	Date to be achieved by and maintained thereafter
Nitrogen dioxide (NO_2)	UK	200µg/m^3 not to be exceeded more than 18 times a year	1 hour mean	31.12.2005	200µg/m^3 not to be exceeded more than 18 times a year	01.01.2010
	UK	40µg/m^3	annual mean	31.12.2005	40µg/m^3	01.01.2010
Particulate Matter (PM_{10}) (gravimetric)[A]	UK (except Scotland)	40µg/m^3	annual mean	31.12.2004	40µg/m^3	01.01.2005
	UK (except Scotland)	50µg/m^3 not to be exceeded more than 35 times a year	24 hour mean	31.12.2004	50µg/m^3 not to be exceeded more than 35 times a year	01.01.2005
Particulate Matter ($PM_{2.5}$)	UK (except Scotland)	25µg/m^3	annual mean	2020	Target value 25µg/m^3	2010

[A] Measured using the European gravimetric transfer sampler or equivalent

µg/m^3 = microgram per cubic metre

Appendix C

IAQM CONSTRUCTION ASSESSMENT METHODOLOGY

STEP 1 – SCREENING THE NEED FOR A DETAILED ASSESSMENT

An assessment will normally be required where there are:

- à 'human receptors' within 350m of the site boundary; or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s); and/or
- à 'ecological receptors' within 50m of the site boundary; or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s).

Where the need for a more detailed assessment is screened out, it can be concluded that the level of risk is "negligible".

STEP 2A – DEFINE THE POTENTIAL DUST EMISSION MAGNITUDE

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

Table 2A: Examples of Human Receptor Sensitivity to Construction Phase Impacts

DUST EMISSION MAGNITUDE	ACTIVITY
Large	**Demolition** >50,000m^3 building demolished, dusty material (e.g. concrete), on-site crushing/screening, demolition >20m above ground level
	Earthworks >10,000m^2 site area, dusty soil type (e.g. clay), >10 earth moving vehicles active simultaneously, >8m high bunds formed, >100,000 tonnes material moved
	Construction >100,000m^3 building volume, on site concrete batching, sandblasting
	Trackout >50 HDVs out / day, dusty surface material (e.g. clay), >100m unpaved roads
Medium	**Demolition** 20,000 - 50,000m^3 building demolished, dusty material (e.g. concrete) 10-20m above ground level
	Earthworks 2,500 - 10,000m^2 site area, moderately dusty soil (e.g. silt), 5-10 earth moving vehicles active simultaneously, 4m - 8m high bunds, 20,000 -100,000 tonnes material moved
	Construction 25,000 - 100,000m^3 building volume, dusty material e.g. concrete, on site concrete batching
	Trackout 10 - 50 HDVs out / day, moderately dusty surface material (e.g. clay), 50 -100m unpaved roads
Small	**Demolition** <20,000m^3 building demolished, non-dusty material (e.g metal cladding), <10m above ground level,

Dust Emission Magnitude	Activity
	work during wetter months
	Earthworks <2,500m^2 site area, soil with large grain size (e.g. sand), <5 earth moving vehicles active simultaneously, <4m high bunds, <20,000 tonnes material moved, earthworks during wetter months
	Construction <25,000m^3, non-dusty material (e.g. metal cladding or timber)
	Trackout <10 HDVs out / day, non-dusty soil, < 50m unpaved roads

STEP 2B – DEFINE THE SENSITIVITY OF THE AREA

The tables below present the IAQM assessment methodology to determine the sensitivity of the area to dust soiling, human health and ecological impacts respectively. The IAQM guidance provides guidance to allow the sensitivity of individual receptors to dust soiling and health effects to assist in the assessment of the overall sensitivity of the study area.

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

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

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

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

Table 2Bc: Sensitivity of the Area to Ecological Impacts

Receptor Sensitivity	Distance from the Sources (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

STEP 2C – DEFINE THE RISK OF IMPACTS

The dust emissions magnitude determined at Step 2A should be combined with the sensitivity of the area determined at Step 2B to determine the risk of impacts without mitigation applied. For those cases where the risk category is 'negligible' no mitigation measures beyond those required by legislation will be required.

Table 2C: Risk of Dust Impacts

Sensitivity of surrounding area	Dust Emission Magnitude		
	Large	Medium	Small
Demolition			
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible
Earthworks and Construction			
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible
Trackout			
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

STEP 3 –SITE SPECIFIC MITIGATION

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

STEP 4 – DETERMINE SIGNIFICANT EFFECTS

Once the risk of dust impacts has been determined in Step 2C and the appropriate dust mitigation measures identified in Step 3, the final step is to determine whether there are significant effects arising from the construction phase. For almost all construction activities, the application of effective mitigation should prevent any significant effects occurring to sensitive receptors and therefore the residual effect will normally be negligible.

Appendix D

ENERGY CENTRE MODEL PARAMETERS

Building Parameters

Building Number	Building Type	Location X (m)	Location Y (m)	Height (m)	Width (m)	Length (m)	Roof orientation (degrees)	Diameter (m)
1 (main)	Rectangular	542542	195748.1	17.5	21.13	61.4	63.74	---
2	Rectangular	542509.9	195773	15	51.77	25.13	63.97	---
3	Rectangular	542532.5	195796	15	23.32	35.47	63.51	---

Notes: Building representation in ADMS is simplistic

Source Parameters

Source Parameter	
Stack Location(s) (X,Y)	542524,195741
Stack Height (m)	19.8
Stack diameter (m)	0.6
Release temperature (ºC)	69
Release velocity (m/s)	5.08
NOx emission rate (mg/s)	26.1
Time-varying sources data	Not available

Notes: Hovel UltraGas 1700D natural gas boilers x3 with 2 in operation at 100% load at any one time. Stack height assumed to be 2.3m above roof top level of main building.

Site Parameters

Site Parameter	
Latitude (degrees)	51.64
Surface Roughness (m)	0.5 (same value applied to dispersion site and met site)
Monin-Obukhov Length (m)	30 (100 applied at met site)

Notes: Meteorological data from London Heathrow Airport for 2013.

Appendix E

WINDROSE

WIND ROSE FOR LONDON HEATHROW - 2013