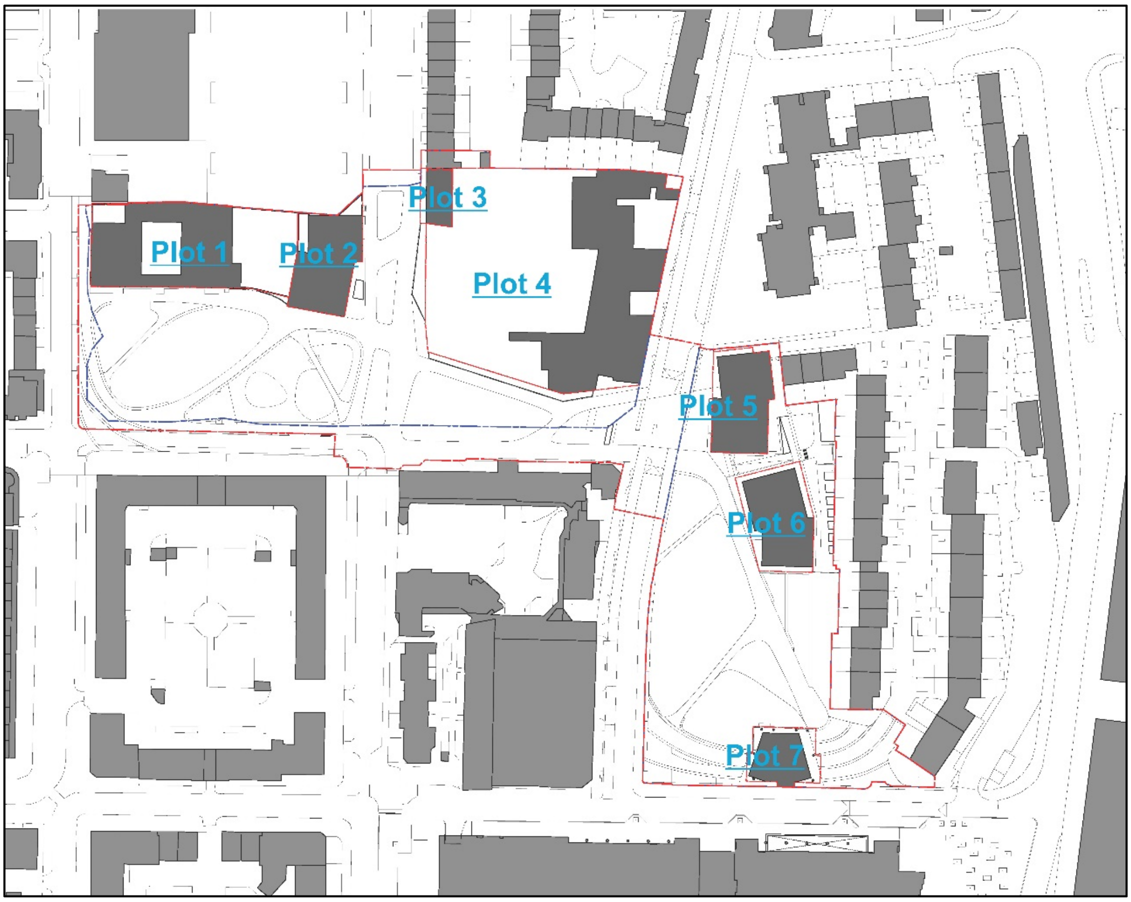
- Plot 5: Purchese Street Housing North and Community Hall - 20 no. residential units over a replacement community hall (Use Class D1) (approximately 211sq.m);
- Plot 6: Purchese Street Housing South - 14 no. residential units; and
- Plot 7: Brill Place Tower - 54 no. residential units over flexible A1/A2/A3/D1 floorspace at ground level (approximately 70sq.m).

In addition, the Proposed Development would provide 11,760 sqm of public open space along with associated highways works and landscaping.

The Red Line Boundary encompassing the Proposed Development is shown in Figure 2-3, with the plot locations identified on Figure 2-4.

**Figure 2-3: Red Line Boundary**

**Figure 2-4 Plot Locations**



# 3. POLICY CONTEXT

## 3.1 International Legislation and Policy

EU Directive 2008/50/EC[4] on ambient air quality and cleaner air for Europe (the CAFE directive) sets out the ambient air quality standards for $NO_2$ and $PM_{10}$, to be achieved by 1st January 2010 and 2005 respectively. The Air Quality Standards Regulations 2010[5] implements the requirements of the Directive into UK legislation.

The Directive contains a series of limit values for the protection of human health and critical levels for the protection of vegetation.

Compliance with the EU Limit Values is mandatory. However, Member States can apply for a time extension for compliance, subject to approval of an action plan by the European Commission. The UK Government applied in autumn 2011 for a time extension for compliance with the $NO_2$ limit values until 2015 for a number of areas throughout England. However, the UK Government withdrew its application for those zones where compliance is not expected until after 2015, which included central London.

In September 2015, the Department for the Environment, Food and Rural Affairs on behalf of the UK Government produced new Draft Plans for consultation to improve air quality in the UK in order to meet the EU targets in the shortest possible time. An overview document has been produced[6], together with detailed plans for 31 zones where air quality is not predicted to meet the objective in 2013. The plan for the Greater London Area[7] sets out a range of measures to reduce $NO_2$ concentrations and indicates that with these measures air quality in London will be compliant by 2025.

## 3.2 Local Air Quality Management

Part IV of the Environment Act 1995[8], requires the UK Government to publish an Air Quality Strategy and local authorities to review, assess and manage air quality within their areas. This is known as Local Air Quality Management (LAQM).

The 2007 Air Quality Strategy[9] establishes the policy for ambient air quality in the UK. It includes the National Air Quality Objectives (NAQOs) for the protection of human health and vegetation for 11 pollutants. Those NAQOs included as part of LAQM are prescribed in the Air Quality (England) Regulations 2000[10] and the Air Quality (Amendment) (England) Regulations 2002[11]. Table 3-1 presents the NAQOs for $NO_2$ and $PM_{10}$ the two pollutants of most importance in urban areas.

The Air Quality Strategy also introduced a new policy framework for tackling fine particles ($PM_{2.5}$) including an exposure reduction target. This pollutant is not included within LAQM, and therefore has not been considered further in this assessment.

The NAQOs apply to external air where there is relevant exposure to the public over the associated averaging periods within each objective. Guidance is provided within Local Air Quality

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[4] Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe (2008), OJ I. 1521.

[5] The Air Quality Standards Regulations, 2010. SI 2010 No. 1001.

[6] Department for Environment, Food and Rural Affairs, September 2015, Draft Plans to improve air quality in the UK, Tackling nitrogen dioxide in our towns and cities

[7] Department for Environment, Food and Rural Affairs, September 2015, Draft Air Quality Plan for the achievement of EU air quality limit value for nitrogen dioxide (NO2) in Greater London Urban Area (UK0001)

[8] Secretary of State, 1995. The Environment Act part IV Air Quality, HMSO.

[9] Department for Environment, Food and Rural Affairs, 2007. Air Quality Strategy for England, Scotland, Wales and Northern Ireland.

[10] The Air Quality (England) Regulations (2000), SI 2000 No. 928.

[11] The Air Quality (England) (Amendment) Regulations (2002), SI 2002 No. 3043.

Management Technical Guidance 2009 (LAQM.TG (09))[12] issued by Defra for Local Authorities, on where the NAQOs apply as detailed in Table 3-2. The objectives do not apply in workplace locations, to internal air or where people are unlikely to be regularly exposed (i.e. centre of roadways).

**Table 3-1: Objectives included in the Air Quality Regulations (England) 2000 for the Purpose of Local Air Quality Management**

| Pollutant | Concentrations | Measured As | Date to be achieved by |
|---|---|---|---|
| **Nitrogen Dioxide ($NO_2$)** | 200 µg/m$^3$ not to be exceeded more than 18 times per year | 1 hour mean | 31 December 2005 |
| | 40 µg/m$^3$ | Annual mean | 31 December 2005 |
| **Particles ($PM_{10}$)** | 50 µg/m$^3$ not to be exceeded more than 35 times per year | 24 hour mean | 31 December 2004 |
| | 40 µg/m$^3$ | Annual mean | 31 December 2004 |

**Table 3-2: Locations Where Air Quality Objectives 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.<br>Building façades of residential properties, schools, hospitals, libraries etc. | Building façades of offices or other places of work where members of the public do not have regular access.<br>Gardens of residential properties. Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term |
| **24 hour mean** | All locations where the annual mean objective would apply.<br>Gardens of residential properties | Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term. |
| **1 hour mean** | All locations where the annual mean and 24 hour mean objectives apply.<br>Kerbside Sites (e.g. pavements of busy shopping streets).<br>Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where the public might reasonably be expected to spend 1-hour or more. Any outdoor locations where the public might reasonably be expected to spend 1-hour or longer. | Kerbside sites where the public would not be expected to have regular access. |

[12] Department for Environment, Food and Rural Affairs, 2009. Local Air Quality Management Technical Guidance LAQM.TG(09).

It should be noted that the EU Limit Values are numerically the same as the NAQO values but differ in terms of compliance dates, locations where they apply and legal responsibility. The compliance date for the $NO_2$ Limit Values is 1st January 2010, which is five years later than the date for the NAQO.

The Limit Values are mandatory whereas the NAQOs are policy objectives. Local authorities are not required to achieve them, but have to work towards their achievement. In addition, the Limit Values apply in all locations except: where members of the public do not have access and there is no fixed habitation; on factory premises or at industrial installations; and on the carriageway/central reservation of roads except where there is normally pedestrian access.

Where a local authority's review and assessment of its air quality identifies that air quality is likely to exceed the NAQOs, it must designate these areas as Air Quality Management Areas (AQMA) and draw up an Air Quality Action Plan (AQAP) setting out measures to reduce pollutant concentrations with the aim of meeting the NAQOs.

The LBC latest AQAP for 2013 to 2015[13] has the following overarching aims;

- continue to meet the EU objectives for Carbon Monoxide, Sulphur Dioxide, Benzene, 1,3-Butadiene, Lead and $PM_{10}$;
- continue to reduce concentrations of $PM_{10}$; and
- to meet the EU Objective for $NO_2$.

The plan includes the following key objectives to:

- encourage reductions in fossil fuel use, the adoption of clean fuels and technology and promote energy efficiency;
- raise awareness about air quality in Camden and promote lifestyle changes which can help reduce levels of air pollution and exposure to air pollution;
- improve the health and well-being of the local population;
- work in partnership with national and regional bodies, and with local public and private organisations, to foster improvements in air quality;
- lead by example and reduce $NO_2$ and $PM_{10}$ emissions associated with the Council's own buildings and transport services; and
- ensure actions which serve to reduce $NO_2$ and $PM_{10}$ emissions complement actions to mitigate $CO_2$ emissions, and vice-versa.

## 3.3 Planning Policy

### 3.3.1 National Planning Policy Framework, 2012

The National Planning Policy Framework (NPPF)[14] published in March 2012 sets out the Government's planning policies for England. Planning policy requires that applications for planning permission must be determined in accordance with the development plan, unless material considerations indicate otherwise.

The NPPF is a material consideration in planning decisions. It states that the purpose of the planning system is to contribute to the achievement of sustainable development; and that planning decisions on individual applications must reflect relevant EU obligations and statutory requirements. Specifically, in terms of air quality, it requires the planning system to prevent

[13] London Borough of Camden, Camden's Clean Air Action Plan 2013-2015

[14] Department for Communities and Local Government, March 2012, National Planning Policy Framework

development from contributing to, or being put at unacceptable risk from unacceptable levels of air pollution.

Planning policies should promote compliance with or contribute towards achievement of EU limit values and NAQOs, taking into account the presence of AQMAs and the cumulative impacts on air quality from individual sites in local areas.

Planning decisions should ensure that new development within an AQMA is consistent with the Local Air Quality Action Plan.

The NPPF is supported by a series of Planning Practice Guidance. The guidance[15] in relation to air quality provides guiding principles on how planning can take account of the impact of new development on air quality.

3.3.2 The London Plan, 2015 - The Spatial Development Strategy for London Consolidated with Alterations since 2011

The following policies of the London Plan[16] are of relevance to this assessment:

- Policy '5.3 - Sustainable design and construction' which states that development proposals should demonstrate that sustainable design standards are integral to the proposal, including its construction and operation, and ensure that they are considered at the beginning of the design process. Major development proposals should meet the minimum standards outlined in the Mayor's supplementary planning guidance and this should be clearly demonstrated within a design and access statement. The standards include measures to achieve other policies in this Plan and the following sustainable design principles:
  - "*minimising carbon dioxide emissions across the site, including the building and services (such as heating and cooling systems);*
  - *avoiding internal overheating and contributing to the urban heat island effect;*
  - *efficient use of natural resources (including water), including making the most of natural systems both within and around buildings; and*
  - *minimising pollution (including noise, air and urban run-off)".*
- Policy '7.14 - Improving air quality' which states that development proposals should:
  - *"minimise increased exposure to existing poor air quality and make provision to address local problems of air quality (particularly within AQMAs and where development is likely to be used by large numbers of those particularly vulnerable to poor air quality (such as children or older people) such as by design solutions, buffer zones or steps to promote greater use of sustainable transport modes through travel plans (see Policy 6.3);*
  - *promote sustainable design and construction to reduce emissions from the demolition and construction of buildings following the best practice guidance in the GLA and London Councils' 'The control of dust and emissions from construction and demolition'; be at least 'air quality neutral' and not lead to further deterioration of existing poor air quality (such as areas designated as AQMAs;*
  - *ensure that where provision needs to be made to reduce emissions from a development, this is usually made on-site. Where it can be demonstrated that on-site provision is impractical or inappropriate, and that it is possible to put in place measures having clearly demonstrated equivalent air quality benefits, planning obligations or planning conditions should be used as appropriate to ensure this, whether on a scheme by scheme basis or through joint area-based approaches; and*

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[15] http://planningguidance.planningportal.gov.uk/blog/guidance/air-quality/

[16] Greater London Authority, March 2015. The London Plan Spatial Development Strategy for Greater London consolidated with alterations since 2011. London. GLA.

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

### 3.3.3 Clearing the Air - The Mayor's Air Quality Strategy, 2010

The Mayor of London has set out a detailed air quality strategy[17] for Greater London in order to deliver the required reductions in $PM_{10}$ and $NO_2$ concentrations to meet the EU limits. The policies and measures within the strategy are divided into transport and non-transport measures. With regard to the Proposed Development the key policies are as follows:

- Policy '6 - Reducing emissions from construction and demolition sites' which states that the Mayor will work with the London Council to review and update the Best Practice guidance for construction and demolition sites and create supplementary planning guidance to assist implementation;
- Policy '7 - Using the planning process to improve air quality - new developments in London as a minimum shall be 'air quality neutral' which states that the Mayor will encourage boroughs to require emissions assessments to be carried out alongside conventional air quality assessments. Where air quality impacts are predicted to arise from developments these will have to be offset by developer contributions and mitigation measures secured through planning conditions, section 106 agreements or the Community Infrastructure Levy;
- Policy '8 - Maximising the air quality benefits of low to zero carbon energy supply' which states that the Mayor will apply emission limits for both PM and $NO_x$ for new biomass boilers and $NO_x$ emission limits for Combined Heat and Power plant (CHP). Air quality assessments will be required for all developments proposing biomass boilers or CHPs and operators will be required to provide evidence yearly to demonstrate compliance with the emission limits; and
- Policy '9 - Energy efficient buildings' which states that the Mayor will set $CO_2$ reduction targets for new developments which will be achieved using the Mayor's Energy Hierarchy. These measures will result in reductions of $NO_x$ emissions.

### 3.3.4 Sustainable Design and Construction Supplementary Planning Guidance, 2014

The Sustainable Design and Construction Supplementary Planning Guidance was published 2014[18]. The following guidance on air quality is provided in Section 4:

- Developers should design schemes to be air quality neutral;
- Developments should be designed to minimise the generation of air pollutants;
- Developments should be designed to minimise exposure to poor air quality;
- Energy plant, including boilers and CHP plant should meet the relevant emission limits; and
- Developers and contractors should follow the relevant guidance on minimising impacts from construction and demolition.

The SPG states that where developers are unable to meet the 'air quality neutral' benchmark, consideration should be given to off-site $NO_x$ and $PM_{10}$ abatement measures.

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[17] Greater London Authority, 2010. Clearing the Air - The Mayors London Air Quality Strategy. London. GLA

[18] Greater London Authority, 2014. Sustainable Design and Construction Draft Supplementary Planning Guidance. London. GLA. Institute of Air Quality Management, 2014, Guidance on the assessment of dust from demolition and construction.

3.3.5 Mayor of London Supplementary Planning Guidance, the Control of Dust and Emissions from Construction and Demolition, 2014

This guidance[19] updates the previous London Council's guidance to control dust and emissions from construction and demolition activities by identifying appropriate levels of mitigation. The methodology proposed and mitigation outlined is broadly in line with that provided by the Institute for Air Quality Management (IAQM), which is discussed in further detail below.

3.3.6 Camden Development Policies 2010-2025, Local Development Framework

There are three development policies contained within LBC Local Development Framework[20] which are relevant to air quality:

- *Policy DP22* - Promoting sustainable design and construction, requires development to incorporate sustainable design and construction measures to be resilient to climate change and to reduce air pollution.
- *Policy DP26* - Managing the impact of development on occupiers and neighbours states that planning permission will only be granted for development that does not cause harm to amenity. Factors that would be considered as potentially impacting amenity include emissions of odour, fumes and dust.
- *Policy DP32* - Air quality and Camden's Clear Zone, states that the council will require an air quality assessment for all development which could potentially cause significant harm to air quality, and that mitigation measures will be expected in developments that are located in areas of poor air quality.

3.3.7 Draft Camden Local Plan 2015

The Camden Local Plan 2015[21] will replace the Council's current Core Strategy and Development Policies (adopted in 2010). The Local Plan will cover the period from 2016-2031.

- *Policy CC2 Adapting to Climate Change* –LBC will require developments to be resilient to climate change, ensuring that schemes include appropriate climate change adaptation measures and promote sustainable design and construction to reduce potential impacts on air quality.
- *Policy CC4 Air Quality* – LBC will take into account the impact of air quality when assessing development proposals, through the consideration of both the exposure of occupants to air pollution and the effect of a development on air quality. Consideration must be taken to the actions identified in the Council's AQAP.
- *Policy T1 Prioritising walking, cycling and public transport* – LBC will promote sustainable transport by prioritising walking and cycling and public transport in the borough, with the aim of relieving transport congestion, deteriorating air quality and emissions, particularly in the context of a growing population.

The Council will take into account the impact of air quality when assessing development proposals, through the consideration of both the exposure of occupants to air pollution and the effect of a development on air quality. Consideration must be taken to the actions identified in the Council's Air Quality Action Plan.

Air Quality Assessments (AQAs) are required where development is likely to expose residents to high levels of air pollution. Where the AQA shows that a development would cause harm to air

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19 Greater London Authority, 2014. The Control of Dust and Emissions During Construction and Demolition, Supplementary Planning Guidance.

20 London Borough of Camden, 2010, Camden Development Policies 2010-2025, Local Development Framework.

21 London Borough of Camden, 2015, Local Plan, Draft.

quality, the Council will not grant planning permission unless mitigation measures are adopted to reduce the impact to acceptable levels. Similarly, developments in locations of poor air quality will not be acceptable unless designed to mitigate the impact to within acceptable limits.

Development which involves significant demolition, construction or earthworks will also be required to assess the risk of impacts in an AQA and include appropriate mitigation measures to be secured in a Construction Management Plan.

The Council will only grant planning permission for development in Camden's Clear Zone region that significantly increases travel demand where it considers that appropriate measures to minimise the transport impact of development are incorporated.

## 3.4 Other Guidance

### 3.4.1 Environmental Protection UK and Institute of Air Quality Management Guidance

EPUK together with the IAQM has produced guidance[22] on how air quality impacts should be assessed within the land-use planning and development control process. This guidance provides clear criteria to determine when a detailed air quality assessment is required and a methodology for assessing the significance of air quality effects.

### 3.4.2 Institute of Air Quality Management Guidance

The IAQM has produced 'Guidance on the assessment of dust from demolition and construction'[23] to assist in the assessment of air quality impacts from construction activities. This guidance provides a consistent methodology for assessing the risks of dust impacts from demolition and construction activities and for identifying the correct level of mitigation which should be applied to avoid significant air quality effects.

### 3.4.3 Odour Legislation

The main legislation that relates to odour is concerned with statutory nuisance; this is contained within Part III of the Environmental Protection Act (EPA) 1990 (as amended by the Noise and Statutory Nuisance Act 1993) and allows local authorities and individuals to take action to prevent a statutory nuisance. Section 79 of the EPA defines, amongst other things, smoke, fumes, dust and smells emitted from industrial, trade or business premises so as to be prejudicial to health or a nuisance, as a potential statutory nuisance.

[22] Institute of Air Quality Management (IAQM) and Environmental Protection UK, 2015, Land-Use Planning & Development Control: Planning for Air Quality

[23] Institute of Air Quality Management, 2014, Guidance on the assessment of dust from demolition and construction.

# 4. METHODOLOGY

## 4.1 Introduction

As discussed in Section 1.2, the Proposed Development is not expected to generate significant emissions of air pollutants. The development would be car free with no additional car parking provided on-Site, thus the Proposed Development would not introduce a significant number of new vehicle movements. All new buildings would obtain heating and hot water from the Phoenix Court DHP and thus on-Site emissions from energy centre plant would be negligible.

As such the main focus of the assessment is to determine the suitability of the air quality at the Site for the receptors that would be introduced by the Proposed Development. There are a number of existing and proposed pollutant sources that have the potential to impact air quality at the Proposed Development including the following:

- Existing background and baseline concentrations;
- Road traffic emissions;
- Railway emissions from St Pancras Station;
- Energy Centre plant emissions from Phoenix Court DHP and the FCI; and
- Odour, emergency generator and other emissions from the FCI.

Each of these sources are discussed separately below.

## 4.2 Existing Background and Baseline Concentrations

In order to predict baseline air quality at the Site and in the vicinity of the Site, relevant monitoring data was reviewed and assessed. Data was obtained from the following sources:

- LBC monitoring data; and
- Defra predicted background pollution maps.

No additional Site specific air quality monitoring was carried out.

## 4.3 Road Traffic Emissions

Road traffic is typically the main source of air pollutant at low levels in urban environments in particular with regard to $NO_2$. High concentration in excess of the annual mean air quality objective of 40 µg/m$^3$ are frequently recorded next to the main roads within London. However, concentrations fall off rapidly away from the roadside and therefore in order to predict concentrations across the Site the ADMS Roads model was run for the existing situation to predict ground level air quality concentrations across the Site.

ADMS Roads incorporates Defra's emissions rates from the Emission Factor Toolkit (version 6.0.2), and is used to predict roadside concentrations of $NO_X$. The predicted concentrations of $NO_x$ have then been converted to total $NO_2$ using the LAQM calculator on the Defra air quality website to allow comparison with the NAQO.

The traffic data used within the modelling is provided in Table 4-1 and was obtained from the Department for Transport count point database and the applicants transport consultant Civic Engineers.

**Table 4-1: Road Traffic Data**

| Source | Link Name | AADT All Vehicle | % HGV | Speed (kph) | Road Width (m) |
|---|---|---|---|---|---|
| Civic Engineers | Purchese Street N | 421 | 4% | 24 | 6.5 |

| Source | Link Name | AADT All Vehicle | % HGV | Speed (kph) | Road Width (m) |
|---|---|---|---|---|---|
| Civic Engineers | Purchese Street S | 374 | 5% | 24 | 6 |
| Civic Engineers | Brill Place E | 406 | 10% | 24 | 6 |
| Civic Engineers | Brill Place W | 63 | 41% | 16 | 6 |
| Civic Engineers | Ossulston Street N | 526 | 5% | 32 | 4.5 |
| Civic Engineers | Ossulston Street S | 980 | 4% | 32 | 5.5 |
| Civic Engineers | Phoenix Road E | 750 | 5% | 24 | 6 |
| Civic Engineers | Phoenix Road W | 1,080 | 5% | 32 | 7.5 |
| Civic Engineers | Polygon Road E | 532 | 4% | 24 | 4.5 |
| Civic Engineers | Polygon Road W | 629 | 4% | 32 | 6 |
| Civic Engineers | Chalton Street N | 366 | 3% | 32 | 6.5 |
| Civic Engineers | Chalton Street CN | 394 | 3% | 32 | 6 |
| Civic Engineers | Chalton Street CS | 433 | 4% | 32 | 6.5 |
| Civic Engineers | Chalton Street S | 961 | 4% | 32 | 6.5 |
| Civic Engineers | Aldenham Street | 201 | 3% | 32 | 5.5 |
| DfT CP | Caledonian Road | 7,342 | 22% | 48 | 9 |
| DfT CP | Wharfdale Road | 9,899 | 16% | 24 | 4.5 |
| DfT CP | Camden Road | 27,880 | 8% | 16 | 11 |
| DfT CP | Camden Street | 16,669 | 12% | 32 | 12 |
| DfT CP | A5202 + Midland* | 5,359 | 8% | 16 | 8 |
| DfT CP | Euston Road W | 51,116 | 11% | 32 | 18 |
| DfT CP | Euston Road E | 51,116 | 11% | 16 | 24 |

AADT: Annual Average Daily Traffic

HGV: Heavy Goods Vehicle

Note speeds were reduced at junctions.

*An additional link parallel to Midland Road was included to account for the taxi rank; assumed 480 AADT at 5 kph.

### 4.3.1 Roads Modelling Verification

Predicted 2014 existing concentrations were compared with measured data from five monitoring sites located in close proximity to the Site (as shown in Figure 5-1) to determine whether the model results required adjustment to more accurately reflect local air quality.

Dispersion modelling results should be within 25 % of monitored concentrations, ideally within 10 %. The results are provided in Table 4-2. The comparison of monitored and modelled concentrations indicated that the ADMS Roads model tended to under predict concentrations at all monitoring sites. To ensure a conservative approach it was considered appropriate to adjust the results using the methodology given in LAQM.TG(09). An adjustment factor of 3.08 was calculated and applied to the results. With the use of this adjustment factor the percentage difference between the modelled and monitored results is 25 % or less at all locations.

**Table 4-2: Model Verification**

| Monitor | Modelled Roadside $NO_x$ µg/m³ | Modelled Total $NO_2$ µg/m³ | Monitored $NO_2$ µg/m³ | % Difference Modelled to Monitored $NO_2$ | Total $NO_2$ after adjustment µg/m³ | % Difference in $NO_2$ after adjustment |
|---|---|---|---|---|---|---|
| DT Brill Place | 3.8 | 36.1 | 52.3 | -31.0 | 39.5 | -24.5 |
| DT Caledonian Rd | 12.8 | 40.7 | 51.0 | -20.1 | 51.0 | 0.0 |
| DT Euston Rd | 50.6 | 60.2 | 89.7 | -32.9 | 89.4 | -0.3 |
| Auto Euston Rd | 52.5 | 57.5 | 98.0 | -41.3 | 87.9 | -10.3 |
| DT Tavistock Gardens | 4.7 | 39.2 | 46.5 | -15.7 | 43.3 | -6.8 |
| DT = Diffusion Tube<br>Auto = Automatic Monitoring Station | | | | | | |

With the use of this adjustment factor it can be seen that the model is still under predicting at the Brill Place Diffusion Tube, the closest monitoring site to the Proposed Development. Examination of the siting of this tube in relation to the surrounding roads and potential emission sources indicates that concentrations at this location may be being impacted from the high numbers of bus and taxi traffic using Midland Road and potentially from diesel train emissions associated with St Pancras Station. Furthermore, dispersion may be constrained on Midland Road due to the presence of the station building to the east and to a lesser extent by a wall and hoardings on the western side, resulting in the funnelling of low level pollutants onto Brill Place. Given the good correlation with other monitoring sites it is considered that this is a highly localised event, and thus it was not considered necessary to adjust the background data used in the model over the wider site and the use of the Defra background factors were appropriate for the majority of the modelling.

However, to account for this localised increase in pollution a background $NO_2$ concentration of 43 µg/m³ was used in the predicted concentrations at Brill Place Tower. This is broadly mid range between the monitored Brill Place concentration and the predicted Defra background concentration to take into account the additional dilution and dispersion which would be expected between the monitoring site location and the site of the proposed Brill Place Tower.

## 4.4 Railway Emissions from St Pancras Station

Diesel trains idling at stations can be a source of pollutant emissions. Guidance provided by the Defra in Technical Guidance LAQM.TG (09) has provided a list of lines with a high number of diesel passenger trains; those lines originating from St Pancras Station are not included within this list. Additionally, the guidance indicates that the impacts would be largely restricted to within 15 m of stations and 30 m of railway lines. At its nearest point the Proposed Development would be some 60 m from St Pancras Station. It was therefore considered not appropriate to model the emissions as a distinct source.

The Defra background pollution maps include a contribution from railway sources, therefore the contribution of rail movements to background pollution concentrations has been included within the modelling.

## 4.5 Energy Centre Plant Emissions from Phoenix Court DHP and the FCI

Impacts from the energy centre plant associated with the Phoenix Court DHP and the FCI have been modelled using the ADMS air dispersion model. This is a new generation air dispersion modelling system used to support regulatory and non-regulatory modelling requirements worldwide. The model has been extensively validated against field data sets and has been subject to numerous validation studies.

Information on the expected emissions arising from the energy centre plant associated with the Phoenix Court DHP has been obtained from the relevant planning submission air quality assessment[24], and are presented below in Table 4-3.

Information on the expected emissions from the FCI were originally obtained from the ES accompanying the planning submission[25]. However, following discussions with FCI, new information was provided indicating that there had been some reduction in the expected emissions between those predicted for the purposes of the ES and those currently being installed[26]. In addition, greater clarity was provided in relation to the expected location of the stacks. To present a more accurate picture of future air quality, the assessment has included these amendments within the modelling as detailed in Table 4-4, 4-6, 4-7 and 4-8.

It should be noted that as information was not provided on the expected operating hours of the plant, the modelling has been carried out assuming that the boilers and CHP units operate continuously for the entire year. In reality, this is likely to be a significant overestimate. Typically, CHPs are sized to provide the baseload heating and would run for 16 to 18 hours per day. The boilers would provide additional heating and hot water during the Spring, Autumn and Winter months or when there is excessive demand. It would be expected that for much of the year the boilers would not run continuously and during the summer months they may not run at all.

**Table 4-3: CHP and Boiler Emissions from Phoenix Court DHP**

| Input Parameters | CHP | Boilers |
|---|---|---|
| No of units per source type | 1 | 2 (plus 1 standby) |
| Electrical output capacity per unit (MWe) | 1.0 | n/a |
| Thermal output capacity per unit (MWe) | ≥1.1 | 1.8 |
| Release Height, above ground level (m) | 26.6 | 21.6 |
| Internal Stack Diameter per unit (m) | 0.35 | 0.35 |
| Exit Gas Velocity (m/s) | 15 | 12 |
| Exit gas temperature ($^{0}$C) | 120 | 195 |
| Peak $NO_X$ emission rate / unit (g/s) | 0.210 | 0.040 |
| Average $NO_X$ emission rate / unit (g/s) | 0.106 | 0.004 |

**Table 4-4: CHP and Boiler Emissions from FCI**

| Input Parameters | CHP | Steam Boiler | LTHW Boiler |
|---|---|---|---|
| Rated Output per unit (kW) | 1,822 kW e | 6,500 kW th | 3,100 kW th |
| Number of Units | 1 | 2 (plus 1 standby) | 3 |

[24] URS, 2013, Phoenix Court Energy Centre Air Quality Assessment Report 47068322

[25] AECOM, 2010, VOLUME I: ENVIRONMENTAL STATEMENT UK Centre for Medical Research and Innovation (UKCMRI)

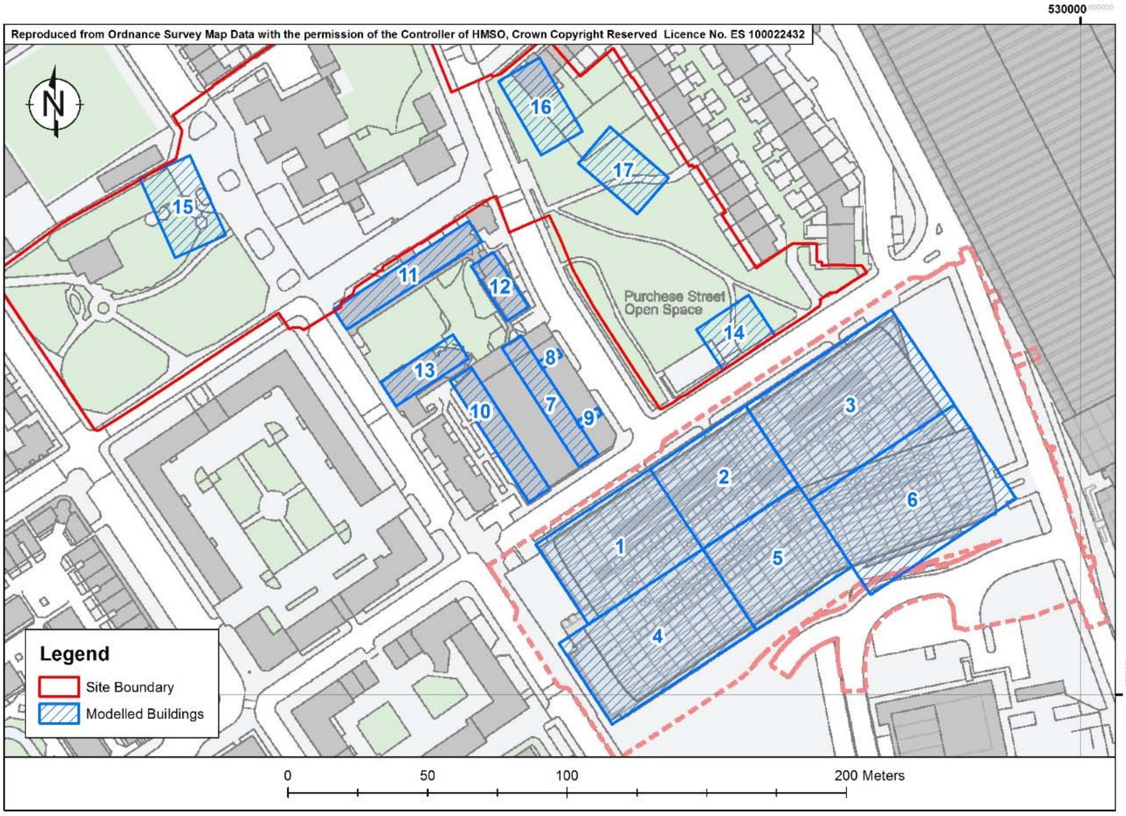
[26] AECON, 2015, Air Quality Impact Assessment for Emissions From FCI on the Proposed Brill Tower

| | | | |
|---|---|---|---|
| Stack tip (m above ground level) | 52.8 | 52.8 | 52.8 |
| Stack Diameter / unit (m) | 0.53 | 0.45 | 0.30 |
| Stack Velocity (m/s) | 18 | 18 | 18 |
| Exit gas temp (°C) | 180 | 150 | 180 |
| $NO_x$ emission rate / unit ($mg/Nm^3$) | 250 | 80 | 80 |
| Annual Average $NO_x$ emission rate / unit (g/s) | 0.51 | 0.045 | 0.017 |
| Peak $NO_x$ emission rate / unit (g/s) | 0.59 | 0.33 | 0.12 |

As the plant will be gas fired consideration has only been given to $NO_x$ emissions which are converted in the atmosphere to the air pollutant $NO_2$. Gas fired plant do not emit significant quantities of particulates. To convert the $NO_x$ emissions to $NO_2$ the Defra $NO_x$ to $NO_2$ calculator has been used to convert the combined contribution from the roads and stacks, together with the background $NO_2$ concentration to total $NO_2$. This methodology assumes an approximate 50% conversion rate and is considered appropriate given the short distances between the stack locations and the nearest receptors which would limit the time for conversion.

The presence of buildings, such as those proposed for the Site, can have a substantial impact on the dispersion of pollutants from the stack, as a result of building downwash i.e. pollutants being drawn down in the wake of a building, giving rise to high concentrations close to the base of the buildings. ADMS 5 is able to take account of this potential impact, and therefore the buildings on and off the Site have been taken into account within the energy centre modelling. Some simplification of the building shapes is required for the model as it can only model rectangular buildings of a uniform height. The configuration of the buildings used in the modelling is shown in Figure 4-1 and the heights provided in Table 4-5. The locations of energy centre stacks is shown in Figure 4-2.

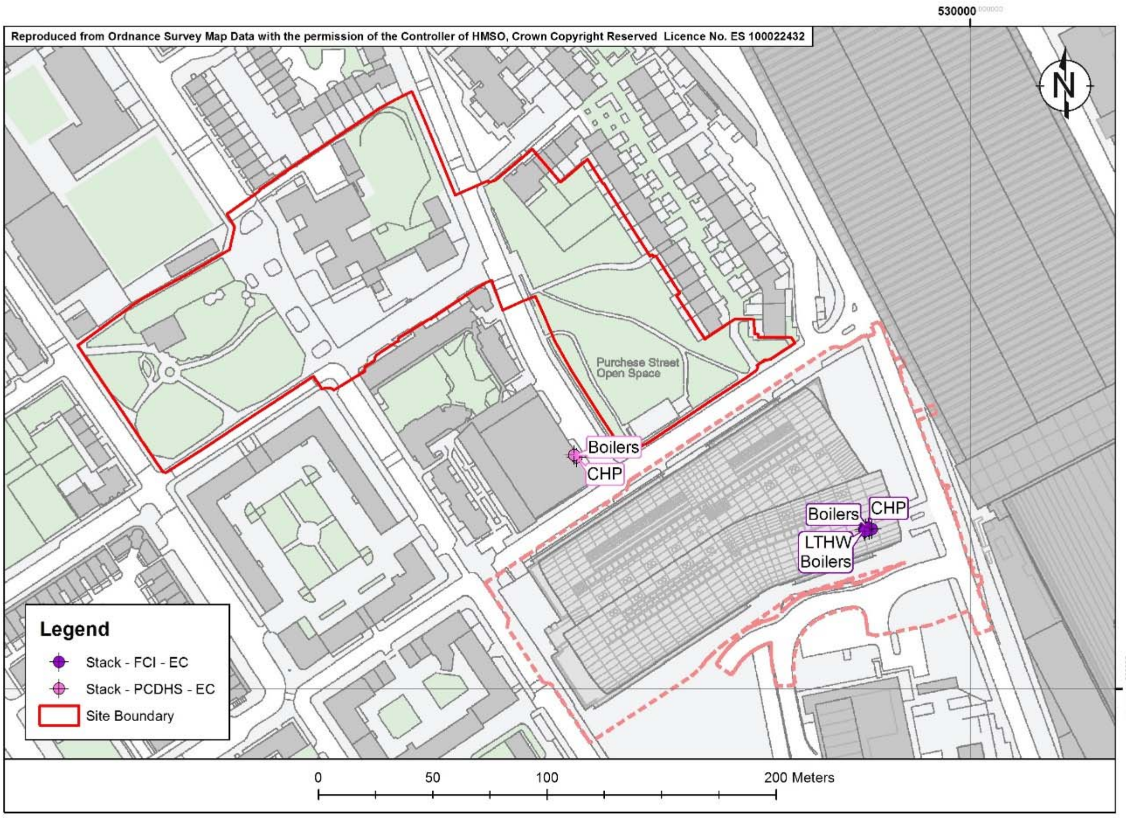
## Figure 4-1: Buildings Included in Modelling




## Table 4-5: Modelled Building Dimensions

| ID | NAME | X (m) | Y (m) | Height (m) | Length (m) | Width (m) | Angle (Degrees) |
|---|---|---|---|---|---|---|---|
| 1 | Crick NW | 529835 | 183053 | 39.5 | 49.1 | 34.3 | 56.6 |
| 2 | Crick NC | 529872 | 183078 | 41.5 | 41.0 | 34.3 | 56.6 |
| 3 | Crick NE | 529917 | 183104 | 41.5 | 62.5 | 40.9 | 56.6 |
| 4 | Crick SW | 529848 | 183021 | 45.0 | 61.6 | 34.6 | 56.7 |
| 5 | Crick SC | 529891 | 183049 | 47.8 | 41.1 | 34.7 | 56.5 |
| 6 | Crick SE | 529940 | 183070 | 47.8 | 62.5 | 40.2 | 56.6 |
| 7 | P_Phoenix Court Main | 529810 | 183105 | 18.6 | 50.8 | 8.2 | 327.0 |
| 8 | P_Phoenix Court N | 529810 | 183120 | 18.6 | 8.4 | 2.7 | 57.0 |
| 9 | P_Phoenix Court S | 529824 | 183099 | 18.6 | 9.2 | 2.7 | 57.0 |
| 10 | P_Monica Shaw 48-61 | 529792 | 183093 | 11.4 | 51.7 | 9.0 | 327.0 |
| 11 | P_Monica Shaw 9-29 | 529759 | 183150 | 17.0 | 57.8 | 8.6 | 57.0 |
| 12 | P_Monica Shaw 1-8 | 529792 | 183146 | 17.0 | 23.4 | 9.4 | 327.0 |
| 13 | P_Monica Shaw 30-37 | 529765 | 183116 | 10.0 | 31.0 | 10.3 | 57.0 |
| 14 | Brill Place Tower | 529877 | 183130 | 78.5 | 22.4 | 17.3 | 56.6 |
| 15 | Block A | 529678 | 183175 | 32.3 | 31.2 | 19.8 | 155.9 |
| 16 | Block B | 529807 | 183210 | 19.3 | 30.6 | 17.0 | 149.9 |
| 17 | Block C | 529836 | 183187 | 14.8 | 27.9 | 17.2 | 130.9 |

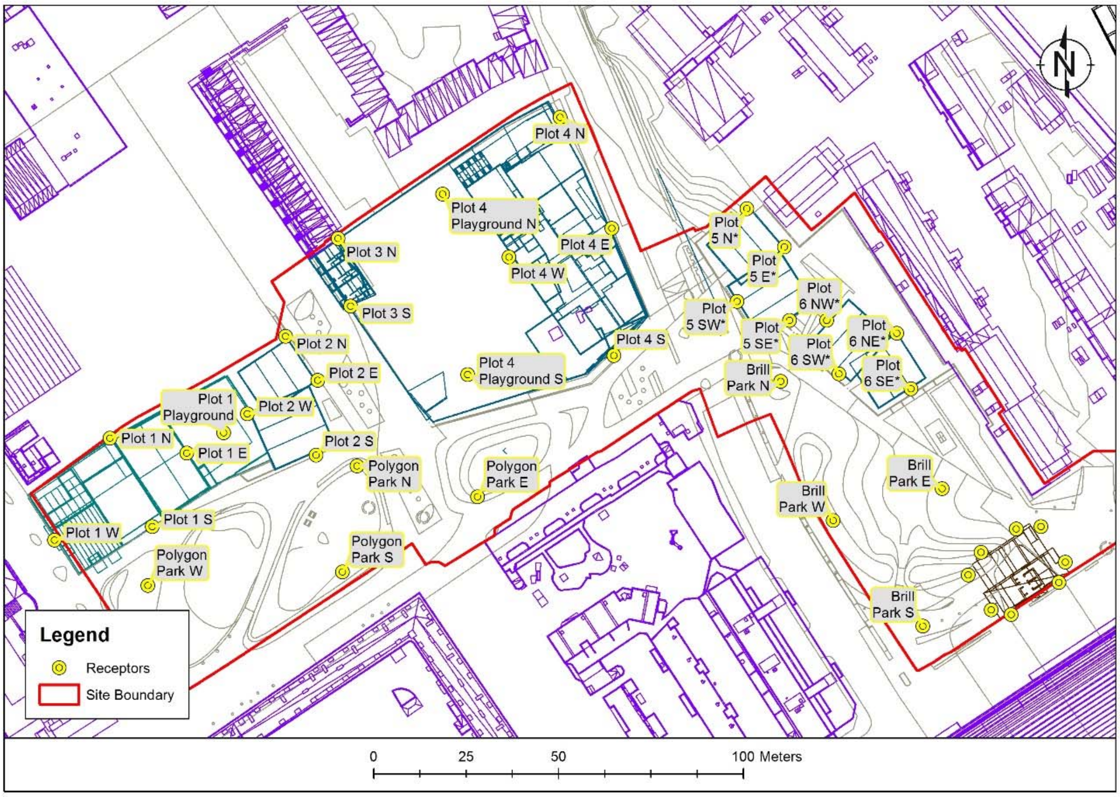
### Figure 4-2: Energy Centre Stack Locations



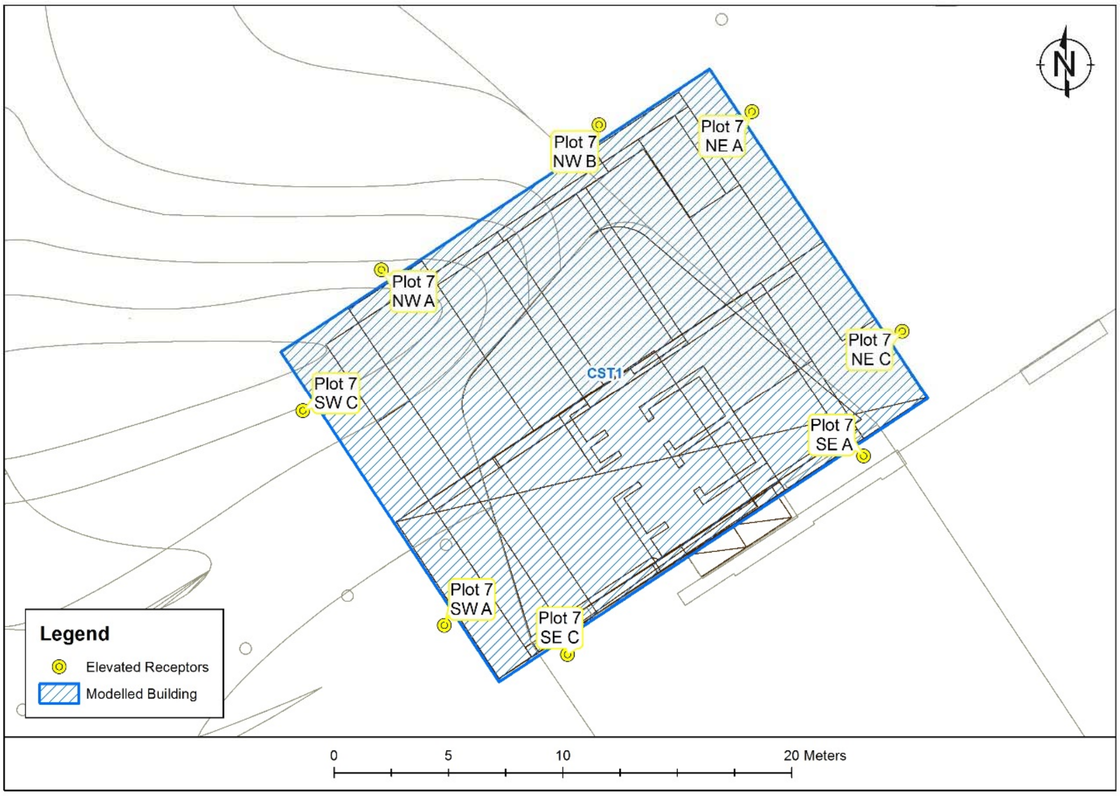

The London Heathrow meteorological site was considered to be the nearest most representative meteorological monitoring station to the site. The traffic model was run with data from 2014 as this is the last year that monitoring data is available. The stack model was run with five years of met data, 2010, 2011, 2012, 2013 and 2014 with the maximum concentration predicted for all years presented in the results tables in Section 7 and 8.

The model has been used to predict concentrations at a number of receptors within the Site. Impacts from the energy plant have been predicted at ground level receptors located over the entire Proposed Development as shown in Figure 4-3 and at elevated sources at Plot 7 Brill Place Tower as shown in Figure 4-4.

## Figure 4-3: Ground Level Receptor Locations




## Figure 4-4: Brill Place Tower Receptor Locations



### 4.6 Odour, emergency generator and other emissions from the FCI

In addition, there are a number of other sources of emissions arising from the FCI that have the potential to impact air quality. The Environmental Statement[27] (ES) carried out in 2010 to support the planning application for the FCI assessed the potential for these emissions to impact nearby existing receptors at ground level and determined that at these locations the impacts were acceptable.

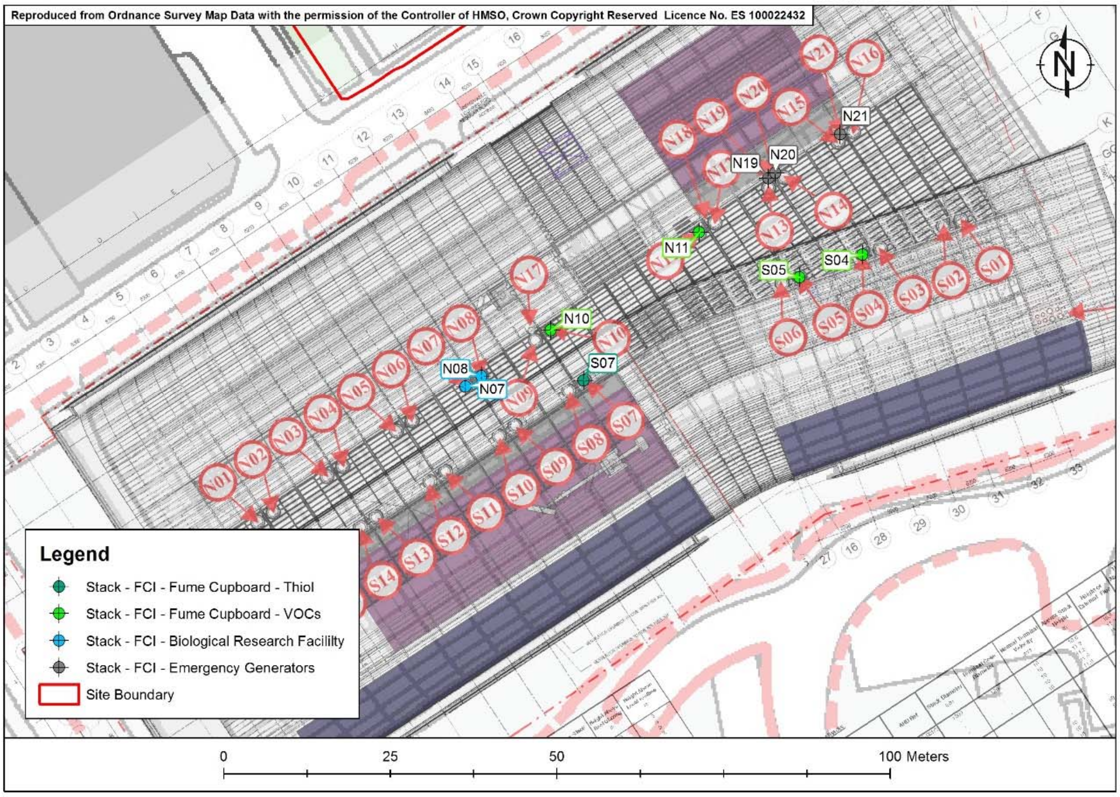
The Brill Place Tower which is part of the Proposed Development would introduce residential receptors at similar and higher elevations than the roof of the FCI building. These new units would be significantly closer than those previously modelled. Therefore potential emissions from these sources have been modelled to predict the resulting concentrations at the façades of the Brill Place Tower. The following sources have been modelled using the updated input data supplied by the FCI:

- Backup diesel generators;
- Biological Research Facility sources; and
- Chemical exhausts.

At the time the ES was undertaken the detailed design of the ventilation system had not been finalised and therefore a number of assumptions were made regarding the location of the stacks. As the FCI is now being constructed, an updated ventilation plan has been supplied by the FCI and the exact location of the relevant stacks has been taken into account within this modelling, as shown in Figure 4-5.

It should be noted that it has not been possible to verify the accuracy of the input data provided within the AECOM reports.

**Figure 4-5: Other Release Points at the FCI (FSC: Fume Storage Cupboard)**




27 AECOM, 2010, VOLUME I: ENVIRONMENTAL STATEMENT UK Centre for Medical Research and Innovation (UKCMRI)

### 4.6.1 Backup Diesel Generators

Four emergency diesel generators are to be installed at the FCI. Information provided by the FCI has indicated that three of the generators would be used in the unlikely event of a total power outage to provide power to the FCI, known as a 'black start event'. The FCI has anticipated that such an event is unlikely to arise for more than 18 hours per year. In addition, to ensure their correct operation the FCI has indicated that each generator would be run in turn for one hour per month for maintenance purposes. Three scenarios have been modelled, emissions from a black start event, emissions from worst case maintenance activities assuming one generator is run continuously and emissions from typical maintenance activities when each generator is run for one hour per week. The emissions data is provided in Table 4-6. Consideration has only been given to $NO_x$ concentrations and compared with the short term one hour $NO_2$ objective. It is considered that there is no danger that either the annual average or 24 hour $PM_{10}$ objective would be exceeded, given the limited operating hours of the generators. Therefore emissions of $PM_{10}$ have not been modelled.

**Table 4-6: Backup Diesel Generator Emissions from the FCI**

| Input Parameter | Backup Generators |
|---|---|
| Rated Output (kWe) | 2,500 |
| Number of units | 3 (plus 1 standby) |
| Stack tip (m above ground level) | 47 |
| Stack Locations | N19, N20, N21 |
| Stack Diameter (m) | 0.5 |
| Stack Velocity (m/s) | 44.2 |
| Exit Gas temp (°C) | 358 |
| $NO_x$ concentration (mg/Nm$^3$) | 1438 |
| Peak $NO_x$ emission rate / unit (g/s) | 2.8 |
| $PM_{10}$ concentration (mg/Nm$^3$) | 50-100 |
| Peak $PM_{10}$ emission rate / unit (g/s) | 0.25 |
| Location of stacks obtained from plan supplied by FCI No G-SCH-9001 | |

### 4.6.2 Biological Research Facility Sources

The Biological Research Facility (BRF) will emit general animal odours and formaldehyde. Formaldehyde will largely be emitted when laboratories require fumigation, which the FCI report is an 'unusual infrequent event'. In line with the assessment undertaken for the FCI, two scenarios have been modelled and the predicted concentrations compared with the Environmental Assessment Levels (EALs) and odour threshold levels for formaldehyde. The original ES assumed that a stack designed to efficiently remove formaldehyde emissions would be more than suitable for animal odours, particularly given the high odour concentrations that are likely during a fumigation event. The two scenarios are as follows:

- Scenario 1: expelling air for 5 minutes from a 200 m$^3$ room through two BRF stacks;
- Scenario 2: expelling air for 4 hours from a 2,400 m$^3$ room through two BRF stacks.

The BRF stacks are arranged in pairs on the roof of the FCI. It has been advised from the FCI that the worst case location with regard to the Tower is assumed to be N07 and N08 and therefore the model has been run to predict emissions from this pair of stacks at each receptor location presented in the results table given in Section 8.

**Table 4-7: Biological Research Facility Emissions from the FCI**

| Input Parameter | Scenario 1 | Scenario 2 |
|---|---|---|
| Number of BRF stacks discharging formaldehyde on north or south building | 2 at any one time | 2 at any one time |
| Stack Locations | N07, N08 | |
| Flow rate of each stack ($m^3/s$) | 19.2 | 19.2 |
| Stack velocity (m/s) | 12.0 | 12.0 |
| Concentration of formaldehyde from each stack ($mg/m^3$) | 12.0 | 3.0 |
| Release rate per stack (g/s) | 0.3 | 0.1 |
| Duration of release (hours) | 0.08 | 4 |
| Location of stacks obtained from plan supplied by FCI No G-SCH-9001 | | |

### 4.6.3 Chemical Exhausts

Volatile Organic Carbons (VOCs) and thiols are likely to be released from the fume cupboard exhausts. Thiols (also known as mercaptans) are a group of highly odorous compounds which in sufficient concentrations can cause throat and nose irritation and other symptoms. Information on the location of the stacks giving rise to the emissions with the largest impact on the Tower has been provided by FCI. Two events have been modelled:

- Typical emissions arising from each of the 135 fume cupboards assuming each cupboard would use five litres of solvent per day, of which 10% is assumed to evaporate. Of the 135 cupboards 105 would emit VOCs and 30 would emit thiols. It is assumed such emissions would arise for eight hours per day Monday to Saturday and the emissions would be spread evenly through all four stacks; and
- Spillage event emissions from an accidental spillage of 2.5 litres of solvent which is discharged for 30 seconds through any one stack.

To compare the predicted results against relevant EALs, in line with the assessment carried out for the FCI, it has been assumed that as a worst case all the VOCs emitted would be benzene, as this is regarded to have the most stringent EALs. However, information provided within the FCI air quality assessment has indicated that it is highly unlikely that benzene would be used within the institute and would therefore not be emitted from the flues.

There are many potential thiols that may be emitted with a wide range of EALs and odour thresholds. Data presented within the FCI ES relating to a number of the most common thiols has indicated that 1-methyl-1-propanethiol has the lowest odour threshold, methanethiol the most stringent long term EAL and hydrogen sulphide the most stringent short term EAL. Therefore these have been used as assessment criteria. Information presented within the FCI air quality assessment indicated that the use of 1-methyl-1-propanethiol is unlikely to be used at the FCI and therefore it assumed that it would not make up more than 10% of the thiols released.

**Table 4-8: Chemical Exhaust Emissions from the FCI**

| Input Parameter | Thiols | VOCs | | | |
|---|---|---|---|---|---|
| No. chemical release points | 1 | 4 | | | |
| Stack Locations | S07 | S04, | S05 | N10 | N11 |

| | | | | | |
|---|---|---|---|---|---|
| Exhaust diameter per release point (m) | 1.07 | 1.5 | 1.0 | 0.9 | 0.7 |
| Flow rate per release point ($m^3/s$) | 9 | 17 | 7 | 6 | 3 |
| Exit gas velocity (m/s) | 10 | 10 | 10 | 10 | 10 |
| Typical emission rate per flue during 8-hr/day (g/s) | $6.3 \times 10^6$ | 0.00145, | 0.003 | 0.00145 | 0.00145 |
| Spillage event emission rate one flue only (g/s) | $1.0 \times 10^{-4}$ | - | $3.3 \times 10^{-2}$ | - | - |
| Location of stacks obtained from plan supplied by FCI No G-SCH-9001 | | | | | |

### 4.7 Demolition and Construction Impacts

The assessment of potential construction impacts follows the guidance published by the IAQM on the assessment of the impacts of construction on air quality. This provides an updated assessment methodology compared with that provided within the Mayor of London's SPG and, more importantly, requires a comparable level of mitigation. The IAQM assessment methodology considers three separate dust effects and defines their significance according to the sensitivity of the surrounding area, as follows:

- Annoyance due to dust soiling;
- Harm to ecological receptors; and
- The risk of health effects due to a significant increase in exposure to $PM_{10}$.

### 4.8 Air Quality Neutral Assessment

In line with the Mayor's Sustainable Design and Construction SPG, an assessment was undertaken to demonstrate whether the Proposed Development would meet the relevant emission benchmarks provided in the guidance.

### 4.9 Significance Criteria

The significance criteria provided in the guidance produced by the Institute of Air Quality Management (IAQM) and Environmental Protection UK, was used to assess the significance of effects on air quality as a result of the Proposed Development.

The guidance includes a matrix which is to be used to calculate the impacts at individual receptor locations as shown in Table 4.9 and takes into account both the change in concentration and the resulting overall concentration. The guidance states that overall significance should be based on professional judgement and *"will need to take into account such factors as:*

- *The existing and future air quality in the absence of the development;*
- *The extent of current and future population exposure to the impacts; and*
- *The influence and validity of any assumptions adopted when undertaking the prediction of impacts."*

**Table 4-9: Impact Descriptors for Individual Receptors**

| Long Term Average Concentration at Receptor with Proposed Development | Percentage Change in Concentration Relative to Annual Mean Air Quality Objective (AQO) | | | |
|---|---|---|---|---|
| | <1 | 2 - 5 | 6 – 10 | >10 |
| 75% or less of AQO | Negligible | Negligible | Slight | Moderate |

| **Long Term Average Concentration at Receptor with Proposed Development** | **Percentage Change in Concentration Relative to Annual Mean Air Quality Objective (AQO)** | | | |
|---|---|---|---|---|
| | **<1** | **2 - 5** | **6 – 10** | **>10** |
| 76 – 94% of AQO | Negligible | Slight | Moderate | Moderate |
| 95 – 102% of AQO | Slight | Moderate | Moderate | Substantial |
| 103 – 109% of AQO | Moderate | Moderate | Substantial | Substantial |
| 110% of more of AQO | Moderate | Substantial | Substantial | Substantial |
| Notes<br>AQO for $NO_2$ and $PM_{10}$ is 40 µg/m$^3$ and for $PM_{2.5}$ is 25 µg/m$^3$<br>Changes of less than 0.5% are considered to be negligible | | | | |

4.9.1 Environmental Assessment Levels

To assess potential impacts arising from laboratory and research facility emissions arising from the FCI the following EALs and odour threshold criteria have been used.

**Table 4-10: Formaldehyde Assessment Levels**

| **Criteria** | **Limit (µg/m³)** | **Averaging Period and Percentile** |
|---|---|---|
| Long Term EAL – Human Health | 5[1] | Annual Average |
| Short Term EAL – Human Health | 100[1] | One Hour 100th Percentile |
| Odour Annoyance Threshold - Amenity | 100 -310[2] | 98th Percentile of one hour concentrations recorded over the year |
| [1] Source Environment Agency H1 Annex F<br>[2] Source SEPA, Odour Guidance 2010 | | |

**Table 4-11: Benzene Assessment Levels**

| **Criteria** | **Limit (µg/m³)** | **Averaging Period and Percentile** |
|---|---|---|
| Long Term Air Quality Objective – Human Health | 5[1] | Annual Average |
| Short Term EAL – Human Health | 208[2] | One Hour 100th Percentile |
| Odour Annoyance Threshold - Amenity | 32,500[3] | 98th Percentile of one hour concentrations recorded over the year |
| [1] Source Environment Agency, 2011, H1 Annex F<br>[2] Source Environment Agency, 2003, H1 Environmental Assessment and Appraisal of BAT<br>[3] Source SEPA, 2010, Odour Guidance | | |

**Table 4-12: Thiol Assessment Levels**

| **Thiol** | **Criteria** | **Limit (µg/m³)** | **Averaging Period and Percentile** |
|---|---|---|---|
| Methanethiol | Long Term Air Quality Objective – Human Health | 10[1] | Annual Average |

| **Thiol** | **Criteria** | **Limit ($\mu g/m^3$)** | **Averaging Period and Percentile** |
|---|---|---|---|
| Hydrogen Sulphide | Short Term EAL – Human Health | 150[2] | One Hour $100^{th}$ Percentile |
| 1-methyl-1-propanethiol | Odour Annoyance Threshold - Amenity | $1x10^{-6}$ – $3x10^{-5}$ | $98^{th}$ Percentile of one hour concentrations recorded over the year |

[1] Source Environment Agency, 2003, H1 Environmental Assessment and Appraisal of BAT

[2] Environment Agency, 2011, H1 Annex F

[3] Source AEA, 1994, Odour measurement and control – An update

# 5. EXISTING AIR QUALITY

## 5.1 Air Quality Monitoring

A summary of the results from those monitoring sites in close proximity to the Site is presented in Table 5-1 to Table 5-45.5, with their location shown in Figure 5-1.

**Table 5-1: Automatic Monitoring Annual Mean $NO_2$ Concentrations (µg/m³)**

| Monitor | Location | Classification | Distance to Kerb (m) | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|---|---|
| CD9 | Euston Road | Roadside | 0.5 | 122 | 106 | 106 | 98 |
| LB | Bloomsbury | Urban Background | 27 | 50 | 55 | 44 | 45 |
| Objective concentration = 40 µg/m³ | | | | | | | |

**Table 5-2: Automatic Monitoring Number of Exceedances of the $NO_2$ 1 Hour Mean Target**

| Monitor | Location | Classification | Distance to Kerb (m) | 2011 | 2012 | 2013 |
|---|---|---|---|---|---|---|
| CD9 | Euston Road | Roadside | 0.5 | 726 | 295 | 293 |
| LB | Bloomsbury | Urban Background | 27 | 0 | 1 | 0 |
| Objective allows 18 exceedances of the one hour limit of 200 µg/m³ | | | | | | |

**Table 5-3: Diffusion Tube Annual Mean $NO_2$ Concentrations**

| Monitor | Classification | Distance to Kerb (m) | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|---|
| CA20 Brill Place | Roadside | <5 | 51 | 50 | 49 | 52 |
| CA4 Euston Road | Roadside | 5 | 93 | 82 | 108 | 90 |
| CA10 Tavistock Gardens | Urban Background | 25 | 48 | 40 | 49 | 47 |
| CA6 Wakefield Gardens | Urban Background | 30 | 46 | 39 | 40 | 36 |
| CA23 Camden Road | Roadside | <1 | 72 | 67 | 78 | 72 |
| Caledonian Road | Roadside | 0.5 | 54 | 50 | 47 | 51 |
| Percy Circus | Urban Background | Not given | 42 | 40 | 38 | 40 |

**Table 5-4: Automatic Monitoring Annual Mean $PM_{10}$ Concentrations (µg/m³)**

| Monitor | Location | Classification | Distance to Kerb (m) | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|---|---|
| CD9 | Euston Road | Roadside | 0.5 | NR | NR | NR | 29 |
| LB | Bloomsbury | Urban Background | 27 | 22 | 19 | 18 | 20 |
| Objective concentration = 40 µg/m³<br>NR = not recorded | | | | | | | |

**Table 5-5: Automatic Monitoring Number of Exceedances of the $PM_{10}$ 24 Hour Mean Target**

| Monitor | Location | Classification | Distance to Kerb (m) | 2011 | 2012 | 2013 |
|---|---|---|---|---|---|---|
| LB | Bloomsbury | Urban Background | 27 | 17 | 10 | 4 |
| Objective allows 35 exceedances of the daily limit of 50 µg/m$^3$ | | | | | | |

**Figure 5-1: Monitoring Site Locations**


## 5.2 Analysis of Data

### 5.2.1 $NO_2$

The $NO_2$ monitoring results demonstrate that there is wide exceedance of the annual mean objective at roadside locations in the vicinity of the Proposed Development. The highest concentrations are associated with Euston Road, with lower concentrations recorded adjacent to Camden Road and Caledonian Road, where traffic flows are lower.

Significantly lower annual mean concentrations are recorded at the urban background sites, where concentrations are either below or just above the annual mean objective of 40 µg/m$^3$.

The automatic monitoring site on Euston Road indicates that there is a wide exceedance of the short term objective at this roadside site. The results recorded at the Bloomsbury urban background site shows comfortable compliance with the short term objective.

The results clearly demonstrate the influence of road vehicles on $NO_2$ concentrations and their rapid decline away from the roadside within a relatively short distance.

### 5.2.2 $PM_{10}$

The $PM_{10}$ monitoring carried out at the Bloomsbury urban background site indicates that air quality is comfortably meeting both the short and long term objective in this location. Results have only been recorded at Euston Road for 2014 and data is currently only available in relation to the annual mean. This indicates that air quality met the annual mean objective at this roadside site in 2014.

The data demonstrates that in contrast to $NO_2$ concentrations, road traffic has less influence over the concentrations, with regional and local background sources having a much greater influence.

## 5.3 Defra Predicted Background Maps

In addition background pollutant concentrations have been obtained from the Defra maps of predicted background pollutant concentrations, which have been produced to aid local authorities in carrying out their Review and Assessment of Air Quality. The 2014 background concentrations used in the assessment, are provided below in Table 5-6.

**Table 5-6: Defra Predicted Annual Mean Background Concentrations 2014**

| x | y | Source Type | Total $NO_x$ ($\mu g/m^3$) | Total $NO_2$ ($\mu g/m^3$) | Total $PM_{10}$ ($\mu g/m^3$) |
|---|---|---|---|---|---|
| 529500 | 184500 | Defra Background | 59.1 | 35.5 | 23.7 |
| | | With Sector Removal | 52.2 | 32.1 | 23.5 |
| 529500 | 183500 | Defra Background | 64.3 | 38.0 | 24.2 |
| | | With Sector Removal | 57.0 | 34.4 | 24.0 |
| 529500 | 182500 | Defra Background | 79.8 | 45.3 | 25.3 |
| | | With Sector Removal | 62.3 | 37.1 | 25.0 |
| 530500 | 182500 | Defra Background | 79.5 | 45.5 | 25.2 |
| | | With Sector Removal | 69.6 | 40.9 | 25.0 |
| 530500 | 183500 | Defra Background | 64.3 | 38.5 | 24.2 |
| | | With Sector Removal | 57.4 | 35.1 | 24.1 |
| With Sector Removal removes the 'Primary A Roads In' contributions. | | | | | |

## 5.4 Air Quality at the Proposed Development

The whole of the Proposed Development is set well back from the main road network and therefore existing air quality would be expected to be similar to those concentrations recorded at urban background monitoring locations and the predicted background concentrations provided by Defra.

Plot 7, Brill Place Tower and Plot 5 and 6 the Purchese Street are located closest to Midland Road, which is the heaviest trafficked road in the immediate vicinity of the Site. The Tower would be located some 65 m and the Purchese Street housing some 75 m from Midland Road respectively. The Purchese Street housing would in part be shielded from direct impacts from Midland Road by the presence of the Coopers Lane housing. The monitoring data above has indicated that at this distance the impacts from road traffic using Midland Road would be expected to have significantly reduced.

Relatively high concentrations in excess of the annual $NO_2$ objective have been recorded at the Brill Place diffusion tube monitoring site which is located approximately equidistant from the proposed location of the Brill Place Tower and Midland Road. Assuming concentrations on Midland Road would be the same or higher than those recorded on Camden Road, the monitored concentrations at Brill Place indicate that a significant drop off in concentrations is likely to occur between Midland Road and the location of the Brill Place monitor. A further drop in concentrations would be expected between the monitor and the location of the Tower, thus concentrations at the base of the tower would be expected to be lower than those recorded at the Brill Place monitoring site and to be approaching background concentrations. To ensure a conservative approach, for the purpose of this assessment professional judgement has been used to predict background concentrations at the base of the Tower. On this basis a background annual mean $NO_2$ concentration of 43 $\mu g/m^3$ has been used which is broadly mid range between the monitored Brill Place concentration and the predicted Defra background concentration.

# 6. CONSTRUCTION PHASE IMPACTS

## 6.1 Introduction

Construction effects as a result of the Proposed Development have been assessed using the recent guidance provided by the IAQM. This guidance is considered to supersede the current London Councils construction dust guidance and requires the implementation of a similar level of mitigation as the supplementary planning guidance produced by the Mayor of London.

## 6.2 Assessment of Impacts

The development will comprise the demolition of the existing buildings and the construction of the Proposed Development. The Site is located in a densely built up area with numerous receptors within 50 m therefore a detailed assessment of potential dust effects is required. No ecological receptors have been identified with 50 m of the site boundary and therefore impacts on ecological receptors have not been considered further.

Using the evaluation criteria within the IAQM's Guidance the potential dust emission magnitude has been identified for each stage of the proposed development as shown in Table 6-1 below.

**Table 6-1: Dust Emission Magnitude for Each Construction Phase**

| Activity | Dust Emission Magnitude | Justification |
|---|---|---|
| Demolition | Small | Existing floor space of buildings to be demolished is 1,903 $m^2$. Assuming an average storey height of 4 m approximate volume is significantly less than 20,000 $m^3$. |
| Earthworks | Large | Site area greater than 10,000 $m^2$. Extensive earthworks would be required for elements such as the Tower |
| Construction | Large | Total building volume greater than 100,000 $m^3$ (total proposed gross external area 16483 $m^2$). |
| Trackout | Large | No information has been provided on construction traffic flows, but depending on the phasing and given the scale of the development it is assumed that daily HGV outward movements would be greater than 50. |

The next stage of the process is to define the sensitivity of the assessment area to dust soiling and ecological receptors. This process combines the sensitivity of the receptor with the distance from the source to determine the overall sensitivity. The sensitivity of the area to dust impacts is provided in Table 6-2.

**Table 6-2: Sensitivity of Area to Dust Impacts (taking into account distance to construction activity)**

| Sensitivity to Dust Soiling | Sensitivity to Human Health Impacts | Sensitivity to Ecological Receptors |
|---|---|---|
| **High** – Site is located in a densely populated area with large numbers of residential properties and schools in close proximity. | **High** – existing $PM_{10}$ concentrations may exceed 24 $\mu g/m^3$, large number of existing residential properties in close proximity | N/a – no ecological receptors sensitive to dust within 50 m of the site or within 50 m of the route used by construction vehicles for a distance of 500 m. |

The dust emission magnitude determined in Table 6-1 has been combined with the sensitivity assessment in Table 6-2 to define the risk of impacts for each phase of development in the absence of mitigation as shown in Table 6-3.

**Table 6-3: Risk of Dust Impacts in the absence of mitigation for each Construction Phase**

| | | Dust Emission Magnitude | | | |
|---|---|---|---|---|---|
| | | **Demolition (Small)** | **Earthworks (Large)** | **Construction (Large)** | **Trackout (Large)** |
| **Sensitivity of the surrounding area** | **Dust Soiling (High)** | Medium Risk | High Risk | High Risk | High Risk |
| | **Human Health (High)** | Medium Risk | High Risk | High Risk | High Risk |

## 6.3 Mitigation of Construction Impacts

The control of dust emissions from demolition and construction sites relies upon good site management and mitigation techniques to reduce emissions of dust and limit dispersion. A summary of the mitigation measures recommended in the IAQM guidance to reduce impacts from high risk sites is provided in Table 6-4. It is recommended that these measures would be set out in the Dust Management Plan which would form part of the Development's overall Construction Management Plan. A CMP has been prepared to support the planning submission.

**Table 6-4: Recommended Dust Mitigation Measures for High Risk Sites**

| Phase | Mitigation Measure |
|---|---|
| **Communications** | Implement a stakeholder communication plan.<br>Display name and contact details of responsible person for dust issues on Site boundary in addition to head/regional office contact information. |
| **Dust Management Plan** | Develop and implement a Dust Management Plan (DMP), to be approved by the Local Authority. |
| **Site Management** | Record all complaints and incidents in a site log.<br>Take appropriate measures to reduce emissions in a timely manner, and record the measures taken within the log.<br>Make the complaints log available to the Local Authority if requested.<br>Record any exceptional dust incidents on or off site.<br>Hold regular liaison meetings with other high risk construction sites within 500m to limit the potential from cumulative impacts |
| **Monitoring** | Undertake daily on and off site visual inspections where there are nearby receptors.<br>Carry out regular inspections to ensure compliance with the DMP and record results in the site log book.<br>Increase the frequency of inspections during activities with a high potential to create dust or in prolonged dry weather.<br>Agree dust monitoring with the local authority where required |
| **Preparing and Maintaining the Site** | Plan site layout to locate dust generating activities as far as possible from receptors. |

| Phase | Mitigation Measure |
|---|---|
| | Use solid screens around dusty activities and around stockpiles.<br>Avoid site runoff of water and mud.<br>Fully enclose the site or specific operations where there is a high potential for dust production and the site is active for an extensive period.<br>Keep site fencing barriers and scaffolding clean using wet methods.<br>Remove dusty materials from site as soon as possible. Minimise emissions from stockpiles by covering, seeding, fencing or damping down. |
| **Operating Vehicle / Machinery and Sustainable Travel** | Enforce an on-site speed limit of 15 mph on surfaced roads and 10 mph on unsurfaced areas.<br>Ensure vehicles switch of engines when stationary.<br>Avoid use of generators where possible.<br>Produce a Construction Logistics Plan to manage the sustainable delivery of materials.<br>Implement a sustainable travel plan for site workers. |
| **Operations** | Cutting, grinding or sawing equipment only to be used with suitable dust suppression equipment or techniques.<br>Ensure adequate water supply for effective dust and particulate matter suppression.<br>Use enclosed chutes, conveyors and covered skips.<br>Minimise drop heights of materials.<br>Ensure suitable cleaning material is available at all times to clean up spills. |
| **Waste Management** | Avoid bonfires. |
| **Measures Specific to Demolition** | Where practical, soft strip inside buildings before demolition of external walls and windows. Ensure effective water suppression is used, preferably through the use of hand held sprays.<br>Avoid explosive blasting.<br>Bag and remove biological debris or damp down material prior to demolition. |
| **Measures Specific to Earthworks** | Re-vegetate earthworks and exposed areas/soil stockpiles as soon as practicable.<br>Use hessian, mulch or trackifiers where it is not possible to re-vegetate or cover with topsoil.<br>Only expose small areas of ground or stockpile when working. |
| **Measures Specific to Construction** | Ensure aggregates are stored in bunded areas and are not allowed to dry out.<br>Avoid concrete scabbling where possible.<br>Ensure bulk cement and other fine powder is delivered in tankers and stored in silos with suitable emission control.<br>Smaller supplies of fine powder material to be in sealed containers and stored appropriately. |
| **Measures Specific to Trackout** | Use water-assisted dust sweepers to clean access and local roads.<br>Avoid dry sweeping of large areas. |

| Phase | Mitigation Measure |
|---|---|
| | Ensure vehicles entering and leaving the site are appropriately covered.<br>Inspect on-site haul roads for integrity and repair as necessary.<br>Inspections of haul roads to be recorded in site log, including any remedial action taken.<br>Implement a wheel washing system. |

## 6.4 Residual Effects

Using the IAQM guidance and on the assumption that appropriate dust mitigation measures are applied commensurate with the risk of potential dust impacts, the potential for residual effects to arise during the construction phase will be reduced to at worse temporary ‘slight adverse’.

# 7. OPERATIONAL IMPACTS PLOTS 1 TO 6

## 7.1 Introduction

As discussed previously, the Proposed Development would not result in significant new emissions to air, but it would introduce new receptors into a location where air quality is predicted to be close to the annual mean $NO_2$ objective. In addition, there are two recently consented developments (the Phoenix Court DHP and the FCI) which have the potential to impact air quality immediately adjacent to the Site and therefore the impacts from these developments also require consideration.

This section provides the results of the air dispersion modelling at the Plots 1 to 6. It predominantly focuses on ground level receptors where impacts from road traffic, the dominant source of emissions would be at a maximum, but also provides predicted concentrations at elevated receptors in the Purchese Street Housing Units (Plot 5 and 6) as there is a potential these could be impacted by the high level releases from the energy centre emissions arising at Phoenix Court DHP and the FCI.

The model has only been run to predict annual mean concentrations of $NO_2$. The energy centres would both be gas fired under normal conditions and would therefore emit negligible amounts of $PM_{10}$. Given that the existing monitoring indicates comfortable compliance with the $PM_{10}$ objectives the need to run the model for this pollutant was not identified. Consideration was also not given to the short term $NO_2$ impacts, guidance provided in LAQM TG(09) has indicated that this objective is unlikely to be exceeded where annual mean concentrations are less than 60 $\mu g/m^3$.

## 7.2 Predicted Concentrations

The predicted annual mean $NO_2$ concentrations at each of the identified receptor locations are provided in Table 7-1. To calculate the total annual mean $NO_2$ a background concentration of 36.2 $\mu g/m^3$ has been used. This is the Defra predicted background concentration for 2014, with the contribution from half the A roads removed using the sector removal tool.

**Table 7-1: Predicted Annual Mean $NO_2$ Concentrations at Plots 1 to 6 and within Purchese Street Open Space and Polygon Road Park**

| Receptor | Height (m) | Contribution to Total Annual Mean $NO_x$ ($\mu g/m^3$) | | | Total Annual Mean $NO_2$ ($\mu g/m^3$) |
|---|---|---|---|---|---|
| | | FCI Energy Centre | Phoenix Court DHP | Roads | |
| Brill Park N | 1.5 | 0.4 | 1.1 | 5.8 | 39.5 |
| Brill Park E | 1.5 | 0.7 | 1.2 | 6.4 | 39.9 |
| Brill Park S | 1.5 | 0.9 | 2.9 | 7.0 | 41.0 |
| Brill Park W | 1.5 | 0.5 | 1.5 | 6.3 | 39.9 |
| Polygon Park N | 1.5 | 0.3 | 0.4 | 4.1 | 38.3 |
| Polygon Park E | 1.5 | 0.3 | 0.4 | 4.8 | 38.7 |
| Polygon Park S | 1.5 | 0.3 | 0.4 | 5.1 | 38.8 |
| Polygon Park W | 1.5 | 0.3 | 0.3 | 4.0 | 38.3 |
| Plot 1 N | 1.5 | 0.3 | 0.3 | 3.4 | 38.0 |
| Plot 1 E | 1.5 | 0.3 | 0.4 | 3.6 | 38.1 |
| Plot 1 S | 1.5 | 0.3 | 0.3 | 3.7 | 38.2 |

| Receptor | Height (m) | Contribution to Total Annual Mean $NO_x$ (µg/m³) FCI Energy Centre | Phoenix Court DHP | Roads | Total Annual Mean $NO_2$ (µg/m³) |
|---|---|---|---|---|---|
| Plot 1 W | 1.5 | 0.3 | 0.3 | 4.4 | 38.5 |
| Plot 1 Playground | 1.5 | 0.3 | 0.4 | 3.6 | 38.1 |
| Plot 2 N | 1.5 | 0.3 | 0.4 | 3.6 | 38.2 |
| Plot 2 E | 1.5 | 0.3 | 0.4 | 3.8 | 38.2 |
| Plot 2 S | 1.5 | 0.3 | 0.4 | 3.9 | 38.3 |
| Plot 2 W | 1.5 | 0.3 | 0.4 | 3.6 | 38.2 |
| Plot 3 N | 1.5 | 0.3 | 0.4 | 3.7 | 38.2 |
| Plot 3 S | 1.5 | 0.3 | 0.4 | 3.8 | 38.2 |
| Plot 4 N | 1.5 | 0.4 | 0.7 | 5.0 | 39.0 |
| Plot 4 E | 1.5 | 0.4 | 0.8 | 5.2 | 39.0 |
| Plot 4 S | 1.5 | 0.3 | 0.8 | 4.8 | 38.8 |
| Plot 4 W | 1.5 | 0.4 | 0.6 | 4.3 | 38.6 |
| Plot 4 Playground N | 1.5 | 0.4 | 0.5 | 4.1 | 38.4 |
| Plot 4 Playground S | 1.5 | 0.3 | 0.5 | 4.2 | 38.5 |
| Plot 5 N | 1.5 | 0.4 | 1.1 | 5.5 | 39.4 |
| Plot 5 E | 1.5 | 0.3 | 1.3 | 5.6 | 39.4 |
| Plot 5 SE | 1.5 | 0.3 | 1.3 | 5.6 | 39.4 |
| Plot 5 SW | 1.5 | 0.3 | 1.2 | 5.8 | 39.4 |
| Plot 6 NE | 1.5 | 0.4 | 1.5 | 6.1 | 39.7 |
| Plot 6 SE | 1.5 | 0.5 | 1.5 | 6.1 | 39.8 |
| Plot 6 SW | 1.5 | 0.4 | 1.1 | 5.8 | 39.5 |
| Plot 6 NW | 1.5 | 0.4 | 1.3 | 5.7 | 39.5 |
| Plot 5 N3 | 11.5 | 0.4 | 1.2 | 4.3 | 38.9 |
| Plot 5 E3 | 11.5 | 0.4 | 1.4 | 4.4 | 39.0 |
| Plot 5 SE 5 | 17.5 | 0.3 | 2.1 | 3.6 | 38.9 |
| Plot 5 SW5 | 17.5 | 0.4 | 1.6 | 3.5 | 38.7 |
| Plot 6 NE2 | 8.5 | 0.4 | 1.7 | 5.3 | 39.5 |
| Plot 6 SE2 | 8.5 | 0.5 | 1.9 | 5.4 | 39.7 |
| Plot 6_SW3 | 11.5 | 0.4 | 2.1 | 4.6 | 39.4 |
| Plot 6 NW3 | 11.5 | 0.3 | 1.8 | 4.6 | 39.2 |
| Air Quality Objective 40 µg/m³<br>Background assumed as 36.2 µg/m³<br>Exceedence shown in bold | | | | | |

### 7.3 Analysis of Results

The predicted concentrations indicate that air quality would be expected to meet the annual mean $NO_2$ objective at all building façade receptor locations in Plots 1 to 6. The results indicate exceedance of the objective at one location, the southern receptor located in Purchese Street Open Space where it is influenced by emissions from the Brill Place and from the Phoenix Court DHP. Whilst exceedance of the objective is not ideal, this receptor is not located at the façade of the building but is representative of amenity space. As such the annual objective would not apply as people would not be expected to spend extended periods of time in this location.

# 8. OPERATIONAL IMPACTS PLOT 7

## 8.1 Introduction

The Proposed Development includes the introduction of a 25 storey residential tower (including a double-height ground floor and top floor plus a single storey basement level) within Brill Place Park at Plot 7 (the Tower). The introduction of the Tower would introduce new receptors at an elevated location which would be significantly closer to the release points at the Phoenix Court DHP and FCI than the existing receptors or those introduced in Plots 1 to 6.

Consideration has been given to possible impacts from a number of sources as detailed in Section 4 which are discussed separately below. With the exception of the energy centre plant, it has not been considered necessary to consider these impacts on Plots 1 to 6 as the air quality assessments previously carried as part of the planning submission for the Phoenix Court DHP and the FCI considered the impact from these sources at representative receptors to those that would be introduced by the Proposed Development. It is therefore considered that on Plots 1 to 6 the concentrations would be no higher than those predicted at the existing residential receptors and have therefore been deemed acceptable given that both schemes received planning permission.

## 8.2 Energy Centre Emissions

The predicted concentrations arising from the operation of the Phoenix Court DHP and the FCI energy centre are provided below in Table 8-1 to Table 8-4. One table is presented for each façade of the building.

**Table 8-1: Predicted Annual Mean $NO_2$ Concentrations at Plot 7 NE Facade**

| Receptor | Height (m) | Contribution to Total Annual Mean $NO_x$ (µg/m³) | | | Total Annual Mean $NO_2$ (µg/m³) |
|---|---|---|---|---|---|
| | | FCI Energy Centre | Phoenix Court DHP | Roads | |
| Plot 7 NE A1 | 7.1 | 1.7 | 1.5 | 6.5 | **47.1** |
| Plot 7 NE A2 | 10.2 | 1.7 | 2.1 | 5.8 | **47.0** |
| Plot 7 NE A3 | 13.3 | 1.7 | 2.7 | 5.1 | **47.0** |
| Plot 7 NE A4 | 16.4 | 1.7 | 3.5 | 4.5 | **47.0** |
| Plot 7 NE A5 | 19.5 | 1.7 | 4.2 | 4.0 | **47.1** |
| Plot 7 NE A6 | 22.6 | 1.7 | 4.9 | 3.6 | **47.2** |
| Plot 7 NE A7 | 25.7 | 1.7 | 5.4 | 3.2 | **47.3** |
| Plot 7 NE A8 | 28.8 | 1.7 | 5.6 | 2.8 | **47.2** |
| Plot 7 NE A9 | 31.9 | 1.7 | 5.4 | 2.5 | **47.0** |
| Plot 7 NE A10 | 35.0 | 1.7 | 4.9 | 2.3 | **46.7** |
| Plot 7 NE A11 | 38.1 | 1.7 | 4.0 | 2.0 | **46.3** |
| Plot 7 NE A12 | 41.2 | 1.7 | 3.1 | 1.8 | **45.8** |
| Plot 7 NE A13 | 44.3 | 1.9 | 2.1 | 1.6 | **45.3** |
| Plot 7 NE A14 | 47.4 | 1.5 | 1.3 | 1.4 | **44.8** |
| Plot 7 NE A15 | 50.5 | 2.8 | 0.8 | 1.3 | **45.0** |
| Plot 7 NE A16 | 53.6 | 3.6 | 0.5 | 1.1 | **45.2** |
| Plot 7 NE A17 | 56.7 | 4.5 | 0.3 | 1.0 | **45.5** |

| Receptor | Height (m) | Contribution to Total Annual Mean $NO_x$ (µg/m³) | | | Total Annual Mean $NO_2$ (µg/m³) |
|---|---|---|---|---|---|
| | | FCI Energy Centre | Phoenix Court DHP | Roads | |
| Plot 7 NE C1 | 7.1 | 2.0 | 1.7 | 6.7 | **47.3** |
| Plot 7 NE C2 | 10.2 | 2.0 | 2.2 | 5.9 | **47.2** |
| Plot 7 NE C3 | 13.3 | 2.0 | 2.7 | 5.2 | **47.2** |
| Plot 7 NE C4 | 16.4 | 2.0 | 3.3 | 4.6 | **47.2** |
| Plot 7 NE C5 | 19.5 | 2.0 | 3.9 | 4.1 | **47.2** |
| Plot 7 NE C6 | 22.6 | 2.0 | 4.6 | 3.6 | **47.3** |
| Plot 7 NE C7 | 25.7 | 2.0 | 5.1 | 3.2 | **47.3** |
| Plot 7 NE C8 | 28.8 | 2.0 | 5.2 | 2.9 | **47.2** |
| Plot 7 NE C9 | 31.9 | 2.0 | 5.1 | 2.6 | **47.0** |
| Plot 7 NE C10 | 35.0 | 2.0 | 4.6 | 2.3 | **46.7** |
| Plot 7 NE C11 | 38.1 | 2.0 | 3.9 | 2.1 | **46.3** |
| Plot 7 NE C12 | 41.2 | 2.0 | 3.0 | 1.8 | **45.9** |
| Plot 7 NE C13 | 44.3 | 2.0 | 2.1 | 1.6 | **45.4** |
| Plot 7 NE C14 | 47.4 | 2.2 | 1.3 | 1.4 | **45.1** |
| Plot 7 NE C15 | 50.5 | 3.2 | 0.8 | 1.3 | **45.2** |
| Plot 7 NE C16 | 53.6 | 4.3 | 0.5 | 1.1 | **45.5** |
| Plot 7 NE C17 | 56.7 | 5.6 | 0.3 | 1.0 | **45.9** |
| Plot 7 NE C18 | 59.8 | 6.6 | 0.2 | 0.9 | **46.3** |
| Plot 7 NE C19 | 63.0 | 6.9 | 0.2 | 0.8 | **46.3** |
| Plot 7 NE C20 | 66.3 | 6.2 | 0.1 | 0.7 | **46.0** |
| Plot 7 NE C21 | 69.5 | 4.9 | 0.1 | 0.6 | **45.4** |
| Air Quality Objective 40 µg/m³<br>Background assumed as 43 µg/m³<br>Exceedances shown in bold | | | | | |

**Table 8-2: Predicted Annual Mean $NO_2$ Concentrations at Plot 7 SE Facade**

| Receptor | Height (m) | Contribution to Total Annual Mean $NO_x$ (µg/m³) | | | Total Annual Mean $NO_2$ (µg/m³) |
|---|---|---|---|---|---|
| | | FCI Energy Centre | Phoenix Court DHP | Roads | |
| Plot 7 SE A1 | 7.1 | 2.1 | 1.7 | 6.6 | **47.3** |
| Plot 7 SE A2 | 10.2 | 2.1 | 2.1 | 5.9 | **47.2** |
| Plot 7 SE A3 | 13.3 | 2.1 | 2.7 | 5.2 | **47.2** |
| Plot 7 SE A4 | 16.4 | 2.1 | 3.4 | 4.6 | **47.2** |
| Plot 7 SE A5 | 19.5 | 2.1 | 4.2 | 4.1 | **47.3** |
| Plot 7 SE A6 | 22.6 | 2.1 | 5.1 | 3.7 | **47.5** |

| Receptor | Height (m) | Contribution to Total Annual Mean $NO_x$ (µg/m³) | | | Total Annual Mean $NO_2$ (µg/m³) |
|---|---|---|---|---|---|
| | | FCI Energy Centre | Phoenix Court DHP | Roads | |
| Plot 7 SE A7 | 25.7 | 2.1 | 5.7 | 3.3 | **47.6** |
| Plot 7 SE A8 | 28.8 | 2.1 | 6.0 | 2.9 | **47.5** |
| Plot 7 SE A9 | 31.9 | 2.1 | 5.8 | 2.6 | **47.4** |
| Plot 7 SE A10 | 35.0 | 2.1 | 5.2 | 2.3 | **47.0** |
| Plot 7 SE A11 | 38.1 | 2.1 | 4.2 | 2.1 | **46.5** |
| Plot 7 SE A12 | 41.2 | 2.1 | 3.1 | 1.8 | **46.0** |
| Plot 7 SE A13 | 44.3 | 2.1 | 2.1 | 1.6 | **45.4** |
| Plot 7 SE A14 | 47.4 | 2.2 | 1.3 | 1.4 | **45.1** |
| Plot 7 SE A15 | 50.5 | 3.1 | 0.8 | 1.3 | **45.2** |
| Plot 7 SE A16 | 53.6 | 4.2 | 0.5 | 1.1 | **45.5** |
| Plot 7 SE A17 | 56.7 | 5.5 | 0.3 | 1.0 | **45.9** |
| Plot 7 SE A18 | 59.8 | 6.6 | 0.2 | 0.9 | **46.2** |
| Plot 7 SE A19 | 63.0 | 6.9 | 0.2 | 0.8 | **46.3** |
| Plot 7 SE C1 | 7.1 | 1.4 | 1.3 | 6.3 | **46.8** |
| Plot 7 SE C2 | 10.2 | 1.4 | 1.9 | 5.7 | **46.8** |
| Plot 7 SE C3 | 13.3 | 1.4 | 2.8 | 5.1 | **46.9** |
| Plot 7 SE C4 | 16.4 | 1.4 | 4.1 | 4.6 | **47.2** |
| Plot 7 SE C5 | 19.5 | 1.4 | 6.1 | 4.1 | **47.8** |
| Plot 7 SE C6 | 22.6 | 1.4 | 8.4 | 3.7 | **48.6** |
| Plot 7 SE C7 | 25.7 | 1.4 | 10.3 | 3.3 | **49.2** |
| Plot 7 SE C8 | 28.8 | 1.4 | 11.1 | 2.9 | **49.3** |
| Plot 7 SE C9 | 31.9 | 1.4 | 10.4 | 2.6 | **48.9** |
| Plot 7 SE C10 | 35.0 | 1.4 | 8.5 | 2.3 | **48.0** |
| Plot 7 SE C11 | 38.1 | 1.4 | 5.9 | 2.1 | **46.9** |
| Plot 7 SE C12 | 41.2 | 1.4 | 3.6 | 1.8 | **45.9** |
| Plot 7 SE C13 | 44.3 | 1.4 | 2.0 | 1.6 | **45.1** |
| Plot 7 SE C14 | 47.4 | 1.3 | 1.1 | 1.4 | **44.7** |
| Plot 7 SE C15 | 50.5 | 2.4 | 0.6 | 1.3 | **44.8** |
| Plot 7 SE C16 | 53.6 | 3.2 | 0.4 | 1.1 | **45.0** |
| Plot 7 SE C17 | 56.7 | 4.1 | 0.3 | 1.0 | **45.3** |
| Plot 7 SE C18 | 59.8 | 4.9 | 0.2 | 0.9 | **45.5** |
| Plot 7 SE C19 | 63.0 | 5.2 | 0.1 | 0.8 | **45.6** |
| Plot 7 SE C20 | 66.3 | 4.9 | 0.1 | 0.7 | **45.4** |
| Plot 7 SE C21 | 69.5 | 4.1 | 0.1 | 0.6 | **45.0** |
| Air Quality Objective 40 µg/m³ | | | | | |

| Receptor | Height (m) | Contribution to Total Annual Mean $NO_x$ ($\mu g/m^3$) | | | Total Annual Mean $NO_2$ ($\mu g/m^3$) |
|---|---|---|---|---|---|
| | | FCI Energy Centre | Phoenix Court DHP | Roads | |
| Background assumed as 43 $\mu g/m^3$<br>Exceedances shown in bold | | | | | |

**Table 8-3: Predicted Annual Mean NO2 Concentrations at Plot 7 SW Facade**

| Receptor | Height (m) | Contribution to Total Annual Mean $NO_x$ ($\mu g/m^3$) | | | Total Annual Mean $NO_2$ ($\mu g/m^3$) |
|---|---|---|---|---|---|
| | | FCI Energy Centre | Phoenix Court DHP | Roads | |
| Plot 7 SW A1 | 7.1 | 1.2 | 1.2 | 6.2 | **46.6** |
| Plot 7 SW A2 | 10.2 | 1.2 | 1.7 | 5.6 | **46.5** |
| Plot 7 SW A3 | 13.3 | 1.2 | 2.5 | 5.0 | **46.7** |
| Plot 7 SW A4 | 16.4 | 1.2 | 3.9 | 4.5 | **47.0** |
| Plot 7 SW A5 | 19.5 | 1.2 | 6.1 | 4.1 | **47.7** |
| Plot 7 SW A6 | 22.6 | 1.2 | 9.0 | 3.6 | **48.7** |
| Plot 7 SW A7 | 25.7 | 1.2 | 11.5 | 3.2 | **49.5** |
| Plot 7 SW A8 | 28.8 | 1.2 | 12.6 | 2.9 | **49.8** |
| Plot 7 SW A9 | 31.9 | 1.2 | 11.7 | 2.6 | **49.3** |
| Plot 7 SW A10 | 35.0 | 1.2 | 9.1 | 2.3 | **48.2** |
| Plot 7 SW A11 | 38.1 | 1.2 | 6.0 | 2.0 | **46.9** |
| Plot 7 SW A12 | 41.2 | 1.2 | 3.5 | 1.8 | **45.7** |
| Plot 7 SW A13 | 44.3 | 1.2 | 1.9 | 1.6 | **45.0** |
| Plot 7 SW A14 | 47.4 | 1.2 | 1.0 | 1.4 | **44.5** |
| Plot 7 SW A15 | 50.5 | 2.2 | 0.6 | 1.3 | **44.7** |
| Plot 7 SW A16 | 53.6 | 2.9 | 0.4 | 1.1 | **44.9** |
| Plot 7 SW A17 | 56.7 | 3.6 | 0.3 | 1.0 | **45.1** |
| Plot 7 SW C1 | 7.1 | 1.0 | 1.4 | 6.0 | **46.5** |
| Plot 7 SW C2 | 10.2 | 1.0 | 1.8 | 5.5 | **46.5** |
| Plot 7 SW C3 | 13.3 | 1.0 | 2.8 | 4.9 | **46.6** |
| Plot 7 SW C4 | 16.4 | 1.0 | 4.3 | 4.4 | **47.1** |
| Plot 7 SW C5 | 19.5 | 1.0 | 6.4 | 4.0 | **47.7** |
| Plot 7 SW C6 | 22.6 | 1.0 | 9.3 | 3.5 | **48.7** |
| Plot 7 SW C7 | 25.7 | 1.0 | 11.8 | 3.2 | **49.5** |
| Plot 7 SW C8 | 28.8 | 1.0 | 12.6 | 2.8 | **49.7** |
| Plot 7 SW C9 | 31.9 | 1.0 | 11.6 | 2.5 | **49.2** |

| Receptor | Height (m) | Contribution to Total Annual Mean $NO_x$ ($\mu g/m^3$) | | | Total Annual Mean $NO_2$ ($\mu g/m^3$) |
|---|---|---|---|---|---|
| | | FCI Energy Centre | Phoenix Court DHP | Roads | |
| Plot 7 SW C10 | 35.0 | 1.0 | 9.0 | 2.3 | **48.1** |
| Plot 7 SW C11 | 38.1 | 1.0 | 5.8 | 2.0 | **46.7** |
| Plot 7 SW C12 | 41.2 | 1.0 | 3.2 | 1.8 | **45.6** |
| Plot 7 SW C13 | 44.3 | 1.0 | 1.7 | 1.6 | **44.8** |
| Plot 7 SW C14 | 47.4 | 1.0 | 0.9 | 1.4 | **44.4** |
| Air Quality Objective 40 $\mu g/m^3$<br>Background assumed as 43 $\mu g/m^3$<br>Exceedances shown in bold | | | | | |

## Table 8-4: Predicted Annual Mean $NO_2$ Concentrations at Plot 7 NW Facade

| Receptor | Height (m) | Contribution to Total Annual Mean $NO_x$ ($\mu g/m^3$) | | | Total Annual Mean $NO_2$ ($\mu g/m^3$) |
|---|---|---|---|---|---|
| | | FCI Energy Centre | Phoenix Court DHP | Roads | |
| Plot 7 NW A1 | 7.1 | 1.0 | 1.2 | 6.1 | **46.5** |
| Plot 7 NW A2 | 10.2 | 1.0 | 1.8 | 5.5 | **46.5** |
| Plot 7 NW A3 | 13.3 | 1.0 | 2.9 | 5.0 | **46.7** |
| Plot 7 NW A4 | 16.4 | 1.0 | 4.3 | 4.4 | **47.0** |
| Plot 7 NW A5 | 19.5 | 1.0 | 6.2 | 3.9 | **47.6** |
| Plot 7 NW A6 | 22.6 | 1.0 | 8.3 | 3.5 | **48.3** |
| Plot 7 NW A7 | 25.7 | 1.0 | 9.9 | 3.1 | **48.8** |
| Plot 7 NW A8 | 28.8 | 1.0 | 10.3 | 2.8 | **48.8** |
| Plot 7 NW A9 | 31.9 | 1.0 | 9.5 | 2.5 | **48.4** |
| Plot 7 NW A10 | 35.0 | 1.0 | 7.7 | 2.2 | **47.6** |
| Plot 7 NW A11 | 38.1 | 1.0 | 5.4 | 2.0 | **46.5** |
| Plot 7 NW A12 | 41.2 | 1.0 | 3.3 | 1.8 | **45.6** |
| Plot 7 NW A13 | 44.3 | 1.0 | 1.8 | 1.6 | **44.9** |
| Plot 7 NW A14 | 47.4 | 0.9 | 1.0 | 1.4 | **44.4** |
| Plot 7 NW B1 | 7.1 | 1.4 | 1.5 | 6.3 | **46.9** |
| Plot 7 NW B2 | 10.2 | 1.4 | 2.1 | 5.7 | **46.8** |
| Plot 7 NW B3 | 13.3 | 1.4 | 2.8 | 5.0 | **46.9** |
| Plot 7 NW B4 | 16.4 | 1.4 | 3.8 | 4.5 | **47.0** |
| Plot 7 NW B5 | 19.5 | 1.4 | 4.9 | 4.0 | **47.3** |
| Plot 7 NW B6 | 22.6 | 1.4 | 5.9 | 3.5 | **47.5** |

| Receptor | Height (m) | Contribution to Total Annual Mean $NO_x$ (µg/m³) | | | Total Annual Mean $NO_2$ (µg/m³) |
|---|---|---|---|---|---|
| | | FCI Energy Centre | Phoenix Court DHP | Roads | |
| Plot 7 NW B7 | 25.7 | 1.4 | 6.6 | 3.1 | **47.6** |
| Plot 7 NW B8 | 28.8 | 1.4 | 6.8 | 2.8 | **47.6** |
| Plot 7 NW B9 | 31.9 | 1.4 | 6.5 | 2.5 | **47.4** |
| Plot 7 NW B10 | 35.0 | 1.4 | 5.7 | 2.3 | **46.9** |
| Plot 7 NW B11 | 38.1 | 1.4 | 4.5 | 2.0 | **46.3** |
| Plot 7 NW B12 | 41.2 | 1.4 | 3.2 | 1.8 | **45.7** |
| Plot 7 NW B13 | 44.3 | 1.5 | 2.0 | 1.6 | **45.2** |
| Plot 7 NW B14 | 47.4 | 1.3 | 1.2 | 1.4 | **44.7** |
| Plot 7 NW B15 | 50.5 | 2.5 | 0.7 | 1.3 | **44.9** |
| Plot 7 NW B16 | 53.6 | 3.2 | 0.4 | 1.1 | **45.0** |
| Plot 7 NW B17 | 56.7 | 4.0 | 0.3 | 1.0 | **45.2** |
| Air Quality Objective 40 µg/m³<br>Background assumed as 43 µg/m³<br>Exceedances shown in bold | | | | | |

8.2.1 Analysis of Result

The modelling of the energy centre emissions indicates that the two energy centres would both result in an increase in concentrations at the façade locations of the Tower. The Phoenix Centre DHP results in a maximum increase in $NO_x$ concentrations of 12.6 µg/m³ concentrated at floors seven to nine. The FCI results in a maximum increase of 6.9 µg/m³, and the impacts occur higher in the Tower around floors 17 to 19.

The road contribution together with the background concentration also contributes to the total $NO_2$. Overall, exceedance of the $NO_2$ objective is predicted at all facades and for all floors of the Tower.

## 8.3 FCI Emergency Generators

8.3.1 Black Start Operations

All three FCI emergency generators would only be used simultaneously during commissioning which is predicted to last two or three hours or in the event of a complete loss of power at the FCI. Information from the FCI air quality assessment has indicated that such an event, termed as a black start is unlikely to arise more than once per year and would not be expected to last more than 18 hours. It is expected that the commissioning tests would have been completed prior to the construction of the Tower.

**Table 8-5: Predicted Worst Case 99.8th Percentile 1 Hour $NO_2$ Concentrations from Black Start Operations of FCI Emergency Generators at Plot 7 NE Facade**

| Receptor | Height (m) | $NO_x$ Process Contribution µg/m³ | $NO_2$ Process Contribution µg/m³ | Total $NO_2$ µg/m³ | Percentage of year Hourly $NO_2$ > 200 µg/m³ |
|---|---|---|---|---|---|
| Plot 7 NE A1 | 7.1 | 105 | 37 | 123 | 0.0 |
| Plot 7 NE A2 | 10.2 | 105 | 37 | 123 | 0.0 |
| Plot 7 NE A3 | 13.3 | 105 | 37 | 123 | 0.0 |
| Plot 7 NE A4 | 16.4 | 105 | 37 | 123 | 0.0 |
| Plot 7 NE A5 | 19.5 | 105 | 37 | 123 | 0.0 |
| Plot 7 NE A6 | 22.6 | 105 | 37 | 123 | 0.0 |
| Plot 7 NE A7 | 25.7 | 105 | 37 | 123 | 0.0 |
| Plot 7 NE A8 | 28.8 | 105 | 37 | 123 | 0.0 |
| Plot 7 NE A9 | 31.9 | 105 | 37 | 123 | 0.0 |
| Plot 7 NE A10 | 35.0 | 105 | 37 | 123 | 0.0 |
| Plot 7 NE A11 | 38.1 | 105 | 37 | 123 | 0.0 |
| Plot 7 NE A12 | 41.2 | 148 | 52 | 138 | 0.0 |
| Plot 7 NE A13 | 44.3 | 387 | 135 | **221** | 1.4 |
| Plot 7 NE A14 | 47.4 | 633 | 221 | **307** | 5.2 |
| Plot 7 NE A15 | 50.5 | 990 | 346 | **432** | 8.7 |
| Plot 7 NE A16 | 53.6 | 1456 | 510 | **596** | 11.2 |
| Plot 7 NE A17 | 56.7 | 2386 | 835 | **921** | 12.8 |
| Plot 7 NE C1 | 7.1 | 105 | 37 | 123 | 0.0 |
| Plot 7 NE C2 | 10.2 | 105 | 37 | 123 | 0.0 |
| Plot 7 NE C3 | 13.3 | 105 | 37 | 123 | 0.0 |
| Plot 7 NE C4 | 16.4 | 105 | 37 | 123 | 0.0 |
| Plot 7 NE C5 | 19.5 | 105 | 37 | 123 | 0.0 |
| Plot 7 NE C6 | 22.6 | 105 | 37 | 123 | 0.0 |
| Plot 7 NE C7 | 25.7 | 105 | 37 | 123 | 0.0 |
| Plot 7 NE C8 | 28.8 | 105 | 37 | 123 | 0.0 |
| Plot 7 NE C9 | 31.9 | 105 | 37 | 123 | 0.0 |
| Plot 7 NE C10 | 35.0 | 105 | 37 | 123 | 0.0 |
| Plot 7 NE C11 | 38.1 | 105 | 37 | 123 | 0.0 |
| Plot 7 NE C12 | 41.2 | 121 | 42 | 128 | 0.0 |
| Plot 7 NE C13 | 44.3 | 385 | 135 | **221** | 1.1 |
| Plot 7 NE C14 | 47.4 | 726 | 254 | **340** | 5.6 |
| Plot 7 NE C15 | 50.5 | 1262 | 442 | **528** | 10.1 |
| Plot 7 NE C16 | 53.6 | 2016 | 705 | **791** | 13.1 |

| Receptor | Height (m) | $NO_x$ Process Contribution µg/m³ | $NO_2$ Process Contribution µg/m³ | Total $NO_2$ µg/m³ | Percentage of year Hourly $NO_2$ > 200 µg/m³ |
|---|---|---|---|---|---|
| Plot 7 NE C17 | 56.7 | 3404 | 1191 | **1277** | 14.8 |
| Plot 7 NE C18 | 59.8 | 4788 | 1676 | **1762** | 15.5 |
| Plot 7 NE C19 | 63.0 | 4872 | 1705 | **1791** | 14.7 |
| Plot 7 NE C20 | 66.3 | 4743 | 1660 | **1746** | 13.5 |
| Plot 7 NE C21 | 69.5 | 3972 | 1390 | **1476** | 10.6 |
| Air Quality Objective 200 µg/m³ not to be exceeded more than 18 times a year<br>Background assumed as twice the annual mean of 43 µg/m³<br>Exceedances shown in bold | | | | | |

**Table 8-6: Predicted Worst Case 99.8th Percentile 1 Hour $NO_2$ Concentrations from Black Start Operations of FCI Emergency Generators at Plot 7 SE Facade**

| Receptor | Height (m) | $NO_x$ Process Contribution µg/m³ | $NO_2$ Process Contribution µg/m³ | Total $NO_2$ µg/m³ | Percentage of year Hourly $NO_2$ > 200 µg/m³ |
|---|---|---|---|---|---|
| Plot 7 SE A1 | 7.1 | 105 | 37 | 123 | 0.0 |
| Plot 7 SE A2 | 10.2 | 105 | 37 | 123 | 0.0 |
| Plot 7 SE A3 | 13.3 | 105 | 37 | 123 | 0.0 |
| Plot 7 SE A4 | 16.4 | 105 | 37 | 123 | 0.0 |
| Plot 7 SE A5 | 19.5 | 105 | 37 | 123 | 0.0 |
| Plot 7 SE A6 | 22.6 | 105 | 37 | 123 | 0.0 |
| Plot 7 SE A7 | 25.7 | 105 | 37 | 123 | 0.0 |
| Plot 7 SE A8 | 28.8 | 105 | 37 | 123 | 0.0 |
| Plot 7 SE A9 | 31.9 | 105 | 37 | 123 | 0.0 |
| Plot 7 SE A10 | 35.0 | 105 | 37 | 123 | 0.0 |
| Plot 7 SE A11 | 38.1 | 105 | 37 | 123 | 0.0 |
| Plot 7 SE A12 | 41.2 | 105 | 37 | 123 | 0.0 |
| Plot 7 SE A13 | 44.3 | 379 | 133 | **219** | 0.8 |
| Plot 7 SE A14 | 47.4 | 763 | 267 | **353** | 5.3 |
| Plot 7 SE A15 | 50.5 | 1353 | 473 | **559** | 9.7 |
| Plot 7 SE A16 | 53.6 | 2242 | 785 | **871** | 12.4 |
| Plot 7 SE A17 | 56.7 | 3616 | 1266 | **1352** | 14.2 |
| Plot 7 SE A18 | 59.8 | 5140 | 1799 | **1885** | 14.5 |
| Plot 7 SE A19 | 63.0 | 5115 | 1790 | **1876** | 13.8 |
| Plot 7 SE C1 | 7.1 | 105 | 37 | 123 | 0.0 |
| Plot 7 SE C2 | 10.2 | 105 | 37 | 123 | 0.0 |

| Receptor | Height (m) | $NO_x$ Process Contribution µg/m³ | $NO_2$ Process Contribution µg/m³ | Total $NO_2$ µg/m³ | Percentage of year Hourly $NO_2$ > 200 µg/m³ |
|---|---|---|---|---|---|
| Plot 7 SE C3 | 13.3 | 105 | 37 | 123 | 0.0 |
| Plot 7 SE C4 | 16.4 | 105 | 37 | 123 | 0.0 |
| Plot 7 SE C5 | 19.5 | 105 | 37 | 123 | 0.0 |
| Plot 7 SE C6 | 22.6 | 105 | 37 | 123 | 0.0 |
| Plot 7 SE C7 | 25.7 | 105 | 37 | 123 | 0.0 |
| Plot 7 SE C8 | 28.8 | 105 | 37 | 123 | 0.0 |
| Plot 7 SE C9 | 31.9 | 105 | 37 | 123 | 0.0 |
| Plot 7 SE C10 | 35.0 | 105 | 37 | 123 | 0.0 |
| Plot 7 SE C11 | 38.1 | 105 | 37 | 123 | 0.0 |
| Plot 7 SE C12 | 41.2 | 105 | 37 | 123 | 0.0 |
| Plot 7 SE C13 | 44.3 | 397 | 139 | **225** | 0.7 |
| Plot 7 SE C14 | 47.4 | 719 | 252 | **338** | 3.4 |
| Plot 7 SE C15 | 50.5 | 1244 | 436 | **522** | 6.1 |
| Plot 7 SE C16 | 53.6 | 1974 | 691 | **777** | 8.7 |
| Plot 7 SE C17 | 56.7 | 3201 | 1120 | **1206** | 10.4 |
| Plot 7 SE C18 | 59.8 | 4538 | 1588 | **1674** | 11.3 |
| Plot 7 SE C19 | 63.0 | 4776 | 1672 | **1758** | 11.0 |
| Plot 7 SE C20 | 66.3 | 4556 | 1595 | **1681** | 9.8 |
| Plot 7 SE C21 | 69.5 | 3760 | 1316 | **1402** | 7.9 |

Air Quality Objective 200 µg/m³ not to be exceeded more than 18 times a year
Background assumed as twice the annual mean of 43 µg/m³
Exceedances shown in bold

**Table 8-7: Predicted Worst Case 99.8th Percentile 1 Hour $NO_2$ Concentrations from Black Start Operations of FCI Emergency Generators at Plot 7 SW Facade**

| Receptor | Height (m) | $NO_x$ Process Contribution µg/m³ | $NO_2$ Process Contribution µg/m³ | Total $NO_2$ µg/m³ | Percentage of year Hourly $NO_2$ > 200 µg/m³ |
|---|---|---|---|---|---|
| Plot 7 SW A1 | 7.1 | 105 | 37 | 123 | 0.0 |
| Plot 7 SW A2 | 10.2 | 105 | 37 | 123 | 0.0 |
| Plot 7 SW A3 | 13.3 | 105 | 37 | 123 | 0.0 |
| Plot 7 SW A4 | 16.4 | 105 | 37 | 123 | 0.0 |
| Plot 7 SW A5 | 19.5 | 105 | 37 | 123 | 0.0 |
| Plot 7 SW A6 | 22.6 | 105 | 37 | 123 | 0.0 |
| Plot 7 SW A7 | 25.7 | 105 | 37 | 123 | 0.0 |

| Receptor | Height (m) | $NO_x$ Process Contribution µg/m³ | $NO_2$ Process Contribution µg/m³ | Total $NO_2$ µg/m³ | Percentage of year Hourly $NO_2$ > 200 µg/m³ |
|---|---|---|---|---|---|
| Plot 7 SW A8 | 28.8 | 105 | 37 | 123 | 0.0 |
| Plot 7 SW A9 | 31.9 | 105 | 37 | 123 | 0.0 |
| Plot 7 SW A10 | 35.0 | 105 | 37 | 123 | 0.0 |
| Plot 7 SW A11 | 38.1 | 105 | 37 | 123 | 0.0 |
| Plot 7 SW A12 | 41.2 | 105 | 37 | 123 | 0.0 |
| Plot 7 SW A13 | 44.3 | 405 | 142 | **228** | 0.8 |
| Plot 7 SW A14 | 47.4 | 677 | 237 | **323** | 3.1 |
| Plot 7 SW A15 | 50.5 | 1076 | 377 | **463** | 5.7 |
| Plot 7 SW A16 | 53.6 | 1711 | 599 | **685** | 7.6 |
| Plot 7 SW A17 | 56.7 | 2775 | 971 | **1057** | 9.0 |
| Plot 7 SW C1 | 7.1 | 104 | 36 | 122 | 0.0 |
| Plot 7 SW C2 | 10.2 | 104 | 36 | 122 | 0.0 |
| Plot 7 SW C3 | 13.3 | 104 | 36 | 122 | 0.0 |
| Plot 7 SW C4 | 16.4 | 104 | 36 | 122 | 0.0 |
| Plot 7 SW C5 | 19.5 | 104 | 36 | 122 | 0.0 |
| Plot 7 SW C6 | 22.6 | 104 | 36 | 122 | 0.0 |
| Plot 7 SW C7 | 25.7 | 104 | 36 | 122 | 0.0 |
| Plot 7 SW C8 | 28.8 | 104 | 36 | 122 | 0.0 |
| Plot 7 SW C9 | 31.9 | 104 | 36 | 122 | 0.0 |
| Plot 7 SW C10 | 35.0 | 104 | 36 | 122 | 0.0 |
| Plot 7 SW C11 | 38.1 | 104 | 36 | 122 | 0.0 |
| Plot 7 SW C12 | 41.2 | 108 | 38 | 124 | 0.0 |
| Plot 7 SW C13 | 44.3 | 374 | 131 | **217** | 0.8 |
| Plot 7 SW C14 | 47.4 | 594 | 208 | **294** | 3.2 |
| Air Quality Objective 200 µg/m³ not to be exceeded more than 18 times a year<br>Background assumed as twice the annual mean of 43 µg/m³<br>Exceedances shown in bold | | | | | |

**Table 8-8: Predicted Worst Case 99.8th Percentile 1 Hour $NO_2$ Concentrations from Black Start Operations of FCI Emergency Generators at Plot 7 NW Facade**

| Receptor | Height (m) | $NO_x$ Process Contribution µg/m³ | $NO_2$ Process Contribution µg/m³ | Total $NO_2$ µg/m³ | Percentage of year Hourly $NO_2$ > 200 µg/m³ |
|---|---|---|---|---|---|
| Plot 7 NW A1 | 7.1 | 104 | 36 | 122 | 0.0 |
| Plot 7 NW A2 | 10.2 | 104 | 36 | 122 | 0.0 |

| Receptor | Height (m) | $NO_x$ Process Contribution µg/m³ | $NO_2$ Process Contribution µg/m³ | Total $NO_2$ µg/m³ | Percentage of year Hourly $NO_2$ > 200 µg/m³ |
|---|---|---|---|---|---|
| Plot 7 NW A3 | 13.3 | 104 | 36 | 122 | 0.0 |
| Plot 7 NW A4 | 16.4 | 104 | 36 | 122 | 0.0 |
| Plot 7 NW A5 | 19.5 | 104 | 36 | 122 | 0.0 |
| Plot 7 NW A6 | 22.6 | 104 | 36 | 122 | 0.0 |
| Plot 7 NW A7 | 25.7 | 104 | 36 | 122 | 0.0 |
| Plot 7 NW A8 | 28.8 | 104 | 36 | 122 | 0.0 |
| Plot 7 NW A9 | 31.9 | 104 | 36 | 122 | 0.0 |
| Plot 7 NW A10 | 35.0 | 104 | 36 | 122 | 0.0 |
| Plot 7 NW A11 | 38.1 | 104 | 36 | 122 | 0.0 |
| Plot 7 NW A12 | 41.2 | 104 | 36 | 122 | 0.0 |
| Plot 7 NW A13 | 44.3 | 373 | 130 | 216 | 1.1 |
| Plot 7 NW A14 | 47.4 | 570 | 200 | **286** | 3.5 |
| Plot 7 NW B1 | 7.1 | 105 | 37 | 123 | 0.0 |
| Plot 7 NW B2 | 10.2 | 105 | 37 | 123 | 0.0 |
| Plot 7 NW B3 | 13.3 | 105 | 37 | 123 | 0.0 |
| Plot 7 NW B4 | 16.4 | 105 | 37 | 123 | 0.0 |
| Plot 7 NW B5 | 19.5 | 105 | 37 | 123 | 0.0 |
| Plot 7 NW B6 | 22.6 | 105 | 37 | 123 | 0.0 |
| Plot 7 NW B7 | 25.7 | 105 | 37 | 123 | 0.0 |
| Plot 7 NW B8 | 28.8 | 105 | 37 | 123 | 0.0 |
| Plot 7 NW B9 | 31.9 | 105 | 37 | 123 | 0.0 |
| Plot 7 NW B10 | 35.0 | 105 | 37 | 123 | 0.0 |
| Plot 7 NW B11 | 38.1 | 105 | 37 | 123 | 0.0 |
| Plot 7 NW B12 | 41.2 | 116 | 41 | 127 | 0.0 |
| Plot 7 NW B13 | 44.3 | 377 | 132 | **218** | 1.5 |
| Plot 7 NW B14 | 47.4 | 587 | 205 | **291** | 4.7 |
| Plot 7 NW B15 | 50.5 | 920 | 322 | **408** | 7.6 |
| Plot 7 NW B16 | 53.6 | 1328 | 465 | **551** | 9.7 |
| Plot 7 NW B17 | 56.7 | 1994 | 698 | **784** | 10.7 |
| Air Quality Objective 200 µg/m³ not to be exceeded more than 18 times a year<br>Background assumed as twice the annual mean of 43 µg/m³<br>Exceedances shown in bold | | | | | |

8.3.2 Analysis of Black Start Predicted Concentrations

The concentrations that have been predicted in the event of a black start of the FCI's emergency generators, indicates that this scenario may result in concentrations in excess of 200 µg/m³ at floor 13 and above on all facades within the Tower in the event that a black start event coincided with certain meteorological conditions. However, as discussed above it should be noted that black start events would only arise during a complete loss of power and are unlikely to persist for a prolonged period. The analysis of the modelling results has indicated that the meteorological conditions which would give result in an exceedance of the one hour $NO_2$ limit at the Tower façade are at worst likely to persist for 15.5 % of the year. Thus whilst the potential for one hour concentrations in excess of 200 µg/m$^3$ to be experienced at the façade of the building the potential for the short term objective to be exceeded is considered unlikely given that the objective allows for the limit to be exceeded on 18 occasions annually.

### 8.3.3 Maintenance Operations of FCI Emergency Generators

To ensure that the generators remain in good working order, each generator would be operated once per month for a period not to exceed one hour. Each generator would be tested in turn, and therefore the maintenance checks correspond with one generator being run for 48 hours per year.

Two scenarios were modelled; a worst case and a more typical scenario. The worst case scenario assumed that the maintenance runs would be carried out during the worst 48 hours in the year for dispersion. The results of the modelling for this scenario are presented in Table 8-9 to Table 8-12.

A more typical scenario was run assuming that one generator would be tested each week for a period of one hour at the same time each week (in this case 10 am on a Saturday morning). This is considered to present a more realistic representation of potential concentrations. The results from this scenario are presented in Table 8-13 to 8-16.

**Table 8-9: Predicted 99.8$^{th}$ Percentile 1 Hour $NO_2$ Concentrations from Worst Case Maintenance Operations of FCI Emergency Generators at Plot 7 NE Facade**

| **Receptor** | **Height (m)** | **$NO_x$ Process Contribution µg/m$^3$** | **$NO_2$ Process Contribution µg/m$^3$** | **Total $NO_2$ µg/m$^3$** | **Percentage of year Hourly $NO_2$ > 200 µg/m$^3$** |
|---|---|---|---|---|---|
| Plot 7 NE A1 | 7.1 | 35 | 12 | 98 | 0 |
| Plot 7 NE A2 | 10.2 | 35 | 12 | 98 | 0 |
| Plot 7 NE A3 | 13.3 | 35 | 12 | 98 | 0 |
| Plot 7 NE A4 | 16.4 | 35 | 12 | 98 | 0 |
| Plot 7 NE A5 | 19.5 | 35 | 12 | 98 | 0 |
| Plot 7 NE A6 | 22.6 | 35 | 12 | 98 | 0 |
| Plot 7 NE A7 | 25.7 | 35 | 12 | 98 | 0 |
| Plot 7 NE A8 | 28.8 | 35 | 12 | 98 | 0 |
| Plot 7 NE A9 | 31.9 | 35 | 12 | 98 | 0 |
| Plot 7 NE A10 | 35.0 | 35 | 12 | 98 | 0 |
| Plot 7 NE A11 | 38.1 | 35 | 12 | 98 | 0 |
| Plot 7 NE A12 | 41.2 | 64 | 22 | 108 | 0 |
| Plot 7 NE A13 | 44.3 | 136 | 48 | 134 | 0 |
| Plot 7 NE A14 | 47.4 | 227 | 79 | 165 | 0 |
| Plot 7 NE A15 | 50.5 | 365 | 128 | **214** | 1 |

| Receptor | Height (m) | $NO_x$ Process Contribution µg/m³ | $NO_2$ Process Contribution µg/m³ | Total $NO_2$ µg/m³ | Percentage of year Hourly $NO_2$ > 200 µg/m³ |
|---|---|---|---|---|---|
| Plot 7 NE A16 | 53.6 | 539 | 189 | **275** | 4 |
| Plot 7 NE A17 | 56.7 | 855 | 299 | **385** | 5 |
| Plot 7 NE C1 | 7.1 | 35 | 12 | 98 | 0 |
| Plot 7 NE C2 | 10.2 | 35 | 12 | 98 | 0 |
| Plot 7 NE C3 | 13.3 | 35 | 12 | 98 | 0 |
| Plot 7 NE C4 | 16.4 | 35 | 12 | 98 | 0 |
| Plot 7 NE C5 | 19.5 | 35 | 12 | 98 | 0 |
| Plot 7 NE C6 | 22.6 | 35 | 12 | 98 | 0 |
| Plot 7 NE C7 | 25.7 | 35 | 12 | 98 | 0 |
| Plot 7 NE C8 | 28.8 | 35 | 12 | 98 | 0 |
| Plot 7 NE C9 | 31.9 | 35 | 12 | 98 | 0 |
| Plot 7 NE C10 | 35.0 | 35 | 12 | 98 | 0 |
| Plot 7 NE C11 | 38.1 | 35 | 12 | 98 | 0 |
| Plot 7 NE C12 | 41.2 | 48 | 17 | 103 | 0 |
| Plot 7 NE C13 | 44.3 | 140 | 49 | 135 | 0 |
| Plot 7 NE C14 | 47.4 | 273 | 96 | 182 | 0 |
| Plot 7 NE C15 | 50.5 | 479 | 168 | **254** | 3 |
| Plot 7 NE C16 | 53.6 | 758 | 265 | **351** | 6 |
| Plot 7 NE C17 | 56.7 | 1296 | 453 | **539** | 7 |
| Plot 7 NE C18 | 59.8 | 1896 | 663 | **749** | 8 |
| Plot 7 NE C19 | 63.0 | 2009 | 703 | **789** | 8 |
| Plot 7 NE C20 | 66.3 | 1862 | 652 | **738** | 7 |
| Plot 7 NE C21 | 69.5 | 1537 | 538 | **624** | 4 |
| Air Quality Objective 200 µg/m³ not to be exceeded more than 18 times a year<br>Background assumed as twice the annual mean of 43 µg/m³<br>Exceedances shown in bold | | | | | |

**Table 8-10: Predicted 99.8th Percentile 1 Hour $NO_2$ Concentrations from Worst Case Maintenance Operations of FCI Emergency Generators at Plot 7 SE Facade**

| Receptor | Height (m) | $NO_x$ Process Contribution µg/m³ | $NO_2$ Process Contribution µg/m³ | Total $NO_2$ µg/m³ | Percentage of year Hourly $NO_2$ > 200 µg/m³ |
|---|---|---|---|---|---|
| Plot 7 SE A1 | 7.1 | 35 | 12 | 98 | 0 |
| Plot 7 SE A2 | 10.2 | 35 | 12 | 98 | 0 |
| Plot 7 SE A3 | 13.3 | 35 | 12 | 98 | 0 |
| Plot 7 SE A4 | 16.4 | 35 | 12 | 98 | 0 |
| Plot 7 SE A5 | 19.5 | 35 | 12 | 98 | 0 |

| **Receptor** | **Height (m)** | **$NO_x$ Process Contribution µg/m³** | **$NO_2$ Process Contribution µg/m³** | **Total $NO_2$ µg/m³** | **Percentage of year Hourly $NO_2$ > 200 µg/m³** |
|---|---|---|---|---|---|
| Plot 7 SE A6 | 22.6 | 35 | 12 | 98 | 0 |
| Plot 7 SE A7 | 25.7 | 35 | 12 | 98 | 0 |
| Plot 7 SE A8 | 28.8 | 35 | 12 | 98 | 0 |
| Plot 7 SE A9 | 31.9 | 35 | 12 | 98 | 0 |
| Plot 7 SE A10 | 35.0 | 35 | 12 | 98 | 0 |
| Plot 7 SE A11 | 38.1 | 35 | 12 | 98 | 0 |
| Plot 7 SE A12 | 41.2 | 35 | 12 | 98 | 0 |
| Plot 7 SE A13 | 44.3 | 141 | 49 | 135 | 0 |
| Plot 7 SE A14 | 47.4 | 271 | 95 | 181 | 0 |
| Plot 7 SE A15 | 50.5 | 488 | 171 | **257** | 2 |
| Plot 7 SE A16 | 53.6 | 807 | 282 | **368** | 5 |
| Plot 7 SE A17 | 56.7 | 1405 | 492 | **578** | 7 |
| Plot 7 SE A18 | 59.8 | 1885 | 660 | **746** | 8 |
| Plot 7 SE A19 | 63.0 | 2016 | 706 | **792** | 7 |
| Plot 7 SE C1 | 7.1 | 35 | 12 | 98 | 0 |
| Plot 7 SE C2 | 10.2 | 35 | 12 | 98 | 0 |
| Plot 7 SE C3 | 13.3 | 35 | 12 | 98 | 0 |
| Plot 7 SE C4 | 16.4 | 35 | 12 | 98 | 0 |
| Plot 7 SE C5 | 19.5 | 35 | 12 | 98 | 0 |
| Plot 7 SE C6 | 22.6 | 35 | 12 | 98 | 0 |
| Plot 7 SE C7 | 25.7 | 35 | 12 | 98 | 0 |
| Plot 7 SE C8 | 28.8 | 35 | 12 | 98 | 0 |
| Plot 7 SE C9 | 31.9 | 35 | 12 | 98 | 0 |
| Plot 7 SE C10 | 35.0 | 35 | 12 | 98 | 0 |
| Plot 7 SE C11 | 38.1 | 35 | 12 | 98 | 0 |
| Plot 7 SE C12 | 41.2 | 35 | 12 | 98 | 0 |
| Plot 7 SE C13 | 44.3 | 134 | 47 | 133 | 0 |
| Plot 7 SE C14 | 47.4 | 246 | 86 | 172 | 0 |
| Plot 7 SE C15 | 50.5 | 397 | 139 | **225** | 1 |
| Plot 7 SE C16 | 53.6 | 614 | 215 | **301** | 3 |
| Plot 7 SE C17 | 56.7 | 1007 | 352 | **438** | 4 |
| Plot 7 SE C18 | 59.8 | 1375 | 481 | **567** | 5 |
| Plot 7 SE C19 | 63.0 | 1515 | 530 | **616** | 5 |
| Plot 7 SE C20 | 66.3 | 1334 | 467 | **553** | 4 |
| Plot 7 SE C21 | 69.5 | 1161 | 406 | **492** | 3 |

| Receptor | Height (m) | $NO_x$ Process Contribution µg/m³ | $NO_2$ Process Contribution µg/m³ | Total $NO_2$ µg/m³ | Percentage of year Hourly $NO_2$ > 200 µg/m³ |
|---|---|---|---|---|---|
| Air Quality Objective 200 µg/m³ not to be exceeded more than 18 times a year<br>Background assumed as twice the annual mean of 43 µg/m³<br>Exceedances shown in bold | | | | | |

**Table 8-11: Predicted 99.8th Percentile 1 Hour $NO_2$ Concentrations from Worst Case Maintenance Operations of FCI Emergency Generators at Plot 7 SW Facade**

| Receptor | Height (m) | $NO_x$ Process Contribution µg/m³ | $NO_2$ Process Contribution µg/m³ | Total $NO_2$ µg/m³ | Percentage of year Hourly $NO_2$ > 200 µg/m³ |
|---|---|---|---|---|---|
| Plot 7 SW A1 | 7.1 | 35 | 12 | 98 | 0 |
| Plot 7 SW A2 | 10.2 | 35 | 12 | 98 | 0 |
| Plot 7 SW A3 | 13.3 | 35 | 12 | 98 | 0 |
| Plot 7 SW A4 | 16.4 | 35 | 12 | 98 | 0 |
| Plot 7 SW A5 | 19.5 | 35 | 12 | 98 | 0 |
| Plot 7 SW A6 | 22.6 | 35 | 12 | 98 | 0 |
| Plot 7 SW A7 | 25.7 | 35 | 12 | 98 | 0 |
| Plot 7 SW A8 | 28.8 | 35 | 12 | 98 | 0 |
| Plot 7 SW A9 | 31.9 | 35 | 12 | 98 | 0 |
| Plot 7 SW A10 | 35.0 | 35 | 12 | 98 | 0 |
| Plot 7 SW A11 | 38.1 | 35 | 12 | 98 | 0 |
| Plot 7 SW A12 | 41.2 | 35 | 12 | 98 | 0 |
| Plot 7 SW A13 | 44.3 | 132 | 46 | 132 | 0 |
| Plot 7 SW A14 | 47.4 | 224 | 78 | 164 | 0 |
| Plot 7 SW A15 | 50.5 | 352 | 123 | **209** | 1 |
| Plot 7 SW A16 | 53.6 | 528 | 185 | **271** | 2 |
| Plot 7 SW A17 | 56.7 | 819 | 287 | **373** | 3 |
| Plot 7 SW C1 | 7.1 | 35 | 12 | 98 | 0 |
| Plot 7 SW C2 | 10.2 | 35 | 12 | 98 | 0 |
| Plot 7 SW C3 | 13.3 | 35 | 12 | 98 | 0 |
| Plot 7 SW C4 | 16.4 | 35 | 12 | 98 | 0 |
| Plot 7 SW C5 | 19.5 | 35 | 12 | 98 | 0 |
| Plot 7 SW C6 | 22.6 | 35 | 12 | 98 | 0 |
| Plot 7 SW C7 | 25.7 | 35 | 12 | 98 | 0 |
| Plot 7 SW C8 | 28.8 | 35 | 12 | 98 | 0 |
| Plot 7 SW C9 | 31.9 | 35 | 12 | 98 | 0 |
| Plot 7 SW C10 | 35.0 | 35 | 12 | 98 | 0 |
| Plot 7 SW C11 | 38.1 | 35 | 12 | 98 | 0 |

| Receptor | Height (m) | $NO_x$ Process Contribution µg/m³ | $NO_2$ Process Contribution µg/m³ | Total $NO_2$ µg/m³ | Percentage of year Hourly $NO_2$ > 200 µg/m³ |
|---|---|---|---|---|---|
| Plot 7 SW C12 | 41.2 | 35 | 12 | 98 | 0 |
| Plot 7 SW C13 | 44.3 | 128 | 45 | 131 | 0 |
| Plot 7 SW C14 | 47.4 | 192 | 67 | 153 | 0 |
| Air Quality Objective 200 µg/m³ not to be exceeded more than 18 times a year<br>Background assumed as twice the annual mean of 43 µg/m³<br>Exceedances shown in bold | | | | | |

**Table 8-12: Predicted 99.8th Percentile 1 Hour $NO_2$ Concentrations from Worst Case Maintenance Operations of FCI Emergency Generators at Plot 7 NW Facade**

| Receptor | Height (m) | $NO_x$ Process Contribution µg/m³ | $NO_2$ Process Contribution µg/m³ | Total $NO_2$ µg/m³ | Percentage of year Hourly $NO_2$ > 200 µg/m³ |
|---|---|---|---|---|---|
| Plot 7 NW A1 | 7.1 | 34 | 12 | 98 | 0 |
| Plot 7 NW A2 | 10.2 | 34 | 12 | 98 | 0 |
| Plot 7 NW A3 | 13.3 | 34 | 12 | 98 | 0 |
| Plot 7 NW A4 | 16.4 | 34 | 12 | 98 | 0 |
| Plot 7 NW A5 | 19.5 | 34 | 12 | 98 | 0 |
| Plot 7 NW A6 | 22.6 | 34 | 12 | 98 | 0 |
| Plot 7 NW A7 | 25.7 | 34 | 12 | 98 | 0 |
| Plot 7 NW A8 | 28.8 | 34 | 12 | 98 | 0 |
| Plot 7 NW A9 | 31.9 | 34 | 12 | 98 | 0 |
| Plot 7 NW A10 | 35.0 | 34 | 12 | 98 | 0 |
| Plot 7 NW A11 | 38.1 | 34 | 12 | 98 | 0 |
| Plot 7 NW A12 | 41.2 | 34 | 12 | 98 | 0 |
| Plot 7 NW A13 | 44.3 | 126 | 44 | 130 | 0 |
| Plot 7 NW A14 | 47.4 | 197 | 69 | 155 | 0 |
| Plot 7 NW B1 | 7.1 | 35 | 12 | 98 | 0 |
| Plot 7 NW B2 | 10.2 | 35 | 12 | 98 | 0 |
| Plot 7 NW B3 | 13.3 | 35 | 12 | 98 | 0 |
| Plot 7 NW B4 | 16.4 | 35 | 12 | 98 | 0 |
| Plot 7 NW B5 | 19.5 | 35 | 12 | 98 | 0 |
| Plot 7 NW B6 | 22.6 | 35 | 12 | 98 | 0 |
| Plot 7 NW B7 | 25.7 | 35 | 12 | 98 | 0 |
| Plot 7 NW B8 | 28.8 | 35 | 12 | 98 | 0 |
| Plot 7 NW B9 | 31.9 | 35 | 12 | 98 | 0 |

| Receptor | Height (m) | $NO_x$ Process Contribution µg/m³ | $NO_2$ Process Contribution µg/m³ | Total $NO_2$ µg/m³ | Percentage of year Hourly $NO_2$ > 200 µg/m³ |
|---|---|---|---|---|---|
| Plot 7 NW B10 | 35.0 | 35 | 12 | 98 | 0 |
| Plot 7 NW B11 | 38.1 | 35 | 12 | 98 | 0 |
| Plot 7 NW B12 | 41.2 | 51 | 18 | 104 | 0 |
| Plot 7 NW B13 | 44.3 | 133 | 46 | 132 | 0 |
| Plot 7 NW B14 | 47.4 | 209 | 73 | 159 | 0 |
| Plot 7 NW B15 | 50.5 | 314 | 110 | 196 | 0 |
| Plot 7 NW B16 | 53.6 | 452 | 158 | **244** | 3 |
| Plot 7 NW B17 | 56.7 | 685 | 240 | **326** | 4 |
| Air Quality Objective 200 µg/m³ not to be exceeded more than 18 times a year<br>Background assumed as twice the annual mean of 43 µg/m³<br>Exceedances shown in bold | | | | | |

**Table 8-13: Predicted 99.8th Percentile 1 Hour $NO_2$ Concentrations from Typical Maintenance Operations of FCI Emergency Generators at Plot 7 NE Facade**

| Receptor | Height (m) | Max 1 Hr $NO_x$ Process Contribution µg/m³ | 99.8 %ile $NO_x$ Process Contribution µg/m³ | 99.8 %ile $NO_2$ Process Contribution µg/m³ | 99.8 %ile Total $NO_2$ µg/m³ | No Hours $NO_2$ > 200 µg/m³ |
|---|---|---|---|---|---|---|
| Plot 7 NE A1 | 7.1 | 36 | 3 | 1 | 87 | 0 |
| Plot 7 NE A2 | 10.2 | 36 | 3 | 1 | 87 | 0 |
| Plot 7 NE A3 | 13.3 | 36 | 3 | 1 | 87 | 0 |
| Plot 7 NE A4 | 16.4 | 36 | 3 | 1 | 87 | 0 |
| Plot 7 NE A5 | 19.5 | 36 | 3 | 1 | 87 | 0 |
| Plot 7 NE A6 | 22.6 | 36 | 3 | 1 | 87 | 0 |
| Plot 7 NE A7 | 25.7 | 36 | 3 | 1 | 87 | 0 |
| Plot 7 NE A8 | 28.8 | 36 | 3 | 1 | 87 | 0 |
| Plot 7 NE A9 | 31.9 | 36 | 3 | 1 | 87 | 0 |
| Plot 7 NE A10 | 35.0 | 36 | 3 | 1 | 87 | 0 |
| Plot 7 NE A11 | 38.1 | 36 | 4 | 2 | 88 | 0 |
| Plot 7 NE A12 | 41.2 | 47 | 3 | 1 | 87 | 0 |
| Plot 7 NE A13 | 44.3 | 132 | 0 | 0 | 86 | 0 |
| Plot 7 NE A14 | 47.4 | 200 | 0 | 0 | 86 | 0 |
| Plot 7 NE A15 | 50.5 | 302 | 0 | 0 | 86 | 0 |
| Plot 7 NE A16 | 53.6 | 410 | 0 | 0 | 86 | 2 |
| Plot 7 NE A17 | 56.7 | 547 | 0 | 0 | 86 | 4 |
| Plot 7 NE C1 | 7.1 | 36 | 14 | 5 | 91 | 0 |

| Receptor | Height (m) | Max 1 Hr $NO_x$ Process Contribution µg/m³ | 99.8 %ile $NO_x$ Process Contribution µg/m³ | 99.8 %ile $NO_2$ Process Contribution µg/m³ | 99.8 %ile Total $NO_2$ µg/m³ | No Hours $NO_2$ > 200 µg/m³ |
|---|---|---|---|---|---|---|
| Plot 7 NE C2 | 10.2 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 NE C3 | 13.3 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 NE C4 | 16.4 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 NE C5 | 19.5 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 NE C6 | 22.6 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 NE C7 | 25.7 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 NE C8 | 28.8 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 NE C9 | 31.9 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 NE C10 | 35.0 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 NE C11 | 38.1 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 NE C12 | 41.2 | 36 | 15 | 5 | 91 | 0 |
| Plot 7 NE C13 | 44.3 | 127 | 0 | 0 | 86 | 0 |
| Plot 7 NE C14 | 47.4 | 230 | 0 | 0 | 86 | 0 |
| Plot 7 NE C15 | 50.5 | 401 | 0 | 0 | 86 | 2 |
| Plot 7 NE C16 | 53.6 | 581 | 0 | 0 | 86 | 4 |
| Plot 7 NE C17 | 56.7 | 734 | 0 | 0 | 86 | 4 |
| Plot 7 NE C18 | 59.8 | 843 | 0 | 0 | 86 | 5 |
| Plot 7 NE C19 | 63.0 | 1007 | 0 | 0 | 86 | 5 |
| Plot 7 NE C20 | 66.3 | 1080 | 0 | 0 | 86 | 5 |
| Plot 7 NE C21 | 69.5 | 999 | 0 | 0 | 86 | 4 |
| Air Quality Objective 200 µg/m³ not to be exceeded more than 18 times a year<br>Background assumed as twice the annual mean of 43 µg/m³<br>Exceedances shown in bold | | | | | | |

**Table 8-14: Predicted 99.8th Percentile 1 Hour $NO_2$ Concentrations from Typical Maintenance Operations of FCI Emergency Generators at Plot 7 SE Facade**

| Receptor | Height (m) | Max 1 Hr $NO_x$ Process Contribution µg/m³ | 99.8 %ile $NO_x$ Process Contribution µg/m³ | 99.8 %ile $NO_2$ Process Contribution µg/m³ | 99.8 %ile Total $NO_2$ µg/m³ | No Hours $NO_2$ > 200 µg/m³ |
|---|---|---|---|---|---|---|
| Plot 7 SE A1 | 7.1 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 SE A2 | 10.2 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 SE A3 | 13.3 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 SE A4 | 16.4 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 SE A5 | 19.5 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 SE A6 | 22.6 | 36 | 14 | 5 | 91 | 0 |

| Receptor | Height (m) | Max 1 Hr $NO_x$ Process Contribution $\mu g/m^3$ | 99.8 %ile $NO_x$ Process Contribution $\mu g/m^3$ | 99.8 %ile $NO_2$ Process Contribution $\mu g/m^3$ | 99.8 %ile Total $NO_2$ $\mu g/m^3$ | No Hours $NO_2$ > 200 $\mu g/m^3$ |
|---|---|---|---|---|---|---|
| Plot 7 SE A7 | 25.7 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 SE A8 | 28.8 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 SE A9 | 31.9 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 SE A10 | 35.0 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 SE A11 | 38.1 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 SE A12 | 41.2 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 SE A13 | 44.3 | 145 | 0 | 0 | 86 | 0 |
| Plot 7 SE A14 | 47.4 | 270 | 0 | 0 | 86 | 0 |
| Plot 7 SE A15 | 50.5 | 433 | 0 | 0 | 86 | 2 |
| Plot 7 SE A16 | 53.6 | 636 | 0 | 0 | 86 | 3 |
| Plot 7 SE A17 | 56.7 | 903 | 0 | 0 | 86 | 4 |
| Plot 7 SE A18 | 59.8 | 1059 | 0 | 0 | 86 | 5 |
| Plot 7 SE A19 | 63.0 | 1019 | 0 | 0 | 86 | 5 |
| Plot 7 SE C1 | 7.1 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 SE C2 | 10.2 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 SE C3 | 13.3 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 SE C4 | 16.4 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 SE C5 | 19.5 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 SE C6 | 22.6 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 SE C7 | 25.7 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 SE C8 | 28.8 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 SE C9 | 31.9 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 SE C10 | 35.0 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 SE C11 | 38.1 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 SE C12 | 41.2 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 SE C13 | 44.3 | 136 | 0 | 0 | 86 | 0 |
| Plot 7 SE C14 | 47.4 | 205 | 0 | 0 | 86 | 0 |
| Plot 7 SE C15 | 50.5 | 291 | 0 | 0 | 86 | 0 |
| Plot 7 SE C16 | 53.6 | 400 | 0 | 0 | 86 | 1 |
| Plot 7 SE C17 | 56.7 | 523 | 0 | 0 | 86 | 1 |
| Plot 7 SE C18 | 59.8 | 615 | 0 | 0 | 86 | 2 |
| Plot 7 SE C19 | 63.0 | 614 | 0 | 0 | 86 | 3 |
| Plot 7 SE C20 | 66.3 | 516 | 0 | 0 | 86 | 4 |
| Plot 7 SE C21 | 69.5 | 586 | 0 | 0 | 86 | 3 |
| Air Quality Objective 200 $\mu g/m^3$ not to be exceeded more than 18 times a year | | | | | | |

| Receptor | Height (m) | Max 1 Hr $NO_x$ Process Contribution $\mu g/m^3$ | 99.8 %ile $NO_x$ Process Contribution $\mu g/m^3$ | 99.8 %ile $NO_2$ Process Contribution $\mu g/m^3$ | 99.8 %ile Total $NO_2$ $\mu g/m^3$ | No Hours $NO_2$ > 200 $\mu g/m^3$ |
|---|---|---|---|---|---|---|
| Background assumed as twice the annual mean of 43 $\mu g/m^3$<br>Exceedances shown in bold | | | | | | |

**Table 8-15: Predicted 99.8th Percentile 1 Hour $NO_2$ Concentrations from Typical Maintenance Operations of FCI Emergency Generators at Plot 7 SW Façade**

| Receptor | Height (m) | Max 1 Hr $NO_x$ Process Contribution $\mu g/m^3$ | 99.8 %ile $NO_x$ Process Contribution $\mu g/m^3$ | 99.8 %ile $NO_2$ Process Contribution $\mu g/m^3$ | 99.8 %ile Total $NO_2$ $\mu g/m^3$ | No Hours $NO_2$ > 200 $\mu g/m^3$ |
|---|---|---|---|---|---|---|
| Plot 7 SW A1 | 7.1 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 SW A2 | 10.2 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 SW A3 | 13.3 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 SW A4 | 16.4 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 SW A5 | 19.5 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 SW A6 | 22.6 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 SW A7 | 25.7 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 SW A8 | 28.8 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 SW A9 | 31.9 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 SW A10 | 35.0 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 SW A11 | 38.1 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 SW A12 | 41.2 | 36 | 14 | 5 | 91 | 0 |
| Plot 7 SW A13 | 44.3 | 133 | 0 | 0 | 86 | 0 |
| Plot 7 SW A14 | 47.4 | 183 | 0 | 0 | 86 | 0 |
| Plot 7 SW A15 | 50.5 | 242 | 0 | 0 | 86 | 0 |
| Plot 7 SW A16 | 53.6 | 322 | 0 | 0 | 86 | 1 |
| Plot 7 SW A17 | 56.7 | 410 | 0 | 0 | 86 | 1 |
| Plot 7 SW C1 | 7.1 | 36 | 0 | 0 | 86 | 0 |
| Plot 7 SW C2 | 10.2 | 36 | 0 | 0 | 86 | 0 |
| Plot 7 SW C3 | 13.3 | 36 | 0 | 0 | 86 | 0 |
| Plot 7 SW C4 | 16.4 | 36 | 0 | 0 | 86 | 0 |
| Plot 7 SW C5 | 19.5 | 36 | 0 | 0 | 86 | 0 |
| Plot 7 SW C6 | 22.6 | 36 | 0 | 0 | 86 | 0 |
| Plot 7 SW C7 | 25.7 | 36 | 0 | 0 | 86 | 0 |
| Plot 7 SW C8 | 28.8 | 36 | 0 | 0 | 86 | 0 |
| Plot 7 SW C9 | 31.9 | 36 | 0 | 0 | 86 | 0 |
| Plot 7 SW C10 | 35.0 | 36 | 0 | 0 | 86 | 0 |

| Receptor | Height (m) | Max 1 Hr $NO_x$ Process Contribution $\mu g/m^3$ | 99.8 %ile $NO_x$ Process Contribution $\mu g/m^3$ | 99.8 %ile $NO_2$ Process Contribution $\mu g/m^3$ | 99.8 %ile Total $NO_2$ $\mu g/m^3$ | No Hours $NO_2$ > 200 $\mu g/m^3$ |
|---|---|---|---|---|---|---|
| Plot 7 SW C11 | 38.1 | 36 | 0 | 0 | 86 | 0 |
| Plot 7 SW C12 | 41.2 | 36 | 0 | 0 | 86 | 0 |
| Plot 7 SW C13 | 44.3 | 128 | 0 | 0 | 86 | 0 |
| Plot 7 SW C14 | 47.4 | 179 | 0 | 0 | 86 | 0 |
| Air Quality Objective 200 $\mu g/m^3$ not to be exceeded more than 18 times a year<br>Background assumed as twice the annual mean of 43 $\mu g/m^3$<br>Exceedances shown in bold | | | | | | |

**Table 8-16: Predicted 99.8th Percentile 1 Hour $NO_2$ Concentrations from Typical Maintenance Operations of FCI Emergency Generators at Plot 7 NW Façade**

| Receptor | Height (m) | Max 1 Hr $NO_x$ Process Contribution $\mu g/m^3$ | 99.8 %ile $NO_x$ Process Contribution $\mu g/m^3$ | 99.8 %ile $NO_2$ Process Contribution $\mu g/m^3$ | 99.8 %ile Total $NO_2$ $\mu g/m^3$ | No Hours $NO_2$ > 200 $\mu g/m^3$ |
|---|---|---|---|---|---|---|
| Plot 7 NW A1 | 7.1 | 36 | 0 | 0 | 86 | 0 |
| Plot 7 NW A2 | 10.2 | 36 | 0 | 0 | 86 | 0 |
| Plot 7 NW A3 | 13.3 | 36 | 0 | 0 | 86 | 0 |
| Plot 7 NW A4 | 16.4 | 36 | 0 | 0 | 86 | 0 |
| Plot 7 NW A5 | 19.5 | 36 | 0 | 0 | 86 | 0 |
| Plot 7 NW A6 | 22.6 | 36 | 0 | 0 | 86 | 0 |
| Plot 7 NW A7 | 25.7 | 36 | 0 | 0 | 86 | 0 |
| Plot 7 NW A8 | 28.8 | 36 | 0 | 0 | 86 | 0 |
| Plot 7 NW A9 | 31.9 | 36 | 0 | 0 | 86 | 0 |
| Plot 7 NW A10 | 35.0 | 36 | 0 | 0 | 86 | 0 |
| Plot 7 NW A11 | 38.1 | 36 | 0 | 0 | 86 | 0 |
| Plot 7 NW A12 | 41.2 | 36 | 0 | 0 | 86 | 0 |
| Plot 7 NW A13 | 44.3 | 138 | 0 | 0 | 86 | 0 |
| Plot 7 NW A14 | 47.4 | 193 | 0 | 0 | 86 | 0 |
| Plot 7 NW B1 | 7.1 | 36 | 3 | 1 | 87 | 0 |
| Plot 7 NW B2 | 10.2 | 36 | 3 | 1 | 87 | 0 |
| Plot 7 NW B3 | 13.3 | 36 | 3 | 1 | 87 | 0 |
| Plot 7 NW B4 | 16.4 | 36 | 3 | 1 | 87 | 0 |
| Plot 7 NW B5 | 19.5 | 36 | 3 | 1 | 87 | 0 |
| Plot 7 NW B6 | 22.6 | 36 | 3 | 1 | 87 | 0 |
| Plot 7 NW B7 | 25.7 | 36 | 3 | 1 | 87 | 0 |
| Plot 7 NW B8 | 28.8 | 36 | 3 | 1 | 87 | 0 |

| **Receptor** | **Height (m)** | **Max 1 Hr $NO_x$ Process Contribution µg/m$^3$** | **99.8 %ile $NO_x$ Process Contribution µg/m$^3$** | **99.8 %ile $NO_2$ Process Contribution µg/m$^3$** | **99.8 %ile Total $NO_2$ µg/m$^3$** | **No Hours $NO_2$ > 200 µg/m$^3$** |
|---|---|---|---|---|---|---|
| Plot 7 NW B9 | 31.9 | 36 | 3 | 1 | 87 | 0 |
| Plot 7 NW B10 | 35.0 | 36 | 3 | 1 | 87 | 0 |
| Plot 7 NW B11 | 38.1 | 36 | 4 | 1 | 87 | 0 |
| Plot 7 NW B12 | 41.2 | 38 | 1 | 0 | 86 | 0 |
| Plot 7 NW B13 | 44.3 | 122 | 0 | 0 | 86 | 0 |
| Plot 7 NW B14 | 47.4 | 194 | 0 | 0 | 86 | 0 |
| Plot 7 NW B15 | 50.5 | 282 | 0 | 0 | 86 | 0 |
| Plot 7 NW B16 | 53.6 | 364 | 0 | 0 | 86 | 2 |
| Plot 7 NW B17 | 56.7 | 431 | 0 | 0 | 86 | 3 |
| Air Quality Objective 200 µg/m$^3$ not to be exceeded more than 18 times a year<br>Background assumed as twice the annual mean of 43 µg/m$^3$<br>Exceedances shown in bold | | | | | | |

8.3.4 Analysis of Maintenance Operations Predicted Concentrations

The modelling of the maintenance operations of the FCI's emergency generators under worst case dispersion conditions has indicated that this could potentially lead to exceedance of the 200 µg/m$^3$ short term target at the façade locations on the Tower above 15$^{th}$ floor level. The modelling has indicated that the weather conditions that result in hourly concentrations in excess of 200 µg/m$^3$ would persist at maximum for eight per cent of the year.

The more typical operating scenario when testing is assumed to be carried out on a Saturday at 10am every week (equating to monthly testing of each generator) indicates that whilst on occasion high concentrations may be experienced at the façade receptors these would not arise on sufficient number of occasions to result in an exceedance of the objective, which can be exceeded 18 times per year.

The results indicate that the maintenance testing of the emergency boilers is considered unlikely to result in exceedance of the short term $NO_2$ objective at the façade receptor locations within the Tower.

## 8.4 FCI Biological Research Facility Sources

The air quality assessment for the FCI considered that the most significant emission arising from the Biological Research Facility Sources would be formaldehyde. Two emission scenarios were modelled:

Scenario 1 assumed a short burst of emissions arising for 5 minutes from a 200 m$^3$ room released through two stacks; and

Scenario 2 release arising from a room fumigation, assumed air was expelled for 4 hours from a 2,400 m$^3$ room released through two stacks. It should be noted that the FCI has reported that this would '*be an unusual infrequent event*'.

8.4.1 Scenario 1 – 5 minute Release

The maximum time weighted average predicted at the façade locations is 45 µg/m$^3$. Thus no exceedance of the short term environmental assessment level (EAL) which is set at 100 µg/m$^3$ would arise from this scenario. Additionally no odour impacts would be likely given that the odour threshold for formaldehyde is given as 100-310 µg/m$^3$.

8.4.2 Scenario 2 – Room Fumigation

The results for the room fumigation scenario are shown in Table 8-17 and 8-18.

**Table 8-17: Maximum 100$^{th}$ Percentile 1 hour mean Formaldehyde Concentrations arising from room fumigation NE and SE Facades**

| | | 100$^{th}$ Percentile Formaldehyde Concentrations µg/m$^3$ | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | NE A | | NE C | | SE A | | SE C | |
| Receptor | Height (m) | Max Concentration | Hours Per Year > 100 | Max Concentration | Hours Per Year > 100 | Max Concentration | Hours Per Year > 100 | Max Concentration | Hours Per Year > 100 |
| Plot 7 1 | 7.1 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 |
| Plot 7 2 | 10.2 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 |
| Plot 7 3 | 13.3 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 |
| Plot 7 4 | 16.4 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 |
| Plot 7 5 | 19.5 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 |
| Plot 7 6 | 22.6 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 |
| Plot 7 7 | 25.7 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 |
| Plot 7 8 | 28.8 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 |
| Plot 7 9 | 31.9 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 |
| Plot 7 10 | 35.0 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 |
| Plot 7 11 | 38.1 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 |
| Plot 7 12 | 41.2 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 | 8.2 | 0 |
| Plot 7 13 | 44.3 | 14.4 | 0 | 14.8 | 0 | 15.4 | 0 | 17.0 | 0 |
| Plot 7 14 | 47.4 | 17.3 | 0 | 19.0 | 0 | 19.9 | 0 | 22.5 | 0 |
| Plot 7 15 | 50.5 | 27.5 | 0 | 30.8 | 0 | 33.4 | 0 | 39.3 | 0 |
| Plot 7 16 | 53.6 | 40.8 | 0 | 48.2 | 0 | 53.3 | 0 | 68.5 | 0 |
| Plot 7 17 | 56.7 | 70.9 | 0 | 81.7 | 0 | 91.3 | 0 | **115.5** | 12 |
| Plot 7 18 | 59.8 | - | - | **124.1** | 2 | **138.6** | 15 | **175.6** | 43 |
| Plot 7 19 | 63.0 | - | - | **148.4** | 7 | **160.9** | 13 | **188.2** | 39 |
| Plot 7 20 | 66.3 | - | - | **143.3** | 12 | - | - | **173.2** | 23 |
| Plot 7 21 | 69.5 | - | - | **143.1** | 12 | - | - | **164.7** | 24 |

Short term Environmental Assessment Level = 100 µg/m$^3$
Odour threshold = 100 – 310 µg/m$^3$
Exceedances shown in bold

**Table 8-18: Maximum 100th Percentile 1 hour mean Formaldehyde Concentrations arising from room fumigation, SW and NW Facades**

| Receptor | Height (m) | 100th Percentile Formaldehyde Concentrations µg/m³ | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | SW A | | SW C | | NW A | | NW B | |
| | | Max Concentration | Hours Per Year > 100 | Max Concentration | Hours Per Year > 100 | Max Concentration | Hours Per Year > 100 | Max Concentration | Hours Per Year > 100 |
| Plot 7 1 | 7.1 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 |
| Plot 7 2 | 10.2 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 |
| Plot 7 3 | 13.3 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 |
| Plot 7 4 | 16.4 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 |
| Plot 7 5 | 19.5 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 |
| Plot 7 6 | 22.6 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 |
| Plot 7 7 | 25.7 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 |
| Plot 7 8 | 28.8 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 |
| Plot 7 9 | 31.9 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 |
| Plot 7 10 | 35.0 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 |
| Plot 7 11 | 38.1 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 | 7.0 | 0 |
| Plot 7 12 | 41.2 | 9.9 | 0 | 11.0 | 0 | 9.6 | 0 | 7.0 | 0 |
| Plot 7 13 | 44.3 | 17.5 | 0 | 17.5 | 0 | 16.1 | 0 | 14.3 | 0 |
| Plot 7 14 | 47.4 | 21.8 | 0 | 19.9 | 0 | 18.5 | 0 | 18.0 | 0 |
| Plot 7 15 | 50.5 | 36.4 | 0 | - | - | - | - | 29.3 | 0 |
| Plot 7 16 | 53.6 | 64.9 | 0 | - | - | - | - | 43.8 | 0 |
| Plot 7 17 | 56.7 | **135.0** | 4 | - | - | - | - | 70.6 | 0 |
| Plot 7 18 | 59.77 | - | - | - | - | - | - | - | - |
| Plot 7 19 | 63.03 | - | - | - | - | - | - | - | - |
| Plot 7 20 | 66.28 | - | - | - | - | - | - | - | - |
| Plot 7 21 | 69.54 | - | - | - | - | - | - | - | - |

Short term Environmental Assessment Level = 100 µg/m³
Odour threshold = 100 – 310 µg/m³
Exceedances shown in bold

### 8.4.3 Analysis of Room Fumigation Concentrations

The predicted concentrations indicate that there is some potential for exceedance of the short term EAL and the lower odour threshold at façade locations at the 17th floor and above. However it should be noted that these concentrations would only arise if an infrequent room fumigation event coincided with the worst case meteorological conditions for dispersion. The modelling has indicated that such conditions are only predicted to arise for a maximum of 43 hours per year. For the vast majority of the year concentrations would be expected to remain within the EAL limit.

There is no exceedance of the higher odour threshold level.

Given the infrequency of the fumigation events the potential for exceedance of the short term EAL or for odour impacts to arise from fumigation events is considered minimal.

## 8.5 FCI Chemical Exhausts

The predicted concentrations of VOCs and thiols arising from the fume cupboard exhaust vents are provided for the general operations in Table 8.19 and for a spillage event in Table 8.20.

**Table 8-19: Maximum predicted concentrations of VOCs and Thiols arising from general operations at the FCI at all façade receptors on Plot 7**

| Pollutant | Percentile | Units | Modelled Process Contribution | Short term EAL | Long Term EAL | Odour Threshold |
|---|---|---|---|---|---|---|
| Benzene | $100^{th}$ | µg/m$^3$ | 5.03 | 208 | NA | NA |
| | $98^{th}$ | µg/m$^3$ | 0.85 | NA | NA | 32,500 |
| | Annual Average | µg/m$^3$ | 0.05 | NA | 5 | NA |
| Thiols | $100^{th}$ | ng/m$^3$ | 7.88 | 300 | NA | NA |
| | $98^{th}$ | ng/m$^3$ | **0.96** | NA | NA | 0.001-0.03 |
| | Annual Average | ng/m$^3$ | 0.05 | NA | 10 | NA |
| Exceedances shown in bold | | | | | | |

**Table 8-20: Maximum predicted concentrations of VOCs and Thiols arising from a spillage the FCI at all façade receptors on Plot 7**

| Pollutant | Percentile | Units | Modelled Process Contribution | Short term EAL | Long Term EAL | Odour Threshold |
|---|---|---|---|---|---|---|
| Benzene | $100^{th}$ | µg/m$^3$ | 0.53 | 208 | NA | NA |
| Thiols | $100^{th}$ | ng/m$^3$ | 1.44 | 300 | NA | NA |
| Exceedances shown in bold | | | | | | |

### 8.5.1 Analysis of Chemical Exhausts Concentrations

The predicted concentrations arising from both scenarios indicate that concentrations are expected to be well within the relevant EALs for the protection of human health at all receptor locations within the proposed Tower.

The results predicted for the general operations indicate that the odour threshold may be exceeded for the thiol release. However, it should be noted that the assessment has assumed that all the thiol released is one compound and this has been assessed against the most stringent odour threshold criteria. In reality, the thiols released would be a mixture of a large number of compounds many of which would have significantly higher odour thresholds. Odour thresholds were provided for some 14 thiols within the FCI air quality assessment. If it is assumed that no one thiol would constitute more than 10% of the thiols emitted the maximum process contribution predicted as the $98^{th}$ percentile concentration would reduce to 0.07. This would be lower than the odour thresholds for all the other thiols compounds listed within the FCI air quality assessment.

The predicted thiol arising from a spillage event is also above the odour threshold. However, spillage events are predicted to be infrequent and to only result in a release for 30 seconds, which would significantly reduce the potential for odour impacts.

The information provided within the FCI air quality assessment has indicated that it is unlikely that the FCI would use 1-methyl-1propanethiol. Given that the assessment has indicated that releases of thiols would be below the criteria to result in significant odour nuisance for the other thiols listed in the FCI air quality assessment, the potential for significant odour impacts to arise from thiol emissions is considered unlikely at the residential receptors within the Tower.

### 8.6 Summary of Potential Impacts at Plot 7, the Tower

In summary, the results of the modelling presented above indicate the following:

- Annual mean $NO_2$ concentrations are predicted to exceed the annual objective at all floors within the Brill Place Tower. At ground floor level the main source would be expected to be road emissions. Energy centre emissions associated with the Phoenix Court DHP and the FCI Energy Centre would be expected to impact $NO_2$ concentrations at the elevated receptors located on the façade of the Tower.
- Black start emissions from the emergency generators associated with the FCI has the potential to result in high concentrations of short term $NO_2$ concentrations at façade receptors within the Tower in the event that a black start coincided with poor dispersion conditions. However, black starts would only arise in the event of a total power outage and is therefore unlikely to arise more than once per year or to persist for an extended period. On this basis it is considered unlikely that the high concentrations would persist on sufficient number of hours to result in an exceedance of the short term objective, which allows for 18 hours of exceedances per year.
- Maintenance testing of the emergency generators would be carried out for approximately 48 hours per year. Whilst under certain meteorological conditions the emissions from the testing have the potential to give rise to elevated one hour concentrations at the façade receptors, it is considered unlikely that the maintenance testing would result in an exceedance of the short term objective.
- The predicted concentrations from the biological research facility has indicated that no odour impacts would be expected to arise from animal sources.
- Higher formaldehyde concentrations are associated with the fumigation events which are occasionally undertaken to clean a laboratory. Under worst case dispersion events these could result in concentrations of formaldehyde above the odour threshold and short term EAL for a maximum of 43 hours per year. Given the reported infrequency of these events the potential for the fumigation to coincide with these worst case dispersion hours is considered minimal.
- The prediction of emissions of VOCs and thiols arising from the fume cupboards and laboratories has indicated that concentrations of both compounds would be well below the relevant long and short term EALs for the protection of human health. The predicted concentrations of thiols from the general operating scenario and spillage events exceeded the most stringent odour threshold. However, information from the FCI has indicated that the use of this thiol is unlikely at the FCI and therefore the potential for odour impacts would be reduced. Predicted concentrations from typical operations would be expected to be below the odour threshold for other thiol compounds.

# 9. MITIGATION

## 9.1 Plots 1 to 6

The predicted concentrations at the facades of Plots 1 to 6 meet the relevant air quality objectives and therefore the need for mitigation has not been identified at these locations.

## 9.2 Plot 7

The predicted concentrations presented in Section 8, has indicated that the residents in the Tower may be impacted by existing background concentrations of pollutants arising predominantly from Midland Road and from emissions from the Phoenix Court DHP and the FCI. To mitigate for these potential impacts the Tower would be mechanically ventilated using local heat reclaim ventilation units installed within each apartment. Supply air will be provided in the living spaces such as lounges and bedrooms. Air will be extracted from cooking areas and bathrooms. The supply air will come from the facades of each apartment and each would be fitted with a filter to remove $NO_x$ and particulates from the incoming air. Discussions with the supplier of the filters has indicated that the filters can reduce outdoor $NO_2$ concentrations by some 75%, resulting in indoor concentrations well below the 40 µg/m$^3$ annual objective.

In the event of high concentrations arising from black start operations or maintenance operations of the emergency generators the filters may not be sufficient to reduce concentrations down to the 200 µg/m$^3$ hourly limit, but test data has indicated that the filters would reduce concentrations by approximately 50%. Further testing is to be carried out on the filters to ensure that they are appropriately specified for the residential units.

Heat reclaim units shall be provided complete with fans, plate heat exchanger, bypass, filters and controls. They shall be acoustically and thermally lined. Fans within the units shall be variable speed. Supply and extract louvres will be required on the external façade.

Each of the residential units would be supplied with openable windows, thus allowing the occupants to boost ventilation rates during the summer peak period. Additionally balconies would be supplied for all apartments from floor one to 14, floors 15 and 16 would have both balconies and winter gardens, whilst from floor 17 to floor 22 there will be only winter gardens.

# 10. AIR QUALITY NEUTRAL ASSESSMENT

## 10.1 Introduction

The Sustainable Design and Construction SPG issued by the Mayor of London requires major development to undertake an assessment to demonstrate whether a Proposed Development would meet the relevant emission benchmarks provided in the guidance and can be considered air quality neutral. Where the emission benchmarks are exceeded additional mitigation measures should be provided to off-set the increase in emissions above the benchmark criteria.

## 10.2 Building Emissions

The Proposed Development would connect in to the off-site Phoenix Court DHP, to provide all of the Proposed Development's heating and hot water requirements. As such emissions from the proposed buildings would be negligible. The calculated emission benchmark is provided in Table 10-1.This it is assumed that the Proposed Development would result in an 382 kg/annum saving in emissions compared with the building emission benchmark.

This demonstrates that the total predicted emissions are below the total building emission benchmarks.

**Table 10-1: Air Quality Neutral Assessment - Building Emissions**

| Class | Description | GEA ($m^2$) | NOx Benchmark ($g/m^2$) | Estimated Development $NO_x$ Emission (kg/annum) |
|---|---|---|---|---|
| Class A1 | Retail | 185 | 22.6 | 4 |
| Class C3 | Residential Dwellings | 10,545 | 26.2 | 276 |
| D1 (b) | Creche, Day Centres etc. | 197 | 75.0 | 15 |
| Class D1 (c-h) | Schools, Libraries etc. | 2,812 | 31.0 | 87 |
| Total building emissions benchmark (BEB) | | | | 382 |
| Total predicted development building emission (kg/annum) | | | | 0 |
| Difference between predicted development building emission and BEB | | | | 382 |

## 10.3 Transport Emissions

The Proposed Development would be car free, with no car parking provision for the proposed residential units. It is therefore assumed that the transport emissions associated with the Proposed Development would be negligible. The relevant traffic emission benchmark is provided in Table 10-2.This indicates that the Proposed Development would result in an annual saving of 116 kg of $NO_2$ and 21 kg of $PM_{10}$ compared with the emission benchmarks.

**Table 10-2: Air Quality Neutral Assessment - Transport Emissions Benchmark (TEB)**

| Land Use Class | Description | GEA ($m^2$ / number dwellings) | Emission Benchmark (kg/annum) | |
|---|---|---|---|---|
| | | | $NO_x$ | $PM_{10}$ |
| Class A1 | Retail | 185 $m^2$ | 41 | 7 |

| Land Use Class | Description | GEA ($m^2$ / number dwellings) | Emission Benchmark (kg/annum) | |
|---|---|---|---|---|
| | | | $NO_x$ | $PM_{10}$ |
| Class C3, C4 | Residential | 136 | 76 | 14 |
| Total TEB | | | 116 | 21 |
| Note: All commercial use assumed as A1, school and community facilities have not been included | | | | |

## 10.4 Analysis of Results

It is therefore considered that the Proposed Development would meet the air quality neutral criteria.

# 11. ASSESSMENT OF SIGNIFICANCE

As discussed in Section Four, the overall assessment of significance of air quality impacts should be based on professional judgement taking into account a number of factors including the overall air quality with the development in place, the future population exposure and to what extent the assessment is considered a worst case.

The Proposed Development would not result in an increase in local air pollutant concentrations as it would be largely car free and connect in to an off-site energy centre for heating and hot water requirements.

The Proposed Development would introduce new residential receptors at Plots 1, 2, 3, 5 and 6 where air quality is predicted to be within the annual mean $NO_2$ objective. At these locations the main influence on air quality is background concentrations as the residential blocks are all located well away from the main road network.

The Proposed Development includes for the rebuilding of the Edith Neville School within the same development plot. As such this is not introducing new receptors. Air quality concentrations at the school site are predicted to be within the annual mean $NO_2$ objective.

New residential receptors would also be introduced within the Brill Place Tower, at Plot 7. The assessment has indicated that these residential units would be potentially impacted from existing poor air quality from Midland Road and from energy centre and other emissions from the off-Site sources of the Phoenix Court DHP and the FCI. Annual $NO_2$ concentrations are predicted in excess of the objective at all façade receptors.

The potential for short term impacts arising from the operation of the emergency generators associated with FCI cannot be entirely ruled out. In the event that black start or maintenance operations of the emergency generators coincides with poor dispersion conditions there is the potential that high concentrations of $NO_2$ would arise at the façade of the Tower. However, black start events would only arise during total power outages and thus would be expected to be both rare and to not persist for prolonged periods. Similarly maintenance operations would only occur for 48 hours per year. On this basis the potential for exceedance of relevant short term air quality objectives is considered minimal.

The assessment of emissions of chemical releases arising from the FCI has indicated that there is minimal potential for exceedance of the relevant EALs for the protection of human health and odour thresholds at the on-Site receptors.

Each residential unit within the Tower would be provided with mechanical ventilation to provide an alternative source of make-up air to opening windows. The system would rely on sourcing make up air from the façade passed through filters to remove $NO_x$ and particulates. This would provide residents with a clean source of air in the event of a high pollution episode and would provide effective mitigation against potential impacts arising from the Phoenix Court DHP and the FCI.

The Air Quality Neutral Assessment has indicated that the Proposed Development is considered to be air quality neutral.

The assessment concludes that the Proposed Development would not result in a significant effect on air quality, and that the effect of existing air quality on the Proposed Development can be suitably mitigated as to avoid significant effects from the introduction of new residential receptors.

# 12. SUMMARY AND CONCLUSIONS

The Proposed Development is located with an AQMA due to predicted high concentrations of existing pollutants. The main source of pollutants is road traffic, but may also be being impacted from emissions associated with St Pancras Station. A review of local monitoring data, together with modelling of the existing situation has indicated that existing air quality is expected to just meet all relevant air quality objectives across the Proposed Development Site at ground level locations with the exception of Brill Place Tower, where existing concentrations may exceed the annual $NO_2$ objective.

The assessment of potential impacts to air quality during the demolition and construction phase has identified that the activities, together with the location of nearby sensitive receptors results in a high risk of impacts in the absence of suitable mitigation. Mitigation would be provided through a series of measures set out in a detailed dust management plan secured as part of the wider Construction Environmental Management Plan. On this basis the potential for residual effects would be reduced to at worst temporary slight adverse and for the most part would be expected to be negligible.

The Proposed Development would not be expected to result in an increase in local air pollutant concentrations. No car parking would be provided for any of the elements within the Proposed Development and therefore emissions from road vehicle movements would be negligible. Heating and hot water requirements would be provided through connection to an off-Site district heating scheme, therefore emissions of combustion gases associated with on-Site energy plant would also be negligible.

Existing air quality at the proposed residential Plots 1, 2, 3, 5 and 6 is predicted to meet relevant air quality objectives and thus the plots can be developed for residential use without the need for mitigation in the form of mechanical ventilation. Similarly, the air dispersion modelling has predicted that the redevelopment proposals for the school on its current site, would also not require additional mitigation.

The Proposed Development would introduce new residential units into a 25 storey tower block, adjacent to Brill Place. The assessment has indicated that these residential units would be potentially impacted from existing poor air quality from Midland Road and from energy centre and other emissions from the off-Site sources of the Phoenix Court DHP and the FCI. Annual $NO_2$ concentrations are predicted in excess of the objective at all façade receptors.

The potential for short term impacts arising from the operation of the emergency generators associated with FCI cannot be entirely ruled out. In the event that black start or maintenance operations of the emergency generators coincides with poor dispersion conditions there is the potential that high concentrations of $NO_2$ would arise at the façade of the Tower. However, black start events would only arise during total power outages and thus would be expected to be both rare and to not persist for prolonged periods. Similarly maintenance operations would only occur for 48 hours per year. On this basis the potential for exceedance of relevant short term air quality objectives is considered minimal.

Each residential unit within the Tower would be provided with mechanical ventilation to provide an alternative source of make-up air to opening windows. The system would rely on sourcing make up air from the façade passed through filters to remove $NO_x$ and particulates. This would provide residents with a clean source of air in the event of a high pollution episode and would provide effective mitigation against potential impacts arising from the Phoenix Court DHP and the FCI.

The Air Quality Neutral Assessment has indicated that the Proposed Development can be considered Air Quality Neutral.

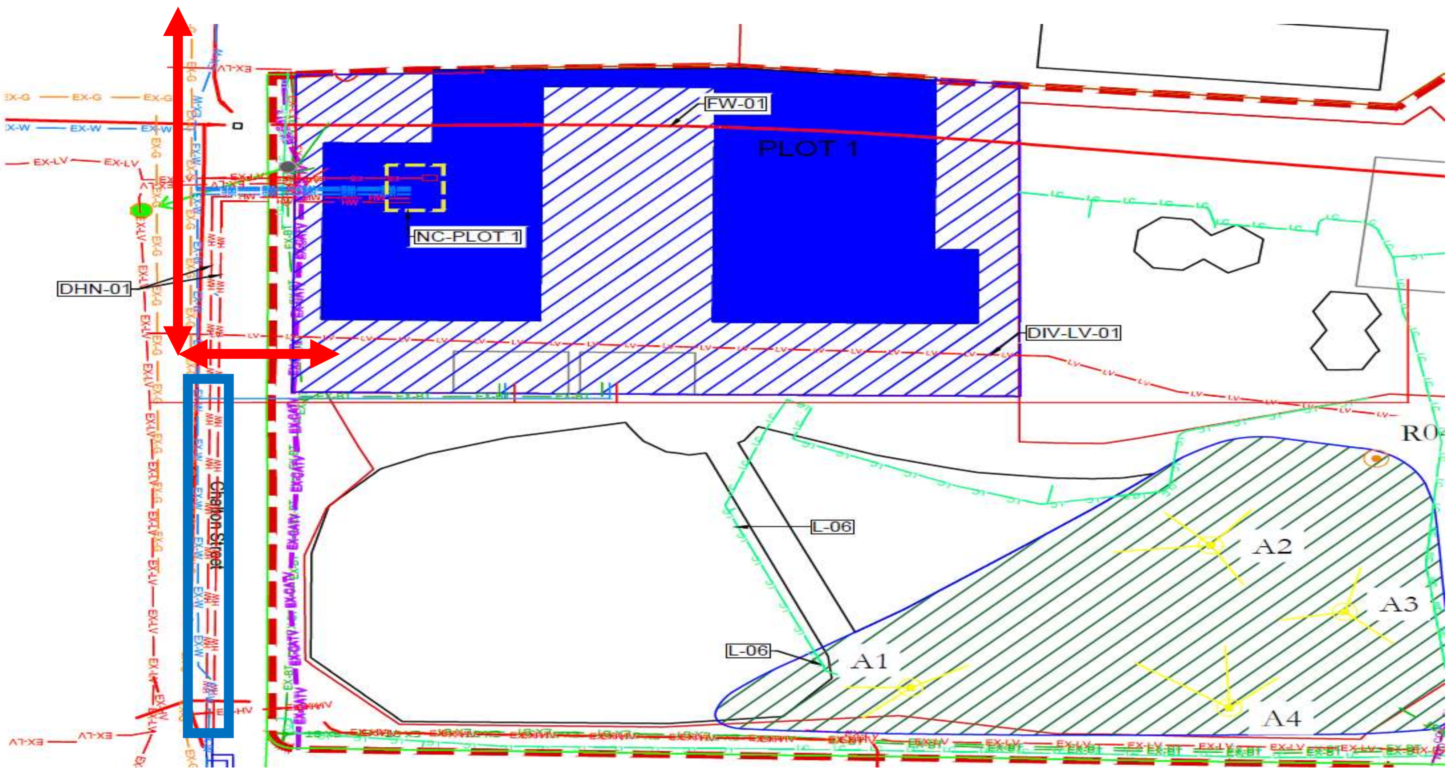
The EPUK/IAQM guidance has been used to assess the overall significance with regard to air quality. The Proposed Development would not increase emissions from either road traffic or on-site energy plant. However, Brill Place Tower would introduce residential receptors into a location where air quality is impacted both by existing traffic emissions and from emissions associated with the FCI and Phoenix Court DHP. Mitigation is proposed to reduce the concentrations of pollutants predicted at the façade and thus exceedance of relevant air quality objectives within Brill Place Tower are unlikely. The assessment therefore concludes that the Proposed Development would not result in a significant effect on air quality.

# 1.

# APPENDIX M – DHN Minimal Disruption Phase Plan Rev2.0

# DHN Works Minimal Disruption Phase Plan – Phase 1 (2 weeks)

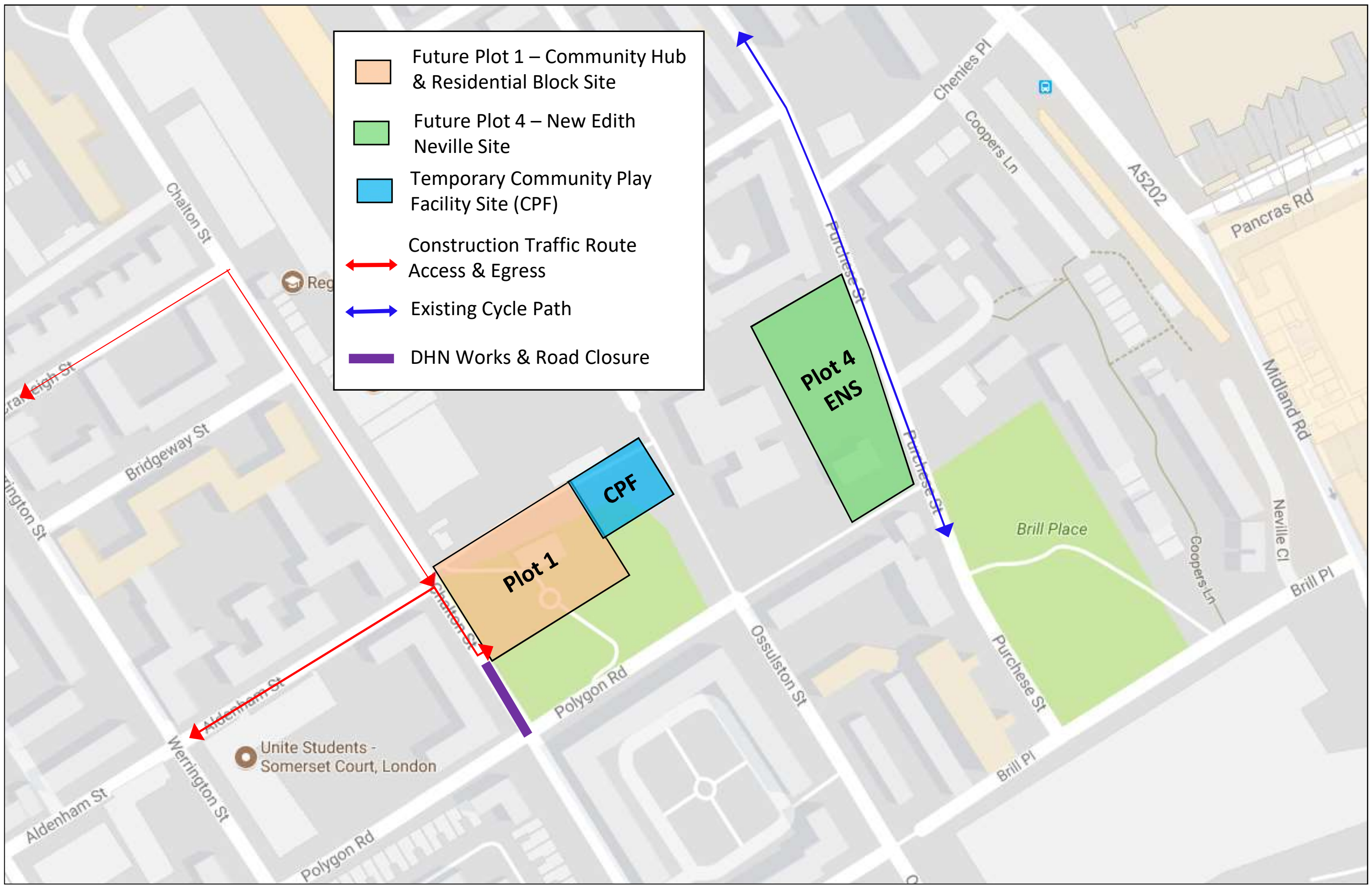
1) NC access to site to remain as specified in CMP (Chalton Street)
2) VITAL ENERGi to install DHN to 1m past hoarding alignment.
3) VITAL ENERGi to reinstate highway for phase 1 installations




| | |
|---|---|
| | Site Access/Site Traffic Route |
| | VITAL ENERGi DHN Installation Works |

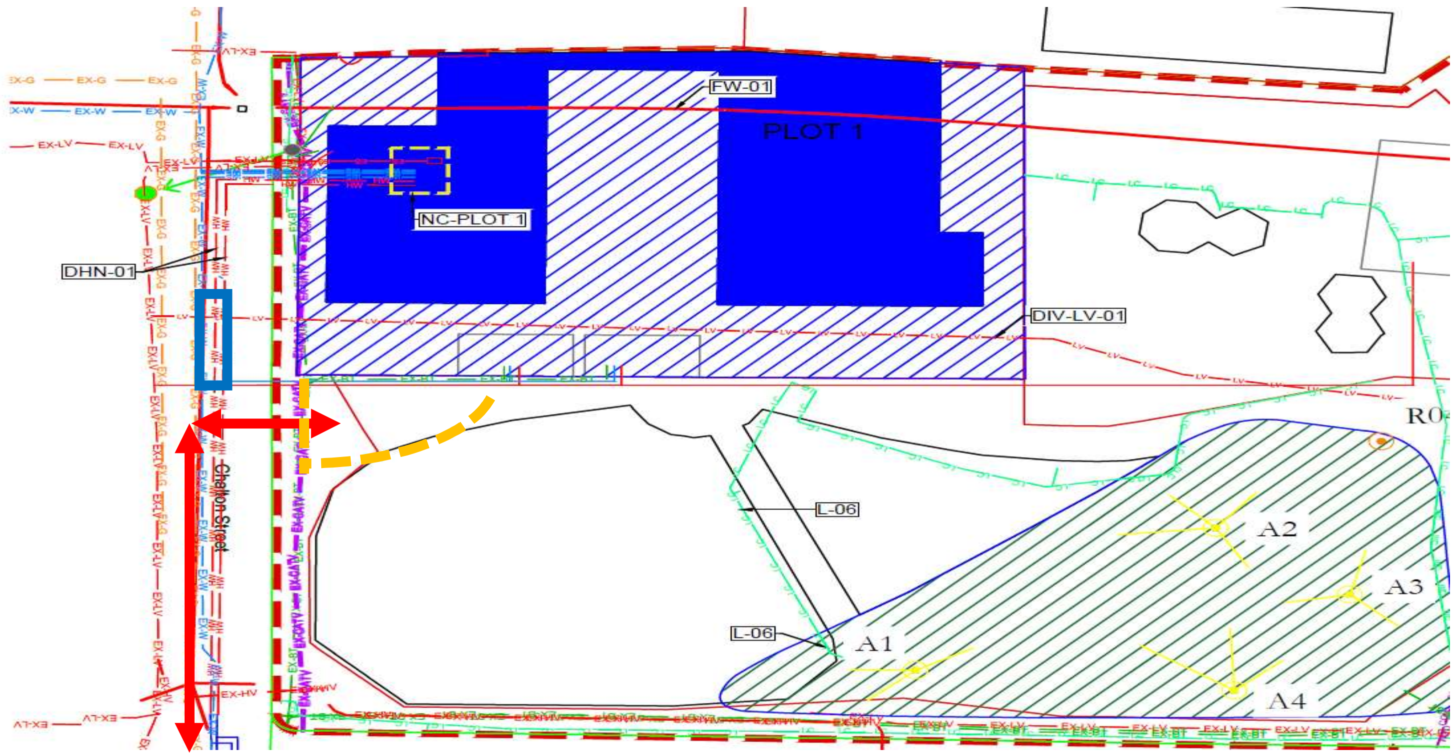
# DHN Works Minimal Disruption Phase Plan – Phase 1 Site Access

Traffic Routes to remain as per the original proposed routes via Cranleigh Street and Aldenham Street



# DHN Works Minimal Disruption Phase Plan – Phase 2 (3 days)

1) NC to access site via temporary access position as indicated (via Eversholt Street – Polygon Road – Chalton Street)
2) VITAL ENERGi excavate, install and backfill section (Phase 2 - 6m) to facilitate reopening of NC original site access



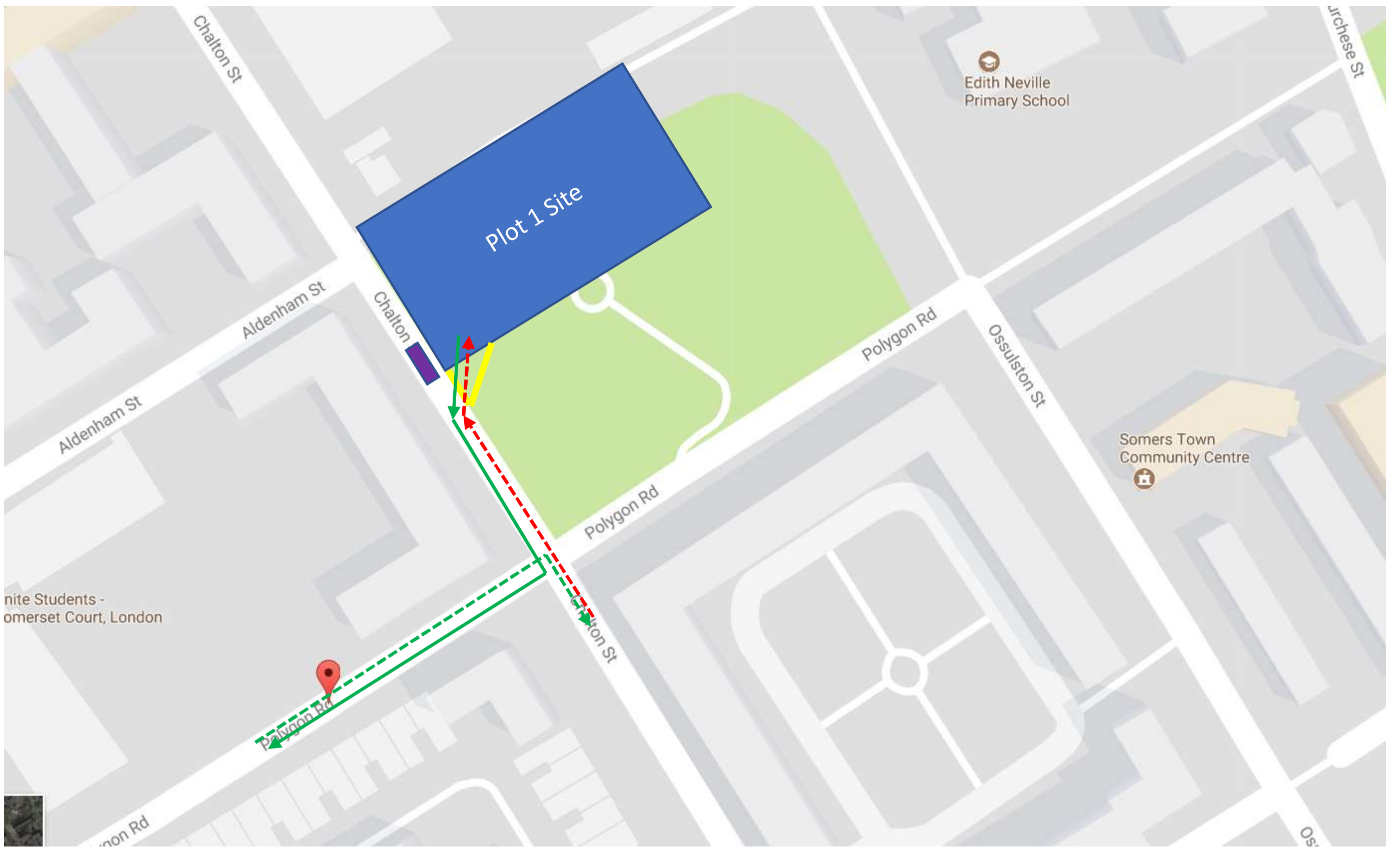

Site Access/Site Traffic Route

VITAL ENERGi DHN Installation Works

Temporary Site Access/Site Traffic Route

# DHN Works Minimal Disruption Phase Plan – Phase 2 (3 days)

Site traffic routes during phase 2 installations of DHN network




| | |
|---|---|
| | Plot 1 Site |
| | Temporary Site Access |
| | DHN Works |
| | Site Traffic Entrance Route (Forward Driven) |
| | Site Traffic Route (Reversed with Banksman) |
| | Site Traffic Exit Route (Forward Driven) |