- construction activities; and
- the transfer of dust making materials from the site onto the local road network.

Particulate matter in air is made up of particulates of a variety of sizes, and the concept of a ‘size fraction’ is used to describe particulates with sizes in a defined range. These definitions are based on the collection efficiency of specific sampling methods and each size fraction are especially associated with different types of impacts. In this assessment the term ‘dust’ is used to mean particulate matter in the size fraction 1µm - 75µm in diameter, as defined in BS 6069:1994 (BSI, 1994). Dust impacts are considered in terms of the change in airborne concentration and the change in the rate of deposition of dust onto surfaces.

The size fraction called ‘PM_{10}’ is composed of material with an aerodynamic diameter of less than 10 µm in diameter and overlaps with the size fraction for dust. Air quality objectives (Defra, 2007) for PM_{10} has been set for the protection of human health and the term PM_{10} is only used in this assessment when referring to the potential impact of emissions of particulate matter from demolition and construction activities on human health receptors. The short term, 24 hour mean objective for airborne concentrations of PM_{10} is the appropriate air quality objective for assessing the potential impact on health of short term fugitive emissions from demolition and construction sites.

The Institute of Air Quality Management (IAQM, 2014) adopts a broad definition of dust that includes the potential for changes in airborne concentration, changes in deposition rates and the risk to human health and public amenity, when considering the significance of effects from emissions of fugitive particulate matter. In this assessment, specific reference is made to the impacts associated with specific size fractions (dust, PM_{10}) within the assessment narrative, before considering the overall effect on receptors using an approach that is consistent with the IAQM’s guidance.

The nature of the impact requiring assessment varies between different types of receptor. In general receptors associated with higher baseline dust deposition rates are less sensitive to impacts, such as farms, light and heavy industry or outdoor storage facilities. In comparison some hi-technology industries or food processing plants operate under clean air conditions and increased airborne particulate matter concentrations may have an increased economic cost associated with the extraction of more material by the plants air filtration units.

Table 2 provides some generic examples of the type of impacts that may result from fugitive emissions of particulate matter. The sensitivity of receptor types is listed for selected impacts, with sensitivity being described as ‘high’ for receptors that are especially sensitive to the specified impact. For example, industrial painting operations are consider to be more sensitive to the impact of material becoming soiled by depositing material, than residential properties or schools are.

Table 2: Types of Impacts from Emissions of Particulate Matter

Nature of Impact	Receptor Types Affected	Relative Sensitivity
Change in 24 hour mean PM_{10} concentrations	Residential properties Schools Hospitals and clinics	Receptor sensitivity was considered when Air Quality Objective Value was set.
Change in rate at which air filtration units require	Hospitals and clinics	High
	Hi-tech industries	High

Nature of Impact	Receptor Types Affected	Relative Sensitivity
maintenance	Food processing industries	High
Change in the rate at which material accumulates on glossy surfaces, such as glass or paint work	Painting and furnishing operations	High
	Residential properties	Medium
	Schools	Medium
	Food retailers	Medium
	Offices	Medium
	Museums and Galleries	Medium
	Glasshouses	Medium
Change in the rate at which property or products becomes soiled by deposited material	Food processing industries	High
	Painting and furnishing operations	High
	Museums and Galleries	High
	Residential properties	High
	Food retailers	Medium
	Offices	Medium
	Horticultural Land	Medium
Change in the rate at which mineral material is deposited onto vegetation	Ecological sites	Medium - Low
Change in chemical composition of mineral material deposited	Ecological sites	Medium - Low
	Outdoor Storage	Medium - Low
	Horticultural Land	low
	Agricultural Land	low

3.1.2 *Road Traffic Emissions*

The incomplete combustion of fuel in vehicle engines results in the presence of hydrocarbons (HC) such as benzene and 1,3-butadiene, and sulphur dioxide (SO_2), carbon monoxide (CO), PM_{10} and $PM_{2.5}$ in exhaust emissions. In addition, at the high temperatures and pressures found within vehicle engines, some of the nitrogen in the air and the fuel is oxidised to form NO_X, mainly in the form of nitric oxide (NO), which is then converted to NO_2 in the atmosphere. NO_2 is associated with adverse effects on human health. Better emission control technology and fuel specifications are expected to reduce emissions per vehicle in the long term.

Although SO_2, CO, benzene and 1,3-butadiene are also present in motor vehicle exhaust emissions, detailed consideration of the associated impacts on local air quality is not considered relevant in the context of this proposal.

Road traffic emissions of these substances have been reviewed by LBC and nowhere within the administrative area is at risk of exceeding these objectives. The development proposals would not be capable of compromising the achievement of the relevant air quality objectives for the protection of human health. Emissions of SO_2, CO, benzene and 1, 3-butadiene from road traffic are therefore not considered further within this assessment.

For the operational phase of the proposed development, emissions from vehicle movements are expected to be limited. The proposed car parking is approximately 5 spaces in total, 2 school and 3 disabled visitor spaces. In addition, the current land use is for a light Industrial State and the new proposal will result in a reduction of HGV movements by approximately 5%. Based on this information, current EPUK and LBC guidance for new development, vehicle movements associated with the proposed development are unlikely to have a significant change, > 5% AADT flows, on the road network. Therefore, a detailed modelling assessment of vehicle emissions has been excluded on this occasion.

3.1.3 *Energy Plant Emissions*

The proposed development will include the use of on-site energy plant including combined heat and power unit (CHP) (70 kWh) and boilers (6 No 135 kWh) to provide heating and hot water to all sites. The proposed development is within the LBC AQMA and therefore, a detailed modelling assessment has been carried out. This assessment considers specifically the impact of the proposed energy facility of the long term (and short term NO_2 concentrations at sensitive receptors in the vicinity of the proposed development, for the future scenario year. NO_2 has been selected as the key pollutant as the proposed CHP and boilers are using natural gas as the main fuel.

3.1.4 *West Hampstead (Thameslink) Train Station*

A assessment of the three railway lines which run through West Hampstead (Thameslink) train station which is located to the north of the site have been discussed in a qualitative manner in the impact assessment section.

3.2 Sensitive Receptors

3.2.1 *Demolition and Construction Phase*

When assessing the impact of dust emissions generated during construction works, receptors are defined as the nearest potentially sensitive receptor to the boundary of the site in each direction. These receptors have the potential to experience impacts of greater magnitude due to emissions of particulate matter generated by the works, when compared with other more distant receptors, or less sensitive receptors.

There are a number of receptors that are sensitive to dust in the immediate vicinity of the proposed development site. These receptors include the existing residential properties to the east, west and south of the proposed development located along Maygrove Road, Brassey Road, Ariel Road, and Iverson Road.

3.2.2 *Operational Phase*

Table 3 and Table 4 list the location of existing and proposed sensitive receptors respectively (Figure 1, Appendix A) with the potential to be affected by the operation of the proposed development. These locations are illustrated in Figure 1. Note that ‘E’ denotes existing receptors, whilst ‘P’ denotes proposed receptors, where future on-site users will be present.

All relevant receptors that have been selected to represent locations where people are likely to be present are based on effects on human health. The AQS Objectives (refer Table 1) have been set at concentrations that provide protection to all members of the public, including more vulnerable groups such as the very young, elderly or unwell. As such the sensitivity of receptors was considered in the definition of the AQS Objectives and therefore no additional subdivision of human health receptors on the basis of building or location type is necessary.

Table 3: Air Quality Sensitive Receptors

ID	Description (Type)	Grid Reference		Height (m)	Distance to Site (km) & Direction
		X	Y		
E1	Maygrove Road (Residential)	525127	184756	1.5	0.02 (S)
E2	Loveridge Road (Residential)	524848	184646	1.5	0.28 (SW)
E3	Brassy Road (Residential)	524919	184851	1.5	0.14 (W)
E4	St Cuthbert's Road (Residential)	524673	184958	1.5	0.41 (W)
E5	Sumatra Road (Residential)	525127	184902	1.5	0.05 (N)
E6	Glastonbury Street (School)	524951	185055	1.5	0.23 (NW)
E7	Mill Lane (School)	525335	185249	1.5	0.43 (NE)
E8	Dennington Park Road (Residential)	525397	185024	1.5	0.25 (NE)
E9	Iverson Road (Residential)	525292	184738	1.5	0.07 (E)
E10	Sheriff Road (Residential)	525391	184531	1.5	0.28 (SE)

Table 4 shows the receptors selected on the new buildings within the proposed development site. The buildings have been modelled at each floor for which residential receptors are proposed for Sites 1, and 2. The modelling has been undertaken to assess the suitability of the proposed development to residential, educational and commercial use.

Table 4: Location of Proposed Sensitive Receptors for Assessment of Site Suitability

ID	Description (Type)	Grid Reference		Floors
		X	Y	
P1	Block B- North (Residential)	525106	184855	Ground, 1st, 2nd,3rd , 4th, 5th, 6th, 7th, 8th, 9th, 10th
P2	Block B South (Residential)	525087	184836	Ground, 1st, 2nd,3rd , 4th, 5th, 6th, 7th, 8th, 9th, 10th
P3	Block C-North (Residential)	525146	184803	Ground, 1st, 2nd,3rd , 4th, 5th
P4	Block C-East (Residential)t	525215	184780	Ground, 1st, 2nd,3rd , 4th, 5th
P5	Block D- (School)	525158	184832	Ground, 1st, 2nd,3rd

Note: Indicative floors heights used in the assessment 1.5m above the floor level for each floor. Ground floor (1.5m), 1st floor (6m), 2nd floor (9m), 3rd floor (12m), 4th floor (15m), 5th floor (18m), 6th floor (21m), 7th floor (24m), 8th floor (27m), 9th floor (30m), 10th floor (33m).

Effects from energy centre emissions are quantified at 10 existing receptors in the vicinity of the proposed development and at 5 proposed new receptors within the development site.

Each of the receptors chosen represents the maximum level of exposure likely to be experienced at other receptors in their vicinity.

3.3 Prediction of Construction Phase Impacts

At present, there are no statutory UK or EU standards relating to the assessment or control of nuisance dust. The emphasis of the regulation and control of demolition and construction dust should therefore be the adoption of good working practices on site. Good design practice is a process that is informed by impact assessments and is able to avoid the potential for significant adverse environmental effects at the design stage. This approach assumes that mitigation measures, beyond those inherent in the proposed design, that are identified as being necessary in the impact assessment, will be applied during works (possibly secured by planning conditions, legal requirements or required by regulations) to ensure potential significant adverse effects do not occur.

Examples of accepted good site practice include guidelines published by the Building Research Establishment (Building Research Establishment, 2003), the Greater London Authority (Greater London Authority, 2014), the Institute of Air Quality Management (IAQM, 2014) and considerate contractor schemes.

A qualitative assessment has been undertaken to assess the significance of effects on sensitive receptors. The steps in the assessment process are to consider potential sources of emissions on the basis of the four main activity groupings; Demolition, Earthworks, Construction and Track-out. For each activity group the same steps are applied with respect to the potential impacts at identified receptors, before coming to an overall conclusion about the significance of the effects predicted.

The steps are:

- identify the nature, duration and the location of activities being carried out;
- establish the risk of significant effects occurring as a result of these activities;
- review the proposed or embedded mitigation against good site practice;
- identify additional mitigation measures, if necessary, to reduce the risk of a significant adverse effect occurring at receptors; and
- summarise the overall effect of the works with respect to fugitive emissions of particulate matter and then report the significance of the effects.

3.3.1 *Construction Phase Road Traffic Emissions*

The construction phase of the proposed development is likely to lead to a small increase in the number of vehicles on the local highway network, for the duration of the construction works only. Environmental Protection UK (EPUK) (EPUK, 2010) set out criteria to establish the need for an air quality assessment for the construction phase of a development as being:

“Large, long-term construction sites that would generate large HGV flows (>200 per day) over a period of a year or more.”

It is unlikely that a development of this size would lead to this number of vehicle movements. The additional number of vehicle movements is not considered to be high enough to have the potential to cause a significant adverse effect at any local air quality sensitive receptor. Construction phase road traffic emissions are not considered further as it can be concluded that the effect on local air quality sensitive receptors are considered to be insignificant.

3.4 Prediction of Air Quality Impacts

The latest version of dispersion model software ADMS 5 has been used to quantify the CHP and boilers contribution to NO_2 concentrations at the sensitive receptors identified in Table 3 and Table 4.

3.4.1 *Dispersion Model Input Data and Model Conditions*

Details of general model conditions are provided in Table 5. In addition to the general model conditions described below the proposed development building has also been included in the detailed modelling.

Table 5: General ADMS Model Conditions

Variables	ADMS 5 Model Input
Surface roughness at source	1.5m
Minimum Monin-Obukhov length for stable conditions	100m
Terrain types	Flat
Receptor location	x, y coordinates determined by GIS z=1.5m (for existing receptors); z=various (for on-site receptors). Receptors Listed in Tables 3 and 4.
Emissions	NO_x
Emission factors	As per CHP and boiler manufacturer's data sheet.
Meteorological data	1 year (2013) hourly sequential data from Heathrow Airport meteorological station
Emission profiles	No Emission Profiles were used
Model output	Long-term annual mean NO_X concentrations Short-term annual mean NO_X concentrations (99.79th percentile of annual mean concentrations)

Details of the specified units in the energy plant are shown in Table 6.

Table 6: Energy Plant Details

Stack	No	Rate (kWh) per unit	Grid Ref (x, y)	Release Height (m)	Volumetric Flux (m^3/s)	Exit Temperature (°C)	NO_X Emission Rate (g/s)
CHP-Tower Block-Application Site 1	1	70	525091, 184853	37.8	0.06	120	0.002
Boilers-Tower Block-Application Site 1	3	135	525091, 184853	37.8	0.80	65	0.005
Boilers-School Block-Application Site 2	3	135	525134, 184812	10.5	0.28	65	0.004

Note: CHP Congenco Model CGC-0050MA-080-NG-50-3WY NOx emissions limit: 50 mg/Nm^3.
Boilers-Hamworthy Fleet Model F150H. NO_X emission limit: 33 mg/kWh for each boiler.

The dispersion of emissions from the proposed energy plant will be influenced by the presence of the proposed development building itself. To account for this, the ADMS 5 building downwash module has been activated to include these buildings. Table 7 sets out the building parameters included in the model using indicative maximum parameters of the proposed development site.

Table 7: Modelled Building Blocks (Indicative)

Building ID	Shape	OS Coordinate (Centre point)		Height (m)	Width (m)	Length (m)	Roof Orientation (º)
		X	Y				
Block A	Rectangular	525084	184811	21	41	24	10
Block B	Rectangular	525091	184848	37	24	25	12
Block C	Rectangular	525165	184789	18	102	20	10
Block D	Rectangular	525188	184827	10	59	18	10
Block E	Rectangular	525128	184817	9	20	23	10
Block F	Rectangular	525123	184841	8	20	21	10

3.4.2 *Meteorological Data*

One year (2013) of the most recent hourly sequential observation data from Heathrow Airport meteorological station has been used in this assessment. The station is located approximately 17 km south west of the proposed development site and experiences meteorological conditions that are considered representative of those experienced in the LBC area.

3.4.3 *Monitoring Air Quality Data*

LBC undertakes the measurement of NO_2 and PM_{10} concentrations in their administrative area, as part of their review and assessment of local air quality management duties. The information presented in this report in relation of the baseline local air quality conditions within the proposed development site have been sources from the LBC progress report (LBC, 2014) and supplemented with LBC data available in the London Air Quality Monitoring Network website (London Air Quality Monitoring Network, 2014).

3.4.4 *Background data*

None of the air quality monitoring sites operating currently by the LBC can be considered as representative of the background concentrations suitable for the proposed development. Therefore; $NO_{2,}$ and PM_{10} background data has been sourced from Defra's background projection maps (Defra, 2014). The background maps include emissions from nearby sources or sectors. Due to the uncertainty in the assumption that year on year background concentrations will decrease as reported by Defra, the 2013 background data has been used for the future year assessment as a conservative approach.

3.4.5 *NO_X to NO_2 Conversion*

The process contribution of annual mean concentrations of NO_2 from the CHP and boilers is derived from the modelled NO_X output, assuming that 100% of NO_X emissions are emitted as or converted to NO_2 as the plume disperses.

The contribution of hourly mean concentrations of NO_2 from the energy plant assumes that 50% of NO_X emissions are emitted as or converted to NO_2 as the plume disperses (Environment Agency, 2011).

3.4.6 *Air Quality Neutral*

An air quality neutral assessment has been undertaken using the GLA's SPG (GLA, 2014a) and the accompanying air quality neutral guidance document (Air Quality Consultants and Environ, 2014). The methodology is presented in Appendix B.

3.5 Assessment of Significance

3.5.1 *Construction Phase*

For amenity effects (including that of dust), the aim is to bring forward a scheme, including mitigation measures if necessary, that does not introduce the potential for additional complaints to be generated as a result of the proposed development. This is important, as amenity effects are more often the key air quality effect during the construction phase rather than effects on ambient air quality.

Table 8: Descriptors Applied to the Predicted Adverse Effects of Fugitive Emissions of Particulate Matter

Significance of Effect at Single Receptor	Description
Substantial	A significant effect that is likely to be a material consideration in its own right.
Moderate	An significant effect that may be a material consideration in combination with other significant effects, but is unlikely to be a material consideration in its own right
Slight	An effect that is not significant but that may be of local concern
Negligible	An effect that is not a significant change

The scale of the risk of adverse effects occurring due to each group of activities, with mitigation in place is described using the terms high, medium and low risk. The basis for the choice of descriptor is set out for each section. Experience in the UK (IAQM, 2014) is that good site practice is capable of mitigating the impact of fugitive emissions of particulate matter effectively, so that in all but the most exceptional circumstances, effects at receptors can be controlled to ensure effects are of negligible or slight adverse significance. The assessment also employs professional judgement to assess the significance of potential effects (See Table 8) and recommendation of appropriate mitigation measures.

3.5.2 *Operational Phase*

With regard to combustion plant emissions from the proposed development boilers and CHP, the change in pollutant concentrations with respect to baseline concentrations has been described at receptors that are representative of exposure to impacts on local air quality within the study area. The absolute magnitude of pollutant concentrations in the future baseline and with development scenario is also described and this is used to consider the risk of the air quality limit values being exceeded in each scenario.

For a change of a given magnitude, the IAQM has published recommendations for describing the magnitude of change at individual receptors (Table 9) and describing the significance (Table 10) of such impacts (IAQM, 2010).

Table 9: Magnitude of Changes in Ambient Pollutant Concentrations of NO_2

Magnitude of Change	Annual Mean Concentrations of NO_2 (µg/m^3)
Large	Increase/decrease > 4
Medium	Increase/decrease 2 – 4
Small	Increase/decrease 0.4 – 2
Imperceptible	Increase/decrease < 0.4

A change in predicted annual mean concentrations of NO_2 of less than 0.4 µg/m^3 is considered (IAQM, 2009) to be so small as to be imperceptible. A change (impact) that is imperceptible, given normal bounds of variation, would not be capable of having a direct effect on local air quality that could be considered to be significant.

The criteria presented in Table 10 relate to air quality statistics that are above the objective values in many urban locations.

Table 10: Air Quality Impact Descriptors for Changes in Ambient Pollutant Concentrations of NO_2

Absolute Concentration in Relation to Objective/Limit Value	Change in Concentration		
	Small	Medium	Large
Increase with Scheme			
Above Objective/Limit Value *With* Scheme (>40 μg/m^3)	Slight Adverse	Moderate Adverse	Substantial Adverse
Just Below Objective/Limit Value *With* Scheme (36-40 μg/m^3)	Slight Adverse	Moderate Adverse	Moderate Adverse
Below Objective/Limit Value *With* Scheme (30-36 μg/m^3)	Negligible	Slight Adverse	Slight Adverse
Well Below Objective/Limit Value *With* Scheme (<30 μg/m^3)	Negligible	Negligible	Slight Adverse
Decrease with Scheme			
Above Objective/Limit Value *Without* Scheme (>40 μg/m^3)	Slight Beneficial	Moderate Beneficial	Substantial Beneficial
Just Below Objective/Limit Value *Without* Scheme (36-40 μg/m^3)	Slight Beneficial	Moderate Beneficial	Moderate Beneficial
Below Objective/Limit Value *Without* Scheme (30-36 μg/m^3)	Negligible	Slight Beneficial	Slight Beneficial
Well Below Objective/Limit Value *Without* Scheme (<30 μg/m^3)	Negligible	Negligible	Slight Beneficial

All relevant receptors that have been selected to represent locations where people are likely to be present are based on impacts on human health. The air quality objective values have been set at concentrations that provide protection to all members of society, including more vulnerable groups such as the very young, elderly or unwell. As such the sensitivity of receptors was considered in the definition of the air quality objective values and therefore no additional subdivision of human health receptors on the basis of building or location type is necessary.

For receptors that are predicted to experience a perceptible change, the effect of the change on local air quality and the risk of exceeding the air quality objective value is summarised in Table 10. A small increase in annual mean concentrations, at receptors exposed to baseline concentrations that are just below the objective value (36 μg/m^3 to 40 μg/m^3) is considered to have a slight adverse effect as the slight increase in the risk of exceeding the objective value is significant. However, a small increase in annual mean concentration at receptors exposed to baseline concentrations that are below or well below (< 36 µg/m^3) is not likely to affect the achievement of the objective value and is therefore not a significant effect (negligible).

The significance of the contribution of the proposed energy plant emissions to short-term concentrations of NO_2 is considered using the Environment Agency's 'headspace' method described in Annex F of the H1 guidance document (Environment Agency, 2010). The approach states that the maximum short-term contribution should not exceed 20% of the 'headroom'. The 'headroom' is defined as the short-term mean objective (200 µg/m^3) minus two-times the local background concentration. In this instance, the headroom is calculated as (200 – (32.4 * 2) = 135 µg/m^3), 20% of this headroom is 27 µg/m^3.

3.5.3 *Assessment of Significance*

The significance of all of the reported impacts is then considered for the development in overall terms. The potential for the scheme to contribute to or interfere with the successful implementation of policies and strategies for the management of local air quality are considered if relevant, but the principle focus is any change to the likelihood of future achievement of the air quality objective values set out in Table 1 for the following pollutants:

- Annual mean nitrogen dioxide (NO_2) concentration of 40 µg/m^3; and
- NO_2 concentration of 200 µg/m^3 not to be exceeded on more than 18 times per year (99.79th percentile);

The achievement of local authority goals for local air quality management are directly linked to the achievement of the air quality objective values described above and as such this assessment focuses on the likelihood of future achievement of the air quality objective values.

In terms of the significance of the consequences of any adverse effects, an effect is reported as being either 'not significant' or as being 'significant'. If the overall effect of the development on local air quality or on amenity is found to be 'moderate' or 'substantial' this is deemed to be 'significant'. Effects found to be 'Slight' are considered to be 'not significant', although they may be a matter of local concern. 'Negligible' effects are considered to be 'not significant'.

The findings of the Air Quality Neutral Assessment are also considered in the overall evaluation of significance along with the ambient air quality effects of the proposed development.

4. BASELINE CONDITIONS

4.1 Monitoring Data

4.1.1 *Nitrogen Dioxide (NO_2)*

LBC monitors NO_2 using automatic monitoring stations. Table 11 summarises the annual mean concentrations measured in close proximity to the proposed development from 2011 to 2013.

Table 11: Monitored Annual Mean NO_2 Concentrations ($\mu g/m^3$) - LBC

Monitoring Station	OS Grid Ref	Monitoring and Location type	Distance to proposed Development (km)	2011	2012	2013
CA25- Emmanuel Primary School	525325, 185255	Diffusion Tube-Roadside	0.5	**41.5**	**45.9**	**57.9**
CA7- Frognal Way	526213, 185519	Diffusion Tube-Urban Background	1.2	31.5	28.9	32.0
CA17- 47 Fitzjohn's Road	526547, 185125	Diffusion Tube-Roadside	1.4	**58.4**	**61.2**	**65.2**
CD1- Swiss Cottage	526633, 184392	Automatic Monitoring -Roadside	1.5	**71.0**	**70.0**	**63.0**
			Objective value:	**40µg/m³**		

Note: **Bold** denotes an exceedance of an air quality objective.

The latest results show annual mean NO_2 concentrations were above the objective at all roadside locations. The only monitoring site meeting the air quality objective was CA7- Frognal Way.

4.1.2 *PM_{10}*

The annual mean concentrations measured between 2010 and 2013 are presented in Table 12 below.

Table 12: Monitored PM_{10} Concentrations - LBC

Monitoring Station (Type)	Distance to Proposed Development (km)	Year	Annual Mean PM_{10} ($\mu g/m^3$)	Number of 24-hour Mean PM_{10} Values >50 $\mu g/m^3$ (days)
CD1- Swiss Cottage-Automatic Station -Roadside	1.5	2011	27.0	31
		2012	23.0	21
		2013	21.0	8
Objective Values:			**40**	**35**

Note: **Bold** denotes an exceedance of an air quality objective.

In 2013 the annual mean PM_{10} concentrations, and the number of days for which PM_{10} concentration is lower than their respective national air quality objective at the Swiss Cottage station.

4.2 Background Pollutant Concentrations

Background NO_2 and PM_{10} concentration projection available from Defra in the areas around the proposed development are summarised in Table 13.

Table 13: DEFRA's Annual Mean Background Pollutant Concentration Projections - 2013

Receptors ID	Annual Mean Background Concentrations-2013 (µg/m^3)	
	NO_2	PM_{10}
E1- E2, E3, E4, E5, E9, E10; P1; P2; P3; P4; P5	32.4	22.2
E7, E8	31.7	22.5
E6	29.6	21.7

Note: Defra background pollutant concentrations projections from the London Boroughs of Camden.

4.3 Baseline Dust Climate

A background level of dust exists in all urban and rural locations in the UK. Dust can be generated on a local scale from vehicle movements and from the action of wind on exposed soils and surfaces. Dust levels can be affected by long range transport of dust from distant sources into the local vicinity.

Residents currently experience dust deposition at a rate that is determined by the contributions of local and distant sources. This baseline rate of soiling is considered normal and varies dependent on prevailing climatic conditions. The tolerance of individuals to deposited dust is therefore shaped by their experience of baseline conditions.

Existing local sources of particulate matter include exhaust emissions and break and tyre wear from road vehicles and the long range transport of material from outside the study area.

5. PREDICTED IMPACTS

5.1 Construction Dust Emissions

The detailed nature and duration of specific aspects of the construction works are, as yet, unknown. In the absence of detailed construction information, the assessment of construction dust effects has made several assumptions on the likely activities and phasing to be undertaken during the construction works.

As with the majority of construction projects of this type, the early phases of the works are likely to involve demolition, excavations and earthworks, temporary stockpiling of potentially dusty materials and the use of unsurfaced haul roads. These activities are likely to be the principle sources of dust during these early phases. During the middle phases, when the buildings are erected, the principle sources of dust are likely to be from the cutting and grinding of materials and the movement of construction related road vehicles. The latter phases, when the majority of the buildings and infrastructure are complete, will involve the landscaping and finishing works. During these phases, the principal sources of dust will include the storage, handling and movement of materials generated during the associated earthworks.

The receptors located close enough to the proposed development site to potentially be adversely effected by the works, are residential properties situated to all directions of the proposed development site located along the Maygrove Road (south), Brassey Road (west) and Sumatra Road (north).

The potential impacts considered at the selected receptors are:

- Effects on Amenity and Property including changes to the rate of deposition of particulate matter onto glossy surface and other property; and
- Changes in 24-hr mean concentrations that might increase the risk of exposure to PM_{10} at levels that could exceed the 24-hr air quality objective.

5.1.1 *Demolition*

5.1.1.1 *Application Site 1*

Demolition and clearance activities of the whole site will take place for the proposed development. The total building volume for demolition is estimated to be greater than 50,000 m^3 and therefore the emission magnitude is large.

There are estimated to be between 10 and 100 properties within 50 m of potential large-scale demolition areas of the site. Sensitivity of the area to dust soiling due to demolition is therefore assessed as medium.

An area of high sensitivity with a large emission magnitude site is at a high risk of adverse impacts due to demolition dust. Site specific mitigation measures, such as those set out in section 5.1.6, will therefore be required to minimise emissions of dust. With site specific mitigation, impacts could be reduced to negligible due to construction dust effects on amenity and property.

Annual mean PM_{10} concentrations at the site are currently less than 24 µg/m^3, with 10 to 100 properties within 50 m of potential large-scale demolition areas of the site, therefore the sensitivity of the area to human health impacts is low. An area of low sensitivity to human health impacts from demolition dust is at a low risk of adverse impacts due to demolition dust. Site specific mitigation measures, such as those set in section 5.1.6 will reduce the exposure to PM_{10} at levels that could exceed the 24 hour air quality exposure to a negligible risk.

5.1.1.2 *Application Site 2*

There is no demolition works proposed for the site as the previous buildings will be demolished as part of Application Site 1.

5.1.2 *Earthworks*

5.1.2.1 *Application Site 1*

Site clearance works, the digging of trenches for foundations and utilities and temporary stockpiling of material represent the principal activities that may generate emissions of particulate material.

The potential for stockpiles of materials to generate dust depends on the nature of the material. Earth is soft and friable compared to hardcore. However, hardcore generally has lower moisture content than soil, and consequently they can both be a potential source of dust.

The total area of the site is greater than 10,000 m^2. The potential dust emission magnitude for earthworks is therefore assessed as large.

There are estimated to be between 10 and 100 properties within 50 m of earthworks. Sensitivity of the area to dust soiling due to earthworks is therefore assessed as medium.

An area of medium sensitivity with a large dust emission magnitude site is at medium risk of adverse impacts due to earthworks dust. Site specific mitigation measures, such as those set out in section 5.1.6, will therefore be required to minimise emissions of dust. With site specific mitigation, impacts should be reduced to slight adverse due to earthworks dust effects on amenity and property.

Annual mean PM_{10} concentrations at the site are currently less than 24 $\mu g/m^3$, with 10 to 100 properties within 50 m of earthworks, therefore the sensitivity of the area to human health impacts is low. An area of low sensitivity to human health impacts from earthworks dust is at a low risk of adverse impacts due to construction dust. Mitigation measures, such as those set out in section 5.1.6, will reduce the exposure to PM_{10} at levels that could exceed the 24 hour air quality exposure to a negligible risk.

5.1.2.2 *Application Site 2*

Site clearance works, the digging of trenches for foundations and utilities and temporary stockpiling of material represent the principal activities that may generate emissions of particulate material.

The potential for stockpiles of materials to generate dust depends on the nature of the material. Earth is soft and friable compared to hardcore. However, hardcore generally has lower moisture content than soil, and consequently they can both be a potential source of dust.

The total area of the site is between 2,500 and 10,000m^2. The potential dust emission magnitude for earthworks is therefore assessed as medium.

There are estimated to be between 10 and 100 properties within 50 m of earthworks. Sensitivity of the area to dust soiling due to earthworks is therefore assessed as medium.

An area of high sensitivity with a medium dust emission magnitude site is at medium risk of adverse impacts due to construction dust. Site specific mitigation measures, such as those set out in section 5.1.6, will therefore be required to minimise emissions of dust. With site specific mitigation, impacts should be reduced to negligible due to construction dust effects on amenity and property.

Annual mean PM_{10} concentrations at the site are currently less than 24 µg/m^3, with approximately between 10 and 100 properties within 50 m of earthworks, therefore the sensitivity of the area to human health impacts is low. An area of low sensitivity to human health impacts from construction dust is at a low risk of adverse impacts due to construction dust. Mitigation measures, such as those set out in section 5.1.6, will reduce the exposure to PM_{10} at levels that could exceed the 24 hour air quality exposure to a negligible risk.

5.1.3 *Construction*

5.1.3.1 *Application Site 1*

Dust emissions during construction can give rise to elevated dust deposition and PM_{10} concentrations. These are generally short-lived changes over a few hours or days, which occur over a limited time period of several weeks or months.

The total building volume is estimated to be between 20,000 and 100,000 m^3. The potential dust emission magnitude for construction is therefore assessed as medium.

There are estimated to be between 10 and 100 properties within 50 m of construction. Sensitivity of the area to dust soiling due to construction is therefore assessed as medium.

An area of medium sensitivity with a high dust emission magnitude site is at medium risk of adverse impacts due to construction dust. Site specific mitigation measures, such as those set out in section 5.1.6, will therefore be required to minimise emissions of dust. With site specific mitigation, impacts should be reduced to negligible due to construction dust effects on amenity and property.

Annual mean PM_{10} concentrations at the site are currently less than 24 µg/m^3, with 10 to 100 properties within 50 m of construction work, therefore the sensitivity of the area to human health impacts is low. An area of low sensitivity to human health impacts from construction dust is at a low risk of adverse impacts due to construction dust. Site specific mitigation measures, such as those set out in section 5.1.6, will reduce the exposure to PM_{10} at levels that could exceed the 24 hour air quality exposure to a negligible risk.

5.1.3.2 *Application Site 2*

Dust emissions during construction can give rise to elevated dust deposition and PM_{10} concentrations. These are generally short-lived changes over a few hours or days, which occur over a limited time period of several weeks or months.

The total building volume is estimated to be more than 100,000 m^3. The potential dust emission magnitude for construction is therefore assessed as large.

There are estimated to be between 10 and 100 properties within 20 m of construction. Sensitivity of the area to dust soiling due to construction is therefore assessed as high.

An area of high sensitivity with a large dust emission magnitude site is at high risk of adverse impacts due to construction dust. Site specific mitigation measures, such as those set out in section 5.1.6, will therefore be required to minimise emissions of dust. With site specific mitigation, impacts should be reduced to slight adverse due to construction dust effects on amenity and property.

Annual mean PM_{10} concentrations at the site are currently less than 24 µg/m^3, with 10 to 100 properties within 20 m of construction work, therefore the sensitivity of the area to human health impacts is low. An area of low sensitivity to human health impacts from construction dust is at a low risk of adverse impacts due to construction dust. Site specific mitigation measures, such as those set out in section 5.1.6, will reduce the exposure to PM_{10} at levels that could exceed the 24 hour air quality exposure to a negligible risk.

5.1.4 *Track-out of Material*

5.1.4.1 *Application Site 1*

Precise numbers of HDV movements are not currently available. Previous experience of construction dust assessments of similar size suggests there will be between 10 and 50 HDV movements per day for a site of this size. Therefore, the potential dust emission magnitude of trackout is therefore assessed as medium.

There are estimated to be 10 to 100 properties within 20 m of trackout routes. Sensitivity of the area to dust soiling due to trackout is therefore assessed as high. An area of high sensitivity with a medium dust emission magnitude site is at a medium risk of adverse impacts due to trackout dust. Site specific mitigation measures, such as those set out in section 5.1.6, will therefore be required to minimise emissions of dust. With site specific mitigation, impacts could be reduced to negligible due to trackout dust effects on amenity and property.

Annual mean PM_{10} concentrations at the site are currently less than 24 µg/m^3, with 10 to100 properties within 20 m of trackout routes, therefore the sensitivity of the area to human health impacts is low. An area of low sensitivity to human health impacts from trackout dust is at a low risk of adverse impacts due to trackout dust. Site specific mitigation measures, such as those set out in section 5.1.6; will reduce the exposure to PM_{10} at levels that could exceed the 24 hour air quality exposure to a negligible risk.

5.1.4.2 *Application Site 2*

Precise numbers of HDV movements are not currently available. Previous experience of construction dust assessments of similar size suggests there will be between 10 and 50 HDV movements per day for a site of this size. Therefore, the potential dust emission magnitude of trackout is therefore assessed as medium.

There are estimated to be 10 to 100 properties within 20 m of trackout routes. Sensitivity of the area to dust soiling due to trackout is therefore assessed as high. An area of high sensitivity with a medium dust emission magnitude site is at a medium risk of adverse impacts due to trackout dust. Site specific mitigation measures, such as those set out in section 5.1.6, will therefore be required to minimise emissions of dust. With site specific mitigation, impacts could be reduced to negligible due to trackout dust effects on amenity and property.

Annual mean PM_{10} concentrations at the site are currently less than 24 µg/m^3, with 10 to100 properties within 20 m of trackout routes, therefore the sensitivity of the area to human health impacts is low. An area of low sensitivity to human health impacts from trackout dust is at a low risk of adverse impacts due to trackout dust. Site specific mitigation measures, such as those set out in section 5.1.6; will reduce the exposure to PM_{10} at levels that could exceed the 24 hour air quality exposure to a negligible risk.

5.1.5 *Summary*

The conclusions of the construction dust assessment are summarised in Table 14. Overall, the implementation of best practice dust control measures, which are standard on all well managed construction sites, would minimise the effects of the construction phase dust emissions so that they are considered to be negligible to slight adverse, which is not considered to represent a significant effect.

Table 14: Summary of Construction Phase Emissions Significance, with Mitigation

Potential Impact	Application Site	Demolition	Earthworks	Construction	Trackout
Effects on Amenity and Property	One	Negligible	Slight Adverse	Negligible	Negligible
	Two	N/A	Negligible	Slight Adverse	Negligible
Exposure to PM_{10} at levels that could exceed the 24 hour air quality objective	One	Negligible	Negligible	Negligible	Negligible
	Two	N/A	Negligible	Negligible	Negligible
Overall Effect	Negligible to Slight Adverse and Not Significant				

5.1.6 *Mitigation*

Mitigation measures for the various stages of the construction phase process and activities are outlined below and it is assumed that these will be implemented during works:

Measures Specific to Communication:

- Develop and implement a stakeholder communications plan that include community engagement before work commences.
- Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environmental manager/engineer of the site manager;
- Display the head or regional office contact information; and
- Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority.

Measures Specific to Site Management:

- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record measures taken;
- Make the complaints log available to the local authority when asked; and
- Record any exceptional incidents that cause dust and/or air emissions, either on- or off-site, and the action taken to resolve the situation in the log book.

Measures Specific to Preparing and maintaining the site:

- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as possible;
- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site;
- Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period;
- Avoid site runoff of water or mud;
- Keep site fencing, barriers and scaffolding clean using wet methods;
- Remove materials that have the potential to produce dust from site as soon as possible; and
- Cover, seed or fence stockpiles to prevent wind whipping.

Operating vehicle/machinery and sustainable travel

- Ensure all on-road vehicles comply with the requirements of the London Low Emission Zone and the London NRMM standards, where applicable;
- Ensure all vehicles switch off engines when stationary - no idling vehicles;
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable; and
- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.

Measures Specific to Operations

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

Measures Specific to Demolition:

- Soft Strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust);

- Ensure effective water suppression is used during demolition operations. In addition high volume water suppression systems, manually controlled, can produce fine water droplets that effective brings the dust particles to the ground;
- Avoid explosive blasting, using appropriate manual or mechanical alternative; and
- Bag and remove any biological debris or damp down such material before demolition.

Measures Specific to Earthworks:

- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable;
- Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable; and
- Only remove the cover in small areas during work and not all at once.

Measures Specific to Construction:

- Avoid scrabbling (roughening of concrete surfaces); and
- Ensure sand and other aggregates are stored in bonded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
- Ensure bulk cement and other fine powder materials are delivered in enclose tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during the delivery.
- For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.

Measures Specific to Trackout:

- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site;
- Avoid dry sweeping of large areas;
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport;
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonable practicable.
- Record all inspections of haul routes and any subsequent action in a site log book;
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
- Ensure there is adequate area of hard surface road between the wheel wash facility and the site exit, wherever site size and layout permits.

- Access gates to be located at least 10m from receptors where possible.

5.2 Operational Phase

5.2.1 *West Hampstead (Thameslink) Train Station*

The development is close to West Hampstead (Thameslink) train station, and the railway line runs north of the proposed development site. This is a National Rail station on the Midland Main Line and is served by Thameslink trains as part of the Thameslink route between Kentish Town and Cricklewood. The East Midlands Trans InterCity services from Nottingham, Sheffield and Leicester run through at high speed, but do not stop.

The proposed development is approximately within 10m from the nearest railway. In order to take into account potential effects associated with diesel trains emissions, this source has been taken into account as part of the background concentrations used for this air quality assessment. In addition, the LAQMTG.(09) lists a number of railway lines which should be considered when undertaking air quality assessments. The Thameslink section route between Kentish Town and Cricklewood is not listed, therefore it has been assumed that the volume of diesel train services is not considered to be high.

Based on the above information, this source (mobile and stationary emissions) has been considered to be of negligible significance.

5.2.2 *Energy Plant*

Annual Mean NO_2 Concentrations

The NO_2 annual mean results of the energy plant predictions at existing and proposed receptors are presented in Table 15 and Table 16 respectively. The greatest contribution to annual mean NO_2 concentrations predicted at existing receptors is E1 (Maygrove Road) which are predicted to experience a change to annual mean concentrations of 0.2 µg/m^3.

Overall, the magnitude of change associated with the proposed energy plant at all existing receptors is considered to be imperceptible resulting in a negligible effect at all existing receptors.

The results presented in this section are considered the worst case scenario as they have assumed that background NO_2 concentrations were used for the 2013 assuming no reduction in future background pollutant concentrations. In addition, the results presented in this assessment have assumed that the operation of the proposed energy units will be 24 hours per day, 7 days a week during a calendar year. This is considered to be conservative as in reality this will change during the winter and summer periods.

Table 15: Energy Centre contributions to annual mean NO_2 total concentrations ($\mu g/m^3$) at existing receptors

Receptor ID	2013 NO_2 Background concentration	Total Annual NO_2 Concentrations (2013 background + CHP contribution)	Change NO_2 Contribution Proposed Development
E1	32.4	32.6	0.2
E2	32.4	32.4	<0.1
E3	32.4	32.4	<0.1
E4	32.4	32.4	<0.1
E5	32.4	32.6	0.2
E6	29.6	29.6	<0.1
E7	31.7	31.7	<0.1
E8	31.7	31.7	<0.1
E9	32.4	32.4	<0.1
E10	32.4	32.4	<0.1

Table 16: Energy Centre contributions to annual mean NO_2 concentrations at on-site receptors

ID	Annual NO_2 Concentrations (2013 background + boilers contribution)		Floors Above Annual Mean NO_2 Objective Value (40 $\mu g/m^3$)
	Min	Max	
P1	33.2	33.2	None
P2	33.3	33.3	None
P3	33.0	33.2	None
P4	32.5	32.5	None
P5	32.8	33.0	None

Hourly Mean

Results of the hourly mean NO_2 concentrations are presented in Table 17 and Table 18 for existing and proposed receptors respectively. The highest hourly mean NO_2 contribution predicted at existing receptors is at Receptor E1 (Maygrove Road), which is predicted to experience a contribution of 1.1 µg/m^3 resulting in a total short term NO_2 concentration of 65.9 µg/m^3. This short term contribution is less than 10% of the short term air quality objective and as such is not considered to be significant at the remaining of the proposed receptors.

For on-site receptors, the predicted process contributions are all below 20% of the headroom at all proposed receptors. Short term concentrations are also less than the short term air quality objective. Therefore, the site is considered to be suitable for the proposed use, in relation to the short-term NO_2 air quality objective.

The results presented in this section are considered the worst case scenario as they have assumed that background NO_2 concentrations were used for the 2013 assuming no reduction in future background pollutant concentrations. In addition, the results presented in this assessment have assumed that the operation of the proposed energy units will be 24 hours per day, 7 days a week during a calendar year. This is considered to be conservative as in reality this will change during the winter and summer periods.

Table 17: Process Contribution of Fully Operational Proposed Development Energy Centre to NO_2 Concentrations at Existing Residential Receptors around the Site

Receptor ID	99.79th percentile NO_2 process contribution (PC) (µg/m^3)	Total Hourly 99.79th percentile NO_2 Concentrations (2013 background + Energy Centre contribution)
E1	1.1	65.9
E2	0.2	65.0
E3	0.4	65.2
E4	0.1	64.9
E5	0.6	65.4
E6	0.2	59.5
E7	0.1	63.5
E8	0.2	63.6
E9	0.3	65.1
E10	0.1	64.9

Table 18: Energy Centre to 99.79th percentile of the hourly mean NO_2 concentrations ($\mu g/m^3$) at on-site receptors

ID	99.79th percentile NO_2 Concentrations (2014 background + Energy Centre contribution)		Floors Above Hourly NO_2 Objective Value (200 $\mu g/m^3$ not to be exceeded more than 18 time in a year)
	Min	Max	
P1	69.5	69.5	None
P2	69.5	69.5	None
P3	68.5	72.9	None
P4	65.5	65.5	None
P5	66.3	68.1	None

5.3 Air Quality Neutral Assessment

An air quality neutral assessment has been undertaken using the GLA's SPG and the accompanying air quality neutral guidance document. The results of the assessment are presented in full in Appendix B.

The Total Building Emissions are calculated from the emission rates specified for the development energy plant in Table 6. As natural gas will be used and only emissions of NO_X are assessed. The Total Building Emissions (332 kg NO_X) were calculated to be lower than the Total Benchmarked Building Emissions (443 kg NO_X). As such, the building emissions for the proposed development were below the benchmark (difference of 111 kg NO_X).

The propose development is compliant with low NO_X emission limits from the CHP (50 mg/Nm^3) and boilers (33 mg/kWh) as recommended by the LBC and Greater London Authority. In addition, in terms of vehicle emissions there are reduction associated with HGV emissions, approximately by 5%, reduction of car parking facilities to 5 only and provision of 180 vehicle cycle parking spaces due to the change of land use from an Industrial state to the proposed uses. Therefore, it is considered that the Application Site 1 and Applications Site 2 are considered to be air quality neutral.

5.4 Site Suitability

This section of the chapter considers the modelling results of the energy plant on the suitability of parts of the proposed development for the type of land use.

The annual mean concentrations of NO_2 were well below the annual average and the hourly objectives at all locations on the proposed development.

Based on the results presented in this report an, the Application Sites 1 and 2 are therefore considered to be suitable for proposed land uses.

6. CONCLUSIONS

In general, construction activities have the potential to generate fugitive dust emissions as a result of demolition, earth works, construction or track-out of material. For the proposed development, the concentrations of any airborne particulate matter generated by these activities would be controlled using on site management practices to the extent that the proposed development should give rise to effects of slight adverse or negligible significance on dust deposition rates at the nearest sensitive receptors. The impact of fugitive emissions of PM_{10} at these receptors, with proposed mitigation applied would be slight adverse/negligible. Overall the effect of fugitive emissions of particulate matter (dust and PM_{10}) from the proposed works for Application Site 1 and Application Site 2 is considered to be not significant with respect to potential effects on health and amenity.

The proposed development includes an energy facility. The effect of NO_2 annual mean and hourly mean concentrations from the proposed CHP and boilers has been predicted at existing receptors for the opening year. Overall, the magnitude of change associated with the proposed energy plant for Application Site 1 and Application Site 2 at existing receptors is considered to be imperceptible resulting in a negligible effect at all existing receptors.

Whilst a series of conservative assumptions have been made in this assessment, the predicted annual and hourly mean concentrations of NO_2 for on-site receptors are well below the relevant NO_2 objectives. Application Site 1 and Application Site 2 are therefore considered to be suitable for the proposed uses.

For the air quality neutral assessment, the Total Building Emissions for the proposed development were calculated within the Total Benchmarked Building Emissions. Therefore, based on LBC and Mayor of London Guidance, Application Site 1 and Application Site 2 are considered to be air quality neutral developments.

Providing that mitigation measures assumed herein are in place for the proposed development, Application Site 1 and Application Site 2 combined or in isolation, is considered ‘not significant’ in terms of local air quality.

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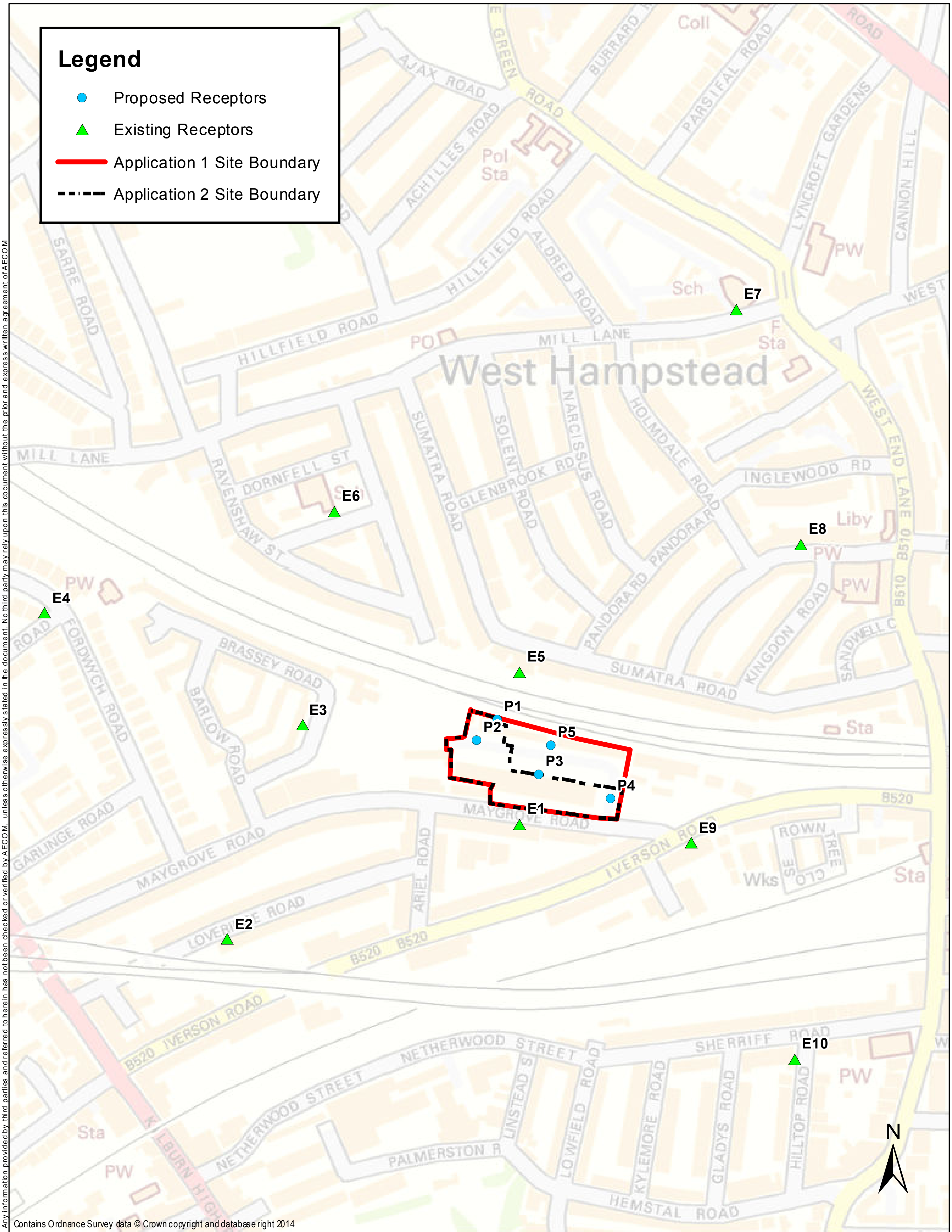
APPENDIX A FIGURE



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APPENDIX B AIR QUALITY NEUTRAL ASSESSMENT

The London Plan includes a policy relating to 'air quality neutral development' and aims to bring forward developments that are air quality neutral or better and that do not degrade air quality in areas where EU limit values (or air quality objectives) are not currently achieved. The "Air Quality Neutral Planning Support Update: GLA 80371" (Air Quality Consultants and Environ, 2014) was published in April 2014 to accompany the 2014 publication of the GLA's Sustainable Design and Construction Supplementary Planning Guidance (SPG It provides specialist consultants with a methodology to undertake an 'air quality neutral' assessment, as well as emission benchmarks for buildings and transport, against which the predicted values for the considered development will be compared.

With regards to emissions from road traffic and energy plants, the current assessment approach most widely adopted for developments in London is to calculate the change in pollutant concentrations, for the pollutants nitrogen dioxide (NO_2) and particulate matter (PM_{10}). Through the application of physical mitigation (stacks, catalysts, particle traps or ventilation systems) the concentration of pollutants that receptors are exposed to can be controlled so the effect is not significant. However, the emitted pollutants contribute to the background pollutant concentration in London as a whole and in combination are helping to maintain pollutant concentrations higher than legislation requires. To address this, the air quality neutral approach compares the amount of pollutant(s) emitted against a benchmark value, with the aim of minimising the mass of pollutant emitted, instead of targeting the ambient concentration of the pollutant.

In accordance with the Mayor of London's Draft Sustainable Design and Construction SPG (Mayor of London, 2014), an air quality neutral assessment has been undertaken using the latest information about the proposed development. The methodology and emission factors are taken from the Air Quality Neutral Planning Support Update: GLA 80371 (Air Quality Consultants and Environ, 2014).

Operational Road Traffic Emissions

The proposed development is largely car free with only five car parking spaces and as such vehicle trips will be lower than those currently. Therefore, emissions from vehicle movements are not considered further in the air quality neutral assessment.

Operational Energy Plant Emissions

The air quality neutral assessment for the proposed energy centre compares the energy related emissions against calculated benchmark values based upon floor space, land use and energy demand, in accordance with the Air Quality Neutral Planning Support Update: GLA 80371 (Air Quality Consultants and Environ, 2014).

The Total Benchmarked Building Emissions for the proposed development are calculated using the floor area for each land-use class, multiplied by default emission factors for each land-use category, as shown in Table 1. Only emissions of NO_x are calculated as the energy plant of the proposed development will be fuelled using natural gas.

Table 1: Calculation of Benchmarked building Emissions

Land Use	Gross Floor Area (GFA/m^2)	Building Emissions Benchmarks ($gNO_X/m^2/annum$)	Benchmarked Emissions ($kgNO_X/annum$)
Residential (C1)	9,817	26.2	257
Commercial (B1)	3,729	30.8	115
Schools (D1)	2,280	31.0	71
Total Benchmarked Building Emissions			**443**

The proposed development includes the installation of one CHP and 6 boilers. As the proposed energy plant would be fuelled by natural gas, the main pollutant of concern would be emissions of oxides of nitrogen (NO_x).

The annual building energy consumption (kWh) for proposed land uses has been provided by the design team. The estimated numbers provided are 417,234 kWh for domestic and 23,766 for commercial use in a year. This gives an equivalent Total Building NO_X emission of 332 kg/annum.

The Total Benchmarked Building Emissions are then subtracted from the Total Building Emissions, as presented in Table 2 below, to assess whether the Total Building Emissions for the proposed development are within the benchmark.

Table 2: Comparison Between Total Building Emissions and Benchmarked Building Emissions

Oxides of Nitrogen (kg/annum)	
Total Building Emissions	332
Total Benchmarked Building Emissions (Assessment Criteria)	443
Difference	**111**

The Total Benchmarked Building Emissions (443 kg NO_X) are higher than the Total Building Emissions (332 kg NO_X), the building emissions are within the benchmark. Therefore, further mitigation could be considered to reduce NO_X emissions further or opportunities to off-set NO_X emissions off-site identified.

Target Minimum Emissions Standards for CHP and boilers

It is noted that in addition to the achievement of benchmark emissions, the London Plan states that new development proposals should meet the minimum standards outlined in the SPG. Emission standards are provided for:

- individual gas boilers;
- communal gas boilers; and
- combined heat and power.

Plant proposed within developments are to comply with these standards, in addition to the development meeting the overall ‘air quality neutral’ benchmarks. Where meeting these emission standards still does not allow the air quality neutral benchmarks to be met, further reduction or offsetting measures would be required.

The NO_X reference emission standard for the proposed development is specified at $50mg/Nm^3$ for the CHP and 33mg/kWh for proposed boilers. Based on the LBC and the Greater London Authority guidance, the NO_X emissions standard for on-site energy facilities is met.

Summary

For the air quality neutral assessment, the Total Building Emissions for the proposed development were calculated within the Total Benchmarked Building Emissions. Therefore, based on LBC and Mayor of London Guidance, Application Site 1 and Application Site 2 are considered to be air quality neutral developments.