Sustainability Statement

252 Finchley Road, Camden, NW3 7AA

Planning Reference: 2014/7283/PRE

Produced for: Douglas and King Architects

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Aerial View of Site Image Courtesy of Bing Maps

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Introduction

Purpose of statement

Darren Evans Assessments has compiled this report following energy calculations undertaken on the proposed development at 252 Finchley Road, Camden, NW3 7AA.

The proposals includes the demolition of existing building and erection of a four storey building to create 12 self-contained dwellings

The following statement seeks to outline how the proposed development will comply with the requirements and objectives of Policies 5.2, 5.3, 5.5, 5.6 and 5.7 of the London Plan 2011. In addition to this the report will set out how the development will comply with the relevant points of Policy CS13 in line with the London Borough of Camden's Local Development Framework.

Policy context

Climate change can be described as the change in global climate caused by human activity. In response to the increased scientific awareness of the effect of human activities there has been a push in developed economies towards more sustainable development.

In 1992, the UK signed the Kyoto protocol committing itself and other nations to cut emissions of various greenhouse gases, the most significant being carbon dioxide. Different policies and targets have been set at national, regional and local levels to stimulate and regulate more sustainable development.

National Policy

In March 2012 the government published the new national planning policy framework as part of the reforms to make the planning system less complex and easier to understand.

*"At the heart of the National Planning Policy Framework is a **presumption in favour of sustainable development**, which should be seen as a golden thread running through both plan-making and decision-taking."*[1]

This development shall adhere to this presumption through decision making that leads to a sustainable project and by supporting the local strategic development needs in the housing facilities that it provides.

"To support the move to a low carbon future, local planning authorities should:

- *plan for new development in locations and ways which reduce greenhouse gas emissions;*
- *actively support energy efficiency improvements to existing buildings; and*
- *when setting any local requirement for a building's sustainability, do so in a way consistent with the Government's zero carbon buildings policy and adopt nationally described standards."*[1]

[1] National Planning Policy Framework

The framework also encourages applications to comply with local plans on decentralised energy supply where feasible and to take into account landform, layout, orientation, massing and landscaping design to minimise energy consumption.

Paragraph 97 encourages the use of renewable and low carbon energy where suitable and for applications to have a positive strategy to promote the above.

This development is committed to meeting the regional and local requirements for carbon emissions and energy use from the development as a minimum.

Regional Policy- Greater London Authority

London consumes in a year as much energy as Greece and Portugal and more than Ireland. In order for London to make a difference, it must not only save energy, but also make it from renewable sources. Taking the lead from the national targets, London has set its own targets in the London Plan, London's Response to Climate change. "*The Mayor seeks to achieve an overall reduction in London's carbon dioxide emissions of 60 per cent (below 1990 levels) by 2025.*"[2]

It is thought that whilst challenging, the target set by the mayor should be achievable with the full commitment and collaboration of all stakeholders. The energy hierarchy has been defined to enable development proposals to make the fullest possible contribution to minimising carbon dioxide.

1. Be lean: use less energy
2. Be clean: supply energy efficiently
3. Be green: use renewable energy

Applying the hierarchy to developments in this order will help to produce sustainable development in the most economically viable manner. Targets have also been set in the London Plan for the reduction of carbon emissions over the target emissions level:

Local Plan and London Plan 2011 Policy 5.2 – Minimising Carbon Dioxide Emissions

As a minimum, all major development proposals should meet the following targets for CO_2 emissions reduction in buildings. These targets are expressed as minimum improvements over the Target Emission Rate (TER) outlined in the national Building Regulations leading to zero carbon residential buildings from 2016 and zero carbon non-domestic buildings. As of 2014 upon the implementation of the Part L 2013 Building Regulations the targets have changed.

As outlined in the Sustainable, Design and Construction SPG (published in April 2014), from 6 April 2014 the Mayor will apply a 35 per cent carbon reduction target beyond Part L 2013 of the Building Regulations - this is deemed to be broadly equivalent to the 40 per cent target beyond Part L 2010 of the Building Regulations, as specified in Policy 5.2 of the London Plan for 2013-2016.

[2] Chapter 5, London's Response to Climate Change, The London Plan 2011

Assessment Methodology

Major development proposals should include a detailed energy assessment to demonstrate how the minimum targets for carbon dioxide emissions reduction outlined above are to be met within the framework of the energy hierarchy. As a minimum, energy assessments should include the following details:

Calculation of baseline energy demand and carbon dioxide emissions on a residual energy basis, showing the contribution of emissions from uses covered by building regulations (regulated emissions);

Proposals to reduce carbon dioxide emissions through the energy efficient design of the site, buildings and services;

Proposals to further reduce carbon dioxide emissions through the use of decentralised energy where feasible, such as district heating and cooling and combined heat and power (CHP).

Proposals to further reduce carbon dioxide emissions through the use of onsite renewable energy technologies.

The carbon dioxide reduction targets should be met onsite. Where it is clearly demonstrated that the specific targets cannot be fully achieved onsite, any shortfall may be provided offsite or through a cash in lieu contribution to the relevant borough to be ring fenced to secure delivery of carbon dioxide savings elsewhere.

Darren Evans Assessments have been commissioned to ensure the development incorporates sustainability by;

- Ensure the development complies with policy CS13 of the Camden Core Strategy by ensuring at least a 20% reduction CO_2 emissions through the use of onsite renewables.

- Ensure the site as a whole achieves a greater than 35% improvement on building regulations emission targets (Part L 2013). Calculated using SAP Methodology, and approved software (FSAP 2012)

- Reduce carbon emissions associated with the development by following the Energy Hierarchy (Be Lean, Be Clean, Be Green)

- Investigate potential renewable energy technologies based on their practical feasibility and technical viability

Summary and Proposals

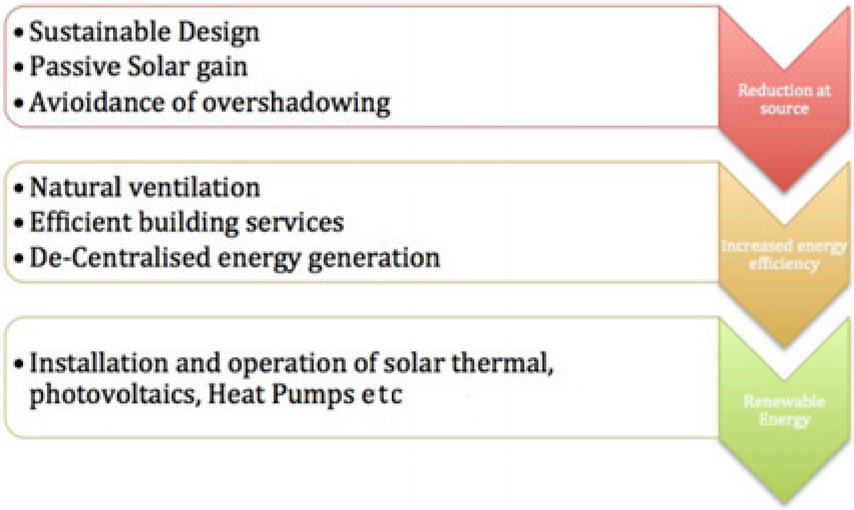
The conclusion of the energy strategy is that the development significantly reduces the buildings Carbon dioxide emissions when compared to the baseline target, through a combination of passive measures, building fabric design improvements, the installation of high efficiency heating and hot water services supplied by a through a community gas boiler and the installation of a 15kWp solar photovoltaic system .

A saving in CO_2 of 37.92% is estimated to be achieved annually compared to the building regulations compliant baseline assessment. This will ensure compliance with the London Plan 2011 Policy 5.2. It is predicted a reduction of 36.99% will be achieved by the use of on-site technologies satisfying policy CS13 of the Camden Core Strategy.

The report confirms the dwellings have been designed to show consideration to the following sustainability issues: Limiting excessive solar gain, reducing artificial lighting demand, summer shading, sustainable urban drainage, green roof provision, enhanced bio-diversity and efficient use of water.

The Energy Hierarchy

The Energy Hierarchy adopts a set of principles to guide design development and decisions regarding energy, balanced with the need to optimise environmental economic benefits. The hierarchy, which is widely accepted approach amongst many local county councils, seeks to ensure that development incorporates energy efficiency through the approach:



It is considered that the above principles carbon reduction forms the most appropriate approach from both the practical and financial perspective. The industry is broadly in agreement that the energy efficiency and low carbon technologies have the greatest impact offsetting CO_2 emissions. Therefore, it is logical to encourage enhanced mitigation through energy efficiency and low carbon technologies in the first instance, as opposed to applying renewables as the first option at a significantly greater cost.

Sustainable Design and Construction

The approach employed in reducing the energy usage of the site follows the below hierarchy:

- Be lean: use less energy
- Be clean: supply energy efficiently
- Be green: use renewable energy

Be Lean

Buildings can use less energy through passive means. Passive factors that affect the buildings energy use include Orientation, thermal Insulation and air infiltration.

At the earliest stage the dwellings have been designed using a fabric first approach as to initially minimise energy and resulting CO_2 emissions. Best practice and appropriate measures have been included into the design as to minimise the environmental impact on the site.
The building has been designed to maximise the potential for passive energy savings. Particular attention will be paid to thermal envelope, and it has been designed to include high levels of insulation to meet and exceed Part L 2013 standards.

The following table provides a summary of the energy efficient and carbon reducing design characteristics across the development. These have been incorporated into the SAP calculations to predict the annual energy consumption and resultant CO_2.

Element		Details	Comments
Floor U-Values	Ground Floor	0.14 W/m^{2}K	-
Wall U-Values	External Walls	0.18 W/m^{2}K	Insulated Timber Frame
	Walls to Unheated Corridors	0.18 W/m^{2}K	Insulated as External Walls
	Party Walls	0.0 W/m^{2}K	Fully filled and sealed cavity
Roofs	All Sloping Roofs	0.18 W/m^{2}K	-
Opening U-Values	Windows	1.2 W/m^{2}K	Double glazed Argon Filled Low E Coating
	Door - Solid	1.4 W/m^{2}K	Insulated Door to Corridor
Thermal Bridging	y - value	Varies	Accredited Construction Details
Ventilation	Air Tightness	4.5	-
	Ventilation	MVHR	Greenwood Vireo HR155WM
Heating and HWS	Primary Heating System	Community Gas Boilers	With a Minimum efficiency of 96%
	Controls	Programmer and at least two thermostats with charging linked to use.	
	Water Heating	From Community Gas boiler	No hot water storage in dwellings supplied from central system
	Secondary Heating System	None	-
Low Energy Lighting		100%	100% Low-Energy Fittings

Table 1: Summary of energy efficient features in design

Site Wide Summary of Be Lean Measures

Incorporating the above measures into the design will reduce the sites overall energy demand and subsequent CO_2 emissions beyond the requirements of Part L Building (See Table 2)

At this early planning stage only 4 dwellings have been assessed and the energy demand and resultant CO_2 calculated. The figures have been extrapolated and multiplied out based on the total number of dwellings to estimate the site wide emissions and energy consumption.

Dwelling	Floor Area	Target Emission Rate ($kgCO_2/m^2$/Year)	Dwelling Emission Rate ($kgCO_2/m^2$/Year)	Percentage Improvement	Total Emissions ($kgCO_2$/Year)
Plot 4	42.27	21.08	20.44	3.0	863.96
Plot 5	62.31	15.70	15.41	1.80	960.34
Plot 6	58.34	17.72	17.88	-	1042.87
Plot 11	121.47	16.67	16.73	-	2031.88
				Total	**4035.08**

Table 2: Summary of emissions of 'Be Lean' stage

The specification suggested improves upon building regulations emission targets by a margin on **0.58%**.

Design Emission Rate**: 4,035.08 $KgCO_2$/Year**
Target Emission Rate: **4,036.96 $KgCO_2$/Year**

In order to estimate the side wide emissions, the dwelling emission rates have been averaged out by storey to give the following figures;

- 20.43 $kgCO_2/m^2$ /year for the ground floor
- 16.60 kgCO2/m^2 /year for the first floor
- 16.73 kgCO2/m^2 /year for the second and third floors

The figures have then been multiplied out by the floor areas of each dwelling in order to estimate the total emissions. The specification suggested site wide improvements upon building regulations emission targets by a margin of **0.93%.**

Site Wide Emissions
Design Emission Rate: **16,702.11 KgCO2/Year**
Target Emission Rate: **16,859.09 KgCO2/Year**

Please see Appendix A, Table 1 for an in depth summary of the figures.

Be Clean

Policy 5.5 and 5.6 of the London Plan encourage the move to decentralised generation of heat and power seeking to reduce the losses and inefficiencies of reliance upon a centralised system. The mayor has set a target of 25% to be generated through localised decentralised energy systems by 2025.

The opportunity for on-site community heating has been identified as suitable for the proposed development at Finchley Road. A community gas fired central heating system will be installed, with charging for the residents linked to use.

Co-generation has been evaluated for use in the project, however it has been considered inappropriate in this instance. For a combined heat and power unit to be economic it needs to operate for as much time as possible. As these are well insulated dwellings the heating and hot water demand profiles will be infrequent and insignificant enough to warrant the application of CHP.

The capital costs are also high compared to other technologies with pay back periods in excess of 20 years. Along with the increase in maintenance requirements, current low life expectancies and high cases of unreliability render CHP unfeasible.

According to the interactive London Heat Map website, there are no current district heating networks in the area or imminent plans for a new network (See Table 3). However, the proposed communal boiler and heat network arrangement on this development may form part of an area wide district heating network at some point in the future. Tee points may be included in the pipework installation to enable retrofitting to connect with flow and return district heating pipes passing in the public highway.

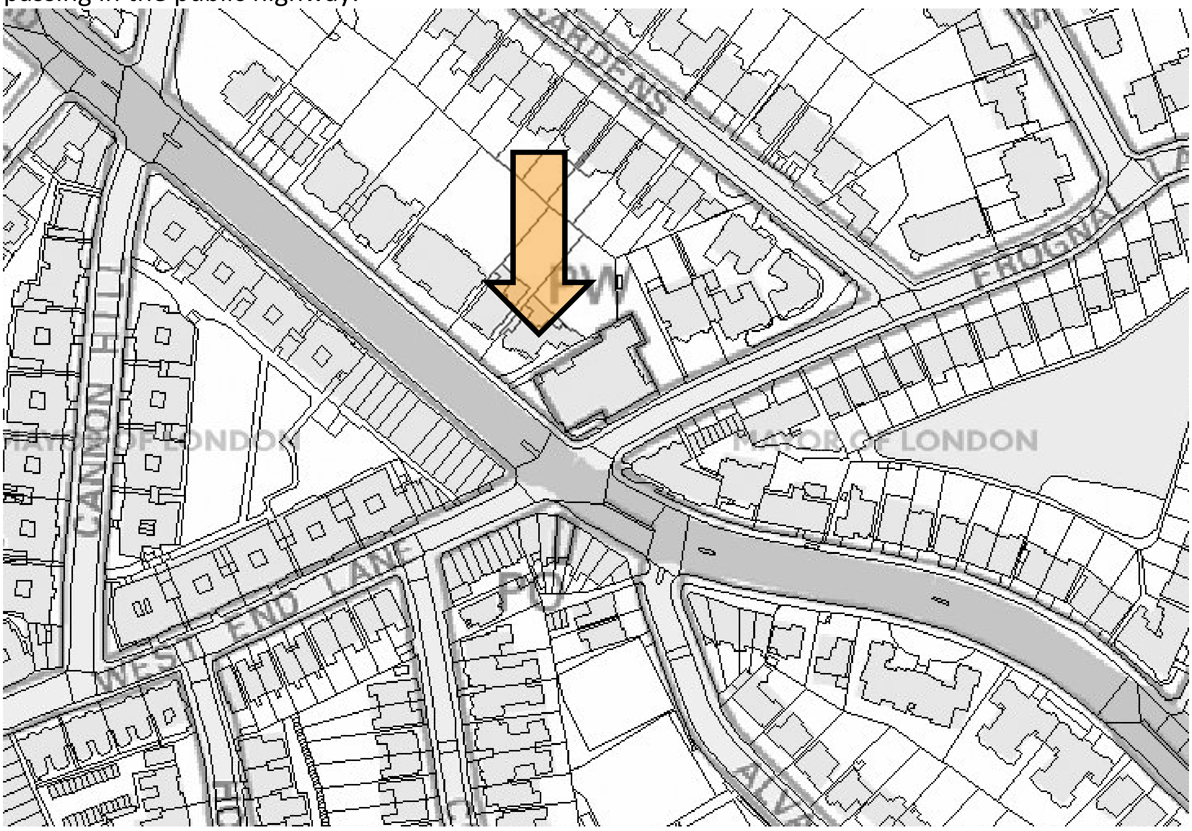


Table 3: London Heat Map (http://www.londonheatmap.org.uk/Mapping/)

Be Green

Policy 5.7 of the London plan states “The Mayor seeks to increase the proportion of energy generated from renewable sources, and expects that the projections for installed renewable energy capacity outlined in the Climate Change Mitigation and Energy Strategy and in supplementary planning guidance will be achieved in London”

Individual projects are expected to consider renewable technologies and seek to reduce carbon dioxide emissions following the installation wherever possible.

The following renewable technologies have been evaluated for use:

- Solar Photovoltaic Cells
- Solar Hot Water
- Wind Turbines
- Ground Source Heat Pump
- Air Source Heat Pump
- Biomass

Photovoltaics

Solar photovoltaics (PVs) convert energy from daylight into electricity using a semiconductor material such as silicon. When light hits the semiconductor, the energy in the light is absorbed, ‘exciting’ the electrons in the semiconductor so that they break free from their atoms. The resultant flow of electrons through the semiconductor material produces electricity.

Feasibility	Further Consideration
The proposed roof of this project has a large flat roof section so solar PV panels could be installed on to frames to be orientated due-South for maximum efficiency. These panels could be visible to the neighboring grade II Listed St Andrews Church	Yes

Solar Thermal (Hot Water)

Solar water heating systems convert solar radiation to heat carried by water for use in space heating or the provision of domestic hot water. Solar water heating systems normally operate with a back-up source of heat, such as gas condensing boilers. The solar water heating preheats the incoming water, which is topped up by the back-up heat source when there is insufficient solar energy to reach the target water temperature.

Feasibility	Further Consideration
Although the building has an adequate area of flat roof, ideal for an array of panels there are concerns regards the additional capital cost and logistics of each individual apartment requiring its own hot water cylinder and its own solar panels. Dedicated flow and return pipes are required linking the cylinder to panel, and pumps and controls are also	No

needed in each apartment. Furthermore, the potential gains are capped for domestic applications as only so much hot water can be used within a property. Energy can be wasted as a result when for example the system is at its most efficient in summer yet when the demand for hot water is at its lowest.	

Wind Turbines

Wind turbines are modern, high-technology descendants of the windmills that have been around for centuries. In modern windmills the kinetic energy of the wind is used to turn a turbine to generate electricity as opposed to moving water or turning a grist mill wheel. There are two types of wind turbine, the horizontal-axis type which faces up or downstream of the wind and where the rotational movement of the blade is connected to a generator to create electricity. The other is the vertical-axis design, which is by far the most flexible type of wind turbine being best suited to more urban sites as it is more cost effective and operates with wind coming from any direction.

Feasibility	Further Consideration
Owing to site-constraints, micro-wind turbines have not been considered as part of this feasibility study. The primary constraints include the character of the building, the urban surroundings (and associated potential planning restrictions) and relatively low wind speeds in this area, averaging ~ 5.0 ms-1. Wind turbines are also likely to have a significant visual impact on local environment, as well as health and safety implications for occupiers or users on-site and on adjacent areas as a result of noise and light flicker associated with the wind turbines.	No

Ground Source Heat Pumps

Ground source heating takes advantage of the stable ground temperature of 12ºC to heat either air or water to provide energy efficient heating (and optional comfort cooling) to a building. The energy flow is driven by the temperature difference between the ground and the circulating fluid which can then be used to deliver heating (and optional cooling) to the building.

The direct bore hole type of installation requires a number of boreholes with a depth of up to 100m and a minimum centreline distance of 6m separating each bore hole.
Alternatively, closed loops can be installed along with the piles and or pad foundations of the building to take advantage of the foundation excavations to maximise the earth-connectivity of the system

Feasibility	Further Consideration
The site has a large area of open space to the rear which could be used as the locations for the boreholes needed to extract the heat from the ground. Ground source heat pumps are suitable for community networks and are favorable in these situations due to their reliability and the	No – the site has been deemed unsuitable for boreholes.

lack of maintenance required. The Ground source heat pump can offer large savings in heating and hot water to the occupiers. Also as a communal system each dwelling can still receive its own energy bill based on their usage from the supplier.	

Air Source Heat Pumps

An air source heat pump (ASHP) is a system which transfers heat from outside to inside a building. Under the principles of vapour compression refrigeration, an ASHP uses a refrigerant system involving a compressor and a condenser to absorb heat at one place and release it at another.

In domestic heating use, an ASHP absorbs heat from outside air and releases it inside the building, as hot air, hot water-filled radiators, under floor heating and/or domestic hot water supply.

Feasibility	Further Consideration
Air Source Heat Pumps have been evaluated for use in the development and could be considered viable if used in conjunction with another technology (PV). However, due to the increase in efficiencies offered by ground source heat pumps air source heat pumps will not be considered at this stage.	No

Biomass

Biomass boilers are an alternative to conventional fossil fuel heating. They burn woodchip, wood pellets, cereal waste or a combination of organic fuels, and are a carbon neutral option. Using biomass as an energy source creates a 'closed carbon cycle' – i.e. as a biomass energy source grows it absorbs CO_2 from the atmosphere, when it is burnt the CO_2 stored by the biomass is released, making it carbon neutral.

Feasibility	Further Consideration
Consideration needs to be given to the residential nature of the area and the frequent deliveries that would be required for this system as well as the size of storage. There are also potential noise, dust and odor problems associated with the deliveries as well as Air Quality issues from the burning of the fuel. The higher NOx emissions are also of concern in this borough and as a result of this and the aforementioned items; Biomass is not considered a viable option.	No

Site Wide Summary of Be Green Measures

After consultation with the client an agreement has been reached to proceed based on the use of Solar Photovoltaic (PV) panels. The adequate unshaded roof on the SE orientation lends itself to application of this technology.

Calculations have been completed incorporating a 4.5 kWp solar PV system which will feed into a central landlord supply but following SAP conventions has been allocated to each apartment based upon floor area.

The results are as follows:

Dwelling	Floor Area	Target Emission Rate ($kgCO_2/m^2/Year$)	Dwelling Emission Rate ($kgCO_2/m^2/Year$)	Percentage Improvement	Total Emissions ($kgCO_2/Year$)
Plot 4	42.27	21.08	13.83	34.40	584.66
Plot 5	62.31	15.70	8.79	44.00	547.65
Plot 6	58.34	17.72	11.30	36.20	659.36
Plot 11	121.47	16.67	10.14	39.20	1231.51
				Total	**2435.51**

Table 4: Summary of emissions of 'Be Green' stage

With the solar PV implemented the assessed plots improves upon building regulations emission targets by a margin of 39.60%.

Total Design Emission Rate for assessed plots: **2,438.51 $KgCO_2$/Year**
Total Target Emission Rate for assessed plots: **4,036.96 $KgCO_2$/Year**

In order to estimate the side wide emissions, the dwelling emission rates have been averaged out by storey to give the following figures;

- 13.83 $kgCO_2/m^2$ /year for the ground floor
- 10.00 kgCO2/m^2 /year for the first floor
- 10.14 kgCO2/m^2 /year for the second and third floors

The figures have then been multiplied out by the floor areas of each dwelling in order to estimate the total emissions. The amount of solar PV has also been multiplied across the site which results in a 15.00kWp solar PV system. This equates to 60 x 250W panels with an approximate area of 96m^2. For the purpose of this assessment the panels have been orientated facing SE at a 45° angle with no shading issues. The panels could either be mounted on the flat roof on A Frames or on the sloping roof.

Site Wide Emissions
Total Site Wide Design Emission Rate: **10,465.50 KgCO2/Year**
Total Site Wide Target Emission Rate: **16,859.09 KgCO2/Year**

Please see Appendix A, Table 2 for an in depth summary of the figures.

The total site wide Dwelling Emissions Rate will improve upon the Target Emissions Rate by a margin of **37.92%**. This will satisfy the requirements of Policy 5.2 of the London Plan. This is also adequate to meet the requirements of Policy 5.7 of the London plan as the site has further reduced the sites CO_2 emissions by **36.99%** through the use of on-site renewable technologies when compared with the Be Lean stage assessment.

Further Sustainability Measures

Water Conservation

This scheme will aim to reduce potable water consumption in the dwellings to below 105 litres per person per day to meet the performance standards outlined in policy CS13. This will be achieved through the use of internal potable water fixtures and fittings which utilise low flow rates and capacities without reducing an individual's ability to enjoy their property. An example of potential flow rates and fixtures is outlined in the table below:

Internal Potable Water Fixing	Flow Rate / Capacity
Toilet	Dual Flush 4 and 3 litres / min
Basin Taps	4 litres / min
Bath	165 litre capacity to overflow
Shower	8.00 litres / min
Kitchen Taps	4 litres / min

Table 5: Flow rates and capacities to achieve a water usage of 105 litres per person day.

To further reduce external water consumption all guttering downpipes will be connected to an external water butt.

Drainage

In order to reduce surface water run-off and its associated impacts such as increased flood risk, pollution and contamination of groundwater Sustainable Urban Drainage Systems (SuDS) will be implemented on site. The SuDS techniques that will be considered/implemented on this site include; green roofs, permeable surfaces, infiltration trenches, filter drains and filter strips.

Green Roof

Incorporating a green roof will further help reduce surface run off as the water is retained in the roof reducing sewer overflows. However there are also other further benefits such as improving the local environment by absorbing greenhouse gases, absorbing air pollution and dust, providing a habitat for plants and wildlife. For the above reasons as part of the development a green roof will be incorporated on all/part of the top floor, flat roof (depending on structural calculations).

Biodiversity

In addition to the green roof improving the biodiversity of the site further measures will be implemented in the rear garden which will enhance the biodiversity. These measures will include the planting of native plants species, provision of bat and bird boxes, preservation of existing trees and hedgerows and providing a composting area.

Solar Gains, Lighting & Shading

Due to the location of the site, there are limitations to how the building can be orientated as to achieve best results with regards to solar gain. With this in mind it has been evaluated that the building is rightly situated, with appropriately sized, high specification glazing in order to benefit from adequate amounts of daylight. This will help to reduce the load on the lighting and heating system. As a consideration for shading louvers may be fitted on some of the widows situated in direct summer sunlight.

Conclusions

Based on the above SAP outputs an improvement on the Target Emission Rate of **37.92%** has been achieved across the site. This satisfies the requirements of the Building Regulations, Policy 5.2 of the London Plan and ensures the development achieves the required 20% reduction in CO_2 emissions through renewables in line with policy CS13.This is demonstrated through the reduction in CO2 emissions of **36.99**% which has been achieved solely through the implementation of solar PV. Based on a standard 250W panel being 1.6m², to achieve 15.00kWp an approximate panel area of 96m² will be required

The Energy Statement has shown how the proposed development will be designed using the principles of the Energy Hierarchy in order to deliver significant carbon dioxide savings where possible as required by the London Borough of Camden and the London Plan. In particular, the design team have sought to minimise emissions through incorporation of sustainable design features and a strategy utilising the principles of passive design and energy efficiency.

A review of the possible energy strategies for the development has been carried out and it is concluded that addition of solar photovoltaic panels is the most appropriate method to address the policies, both commercially and in respect to carbon emissions savings. Compliance with Policies 5.2 & 5.7 of the London Plan is demonstrated in Tables 6, 7 & 8.

The overall energy strategy through the combination of a fabric first approach, sustainable design and the use of on-site energy generation will ensure the proposed development at 252 Finchley Road, Camden, NW3 7AA achieves a reduction in CO_2 against the developments baseline case and complies with Polices 5.2, 5.7 of the London Plan and Policy CS13 of the Camden Core Strategy.

On consideration of the above, it is has been evaluated this is the most technically viable and financially feasible approach and the appropriate way to proceed to satisfy National Planning Policy Framework, The London Borough of Camden’s Planning Policies and Building Regulation requirements.

See Tables 6 and 7 for a summary of the emissions and savings at each stage of the Energy Hierarchy.

Summary Tables

	Emissions $kgCO_2$ per annum
Baseline: Part L 2013 Building Regulations	16859.09
Be Lean: After Energy Demand Reduction	16702.11
Be Clean: After CHP (Not applicable at this site)	16702.11
Be Green: After Renewable Energy Community Ground Source Heat Pump	10465.50

Table 6: Carbon Dioxide Emissions after each stage of the Energy Hierarchy

	$KgCO_2$ per annum	(%)
Savings from energy demand reduction	156.99	0.93%
Savings from CHP	0.00	0%
Savings from renewable energy	6236.61	36.99%
Total Cumulative Savings	6393.60	37.92%
Total Target Savings	5900.68	35%
Annual Surplus	492.91	-

Table 7: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy

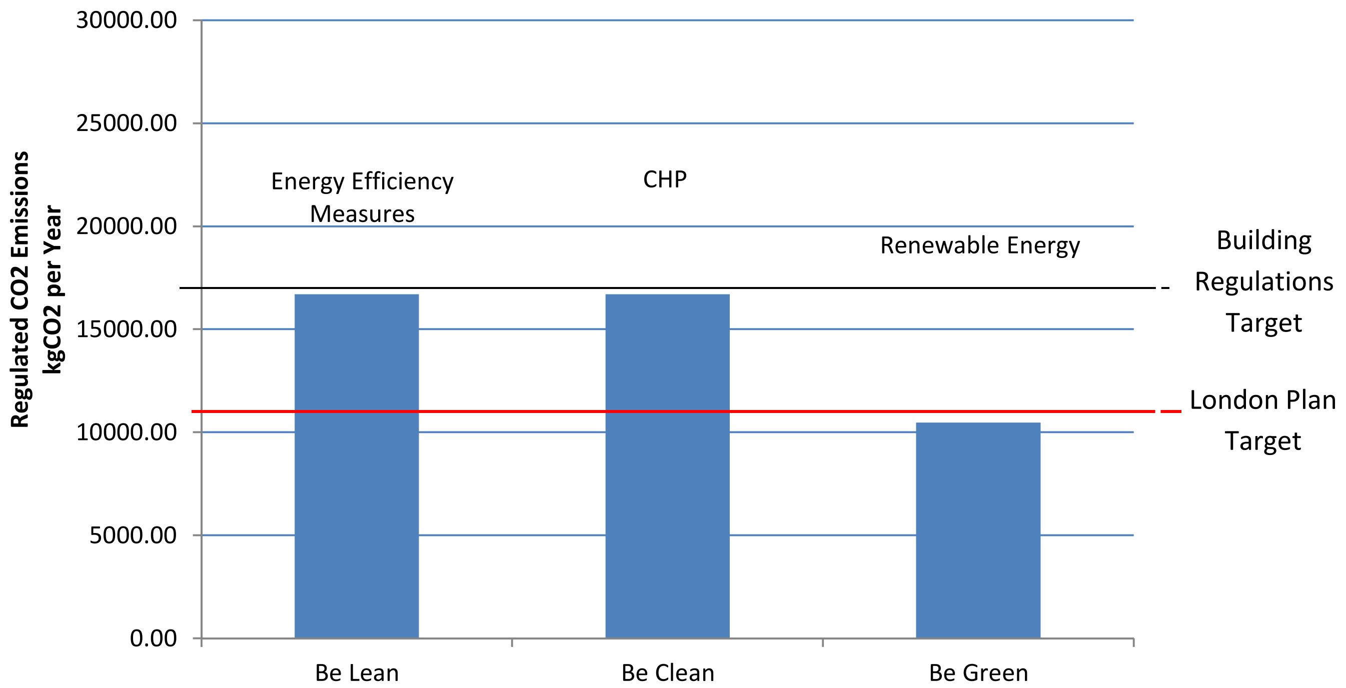


Table 8: Summary of Energy Hierarchy

Appendix A

Dwelling	Floor Area m^2	TER	DER	Actual Emission	Target Emission
Plot 1	60.65	21.08	20.43	1239.08	1278.502
Plot 2	57.95	21.08	20.43	1183.92	1221.586
Plot 3	87.07	21.08	20.43	1778.84	1835.436
Plot 4	42.27	21.08	20.43	863.58	891.0516
Plot 5	62.31	16.68	16.6	1034.35	1039.331
Plot 6	58.34	16.68	16.6	968.44	973.1112
Plot 7	82.55	16.68	16.6	1370.33	1376.934
Plot 8	65.97	16.68	16.6	1095.10	1100.38
Plot 9	92.96	16.67	16.73	1555.22	1549.643
Plot 10	102.64	16.67	16.73	1717.17	1711.009
Plot 11	121.47	16.67	16.73	2032.19	2024.905
Plot 12	111.41	16.67	16.73	1863.89	1857.205
			Total	**16702.11**	**16859.09**

Table 1: Estimated Site Wide Emissions at the Be Lean Stage

Dwelling	Floor Area m^2	TER	DER	Actual Emission	Target Emission
Plot 1	60.65	21.08	13.83	838.79	1278.502
Plot 2	57.95	21.08	13.83	801.45	1221.586
Plot 3	87.07	21.08	13.83	1204.18	1835.436
Plot 4	42.27	21.08	13.83	584.59	891.0516
Plot 5	62.31	16.68	10	623.10	1039.331
Plot 6	58.34	16.68	10	583.40	973.1112
Plot 7	82.55	16.68	10	825.50	1376.934
Plot 8	65.97	16.68	10	659.70	1100.38
Plot 9	92.96	16.67	10.14	942.61	1549.643
Plot 10	102.64	16.67	10.14	1040.77	1711.009
Plot 11	121.47	16.67	10.14	1231.71	2024.905
Plot 12	111.41	16.67	10.14	1129.70	1857.205
			Total	**10465.50**	**16859.09**

Table 2: Estimated Site Wide Emissions at the Be Green Stage