ENERGY & SUSTAINABILITY STATEMENT

Land Adjacent to Jack Straw's Castle

Produced by XCO2 for Albany Homes UK

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EXECUTIVE SUMMARY

The energy & sustainability strategy for the Land Adjacent to Jack Straws Castle development has been developed in line with the energy policies of the London Plan and of the Camden Council Local Plan. The three-step Energy Hierarchy has been implemented and the estimated regulated CO_2 savings on site are 0.3%, against a Part L 2013 compliant scheme. Sustainability measures will also include reductions in water use, waste and pollution as well as improvements in occupant health & wellbeing and the ecology of the site.

This report assesses the predicted energy performance and carbon dioxide emissions of the proposed development at Land Adjacent to Jack Straws Castle located in the London Borough of Camden.

The proposed development comprises the construction of 2 new build semi-detached houses from the basement to the second floor.

This document is divided into three parts:

- Planning policies;
- Proposed sustainability measures incorporated into the scheme; and
- Energy Strategy.

The Planning Policy section provides an overview of the site and planning policies applicable to this development in accordance with the London Plan and the relevant Camden council planning policies.

The second section on proposed sustainability measures section outlines the sustainability measures that have been adopted in the team's aim to maximise sustainability within the site.

The third section describes the predicted energy performance and carbon dioxide emissions of the proposed development at Land Adjacent to Jack Straw's Castle. The development will be compared to a notional building constructed to Part L1A standards.

Figure 1 summarises the regulated CO_2 savings achieved by the proposed development in comparison to the baseline building at each stage of the energy hierarchy. In total, the development is expected to achieve regulated CO_2 savings of 0.3%. This reduction reflects regulated energy use only, as unregulated energy use (e.g. plug-in appliances) is not taken into account in Part L of the Building Regulations.

The regulated CO_2 saving has been achieved by maximising fabric efficiency. The team aims to improve the building fabric beyond the Building Regulations Part L Baseline through the incorporation of an efficient fabric with low U values, a good air permeability rate and a thermal bridging y-value in line with the Accredited Construction Details

The London Plan does not set specific CO_2 reduction targets for minor developments such as that at Land Adjacent to Jack Straw's Castle. However, CO_2 emissions have been reduced as far as is feasible. The 0.3% reduction in regulated CO_2 emissions exceeds Part L building regulations compliance through energy efficiency measures alone. This reduction demonstrates the client and design team's commitment in adopting a range of sustainability measures for the life-cycle of the development.

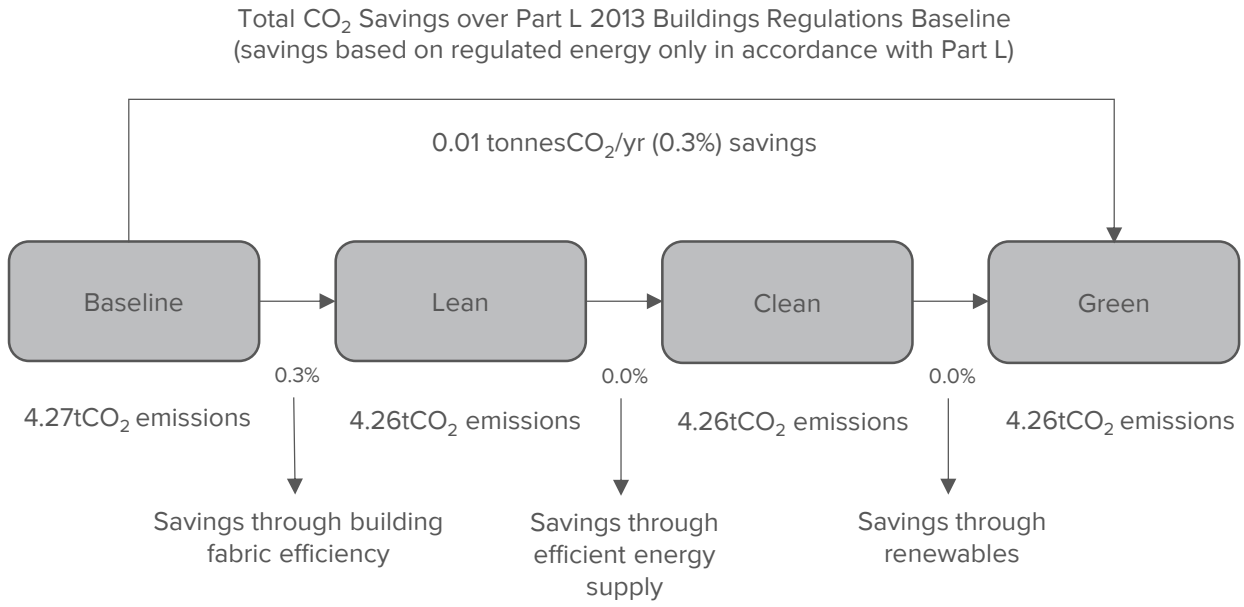


Figure 1: Energy Hierarchy

INTRODUCTION

The existing site is currently a car park and is located within Hampstead Heath in Camden. The development proposal includes the construction of 2 x three storey (plus basement) houses from basement to second floor level. The methodology employed for the energy assessment follows the three-step energy hierarchy and the sustainability sections will follow local planning policy and industry best practice.

SITE & PROPOSAL

The proposed development site is located on the corner of North End Way and Heath Brow, to the east of West Heath close to Hampstead Heath in Camden Borough. The site itself is currently an existing car park serving Jack Straws Castle (predominantly in residential use) with industrial buildings immediately to the east and the west of the site.

The proposed development comprises the construction of two x four bedroom residential dwellings of three storeys plus basement, including associated hard and soft landscaping and cycle storage.

The approximate location and boundary of the application site is shown in the figure below.

Figure 2: Location of the application site.

PLANNING POLICIES

The proposal will seek to respond to the energy and sustainability policies pertinent to minor developments outlined within the London Plan and the policies within Camden Council's Core Strategy and Development Policies documents.

The most relevant applicable energy & sustainability policies in the context of the proposed development are presented below.

THE LONDON PLAN

The London Plan (2016) is the overall strategic plan for London, setting out an integrated economic, environmental, transport and social framework for the development of London over the next 20–25 years.

The overarching energy policies of the London Plan are included in Chapter Five *London's Response to Climate Change* and include Policies 5.2 to 5.9:

- Policy 5.2: Minimising carbon dioxide emissions;
- Policy 5.3: Sustainable Design and Construction;
- Policy 5.4: Retrofitting;
- Policy 5.4A: Electricity and gas supply;
- Policy 5.5: Decentralised energy networks;
- Policy 5.6: Decentralised energy in development proposals;
- Policy 5.7: Renewable energy;
- Policy 5.8: Innovative energy technologies, and,
- Policy 5.9: Overheating and cooling.

Extracts of Policies 5.2, 5.6, 5.7 and 5.9 are presented below as these are considered most relevant to the proposed scheme.

The London Plan also consists of a suite of guidance documents, most relevant of which are the Sustainable Design and Construction SPG (April 2014) & Energy Planning – GLA Guidance on preparing energy assessments (March 2016).

POLICY 5.2 MINIMISING CARBON DIOXIDE EMISSIONS

***A**. Development proposals should make the fullest contribution to minimising carbon dioxide emissions in accordance with the following energy hierarchy:*

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

POLICY 5.3 SUSTAINABLE DESIGN AND CONSTRUCTION

"Planning decisions:
B. Development proposals should demonstrate that sustainable design standards are integral to the proposal, including its construction and operation, and ensure that they are considered at the beginning of the design process.
C. Major development proposals should meet the minimum standards outlined in the Mayor's supplementary planning guidance and this should be clearly demonstrated within a design and access statement. The standards include measures to achieve other policies in this Plan and the following sustainable design principles:

- *a. minimising carbon dioxide emissions across the site, including the building and services (such as heating and cooling systems)*
- *b. avoiding internal overheating and contributing to the urban heat island effect*
- *c. efficient use of natural resources (including water), including making the most of natural systems both within and around buildings*
- *d. minimising pollution (including noise, air and urban runoff)*
- *e. minimising the generation of waste and maximising reuse or recycling*
- *f. avoiding impacts from natural hazards (including flooding)*
- *g. ensuring developments are comfortable and secure for users, including avoiding the creation of adverse local climatic conditions*
- *h. securing sustainable procurement of materials, using local supplies where feasible, and*
- *i. promoting and protecting biodiversity and green infrastructure."*

POLICY 5.6 DECENTRALISED ENERGY IN DEVELOPMENT PROPOSALS

A. Development proposals should evaluate the feasibility of Combined Heat and Power (CHP) systems, and where a new CHP system is appropriate also examine opportunities to extend the system beyond the site boundary to adjacent sites.
B. Major development proposals should select energy systems in accordance with the following hierarchy:

Connection to existing heating or cooling networks;
Site wide CHP network;
Communal heating and cooling.

C. Potential opportunities to meet the first priority in this hierarchy are outlined in the London Heat Map tool. Where future network opportunities are identified, proposals should be designed to connect to these networks.

POLICY 5.7 RENEWABLE ENERGY

B. Within the framework of the energy hierarchy (see Policy 5.2), major proposals should provide a reduction in expected carbon dioxide emissions through the use of on-site renewable energy generation, where feasible.
D. All renewable energy systems should be located and designed to minimise any potential adverse impacts on biodiversity, the natural environment and historical assets, and to avoid any adverse impacts on air quality.

POLICY 5.15 WATER USE AND SUPPLIES

"...setting an upper limit of daily domestic water consumption to 105 litres/head for residential developments (excluding a maximum allowance of 5 litres/head/day for external water consumption)."

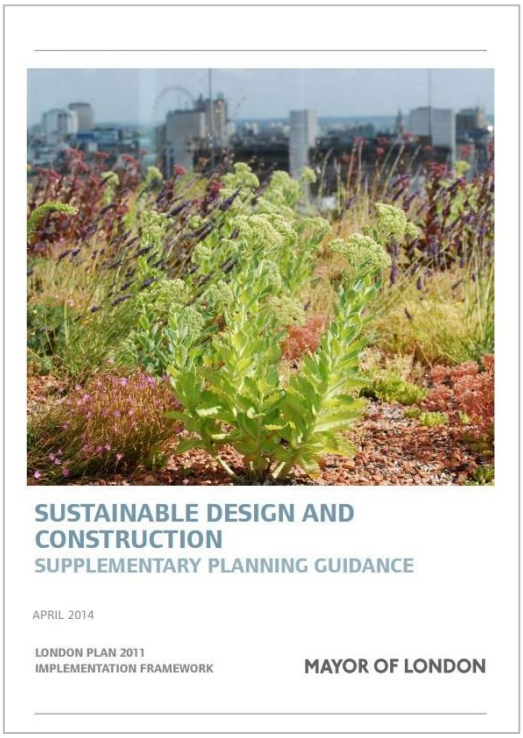
SUSTAINABLE DESIGN AND CONSTRUCTION SPG

The Sustainable Design and Construction SPG, adopted in April 2014, provides additional information and guidance to support the implementation of the Mayor's London Plan. The SPG does not set new policy, but explains how policies in the London Plan should be carried through into action.

It is applicable to all major developments and building uses so it is not technically applicable to this development, however in line with the developer's intention to implement the requirements of the London Plan it has been used to guide the design. It covers the following areas:

- Resource Management
- Adapting to Climate Change and Greening the City
- Pollution Management

This SPG provides a basis for sustainable design in London and is used as the overarching structure of this report. Where additional local policies are addressed by these areas this has also been indicated.

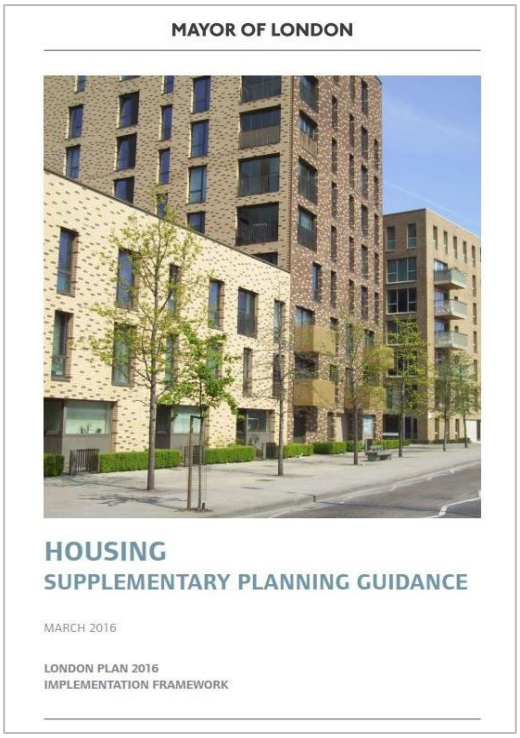


HOUSING SPG

This document provides guidance on the implementation of housing policies in the London Plan and it replaces the 2012 Housing SPG.

Part 2 covers housing quality and updates London housing standards to reflect the implementation of the government's new national technical standards through the Minor Alterations to the London Plan (2015-2016).

As design affects the quality of life, health & wellbeing, safety and security of users and neighbours, this guidance is integral to sustainable development and will be cross-referenced as relevant in the subsequent sections.



CAMDEN CORE STRATEGY 2010

The Camden Core Strategy sets out the Council's key planning policies and is a central part of their Local Development Framework (LDF). The pertinent sustainability excerpts are inserted below:

POLICY CS13 – TACKLING CLIMATE CHANGE THROUGH PROMOTING HIGHER ENVIRONMENTAL STANDARDS

Reducing the effects of and adapting to climate change

The Council will require all development to take measures to minimise the effects of, and adapt to, climate change and encourage all developments to meet the highest feasible environmental standards that are financially viable during construction and occupation by:

a) Ensuring patterns of land use that minimise the need to travel by car and help support local energy networks;

b) Promoting the efficient use of land and buildings;

c) Minimising carbon emissions from the redevelopment, construction and occupation of buildings by implementing, in order, all of the elements of the following energy hierarchy:

1. *Ensuring developments use less energy,*
2. *Making use of energy from efficient sources, such as the King's Cross, Gower Street, Bloomsbury and proposed Euston Road decentralised energy networks;*
3. *Generating renewable energy on-site; and*
4. *Ensuring buildings and spaces are designed to cope with, and minimise the effects of climate change.*

The Council will have regard to the cost of installing measures to tackle climate change as well as the cumulative future costs of delaying reductions in carbon dioxide emissions.

Water and surface water flooding

We will make Camden a water efficient borough and minimise the potential for surface water flooding by:

g) protecting our existing drinking water and foul water infrastructure, including Barrow Hill Reservoir, Hampstead Heath Reservoir, Highgate Reservoir and Kidderpore Reservoir;

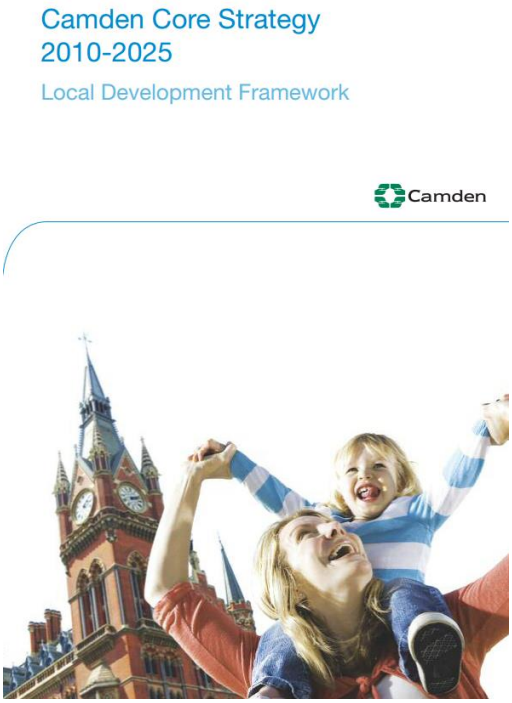
h) making sure development incorporates efficient water and foul water infrastructure;

i) requiring development to avoid harm to the water environment, water quality or drainage systems and prevents or mitigates local surface water and downstream flooding, especially in areas up-hill from, and in, areas known to be at risk from surface water flooding such as South and West Hampstead, Gospel Oak and King's Cross.

POLICY CS18 – DEALING WITH OUR WASTE AND ENCOURAGING RECYCLING

The Council will seek to make Camden a low waste borough. We will:

b) make sure that developments include facilities for the storage and collection of waste and recycling.



CAMDEN DEVELOPMENT POLICIES 2010

In addition to the Core Strategy Document the Camden Development Policies also forms part of the LDF. The policy relating to sustainability is listed below:

POLICY DP22 – PROMOTING SUSTAINABLE DESIGN AND CONSTRUCTION

The Council will require development to incorporate sustainable design and construction measures. Schemes must:

a) Demonstrate how sustainable development principles, including the relevant measures set out in paragraph 22.5 below, have been incorporated into the design and proposed implementation; and

b) Incorporate green or brown roofs and green walls wherever suitable.

The Council will require development to be resilient to climate change by ensuring schemes include appropriate climate change adaptation measures, such as:

1. *summer shading and planting;*
2. *limiting run-off;*
3. *reducing water consumption;*
4. *reducing air pollution; and*
5. *not locating vulnerable uses in basements in flood-prone areas.*

POLICY DP23 – WATER

The Council will require developments to reduce their water consumption, the pressure on the combined sewer network and the risk of flooding by:

a) Incorporating water efficient features and equipment and capturing, retaining and re-using surface water and grey water on-site;

b) Limiting the amount and rate of run-off and waste water entering the combined storm water and sewer network through the methods outlined in part a) and other sustainable urban drainage methods to reduce the risk of flooding;

c) Reducing the pressure placed on the combined storm water and sewer network from foul water and surface water run-off and ensuring developments in the areas identified by the North London Strategic Flood Risk Assessment and shown on Map 2 as being at risk of surface water flooding are designed to cope with the potential flooding;

d) Ensuring that developments are assessed for upstream and downstream groundwater flood risks in areas where historic underground streams are known to have been present; and

e) Encouraging the provision of attractive and efficient water features.

The Camden Local Plan (2016) is currently undergoing review and consultation before it is issued. The development at Land Adjacent to Jack Straws Castle will aim to follow the Sustainability and climate change sections within the plan irrespective of the fact that it has not yet been formally issued.

CAMDEN PLANNING GUIDANCE – SUSTAINABILITY CPG3 - 2013

The Camden Planning Guidance support the policies set out in the Local Development Framework (LDF). While the Camden LDF contains policies relating to sustainability in their Core Strategy and Development Policies documents, the Council also as a separate planning guidance specific to sustainability.

The sections that will be covered by the following sections of this Sustainability Statement are listed below:

The energy hierarchy

All new developments are to be designed to minimise carbon dioxide emissions by being as energy efficient as is feasible and viable.

Energy efficiency: new buildings

All new developments are to be designed to minimise carbon dioxide emissions by being as energy efficient as is feasible and viable.

Decentralised energy networks and combined heat and power

Development should follow the Energy Hierarchy

1. use less energy

2. supply energy efficiently

3. use renewable energy

Renewable Energy

All developments are to target at least a 20% reduction in carbon dioxide emissions through the installation of on-site renewable energy technologies. Special consideration will be given to heritage buildings and features to ensure that their historic and architectural features are preserved.

Water Efficiency

The Council expects all developments to be designed to be water efficient by minimising water use and maximising the re-use of water. This includes new and existing buildings.

Sustainable use of materials

Major developments are anticipated to be able to achieve 15-20% of the total value of materials used to be derived from recycled and reused sources.

Sustainability assessment tools

Developments are anticipated to be able to achieve BREEAM 'Excellent' from 2013 onwards and at least 60% of Energy and Water credits and 40% of Materials credits.

Brown roofs, green roofs and green walls

The Council will expect all developments to incorporate brown roofs, green roofs and green walls unless it is demonstrated this is not possible or appropriate. This includes new and existing buildings. Special consideration will be given to historic buildings to ensure historic and architectural features are preserved.

Flooding

Developments must not increase the risk of flooding, and are required to put in place mitigation measures where there is known to be a risk of flooding.

Adapting to climate change

All development is expected to consider the impact of climate change and be designed to cope with the anticipated conditions.

CAMDEN LOCAL PLAN – PROPOSED SUBMISSION 2016

Camden council are currently in the process of consultation on their new Local Plan. It is in a draft phase at present, however, the development at The Land Adjacent to Jack Straw's castle has still taken into account the policies within document. The policies relating to energy and sustainability are listed below:

POLICY CC1 CLIMATE CHANGE MITIGATION

The Council will require all development to minimise the effects of climate change and encourage all developments to meet the highest feasible environmental standards that are financially viable during construction and occupation.

We will:

a. promote zero carbon development and require all development to reduce carbon dioxide emissions through following the steps in the energy hierarchy;

b. require all major development to demonstrate how London Plan targets for carbon dioxide emissions have been met;

c. ensure that the location of development and mix of land uses minimise the need to travel by car and help to support decentralised energy networks;

d. support and encourage sensitive energy efficiency improvements to existing buildings;

e. require all proposals that involve substantial demolition to demonstrate that it is not possible to retain and improve the existing building; and

f. expect all developments to optimise resource efficiency.

POLICY CC2 ADAPTING TO CLIMATE CHANGE

The Council will require development to be resilient to climate change.

All development should adopt appropriate climate change adaptation measures such as::

a. the protection of existing green spaces and promoting new appropriate green infrastructure;

b. not increasing, and wherever possible reducing, surface water runoff through increasing permeable surfaces and use of Sustainable Drainage Systems;

c. incorporating bio-diverse roofs, combination green and blue roofs and green walls where appropriate; and

d. measures to reduce the impact of urban and dwelling overheating, including application of the cooling hierarchy.

Any development involving 5 or more residential units or 500 sqm or more of any additional floorspace is required to demonstrate the above in a Sustainability Statement.

Sustainable design and construction measures

The Council will promote and measure sustainable design and construction by:

e. ensuring development schemes demonstrate how adaptation measures and sustainable development principles have been incorporated into the design and proposed implementation;

f. encourage new build residential development to use the Home Quality Mark and Passivhaus design standards;

g. expecting developments (conversions/extensions) of 500 sqm of residential floorspace or above or five or more dwellings to achieve "excellent" in BREEAM domestic refurbishment; and

h. expecting non-domestic developments of 500 sqm of floorspace or above to achieve "excellent" in BREEAM assessments and encouraging zero carbon in new development from 2019.

POLICY CC3 WATER AND FLOODING

The Council will seek to ensure that development does not increase flood risk and reduces the risk of flooding where possible.

We will require development to:

a. incorporate water efficiency measures;

b. avoid harm to the water environment and improve water quality;

c. consider the impact of development in areas at risk of flooding (including drainage);

d. incorporate flood resilient measures in areas prone to flooding;

e. utilise Sustainable Drainage Systems (SuDS) in line with the drainage hierarchy, unless inappropriate, to achieve a greenfield run-off rate where feasible; and

f. not locate vulnerable development (such as basement dwellings) in flood-prone areas.

Where an assessment of flood risk is required, developments should consider surface water flooding in detail and groundwater flooding where applicable.

POLICY CC5 WASTE

The Council will seek to make Camden a low waste borough.

We will:

a. aim to reduce the amount of waste produced in the borough and increase recycling and the reuse of materials to meet the London Plan targets of 50% of household waste recycled/composted by 2020 and aspiring to achieve 60% by 2031; and

d. make sure that developments include facilities for the storage and collection of waste and recycling.

PROPOSED SUSTAINABILITY MEASURES

The proposal incorporates a range of passive and active design measures that will reduce the energy demand for heating, hot water and lighting. Sustainability measures will also include reductions in water use, waste and pollution as well as improvements in occupant health & wellbeing and ecology.

The following subsections detail the sustainability measures that will be incorporated into the design of the proposed dwellings.

ENERGY

DWELLING EMISSION RATE AND FABRIC ENERGY EFFICIENCY

The methodology set out by the Department of Energy and Climate Change (DECC) for assessing the energy use of dwellings is the Standard Assessment Procedure (SAP). The current version is SAP 2012.

Preliminary SAP calculations were carried out to assess the potential CO_2 savings achieved through

- Energy efficiency measures
- The efficient supply of energy and
- Renewable systems

The preliminary calculations showed an improvement over Part L Building Regulations 2013, amounting to a 0.3% reduction in regulated CO_2 emissions for the scheme.

The energy demand of the two houses will be reduced through the adoption of high levels of insulation, accredited thermal bridging details and good levels of air tightness to improve the two houses' fabric efficiency. SAP calculations were based on a building fabric with low U-values and an air permeability rate of $5m^3/m^2.h$ at 50 Pa.

ENERGY LABELLED WHITE GOODS

The houses will be supplied with an EU Energy Efficiency Labelling Scheme Leaflet to help the tenants choose energy efficient white goods; or in the case where the two houses have been fitted out, energy efficient white goods will be provided

EXTERNAL LIGHTING

Energy efficient light fittings will be installed throughout the development where appropriate. In addition, external lights will be fitted with controls to reduce the energy consumption of the building during periods of infrequent use:

- External space lighting will include energy efficient fittings
- Security lighting will include daylight cut-off devices, with a maximum wattage of 150W and PIR.

LOW OR ZERO CARBON TECHNOLOGIES

A feasibility study was carried out to determine the energy strategy for the proposed development. The proposed strategy has surpassed Part L Building Regulations due to the reduction in the demand by a highly efficient shell. No LZC technologies were considered feasible for various technical and financial reasons explained later on in the report.

WATER

INDOOR WATER USE

The development at Land Adjacent to Jack Straw's Castle aims to reduce water consumption in the two houses to below 105 litres per person per day, in line with the new target set out within the London Plan (Minor Alterations to the London Plan 2016), through the use of water efficient fittings, and these are listed below.

Fitting	Consumption per use
WC (full flush)	6 litres per flush
WC (half flush)	3 litres per flush
Kitchen sink tap	6 litres per min
Wash basin tap	3 litres per min
Bath	180 litres to overflow
Shower	8 litres per min
Washing machine	8.17 litres per kilogram
Dishwasher	1.25 litres per place setting

MATERIALS

Embodied energy is the energy that is used in the manufacture, processing and the transportation of the materials to site.

The construction build-ups for each of the main building elements are rated from A+ to E. Each element to be used in the building has been rated according to the BRE Green Guide to Specification whereby:

- A+ rated elements are least likely to affect the environment
- E rated elements are most likely to affect the environment

It is assumed that most of the main building elements within this development will achieve between an A+ to C rating where possible.

All timber used during site preparation and construction to be FSC certified, and all non-timber materials to be certified with Environmental Management Systems (ISO 14001 OR BES 6001) where possible.

WASTE

HOUSEHOLD WASTE

Dedicated external waste storage for the dwellings will be provided to meet the Local Authority requirements.

Adequate internal storage for recyclable waste will be provided to all dwellings in a dedicated position. The Local Authority provides recyclable household waste collection and sorting.

CONSTRUCTION SITE WASTE MANAGEMENT

The development will minimise the impact of construction waste on the environment through a Resource Management Plan or Strategy. This plan will include information such as:

- Benchmarks for resource efficiency
- Procedures and commitments to reduce hazardous and non-hazardous waste
- Monitoring hazardous and non-hazardous waste

POLLUTION

GLOBAL WARMING POTENTIAL (GWP) OF INSULANTS

Global warming potential (GWP) is a measure of how effective a gas is at preventing the passage of infrared radiation. Blowing agents, used in the production of insulation, are a common source of gases with high GWPs.

The development will aim to specify insulation materials that have a low Global Warming Potential (GWP).

NO_x EMISSIONS

Space heating and hot water requirements are to be met through high efficiency individual gas boilers with inherently low NOx emissions.

HEALTH AND WELLBEING

DAYLIGHTING

The houses have been designed with daylight in mind and as such the layouts and the large windows will provide the occupants with high levels daylight.

SOUND INSULATION

The development proposes that airborne sound insulation will comply with or exceed current Building Regulations Part E standards.

PRIVATE SPACE

Private external spaces will be provided for both houses in this development at the basement level with courtyard spaces and balconies on the upper levels with the aim of improving the quality of life of the occupants. Both houses are also in very close proximity to Hampstead Heath.

SURFACE WATER RUN-OFF

The proposed development will replace part of a car park which is hardstanding in its entirety. As such the post-development run-off from the site will be no worse than the pre-development run-off rate.

The Environment Agency flood map (shown in Figure 3 below) shows the proposed development to be located within an area at low risk of flooding.

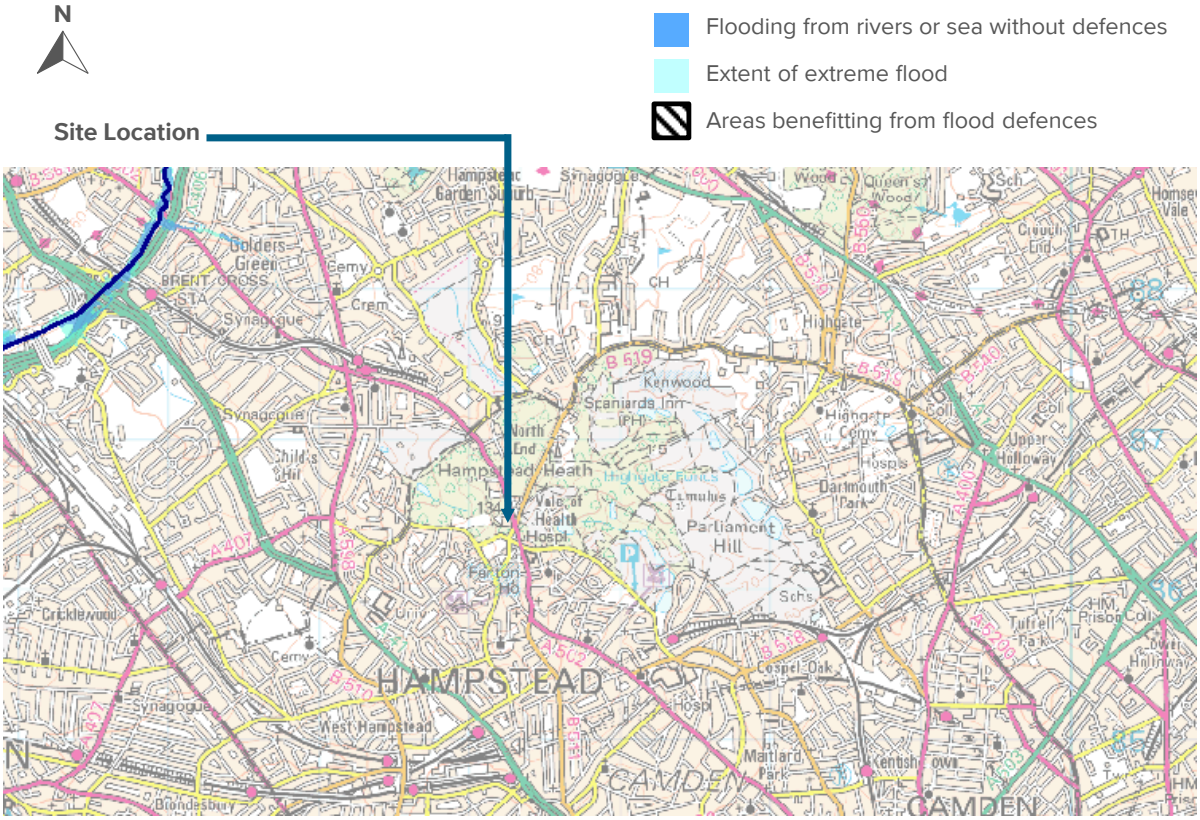


Figure 3: Flood map for area surrounding the proposed development

MANAGEMENT

CONSTRUCTION SITE IMPACTS

To minimise the construction impacts of the site, the contractor will strive to monitor, report and set targets for:

- The production of CO_2 arising from site activities
- Water consumption from site activities

In addition, contractors will strive to adopt best practice policies for air (dust) and water (ground and surface) pollution occurring on site. All timber will be sourced following the Government's Timber Procurement Policy.

ECOLOGY

ECOLOGICAL VALUE OF SITE & PROTECTION OF ECOLOGICAL FEATURES

Due to its urban location, previous use as a car park and absence of ecological features on the existing site, the site is considered to be of low ecological value. Native species will be incorporated within the landscaped areas and private gardens, to maximise ecological improvement on site.

ECOLOGICAL MITIGATION AND ENHANCEMENT

The architect/landscape architect will provide recommendations for the planting to enhance the existing biodiversity on site. The development will introduce potted plants on the balconies and private courtyards to increase the biodiversity of the post-developed site.

BUILDING FOOTPRINT

The proposed development will increase the density of the site. This will ensure that the land is used efficiently whilst maximising the building area.

MINIMISING OVERHEATING

The potential risk of overheating will be mitigated by incorporating passive and active design measures, in line with the London Plan Policy 5.9 and the Cooling Hierarchy, as follows.

THE COOLING HIERARCHY

MINIMISING INTERNAL HEAT GENERATION THROUGH ENERGY EFFICIENT DESIGN

The distribution of heat within both dwellings will be designed to reduce the lateral pipework lengths within the corridors, reducing heat loss. Heat sources and pipework will be sufficiently insulated (following CIBSE CoP1 guidelines).

REDUCING THE AMOUNT OF HEAT ENTERING THE BUILDING IN SUMMER

The development is orientated east to west to significantly reduce solar gains into occupied spaces. Internal blinds will be included to further reduce the amount of heat entering the building.

USE OF THERMAL MASS AND HIGH CEILINGS TO MANAGE THE HEAT WITHIN THE BUILDING

During peak summer periods the thermal mass of the building will absorb and store excess heat. The building will release its heat in the cooler evenings to allow for cooler internal spaces dampening the peak diurnal weather conditions.

PASSIVE VENTILATION

Passive cross ventilation will be employed as the main strategy for providing fresh air and dissipating heat across the development.

OVERHEATING RISK ASSESSMENT

The potential risk of overheating was assessed via the Part L Building Regulation compliance tool SAP.

A slight overheating risk was found for both houses modelled in SAP.

ENERGY STRATEGY SUMMARY

This section describes the predicted energy performance and carbon dioxide emissions of the proposed Land Adjacent to Jack Straw's Castle development based on the information provided by the design team.

METHODOLOGY - BE LEAN, BE CLEAN, BE GREEN

The methodology used to determine CO_2 emissions is in accordance with the London Plan's three-step Energy Hierarchy (Policy 5.2A) outlined below. The dwelling will be compared to a Building Regulations Part L 2013 baseline.

The reductions made through each step have been outlined here:

BE LEAN - USE LESS ENERGY

The first step addresses reduction in energy demand, through the adoption of passive and active design measures.

The proposed energy efficiency measures include levels of insulation beyond Building Regulation requirements, low air tightness levels, efficient lighting as well as energy saving controls for space conditioning and lighting.

By means of energy efficiency measures alone, regulated CO_2 emissions are shown to reduce by 0.3% (0.01 tonnes per annum) for the two houses.

BE CLEAN – SUPPLY ENERGY EFFICIENTLY

The application site is located in an area where district heating is not existing or expected to be implemented in the future.

A site heat network has not been found to be feasible or viable for a development of this scale; individual high efficiency gas boilers are instead proposed to provide heat to the dwellings.

BE GREEN - USE RENEWABLE ENERGY

The renewable technologies feasibility study carried out for the development identified photovoltaics as the most suitable technology for the development; however, as the building is located in a conservation area their incorporation is not possible due to unacceptable visual impact. Therefore, no renewable technologies have been incorporated into the proposed development and there are no further CO_2 reductions from the 'Be Green' stage.

CUMULATIVE ON SITE SAVINGS

The overall regulated CO_2 savings on site against a Part L 2013 compliant scheme are therefore 0.01 tonnes, equivalent to 0.3% of the baseline emissions.

BE LEAN – USE LESS ENERGY

The proposals incorporate a range of passive and active design measures that will reduce the energy demand for space conditioning, hot water and lighting. Measures will also be put in place to reduce the risk of overheating. The regulated carbon saving achieved in this step of the Energy Hierarchy is 0.3% over the site wide baseline level.

PASSIVE DESIGN MEASURES

ENHANCED U-VALUES

The heat loss of different building fabric elements is dependent upon their U-value. A building with low U-values provides better levels of insulation and reduced heating demand during the cooler months.

The proposed development will incorporate high levels of insulation and high-performance glazing beyond Part L 2013 targets and notional building specifications, in order to reduce the demand for space conditioning (heating and/or cooling).

The table to the right demonstrates the improved performance of the proposed building fabric beyond the Building Regulations requirements for both houses.

AIR TIGHTNESS IMPROVEMENT

Heat loss may also occur due to air infiltration. Although this cannot be eliminated altogether, good construction detailing and the use of best practice construction techniques can minimise the amount of air infiltration.

The proposed development will aim to improve upon the Part L 2013 minimum standards for air tightness by targeting air permeability rates of $5m^3/m^2$ at 50Pa for both houses.

Table 1: Thermal Envelope U-values

Domestic (U-values in $W/m^2.K$)			
Element	**Building Regulations**	**Proposed**	**Improvement**
Walls	0.30	0.15	50%
Floor	0.25	0.1	60%
Roof	0.20	0.1	50%
Windows	2.00	1.6	20%

REDUCING THE NEED FOR ARTIFICIAL LIGHTING

The development has been designed to maximise daylight in all habitable spaces as a way of improving the health and wellbeing of its occupants.

All of the habitable areas will benefit from large areas of glazing to increase the amount of daylight within the internal spaces where possible. This is expected to reduce the need for artificial lighting whilst delivering pleasant, healthy spaces for occupants.

ACTIVE DESIGN MEASURES

HIGH EFFICACY LIGHTING

The development intends to incorporate low energy lighting fittings throughout both houses. All light fittings will be specified as low energy lighting, and will accommodate LED, compact fluorescent (CFLs) or fluorescent luminaries only.

MONITORING

Apart from the above design measures, the development will incorporate monitoring equipment and systems to enable occupiers to monitor and reduce their energy use.

Smart meters will be installed to monitor the heat and electricity consumption of each dwelling; the display board will demonstrate real-time and historical energy use data and will be installed at an accessible location within the dwellings.

ENERGY USE

The table below shows a breakdown of carbon dioxide emissions associated with the proposed development's fossil fuel and electricity consumption for the different uses. Data for both houses is presented; the figures provide a comparison between the baseline condition and the proposed development once energy efficiency measures (Lean) have been applied.

This table demonstrates the energy savings achieved through energy efficiency measures (Lean stage of the Energy Hierarchy).

Table 2: Breakdown of energy consumption and CO_2 emissions for the baseline and the proposed schemes after 'Lean' measures are implemented

	Baseline			Lean		
	Energy (kWh/yr.)	$kgCO_2$ /yr.	$kgCO_2/m^2$	Energy (kWh/yr.)	$kgCO_2$ /yr.	$kgCO_2/m^2$
Hot Water	5,220	1,130	4.3	5,460	1,180	4.5
Space Heating	11,950	2,580	9.9	11,870	2,560	9.9
Cooling	0	0	0.0	0	0	0.0
Auxiliary	150	80	0.3	60	30	0.1
Lighting	940	490	1.9	940	490	1.9
Equipment	7,600	3,940	15.2	7,600	3,940	15.2
Total Part L	18,260	4,270	16.4	18,330	4,260	16.4
Total (incl. equipment)	25,850	8,220	31.6	25,930	8,200	31.6

BE LEAN CO_2 EMISSIONS & SAVINGS

By means of energy efficiency measures alone, regulated CO_2 emissions are shown to reduce by:

- 0.3% (0.01 tonnes per annum) for both of the two houses.

BE CLEAN – SUPPLY ENERGY EFFICIENTLY

There are no existing or proposed district heat networks within close proximity to the development site. Additionally, the heating and hot water demand is too low to consider the inclusion of a communal heating system such as a CHP. As such, there are no further CO_2 savings at the 'Be Clean' stage.

ENERGY SYSTEM HIERARCHY

The energy system for the development has been selected in accordance with the London Plan decentralised energy hierarchy. The hierarchy listed in Policy 5.6 states that energy systems should consider:

1. Connection to existing heating and cooling networks;
2. Site wide CHP network; and,
3. Communal heating and cooling.

Local heat and power sources minimise distribution losses and achieve greater efficiencies when compared to separate energy systems, thus reducing CO_2 emissions.

In a communal energy system, energy in the form of heat, cooling, and/or electricity is generated from a central source and distributed via a network of insulated pipes to surrounding residences.

CONNECTION TO AN EXISTING NETWORK

The London Heat Map identifies existing and potential opportunities for decentralised energy projects in London. It builds on the 2005 London Community Heating Development Study.

An excerpt from the London Heat Map can be seen on the following page which shows the energy demand for different areas. Darker shades of red signify areas where energy demand is high. The map also highlights any existing and proposed district heating networks within the vicinity of the development.

A review of the map shows that there are no existing or proposed heat networks within close proximity to the development site. Figure 1 below shows the heat map for the area surrounding the proposed development.

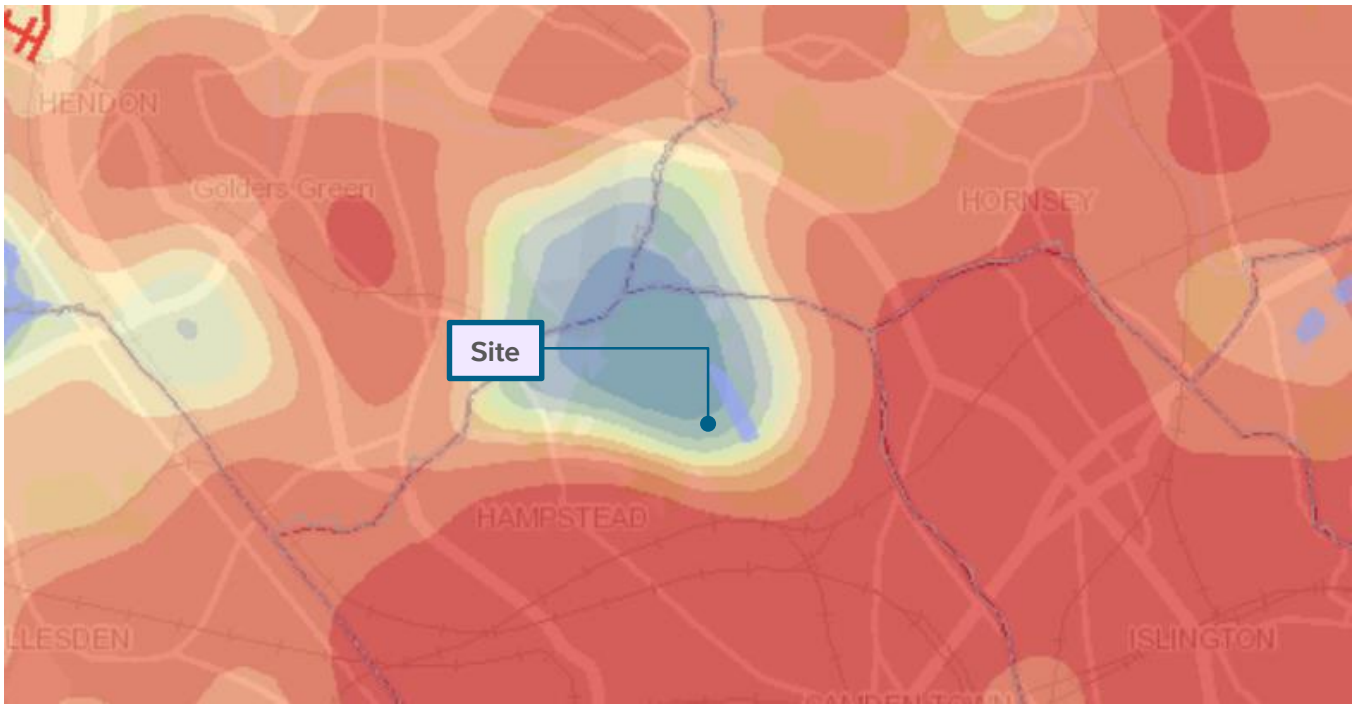


Figure 4: Excerpt from the London Heat Map. Existing district networks outlined in red, proposed networks in yellow.

COMMUNAL HEATING

A centralised system is not suitable to a development of this size, due to the relatively large space required for the plant room and the small overall demand for heating rendering the centralised system inefficient.

INDIVIDUAL HEATING

Space heating and hot water for both houses will therefore be provided by individual high efficiency gas boilers.

BE CLEAN CO_2 EMISSIONS & SAVINGS

Given that it has not been found feasible or viable for the proposed development to incorporate the supply of low carbon heating or cooling, no carbon savings are achieved for this step of the Energy Hierarchy.

BE GREEN – USE RENEWABLE ENERGY

The renewable technologies feasibility study carried out for the development identified photovoltaics as the most suitable technologies for the development, however, all technologies have been adjudged to be not feasible considering all parameters. Therefore, there are no CO_2 savings at the 'Be Green' stage.

RENEWABLE TECHNOLOGIES FEASIBILITY STUDY

Methods of generating on-site renewable energy (Green) were assessed, once Lean and Clean measures were taken into account.

The development of Land adjacent to Jack Straws Castle will benefit from an energy efficient building fabric which will significantly reduce the energy consumption of the scheme. A range of renewable technologies were subsequently considered including:

- Biomass;
- Ground/water source heat pumps;
- Air source heat pump;
- Wind energy;
- Photovoltaic panels, and,
- Solar thermal panels.

In determining the appropriate renewable technology for the site, the following factors were considered:

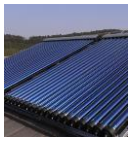
- CO_2 savings achieved;
- Site constraints; and
- Any potential visual impacts.

RENEWABLE ENERGY APPRAISAL SUMMARY

The table below summarises the factors taken into account in determining the appropriate renewable technologies for this project. This includes estimated capital cost, lifetime, level of maintenance and level of impact on external appearance. The final column indicates the feasibility of the technology in relation to the site conditions (10 being the most feasible and 0 being infeasible). It is important to note that the information provided is indicative and based upon early project stage estimates.

The feasibility study demonstrates that none of the renewable technologies investigated for the site were considered feasible for the reasons outlined in the table below.

Table 3: Summary of renewable technologies feasibility study

		Comments	Lifetime	Maintenance	Impact on external appearance	Site feasibility
Biomass		**Not adopted** -burning of wood pellets releases high NOx emissions and there are limitations for their storage and delivery within an urban location.	20 yrs.	High	High	1
PV		**Not adopted** - PV panels mounted on the pitched roof would significantly alter the appearance and character of the conservation area.	25 yrs.	Low	Med	4
Solar thermal		**Not adopted** - Solar thermal array mounted on the pitched roof would significantly alter the appearance and character of the conservation area.	25 yrs.	Low	Med	3
GSHP		**Not adopted** -the installation of ground loops requires significant space, additional time at the beginning of the construction process and very high capital costs.	20 yrs.	Med	Low	1
ASHP		**Not adopted** -ASHP evaporator units are located externally and produce noise which can be an issue in a residential location, especially at night.	20 yrs.	Med	Med	3
Wind		**Not adopted** - Wind turbines located at the site will have a significant visual impact on the appearance of the development within the Conservation Area.	25 yrs.	Med	High	1

BE GREEN CO_2 EMISSIONS & SAVINGS

Given that it has not been found feasible or viable for the proposed development to incorporate any renewable technologies, no carbon savings are achieved for this step of the Energy Hierarchy.

CONCLUSIONS

Following the implementation of the three-step Energy Hierarchy, the cumulative CO_2 savings on site are estimated at 0.3% for the two houses, against a Part L 2013 compliant scheme. Sustainability measures will also include reductions in water use, waste and pollution as well as improvements in occupant health & wellbeing and the ecology of the site.

ON SITE CO_2 SAVINGS

By implementing the three step Energy Hierarchy as detailed in the previous sections, the Regulated CO_2 emissions for the development have been reduced against a Part L 2013 compliant scheme through on site measures alone by 0.3% (0.01 tonnes per annum) for both of the houses within the development.

SUSTAINABILITY

In summary, the proposed Land Adjacent to Jack Straws Castle development will meet the targets set out by Camden Council and the Greater London Authority (GLA).

The various sustainability measures incorporated into the development reflect the client and design team's aspirations in integrating sustainability measures and also demonstrates that the project is designed to exceed the sustainability requirements set out within the local planning policy

SITE WIDE CO2 SAVINGS

Table 4: CO_2 emissions after each step of the Energy Hierarchy for the domestic part of the development

	Carbon dioxide emissions for domestic buildings (tonnes CO2 per annum)	
	Regulated	Unregulated
Baseline	4.27	3.94
After energy demand reduction	4.26	3.94
After heat network/CHP	4.26	3.94
After renewable energy	4.26	3.94

Table 5: Regulated CO_2 savings from each stage of the Energy Hierarchy for the domestic part of the development

	Regulated domestic carbon dioxide savings	
	Tonnes CO_2 per annum	% over baseline
Savings from energy demand reduction	0.01	0.3
Savings from heat network/CHP	0.00	0.0
Savings from renewable energy	0.00	0.0
Cumulative on site savings	0.01	0.3

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