41 FROGNAL / LONDON / NW3 6YD / SUSTAINABILITY & ENERGY STATEMENT / MARCH 2015 / PLANNING APPLICATION ISSUE

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EXECUTIVE SUMMARY

This Sustainability & Energy Statement has been prepared by Integration Consultancy Limited in support of the planning application for the modifications and extensions to the existing dwelling at 41 Frognal in the London Borough of Camden.

Regional and Local Policy, in particular the London Plan and the London Borough of Camden Strategy Policies, outline the sustainability issues which should be addressed in the planning application for the proposed modifications to the property. The key issues to be incorporated into the design are:

- A BREEAM Domestic Refurbishment Assessment will be required, a rating of 'Excellent' will be targeted with a minimum standard achieved for the following categories:
  - Energy – 60%
  - Water – 60%
  - Materials – 40%
- 20% reduction of CO_2 emissions through on-site renewable energy generation should be incorporated where feasible;
- The property should be designed to be water efficient by minimising water use and maximising the re-use of water, i.e. grey water and rainwater collection and re-distribution systems should be incorporated;
- The property should incorporate brown roofs, green roofs and green walls unless it is demonstrated this is not possible or appropriate;

Due to the extent and nature of the proposed modifications to the existing property there is an opportunity to significantly reduce the energy demand of the building through passive measures. The thermal performance of all new exposed elements will exceed the minimum requirements for Building Regulations compliance. All retained elements will be significantly upgraded to improve the overall thermal performance of the property, minimise thermal bridging and avoid any condensation risk.

All existing building services systems within the property will be stripped out and replaced with new, high efficiency plant and equipment to suit the remodelled and extended property. All new systems will be in accordance with, and where possible, exceed the energy efficiency requirements of the Domestic Building Service Compliance Guide.

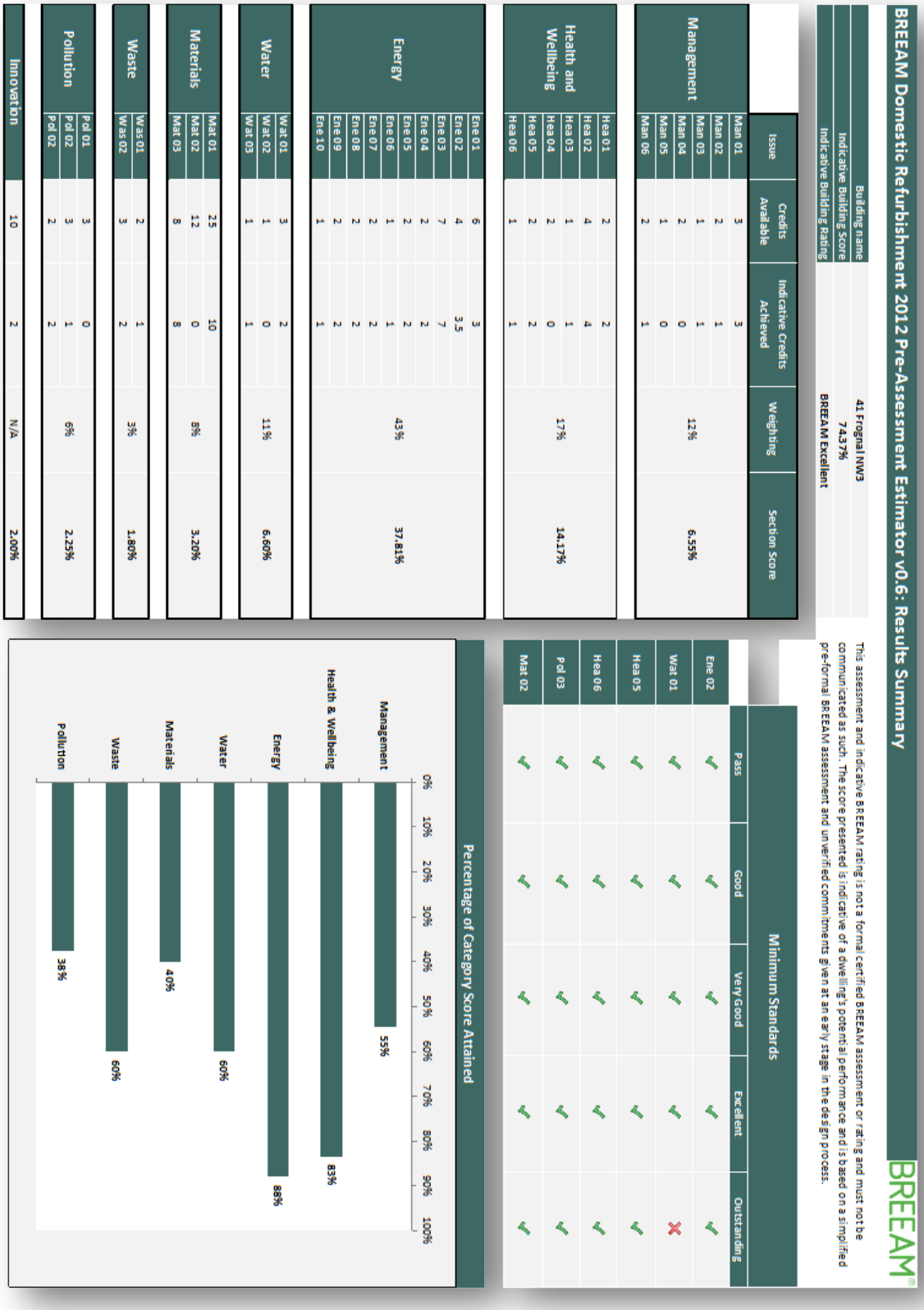
It is proposed that the primary heat source to the property will be a ground source heat pump (GSHP) with a closed loop heat exchange network comprising a series of boreholes within the grounds of the property. The GSHP, heating and cooling systems will be configured to optimise the heat balance of the property maximising the recovery and reuse of heat. This technology is ideal for buildings with a requirement for heating in winter and cooling in summer

The GSHP will generate low temperature hot water to serve underfloor heating systems and pre-heat the domestic hot water and swimming pool water. The GSHP and borehole system will also be the primary source of cooling for the air conditioning systems, minimising or eliminating the requirement for external heat rejection plant. Similarly, the systems will be configured to enable heat to be rejected from the air conditioning system to pre-heat both the internal and external swimming pool water.

A viability assessment for the most applicable renewable energy and low carbon technologies that could be installed to meet the target 20 % CO_2 emissions reduction has been prepared. In addition to the ground source heat pump, photovoltaic panels will be installed on the roof of the main house, orientated to maximise power generation throughout the year without any over shading from surrounding buildings. The proposed renewable energy systems will provide up to 29% reduction in CO_2 emissions over the predicted regulated energy use of the proposed dwelling.

It is demonstrated that with the introduction of new and upgraded external fabric elements and passive design measures in conjunction with low energy and renewable energy building services systems, a reduction in CO_2 emissions per m^2 of over 60% could be achieved compared with existing/current property. In addition, the proposed building will achieve an improvement of 50% above the requirements of the Building Regulations Part L1B.

A BREEAM Domestic Refurbishment Pre-Assessment has been prepared for the planning application, the following summary demonstrates that the proposed development could achieve an 'Excellent' rating, with a predicted score of 74.4.



BREEAM Domestic Refurbishment 2012 Pre-Assessment Estimator v0.6: Results Summary

BREEAM

Building name	41 Frognal NW3
Indicative Building Score	74.37%
Indicative Building Rating	BREEAM Excellent

This assessment and indicative BREEAM rating is not a formal certified BREEAM assessment or rating and must not be communicated as such. The score presented is indicative of a dwelling's potential performance and is based on a simplified pre-formal BREEAM assessment and unverified commitments given at an early stage in the design process.

Issue	Credits Available	Indicative Credits Achieved	Weighting	Section Score
Management			12%	6.55%
Man 01	3	3		
Man 02	2	1		
Man 03	1	1		
Man 04	2	0		
Man 05	1	0		
Man 06	2	1		
Health and Wellbeing			17%	14.17%
Hea 01	2	2		
Hea 02	4	4		
Hea 03	1	1		
Hea 04	2	0		
Hea 05	2	2		
Hea 06	1	1		
Energy			43%	37.81%
Ene 01	6	3		
Ene 02	4	3.5		
Ene 03	7	7		
Ene 04	2	2		
Ene 05	2	2		
Ene 06	1	1		
Ene 07	2	2		
Ene 08	2	2		
Ene 09	2	2		
Ene 10	1	1		
Water			11%	6.60%
Wat 01	3	2		
Wat 02	1	0		
Wat 03	1	1		
Materials			8%	3.20%
Mat 01	25	10		
Mat 02	12	0		
Mat 03	8	8		
Waste			3%	1.80%
Was 01	2	1		
Was 02	3	2		
Pollution			6%	2.25%
Pol 01	3	0		
Pol 02	3	1		
Pol 02	2	2		
Innovation	10	2	N/A	2.00%

Minimum Standards	Pass	Good	Very Good	Excellent	Outstanding
Ene 02	✓	✓	✓	✓	✓
Wat 01	✓	✓	✓	✓	✗
Hea 05	✓	✓	✓	✓	✓
Hea 06	✓	✓	✓	✓	✓
Pol 03	✓	✓	✓	✓	✓
Mat 02	✓	✓	✓	✓	✓

Percentage of Category Score Attained

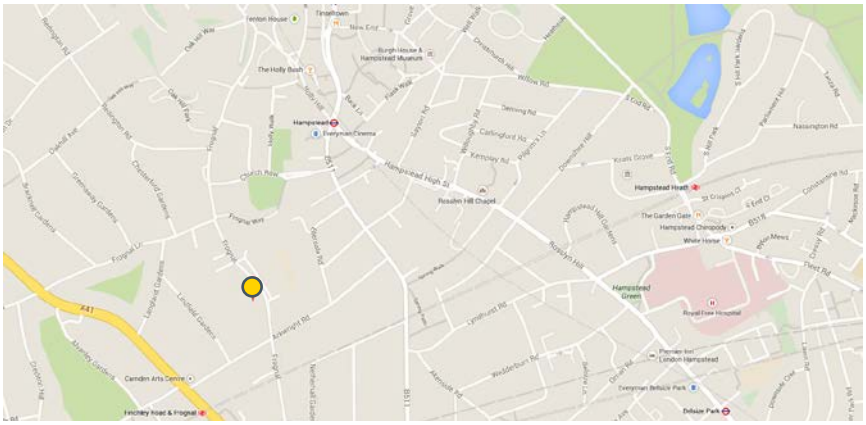
1 INTRODUCTION

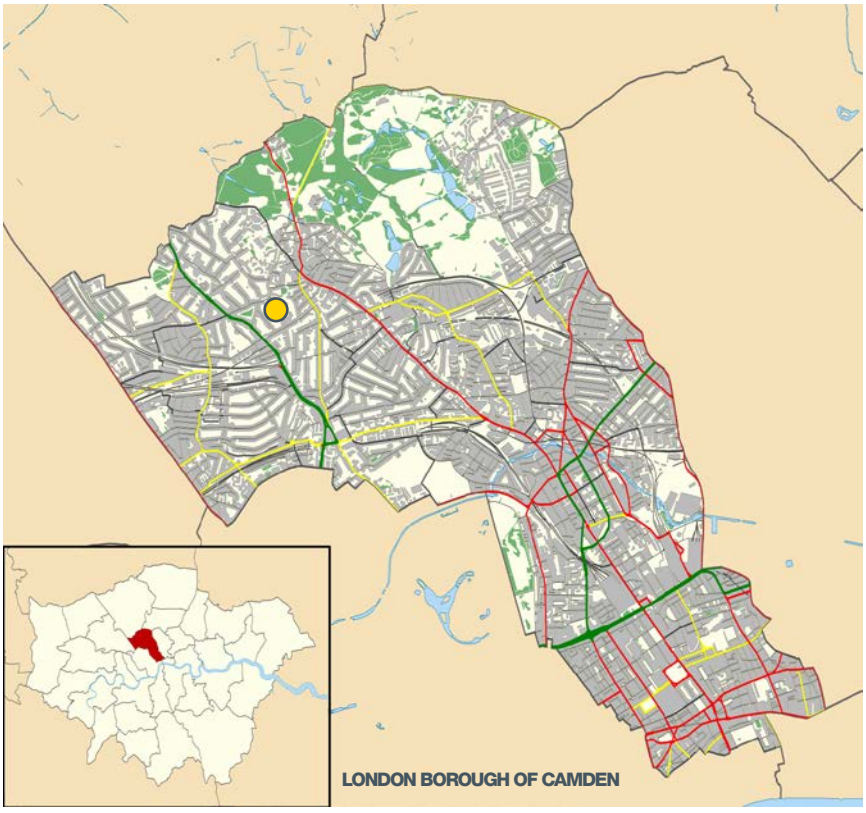
This Sustainability & Energy Statement has been prepared by Integration Consultancy Limited in support of the planning application for the refurbishment and extension of the existing property at 41 Frognal, Hampstead in the London Borough of Camden. The report is one of several documents that accompany the planning application and should be read in conjunction with these.

The purpose of this report is to set out how sustainability is integrated into the design and construction of the proposals, to demonstrate the design approach and the measures adopted to meet the sustainability targets set out in the London Borough of Camden Strategic Policies.

The Development Site

The site comprises an existing single two storey dwelling of approximately 395m^2 set in landscaped grounds of just under an acre. The extension to the property includes the construction of a new basement level to accommodate a swimming pool, gym and other facilities, the addition of a new floor at roof level and an adjoining one bedroom maisonette. The total extended floor area of the proposed dwelling is approximately 1,600m^2.





2 PLANNING POLICY CONTEXT

The London Plan 2015 – Chapter 5: London's Response to Climate Change

Regional policy in London is controlled by The Greater London Authority, and is set out in The London Plan, adopted March 2015. The Plan sets out policy and guidance in the London context and identifies a number of main objectives related to improving London as a workplace and living place.

The concept of sustainable development runs through the London Plan and all its policies with reference to topics including Places, People, Economy, Response to climate change, Transport, and Living places and spaces. Chapter 5 of the London Plan sets out a range of policies in relation to climate change, including climate change mitigation and adaptation, waste, aggregates, contaminated land and hazardous substances.

Key policies within the London Plan which are applicable to the proposed development and addressed in this report are:

POLICY 5.2 -MINIMISING CARBON DIOXIDE EMISSIONS

Planning Decisions

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

1 Be lean: use less energy

2 Be clean: supply energy efficiently

3 Be green: use renewable energy

B The Mayor will work with boroughs and developers to ensure that major developments meet the following targets for carbon dioxide 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 from 2019.

Residential Buildings:

Year	Improvement on 2010 Building Regulations
2010 – 2013	25 per cent
2013 – 2016	40 per cent
2016 – 2031	Zero carbon

Other key policies within the London Plan which are applicable to the proposed development and addressed in this report are:

- 5.3 - Sustainable Design & Construction
- 5.4 - Retrofitting
- 5.6 - Decentralised Energy In Development Proposals
- 5.7 - Renewable Energy
- 5.8 – Innovative Energy Technologies
- 5.9 - Overheating & Cooling
- 5.11 - Green Roofs & Development Site Environs
- 5.13 – Sustainable Drainage
- 5.15 - Water Use & Supplies

London Borough of Camden Relevant Policies

The sustainability and energy strategy for the property will be developed in accordance with London Borough of Camden's Local Development Framework, specifically the following policies:

- Core Strategy Policy CS13: Tackling climate change through promoting higher environmental standards
- Development Policy DP22: Promoting Sustainable Design and Construction
- Development Policy DP23: Water
- Camden Planning Guidance CPG3: Sustainability

Core Strategy Policy CS13: Tackling Climate Change through Promoting Higher Environmental Standards

Camden's Core Strategy sets out the key elements of the Council's planning vision and strategy for the borough and is the central part of the Local Development Framework.

Core Strategy Policy CS13 sets out the Council's commitment to reducing Camden's carbon dioxide emissions in line with the national target of 80% by 2050. Applicable policy for the proposed extensions and modifications to the property at 41 Frognal is:

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 development to meet the highest feasible environmental standards that are financially viable during construction and occupation by:

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,

3. Generating renewable energy on-site; and

d) ensuring buildings and spaces are designed to cope with, and minimise the effects of, climate change.

The retention of the existing building and development of the existing land is considered an efficient use of land and buildings. The proposed property will minimise carbon emissions through enhancements to the thermal performance of the building fabric, passive design measures, the use of energy efficient active building services systems and the incorporation of renewable energy technologies.

Development Policy DP22: Promoting Sustainable Design and Construction

The London Borough of Camden Local Development Framework - Development Management Policies 2010-2025, sets out a long term planning vision and strategic objectives for future development in the area.

Development Policy DP22 sets out the Council's approach to improving energy conservation, efficiency and sustainability.

Applicable policy for the proposed extended property is:

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

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

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

d) expecting developments (except new build) of 500 sq m of residential floorspace or above or 5 or more dwellings to achieve "very good" in EcoHomes assessments prior to 2013 and encouraging "excellent" from 2013;

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

f) summer shading and planting;

g) limiting run-off;

h) reducing water consumption;

i) reducing air pollution; and

j) not locating vulnerable uses in basements in flood-prone areas.

The proposed extended property will be have a floor area greater than 500m^2 therefore a sustainability assessment will be undertaken using BREEAM Domestic Refurbishment 2014 as the assessment tool. This has superseded EcoHomes which is referenced in DP22. A rating of 'Excellent' is targeted for the proposed property.

Appropriate climate change adaptation measures will be incorporated into the proposals, including rainwater collection and recycling and clean, renewable energy systems.

The proposed basement is not in a flood prone area.

Development Policy DP23: Water

Development Policy DP23 sets out the Council's approach to the efficient use and disposal of water and the minimisation of surface water run-off.

Applicable policy for the extended property is:

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 foulwater 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;

Rainwater collection tanks will be including in the design to collect run-off from all roofs and hard standing areas. The water will be re-used wherever possible including for garden irrigation, WC flushing systems and swimming pool make –up supply. A greywater recycling system will be provided to collect waste water from basins, baths and shower for re-use for WC flushing.

It is proposed that these measures will significantly reduce the rate of run-off into the sewer network compared to that of the existing property.

Camden Planning Guidance CPG3: Sustainability

Camden Planning guidance CPG3 is a Supplementary Planning Document including additional "material considerations" in planning decisions. The document provides information on ways to achieve carbon reductions and more sustainable developments. It also highlights the Council's requirements and guidelines which support the relevant Local Development Framework (LDF) policies.

The majority of the guidance within this document is relevant to the proposals for 41 Frognal, however the key issues and requirements are:

2 The Energy Hierarchy

All developments are to be design to reduce carbon dioxide emissions

Energy strategies are to be designed following the steps set out by the energy hierarchy

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

4 Energy Efficiency: Existing Buildings

All buildings, whether being updated or refurbished, are expected to reduce their carbon emissions by making improvements to the existing building. Work involving a change of use or an extension to an existing property is included. As a guide, at least 10% of the project cost should be spent on the improvements.

Development involving a change of use or a conversion of 5 or more dwellings or 500sq m of any floorspace, will be expected to achieve 60% of the un-weighted credits in the Energy category in their BREEAM assessment.

Special consideration will be given to buildings that are protected e.g. listed buildings to ensure that their historic and architectural features are preserved.

6 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.

7 Water Efficiency

Developments over 10 units or 1000sq m should include grey water recycling

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.

9 Sustainability Assessment Tools

A BREEAM Domestic Refurbishment Assessment will be required, a rating of 'Excellent' will be targeted with a minimum standard achieved for the following categories:

- Energy – 60%
- Water – 60%

– Materials – 40%

10 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.

The key design elements included within the proposals in response to the requirements of CPG3 are:

- enhancements to the thermal performance of the building fabric
- passive design measures,
- the use of energy efficient active building services systems
- the incorporation of renewable energy technologies
- Rainwater and greywater collection and recycling systems
- BREEAM Domestic Refurbishment 2014 as the assessment tool targeting a rating of 'Excellent'.
- Green roof(s) will be incorporated into the design

Summary of Key Policy Requirements

1. A BREEAM Domestic Refurbishment Assessment will be required, a rating of 'Excellent' will be targeted with a minimum standard achieved for the following categories:
   - Energy – 60%
   - Water – 60%
   - Materials – 40%
2. 20% reduction of CO_2 emissions through on-site renewable energy generation where feasible
3. The property should be designed to be water efficient by minimising water use and maximising the re-use of water, i.e. grey water and rainwater collection and re-distribution systems should be incorporated
4. The property should incorporate brown roofs, green roofs and green walls unless it is demonstrated this is not possible or appropriate

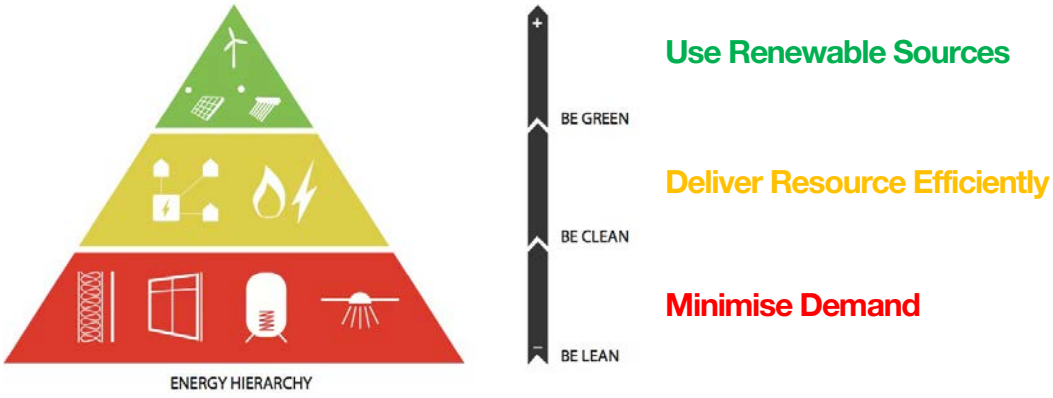
3 ENERGY STRATEGY

The Energy Strategy for 41 Frognal will have the potential to generate significant carbon savings over the lifetime of the property. The objective is to develop an energy infrastructure that supplies low carbon energy, utilises renewable sources, reduces energy bills for the home occupier, provides a high quality internal environment, is adaptable and able to accommodate future upgrades and retrofits.

The BREEAM Domestic Refurbishment Assessment will be used to demonstrate that sustainability is integral to the design, construction, operation and performance of the proposed property, outlining the design principles proposed across a wide range of criteria, i.e. Energy, Water, Materials, Surface Water run-off, Waste, Pollution, Health & Well-Being, Management, Ecology.

The Energy Hierarchy

The energy hierarchy referred to in the London Plan and Camden Planning Guidance CPG3 suggests a three-step approach to decision making and prioritizing strategies for the reduction of resource consumption and carbon emissions from energy. This approach is applicable to other resources such as water, waste and construction materials.



ENERGY HIERARCHY

Minimising Demand

The incorporation of appropriate passive measures in the building design is essential if the building services systems are to be efficient and economic. Passive design measures are integral to the building form and fabric and therefore have the greatest influence on carbon emissions throughout the life cycle of a building.

The development of passive design strategies starts by identifying site-specific challenges and opportunities, considering the microclimate, location and surroundings and applying them to the building form, façade and orientation.

Due to the extent and nature of the proposed modifications to the existing property there is an opportunity to significantly reduce the energy demand by enhancing the performance of existing fabric elements, and introducing new elements with low U values.

Building Fabric Performance & Insulation

Thermal insulation must be able to deliver significant carbon emissions reductions throughout the life of the development. High levels of insulation will significantly reduce energy consumption and ensure optimum occupant comfort all year round by retaining heat in the winter and reducing heat gain in the summer. For the existing, retained elements of the walls, floors and roof of the property, this will be achieved by the introduction of additional insulation and membranes to reduce air leakage.

This is particularly relevant for glazed surfaces that may suffer from overheating in summer or overcooling and condensation formation in winter. A minimum U-value of 1.4 W/m^{2}K is recommended to avoid radiant temperature asymmetry in winter.

The thermal performance of all new exposed elements will exceed the minimum requirements for Building Regulations compliance. All retained thermal elements will be significantly upgraded to improve the overall thermal performance of the property minimise thermal bridging and avoid any condensation risk. This will be achieved by one or a combination of the following methods:

- Cladding or rendering the external surface of the thermal element and applying insulation as necessary;
- Dry-lining the internal surface of a thermal element and applying insulation as necessary;
- Stripping down the element to expose the basic structural components (brick, blockwork, timber frame etc.) and then reconstructing to achieve all the necessary performance requirements;

The following proposed U values will be targeted, this data is used in the calculation of the annual energy demand for the proposed extended property.

External Fabric Element	Existing U-Values (W/m^2 K)	Building Regulations Part L1B Requirements for Upgraded Thermal Elements (W/m^2 K)		Proposed U Values (W/m^2 K)	
		Threshold U-Value	Improved U-Value	Retained Elements	New Elements
External Wall	1.60	0.70	0.30	0.18	0.18
Floor	1.20	0.70	0.25	0.15	0.15
Flat Roof	2.30	0.35	0.18	0.13	0.13
Glazing	5.60	n/a	1.60	n/a	1.20 - 1.40
Swimming Pool Basin	n/a	n/a	n/a	n/a	0.25

It can be seen from the table above that the proposed U values for the retained thermal elements significantly exceed the minimum requirements for compliance with Part L1B.

Air Tightness & Infiltration

The target air-permeability rate is 5 m^3/m^2/h, achieved though appropriate selection of materials, membranes and seals and the design of airtight details. This is considered achievable due to the extent of façade elements to be replaced or significantly upgraded as part of the proposals.

The key to achieving high levels of airtightness is the quality of construction. Selection of Accredited or Improved Robust Details improves air-tightness of the building envelope in practice.

Thermal Bridging

By implementing Accredited or Improved Robust Details to all new elements of the construction overall thermal bridging heat loss factor can be reduced to as low as 0.04, for the purposes of the Energy Calculations a value of 0.08 is assumed.

Natural Ventilation & Thermal Mass

Daytime natural ventilation is essential to purge excess heat during the summer months and enables rapid dilution of pollutants. When used in combination with exposed thermal mass, natural ventilation will reduce high internal daily temperature variations which will minimise the overheating risk in the summer. Therefore occupant comfort can be maintained without sole reliance on the mechanical cooling or ventilation systems.

Solar Exposure and Daylight

Maximising exposure to solar energy and daylight is essential to reduce reliance on artificial lighting reducing winter daytime heating requirements and to contribute to the general wellbeing of occupants.

The site has excellent access to solar energy and natural daylight, as the property is set in extensive grounds, neighbouring buildings are a significant distance away and therefore overshadowing is not an issue.

The primary living areas will have access to large glazed areas to maximise sunlight/daylight deep into the plan, reducing reliance on artificial lighting. High performance glazing with low energy coatings will be specified to reduce heat loss while permitting solar gains during the winter. All habitable spaces within the building will have manually openable windows to maximise natural cross ventilation to minimise overheating risk during the summer. Passive shading systems will be selected and designed to avoid overheating and glare whilst not compromising good daylight availability.

Active Systems

All existing building services systems within the property will be removed and replaced with new high efficiency systems and plant to suit the remodelled and extended property. All new systems will be in accordance with and where possible exceed the energy efficiency requirements of the Domestic Building Service Compliance Guide.

It is proposed that the primary heat source serving the property will be a ground source heat pump (GSHP) with a closed loop heat exchange network comprising a series of boreholes within the grounds of the property. The GSHP, systems will be configured to optimise the heat balance of the property maximising the recovery and reuse of heat and cooling.

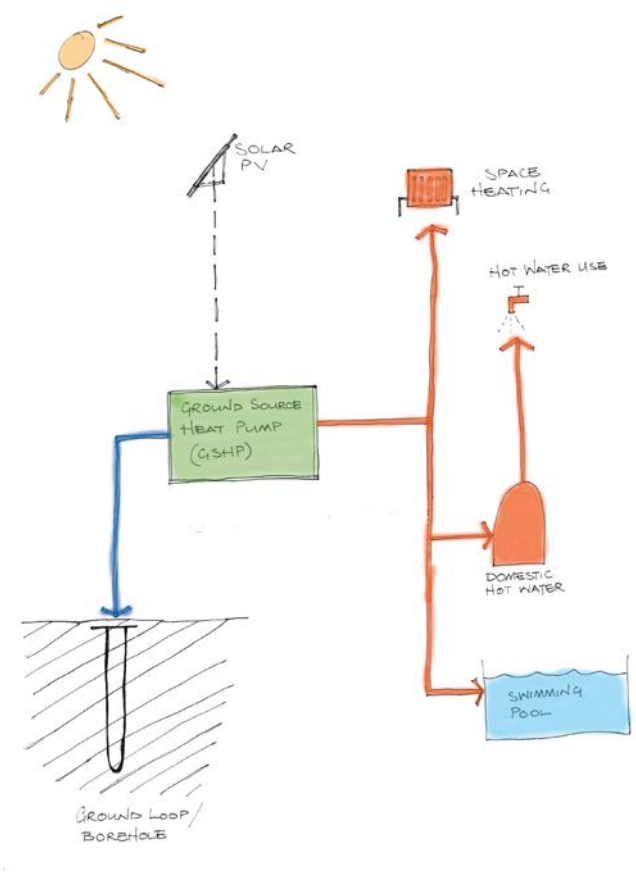
The GSHP will generate low temperature hot water to serve underfloor heating systems, pre-heat the domestic hot water and swimming pool water. The heat pump will have an average COP greater than 6, this is the ratio of heat or cooling generated to the electrical energy used to produce the heat, therefore the system will be at least 600% efficient ensuring the system is considered 'renewable'.

A small high efficiency gas fired condensing boiler will be installed to serve as a 'high temperature top-up' to the domestic hot water to ensure the maximum COP of the GSHP is maintained at all times.

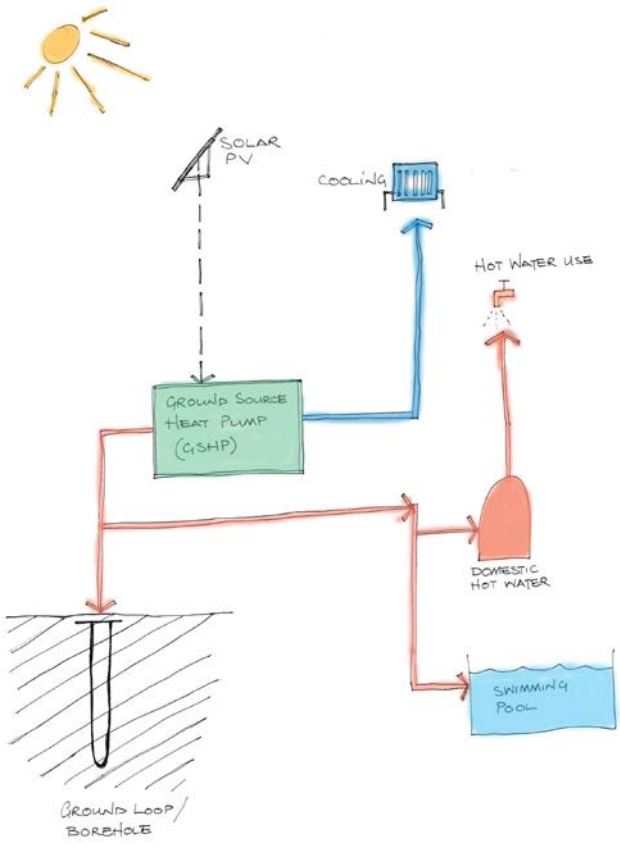
Comfort cooling will be provided to selected rooms with chilled water generated via the GSHP. Heat rejected from the heat pump in the cooling process will be used to pre-heat the domestic hot water and indoor swimming pool water; the outdoor pool may also be used as a 'heat sink' to utilise any residual / surplus heat, minimising or eliminating the requirement for conventional external heat rejection plant.

The heating, air conditioning and ventilation systems will be controlled via a central building management system, providing weather compensation, optimised start and time clock and temperature control to each individual room.

All areas of the property will be mechanically ventilated via centralised supply and extract air handling plant incorporating heat recovery. This will negate any requirement for trickle vents in the façade and contribute to achieving low air permeability rates. Systems will be designed and low energy fans selected to ensure a low specific fan power (SFP) and electrical consumption.



GSHP WINTER CYCLE



GSHP SUMMER CYCLE

The swimming pool heating and ventilation systems will incorporate a range of energy efficiency measures, such as fresh air dehumidification and ventilation system to the pool hall with dynamic heat pump heat recovery to pool water

Low energy fixed lighting, generally comprising LED fittings, will be installed throughout the property.

It is proposed that domestic white goods are in line with BREEAM criteria 'Ene 5– Energy Labelled White Goods', all fridges, freezers, washing machines or tumble dryers will have an A or A+ rating under the EU Energy Labeling Scheme.

Rainwater from the roofs and hard landscaped areas will be collected and reused via a rainwater harvesting system comprising a below ground storage tank and pumped re-distribution system. The recycled rainwater will be used for irrigation of the extensive grounds and swimming pool water make-up.

Delivering Resources Efficiently

Policy 5.9 of the London Plan 2015 and Camden Planning Guidance CPG3, requires developments to connect to a decentralised energy network and use the heat unless it can demonstrate it is not technically feasible or financially viable.

The property is located in the North of the London Borough of Camden, therefore connection to an existing district heating network is unlikely to be viable, the scheme is also not in an area which is deemed to be viable for a future district heating network.

Due to the year-round heat requirement for the swimming pool, a local CHP system could offer significant economic benefits and sufficient carbon savings to be a viable option for the property. However it is considered that the ground source heat pump is a preferable option, providing an energy efficient source of cooling as well as heating and will also benefit from the Renewable Heat Incentive for domestic installations; therefore other low or zero carbon technologies are preferred to a CHP installation. This will be reviewed as part of the detailed design.

Renewable & Low Energy Technology Systems

In accordance with Policy 5.7 of the London Plan 2015 and Camden Planning Guidance CPG3, the table below summarises the viability assessment for the most applicable renewable energy and low carbon technologies that could be installed to meet the target 20 % CO_2 emissions reduction. Capital and operational costs, local availability of renewable energy resource, local pollution, environmental impact, commercial availability, maintenance, control and operational issues, and carbon emissions are considered.

Technology			Assessment / Viability
	**Wind Power**	Wind turbine installed on the roof or within the grounds of the property.	Due to the suburban location, and the impacts in terms of visual appearance, noise and shadow flicker, wind turbines are not considered a viable technology for the property. **VISUALLY AND TECHNICALLY INAPPROPRIATE**
	**Ground Source Heat Pump**	Open or closed loop GSHP system requiring extraction of ground water and / or deep boreholes.	Significant investment required, well matched to the heat demand of the swimming pool, could be used to supply cooling in summer. No external visual impact **CONSIDERED A FEASIBLE OPTION**
	**Air Source Heat Pump**	Electric powered external plant serving each residential unit providing heating and cooling	Simple and economic system utilises grid electricity - resultant CO_2 reductions cannot match other options available, siting of external units may have visual / planning impact **POTENTIALLY VIABLE**
	**Solar Thermal Collectors**	Roof mounted solar thermal panels providing heating energy to a centralised domestic hot water system	Roofs have good potential for solar thermal energy collection. Solar hot water collectors have a high efficiency and would provide a significant proportion of domestic hot water demand of the development. However PV systems have a greater carbon reduction potential and are more cost effective over the lifetime of the building for the same roof area coverage. **POTENTIALLY VIABLE**
	**Solar Photovoltaic Panels**	Roof mounted Photovoltaic panels (PV) provide electricity directly to the development, exporting any surplus production to the grid.	Roofs have good potential for solar power generation. PV electricity is clean and zero-carbon and will offset carbon intensive grid power. Unlike solar thermal systems, all electricity produced by PVs can be utilised with negligible losses regardless of the installation size/capacity. **CONSIDERED A FEASIBLE OPTION**
	**Solar PV-Thermal Panes**	Emerging hybrid system, combination of the Solar Thermal Panels for heat supply and PV panels for electrical power supply.	Hybrid solar thermal + PV systems enhance efficiency by cooling exposed PV cells. Water is circulated on the rear of the panel and the heat is supplied to the building. There are few UK suppliers of PVT systems and installation will require significant investment. **NOT CONSIDERED FINANCIALLY VIABLE**
	**Biomass Heating**	Biomass fired community heating system.	Biomass heating is proven technology and is likely to provide a significant CO_2 reduction. The size of fuel storage, delivery management and local increase in pollution, notably particulates (PM10), SO_2 and NO_x emissions should be considered, The entire borough of Camden is an Air Quality Management Area (AQMA) which states that small biomass boilers are not suitable in AQMA's unless they have no adverse effects on local air quality compared to conventional gas fired boilers. **NOT CONSIDERED TECHNICALLY VIABLE**

It is proposed to install a ground source heat pump to provide, as a minimum, the base heating load to the property. Based on the preliminary calculations this will generate a reduction in total CO_2 emissions of 19%.

Solar PV panels will also be installed at the roof level of the main house, the extent of which will be subject to further economic analysis during the detailed design stage.

Energy Demand & CO_2 Emissions

The energy demand and carbon emissions calculations for Regulated Energy for both the existing and proposed dwelling have been prepared using SAP 2012 software. The calculations are based on the existing building construction details and heating systems and the proposed new and upgraded U values and building services systems detailed in this report.

Non-Regulated Energy demand and associated CO_2 emissions associated with small power and any other process or plant equipment not covered under Building Regulations Part L have been estimated based on a benchmarking exercise, following the methodologies outlined in the BRE Domestic Energy Model (BREDEM).

Energy Demand

Energy Use	Energy Demand (kWh /year)			Energy Demand Rate (kWh/ m^2 / year)		
	Existing	Proposed		Existing	Proposed	
		(1)	**(2)**		**(1)**	**(2)**
Space Heating	114,281	147,222	105,244	290.1	92.0	65.8
Water Heating	15,552	38,490	24,497	39.5	24.1	15.3
Regulated Electricity	3,631	6,298	6,298	9.2	3.9	3.9
Total Regulated Energy	**133,464**	**192,010**	**136,039**	**339**	**120**	**85**
Small Power	6,355	19,200	19,200	16.1	12.0	12.0
Kitchen Equipment	9,000	18,000	18,000	22.8	11.3	11.3
Swimming Pool Heating	0	26,000	8,667	0	16.3	16.3
Total Non-Regulated Energy	**15,355**	**63,200**	**45,867**	**39**	**40**	**29**
Total	**148,819**	**255,210**	**126,899**	**378**	**160**	**114**

(1) Calculated energy demand data for the proposed dwelling following demand reduction measures, i.e. fabric improvements, passive design measure and energy efficient active building services systems.

(2) Calculated net energy demand data for the proposed dwelling following the introduction of renewable energy technology i.e. ground source heat pump.

The predicted total annual energy demand of the proposed property following the introduction of energy efficiency measures, passive design and renewable and low energy technologies is 126,899 kWh compared to the existing property demand of 148,819 kWh. Considering the proposed dwelling is four times larger than the current property, this represents a significant improvement in energy efficiency, equating to a reduction of 264KWh per sq.m or 70%.

The following table details the potential subsequent reduction in CO_2 emissions as a result of the improvements to the energy demand.

CO_2 Emissions

Energy Use	Emissions (kg CO_2/year)			Emissions Rate (kg CO_2/year)		
	Existing	Proposed		Existing	Proposed	
		(1)	(2)		(1)	(2)
Total Regulated Energy	27,584	40,027	26,930	70	25	17
Total Non-Regulated Energy	7,939	24,380	23,713	20	15	15
Total	**35,523**	**64,407**	**50,643**	**90**	**40**	**32**

(1) Calculated carbon reduction data for the proposed dwelling following demand reduction measures, i.e. fabric improvements, passive design measure and energy efficient active building services systems.

(2) Calculated carbon reduction data for the proposed dwelling following the introduction of renewable energy technology i.e. ground source heat pump.

The predicted total annual CO_2 emissions of the proposed property following the introduction of energy efficiency measures, passive design and renewable and low energy technologies is 50,643 Kg compared to the existing property demand of 35,523 Kg. However, considering the size and usage of the property this represents a significant improvement in carbon emissions, equating to a reduction of 60Kg per sq.m or 65%.

Following the energy demand reduction measures, the proposed renewable energy systems (i.e. ground source heat pump) will provide up to 32 % reduction in CO_2 emissions over the predicted regulated energy use and 21% reduction of the total energy use of the proposed dwelling.

Building Regulations Part L1B Compliance

The following table details the potential improvement in CO_2 emissions when compared to the notional Building Regulations compliant dwelling.

CO2 Emissions (kg CO_2/year)	
Building Regulations Compliant Notional Building	Proposed Building
54,258	26,930

This demonstrates an improvement of 50% over the Building Regulations Part L1B (2010).

4 BREEAM Domestic Refurbishment

Camden Planning Guidance CPG3 requires the proposed extended property to be designed and constructed in accordance with BREEAM Domestic Refurbishment. The assessment should target an 'Excellent' rating with a minimum standard achieved for the following categories:

- Energy – 60%
- Water – 60%
- Materials – 40%

A BREEAM Domestic Refurbishment Pre-Assessment has been undertaken for the property and a summary is included as an appendix to this report.

BREEAM Assessor: Dion Mellows

Assessor License Number: L3001888

Scope of BREEAM Domestic Refurbishment 2014

The scheme is used to assess the environmental life cycle impacts of refurbishment projects including existing dwelling undergoing refurbishment, extensions, domestic conversions and change of use projects. The primary aim is to improve the environmental performance of existing dwellings in an appropriate and cost effective manner. This is achieved through integration and use of the scheme at key stages in the refurbishment process and enables the client to measure, evaluate and reflect the performance of their refurbishment project against best practice through an independent and robust process.

This performance is quantified by a number of individual measures and associated criteria across a holistic range of environmental issues, listed below, which is ultimately expressed as a single certified BREEAM rating.

- Energy
- Water
- Materials
- Pollution
- Health and Wellbeing
- Waste
- Management
- Innovation

'Domestic Refurbishment' is classified under two categories:

- Category 1: Alterations to existing dwellings and extensions
- Category 2: Domestic conversions and change of use projects

For the purposes of this development the scheme will be considered as a Category 1 project.

BREEAM Rating Benchmarks

The BREEAM rating benchmarks for domestic refurbishment projects assessed using the 2014 version of BREEAM Domestic Refurbishment are detailed below. The benchmark levels enable a client or other stakeholder to compare an individual building's performance with other BREEAM rated buildings and the typical sustainability performance of refurbished domestic buildings in the UK.

BREEAM Rating	Score	equivalent to:
OUTSTANDING	≥85	Less than top 1% of UK domestic refurbishments (innovator)
EXCELLENT	≥70	Top 10 of UK domestic refurbishments (best practice)
VERY GOOD	≥55	Top 25% of UK domestic refurbishments (advanced good practice)
GOOD	≥45	Top 50% of UK domestic refurbishments (intermediate good practice)
PASS	≥30	Top 75 of UK domestic refurbishments (standard good practice)
UNCLASSIFIED	<30	Performance that fails to meet either the BREEAM minimum standards of performance for key environmental issues or the overall threshold score required for formal BREEAM certification.

BREEAM Domestic Refurbishment 2014 Summary Compliance

Energy Reduction

The property will benefit from:

1. Upgraded pumps for heating and domestic water services.
2. At least 75% Low energy lighting throughout the dwelling.
3. Improved thermal envelope to reduce energy consumption
4. Energy efficient white goods
    - Fridges, Freezers and Fridge-Freezers A+ Rating under EU Energy Efficiency Labelling Scheme
    - Washing Machine A++ under EU Energy Efficiency Labelling Scheme
    - Dishwasher A+ under EU Energy Efficiency Labelling Scheme
5. Low and Zero Carbon technology, i.e. Solar PV panels and Ground Source Heat Pump providing low carbon heating to the property, this will be further enhanced by incorporating zonal heating into the development, reducing the need for the whole property to be heated, considerably reducing energy consumption
6. All windows are being upgraded to double glazed as a minimum with a targeted U-value of 1.4 W/m^2K.
7. Air tightness, the dwelling will benefit from a range of measures which will improve the air tightness of the dwelling. The upgraded windows and doors will increase the air tightness of the dwelling, reducing the heating demands.

Thermal Efficiency

Currently the dwelling has extremely poor levels of insulation in the roof, walls and floor. The proposed design has sought to improve all of these elements retrospectively wherever possible. The following improvements have been made:

1. Walls to have an improved U-Value from the current U Value of 2.1 W/m^2 K to 0.18 W/m^2 K. Exact method of improvement is still to be determined but there are a range of options from cavity fill to an internal dry lined system.
2. Roof to have mineral wool insulation between the rafters and an insulated plasterboard finish. This will improve the U Value from 2.3 W/m^2 K to 0.13 W/m^2 K.

3. Ground Floor to have 100mm rigid board insulation installed under a screed finish. This will prevent a large amount of heat being lost and will provide a warm and comfortable living space. The U Value of the existing floor is 1.2 W/m^2 K, the improved value will be 0.15 W/m^2 K.

The improvements to the dwelling will adopt a fabric first approach to reducing the energy consumption, this is aligned with the Building Regulations Approved Documents Part L1.

Energy Management

The dwelling will benefit from the following measures that will allow energy to be regulated:

1. Energy display device monitoring the use of all electricity, gas and water consumption
2. Time, temperature and zone control of heating in the dwelling

Water Consumption

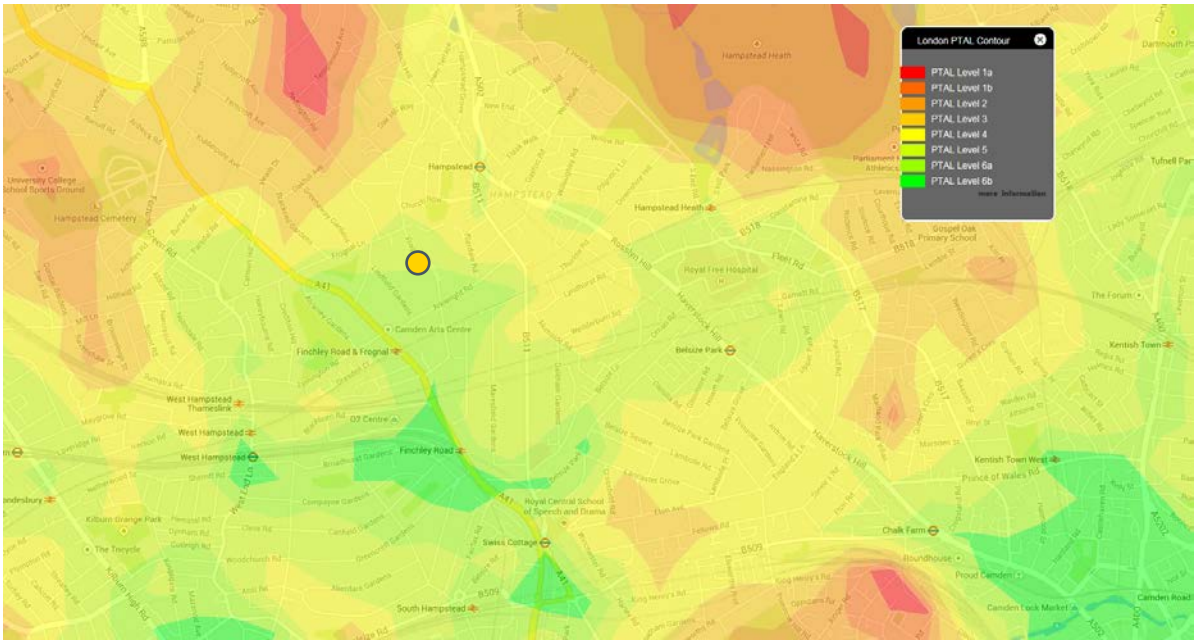
All water consuming appliances will be removed and modern systems will be supplied with the following flow rates:

- WCs - 4.5/2.5 litre dual flush
- Showers - 12 litres per minute
- Baths - 200-250 litres to overflow
- Kitchen taps - 6 litres per minute
- Basin taps 4 litres per minute
- Washing Machines - 7 litres per kg dry load
- Dishwashers - 1 litre per place setting

Transport

The dwelling will incorporate a cycle store within the garage with space provision for at least 4 bicycles. This will give the residents a safe and convenient location to store bicycles and will also provide greater transport options.

The site benefits from gaining a London Public Transport Accessibility Level (PTAL) of 6a. This is the second highest rating and demonstrates the site is extremely well placed for public transport.



Materials

All new materials will be responsibly sourced according to the BRE`s Green Guide to Specification document. All existing elements will achieve an A rating. Any new building elements will be sourced from companies that supply materials with either tier 1 or tier 2 responsible sourcing schemes.

All timber will be sourced in line with the UK Governments Procurement policy for Timber.

A pre-demolition audit will be under taken with the following targets set for diversion from landfill:

- 70% non-hazardous construction waste
- 80% non-hazardous demolition waste

Where possible a minimum of 10% of materials will be sourced from recycled and re-used sources to ensure compliance with Camden Boroughs policy DP22 Promoting Sustainable Design and Construction

Ecology

The majority of construction works will be internal and there will be minimal impact on the external landscape once the works are completed. A green roof will be provided on the flat roof of the maisonette.

User Comfort

The dwelling will be improved to ensure that the future dwelling users will live in a modern comfortable home, providing the following:

1. The dwelling construction will improve the airborne sound transmittance to the level as stated by the Building Regulations 2013 Approved Document Part E.
2. The design will seek to improve upon the daylighting in the property where possible. The design will be complaint with BRE`s site layout and planning for daylight and sunlight internal daylight standards. CIBSE`s LG10:1999 guidance document will be used to ensure good internal visual comfort.
3. The property will benefit from having hard-wired fire detection systems. This will improve the safety of the future occupants.
4. All new building finishes (where relevant) will be sourced to have low VOC's
5. The property will have significantly improved ventilation. The ventilation measures will comply with or exceed the requirements of Building Regulations Approved Document F Section 7.

5 CONCLUSIONS

BE LEAN - Minimise Demand

Energy demand from the proposed property will be minimised via a series of passive and active system demand reduction measures.

The thermal performance of all new exposed elements will exceed the minimum requirements for Building Regulations compliance. All retained elements will be significantly upgraded to improve the overall thermal performance of the property, minimise thermal bridging and avoid any condensation risk.

All existing building services systems within the property will be stripped out and replaced with new, high efficiency plant and equipment to suit the remodelled and extended property. All new systems will be in accordance with, and where possible, exceed the energy efficiency requirements of the Domestic Building Service Compliance Guide.

It is proposed that the primary heat source to the property will be a ground source heat pump (GSHP) with a closed loop heat exchange network comprising a series of boreholes within the grounds of the property. The GSHP, heating and cooling systems will be configured to optimise the heat balance of the property maximising the recovery and reuse of heat.

BE CLEAN - Deliver Resource Efficiently

Connection to an existing district heating network is unlikely to be viable due to the location of the property, the scheme is also not in an area which is deemed to be viable for a future district heating network.

A local CHP system could offer significant economic benefits and sufficient carbon savings to be a viable option for the property. However it is considered that the ground source heat pump is a preferable option, providing an energy efficient source of cooling as well as heating and will also benefit from the Renewable Heat Incentive for domestic installations; therefore other low or zero carbon technologies are preferred to a CHP installation. This will be reviewed as part of the detailed design.

BE GREEN - Use Renewable Sources

The GSHP will generate low temperature hot water to serve underfloor heating systems and pre-heat the domestic hot water and swimming pool water. The GSHP and borehole system will be the primary source of cooling for the property, minimising or eliminating the requirement for external heat rejection plant. Similarly, the systems will be configured to enable heat to be rejected from the air conditioning system to pre-heat both the internal and external swimming pool water therefore maximising the use of the GSHP throughout the year.

Solar Photovoltaic panels will be installed on the roof of the main house, southerly orientated and unobstructed to maximise electricity generation efficiency and produce a proportion of the energy demand required by the ground source heat pump.

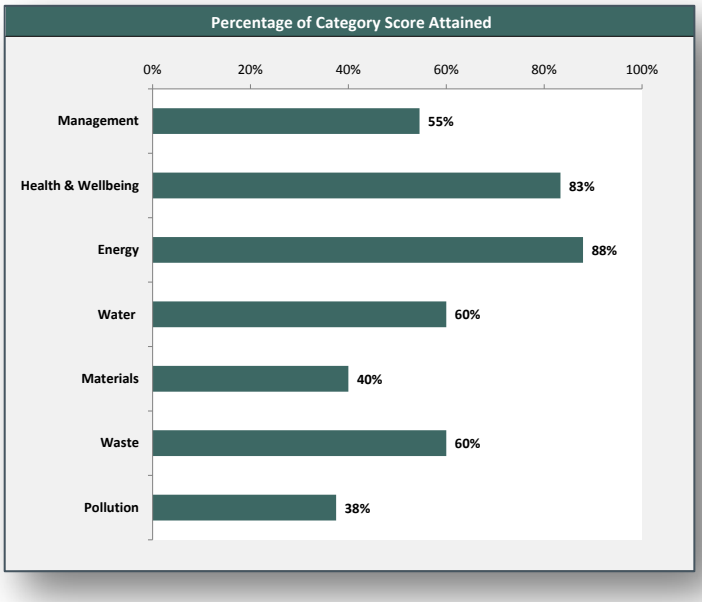
The proposed renewable energy systems will provide up to 29% reduction in CO_2 emissions over the predicted regulated energy use of the proposed dwelling.

To reduce potable water demand and use the resource efficiently, dual and low flush toilets, flow restrictors on piped water supplies to sinks and basins and the use of water efficient appliances (A+ rated) will be adopted. Rainwater will be collected for re-use for irrigation of the gardens, make –up water for the swimming pools and WC flushing.

The total consumption calculated equates to 115 litres per person per day using the BREEAM Refurbishment 2012 – Domestic Buildings Water Calculator Tool; this would satisfy the minimum standards requirements for an Excellent rating.

It is demonstrated that with the introduction of new and upgraded external fabric elements and passive design measures in conjunction with low energy and renewable energy building services systems, a reduction in CO_2 emissions per m^2 of over 60% could be achieved compared with existing/current property. Furthermore, the proposed property will achieve an improvement of over 50% above the requirements of the Building Regulations Part L1B (2010).

A BREEAM Domestic Refurbishment Pre-Assessment has been prepared for the planning application, the assessment demonstrates that the proposed development could achieve an 'Excellent' rating, with a predicted score of 74.4 and the minimum standards achieved for the Energy (60%), Water (60%) and Materials (40%) categories:



6 APPENDIX 1 - Checklist for Retro-Fitting Measures

The following checklist for retro-fitting measures details the measures included in the design proposals. The checklist is in accordance with Camden Planning Guidance CPG3, section 4, Energy Efficiency: Existing Buildings, as required for conversions and extensions over 30m^2.

Measures	Proposal / Details
Draught proofing	All existing doors and windows to be replaced with sealed units
Reflective radiator panels	Not applicable, existing radiators removed and replaced with new underfloor heating
Overhauling/upgrading windows	All windows to be replaced with double glazed units with a maximum U Value of 1.4 W/m^{2}K or better.
New boiler	Existing boiler will be removed and replaced with new high efficiency gas fired condensing boiler and ground source heat pump.
LED lighting	All existing lighting will be replaced with low energy LED lighting
Meters, timers, sensors, controls on heating or lighting	A new comprehensive BMS system will be installed throughout the property to provide weather compensation, optimised start and time clock and temperature control to each individual room. A new intelligent, digital lighting control system will be installed throughout the property.
Mechanical Ventilation with Heat Recovery	All areas of the property will be mechanically ventilated via centralised supply and extract air handling plant incorporating heat recovery. Systems will be designed and low energy fans selected to ensure a low specific fan power (SFP) and electrical consumption.
Insulation ▪ Hot water tank & pipes ▪ Roof ▪ Walls Internal ▪ Walls External ▪ Floor	Hot water tanks and pipes will be insulated in accordance with the requirements of the Domestic Building Services Compliance Guide. The thermal performance of all new walls, roofs and floors will exceed the minimum requirements for Building Regulations compliance. All retained thermal elements will be significantly upgraded to improve the overall thermal performance of the property minimise thermal bridging and avoid any condensation risk.
Renewable energy technology ▪ Solar PV panels ▪ Solar thermal (hot water) panels ▪ Ground source heat pumps	Solar PV panels will be installed on the roof of the main house. A ground source heat pump will be installed to provide, as a minimum, the base heating load to the property. Solar thermal water heating panels are not considered.
Double glazed windows / Secondary glazing	All windows to be replaced with double glazed units with a maximum U Value of 1.4 W/m^{2}K or better.
Combined heat and power unit	CHP not considered at this stage, not considered financially viable or applicable due to the proposed ground source heat pump.
Green or brown roof	A green roof is proposed for the maisonette roof.
Rainwater harvesting	Rainwater from the roofs and hard landscaped areas will be collected and reused via a rainwater harvesting system comprising a below ground storage tank and pumped re-distribution system. The recycled rainwater will be used for irrigation of the extensive grounds and swimming pool water make-up.

7 APPENDIX 2 – BREEAM Domestic Refurbishment Pre-Assessment

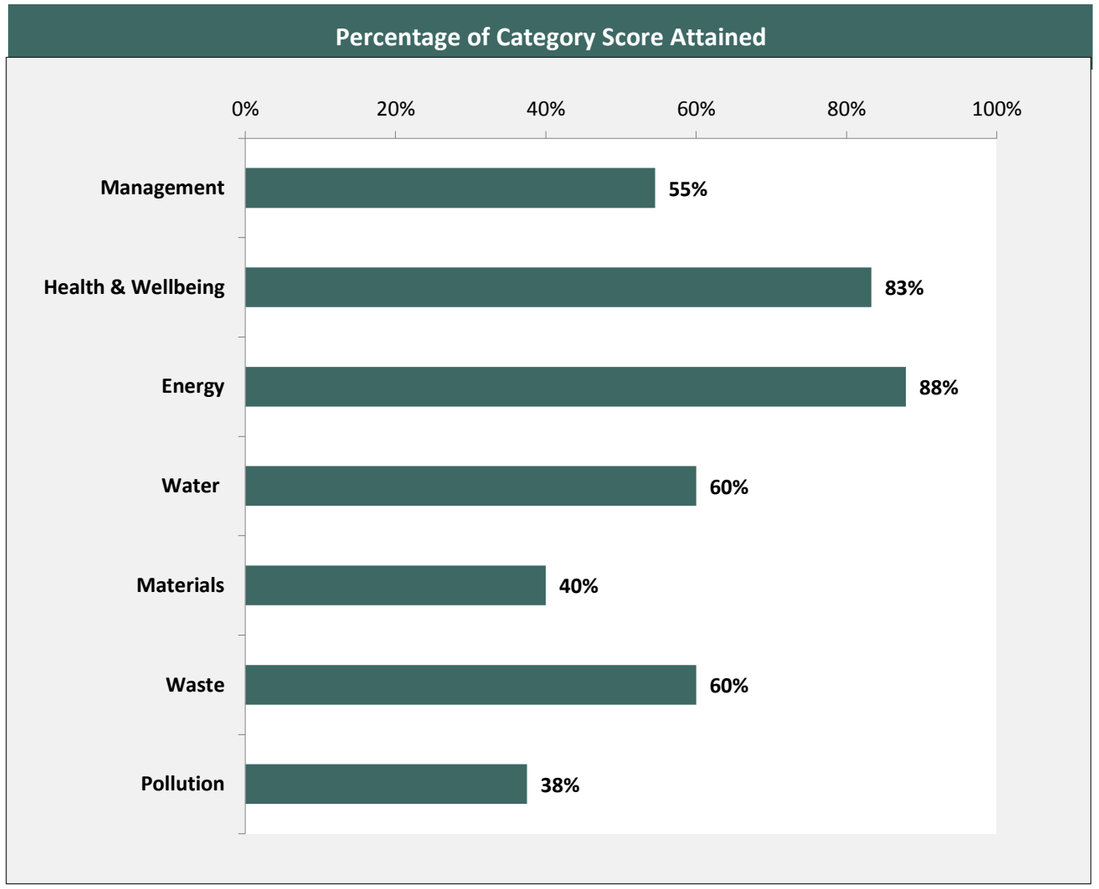
BREEAM Domestic Refurbishment 2012 Pre-Assessment Estimator v0.6: Results Summary

Building name	41 Frognal NW3
Indicative Building Score	74.37%
Indicative Building Rating	BREEAM Excellent

This assessment and indicative BREEAM rating is not a formal certified BREEAM assessment or rating and must not be communicated as such. The score presented is indicative of a dwelling's potential performance and is based on a simplified pre-formal BREEAM assessment and unverified commitments given at an early stage in the design process.

	Issue	Credits Available	Indicative Credits Achieved	Weighting	Section Score
Management	Man 01	3	3	12%	6.55%
	Man 02	2	1		
	Man 03	1	1		
	Man 04	2	0		
	Man 05	1	0		
	Man 06	2	1		
Health and Wellbeing	Hea 01	2	2	17%	14.17%
	Hea 02	4	4		
	Hea 03	1	1		
	Hea 04	2	0		
	Hea 05	2	2		
	Hea 06	1	1		
Energy	Ene 01	6	3	43%	37.81%
	Ene 02	4	3.5		
	Ene 03	7	7		
	Ene 04	2	2		
	Ene 05	2	2		
	Ene 06	1	1		
	Ene 07	2	2		
	Ene 08	2	2		
	Ene 09	2	2		
	Ene 10	1	1		
Water	Wat 01	3	2	11%	6.60%
	Wat 02	1	0		
	Wat 03	1	1		
Materials	Mat 01	25	10	8%	3.20%
	Mat 02	12	0		
	Mat 03	8	8		
Waste	Was 01	2	1	3%	1.80%
	Was 02	3	2		
Pollution	Pol 01	3	0	6%	2.25%
	Pol 02	3	1		
	Pol 02	2	2		
Innovation		10	2	N/A	2.00%

	Minimum Standards				
	Pass	Good	Very Good	Excellent	Outstanding
Ene 02	✓	✓	✓	✓	✓
Wat 01	✓	✓	✓	✓	✗
Hea 05	✓	✓	✓	✓	✓
Hea 06	✓	✓	✓	✓	✓
Pol 03	✓	✓	✓	✓	✓
Mat 02	✓	✓	✓	✓	✓



BREEAM Domestic Refurbishment 2012 Pre-Assessment Estimator v0.7

BREEAM

This assessment and indicative BREEAM rating is not a formal certified BREEAM assessment or rating and must not be communicated as such. The score presented is indicative of a dwelling's potential performance and is based on a simplified pre-formal BREEAM assessment and unverified commitments given at an early stage in the design process.

Building name	41 Frognal NW3
Indicative building score (%)	74.37%
Indicative BREEAM rating	BREEAM Excellent

Management | Health & Wellbeing | Energy | Water | Materials | Waste | Pollution

	Minimum Standards				
	Pass	Good	Very Good	Excellent	Outstanding
Ene 02	✓	✓	✓	✓	✓
Wat 01	✓	✓	✓	✓	✗
Hea 05	✓	✓	✓	✓	✓
Hea 06	✓	✓	✓	✓	✓
Pol 03	✓	✓	✓	✓	✓
Mat 02	✓	✓	✓	✓	✓

INNOVATION

Section Weighting: 10% — Indicative Section Score: 2.00%

Comments

This assessment has been completed for the ground floor flat only, some of the credits achieved under this assessment will also be available to the top floor maisonette. A separate assessment will be carried out for the top floor maisoneete. The development overall will achieve a score of 20% CO2 emission reductions.

MANAGEMENT

Section Weighting: 12% — Indicative Section Score: 6.55%

Man 01 Home Users Guide

No. of BREEAM credits available	3	Available contribution to overall score	3.27%
No. of BREEAM innovation credits	0	Minimum Standards applicable:	No

Assessment Criteria

Where a Home Users Guide be provided to all dwellings, covering all issues set out in the 'Users Guide Contents list', three credits may be awarded

Indicative Credits: 3

Comments

A Home user guide will be provided to the dwelling

Man 02 Responsible Construction Practices

No. of BREEAM credits available	2	Available contribution to overall score:	2.18%
No. of BREEAM innovation credits	1	Minimum Standards	No

Assessment Criteria

Where a compliant considerate construction scheme will be used, credits are awarded depending the score achieved as outlined below:

Indicative Credits: 1

Large Scale - project with more than 5 units

	One Credit	Two Credits
Considerate Constructors Scheme	Score of 25-34 with a score of 5 in each section	Score of 35-39 with a score of 7 in each section
Alternative Compliant Scheme	Compliance	Beyond Compliance

Small Scale - project with 5 units or fewer

	One Credit	Two Credits
Considerate Constructors Scheme	Score of 25-34 with a score of 5 in each section	Score of 35-39 with a score of 7 in each section
Alternative Compliant Scheme	Compliance	Beyond Compliance
Checklist A-3	50% of the optional items	80% of the optional items

Exemplary Credit

Considerate Constructors Scheme	Score of 40 or more with a score of 7 in each section
Alternative Compliant Scheme	Exemplary Level Compliance
Checklist A-3*	All Items (Optional & Mandatory)

* Small Scale Project Only

Indicative Innovation Credits Achieved: Please Select

Comments

Credit dependant on the developer, do you wish to gain these credits??

Man 03 Construction Site Impacts

No. of BREEAM credits available	1	Available contribution to overall score	1.09%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where evidence demonstrate that site impacts will be monitored, as detailed below:

Indicative Credits: 1

	One Credit
Large Scale	Where there is evidence to demonstrate that **2 or more** of the sections in **Checklist A-4** are completed
Small Scale	Where there is evidence to demonstrate that **2 or more** of the sections in **Checklist A-5** are completed

Sections of Checklist	
Large Scale - Checklist A-4	Small Scale - Checklist A-5
Monitor, report and set targets for CO2 production of energy use arising from site activities	Set objectives for reducing CO2 production from energy use arising from site activities
Monitor, report and set targets for water consumption arising from site activities	Set objectives for reducing water use arising from site activities
A main contractor with an environmental materials policy	Main contractor environmental materials statement
A main contractor that operates an Environmental Management System	80% of site timber is reclaimed, re-used or responsibly sourced
80% of site timber is reclaimed, re-used or responsibly sourced	

Same definition of small and large scale as in Man 02

Comments

Policy DP26 of Camdens policies require dust and other factors to be monitored and controlled. This should be targeted to show compliance with the policy

Man 04 Security

No. of BREEAM credits available	**2**	**Available contribution to overall score:**	**2.18%**
No. of BREEAM innovation credits	**0**	**Minimum Standards applicable:**	**No**

Assessment Criteria

Where the following requirements will be met:

Indicative Credits: 0

One Credit Secure windows and doors	External doors and accessible windows meet minimum standards and appropriately certified
Two Credits Secured by design	Principles and guidance of Secured by Design Section 2 are complied with
	A suitably qualified security consultant is consulted at the design stage and their recommendations are incorporated into the refurbishment

Comments

Doors to be to PAS24:2007 and windows to BS 7950:1997. An architectural liason officer or secured by design consultant will need to be consulted to obtain this credit. A written commitment to undertake liaison and comply with outcomes, and to commit to installation of doors and windows compliant with appropriate standards - Credits currently not targetted

Man 05 Protection and Enhancement of Ecological Features

No. of BREEAM credits available	**1**	**Available contribution to overall score:**	**1.09%**
No. of BREEAM innovation credits	**1**	**Minimum Standards applicable:**	**No**

Assessment Criteria

Where the following requirements will be met:

Indicative Credits: 0

One Credit Protecting Ecological Features	Site survey carried out to determine presence of ecological features
	Statutory Nature Conservation Organisation notified of protected species
	Features of ecological value protected during refurbishment works
Exemplary Credit **Ecological enhancement**	A suitably qualified ecologist recommends features to enhance ecology of the site
	adopts all general ecological recommendations
	adopts 30% of additional recommendations

Indicative Innovation Credits Achieved: 0

Comments

Credit not targetted

Man 06 Project Management

No. of BREEAM credits available	**2**	**Available contribution to overall score**	**2.18%**
No. of BREEAM innovation credits	**2**	**Minimum Standards applicable**	**No**

Assessment Criteria

Where the following requirements will be met:

Indicative Credits: 1

One Credit Project Roles and Responsibilities	Where all of the project team are involved in the project decision making
	Small Scale - the project manager assigns individual and shared responsibilities amongst the project team including all trades on site
	Large Scale - the project manager assigns individual and shared responsibilities across the following key design and refurbishment stages: i. Planning and Building control notification ii. Design iii. Refurbishment iv. Commissioning and handover v. Occupation

Small Scale projects: five units or fewer and less than £100k

Large Scale projects: more than five units and more than £100k

One Credit Handover and Aftercare	Handover meeting arranged
	2 or more of the following committed to: - A site inspection within 3 months of occupation - Conduct post occupancy interviews with building occupants or a survey via phone or posted information within 3 months of occupation - Longer term after care e.g. a helpline, nominated individual or other appropriate system to support building users for at least the first 12 months of occupation

Indicative Innovation Credits Achieved: 1

Exemplary Credits

Credits Achieved: 1

One Exemplary Credit Early Design Input	Where A BREEAM Accredited Professional has been appointed to oversee key stages within the project. OR Where a BREEAM Domestic Refurbishment Assessor has been appointed at an early stage of the project, prior to the production of a refurbishment specification
One Exemplary Credit Thermographic Surveying and Airtightness Testing	Where Thermographic surveying and Airtightness testing have been carried out at both pre and post refurbishment stages Where an improved air tightness target has been set at design stage and testing demonstrates that this has been achieved post refurbishment

Comments

Because a BREEAM assessor has been employed at an early stage then an exemplary credit can be awarded.

HEALTH & WELLBEING

Section Weighting: 17%

Indicative Section Score 14.17%

Hea 01 Daylighting

No. of BREEAM credits available	2	Available contribution to overall score	2.83%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Indicative Credits: 2

Where the refurbishment results in a neutral impact on daylighting or where minimum daylighting standards are met, up to two credits may be awarded as follows:

For Existing Dwellings and Change of Use Projects

First Credit Maintaining Good Daylighting	The refurbishment results in a neutral impact on the dwellings daylighting levels in the kitchen, living room, dining room and study

Where the property is being extended

First Credit Maintaining Good Daylighting	New spaces achieve minimum daylighting levels
	The extension does not significantly reduce daylighting levels in the kitchen, living room, dining room or study of neighbouring properties

For All Properties

Second Credit Minimum Daylighting	The dwelling achieves minimum daylighting levels in the kitchen, living room, dining room and study

Comments

To gain a credit under this issue, the refurbishment works would need to have a neutral impact on the dwelling's daylighting levels in the kitchen, living room, dining room and study (see issue Ene 10: Home Office). A full daylight assessment of the existing and proposed units will have to be undertaken for this
Two credits would be targeted in this scenario.

Hea 02 Sound Insulation

No. of BREEAM credits available	4	Available contribution to overall score	5.67%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Indicative Credits: 4

To ensure the provision of acceptable sound insulation standards and so minimise the likelihood of noise complaints.

Properties where sound testing has been carried out:

Up to Four Credits	Four credits awarded according to the improvement over building regulations. See table in additional information in Technical Manual

Properties where sound testing is not feasible and not required by the appointed Building Control body

Two Credits	Where existing separating walls and floors are designed to meet the requirements of Building Regulations with compliant construction details
Up to Four Credits	Where a Suitably Qualified Acoustician (SQA) provides recommendations for the specification of all existing separating walls and floors
	SQA confirms in their professional opinion that they have the potential to meet or exceed the sound insulation credit requirements
	Where these recommendations are implemented
	See table in additional information in Technical Manual

Historic Buildings

Up to Four Credits	Where the dwelling is a Historic Building and sound testing results demonstrate existing separating walls and floor meet the Historic Building credit requirements
	See table in additional information in Technical Manual
	Where sound testing is not feasible and not required by the appointed Building Control body meeting criteria 2 and 3 using Table 12
	Properties where sound testing has been carried out, credits awarded according to the improvement over building regulations. See table in additional information in Technical Manual
	Where the dwelling is a detached property
	Where the dwelling is a propertywith separating walls or floors only between non habitable rooms OR Testing not required by building control body

Detached Properties

Four Credits	By Default

Properties with separating walls or floors only between non habitable rooms OR Testing not required by building control body

Four Credits	By Default

Comments

Detached property, credits awarded by default / the adjoining flat would required to achieve an 8db improvement on ADL Part E for airbourne sound transmittance

Hea 03 Volatile Organic Compounds

No. of BREEAM credits available	**1**	**Available contribution to overall score**	**1.42%**
No. of BREEAM innovation credits	**0**	**Minimum Standards applicable**	**No**

Assessment Criteria

Where the refurbishment avoids the use of VOCs with new products meeting the following requirements:

Indicative Credits: 1

One Credit Avoiding the use of VOCs	Where all decorative paints and varnishes used in the refurbishment have met the requirement listed in table 5.4 in the Technical Manual
	Where at least five of the eight remaining product categories listed in table 5.4 have met the testing requirements and emission levels for Volatile Organic Compound (VOC) emissions against the relevant standards identified within table 5.4 in the Technical Manual
	Where five or less products are specified within the refurbishment, all must meet the requirements in order to achieve this credit.

Comments

For this credit, internal finishes and fittings that emit high levels of volatile organic compounds would be avoided in the development specification.
The available credit for this issue would be targeted in this scenario. Easily achieved , all the materials this covers will be regulated by the EU to ensure compliance.

Hea 04 Inclusive Design

No. of BREEAM credits available	**2**	**Available contribution to overall score**	**2.83%**
No. of BREEAM innovation credits	**1**	**Minimum Standards applicable**	**No**

Assessment Criteria

Where an access statement has been carried out using Checklist A-8 of the Technical Manual to optimise the accessibility of the home as follows:

Indicative Credits: 0

	Checklist A-8 of the Technical Manual	
	Section 1	**Section 2**
One Credit Minimum Accessibility	Completed with Evidence	
Two Credits Advanced Accessibility	Completed with Evidence	Completed with Evidence

Exemplary Performance

One Credit	Where an access expert suitably qualified member of the design team has completed sections 1, 2 and 3 of Checklist A-8, access statement template with evidence provided of the measures implemented in the refurbishment

Indicative Innovation Credits Achieved: Please Select

Comments

Unless an NRAC Access Consultant is appointed or the architect or design team member can comply with the requirements of NRAC then do not target these credits.

Hea 05 Ventilation

No. of BREEAM credits available	**2**	**Available contribution to overall score**	**2.83%**
No. of BREEAM innovation credits	**0**	**Minimum Standards applicable**	**Yes**

Assessment Criteria

Where the dwelling meets the following ventilation requirements:

Indicative Credits: 2

One Credit Minimum Ventilation Requirements	A minimum level of background ventilation is provided (with trickle ventilators or other means of ventilation) for all habitable rooms, kitchens, utility rooms and bathrooms compliant with section 7, Building Regulations Approved Document Part F, 2010
	A minimum level of extract ventilation is provided in all wet rooms (e.g. kitchen, utility and bath-rooms), compliant with section 5, Building Regulations Approved Document Part F 2010.
	A minimum level of purge ventilation is provided in all habitable rooms and wet rooms, compliant with section 7, Building Regulations Approved Document Part F, 2010.
	It is an historic building and meets historic building requirements in CN4 of the technical manual
Two Credits Advanced Requirements	Ventilation is provided for the dwelling that meets the requirements of Section 5 of Building Regulations Part F in full
	Where the building is a historic building and meets the requirements for Historic Buildings in compliance note 4 of the technical manual

Comments

NB: MINIMUM STANDARD FOR BREEAM 'Excellent': 1 CREDIT
For this credit, ventilation standards would need to be met in line with the BRE requirements. This involves air leakage and structural moisture testing, the results of which would then inform the ventilation strategy. Two available credits would be targeted in this scenario, and would have to be obtained in order to achieve a BREEAM 'Excellent' rating.

Hea 06 Safety

No. of BREEAM credits available	**1**	**Available contribution to overall score**	**1.42%**
No. of BREEAM innovation credits	**0**	**Minimum Standards applicable**	**Yes**

Assessment Criteria

Where a fire and carbon monoxide (CO) detection and alarm system is specified as follows:

Indicative Credits: 1

One Credit Fire and Carbon Monoxide (CO) Detection and Alarm Systems	Where a compliant fire detection and fire alarm system is provided
	Carbon Monoxide detector installed if dwelling is supplied with mains gas or other fossil fuel
	Mains supplied fire detection and alarm system if project involves re-wiring*
	Battery operated fire detection and alarm system if no re-wiring* is to take place

*** see CN9 in Hea 06 for the definition of re-wiring**

Comments

MINIMUM STANDARD FOR BREEAM 'Excellent': 1 CREDIT A mandatory credit for all BREEAM ratings, fire and carbon monoxide detection systems would be installed, meeting the following requirements: • The fire detection system would need to be a Grade D, Category LD3 system in accordance with BS 5839-6: 2004, positioned in accordance with Approved Document B.
• Carbon Monoxide detection systems would need to meet BS EN 50291-1:2001 (40), positioned in accordance with BS EN 50292:2002.

ENERGY — Section Weighting: 43% — Indicative Section Score 37.81%

Ene 01 Improvement in Energy Efficiency Rating

No. of BREEAM credits available	6	Available contribution to overall score	8.90%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where the following targets are met for the improvement in Energy Efficiency Rating achieved as a result of refurbishment:

Improvement in EER	Credits
≥ 5	0.5
≥ 9	1
≥ 13	1.5
≥ 17	2
≥ 21	2.5
≥ 26	3
≥ 31	3.5
≥ 36	4
≥ 42	4.5
≥ 48	5
≥ 54	5.5
≥ 60	6

Indicative Credits: 3

Comments

an improvemnet in EER of 26 has been achieved, therefore 3 credits can be gained

Ene 02 Energy Efficiency Rating Post Refurbishment

No. of BREEAM credits available	4	Available contribution to overall score	5.93%
No. of BREEAM innovation credits	2	Minimum Standards applicable	Yes

Assessment Criteria

Where the following Energy Efficiency Rating benchmarks will be met as a result of refurbishment:

EER post refurbishment	Credits	Minimum requirements
≥50	0.5	'Pass' level EER of 50
≥55	1	'Good' level EER of 58
≥60	1.5	
≥65	2	'Very Good level' EER of 65
≥70	2.5	'Excellent' level EER of 70
≥75	3	
≥80	3.5	'Outstanding' level EER of 81
≥85	4	

Indicative Credits: 3.5

Exemplary	Credits
≥90	1
≥100	2

Indicative Innovation Credits Achieved: Please Select

Comments

The proposed new dwelling can acheive a score 80 based on current assumptions

Ene 03 Primary energy demand

No. of BREEAM credits available	7	Available contribution to overall score	10.38%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where the following Primary Energy Demand benchmarks will be met as a result of refurbishment:

Indicative Credits
7

Primary Energy Demand Post Refurbishment (kWh/m^2/year)	Credits
≤ 400	0.5
≤ 370	1
≤ 340	1.5
≤ 320	2
≤ 300	2.5
≤ 280	3
≤ 260	3.5
≤ 240	4
≤ 220	4.5
≤ 200	5
≤ 180	5.5
≤ 160	6
≤ 140	6.5
≤ 120	7

Comments

The dwelling achieves a primary energy demand of 79.92 kWh/m2/yr primary energy demand

Ene 04 Renewable Technologies

No. of BREEAM credits available	2	Available contribution to overall score	2.97%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where the dwelling will meet the following % contribution from renewables and primary energy demand targets as a result of refurbishment

Indicative Credits
2

Dwelling Type	Primary Energy Demand	Percentage from Renewables	
		1 Credit	2 Credits
Detached	≤ 250 kWh/m^2/year	≥10%	≥20%
Semi-Detached		≥10%	≥20%
Bungalow		≥10%	≥20%
End of Terrace		≥10%	≥20%
Mid Terrace	≤ 220 kWh/m^2/year	≥10%	≥20%
Low Rise Flat		≥10%	≥20%
Mid Rise Flat		≥10%	≥15%
High Rise Flat		≥10%	≥15%

Comments

Ground source heat pump or a range of solar p.v should be considered to gain atleast a 10% reduction. 20% would be favoured by the council

Ene 05 Energy Labelled White Goods

No. of BREEAM credits available	2	Available contribution to overall score	2.97%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where Energy Efficiency White goods are to be provided as follows:

Indicative Credits
2

First Credit

Appliance	Appliance provided	Appliance not to be provided
Fridges, Freezers and Fridge-Freezers	Energy Saving Trust Recommended appliances specified	EU Energy Efficiency Labelling Scheme Information Leaflet provided to all dwellings

Second Credit

Appliance	Appliance provided	Appliance not to be provided
Washing Machines and Dishwashers	Energy Saving Trust Recommended appliances specified	Second credit not achieved
Washer-Dryers and Tumble Dryers	Appliances specified with B Rating under EU Energy Efficiency Labelling Scheme	EU Energy Efficiency Labelling Scheme Information Leaflet provided to all dwellings

Comments

Fridge and freezers or fridge freezers have an A+ rating or better under the EU Energy Efficiency Labelling Scheme
Washing machines have an A++ rating or better under the EU Energy Efficiency Labelling Scheme, Dishwashers have an A+ rating or better under the EU Energy Efficiency Labelling Scheme AND Washer-dryers and tumble dryers have an A rating or better under the EU Energy Efficiency Labelling Scheme

Ene 06 Drying Space

No. of BREEAM credits available	1	Available contribution to overall score	1.48%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where adequate, secure internal or external space with posts and footings or fixings is provided with the following:

Indicative Credits
1

1 Credit

Number of bedrooms	Drying line required
1-2	4m+
3+	6m+

Comments

For the drying space credit, 6m+ of clothes-drying line would be provided to the dwelling, fixed within an external space or an adequate, secure internal space, ventilated in accordance with Part F of the building regulations.

Ene 07 Lighting

No. of BREEAM credits available	**2**	**Available contribution to overall score**	**2.97%**
No. of BREEAM innovation credits	**0**	**Minimum Standards applicable**	**No**

Assessment Criteria — **Indicative Credits**: 2

Where energy efficient internal and external lighting is provided as follows:

External Lighting - 1 Credit

Energy Efficient Space Lighting of more than 45 lumens per circuit watt and Energy Efficient Security Lighting OR
Where Energy Efficient Space Lighting is provided ONLY

Internal Lighting - 1 Credit

Maximum average wattage across the total floor area of the dwelling of 9 watts/m2

Comments

For lighting credits, energy efficient lighting would be specified throughout the dwelling. The internal lighting system would need to have an energy demand of no more than 9 watts/m2 of the total floor area, and external lighting would meet the BRE's requirements for Energy Efficient Space Lighting.

Ene 08 Display Energy Devices

No. of BREEAM credits available	**2**	**Available contribution to overall score**	**2.97%**
No. of BREEAM innovation credits	**1**	**Minimum Standards applicable**	**No**

Assessment Criteria — **Indicative Credits**: 2

Where consumption data is displayed to occupants by a compliant energy display device

Electricity usage data displayed	Primary Heating Fuel	
	Electricity	Other
Electricity usage data displayed	2 credits awarded	1 credit awarded
Primary Heating Fuel usage data displayed	N/A	1 credit awarded
Electricity & Primary Heating Fuel usage displayed	N/A	2 credits awarded

Exemplary Credits

One credit Recording consumption data	Where the first two credits are achieved	**Indicative Innovation Credits Achieved**
	Where any compliant Energy Display Device is capable of recording consumption data	1

Comments

To gain the energy display devices credit, a visual display device would be specified, fixed in a location within the dwelling that would be visible to occupants. The device should also have the function of recording consumption data.

Ene 09 Cycle Storage

No. of BREEAM credits available	**2**	**Available contribution to overall score**	**2.97%**
No. of BREEAM innovation credits	**0**	**Minimum Standards applicable**	**No**

Assessment Criteria — **Indicative Credits**: 2

Where individual or communal compliant cycle storage is provided as follows:

Dwelling Size	One Credit	Two Credits
Studios/ 1 bedroom	1 per two dwellings	1 per dwelling
2-3 bedrooms	1 per dwelling	2 per dwelling
4 bedrooms	2 per dwelling	4 per dwelling

Comments

4 Cycle spaces will be provided to the dwelling

Ene 10 Home Office

No. of BREEAM credits available	**1**	**Available contribution to overall score**	**1.48%**
No. of BREEAM innovation credits	**0**	**Minimum Standards applicable**	**No**

Assessment Criteria — **Indicative Credits**: 1

Where sufficient space and services will be provided to allow occupants to set up a home office in a suitable room with adequate ventilation

Comments

A home office is to be provided to the unit

WATER — Section Weighting: 11% — Indicative Section Score 6.60%

Wat 01 Internal Water Use

No. of BREEAM credits available	**3**	**Available contribution to overall score**	**6.60%**
No. of BREEAM innovation credits	**1**	**Minimum Standards applicable**	**Yes**

Assessment Criteria

Where the dwellings water consumption meets the following consumption benchmarks, or where terminal fittings meet the following water consumption standards:

Indicative Credits: 2

Calculated Water Consumption (litres/person/day)	Equivalent terminal fitting standards	Minimum Standard	Credits
>150	Typical baseline performance	N/A	0
from 140 to ≤ 150	All showers specified to 'Good' **OR** All taps and WC's to 'Good' **OR** Kitchen fittings specified to 'Excellent'	N/A	0.5
from 129 to < 140	All showers specified to 'Excellent' **OR** All showers and bathroom taps to 'Good'	BREEAM Very Good	1
from 118 to < 129	All bathroom and WC room fittings specified to 'Good' **OR** All bathroom fittings specified to 'Excellent'	N/A	1.5
from 107 to < 118	All Bathroom and WC room fittings specified to 'Excellent' **OR** All Bathroom fittings Specified to 'Excellent' and WC room fitting specified to 'Good' **OR** All Bathroom fittings, kitchen and utility sittings specified to 'Good'	BREEAM Excellent	2
from 96 to < 107	All kitchen, bathroom, utility room and WC room fittings specified to 'Good' **OR** All bathrooms, kitchens and utility rooms specified to 'Excellent'	N/A	2.5
< 96	All bathroom fittings specified to 'Excellent' and WC room, kitchen and utility room fittings specified to 'Good'	BREEAM Outstanding	3

NOTE: 'Good' fittings are equivalent to good practice fittings with "Excellent" fittings equivalent to best practice fittings (see the technical manual for full details.

Exemplary Credit	If the water consumption is less than 80l/person/day

Indicative Innovation Credits Achieved: Please Select

Comments

The calculated water consumption would need to meet the target of <118 litres per person resident in the dwelling, per day. Two of the available three credits would be targeted in this scenario, which would meet the minimum requirements for a BREEAM 'Excellent' rating. The local authority requie that if the development increases the surface water run off from the site then mitigation measures should be incorporated. It would be beneficial to install a rainwater harvesting system for the development, a higher specification of water devices could then be achieved. The swimming pool is not considered in this

Wat 02 External Water Use

No. of BREEAM credits available	**1**	**Available contribution to overall score**	**2.20%**
No. of BREEAM innovation credits	**0**	**Minimum Standards applicable**	**No**

Assessment Criteria

Where the following requirements will be met:

Indicative Credits: 0

Requirements:

One Credit	Where a compliant rainwater collection system for external/internal irrigation use has been provided to dwellings. **OR** Where dwellings have no individual or communal garden space.

Comments

There will be an external water collection system connected to the drainage system from the roof, or from a rainwater harvesting system, however dur to the pool credits cannot be achieved

Wat 03 Water Meter

No. of BREEAM credits available	**1**	**Available contribution to overall score**	**2.20%**
No. of BREEAM innovation credits	**0**	**Minimum Standards applicable**	**No**

Assessment Criteria

Where an appropriate water meter for measuring usage of mains potable water meter has been provided to dwelling(s), one credit may be awarded

Indicative Credits: 1

Comments

A water meter will be supplied with a pulsed output to the home energy display system. The meter will supply current and historical consumption figures.

MATERIALS

Section Weighting: 8%

Indicative Section Score 3.20%

Mat 01 Environmental Impact of Materials

No. of BREEAM credits available	25	Available contribution to overall score	4.44%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Indicative Credits: 10

Up to 25 credits can be awarded, with credits calculated using the Mat 01 calculator tool. The table below shows the maximum number of credits available for each element:

Elements	Green Guide Rating credits available	Thermal performance credits available*
Roof	5	3
External walls	5	3.8
Internal walls (including separating walls)	5	-
Upper and Ground Floor	5	1.2
Windows	5	2

The full 25 credits represents all of the elements containing refurbished or existing materials that meet the Green Guide Rating of A+(6)

GG Rating	Points for existing / refurbished elements	Points for new elements
A+ (6)	5	
A+ (5)	4.6	
A+ (4)	4.2	
A+ (3)	3.8	
A+ (2)	3.4	
A+	3	3
A	2	2
B	1	1
C	0.5	0.5
D	0.25	0.25
E	0	0

Where the full 25 credits cannot be achieved the score can be 'topped up' with thermal performance credits. The full number of thermal performance credits for each element can be achieved when achieving the minimum U-values shown below.

Elements	Minimum U-Value (W/m2K)
Roof	0.11
External walls	0.15
Internal walls (including separating walls)	-
Upper and Ground Floor	0.15
Windows	1.4

Comments

a provisional conservative amount of credits have been provided here to gain the minumim 40% category score required by LB Camden

Mat 02 Responsible Sourcing of Materials

No. of BREEAM credits available	12	Available contribution to overall score	2.13%
No. of BREEAM innovation credits	0	Minimum Standards applicable	Yes

Assessment Criteria

Indicative Credits: 0

Where new materials are responsibly sourced, up to 12 credits may be awarded where 80% of new materials for an element are responsibly sourced. The credits achieved are dependent on % of point achieved which is based upon the responsible sourcing tier level of each material sourced as detailed below:

Table 1

Tier level	Points
1	4
2	3.5
3	3
4	2.5
5	2
6	1.5
7	1
8	0

Will all new timber used in the project be sourced in accordance with the UK Government's Timber Procurement: **Yes**

Table 2

BREEAM credits	% of available points achieved
12	≥54%
10	≥45%
8	≥36%
6	≥ 27%
4	≥ 18%
2	≥ 9%

Comments

All timber has to be responsibly sourced, i.e. Under the FSC standard. Suppliers will need to be able to provide these.

Mat 03 Insulation

No. of BREEAM credits available	8	Available contribution to overall score	1.42%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Indicative Credits: 8

Where any new insulation specified for use within external walls, ground floor, roof and buildings services meet the following requirements:

Requirements	
4 Credits	Where the Insulation Index for new insulation used in the buildings is ≥2
	Where Green Guide ratings are determined using the Green Guide to specification tool

Requirements	
4 Credits	Where ≥ 80% of the new thermal insulation used in the building elements is responsibly sourced.

Comments

To obtain the insulation credits, where thermal insulation is required, responsibly sourced materials with a low embodied environmental impact relative to its thermal properties would be specified in line with BRE requirements. Eight of the available eight credits would be targeted in this scenario.

WASTE

Section Weighting: 3%

Indicative Section Score 1.80%

Was 01 Household Waste

No. of BREEAM credits available	2	Available contribution to overall score	1.20%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where compliant recycling and composting facilities are provided, up to two credits may be awarded as follows

Indicative Credits
1

First Credit - Recycling Facilities

Scenario	Internal recycling storage requirements
Compliant collection scheme in place	3 internal recycling containers provided where recycling is not sorted post collection
	1 internal recycling container provided where recycling is sorted post collection
	Minimum 30 litre total capacity, no single container less than 7 litre capacity
	Dedicated position in accordance with compliance note 1
No compliant collection scheme in place No adequate external storage	3 internal recycling containers provided
	Minimum 60 litre total capacity
	Dedicated position in accordance with compliance note 1
No compliant collection scheme in place Adequate external storage provided	3 internal recycling containers provided
	Minimum 30 litre total capacity, no single container smaller than 7 litre capacity
	Dedicated position in accordance with compliance note 1

Second credit - Composting facilities

With external space	Without external space
Where a composting service or facility is provided for green/garden waste	Where a composting service or facility is provided for kitchen waste
Where a composting service or facility is provided for kitchen waste	Where an interior container is provided for kitchen composting waste of at least 7 litres
Where an interior container is provided for kitchen composting waste of at least 7 litres	

Comments

To gain a credit for this issue, household recycling facilities would be provided to the dwelling alongside those for non-recyclable waste, thus diverting household waste from landfill or incineration.

Was 02 Refurbishment Site Waste Management

No. of BREEAM credits available	3	Available contribution to overall score	1.80%
No. of BREEAM innovation credits	1	Minimum Standards applicable	No

Assessment Criteria

Up to three credits are available depending on the site waste management plan to be implemented as follows

Indicative Credits
2

Projects up to £100k

Three Credits	Where waste generated through the refurbishment process is managed in accordance with Checklist A-9
Exemplary Credit	Where a compliant Level 1; Site Waste Management Plan (SWMP) is in place

Indicative Innovation Credits Achieved
Please Select

Projects up to £300k

Three Credits	Where a compliant Level 1; Site Waste Management Plan (SWMP) is in place
Exemplary Credit	Where a compliant Level 2; Site Waste Management Plan (SWMP) is in place
	Non-hazardous construction waste generated by the dwellings refurbishment meets or exceeds the resource efficiency benchmark
	The percentage of non-hazardous construction waste and demolition waste generated by the project has been diverted from landfill and meets or exceeds the refurbishment & demolition waste diversion benchmarks

Projects over £300k

First Credit Management Plan	Where a compliant Level 2; Site Waste Management Plan (SWMP) is in place
Second Credit Good Practice Waste Benchmarks	First credit achieved
	Non-hazardous construction waste generated by the dwellings refurbishment meets or exceeds the resource efficiency benchmark
	Amount of waste generated against £100,000 of project value is recorded in the SWMP
	Pre-refurbishment audit of the existing building is completed
	If demolition is included as part of the refurbishment programme, then the audit should also cover demolition materials
Third Credit Best Practice Waste Benchmarks	Where the first two credits have been achieved achieved
	Where Non-hazardous demolition waste generated by the dwellings refurbishment meets or exceeds the refurbishment & demolition waste diversion benchmarks
Exemplary Credit	Where non-hazardous construction waste generated by the dwellings refurbishment meets or exceeds the *exemplary level resource efficiency benchmark*
	Where Non-hazardous demolition waste generated by the dwellings refurbishment meets or exceeds the exemplary level diversion benchmarks

Comments

Main contractor will be required to produce SWMP and monitor, sort and recycle construction waste. This may have to be reviewed to consider the demolition works.

POLLUTION

Section Weighting: 6%

Indicative Section Score 2.25%

Pol 01 NOx Emissions

No. of BREEAM credits available	3	Available contribution to overall score	2.25%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Credits are awarded on the basis of NOx emissions arising from the operation of space heating and hot water systems for each refurbished dwelling as follows:

	Dry NOx Emissions
One Credit	≤100 mg/kWh (NOx class 4 boiler)
Two Credits	≤70 mg/kWh (NOx class 5 boiler)
Three Credits	≤40 mg/kWh

Indicative Credits: 0

Comments

not possible to gain these credits with a GSHP

Pol 02 Surface Water Runoff

No. of BREEAM credits available	3	Available contribution to overall score	2.25%
No. of BREEAM innovation credits	1	Minimum Standards applicable	No

Assessment Criteria

Where impacts of the refurbishment on surface water runoff are neutralised or where runoff is reduced as a result of refurbishment, up to three credits can be awarded as follows:

Indicative Credits: 1

Requirements

One Credit Neutral Impact on Surface Water	New hard standing areas must be permeable
	If building on to previously permeable area additional run-off must be managed on site
	Calculations should be carried out by an appropriately qualified professional

Requirements

OR Second Credits Reducing Run-Off From Site: Basic	Where the criteria needed for One Credit has been achieved
	Where all run-off from the roof for rainfall depths up to 5 mm, have been managed on site using source control methods
	Include runoff from all existing and new parts of the roof.
	An appropriately qualified professional should be used to design an appropriate drainage strategy for the site

Requirements

OR Three Credits Reducing Run-Off From Site: Advanced	Where run-off as a result of the refurbishment is managed on site using source control
	An appropriately qualified professional should be used to design an appropriate drainage strategy for the site.
	The peak rate of run-off as a result of the refurbishment for the 1 in 100 year event has been reduced by 75% from the existing site.
	The total volume of run-off discharged into the watercourses and sewers as a result of the refurbishment, for a 1 in 100 year event of 6 hour duration has been reduced by 75%.
	An allowance for climate change must be included for all of the above calculations, in accordance with current best practice (PPS25, 2010).

Requirements

Exemplary Credit	Where all run-off from the developed site is managed on site using source control
	The peak rate of run-off as a result of the refurbishment for the 1 in 1 year event is reduced to zero.
	The peak rate of run-off as a result of the refurbishment for the 1 in 100 year event is reduced to zero.
	There is no volume of run-off discharged into the watercourses and sewers as a result of the refurbishment, for a 1 in 100 year event of 6 hour duration.
	An allowance for climate change must be included for all of the above calculations, in accordance with current best practice (PPS25, 2010).

Indicative Innovation Credits Achieved: Please Select

Comments

at least 2 credits are required to be targeted under this section, this is to comply with the local authorities policies on surface water and flooding., it is advised to have this carried out at an early stage.

Pol 03 Flooding

No. of BREEAM credits available	2	Available contribution to overall score	1.50%
No. of BREEAM innovation credits	0	Minimum Standards applicable	Yes

Assessment Criteria

Where the dwelling is located in a low flood risk zone, or where in a medium to high flood risk zone and a flood resilience/resistance strategy has been implemented, up to two credits can be awarded as follows:

Indicative Credits: 2

Minimum Standards	A minimum of two credits must be achieved for this issue at the Excellent and Outstanding levels

Option 1 - Low Flood Risk

Two Credits	Where a Flood Risk Assessment (FRA) has been carried out and the assessed dwellings are defined as having a low annual probability of flooding.

Option 2 - Medium / High Flood Risk

Two Credits	Where a Flood Risk Assessment (FRA) has been carried out and the assessed dwellings are defined as having a medium or high annual probability of flooding.
	Two credits are awarded where as a result of the dwellings floor level or measures to keep water away the dwelling is defined as achieving avoidance from flooding by following Checklist A-10; Decision Strategy Flow Chart.
	Where avoidance is not possible, two credits are achieved where a full flood resilience/resistance strategy is implemented for the dwellings in accordance with recommendations made by a Suitably Qualified Building Professional

Comments

A Flood Risk Assessment would need to be carried out to determine the development's annual probability of flooding in line with BRE requirements.
Two of the available two credits would be targeted in this scenario.