ENERGY STATEMENT

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VERSION 02

6 JUNE 2014

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PROJECT DETAILS

PROJECT:	**71 RICHMOND ROAD DEVELOPMENT**
JOB NO:	**2013.1036**
PROJECT SCOPE:	**THE CONVERSION OF THE EXISTING 1ST FLOOR ROOMS TO CREATE 2x2 BED DWELLINGS, AND THE CONSTRUCTION OF A 1ST/2ND FLOOR EXTENSION TO CREATE 2x2 BED DWELLINGS**
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EXECUTIVE SUMMARY

This report details the proposed energy strategy for the 71 Richmond Road scheme, which entails the re-development of the exiting upper floors into two 2 bed flats, and the construction of a new first floor extension to accommodate three new dwellings (2No. 2 bed flats) in the London Borough of Richmond upon Thames.

This report includes a Code for Sustainable Homes and a BREEAM Domestic Refurbishment Pre-assessment, which highlights the most suitable route to meet the Planning requirements as set out in the London Borough of Richmond upon Thames. A minimum standard of a Code 3 rating, and BREEAM score of 'EXCELLENT' have been met.

The proposed development addresses national planning policies on energy; in particular, mitigation of climate change and energy security through energy efficiency enhancements and use of alternative energy technologies. In order to reduce the carbon footprint of the building beyond the requirements of current regulatory and market standards, the development will benefit from the following integrated systems:

- **Passive design features (Be Lean)**
- **Energy efficiency measures (Be Clean)**
- **Low and zero carbon technologies (Be Green)**

The building fabric performance will meet or exceed the Part L1a 2013 (New Build), and Part L1b 2010 (conversion) requirements where applicable.

An energy assessment has been carried out on the two dwelling types based on design information to identify the most appropriate renewable strategy. The proposed strategy for the new build unit has the potential to provide a 58.3% improvement over the Building Regulations ADL1a 2010 minimum target.

The proposed strategy for the converted units has the potential to provide a 75.9% over the Building Regulations ADL1b 2010 minimum refurbishment fabric improvements.

This will be achieved through passive design measures, energy efficient equipment and renewable technologies. This demonstrates the scheme's compliance with the London Plan Policy 5.2 and the London Borough of Richmond upon Thames' planning requirements.

To maximise the use of the available flat roof space on the development, it has been demonstrated that it is possible to install and an array of 20No. 1065x1500 250Wp mono-crystalline module panels in landscape format at a 30^{o} pitch. This equates to a total 5kWp solar PV array which will provide a 1kWp contribution to each of the converted dwellings, & 1.5kWp for each newly constructed dwelling.

Based on the above mentioned PV system alone, the newly built dwelling will achieve a 51.2% reduction of CO^2 emissions, and the two new dwellings developed through the conversion of the exiting building will achieve a 11.5% reduction of CO^2 emissions.

CODE FOR SUSTAINABLE HOMES ASSESSMENT

Based on the proposed energy strategy, 5.9 credits can also be achieved for ENE 01 of the Code for Sustainable Homes assessment, 6 credits in ENE 02 and 2 credits for ENE 07, helping to achieve up to a Code Level 4 on the scheme. Further details can be found in the

Nuplanet Sustainable Solutions Code for Sustainable Homes Pre-assessment report (Appendix B).

BREEAM DOMESTIC REFURBISHMENT ASSESSMENT

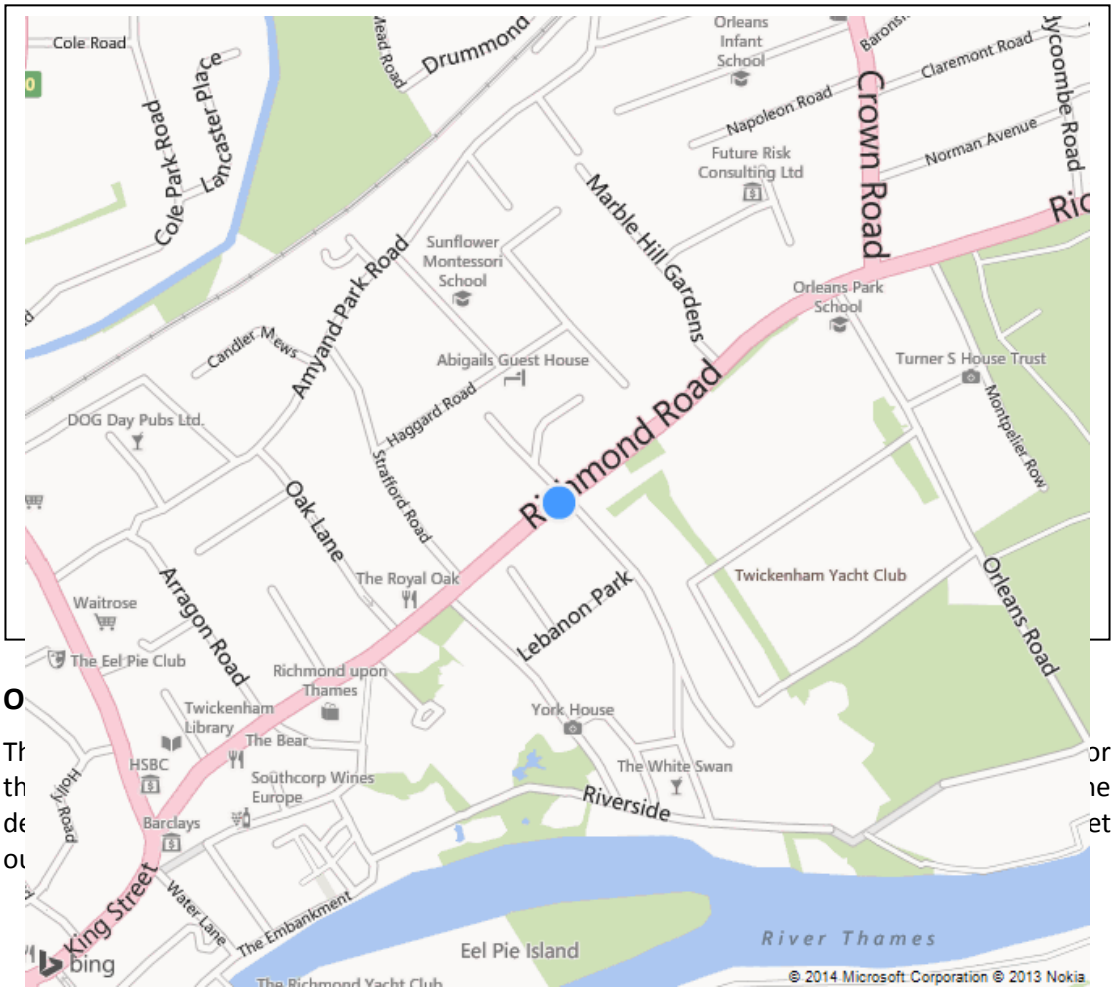
Based on the proposed energy strategy, 3 credits can be achieved for ENE 01, 3.5 credits in ENE 02, 6.5 credits in ENE 03, and 2 credits in ENE 04 of the BREEAM Domestic Refurbishment assessment, helping to achieve an 'EXCELLENT' rating under the scheme. Further details can be found in the Nuplanet Sustainable Solutions BREEAM Domestic Refurbishment Pre-assessment report (Appendix C)

INTRODUCTION

THE SITE

The Richmond Road development can be located in the London Borough of Richmond upon Thames. The site is on a previously developed site on the junction of Richmond Road and Seymour Gardens.

The development will comprise of two new dwellings (2No. 2 bed maisonettes) with a further two 2 bed maisonettes being created through the conversion of the existing first floor rooms and rood space of 71 Richmond Road. However, one of the newly constructed dwellings will include an existing wall, which means that it will be assessed under BREEAM Domestic Refurbishment rather than Code for Sustainable Homes.



This work has resulted in a strategy that requires design, technical and commercial decisions in order to continue the design development and ultimately select the final solution for ensuring a low carbon development.
This report outlines the energy strategy for the development, including passive design, energy and CO2 footprint of the proposed scheme, and renewable energy options.

POLICY

LONDON BOROUGH OF RICHMOND UPON THAMES POLICIES ON ENERGY

Policy DM SD 1

Sustainable Construction

All development in terms of materials, design, landscaping, standard of construction and operation should include measures capable of mitigating and adapting to climate change to meet future needs.

New buildings should be flexible to respond to future social, technological and economic needs by conforming to the Borough's Sustainable Construction Checklist SPD.

New homes will be required to meet or exceed requirements of the Code for Sustainable Homes Level 3. New dwellings created through conversion of an existing building are required to achieve a BREEAM Domestic Refurbishment 'excellent' standard.

They also must achieve a minimum 40 per cent reduction in carbon dioxide emissions over Building Regulations (2010) in line with best practice from 2010 to 2013, 40 per cent improvement from 2013 to 2016, and 'zero carbon' standards **(2)** from 2016. It is expected that efficiency measures will be prioritised as a means towards meeting these targets. These requirements may be adjusted in future years to take into account the then prevailing standards and any other national guidance to ensure the standards are met or exceeded.

New non-residential buildings over 100sqm will be required to meet the relevant BREEAM 'excellent' standards. For conversions see Policy DM SD 3 'Retrofitting'.

Policy DM SD 2

Renewable Energy and Decentralised Energy Networks

New development will be required to conform with the Sustainable Construction Checklist SPD and:

(a) Maximise opportunities for the micro-generation of renewable energy. Some form of low carbon renewable and/or de-centralised energy will be expected in all new development, and

(b) Developments of 1 dwelling unit or more, or 100sqm of non-residential floor space or more will be required to reduce their total carbon dioxide emissions by following a hierarchy that first requires an efficient design to minimise the amount of energy used, secondly, by using low carbon technologies and finally, where feasible and viable, including a contribution from renewable sources.

(c) Local opportunities to contribute towards decentralised energy supply from renewable and low-carbon technologies will be encouraged where there is no over-riding adverse local impact.

(d) All new development will be required to connect to existing or planned decentralised energy networks where one exists. In all major developments and large Proposals Sites identified in the (forthcoming) Site Allocations DPD, provision should be made for future connection to a local energy network should one become available.

Policy DM SD 3

Retrofitting

High standards of energy and water efficiency in existing developments will be supported wherever possible through retrofitting. Proposals for conversions and extensions will be encouraged to comply with the Sustainable Construction Checklist SPD as far as possible and opportunities for micro-generation of renewable energy will be supported.

Development in an area susceptible to flooding should include flood resistant and/or resilient measures to mitigate potential flood risks.

LONDON PLAN POLICIES ON ENERGY

5. Application of the hierarchy in referable applications

The application of policy at each stage of the energy hierarchy and the commitments secured are described in the subsections below. Additionally, observations are made that are relevant to the future implementation of policy.

5.1 Be lean: use less energy

5.2 Be clean: supply energy efficiently

5.3 Be green: use renewable energy

The following targets have been set for carbon dioxide emission reductions in buildings:

- **2010 - 2013: 25% improvement over Part L 2010**
- **2013 - 2016: 40% improvement over Part L 2010**

All major development proposals should include a detailed energy assessment to demonstrate how the targets for carbon dioxide emissions reduction outlined above are to be met within the framework of the energy hierarchy.

This report contains a detailed energy assessment in line with the requirements as set out in the above mentioned policies to demonstrate how the Richmond Road development will comply.

Policy 5.6: Decentralised Energy in Development Proposals

This policy of the London Plan requires that development proposals should evaluate the feasibility of combined heat and power (CHP). Major development proposals should select energy systems in accordance with the following hierarchy:

1. **Connection to existing heating and cooling networks**

2. **Site wide CHP network**
3. **Communal heating and cooling**

There is potential for significant CO2 savings in high-density areas where heat networks, often utilising CHP, are highly applicable. London offers particular opportunities for the establishment of networks, as the vast majority of new and existing developments across London are high density.

The opportunities to meet the first point in this hierarchy are outlined in the London Heat Map Tool.

Policy 5.7: Renewable Energy

Within the framework of the energy hierarchy, Policy 5.7 of the London Plan states that major development proposals should provide CO2 emissions reductions through the use of onsite renewable energy generation, where feasible. A minimum target of 20% has been set through the use of the following Low or Zero Carbon Technologies:

- **Photovoltaics**
- **Solar water heating**
- **Ground and air source heat pumps**
- **Wind turbines**
- **Micro CHP**
- **Bio mass**

These should be considered and incorporated wherever site conditions make them feasible and where they contribute to the highest overall and most cost effective carbon dioxide emissions savings for a development proposal.

METHODOLOGY

This document has been prepared in line with Energy Planning GLA Guidance on preparing energy Assessments (GLA, Sept 2013), and the methodology that has been applied is in line with the Mayor's energy hierarchy and national calculation methodologies.

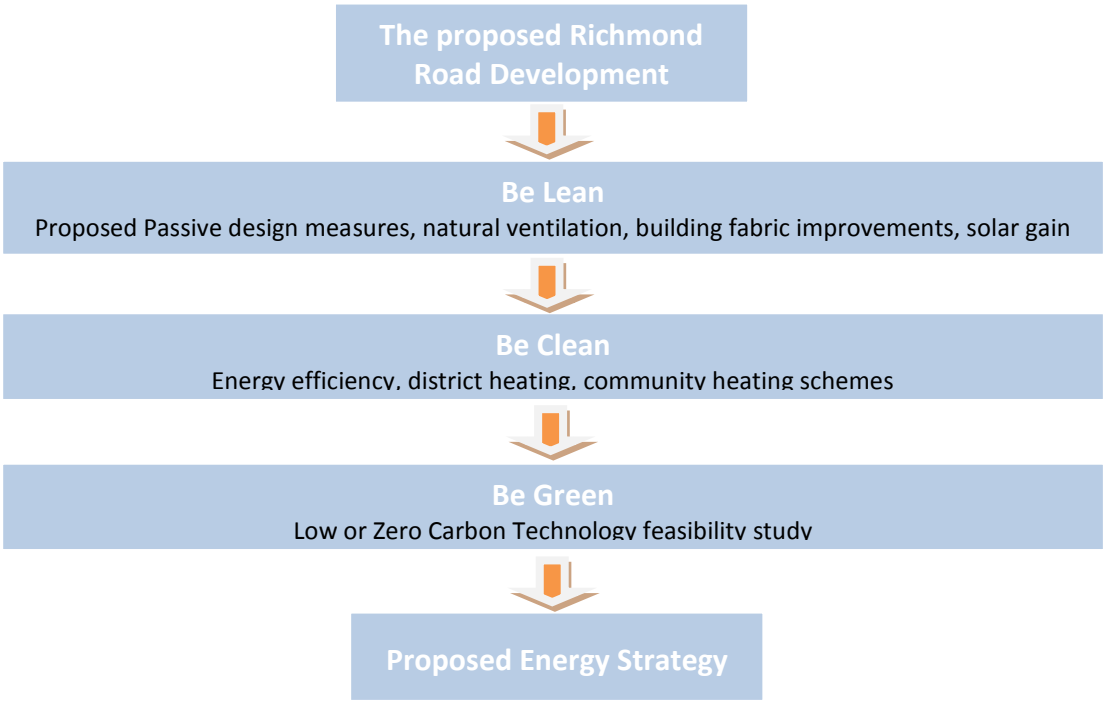
The calculations in this report are based on drawings and information provided for pre-planning approval. These results are intended to provide initial assessment of the design to ensure that planning policies can be achieved at this site.

The approach to achieving the planning policy energy objectives has been to consider strategies and technologies to achieve a low energy and carbon footprint for the scheme.

The development will adopt the following energy hierarchy:

- **Use less energy through passive design measures (Be Lean)**
- **Supply and consume energy efficiently (Be Clean)**
- **Utilise renewable energy sources to reduce carbon emissions (Be Green)**

This energy strategy examines the energy performance of the proposed Richmond Road development based on the following methodology:



The performance of the development in terms of energy consumption and carbon emissions is calculated at each stage of the assessment, ensuring that both regulated and unregulated energy is considered when determining the performance of the proposed energy strategy.

ACCREDITED ENERGY ASSESSOR

This report has been prepared by Giles Murgatroyd who is an On Construction Domestic Energy Assessor (OCDEA) for Nuplanet Sustainable Solutions. The energy consumption and carbon emission figures within this report have been calculated using the approved Standard Assessment Procedure for the Energy Rating of Dwellings (SAP), former SAP 2009 version. This will then provide our baseline assessment.

SITE ENERGY DEMAND & NOTIONAL BASELINES

The London Plan promotes a 'regulated' energy approach to calculating the energy demand and carbon baseline of development. The baseline therefore includes the energy consumed in the operation of the space heating/cooling and hot water systems, ventilation, all internal lighting, and, reported separately is the energy demand and carbon dioxide emissions from cooking and all electrical appliances that are not covered by the Building Regulations, also called 'unregulated' energy.

Notional baseline for Dwellings 1,2, & 3, 71 Richmond Road Development – Through the conversion of existing first floor rooms, & the extension of the rear rooms – Modelling has been carried out under the current Building Regulation ADL1b 2010 through the use of BRE Approved SAP software.

To gain a baseline for the BREEAM Domestic Refurbishment Assessment which requires an assessment of the current building performance, the propose dwellings have been assessed firstly using a mixture of information provided by the design team through a site survey with the U-value taken from Appendix S (dwelling constructed between 1900 & 1930 and of masonry construction) – SAP2009 Document. Table 1.1 shows the used values.

To gain a baseline for the purpose of this report a second assessment has then been undertaken using the minimum improvement standards as set out in ADL1b. The used value in the second assessment can be seen in table 1.2.

ELEMENT	VALUE
FLOOR	Above the commercial space - baseline is set to a U-Value of 0.7 W/m^2K
WALLS	The external wall is set to a U-Value of 2.1 W/m^2K
PART WALLS	Solid construction – U-value of 0Wm^2K
PITCHED ROOF	Baseline U-Value of 2.3 W/m^2K
WINDOWS	Baseline U-Value of 4.8 W/m^2K
DOORS	Baseline U-Value of 3.0 W/m^2K
THERMAL BRIDGING	Non-accredited Construction Details
VENTILATION	Natural ventilation– An intermittent extraction fan installed in the kitchen
AIR PERMIABILITY	$15m^3/m^2.h$
HEATING	The existing boiler is pre-1998 with a given efficiency of 68.95%.
HOT WATER	Assumed 160L hot water tank with 12mm insulation jacket
LIGHTING	100% Non-energy efficient lighting
RENEWABLES	Not considered at this stage of the assessment

Table 1.1 – Current performance values

ELEMENT	VALUE
FLOOR	0.22 W/m^2K
WALLS	0.28 W/m^2K
PART WALLS	Solid construction – U-value of 0Wm^2K
PITCHED ROOF	0.18 W/m^2K
WINDOWS	1.6 W/m^2K
DOORS	1.8 W/m^2K
THERMAL BRIDGING	Accredited Construction Details
VENTILATION	Natural ventilation– An intermittent extraction fan installed wet rooms
AIR PERMIABILITY	$15m^3/m^2.h$
HEATING	The baseline heating is gas combi boiler, has an efficiency of 88.90%.
HOT WATER	Boiler feed
LIGHTING	100% energy efficient lighting
RENEWABLES	Not considered at this stage of the assessment

Table 1.2 – Minimum improvement value under ADL1b

Notional baseline for Dwellings 4, 71 Richmond Road Development – Through an extension at first & second floor levels creating new dwellings

To create a notional baseline the propose dwellings have been modelled to comply with the former Building Regulations ADL1a 2010 using BRE approved SAP software. Under SAP2009 a notional house is used to set a Target Emissions Rating (TER), this is then used as a baseline to demonstrate the minimum requirements of the Dwelling Emissions Rating (DER). The values to achieve the minimum DER in this assessment can be found in table 1.3.

ELEMENT	VALUE
FLOOR	0.14 W/m^2K
WALLS	0.24 W/m^2K
PART WALLS	Solid construction – U-value of 0Wm^2K
FLAT ROOF	0.16W/m^2K
PITCHED ROOF	0.18 W/m^2K
WINDOWS	1.6 W/m^2K
DOORS	1.6 W/m^2K
THERMAL BRIDGING	Accredited Construction Details
VENTILATION	Natural ventilation– An intermittent extraction fan installed wet rooms
AIR PERMIABILITY	7.4m^3/m^2.h
HEATING	The baseline heating is gas combi boiler, has an efficiency of 88.90%.
HOT WATER	Boiler feed
LIGHTING	100% energy efficient lighting
RENEWABLES	Not considered at this stage of the assessment

Table 1.3 – Used values to ADL1a

IMPROVEMENTS THROUGH PASSIVE DESIGN

As part of the Be Lean approach, passive design measures have been considered throughout the pre-planning stage to reduce energy demand.

SOLAR GAIN & DAYLIGHT

Orientation and Natural Light

This section considers the possibility of creating a more energy efficient development by targeting the build and design to maximise natural daylight and solar gains through balancing the positive & negative effect by looking at the sizing and orientation of external windows, and the effects of shading. This means there will be less of a demand for artificial lighting and mains heating.

Where possible, windows and natural daylight have been provided to ensure appropriate daylighting levels throughout the development and reduce the lighting demand.

NATURAL VENTILATION & AIR PERMEABILITY

New buildings are required to have air permeability (or 'air leakage') tests completed once constructed to confirm the building work is sufficiently tight.

The Baseline for this assessment has been created using an assumed air leakage rating of 5m^3/m^2per hour. The maximum allowed for a new build construction is 10m^3/m^2per hour.
The dwelling will be air tested on construction to achieve a value no higher than 5.
The Baseline houses have been created based on a System 1 ventilation system (intermittent fans and trickle vents).

It is proposed the dwelling will use a natural ventilation system for the dwelling. Intermittent extraction fans will be fitted to all wet rooms and kitchen, and trickle vents will be fitted to all windows to ensure a good level of natural air flow.
The impact of solar gains has been incorporated into the SAP analysis for compliance with Part L and using a natural ventilation strategy the risk of solar overheating has been concluded to be not significant for the development.

BUILDING FABRIC EFFICIENCY

Improvements to the building fabric have been considered to assist in exceeding current Building Regulations requirements. Table 2.1 shows the targeted U-values for the two dwellings being created through the conversion of existing rooms. Table 2.2 shows the targeted U-values for the three new dwellings to be constructed at 1st and 2nd floor levels.

LIGHTING

The baseline calculation has been created on the assumption that 100% of internal light bulbs will be low energy. The minimum allowed under Part L is 75%.

The developer will ensure ALL lighting in the home will be low energy.

Low energy lamps are defined as any which produce at least 45 lumens per circuit watt. This is achievable through the installation of modern fluorescent lamps, energy saving bulbs (also known as compact fluorescents) and LED lamps.

HEATING & HOT WATER

It is vital to specify an efficient heating and hot water system within a new or converted dwelling. It is equally important to make sure the specified control systems provide a high level of user control.

Main heating

The baseline calculation was created using a notional mains gas boiler with efficiency no lowers than 88.9% which is based on SEDBUK2009 efficiency calculations. However, the Worcester Bosch Greenstar 28CDi compact offers which has an efficiency rating of 90.5% has been used in the improvement assessment – As shown in table 2.1 for the converted dwellings and 2.2 for the newly constructed dwellings

Heating Controls

Both the baseline and the improvement assessments have been modelled using Programmable roomstat with TVR's installed on all the radiators.

The boiler has been interlocked and fitted with a weather compensator which measures the external temperature to add additional control to the heating system.

Hot water

The hot water demand will be met through the above mentioned Combi boilers, which produce hot water directly from the mains. This makes them very fast and very efficient particularly for smaller homes.

ELEMENT	VALUE
FLOOR	Above the commercial space - baseline is set to a U-Value of 0.14 W/m^2K
WALLS	The external wall is set to a U-Value of 0.2 W/m^2K
PART WALLS	Solid construction – U-value of 0Wm^2K
PITCHED ROOF	Baseline U-Value of 1.6 W/m^2K
WINDOWS	Baseline U-Value of 1.4 W/m^2K
DOORS	Baseline U-Value of 1.4 W/m^2K
THERMAL BRIDGING	Non-accredited Construction Details
VENTILATION	Natural ventilation– An intermittent extraction fan installed in the kitchen
AIR PERMIABILITY	$5m^3/m^2.h$
HEATING	The existing boiler is pre-1998 with a given efficiency of 90.5%.
HOT WATER	Boiler feed
LIGHTING	100% Non-energy efficient lighting
RENEWABLES	Not considered at this stage of the assessment

Table 2.1 – Proposed energy efficient design measures for converted dwellings 1, 2 & 3

ELEMENT	VALUE
FLOOR	0.14 W/m^2K
WALLS	0.20 W/m^2K
PART WALLS	Solid construction – U-value of 0Wm^2K
FLAT ROOF	0.16W/m^2K
PITCHED ROOF	0.16 W/m^2K
WINDOWS	1.4 W/m^2K
DOORS	1.4 W/m^2K
THERMAL BRIDGING	Accredited Construction Details
VENTILATION	Natural ventilation– An intermittent extraction fan installed wet rooms
AIR PERMIABILITY	$5m^3/m^2.h$
HEATING	The baseline heating is gas combi boiler, has an efficiency of 90.5%.
HOT WATER	Boiler feed
LIGHTING	100% energy efficient lighting
RENEWABLES	Not considered at this stage of the assessment

Table 2.2 – Proposed energy efficient design measured for the newly constructed dwellings 4

The energy average results for the converted dwellings 1, 2 & 3 against the energy averaged notional baseline assessments can be seen below in table 3.1.

The energy results for the newly built dwelling 4 can be seen below in tables 3.2

Notional baseline DER	**76.05**
Upgraded dwelling DER	**24.86**
Improvement	**-67.3%**

Table 3.1 – Improvement values for converted dwellings 1, 2 & 3

Notional baseline DER	**17.87**
Upgraded dwelling DER	**16.62**
Improvement	**-7%**

Table 3.2 – Improvement values for newly constructed dwellings 4

ENERGY EFFICIENCY MEASURES

The second stage in the Mayor's energy hierarchy (Be Clean) is to investigate the application of connecting to a heating or cooling network, developing a site wide CHP network, and installation of a communal heating & cooling system to produce energy more efficiently with the aim of reducing the carbon baseline further.

Building up a network of mini-power stations that are far more efficient than traditional centralised power stations is an important part of the Mayor's overall strategy to move London towards its long term carbon reduction targets.

CHP is an engine which produces electricity. The process of creating the electricity produces heat as a by-product. Heat can be easily stored in a thermal storage tank and distributed across the site to provide for hot water and heating demands.

The Mayor's energy hierarchy and the London Plan Policy 5.6 requires all major developments to demonstrate that the proposed energy systems have been selected in accordance with the following hierarchy:

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

DISTRICT ENERGY SYSTEMS

District energy systems produce steam, hot water or chilled water at a central energy centre. The steam or water is distributed in pre-insulated pipework to individual buildings for space heating, domestic hot water and air conditioning. As a result, individual buildings served by a district energy system don't required their own boilers or chillers.

An investigation of the area was undertaken using the London Heat Map tool to determine opportunities to connect to existing heat infrastructure.

Research has shown that the development is not in the vicinity of any existing heat networks as identified within the Borough of Richmond upon Thames on the London Heat Map and therefore there is low potential for the development to connect to a decentralised energy network. Additionally, the ancillary infrastructure that would be required to connect to an existing network would not be viable for a project on this small scale. (Please see Figure 2).

COMMUNAL HEATING SYSTEMS

Community heating involves distributing space and water heating services throughout the development served from a central plant, making use of higher efficiencies available from larger systems.

For a small development such as this, community heating is not a viable option.

COMBINED HEAT AND POWER (CHP)

An investigation of the area was undertaken using the London Heat Map tool to determine opportunities to connect to existing heat infrastructure. Research has concluded that there is not currently any opportunity to connect to a local heat network or CHP. Hence connection to an existing CHP is not possible for the site. (Please see Figure 2).

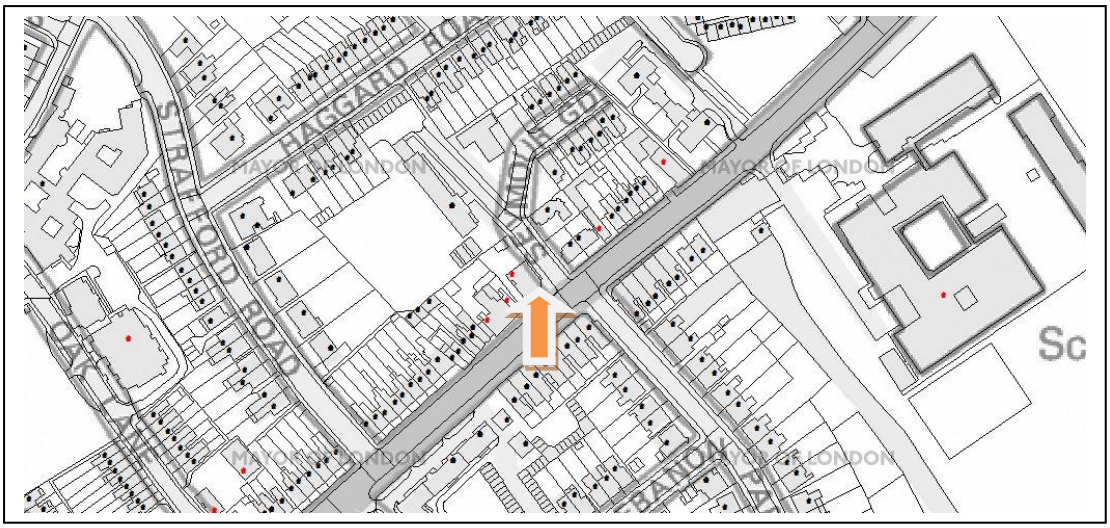


Figure 1 – London Heat Map Indicating CHP Sites and District Heat Networks

LOW & ZERO CARBON (LZC) TECHNOLOGY FEASIBILITY STUDY

The third stage of the energy hierarchy refers to the production of renewable energy, which relates to London Plan Policy 5.7.

Each of the following approved renewable energy technologies have been appraised, examining the suitability to the site and potential for delivering CO2 reductions. The general feasibility of the technologies which were discounted is discussed in Appendix A in order to determine the most suitable solution for the site.

- Solar Thermal (solar hot water)
- Ground sourced heat pumps
- Air sourced heat pumps
- Biomass
- Combined Heat & Power
- Solar PV
- Wind

THE TECHNOLOGIES

SOLAR HOT WATER

Solar thermal collectors provide hot water by using the energy present in sunlight to heat a collector; this energy is then transferred to a circulating fluid and used to heat hot water. There are two types of collector available, flat plate and vacuum tube. The efficiency of the systems differs with, on average evacuated tube systems providing a greater annual output than that of flat plate collector systems.

Image 1 – Solar hot water collector

GROUND SOURCED HEAT PUMPS

Ground source heat pumps extract heat (or coolth) from the ground. Collector systems can be either laid horizontally in the ground over a large area, or installed through a vertical collector system. Vertical systems are more suitable for sites with limited available area, and can be between 15m – 180m deep with a minimum spacing between adjacent boreholes of 5-15m to prevent thermal interference.

A key component of this technology is the heat exchanger and larger heat exchangers deliver greater heat transfer and are therefore more efficient but have a higher capital cost.

Image 2 – Ground sourced heat pump

AIR SOURCED HET PUMPS

Air sourced heat pumps (ASHP) are another variant, with the heat pump working on the temperature difference between the external and internal heat. In non-residential buildings the use of ASHP are very common to provide space heating using a hot water distribution system.

Image 3 – Air sourced heat pump

BIOMASS BOILER

Biomass boilers (please see image 5) replace conventionally powered boilers with a carbon neutral fuel such as wood pellets (please see image 4). A significant space is required for these boilers and storage of the fuel and it may not be possible to source the fuel from within the local area.

Image 4 – Biomass fuel pellets

Image 5 – Biomass boiler

However, it should be noted that fossil fuels are utilised in the production, processing and transportation of biomass fuels and therefore care should be taken when choosing the fuel supplier as the distance and method over which the fuel is transported should be accounted for within the overall emissions calculations.

COMBINED HEAT & POWER (CHP)

CHP (please see image 6) can provide both heat and electricity use for the site. This site would require only a small CHP unit to supplement fossil fuel boilers. For economic viability CHP units need to operate throughout the year, usually up to 17 hours/day. It is common for most developments to have insufficient summer time heat load for this type of technology without the need to dumping significant amounts of heat during the summer period.

Image 6 – Combined Heat & Power Boiler

PHOTOVOLTAIC CELLS

Provision of electricity from photovoltaic (PV) roof mounted system can be considered where the development's design includes un-shaded, roof spaces having a potential angle of more than 30º. PVs have the ability to replace some of the electricity used, but can require relatively large areas of panels. A PV system is relatively easy to install.

Image 7 – Photovoltaic Cells

SMALL SCALE WIND TURBINES

Off shore wind farms are becoming a major provider of energy throughout the UK. However, small scale wind turbines erected on site are a lot harder to incorporate into a scheme. There is a demand for sufficient space to construct a 20/30m high wind turbine. There also needs to be sufficient wind speeds to drive the turbine. This means that built up areas are not suitable for this type of technology. Other issues are planning requirements, noise, and reverberation. However, this technology can produce a high level of energy in the right environment.

Image 8 – Small Scale Wind Turbine

LZC TECHNOLOGY FEASIBILITY STUDY

The above mentioned LZC Technologies have been considered for suitability of the Richmond Road Development site through a detailed Feasibility study. Appendix A shows a breakdown of the Feasibility findings.

SUMMARY OF CO^2 EMISSION SAVING THOUGH LZC TECHNOLOGY STUDY

The most appropriate LZC technology for the development to meet the London Plan and Borough's target for on-site renewables has been identified as solar PV panels

It is believed that the development has sufficient roof space to support a 5 kWp PV system. This will allow each newly converted dwelling to receive a 1kWp & each newly built dwelling to receive 2 kWp contribution.
Table 4.1 demonstrates the impact a 1kWp PV system will have on the two dwellings that will be created through the conversion of the existing rooms against the notional baseline assessment.

Table 4.2 demonstrates the impact a 2kWp PV system will have on the three dwellings that will be created through the extension at 1st and 2nd floor level to create the new dwellings against the notional baseline assessment.

Notional baseline DER	**76.05**
Dwelling with PV DER	**67.27**
Improvement	**-11.5%**

Table 4.1 – Improvement values for the converted dwellings 1,2 & 3

Notional baseline DER	**17.87**
Dwelling with PV DER	**8.72**
Improvement	**-51.2%**

Table 4.2 – Improvement values for newly constructed dwelling 4

SUSTAINABLE CONSTRUCTION

CODE FOR SUSTAINABLE HOMES

London Borough of Richmond upon Thames requires that all newly constructed dwellings be assessed under the Code for Sustainable Homes scheme, and achieve a minimum code 3 rating. To achieve this, a number of minimum and mandatory standards are required to be met through.

Code for Sustainable Homes – Minimum requirements for a 'CODE 3' rating:

- **ENE 01 - Minimum carbon reduction as set out in ADL1a**
- **ENE 02 - For a flat the minimum Fabric Energy Efficiency (FEE) is <48**
- **WAT 01- a maximum water consumption of 105L per person per day**
- **SUR 01 - No increase in rain water run-off following development**
- **WAS 01- The provision of adequate external waste/recycling facilities**

BREEAM DOMESTIC REFURBISHENT

London Borough of Richmond upon Thames require that all new dwelling created through a change of use or refurbishment be assessed under the BREEAM Domestic Refurbishment scheme, and achieve a minimum 'Excellent' rating. To achieve this, a number of minimum and mandatory standards are required to be met through.

BREEAM Domestic Refurbishment – Minimum standards require for an 'EXCELLENT' rating:

- **ENE 02: Energy Efficiency Rating Post Refurbishment – 2.5 credits**
- **WAT 01: Internal Water use – 2 credits**
- **HEA 05: Ventilation – 1 credit**
- **HEA 06: Safety – 1 credit**
- **POL 03 – Flooding – 2 credits**
- **MAT 02: Responsible sourcing of materials – Criteria 3 – all timber products from a Sustainable Source**

CONCLUSION

This report has followed the energy hierarchy which has enabled significant carbon reductions to be identified and calculated for the proposed 71 Richmond Road Development. Passive design measures, energy efficient equipment and LZC technologies have been shown to provide an overall 34.3% saving in carbon emissions over the Building Regulations ADL1a Target Emissions Rating (TER) for the proposed first and second floor extension providing three newly constructed dwellings. It has also shown that a 44.7% reduction in Carbon over the Baseline Notional assessment for the two new dwellings which will be created through the conversion of the existing upper rooms.

The first stage (Be Lean) of the energy hierarchy was followed with improvements to the building fabric performance achieving a 7% for the proposed newly constructed dwellings, and a 67.3% for the three dwellings created through the change of use & extension (unit 3).

The second stage (Be Clean) of the energy hierarchy which involved investigations in line with London Plan Policy 5.7, shows that there are no local CHP plant installations or district heat networks nearby that the site can connect too. However, the proposed efficient condensing gas combi boilers will assist in the significant reduction in carbon through the heating system.

The third stage (Be Green) of the energy hierarchy involved an in depth feasibility study into the suitability of approved Low & Zero Carbon technologies. The study came to the conclusion that Photovoltaic panels would be the most suitable on-site renewable technology for this proposed development. Further studies demonstrated that 2kWp of PV on the newly constructed dwelling, and 1kWp on the converted dwellings would result in a further 51.2% carbon reduction against the TER for the new build dwelling, and 11.5% carbon reduction against the notional baseline assessment for the converted dwellings.

The results of this energy strategy for the three newly constructed dwellings, in conjunction with the Code for Sustainable homes Pre-assessment have highlighted that the targeted code 3 rating which is a minimum requirement under the London Borough of Richmond upon Thames planning requirement guidelines should be easily achievable, with sufficient improvements in ENE 01 & ENE 02 to assist in achieving up to a code 4 rating.

The results of the Energy strategy for the two dwellings that will be created through the conversion of the exiting first floor rooms and roof space, along with the BREEAM pre-assessment indicate that the development is on target to achieve minimum energy performance in ENE 02 which will assist in meeting the required “Excellent” standard.

The figures within this report are based on preliminary analysis only and further detailed studies will be required at the detailed design stage before specifying any of the proposed systems.

This report has taken a sustainable approach to demonstrate compliance with a number of key London Plan and London Borough of Richmond upon Thames policy requirements in the design of the proposed 71 Richmond Road development.