Planning Application Submission- February 2014

Sustainability and Energy Assessment

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Latchmere House – Scheme 2

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Audit Sheet

Rev.	Description	Prepared and checked by	Reviewed by	Date
A	Planning issue	R. Murray	L. Wille	18.12.2013
B	Updated planning issue – team comments included	R. Murray	L. Wille	18.12.2013

Contents

1.0 Executive Summary

This report describes the proposed energy and sustainability strategy for the Latchmere House development in the London Borough of Richmond upon Thames and the Royal Borough of Kingston upon Thames, on behalf of the Berkeley Homes.

The Proposed Development consists of a mix of new-build (55 houses and 27 apartments) and refurbished residential areas (7 apartments).

A holistic approach has been taken to carbon savings on site, and an ambitious target for carbon savings has been set: the carbons saving measures implemented on site are expected to lead to carbon savings of approximately 40% site-wide, compared to the combined baseline.

1.1 Carbon Reduction Strategy

The carbon reduction strategy for the development currently proposes the below targets, which have been estimated over 'baseline' schemes. Reference is made to the performance of each type of area on its own, including carbon reduction targets and environmental assessment target ratings, as well as to their combined performance. The baselines are Part L 2010 compliance for the new build houses, affordable houses, apartments and an estimate of the pre-refurbishment performance for the refurbished areas (Latchmere House apartments).

'Be Lean' strategy (Passive design and energy efficiency)

- **New-build houses**

  Passive design and energy efficiency measures have been incorporated to allow an expected ~16-17% CO_2 improvement on Part L 2010 Building Regulations (regulated emissions, as an area-weighted average) before incorporation of low or zero carbon (LZC) technologies.

- **New build apartments**

  Passive design and energy efficiency measures have been incorporated to allow an expected ~14% CO_2 improvement on Part L 2010 Building Regulations (regulated emissions, as an area-weighted average) before incorporation of low or zero carbon (LZC) technologies.

- **Refurbished areas (existing Latchmere House)**

  Significant improvements are expected to be achieved on the refurbished apartments. The design will incorporate best practice standards respectful of the building's local designation as a Building of Townscape Merit within the conservation area. Measures have been developed in consultation with the heritage consultant which includes the introduction of roof and ground floor insulation, new double glazed windows, new internal insulation to external walls where there are no heritage constraints, new services and lighting, and provision of space and hot water heating via new central boiler plant.

  Initial calculations indicate that a reduction of approximately 40-50% in CO_2 emissions over estimated pre-refurbishment CO_2 levels (as predicted by SAP 2009) could be achieved overall based on these proposed improvements. Proposals have been developed in collaboration with a heritage specialist.

Preliminary Part L1A (new-built units) and Part L1B (refurbished units) calculations have been carried out on a sample of dwellings in order to inform this strategy. Results have been area-weighted to achieve a representative estimated site-wide performance, (see Appendix A for further details).

All houses and apartments will be provided with openable windows, which are expected to satisfy Part L Criterion 3 (summer overheating).

Overall targets

The development is expected to achieve CO_2 savings of approx. 23% over combined baseline (Part L 2010 for new-build areas, and pre-refurbishment performance for refurbished areas) through passive design and energy efficiency before the incorporation of low or zero carbon sources (LZC).

'Be Clean' strategy - Combined Heat and Power (CHP)

A CHP unit is proposed on site, serving new-built apartments and affordable houses. The unit has been sized to meet 100% of the domestic hot water (DHW) load and small proportion of the space heating (SH) load for these areas.

This is currently expected to result in carbon emission savings of approximately 23% for the affordable houses and apartments after the incorporation of passive design and energy efficiency measures, equivalent to approximately 3-4% carbon savings site-wide.

'Be Green' strategy – Low or Zero Carbon (LZC) sources

Photovoltaic (PV) panels are proposed to be installed on new buildings on brackets on the flat parts of roofs, and in some cases on South-East facing pitched roofs, and are expected to achieve a further side-wide improvement in site wide CO_2 emissions of approximately 18-19% after the incorporation of passive design and energy efficiency measured and CHP. A total PV panel output of 80-85 kWp (estimated to equate to ~580m^2 net panel area) is currently proposed to meet this target. The provision and location of PV panels will be subject to a detailed assessment of roof layouts by a PV installation specialist at detailed design stage.

Site-wide targets

Site-wide, the development is expected to achieve CO_2 savings of approx. 40% over the combined baseline (Part L 2010 for new-build areas, and pre-refurbishment performance for refurbished areas) from a combination of passive design and energy efficiency, CHP and PVs.

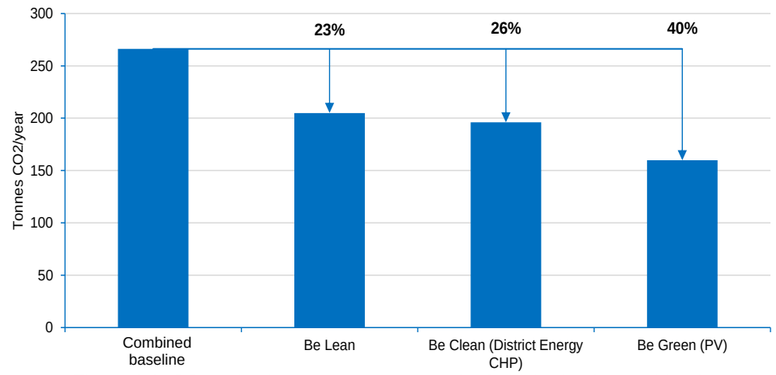


Figure 1.1: CO_2 reduction strategy – new and refurbished units combined

Further, it is currently estimated that each new-built house, rows of houses or apartment block will achieve a minimum of 25% carbon savings (as an area-weighted average within each thermal envelope) in order to meet the mandatory requirement for Code for Sustainable Homes Level 4. Most dwellings will achieve substantially beyond 25% carbon savings.

The Government has announced targets for the next update to Part L (Part L 2013) to be implemented in April 2014. The target for residential units (sector-wide) will be increased by 6% compared to Part L 2010 levels. It is currently estimated that the dwellings at the Latchmere House development will meet this updated requirement based on the estimated performance of dwellings on site, as set out in this report. This will be subject to further assessment when tools become available for assessment against Part L 2013.

1.2 Environmental Assessment Methods

A Code for Sustainable Homes target of Level 4 is proposed for the new build units. The following ratings are currently targeted:

- New residences: Target of Code for Sustainable Homes Level 4. A pre-assessment has been carried out to identify the measures likely to be implemented. This currently indicates the following targets, separate for houses as apartments due to inherent design differences between these types of dwellings:
    - New private and affordable houses: 70.16% i.e. a margin of 2.16% above the minimum required for Code Level 4.
    - New apartments: 68.36% i.e. a margin of 0.36% above the minimum required for Code Level 4.
- Refurbished areas: It is further estimated that the refurbished apartments (Latchmere House) will target BREEAM Domestic Refurbishment (DR) Excellent and will meet the mandatory requirement for BREEAM DR Excellent through fabric and services efficiency alone. A pre-assessment has been carried out to identify the measures likely to be implemented. This currently indicates a targeted score of 70.28%, i.e. 0.28% above the minimum required for Excellent.

  The BREEAM DR target is subject to a detailed heritage, technical and viability assessment post submission of the planning application. Should this prove unachievable, a full justification will be provided to the Councils and a BREEAM DR Very Good rating will be proposed as alternative.

Pre-assessments have been undertaken based on preliminary assumptions and information provided by the design team. These preliminary assessments indicate that both targets are viable, subject to review at detailed design stage. Pre-assessments have been included in appendices B and C of this document.

2.0 Introduction: Site context and approach

2.1 Site Context

The Latchmere House site is located adjacent to Richmond Park and Ham Common, approx. 2.7 miles south of Richmond Town Centre, and 1.8 miles north of Kingston Town Centre. The northern part of the site, including Latchmere House itself (a three storey 19th century residential property – see figure 2.2), is part of the Ham Common Conservation Area. Latchmere House is considered a 'Building of Townscape Merit', but is not listed.

Directly adjoining the northern boundary of the site is the wooded area of Ham Common, an area of Metropolitan Open Land, Public Open Space and an Other Site of Nature Importance as designated in the LBRuT Development Plan Documents which is of biodiversity importance (see figure 2.1).

The site's northern part (including Latchmere House) lies within the London Borough of Richmond upon Thames (LBRuT), while the southern part lies within the Royal Borough of Kingston upon Thames (RBKuT).

The Proposed Development consists of the following areas:

- 48 New Built Houses: 9,745 m^2 GIA
- 7 New Built Affordable Houses: 710 m^2 GIA
- 27 New Built Apartments: 2,103 m^2 GIA
- 7 Refurbished Private Apartments (Latchmere House): 897 m^2 GIA

2.2 Approach to energy and sustainability strategy

This report is structured as follows:

- Section 3 summarises the regulatory and planning context which has informed the energy and sustainability strategy for the site.
- Section 4 describes the energy strategy and approach to carbon reduction, following the Mayor's energy hierarchy to describe passive design and energy efficiency measures currently considered for the new and refurbished areas. An estimate of energy demand, and a feasibility appraisal of district energy, Combined Heat and Power (CHP), and low/zero carbon (LZC) energy sources is included.
- Section 5 describes the sustainability strategy and measures proposed applied from site selection through to design, construction and operation of the scheme. This section also includes a summary of the approach to environmental assessment methodologies (BREEAM Domestic Refurbishment and Code for Sustainable Homes).

Further details are provided in Appendices for the BREEAM Domestic Refurbishment (BREEAM DR) and Code for Sustainable Homes (CfSH) pre-assessments, as well as preliminary Part L modelling:

- Appendix A: Preliminary Part L modelling inputs and results report
- Appendix B: Code for Sustainable Homes pre-assessment
- Appendix C: BREEAM Domestic Refurbishment pre-assessment
- Appendix D: LBRuT Sustainable Construction Checklist

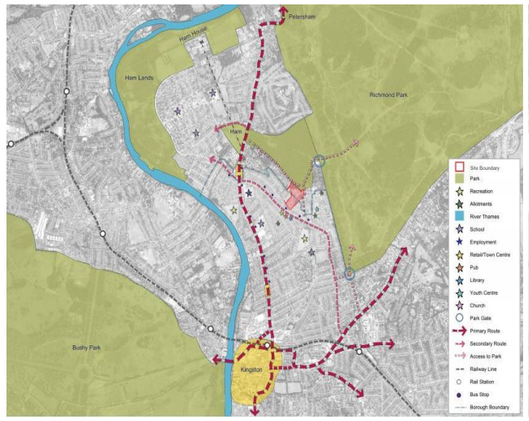


Figure 2.1: Context Plan – source: Latchmere House and HM Remand Centre Planning Brief

Figure 2.2: Latchmere House – source: Latchmere House and HM Remand Centre Planning Brief

Figure 2.3: Proposed Site Plan (marked up to show plant strategy) – source: MAA Architects

3.0 Planning and regulatory framework

3.1 Building Regulations Part L

On a national level, the leading requirement applicable to the project's energy strategy is Part L of the Building Regulations: L1A for the new build elements, and L1B for the refurbished areas. Under Building Regulations Approved Document Part L: Conservation of Fuel and Power (2010), compliance is achieved for new buildings by demonstrating that the Dwelling Emission Rate (DER) does not exceed the Target Emission Rate (TER).

The Government has announced targets for the updated to Part L to be implemented in April 2014. The target for residential units (sector-wide) will be increased by 6% compared to Part L 2010 levels.

For refurbished areas, and depending on the extent of the refurbishment, requirements vary and include minimum standards for new or replaced elements, requirements for upgrade of retained elements to minimum standards, and potentially the requirement for consequential improvements.

3.2 National Planning Guidance

The National Planning Policy Framework, March 2012

The National Planning Policy Framework (NPPF) was published in March 2012 and has superseded all Planning Policy Statements (PPS) and Planning Policy Guidance (PPG) documents, with the exception of PPS10 (Waste). The NPPF sets out the Government's strategy on the delivery of sustainable development.

The NPPF places responsibility for policy making with the Local Planning Authority, who shall communicate their policies through Local Plans and facilitate the creation of Neighbourhood Plans. The NPPF states that there is a presumption in favour of sustainable development. The following is extracted from paragraph 14 of the NPPF:

"For decision-taking this means: approving development proposals that accord with the development plan without delay; and where the development plan is absent, silent or relevant policies are out of date, granting permission unless:

- *any adverse impacts of doing so would significantly and demonstrably outweigh the benefits, when assessed against the policies in this Framework taken as a whole; or*
- *specific policies in this Framework indicate development should be restricted."*

In respect of energy policy contained within the NPPF, paragraph 96 sets out that:

"In determining planning applications, local planning authorities should expect new development to:

- *comply with adopted Local Plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and*
- *take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption."*

3.3 Spatial Development Strategy

The London Plan, 2011

London-wide policy is contained within the London Plan 2011. The London Plan Policy 5.2 (Minimising Carbon Dioxide Emissions) states that developments should make the fullest contribution to minimising carbon dioxide emissions in accordance with the energy hierarchy: be lean, be clean, be green.

The policy outlines targets for improvements on 2010 Building Regulations for CO_2emissions. For new developments, a 25% improvement on 2010 Building Regulations should be achieved between 2010 and 2013. This rises to 40% improvement between 2013 and 2016.

London Plan Policy 5.7 states that major development proposals should provide a reduction in expected CO_2 emissions through the use of on-site renewable energy technology, where feasible. Paragraph 5.42 states that there is a presumption that all major development proposals should seek to reduce CO_2 emissions by at least 20% through the use of on-site renewable energy generation, where feasible.

For refurbished developments the Mayor's target is for the environmental impact of existing buildings to be reduced through policies and programmes that bring existing buildings up to the Mayor's standards on sustainable design and construction (policy 5.4).

Policy 7.8 of the states that *"Development affecting heritage assets and their settings should conserve their significance, by being sympathetic to their form, scale, materials and architectural detail."*

Please refer to section 4 for a description of the carbon reduction strategy, structured around the energy hierarchy i.e. 'be lean' (including energy efficiency improvements), 'be clean', 'be green'.

3.4 Local Planning Policy

London Borough of Richmond upon Thames Core Strategy, adopted April 2009

The local policies for Energy and Sustainability applicable to the Proposed Development are set out in Policies CP1-CP6 – For a Sustainable Future, with policies CP2 and CP3 most pertinent for this strategy.

Policy CP2 states the following:

2.A The Borough will reduce its carbon dioxide emissions by requiring measures that minimise energy consumption in new development and promoting these measures in existing development, particularly in its own buildings.

2.B The Council will require the evaluation, development and use of decentralised energy in appropriate development.

2.C The Council will increase the use of renewable energy by requiring all new development To achieve a reduction in carbon dioxide emissions of 20% from on – site renewable energy

Generation unless it can be demonstrated that such provision is not feasible, and by promoting Its use in existing development.

Policy CP3 states the following:

3.A Development will need to be designed to take account of the impacts of climate change over its lifetime, including:

- *Water conservation and drainage*
- *The need for summer cooling*
- *Risk of subsidence*
- *Flood risk from the River Thames and its tributaries*

London Borough of Richmond upon Thames Sustainable Construction Checklist Guidance Document, adopted August 2011

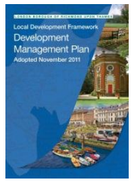
This Sustainable Construction Checklist SPD forms part of the assessment for planning applications for new build, conversion and retrofit properties within the London Borough of Richmond upon Thames. Please refer to Appendix D for a completed version of his checklist for the proposed development.

The Checklist forms a mandatory part of the planning application for the following classes of development:

- All new residential development providing 1 or more new dwellings, including conversions and extensions that create one or more new dwellings.
- *All new non-residential development providing 100m^2 or more floor area, including extensions over 100m^2.*

The Checklist covers a range of sustainability issues, from energy consumption to site accessibility.

London Borough of Richmond upon Thames Local Development Framework – Development Management Plan, adopted November 2011



The DMP includes the detailed policies which will be used when new developments are considered. The DMP takes forward the strategic objectives in the Core Strategy and is consistent with it and with National and Regional Policies. It also takes into account emerging policies. The following policies are relevant ot this report:

Policy DM SD1 states the following:

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.

They also must achieve a minimum 25 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 from 2016.

Policy DM SD2 states the following:

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 SD4 states the following:

Adapting to Higher Temperatures and Need for Cooling

All new developments, in their layout, design, construction, materials, landscaping and operation, are required to take into account and adapt to higher temperatures, avoid and mitigate overheating and excessive heat generation to counteract the urban heat island effect, and meet the need for cooling.

All new development proposals should reduce reliance on air conditioning systems and demonstrate this in accordance with the following cooling hierarchy:

1 minimise internal heat generation through energy efficient design

2 reduce the amount of heat entering a building in summer through shading, reducing solar reflectance, fenestration, insulation and green roofs and walls

3 manage the heat within the building through exposed internal thermal mass and high ceilings

4 passive ventilation

5 mechanical ventilation

6 active cooling systems (ensuring they are the lowest carbon options). Opportunities to adapt existing buildings, places and spaces to manage higher temperatures should be maximised and will be supported.

Policy DM HD3 states the following:

Buildings of Townscape Merit

1 The Council will seek to ensure and encourage the preservation and enhancement of Buildings of Townscape Merit and will use its powers where possible to protect their significance, character and setting, by the following means:

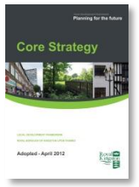
2 consent will not normally be granted for the demolition of Buildings of Townscape Merit;

3 alterations and extensions should be based on an accurate understanding of the significance of the asset including the structure, and respect the architectural character, and detailing of the original building. The structure, features, and materials of the building which contribute to its architectural and historic interest should be retained or restored with appropriate traditional materials and techniques;

4 any proposals should protect and enhance the setting of Buildings of Townscape Merit;

5 taking a practical approach towards the alteration of Buildings of Townscape Merit to comply with the Disability Discrimination Act 2005 and subsequent amendments, provided that the building's special interest is not harmed, using English Heritage advice as a basis.

Royal Borough of Kingston upon Thames Core Strategy, adopted April 2012



The local policies for Energy and Sustainability applicable to the Proposed Development are set out in Policies CS1 (Climate Change Mitigation), CS2 (Climate Change Adaptation), DM1 (Sustainable Design and Construction Standards), DM2 (Low Carbon Development), DM3 (Designing for Changing Climate), DM4 (Water Management and Flood Risk), and DM6 (Biodiversity). The main headlines form the most pertinent policies are set out below.

Policy CS1 states the following:

The Council will:

1 Ensure that all development (including extensions, refurbishments and conversions) is designed and built to make the most efficient use of resources, reduce its lifecycle impact on the environment and contribute to climate change mitigation and adaptation by:

- *Reducing CO_2 emissions during construction and throughout the lifetime of the development*
- *Building to the highest sustainable design and construction standards*
- *Minimising water consumption*
- *Using sustainable materials*
- *Reducing levels of pollution; air, water, noise and light*
- *Planning for increased flood risk*

2 Optimise opportunities for retrofitting existing buildings with energy efficiency measures and low and zero carbon energy technologies.

Policy CS2 states the following:

The Council will:

1 adapt to the effects of current and predicted climatic changes by working with its partners to develop a Climate Change Adaptation Strategy which will identify priorities for the Borough and future work programmes

2 work towards minimising the urban heat island effect and prioritise areas

3 ensure that future development takes into consideration the following:

- *hotter summers and therefore increased cooling demands*
- *warmer, wetter winters and increased flood risk*
- *water shortages and drought*
- *urban heat island effect*
- *subsidence*

Policy DM1 states the following:

The Council will require all new residential developments to achieve successively higher levels of the Code for Sustainable Homes Level category for energy / CO2 in accordance with the following timeline:

- *Up to 2016: Code for Sustainable Homes Level 4*
- *From 2016: Code for Sustainable Homes Level 6*
- *Major developments should meet Code level 5 from 2013*

Residential developments are encouraged to meet the other Code for Sustainable Homes Level categories (water, materials, surface water run-off and waste) as well.

Policy DM2 states the following:

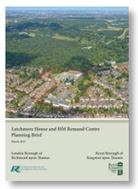
The Council will consider all applications for independent renewable energy installations favourably, subject to other Core Strategy policies.

The development of energy generating infrastructure will be fully encouraged by the Council providing that any opportunities for generating heat simultaneously with power are fully exploited.

Policy DM3 states the following:

> *Design proposals should incorporate climate change adaptation measures based on the type and extent of the main changes expected in the local climate throughout the lifetime of the development, this is likely to require a flexible design that can be adapted to accommodate the changing climate, e.g. provision of additional shading or cooling.*

Latchmere House and HM Remand Centre Planning Brief, March 2013



This Planning Brief has been jointly prepared by the London Borough of Richmond upon Thames (LBRuT) and The Royal Borough of Kingston upon Thames (RBKuT) for the Latchmere House site.

Of particular note for this report are the sections on Heritage and Conservation, and Sustainability which state:

Heritage and Conservation:

> *Both Councils consider it is essential that Latchmere House is restored and the setting enhanced as part of any redevelopment proposals. This includes the retention of any historic features that refer to the building's previous use and/or any other references within the development to the site's historical use. The Councils will seek to ensure the Buildings of Townscape Merit are retained and incorporated into any new development*

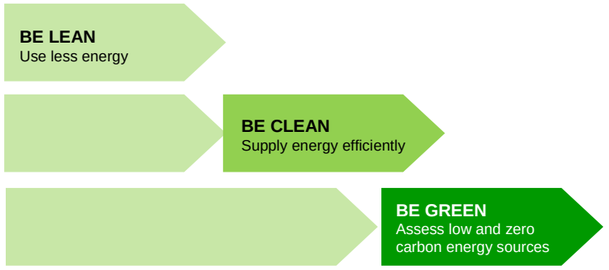
Sustainability

> *The Councils expect developers to embrace the opportunity for sustainable development through:*
>
> - *the efficient use of resources including land, water and energy*
> - *reducing carbon dioxide emissions*
> - *using renewable technologies and local power generation*
> - *sustainable drainage systems such as swales and soakaways*
> - *re-cycling waste and generally assisting in reducing any long term adverse environmental impacts of development*
>
> *Any sustainability measures should be in accordance with LBRuT policies CP1-3 and DM SD1, SD2, SD4, SD5 and the Sustainable Construction Checklist SPD 2011; and RBKuT policies CS1, CS2 and DM 1-4. LBRuT policies require new homes as part of a major application to achieve a minimum 40 per cent reduction in carbon dioxide emissions over Building Regulations (2010) from 2013-2016 and 'zero carbon' standards (2) from 2016 in line with the London Plan (2011). In order to meet the GLA's London Housing SPG (2012) standards however all new residential developments should seek to achieve a minimum of Code Level 4. RBKuT policies require Code Level 4-5 to be met for the energy/carbon dioxide emissions category on major residential applications from 2013.*

It should be noted here that neither LBRuT nor RBKUT have a specific requirement for BREEAM Domestic Refurbishment (DR), as this is a fairly recent scheme which replaces the previous Ecohomes schemes (referred to in LBRuT's guidance). It has been estimated by the design team that the target of BREEAM DR Excellent is equivalent to or better than the required Ecohomes rating of Excellent as required by LBRuT in their Core Strategy guidance.

4.0 Energy Strategy

The energy strategy for both sites will follow the principles of the energy hierarchy when reducing carbon emissions: Be Lean – Be Clean – Be Green.



4.1 Be Lean – Passive Design and Energy Efficiency

New built areas

The development will demonstrate best practice performance for fabric and services, and there is a target for the new-build parts to exceed Part L of the Building Regulations 2010 from passive design and energy efficiency alone, before the incorporation of Low and Zero Carbon technologies (LZCs). The method by which this will be achieved is outlined below:

- New built residential units: Targeting approximately 14-18% improvement over Part L 2010 before incorporation of CHP and LZCs, as area weighted average.
- This passive design and efficiency target will be achieved through careful consideration of building design, high-performance façade, and high-efficiency services for hot water and space heating. All new dwellings will be provided with Mechanical Ventilation with Heat Recovery (MVHR) units. Please refer to Appendix A for further details of this.
- All houses and apartments will be provided with openable windows. These will be relied upon to satisfy Part L Criterion 3 (summer overheating), taking into account that security constraints mean windows on the ground floor will be on a security latch. Although staircases within houses are zoned as per fire regulations, fire doors do not have to be self-closing and therefore cross ventilation between floors within houses can be relied upon to mitigate overheating. Light coloured blinds will be used within all new built apartments (with the understanding that these are to be provided by the developer) and a selection of single aspect apartments on the ground floor may require increased thermal mass to internal finishes to satisfy Part L Criterion 3. This will be further investigated at the detailed design stage.
- The facades are designed with reasonable proportions of glazing to allow good daylight levels and beneficial winter solar gains, while reducing the risk of excessive summer solar gains (see figure 4.1).

Preliminary Part L modelling has been carried out for a selection of residential units to inform the façade design and services selection – please refer to the summary report in Appendix A for details of the assumptions on envelope and services, and results.

Figure 4.1: Elevation demonstrating proportions of glazing at front of typical new-build houses (Examples shown: house type F3, affordable blocks C and B.)

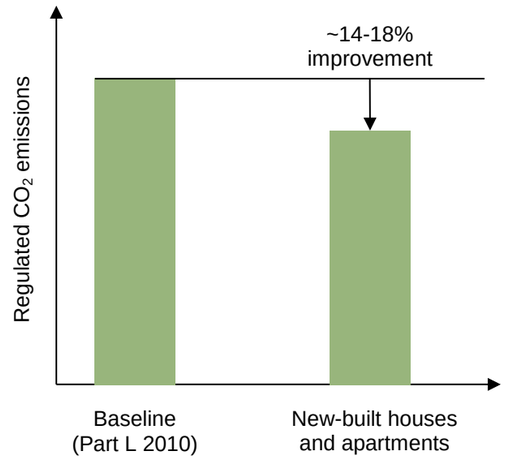


*Figure 4.2: CO_2 emissions targets proposed for **new-built areas (houses and apartments)** before the incorporation of LZCs*

Refurbished areas

The options available for improvement to the building envelope have been investigated with the heritage specialist. The proposed apartment conversion has been discussed with LBRuT's Principal Conservation Officer, and this has informed the approach.

From a **fabric efficiency** perspective, the main measures being considered are currently as follows:

- Insulation added to ground / basement slabs
- Insulation added to roofs
- Internal wall insulation – where appropriate in design terms
- Windows: New heritage sash style windows are proposed throughout, providing carbon benefits as well as thermal and acoustic comfort improvements for the residents.

Preliminary Part L modelling pre- and post-refurbishment has been carried out on a sample of the refurbished residential units to inform the design – please refer to Appendix A for details. Note that, due to the nature of the building, calculations have been based on Appendix S of the SAP Guidance, using assumptions on information such as the age and construction of the building. These will need to be reviewed as the design progresses. The current estimated CO_2 reduction possible for Latchmere House is described below:

- Initial calculations indicate that an approximate 40-50% reduction in CO_2 emissions could be achieved for refurbished residential units from passive design and energy efficiency alone, before the incorporation of Low and Zero Carbon technologies (LZCs).

The proposed ventilation strategy for the refurbishment is natural ventilation; however at detailed design stage a further assessment of comparable benefits between MVHR and natural ventilation will be undertaken based on airtightness levels expected post-refurbishment.

While MVHR is considered the most energy efficient strategy in modern, highly airtight buildings, its implementation should be carefully assessed in existing buildings where air leakage rates, even after refurbishment improvements, may in themselves ensure that sufficient background ventilation rates are achieved. Bearing this in mind, the implementation of MVHR units (i.e. the incorporation of additional fan-driven ventilation) may, in some instances, lead to an *increase* in overall energy consumption.

A **significant improvement in carbon emissions is expected through the incorporation of new services**, as all areas will be served by new services for hot water, space heating, and lighting.

Certain **heritage considerations** will be considered, such as the aspiration to retain any original features that refer to the building's previous use and / or any other references within the development to the site's previous use.

Specific to this site there are two particular rooms where it has been decided not to alter the wall fabric due to existing internal features in these rooms, based on advice from a heritage consultant. These rooms are shown on the below plan.

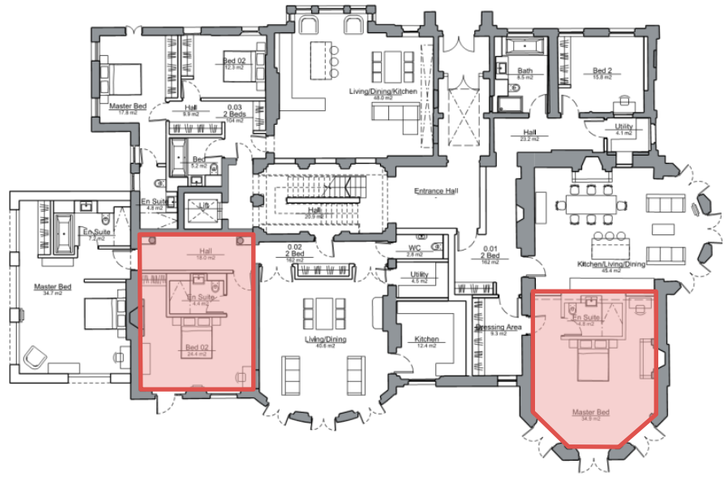


Figure 4.3: Existing rooms where the wall insulation is influenced by heritage considerations

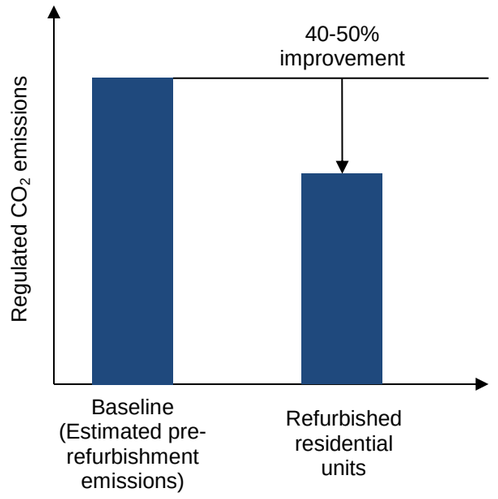


*Figure 4.4: CO_2 emissions targets for **refurbished areas** before the incorporation of LZCs*

4.2 Energy Demand Appraisal – 'Lean Scheme'

Energy consumption benchmarks

Samples of dwellings of various orientations and sizes have been modelled in a preliminary study to give an initial overview of the energy performance levels that are expected to be achieved across the development:

- Proposed new-build residential units have been modelled using the SAP Methodology to assess a sample of dwellings, based on information provided by the design team. Modelling has been carried out using the approved *NHER Plan Assessor software version 5.5.4.1* – see Appendix A for details.
- Refurbished flats have been modelled pre- and post- refurbishment using SAP Appendix S as a benchmark for pre-refurbishment performance and proposed improvements for post-refurbishment performance. Modelling has been carried out using the approved *NHER Plan Assessor software version 5.4.2* – see Appendix A for details
- An area-weighted average of these figures has then been produced to give an initial indication of the energy performance of the proposed development.

The performance for each type of dwelling, before the incorporation of CHP or renewables is:

- **New private and affordable houses are currently expected to be ~16-17% better than Part L 2010,**
- **New built apartments are currently expected to be ~14% better than Part L 2010,**
- **Refurbished flats are currently expected to be ~40-50% better than pre-refurbishment.**

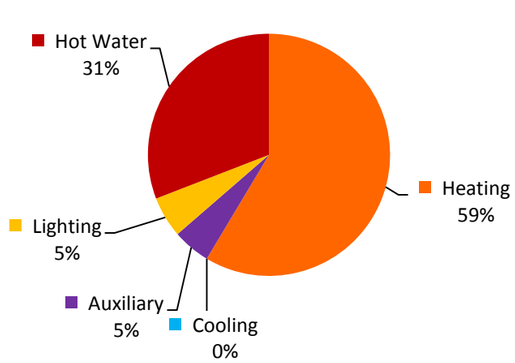
Table 4.1: Area-weighted Energy Consumption Benchmarks

Dwelling Type	Area m^2 GIA	Gas consumption for space heating kWh/m^2.yr	Gas consumption for Hot Water kWh/m^2.yr	Electricity consumption for pumps and fans kWh/m^2.yr	Electricity consumption for lighting kWh/m^2.yr	Electricity consumption for unregulated electricity kWh/m^2.yr
New Build houses	11,030	31	15.1	3.1	3	17.4
Refurbished apartments (Latchmere House)	897	102.6	22.7	1.2	3.7	26.6
New build apartments: Block A	466	28.6	32.4	2.8	4.4	32.8
New build apartments: Block B	1,140	29.1	31.9	2.8	4.5	32.3
New build apartments: Block C	480	30.5	31.7	2.8	4.4	32.1
Affordable Houses	710	32.5	29.0	3.7	4.0	29.5

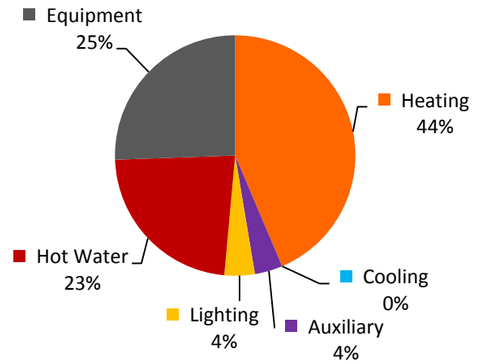
4.3 Assessment of energy consumption and CO_2 emissions

Energy consumption

The below tables and pie charts summarise the estimated consumption breakdown based on the benchmarks listed above.



Site wide energy consumption breakdown (regulated only)



Site wide energy consumption breakdown (regulated and unregulated)

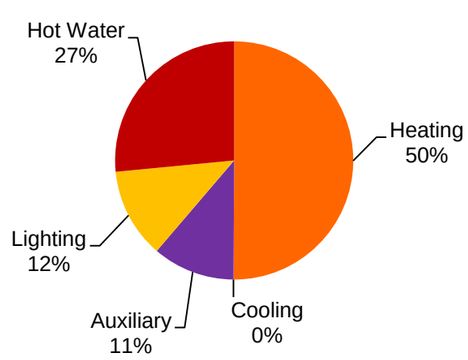
Table 4.2: Area-weighted Estimated Energy Consumption Breakdown

Dwelling Type	Gas consumption for space heating kWh/yr	Gas consumption for Hot Water kWh/yr	Electricity consumption for pumps and fans kWh/yr	Electricity consumption for lighting kWh/yr	Electricity consumption for unregulated electricity kWh/yr
New Build houses	340,000	166,600	34,700	33,000	192,000
Refurbished apartments (Latchmere House)	92,000	20,300	1,100	3,400	23,900
New build apartments: Block A	13,300	15,100	1,300	2,000	15,300
New build apartments: Block B	33,200	36,400	3,200	5,100	36,800
New build apartments: Block C	14,600	15,200	1,400	2,100	15,400
Affordable Houses	23,000	20,600	2,600	2,900	20,900

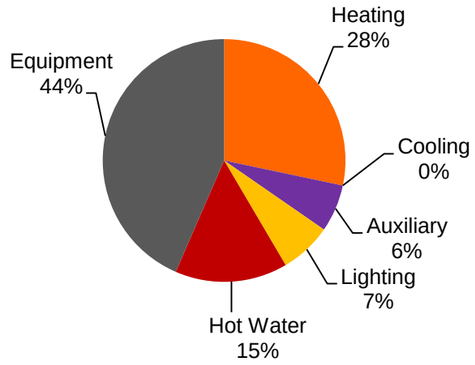
CO_2 emissions

The adjacent table and pie charts show the predicted carbon dioxide emissions for the development. These have been calculated using the following carbon dioxide emission factors (source: Part L 2010):

- Natural gas: 0.198 kgCO2/kWh
- Grid supplied electricity: 0.517 kgCO2/kWh



Site wide energy consumption breakdown (regulated only)



Site wide energy consumption breakdown (regulated and unregulated)

Table 4.3: Area-weighted Estimated CO_2 Emissions Breakdown

Space Use	CO_2 emissions from gas for space heating	CO_2 emissions from gas for Hot Water	CO_2 emissions from electricity for pumps and fans	CO_2 emissions from electricity for lighting	CO_2 emissions from electricity for unregulated electricity
	$kgCO_2/yr$	$kgCO_2/yr$	$kgCO_2/yr$	$kgCO_2/yr$	$kgCO_2/yr$
New Build houses	67,800	33,000	18,000	17,100	99,300
Refurbished apartments (Latchmere House)	18,200	4,000	500	1,700	12,300
New build apartments: Block A	2,600	3,000	700	1,000	7,900
New build apartments: Block B	6,600	7,200	1,700	2,600	19,000
New build apartments: Block C	2,900	3,000	700	1,100	8,000
A1 Affordable Houses	4,600	4,100	1,400	1,470	10,800

4.4 Be Clean – Community Energy and CHP

Combined Heat and Power (CHP) has been considered for the site.

A factor that has to be taken into account is the heat loss through distribution pipework if a central CHP were to be implemented, due to the low-density layout of the site with detached, semi-detached and terraced houses spread over a relatively large area. However, on the part of the site where apartment blocks are located the density of the layout is higher, and therefore a CHP would be more viable for this part of the site.

It has been considered whether a CHP could serve the private Latchmere House apartments as well as the new-built affordable apartments. Contractually it is complicated serving private dwellings and dwellings (with landlord arrangements) due to the billing systems and metering requirements. However, the affordable houses are also placed on the same part of the site, which would have similar landlord arrangements as the apartments, and it was therefore decided to serve these houses by the CHP as well.

Based on these considerations it has been deemed that a block boiler serving the Latchmere House apartments will be the most appropriate method of providing heating and hot water to this part of the scheme.

A CHP unit sized to meet 100% of domestic hot water (DHW) and a small proportion of the space heating (SH) load for affordable houses would be expected to result in carbon emission savings of approximately ~23% for the affordable housing areas after the incorporation of passive design and energy efficiency measures. The system is expected to run for up to 19 hours per day. The current estimated size of CHP is small, and is not estimated to be able to cover any more of the SH load. The next bigger size of CHP unit readily available in the market is currently assessed to be too large to be run efficiently at this development.

This carbon saving is expected to be equivalent to site wide carbon emission savings of approximately ~3-4% after the incorporation of passive design and energy efficiency measures.

Table 1.4: Estimated CHP outputs

CHP	Efficiency (thermal and electrical combined)	Estimated annual running	Estimated annual thermal output	Estimated annual elec. output	Estimated net annual CO_2 savings	Estimated net annual CO_2 reduction on energy efficient scheme
	%	hours	(kWh/yr)	(kWh/yr)	($kgCO_2$/yr)	(Regulated only)
System size estimated: 10 kWe	75	5,300	90,600	52,300	10,300	~23% for affordable units (equivalent to ~3-4% site-wide)

Decentralised Energy Networks

As presented in sections 3.3 and 3.4, regional and local Development Plan policies are in favour of decentralised energy networks, where feasible.

The map presented here is taken from the London Heat Map (http://www.londonheatmap.org.uk/Mapping/).

The proposed development site is indicated by the yellow circle in Figure 4.5 below.

The areas shaded purple indicate 'opportunity areas'. No existing or proposed sites can be seen on the map section given here.

It is evident that the proposed development site is not directly in the vicinity of existing or proposed networks. As such, it is considered that at this time, a connection to a district heat network is not feasible.

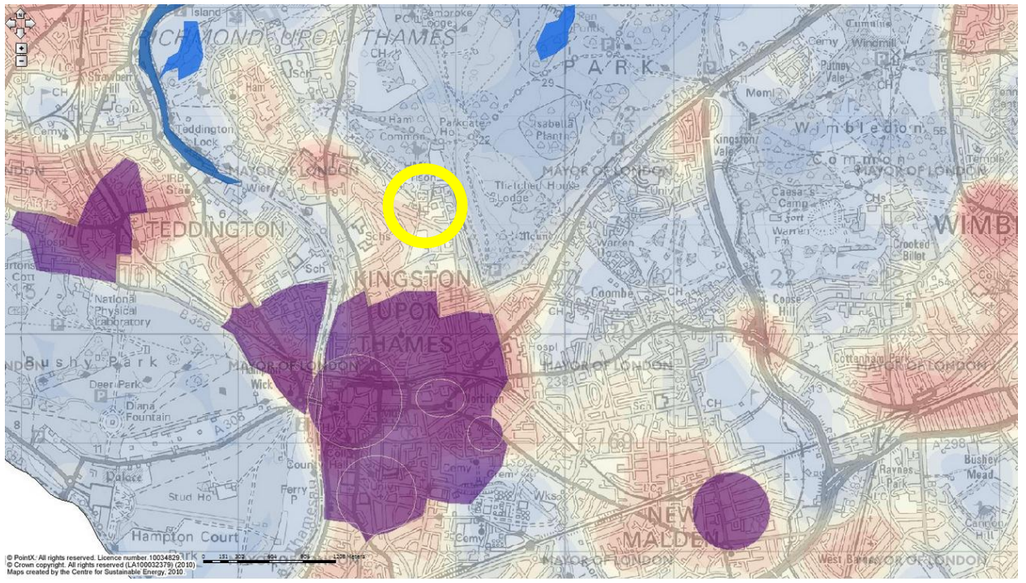
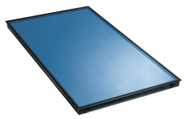
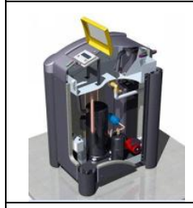


Figure 4.5: London Heat Map – Site shown with yellow circle

4.5 Be Green – Renewable Energy

The table below provides an appraisal of the renewable technologies that can be considered for the proposed development.

Table 4.4: Overview of LZC feasibility appraisal

-	Low and Carbon Technology Option	System size assessed	Feasibility at Latchmere Development	Estimated annual thermal output (kWh/yr)	Estimated annual electrical output (kWh/yr)	Estimated net annual CO_2 savings ($kgCO_2$/yr)	Estimated net CO_2 reduction (Regulated, % compared to energy efficient scheme with CHP)	Comments
	**Photovoltaic Electricity Generation** Photovoltaic modules use the photovoltaic effect to generate electricity directly from sunlight. Roof mounted PVs: 30° tilted south	80-85 kWp (estimated ~580m^2 net panel area)	✓	-	68,600	36,300	18-19%	Sized to meet roof availability and carbon emission savings targets. The provision of PV panels will be subject to a detailed assessment of roof layouts by a PV installation specialist at detailed design stage.
	**Solar Water Heating** Solar water heating systems use energy from the sun to pre-heat domestic hot water. Solar water heating systems are generally composed of solar thermal collectors and a fluid system to move the heat from the collector to a storage tank in order to store the heat for subsequent use.	270 m^2	✗	107,400	-	22,200	~11%	Sized to provide 80% of the Domestic Hot Water in summer. Review of available roof space indicates that solar thermal could be a viable option, however they would compete for space with the PVs units, which are proposed for this development.
	**Ground Source Heat Pump** Ground source heat pumps can be used to extract heat from the ground by circulating a fluid through a system of pipes to a heat exchanger which transfers the energy to the distribution network. They have the advantage that they can act as a source of both heating and cooling for buildings. Ground source heat pumps are either open-loop (extracting and rejecting water to the aquifer below the site) or closed-loop.	340 kW (to provide ~40% of space heating for the site)	✗	200,300	0 (No cooling proposed for site)	15,200	~8%	GSHP would be best implemented as a site wide strategy. As such, it has been discarded for the same reasons as CHP. It would not be viable to provide a separate system for each house in the development to tie in with the individual systems proposed. Further, as cooling is not proposed for the development it would not be possible to balance the system.
	**Biomass** Biomass heating systems combust biomass material in a biomass boiler in order to heat water in the same way that gas boilers combust gas. Biomass heating approaches a carbon neutral process. Biomass boilers require storage adjacent to the boiler to be provided. The fuel is then delivered on a regular basis.	180kW (to provide 100% of the DHW and 30% of the space heating for the site)	✗	412,800	-	79,100	~40%	Biomass would be best implemented as a site wide strategy. As such, it has been discarded for the same reasons as CHP. Refer to Section 4.4 for more details. Further implications which would have to be considered are the detrimental impact on transport and air quality for the site, and the need for storage space for wood chips / pellets.
	**Wind Power** Wind turbines use the wind's forces to turn a rotor which generates electricity. Wind power is used in large scale wind farms for national electrical grids as well as in small individual turbines or building integrated turbine.	5 No. 6kW turbines (vertical axis type)	✗	-	7,900	4,200	~2%	This system would not be expected to lead to significant CO_2 savings due to wind patterns in urban locations. It is also not expected to be acceptable in a Conservation area. It is therefore not proposed.

4.6 Summary of energy strategy

In summary, the energy strategy for the Latchmere House development is as follows:

'Be Lean' strategy (Passive design and energy efficiency)

- **New-build houses**
  Passive design and energy efficiency measures have been incorporated to allow an expected ~16-17% CO_2 improvement on Part L 2010 Building Regulations (regulated emissions, as an area-weighted average) before incorporation of low or zero carbon (LZC) technologies.

- **New build apartments**
  Passive design and energy efficiency measures have been incorporated to allow an expected ~14% CO_2 improvement on Part L 2010 Building Regulations (regulated emissions, as an area-weighted average) before incorporation of low or zero carbon (LZC) technologies.

- **Refurbished areas (existing Latchmere House)**
  The design will incorporate best practice standards respectful of the building's local designation as a Building of Townscape Merit within the conservation area. It is currently expected that the refurbishment will lead to a 40-50% CO_2 improvement on the current performance baseline, to be determined as design progresses and in consultation with the conservation officer. Proposals will be developed in collaboration with the heritage specialist to identify the most appropriate energy efficiency improvements.

- **Overall targets**
  The development is expected to achieve CO_2 savings of approx. 23% over combined baseline (Part L 2010 for new-build areas, and pre-refurbishment performance for refurbished areas) through passive design and energy efficiency before the incorporation of low or zero carbon sources (LZC).

'Be Clean' strategy - Combined Heat and Power (CHP)

A CHP unit is proposed on site, serving new-built apartments and affordable houses. The unit has been sized to meet 100% of the domestic hot water (DHW) load and a small proportion of the space heating (SH) load for these areas.

This is currently expected to result in carbon emission savings of approximately 23% for the affordable houses and apartments after the incorporation of passive design and energy efficiency measures, equivalent to approximately 3-4% carbon savings site-wide.

'Be Green' strategy – Low or Zero Carbon (LZC) sources

Photovoltaic (PV) panels are proposed to be installed on new buildings on brackets on the flat parts of roofs, and in some cases on South-East facing pitched roofs, and are expected to achieve a further improvement in site-wide CO_2 emissions of approximately 18-19% after the incorporation of passive design and energy efficiency measured and CHP. A total PV panel output of 80-85 kWp (estimated to equate to ~580m^2 net panel area) is currently proposed to meet this target.

The provision of PV panels will be subject to a detailed assessment of roof layouts by a PV installation specialist at detailed design stage.

Site-wide targets

Site-wide, the development is expected to achieve CO_2 savings of approx. 40% over the combined baseline (Part L 2010 for new-build areas, and pre-refurbishment performance for refurbished areas) from a combination of passive design and energy efficiency, CHP and PVs.

Further, it is currently estimated that each new-built house, rows of houses or apartment block will achieve a minimum of 25% carbon savings (as an area-weighted average within each thermal envelope) in order to meet the mandatory requirement for Code for Sustainable Homes Level 4.

The Government has announced targets for the next update to Part L (Part L 2013) to be implemented in April 2014. The target for residential units (sector-wide) will be increased by 6% compared to Part L 2010 levels. It is currently estimated that the dwellings at the Latchmere House development will meet this updated requirement based on the estimated performance of dwellings on site, as set out in this report. This will be subject to further assessment when tools become available for assessment against Part L 2013.

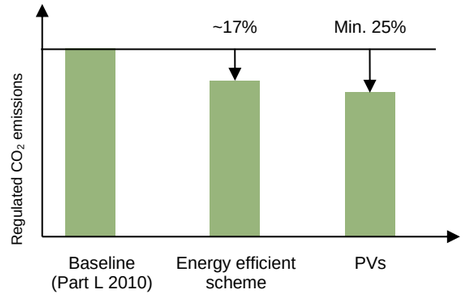


*Figure 4.7: CO_2 emissions targets proposed for **new-built private houses***

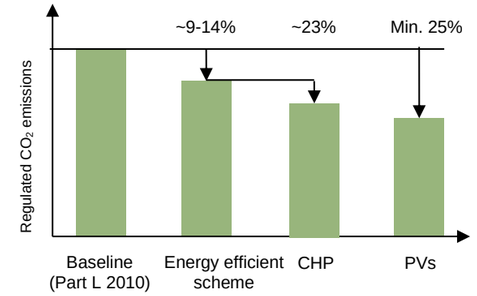


*Figure 4.8: CO_2 emissions targets proposed for **new-built affordable houses and apartments***

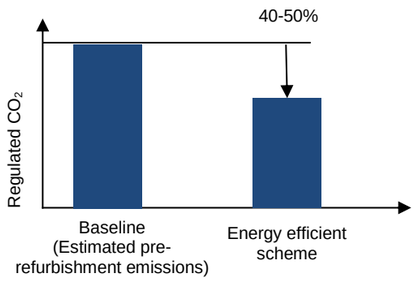


*Figure 4.10: CO_2 emissions targets proposed for **re-furbished areas***

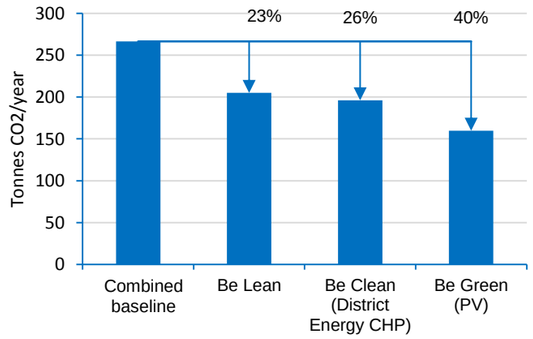


*Figure 4.11: CO_2 reduction strategy – **Site wide***

5.0 Sustainability Strategy

5.1 Site Selection

The site is located within an existing residential area, and has been previously developed.

The Proposed Development will be accessible by a choice of transport modes. The immediate area is served by bus service 371 which runs north to Richmond and south to Kingston. Bus stops are situated along Tudor Drive. The layout and design approach has been developed to encourage pedestrian access to the nearby bus stops. Public transport and cycling will be promoted to and from the developments, and the sites will include secure and sheltered bicycle parking spaces for residents.

Pedestrian and cycle access to the site and permeability through the site will be provided, in particular enabling improved access to local facilities on Tudor Drive to the south and towards Richmond Park to the north for both existing and new residents. A new pedestrian and cycle route is to be provided via Garth Road. New pedestrian links are also provided to Latchmere Lane and St Anne Boleyns Walk, improving permeability and access to the local facilities and bus stops on Tudor Drive.

Please refer to the Design and Access Statement and the Transport Assessment for further information. A Travel Plan will be produced.

5.2 Biodiversity

An ecological assessment has been undertaken for the development. Enhancements to increase the biodiversity value of the site are being incorporated as far as possible. Further details can be found in the Design and Access Statement. The development is targeting a minimum of 5 credits under the 'ecology' heading of Code for Sustainable homes (Nov. 2010 version), and the one credit available under the BREEAM Domestic Refurbishment scheme (July 2012 version). A brown roof is proposed on apartment block B. Please refer to the site's biodiversity report for further information.

5.3 Flood risk

The site is in a low flood risk zone. Surface water run-off from the site is expected to be lower than it was for the pre-development site and there will be no increase in impermeable areas. Surface water drainage on site will discharge via infiltration in to the ground as part of a SUDS strategy. A flood risk assessment has been prepared as part of this planning submission.

5.4 Construction Site Procedures

The proposed scheme will aim to minimise the generation of waste throughout demolition, construction and operational phases. Prior to demolition and construction works the contractor will be responsible for producing a Site Waste Management Plan (SWMP), which will include an estimate of the types and quantities of waste that will be produced throughout the proposed works. The plan will also highlight potential opportunities to minimise / re-use demolition waste and divert waste streams going to landfill.

The contractor will be expected to adhere to best practice guidelines for prevention of air and water pollution during construction. The contractor will furthermore monitor and set targets for energy usage, water usage and construction waste related to the site for the duration of the works.

Contractors expected to target a best practice score of no less than 35 under the Considerate Contractors Scheme.

5.5 Refuse and Recycling

A strategy to monitor, sort and recycle construction waste on site will be prepared by the contractor, and waste will be diverted from landfill where feasible. A target of minimum 85% diversion of non-hazardous waste from landfill has been set.

The central waste storage area for Latchmere House will include dedicated areas for recyclable waste in addition to what is provided for general waste. A dedicated waste recycling area will be incorporated in each dwelling.

Provision for composting will be provided for each new-build house in the development.

5.6 Materials and other Resources

Materials with low environmental impact will be implemented where feasible. Recycled, sustainably and locally sourced materials will be used where possible. A full review of the materials specified for the development will be undertaken during the detailed design development stages using the BRE's Green Guide to Specification.

5.7 Water Use

Water consumption in the development will be minimised by the specification of highly efficient water installations. There is a target for water consumption in new dwellings of no more than 105 litres/person/day, and for refurbished dwellings of no more than 117 litres/person/day, in accordance with mandatory CfSH Level 4 and BREEEAM DR 'Excellent' requirements.

Rainwater harvesting will be incorporated where feasible for irrigation of external areas.

Water metering and usage display will be provided for the refurbished dwellings.

5.8 Further Measures

Current electricity and primary heating fuel consumption data will be displayed to occupants by a correctly specified energy display device.

All white goods provided will be energy efficient in accordance with CfSH/BREEAM DR requirements.

A Home User Guide will be developed to inform occupants about the energy efficiency features of the houses and explaining the everyday use of these.

5.9 Code for Sustainable Homes and BREEAM Domestic Refurbishment Summary

The following ratings are currently targeted:

- New residences: Target of Code for Sustainable Homes Level 4. A pre-assessment has been carried out to identify the measures likely to be implemented. This currently indicates the following targets, separate for houses as apartments due to inherent design differences between these types of dwellings:
  - New private and affordable houses: 70.16% i.e. a margin of 2.16% above the minimum required for Code Level 4.
  - New apartments: 68.36% i.e. a margin of 0.36% above the minimum required for Code Level 4.

Please refer to Appendix B for details of the credits currently assumed, and a justification of the measures that cannot be implemented at this stage.

- Refurbished residences *(Latchmere House):* Aspiration to a target rating of BREEAM Domestic Refurbishment (DR) Excellent, subject to heritage constraints. A pre-assessment has been carried out to identify the measures likely to be implemented. This currently indicates a targeted score of 70.28%, i.e. 0.28% above the minimum required for Excellent. It should however be noted that a number of credits, and crucially the mandatory requirements for Excellent, cannot be detailed at this stage as they rely on a detailed site survey and detailed assessment of heritage implications. The target rating of Excellent will therefore only be achieved subject to a detailed heritage, technical and viability assessment as the design progresses and following site surveys. Should this prove unachievable, a full justification will be provided to LBRuT and RBKuT and a BREEAM DR Very Good rating will be proposed as alternative. Please refer to Appendix C for a summary of the current pre-assessment, measures not proposed at this stage, and credits particularly sensitive to the detailed site survey and heritage assessment.

Table 2: Summary of Code for Sustainable Homes and BREEAM Domestic Refurbishment targets

Energy	– Ambitious dwelling emission rate based on passive design, energy efficiency, Photovoltaic Panels, resulting in a minimum 25% CO_2 reduction on Part L 2010 for each thermal envelope and 40% site wide. – Installation of Energy Display Devices – Drying space for clothes to be incorporated in dwellings – A-rated Energy Labelled White Goods and A+ rated fridge freezers in the private dwellings. Information regarding the EU Energy Efficiency Labelling will be provided to all affordable dwellings – 100% energy efficient internal and external lighting – Provision of secure and sheltered cycle storage spaces for residents
Water	– All new residential units will target a maximum water consumption of 105 litres/person/day – All refurbished residential units will target a maximum water consumption of 117 litres/person/day – Water metering and usage display will be provided for the refurbished dwellings
Materials	– Materials will be responsibly sourced where possible. For timber products this will require FSC or similar certification, and for non-timber products that the materials have EMS certification at either the process stage or the process and extraction phases. – By means of consultation with the BRE Green Guide to Specification, the project will, as far as is practical and feasible, specify products of low environmental impact and responsible sourcing
Surface Water Run-off	– The site is in a low flood risk zone (Zone 1) – Surface water run-off from each site is not expected to be greater than it was for the pre-development sites and there is no increase in impermeable areas. All surface water drainage on site will discharge via infiltration in to the ground
Waste	– Dedicated internal storage bins for recyclable waste will be provided for each dwelling (internally). A combination of centralised and individual waste storage areas will be provided for recyclables and non-recyclables – A compliant Site Waste Management Plan will be developed. – Provision for composting will be provided for each new-build house in the development
Pollution	– Insulants with a low global warming potential (GWP < 5) to be used where possible – Boilers and CHP will be selected to have low NOx emissions
Health and Well-being	– Airborne and impact sound insulation values expected to be at least 5dB better than building regulations new dwellings, and 3dB better than pre-refurbishment values for refurbished apartments – Private and semi-private amenity spaces provided for all residents in new-build homes – Principles of Lifetime Homes to be adhered to for all new build dwellings – The development will seek to incorporate advice from the local Architectural Liaison Officer and adhere to the principles of Secured by Design for the new build residential units and to incorporate secure windows and doors in the listed buildings where required and where acceptable to heritage conservation
Management	– Home user guide to be produced on completion to give details of operation and energy performance – Main contractor to achieve a best practice score under the Considerate Constructors Scheme – Energy, water usage and waste related to each site to be monitored for the duration of the construction
Ecology	– Ecologist appointed to advise on current ecological value and possible improvements – An ecological survey has been carried out. There is not expected to be net loss of biodiversity or access to nature from the current site. – Enhancements to increase the biodiversity value of the site, including a brown roof o Block B, are being incorporated as far as possible. Please refer to the biodiversity report for further information.

6.0 Conclusion

This report describes the proposed energy and sustainability strategy for the Latchmere House development located across two boroughs in South-west London: London Borough or Richmond upon Thames and Royal Borough of Kingston upon Thames.

The Proposed Development consists of a mix of new-build and refurbished residential areas.

Reference is made to the performance of each type of area on its own, including carbon reduction targets and environmental assessment target ratings, as well as to their combined performance.

A holistic approach has been taken to carbon savings on site, and an ambitious target for carbon savings has been set: the carbons saving measures implemented on site are expected to lead to carbon savings of approximately 40% site-wide, compared to the combined baseline.

6.1 Carbon Reduction Strategy

The carbon reduction strategy for the development currently proposes the following targets, compared to 'baseline' schemes which would be Part L 2010 compliant for the new build areas and to an estimate of the pre-refurbishment CO_2 emissions for the refurbished areas (Latchmere House).

'Be Lean' strategy (Passive design and energy efficiency)

- New-build houses

  Passive design and energy efficiency measures have been incorporated to allow an expected ~16-17% CO_2 improvement on Part L 2010 Building Regulations (regulated emissions, as an area-weighted average) before incorporation of low or zero carbon (LZC) technologies.

- New build apartments

  Passive design and energy efficiency measures have been incorporated to allow an expected ~14% CO_2 improvement on Part L 2010 Building Regulations (regulated emissions, as an area-weighted average) before incorporation of low or zero carbon (LZC) technologies.

- Refurbished areas

  The design will incorporate best practice standards respectful of heritage buildings and conservation area constraints. It is currently expected that the refurbishment will lead to a 40-50% CO_2 improvement on the current performance baseline, to be determined as design progresses and in consultation with the conservation officer.

Overall targets

The development is expected to achieve CO_2 savings of approx. 23% over combined baseline (Part L 2010 for new-build areas, and pre-refurbishment performance for refurbished areas) through passive design and energy efficiency before the incorporation of low or zero carbon sources (LZC).

'Be Clean' strategy - Combined Heat and Power (CHP)

A CHP unit is proposed on site, serving new-built apartments and affordable houses. The unit has been sized to meet 100% of the domestic hot water (DHW) load and small proportion of the space heating (SH) load for these areas.

This is currently expected to result in carbon emission savings of approximately 23% for the affordable houses and apartments after the incorporation of passive design and energy efficiency measures, equivalent to approximately 3-4% carbon savings site-wide.

'Be Green' strategy – Low or Zero Carbon (LZC) sources

Photovoltaic (PV) panels are proposed to be installed on new buildings on brackets on the flat parts of roofs, and in some cases on South-East facing pitched roofs, and are expected to achieve a further side-wide improvement in site wide CO_2 emissions of approximately 18-19% after the incorporation of passive design and energy efficiency measured and CHP. A total PV panel output of 80-85 kWp (estimated to equate to ~580m^2 net panel area) is currently proposed to meet this target. The provision and location of PV panels will be subject to a detailed assessment of roof layouts by a PV installation specialist at detailed design stage.

Site-wide targets

Site-wide, the development is expected to achieve CO_2 savings of approx. 40% over the combined baseline (Part L 2010 for new-build areas, and pre-refurbishment performance for refurbished areas) from a combination of passive design and energy efficiency, CHP and PVs.

Further, it is currently estimated that new-built each house or apartment block will achieve a minimum of 25% carbon savings (as an area-weighted average within each thermal envelope) in order to meet the mandatory requirement for Code for Sustainable Homes Level 4. Most dwellings will achieve substantially beyond 25% carbon savings.

The Government has announced targets for the next update to Part L (Part L 2013) to be implemented in April 2014. The target for residential units (sector-wide) will be increased by 6% compared to Part L 2010 levels. It is currently estimated that the dwellings at the Latchmere House development will meet this updated requirement based on the estimated performance of dwellings on site, as set out in this report. This will be subject to further assessment when tools become available for assessment against Part L 2013.

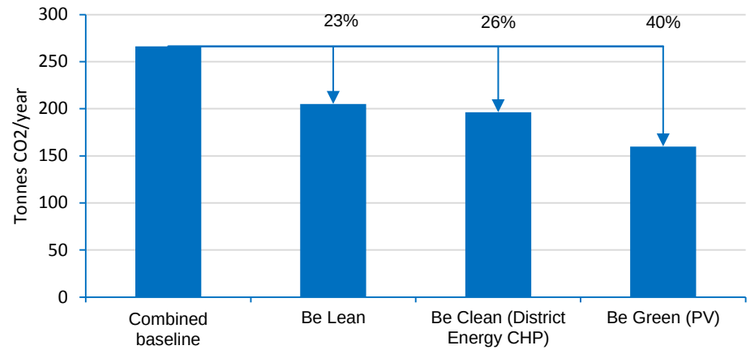


Figure 6.1: CO_2 reduction strategy – New and Refurbished Units Combined

6.2 Environmental Assessment Methods

Code for Sustainable Homes and BREEAM Domestic Refurbishment pre-assessments have been carried out which will be reviewed regularly by the team as the design progresses. Targets have been set as follows:

- **New residences: Code for Sustainable Homes Level 4.**

  A pre-assessment has been carried out to identify the measures likely to be implemented. This currently indicates the following targets, separate for houses as apartments due to inherent design differences between these types of dwellings:

  - New private and affordable houses: 70.16% i.e. a margin of 2.16% above the minimum required for Code Level 4.

  - New apartments: 68.36% i.e. a margin of 0.36% above the minimum required for Code Level 4.

- **Refurbished residences (Latchmere House): BREEAM Domestic Refurbishment (DR) Excellent** through fabric and services efficiency alone.

  - A pre-assessment has been carried out to identify the measures likely to be implemented. This currently indicates a targeted score of 70.28%, i.e. 0.28% above the minimum required for Excellent.

  The BREEAM DR target is subject to a detailed heritage, technical and viability assessment post submission of the planning application. Should this prove unachievable, a full justification will be provided to the Councils and a BREEAM DR Very Good rating will be proposed as alternative.

Pre-assessments have been undertaken based on preliminary assumptions and information provided by the design team. These preliminary assessments indicate that both targets are viable, subject to review at detailed design stage. Pre-assessments have been included in appendices B and C of this document.

7.0 Appendix A: Preliminary Part L modelling report

Latchmere House
Berkeley Homes

Preliminary Part L1A and L1B Report – Scheme 2
Rev. B

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Audit Sheet

Rev.	Description	Prepared and checked by	Reviewed by	Date
A	Issued for planning	T. Cox	L. Wille	27.09.13
B	Issued for revised planning application – scheme 2	L. Wille	R. Murray	18.12.13

Contents

1 Executive Summary

This SAP assessment has been prepared on behalf of Berkeley Homes, for the proposed residential development at Latchmere House in the London Borough of Richmond upon Thames and the Royal Borough of Kingston upon Thames, hereafter referred to as the Proposed Development.

The Proposed Development comprises of both new build houses, new built apartmentes and refurbished apartments (within the existing Latchmere House). NHER version 5.4.2 has been used for the modelling of refurbished elements, and version 5.5.4.1 used for the modelling of new-built residences described in this report.

1.1 Assessment of Building Regulations compliance

This report tests preliminary compliance with Building Regulations Part L for a sample of dwellings as follows:

New Build Private Houses: Building Regulations Part L1A

a) Carbon emissions compliance (Part L Criterion 1)

The Criterion 1 results of the sample of houses have been area-weighted across houses in the development. Using the assumptions stated in this report, and on an area-weighted average basis across the whole development, the new houses are expected to pass Part L1A 2010 carbon emissions compliance requirements (Criterion 1) by approximately 18%, before the incorporation of Low and Zero Carbon technologies (LZC).

b) Limiting the effects of solar gains in summer compliance (Part L Criterion 3):

In terms of overheating risk (Criterion 3), it is proposed that compliance is achieved with the use of internal dark-coloured blinds (as the default setting in SAP since it is not known what blinds or curtains will be used) and natural ventilation via openable windows.

New Build Affordable Houses: Building Regulations Part L1A

a) Carbon emissions compliance (Part L Criterion 1)

The Criterion 1 results of the sample of houses have been area-weighted across houses in the development. Using the assumptions stated in this report, and on an area-weighted average basis across the whole development, the new houses are expected to pass Part L1A 2010 carbon emissions compliance requirements (Criterion 1) by approximately 9%, before the incorporation of Low and Zero Carbon technologies (LZC).

b) Limiting the effects of solar gains in summer compliance (Part L Criterion 3):

In terms of overheating risk (Criterion 3), it is proposed that compliance is achieved with the use of internal dark-coloured blinds (as the default setting in SAP since it is not known what blinds or curtains will be used) and natural ventilation via openable windows.

New Build Apartments: Building Regulations Part L1A

a) Carbon emissions compliance (Part L Criterion 1)

The Criterion 1 results of the sample of dwellings have been area-weighted across the apartments in the development. Using the assumptions stated in this report, and on an area-weighted average basis across the whole development, the new apartments are expected to pass Part L1A 2010 carbon emissions compliance requirements (Criterion 1) by approximately 14%, before the incorporation of Low and Zero Carbon technologies (LZC).

b) Limiting the effects of solar gains in summer compliance (Part L Criterion 3):

In terms of overheating risk (Criterion 3), it is proposed that compliance is achieved with the use of internal light-coloured blinds (with the understanding that these are to be provided by the developer) and natural ventilation via openable windows. Further, some apartments may need to implement a higher degree of thermal mass in order to meet the overheating criterion. This will be assessed further at detailed design stage.

Refurbished Apartments: Building Regulations Part L1B

In order to indicate compliance with Part L1B, SAP 2009 calculations were undertaken to determine the estimated pre-refurbishment Energy Efficiency Rating (EER) (using input values from SAP Appendix S in accordance with SAP methodology) and the estimated proposed post-refurbishment EER based on the proposed building services design and proposed fabric improvements as agreed with the team (i.e. new internal insulation where allowed, new windows, new floor and roof insulation, and an estimate of improvement to the fabric air tightness). Calculations indicate that the proposed refurbishment EER is estimated to be higher than the pre-refurbishment values for those of the sample apartments, meaning that the proposed post-refurbishment apartments have lower estimated carbon emissions than the pre-refurbishment apartments.

The preliminary Part L calculations carried out on a sample of the Latchmere House refurbished residences pre- and post -refurbishment estimate that proposed fabric and services improvements alone would bring an estimated 40-50% improvement in CO_2 emissions over the estimated pre-refurbishment performance.

1.2 Environmental Assessment Methods: Assessment of compliance with the relevant credits

A number of credits under the Code for Sustainable Homes and BREEAM Domestic Refurbishment rely on modelling results to assess the number of credits available.

Code for Sustainable Homes (Nov 2010) Ene 2 – Fabric Energy Efficiency credit

This analysis assesses the number of credits achievable for Fabric Energy Efficiency Standard (FEES) under the Code for Sustainable Homes (credit Ene 2) to inform the design and targeting of Code credits. The analysis has shown that between 6 and 8 credits are currently expeced to be achievable for the houses assessed, and 3-8 credits are estimated to be achievable for apartments.

BREEAM Domestic Refurbishment Ene 2 – Energy efficiency rating post refurbishment

This analysis also assesses the number of credits achievable for the energy efficiency rating post-refubishment (credit Ene 2) to inform the design and targeting of BREEAM DR credits. The minimum requirement is to achieve an EER of 70. All of the assessed apartments are estimated to meet this requirement.

2 Methodology

Figures 2.1 - 2.4 below depict the sample of dwellings tested in this report. This analysis was undertaken based on the architect's drawings as listed in the sections 4.1 and 5.1 using the National Home Energy Ratings (NHER) software version 5.5.4.1 for new dwellings, and version 5.4.2 for refurbished apartments. 3 apartment blocks are proposed on site, labeled Block A, block B and Block C respectively. A sample of apartments in two of the blocks (A&B) have been modelled, and results interpolated to also cover Block C.

Apartment layouts have since changed slightly, and the area weighting has been updated to reflect this, however it is estimated that the current modelling is still a good representation of the apartments proposed.

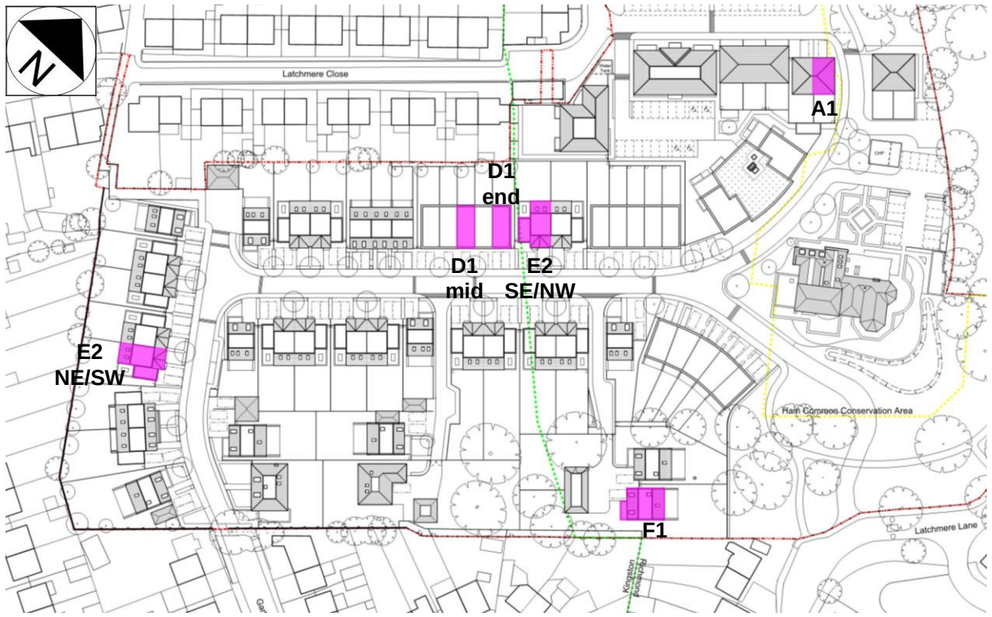


Figure 2.1: Tested proposed new houses at the Proposed Development

Figure 2.2: Tested proposed new apartments at the Proposed Development Block A

Figure 2.3: Tested proposed new apartments at the Proposed Development Block B

Figure 2.4: Tested proposed refurbished dwellings within Latchmere House

3 Compliance criteria

3.1 New build

In order to show compliance with the requirements for Approved Document L1A 2010 for new dwellings, there are five separate criteria that must be met. Criteria 1 and 3 are covered in this report. Criterion 2 is also relevant at design stage. Criteria 4 and 5 are to be considered at the construction stage.

Design stage criteria

Criterion 1, achieving an acceptable Building CO_2 Dwelling Emission Rate (DER).

The 2010 revision to Part L includes a similar assessment methodology to Part L1A 2006 that is used for all types of domestic buildings, and is based upon calculating CO_2 emissions for the building using an approved modelling tool. The carbon emissions from a notional building (of the same size and geometry as the actual building but with set design parameters such as areas of windows, thermal elements and services) are compared with the actual building. From the notional building emissions, a Target CO_2 Emission Rate (TER) is generated for the actual building. Once the TER is calculated the actual Dwelling Emission Rate (DER) is computed using the same methodology. Compliance is met where the DER is less than or equal to the TER.

Criterion 2, limits on building fabric and building services systems performance

As the method for calculating the DER allows a large degree of flexibility on design, the new Part L imposes worst case design limits for the building fabric and services.

Criterion 3, limiting the effects of solar gains

It is a requirement to show that the effect of solar gains has been limited for all dwellings.

Construction stage criteria

Criterion 4, quality of construction and commissioning

It must be shown through further calculation at construction stage that the actual performance of the building will be no worse than is expected during the design.

Criterion 5, providing information

Sufficient information must be provided to the building users to enable the building to be run as efficiently as possible.

3.2 Refurbished apartments

Compliance with Approved Document L1B 2010 for refurbished dwelllings is achieved by demonstrating an improvement in energy efficiency over the pre-furbished dwelling.

In order to indicate compliance with Part L1B, SAP 2009 calculations were undertaken to determine the estimated pre-refurbishment Energy Efficiency Rating (EER) (using input values from SAP Appendix S in accordance with SAP methodology) and the estimated proposed post-refurbishment EER based on the proposed building services design and proposed fabric improvements as agreed with the team (i.e. new internal insulation where allowed, new windows, new floor and roof insulation, and an estimate of improvement to the fabric air tightness).

4 Input Data – New Build

4.1 Drawings

The following table details the drawings on which the Part L1A 2010 calculations were undertaken.

Table 1: Architect's drawings used for new-built dwellings

Drawing Description	Filename	Drawing Revision	Received from architect
Proposed Site Plan	BKH06_P_101	P05	2013.12.06
House Type A1 Plans, Sections and Elevations	BKH06_P_211	P01	2013.10.30
House Type D1 Plans, Sections and Elevations (modelled as both a mid-row and end-row type)	BKH06_P_205	P01	2013.10.30
House Type E2 Plans, Sections and Elevations (modelled as both a SE/NW type and a NE/SW type)	BKH06_P_207	P02	2013.10.30
House Type F1 Plans, Sections and Elevations	BKH06_P_208	P01	2013.10.30
Block A apartments, Plans	BKH06_P_213	P01	2013.10.30
Block A apartments, Sections and Elevations	BKH06_P_214	P01	2013.10.30
Block B apartments, Plans	BKH06_P_215	P01	2013.10.30
Block B apartments, Sections and Elevations	BKH06_P_216	P01	2013.10.30

4.2 Construction Parameters

The parameters used for the building construction are shown in table 2 below. If any of the values should change during the procurement stage, further calculations would be required to ensure that the CO_2 performance targets can be achieved.

Table 2: Construction parameters for new-built dwellings

	Parameter	Input	Part L1A 2010 limiting factors
Construction	thermal mass	Low (potentially 'medium' needed in some apartments – see section 6.2)	-
	air permeability, $m^3/hr/m^2$	4	10
	thermal bridging factor (y-value) $W/m^2.K$	0.08	-
	heated communal areas, YES/NO	N/A	-
	floor-ceiling height (m)	Various – as per section drawings	-
U-value (W/m^2K)	external wall	0.15	0.30
	casement window (incl. frame)	1.2	2.0
	sash window (incl. frame)	1.41	2.0
	rooflights	1.2	2.0
	party wall	0	-
	flat entrance doors	1.1	2.0
	Patio door	1.1	2.0
G-value	window	0.5	-

4.3 Mechanical services & lighting

To comply with Part L1A the building services will need to be suitably controlled to ensure a reasonable level of energy efficiency. The building services assumed in the modelling are summarised in the table below. There are no limiting factors for building services according to Part L1A 2010.

Table 3: Mechanical Systems and Lighting

	Parameter	Input
Systems	Ventilation type	MVHR
	ductwork	insulated
	Ventilation SFP	0.6 W/l.s
	Heat exchange efficiency	90%
	space heating category	Individual
	space heating type	Radiators
	heating fuel	Gas
	boiler efficiency	90%
	Domestic Hot Water (DHW)	From main
	cylinder in dwelling	YES (Apart from A1 huses)
	Insulation	Spray foam, 100mm thick
	plate heat exchanger	NO
	< 125 litres water/person/day	YES
	% low energy lighting	100
	Cooling	None

5 Input Data – Refurbishment

5.1 Drawings

The following table details the drawings on which the pre-planning Part L1B 2010 calculations were undertaken.

Table 4: Architect's Drawing's Used for refurbished apartments

Drawing Description	Filename	Drawing Revision	Received from architect
Latchmere House Proposed Plans	BKH04_P_504	D	2013.09.03
Latchmere House Proposed Elevations	BKH04_P_233	A	2013.09.20
Latchmere House Proposed Sections	BKH04_P_234	A	2013.09.20

5.2 Construction Parameters

The parameters used for the building constructions are shown in table 5 below. If any of the values should change during the procurement stage, further calculations would be required to ensure that the CO_2 performance targets can be achieved.

Table 5: Construction parameters for refurbished apartments

	Parameter	Pre-refurbishment	Post-refurbishment
Construction	thermal mass	Medium	Low
	air permeability, $m^3/hr/m^2$	15	10
	thermal bridging factor (y-value) $W/m^2.K$	0.15	0.15
	heated communal areas, YES/NO	YES	YES
	floor-ceiling height (m)	Various	Various
U-value (W/m^2K)	external wall	2.1	**0.6 (2.1 where insulation cannot be installed, see figure 5.1**)
	window	4.8	1.6
	rooflight	4.8	1.6
	sheltered wall	0.4	0.4
	flat entrance doors	4.8	1.6
G-value	window	0.85	0.6

5.3 Heritage Considerations

Certain heritage considerations will be considered, such as the aspiration to retain any original features that refer to the building's previous use and / or any other references within the development to the site's previous use. Specific to this site are two particular rooms where it has been decided not to alter the wall fabric due to existing internal features in these rooms. Those areas where it is not possible to retro-fit insulation have been shown in 5.1 below in pink.

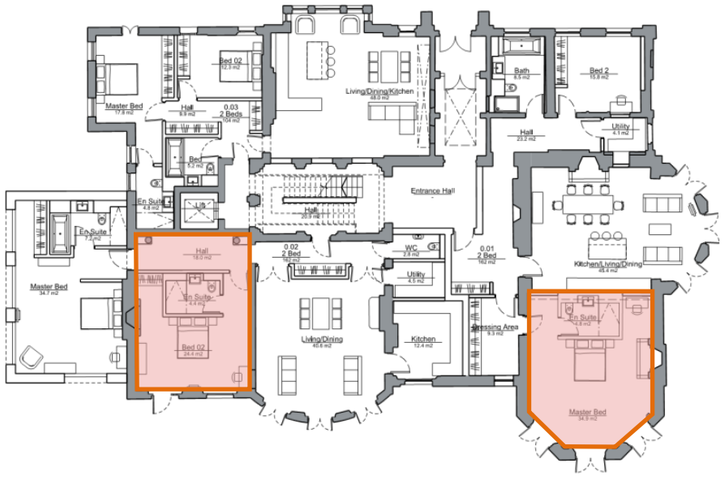


Figure 5.1: Existing rooms where the external wall is influenced by heritage considerations

5.4 Mechanical services & lighting

To comply with Part L1B 2010 the building services will need to be suitably controlled to ensure a reasonable level of energy efficiency. The building services assumed in the modelling are summarised in the table below.

Table 6: Mechanical Systems and Lighting

	Parameter	Pre-refurbishment	Post-refurbishment
systems	Ventilation type	Natural	Natural
	space heating category	Individual – Boiler	Community – Boilers
	space heating type	Radiators	Radiators
	heating fuel	Gas	Gas
	boiler efficiency	80%	90%
	Domestic Hot Water (DHW)	From main	From main
	cylinder in dwelling	NO	NO
	plate heat exchanger	NO	NO
	< 125 litres water/person/day	YES	YES
	% low energy lighting	0	100
	Cooling	None	None

6 Results – New Build

6.1 Criterion 1 – Achieving the TER

The target emission rate (TER) is the minimum energy performance requirement for a new dwelling. Expressed in terms of $kgCO_2/m^2$/year, it is arrived at using a notional building with the same size and shape as the actual dwelling, with reference construction and building service properties. The dwelling emission rate (DER) is then calculated using the proposed construction and building service properties. In order to comply with Criterion 1, the DER must be less than the TER.

Criterion 1 considers only regulated loads. It does not consider non-fixed equipment that residents will install and use to varying extents e.g. fridges, freezers, cooking, televisions etc. However, SAP provides a methodology for evaluating these unregulated energy uses, and this was also calculated across the sample of dwellings as shown in Table 7.

It should be noted that these results do not allow for any inclusion of Low-Zero Carbon technologies proposed for this development, i.e. CHP and PV panels.

Table 7: Summary of Criterion 1 – achieving the DER results – new-built houses

	House modelled					
Preliminary result	**A1**	**D1 MID**	**D1 END**	**E2 SE/NW**	**E2 NE/SW**	**F1**
Target Emission Rate (TER), $kgCO_2/m^2/yr$	17.67	13.71	16.01	15.08	15.05	15.03
Dwelling Emission Rate (DER), $kgCO_2/m^2/yr$	16.15	11.89	13.28	12.45	12.28	12.04
% improvement	8.6	13.3	17.0	17.5	18.3	23.6
Fabric Energy Efficiency Standard (FEES)	44.9	37.6	44.4	46.1	45.5	47.3
Code for Sustainable Homes Ene 2 credits (FEES)	7.2	7.3	7.4	6.9	7.1	6.5
Un-regulated CO_2, $kgCO_2/m^2/yr$	15.2	11.2	11.2	8.7	8.7	7.4

The resulting energy consumption benchmarks are listed below for reference. As shown in Table 3, no mechanical cooling is proposed for any of the dwellings.

Table 8: Summary of energy demand benchmarks – new-built houses

	House modelled					
Estimated energy demand	**A1**	**D1 MID**	**D1 END**	**E2 SE/NW**	**E2 NE/SW**	**F1**
Space heating gas ($kWh/m^2/yr$)	32.5	22.4	29.6	32.8	32.0	34.1
Domestic hot water gas ($kWh/m^2/yr$)	29.0	19.9	19.7	14.4	14.4	11.8
Pumps, fans and heat distribution ($kWh/m^2/yr$)	3.7	3.4	3.4	3.1	3.1	3.0
Lighting electricity ($kWh/m^2/yr$)	4.0	3.4	3.4	3.0	3.0	2.6
Space cooling electricity ($kWh/m^2/yr$)	0.0	0.0	0.0	0.0	0.0	0.0

In order to produce the energy strategy, each dwelling across the site was then mapped to the most representative sample dwelling as listed in the table below.

Table 9: Summary of Criterion 1 – achieving the DER results – new-built apartments

	Apartment modelled					
Preliminary result	**A002**	**A003**	**B001**	**B002**	**B005**	**B010**
Target Emission Rate (TER), $kgCO_2/m^2/yr$	18.11	20.09	17.13	19.04	19.04	19.58
Dwelling Emission Rate (DER), $kgCO_2/m^2/yr$	15.22	17.81	14.61	16.52	18.26	16.57
% improvement	16.0	11.3	14.7	13.2	4.1	15.4
Fabric Energy Efficiency Standard (FEES)	42.2	44.0	44.0	40.0	47.5	47.5
Code for Sustainable Homes Ene 2 credits (FEES)	5.3	4.5	4.5	6.5	3.1	8.5
Un-regulated CO_2, $kgCO_2/m^2/yr$	16.3	19.4	14.1	19.2	18.8	19.2

The resulting energy consumption benchmarks are listed below for reference. As shown in Table 3, no mechanical cooling is proposed for any of the dwellings.

Table 10: Summary of energy demand benchmarks – new-built apartments

	Apartment modelled					
Estimated energy demand	**A002**	**A003**	**B001**	**B002**	**B005**	**B010**
Space heating gas ($kWh/m^2/yr$)	25.2	21.9	27.3	19.2	29.4	20.2
Domestic hot water gas ($kWh/m^2/yr$)	24.9	38.1	20.5	35.0	32.4	34.5
Pumps, fans and heat distribution ($kWh/m^2/yr$)	2.8	2.9	2.8	2.9	2.9	2.9
Lighting electricity ($kWh/m^2/yr$)	4.2	4.8	4.1	4.9	4.8	4.7
Space cooling electricity ($kWh/m^2/yr$)	0.0	0.0	0.0	0.0	0.0	0.0

In order to produce the energy strategy, each dwelling across the site was then mapped to the most representative sample dwelling as listed in the table below.

Table 11: Dwellings which have not been modelled have been mapped to a representative modelled dwelling

Modelled dwellings (See section 2)	**No. dwellings represented by sample**	**Approximate total area (m^2)**
A1	7	710
D1 MID	10	1546
D1 END	8	1237
E2 SE/NW	12	2560
E2 NE/SW	6	1280
F1	12	3121
Block A		
A002	4	364
A003	2	100
Block B		
A002	2	182
B001	4	456
B002	6	340
B005	3	190
Block C		
B001	2	228
B005	2	127
B010	2	116

The area-weighted sample has been applied to the new-built area on site as follows: 11,030 m^2 of new-built private houses, 710 m^2 of new-built affordable houses, 466 m^2 for Block A, 1,140 m^2 for Block B, and 480 m^2 for Block C.

6.2 Criterion 3 – Limiting the effects of summertime solar gains

Criterion 3 looks at the risk of the dwelling overheating during the summer and requires proof that an adequate air change rate can be provided to maintain comfort without the need for mechanical cooling. For the purpose of this report it was assumed that openable windows are the preferred overheating mitigation strategy due to the acoustic assessment of the site indicating acceptable acoustic conditions.

New-built houses

A limiting value of 4 air changes per hour (ACH) has been set. This value has been arrived at by use of information within Appendix P of the SAP manual. For a two or more storey dwelling with windows on opposing sides of the building, an assumed ventilation rate of 4 ACH can be used when windows are to be open half the time. This makes an allowance for ground floor windows being shut during nightime, for security reasons.

Calculations have been carried out for the 6 sample houses in order to assess the ventilation flow rate required to mitigate solar gains to a satisfactory level. The calculations are based on the use of a good ratio of solid to glazed areas on the façade and good performance solar control glazing.

It has been assumed that all dwellings would have dark-coloured internal curtains or roller blinds (fraction closed = 1, during daylight hours). This is the default setting in SAP which has been used since it is not known what blinds or curtains wil be used in these houses.

Table 12: Estimated air change rates required to mitigate risk of summertime overheating in tested houses

Unit	**A1**	**D1 MID**	**D1 END**	**E2 SE/NW**	**E2 NE/SW**	**F1**
Estimated air change rate required per hour (ACH)	2.2	1.7	1.5	1.3	1.4	1.2

The required air change rates for each tested dwelling are all below 4 ACH. Therefore, natural ventilation from openable windows is expected to be sufficient to achieve compliance with Criterion 3 in the houses.

New-built apartments

The following limiting values of air changes per hour (ACH) have been set for different types and locations of apartments:

Table 13: Limiting air change rates to mitigate risk of summertime overheating in tested apartments

Unit	**Windows open half the time (Assumed allowable on ground floor apartments)**	**Windows open half the time (Assumed allowable on upper floor apartments)**
Single aspect apartments	2	4
Dual aspect apartments	3	6

These values have been arrived at by use of information within Appendix P of the SAP manual. This makes an allowance for ground floor windows being shut during nightime, for security reasons.

Calculations have been carried out for the 6 sample apartments in order to assess the ventilation flow rate required to mitigate solar gains to a satisfactory level. The calculations are based on the use of a good ratio of solid to glazed areas on the façade and good performance solar control glazing.

It has been assumed that all dwellings would have light-coloured internal curtains or roller blinds (fraction closed = 1, during daylight hours), with the understanding that these are to be provided by the developer.

Table 13: Estimated air change rates required to mitigate risk of summertime overheating in tested apartments

Unit	A002 (dual aspect)	A003 (single aspect)	B001 (dual aspect)	B002 (single aspect)	B005 (single aspect)	B010 (single aspect)
Estimated air change rate required per hour (ACH)	2.3	2.6	1.8	2.5	2.3	2.3

The required air change rates for each tested dwelling are all below 3 ACH, however all single aspect apartments are above 2 ACH. Therefore, for single aspect apartments on the ground floor where the limiting air change rate is 2 ACH according to the SAP methodology (as described in table 13 above), further measures must be implemented in order to meet criterion 3.

It has been tested as a preliminary measure whether these apartments would meet the requirement with 'medium' thermal mass rather than 'low' as originally assumed. 'Medium' thermal mass entails design solutions such as blockwork walls with wetcoat plaster finish, and concrete slab with carpet finish. The results of this test are given in table 14 below.

Table 14: Estimated air change rates required to mitigate risk of summertime overheating in tested apartments with MEDIUM thermal mass

Unit	A002 (dual aspect)	A003 (single aspect)	B001 (dual aspect)	B002 (single aspect)	B005 (single aspect)	B010 (single aspect)
Estimated air change rate required per hour (ach) with 'MEDIUM' thermal mass	N/A	1.7	N/A	1.9	1.9	1.7

This preliminary test (undertaken on single aspect apartments only) shows that all of these would fall within the limit of 2 ACH with medium thermal mass, and would therefore meet the requirement by implementing medium thermal mass parameters.

This option will be further investigated by the design team at detailed design stage.

With the above design solutions implemented, natural ventilation from openable windows is expected to be sufficient to achieve compliance with Criterion 3.

The results given in this report above are based on 'medium' thermal mass parameters for the single aspect apartments.

7 Results – Refurbishment

The results for the sample apartments are indicated in the table below, showing a greater EER for the post-refurbishment data indicating lower carbon emissions.

The values also indicate a post refurbishment EER greater than 70 indicating the mandatory requirement for BREEAM-DR credit Ene 2 – Energy efficiency rating post refurbishment – is estimated to be achievable with the current proposed improvements to fabric and services (subject to heriage constraints).

Table 11: Summary of pre and post-refurbishment EER

Unit	0-01	1-03	2-02
Pre-Refurbishment EER	54	63	37
Post-Refurbishment EER	70	78	71

The preliminary Part L calculations carried out on a sample of the Latchmere House refurbished residences pre- and post -refurbishment estimate that proposed fabric and services improvements alone would bring an estimated 40-50% improvement in CO_2 emissions over the estimated pre-refurbishment performance.

8 Conclusion

The Proposed Development comprises of both new build houses (both private and affordable types), new build apartments and refurbished apartments (within the existing Latchmere House). A sample of both new-built and refurbished dwellings have been tested using NHER version 5.4.2 (refurished units) and 5.5.4.1 (new-built units).

8.1 Assessment of Building Regulations compliance

Compliance with the Building Regulations has been assessed, as well as the potential achievement of a number of credits for environmental assessment methods (Code for Sustainable Homes for new-built houses and BREEAM Domestic Refurbishment for refurbished apartments). A summary of the results is provided below.

New Build Private Houses: Building Regulations Part L1A

a) Carbon emissions compliance (Part L Criterion 1)

The Criterion 1 results of the sample of houses have been area-weighted across houses in the development. Using the assumptions stated in this report, and on an area-weighted average basis across the whole development, the new houses are expected to pass Part L1A 2010 carbon emissions compliance requirements (Criterion 1) by approximately 18%, before the incorporation of Low and Zero Carbon technologies (LZC).

b) Limiting the effects of solar gains in summer compliance (Part L Criterion 3):

In terms of overheating risk (Criterion 3), it is proposed that compliance is achieved with the use of internal dark-coloured blinds (as the default setting in SAP since it is not known what blinds or curtains will be used) and natural ventilation via openable windows.

New Build Affordable Houses: Building Regulations Part L1A

a) Carbon emissions compliance (Part L Criterion 1)

The Criterion 1 results of the sample of houses have been area-weighted across houses in the development. Using the assumptions stated in this report, and on an area-weighted average basis across the whole development, the new houses are expected to pass Part L1A 2010 carbon emissions compliance requirements (Criterion 1) by approximately 9%, before the incorporation of Low and Zero Carbon technologies (LZC).

b) Limiting the effects of solar gains in summer compliance (Part L Criterion 3):

In terms of overheating risk (Criterion 3), it is proposed that compliance is achieved with the use of internal dark-coloured blinds (as the default setting in SAP since it is not known what blinds or curtains will be used) and natural ventilation via openable windows.

New Build Apartments: Building Regulations Part L1A

a) Carbon emissions compliance (Part L Criterion 1)

The Criterion 1 results of the sample of dwellings have been area-weighted across the apartments in the development. Using the assumptions stated in this report, and on an area-weighted average basis across the whole development, the new apartments are expected to pass Part L1A 2010 carbon emissions compliance requirements (Criterion 1) by approximately 14%, before the incorporation of Low and Zero Carbon technologies (LZC).

b) Limiting the effects of solar gains in summer compliance (Part L Criterion 3):

In terms of overheating risk (Criterion 3), it is proposed that compliance is achieved with the use of internal light-coloured blinds (with the understanding that these are to be provided by the developer) and natural ventilation via openable windows. Further, some apartments may need to implement a higher degree of thermal mass in order to meet the overheating criterion. This will be assessed further at detailed design stage.

Refurbished Apartments: Building Regulations Part L1B

In order to indicate compliance with Part L1B, SAP 2009 calculations were undertaken to determine the estimated pre-refurbishment Energy Efficiency Rating (EER) (using input values from SAP Appendix S in accordance with SAP methodology) and the estimated proposed post-refurbishment EER based on the proposed building services design and proposed fabric improvements as agreed with the team (i.e. new internal insulation where allowed, new windows, new floor and roof insulation, and an estimate of improvement to the fabric air tightness). Calculations indicate that the proposed refurbishment EER is estimated to be higher than the pre-refurbishment values for those of the sample apartments, meaning that the proposed post-refurbishment apartments have lower estimated carbon emissions than the pre-refurbishment apartments.

The preliminary Part L calculations carried out on a sample of the Latchmere House refurbished residences pre- and post -refurbishment estimate that proposed fabric and services improvements alone would bring an estimated 40-50% improvement in CO_2 emissions over the estimated pre-refurbishment performance.

8.2 Environmental Assessment Methods: Assessment of compliance with the relevant credits

A number of credits under the Code for Sustainable Homes and BREEAM Domestic Refurbishment rely on modelling results to assess the number of credits available.

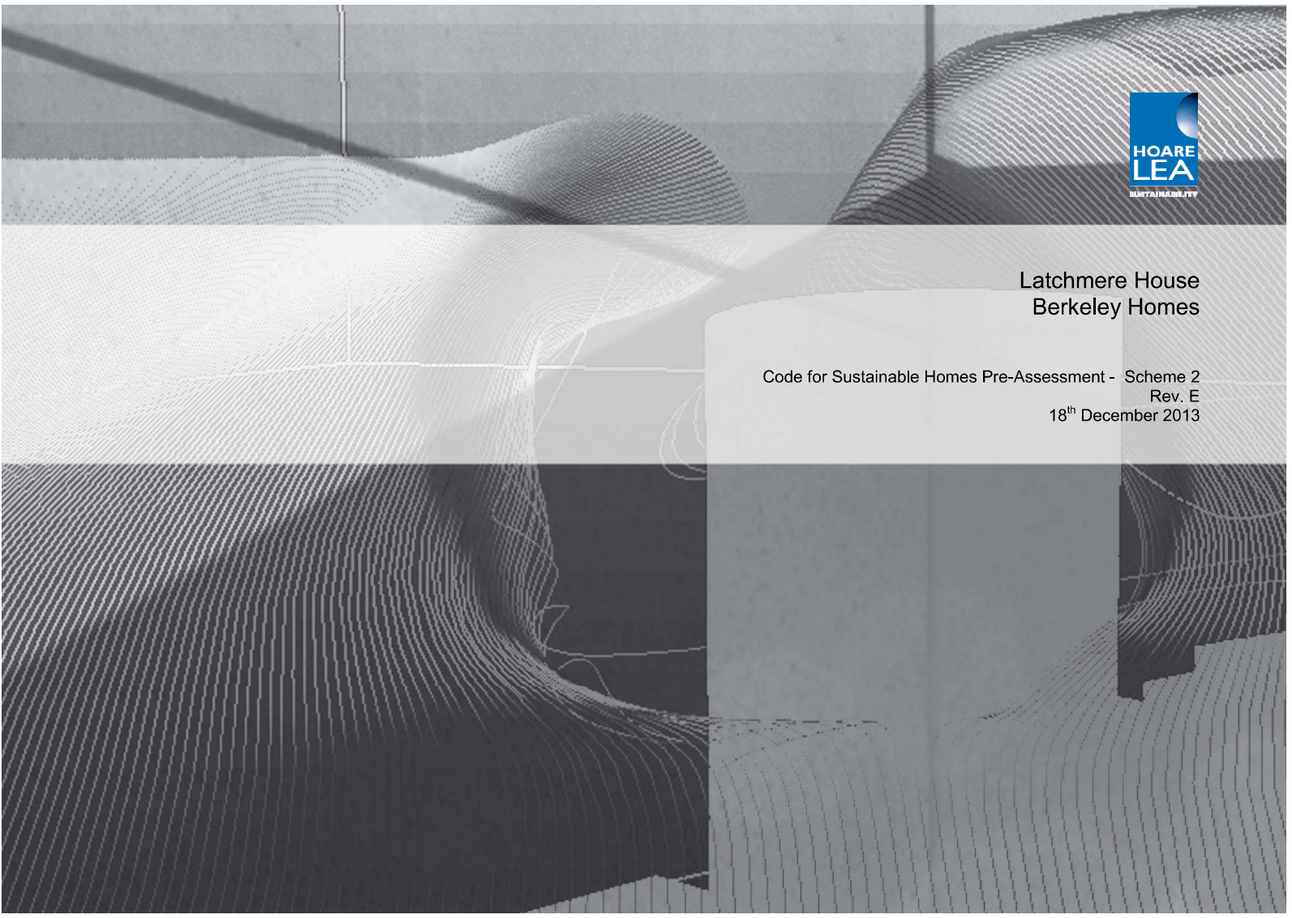
Code for Sustainable Homes (Nov 2010) Ene 2 – Fabric Energy Efficiency credit

This analysis assesses the number of credits achievable for Fabric Energy Efficiency Standard (FEES) under the Code for Sustainable Homes (credit Ene 2) to inform the design and targeting of Code credits. The analysis has shown that between 6 and 8 credits are currently expeced to be achievable for the houses assessed, and 3-8 credits are estimated to be achievable for apartments.

BREEAM Domestic Refurbishment Ene 2 – Energy efficiency rating post refurbishment

This analysis also assesses the number of credits achievable for the energy efficiency rating post-refubishment (credit Ene 2) to inform the design and targeting of BREEAM DR credits. The minimum requirement is to achieve an EER of 70. All of the assessed apartments are estimated to meet this requirement.

8.0 Appendix B: Code for Sustainable Homes Pre-assessment



Latchmere House
Berkeley Homes

Code for Sustainable Homes Pre-Assessment - Scheme 2
Rev. E
18th December 2013

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Audit Sheet

Rev.	Description	Prepared and checked by	Reviewed by	Date
A	First Issue for discussion at workshop 15/08/2013	A. Punter	L. Wille	15.08.2013
B	Incorporation of comments from Workshop 16/08/2013	A. Punter	L. Wille	16.08.2013
C	Draft planning issue	L. Wille	-	13.09.2013
D	New draft planning issue (Scheme 2)	L. Wille	-	13.12.2013
E	Planning issue (Scheme 2)	L. Wille	-	18.12.2013

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1.0 Executive Summary

The 'Code for Sustainable Homes' (CfSH) is a recognised environmental Assessment methodology adopted by the Government and managed by the 'Building Research Establishment' (BRE).

This pre-assessment contains a CfSH review and credit assessment for the new-built areas of the Proposed Development at Latchmere House.

Some credits will differ between different dwelling types – specifically between houses and apartments. Therefore two different target scores are given within this report, one for the houses in the development, and one for apartments.

The current estimated scores for this pre-assessment are:

- 70.16% for houses - equivalent to a 'Level 4' rating
- 68.36% for apartments- equivalent to a 'Level 4' rating

Figure 1.1 outlines the current pre-assessment scores.

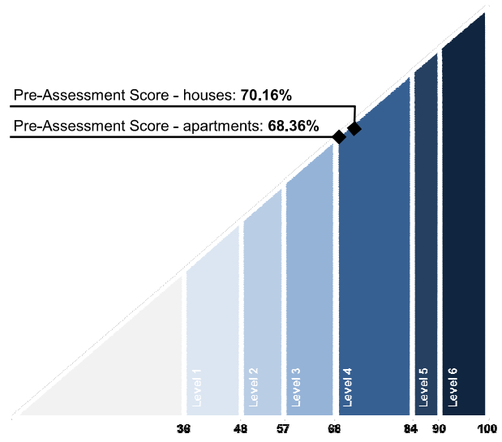

Figure 1.1: CfSH Scale and Pre-Assessment Score.