chapmanbdsp

Manor Road
Revised Energy Statement

Revision 02
May 2023
Ref: 61564

61564 – Manor Road
Revised Energy Statement

Revision	Issued for	Date	Author	Checked by
00	Draft for review	13/04/2023	Giorgio Beghi Xinlong Wang	Carlos Bernal
01	Submission	17/04/2023	Xinlong Wang	Carlos Bernal
02	Submission	18/05/2023	Xinlong Wang	Carlos Bernal

Confidentiality and Third-Party Responsibility

This document is confidential to the party to whom it is addressed and their professional advisers for the specific purpose to which it refers. No responsibility is inferred to any third parties, and neither the whole, nor any part, nor reference thereto may be published or disclosed.

No responsibility is accepted for the advice of the Client's independent consultants which may be reflected in our own reports.

Chapmanbdsp
40 Gracechurch Street, London EC3V 0BT
T: +44 (0)20 7618 4800
E: info@Chapmanbdsp.com

Contents

1 Executive Summary

This Revised Energy Statement has been prepared by chapmanbdsp on behalf of Avanton Richmond Developments Ltd ('the Applicant') as an update report to supersede the previously submitted energy assessment work in support of the development of 84 Manor Road, North Sheen, London Borough of Richmond upon Thames ('the Site'). Planning permission was previously granted for the Site (Planning application no: 19/0510/FUL, GLA reference: GLA/4795/03).

The previously submitted Revised Energy Strategy was prepared in 2020. Since this time there have been minor amendments to the proposed scheme, alongside a number of policy, guidance and regulatory updates (as detailed in Section 3 of this statement).

The aim of this Revised Energy Statement is to demonstrate compliance with the latest national, regional and local policies and regulatory requirements. It identifies the applicable planning policies and measures that have been applied to the design of the development in response to these requirements.

The Proposed Development consists of the demolition of existing buildings and structures and comprehensive phased residential-led redevelopment to provide 453 residential units (of which 173 units will be affordable), flexible retail, community and office uses, provision of car and cycle parking, landscaping, public and private open spaces and all other necessary enabling works ('the Proposed Development').

The Proposed Development seek to provide high quality dwellings and non-domestic spaces that are comfortable throughout the year, with minimal energy consumption and carbon emissions. The design approach for the scheme follows the GLA's energy hierarchy i.e., being 'lean, clean and green' to achieve the following targets:

- A 10% and 15% reduction against domestic and non-domestic elements, respectively, compliant with Part L 2021 of the Building Regulations through energy efficiency measures alone (be lean);
- A minimum 35% reduction in regulated carbon emissions beyond Part L 2021 for non-residential element through on site measures;
- A benchmark 50% reduction in regulated carbon emissions beyond Part L 2021 for residential element through on site measures;
- Zero carbon target for domestic and non-domestic areas of development, with 35% on-site reduction beyond Part L 2021 and proposals for making up the shortfall to achieve zero carbon, where required.

While the above targets form the overarching framework that are followed in the preparation of this statement, a recognition exists that the non-domestic element of the Proposed Development might not be able to achieve these savings. As part of the formal introduction of Building Regulations Part L 2021 on the GLA have issued '15 June 2022 – Note to accompany GLA Energy Assessment Guidance 2022'. The cover note acknowledges that:

Initially, non-residential developments may find it more challenging to achieve significant on-site carbon reductions beyond Part L 2021 to meet both the energy efficiency target and the minimum 35 per cent improvement. This is because the new Part L baseline now includes low carbon heating for non-residential developments but not for residential developments. However, planning applicants will still be expected to follow the energy hierarchy to maximise the carbon savings before the offset is considered.

It continues to advise that:

Over time it is expected that performance against Part L 2021 will improve to enable these developments to achieve the closer alignment with the energy efficiency targets and the minimum 35 per cent on-site improvement due to technological improvements and as cost come down. We will monitor this progress and may update the benchmarks to reflect these improvements as appropriate. In the intervening period applicants should continue to aim to maximise on-site carbon reductions as far as possible.

1.1 Energy Strategy Summary

This report demonstrates the strategy proposed for the domestic and non-domestic element of the Proposed Development. The design approach targets demand reduction measures first, giving priority to optimisation of building fabric to reduce the need for heating, cooling, and artificial lighting. The objective was to have buildings as energy efficient (i.e., 'lean') as possible before considering any mechanical systems and onsite and offsite measures to deliver low carbon performance.

The design of the building, together with the MEP systems, and sustainability features have been optimised to minimise the energy demand. High level of envelope insulation is proposed to ensure heating demand is minimised; whilst solar coating (low g value) on windows has been proposed to reduce the need for cooling. Efficient low energy lighting (with LED lighting where appropriate) and mechanical ventilation with high rate of heat recovery are implemented throughout to further reduce energy demand.

Figure 1-1 chapmanbdsp Environmental Design Approach

1.2 Predicted Carbon Emissions Summary

In summary, the Proposed Development seek to deliver savings in line with the GLA energy hierarchy, limiting energy use in the first instance, selecting energy efficient plant and building services, before maximising the use of renewable energy via heat pumps and photovoltaics.

Overall, the Proposed Development could be expected to achieve a 62% reduction in regulated carbon emissions over Part L 2021. This overall figure breaks down into regulated carbon emissions reductions of 11% and 3% at 'Be Lean' stage, and 52% and 5% at 'Be Green' stage for the domestic and non-domestic element of the Proposed Development respectively.

As part of the London Plan 2021, developments are required to offset all remaining regulated CO_2 emissions associated with the building through a financial contribution. The GLA's Energy Assessment Guidance (April 2020) states a figure of £95/tonne of CO_2e across a 30-year lifespan. The total carbon emissions, reductions achieved and offset payment is provided below.

Domestic Assets – Residential Units Energy Hierarchy

	Regulated domestic carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be Lean	38.4	11%
Be Clean	0	0%
Be Green	183.1	52%
Cumulative on-site savings	**221.5**	**63%**
Annual savings from off-set payment	131.9	-

Cumulative savings for off-set payment	3,956 tCO2/annum
Cash in-lieu contribution (£)	**£ 375,863**

Table 1-1 - Regulated CO_2 savings from each stage of the energy hierarchy for domestic buildings

Non-Domestic assets – Commercial Space Energy Hierarchy

	Regulated domestic carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be Lean	0.1	3%
Be Clean	0	0%
Be Green	0.1	5%
Cumulative on-site savings	**0.2**	**8%**
Annual savings from off-set payment	1.9	-

Cumulative savings for off-set payment	56 tCO2/annum
Cash in-lieu contribution (£)	**£ 5,301**

Table 1-2 - CO_2 emissions after each stage of the energy hierarchy for non-domestic buildings

Site Wide Energy Hierarchy

	Total regulated carbon dioxide savings		
	Total (Tonnes CO_2 per annum)	CO_2 savings (Tonnes CO_2 per annum)	(%)
Part L 2021 Baseline	355.4	N/A	N/A
Be Lean	316.9	38.5	11%
Be Clean	316.9	0	0%
Be Green	133.7	183.2	52%
Total savings	**-**	**221.7**	**62%**
	-	CO_2 savings off-set (Tonnes CO_2)	-
Off-set	**-**	**4,012.3**	**-**

Cumulative savings for off-set payment	4,012 tCO2/annum
Cash in-lieu contribution (£)	**£ 381,164**

Table 1-1 CO_2 emissions after each stage of the energy hierarchy for the site

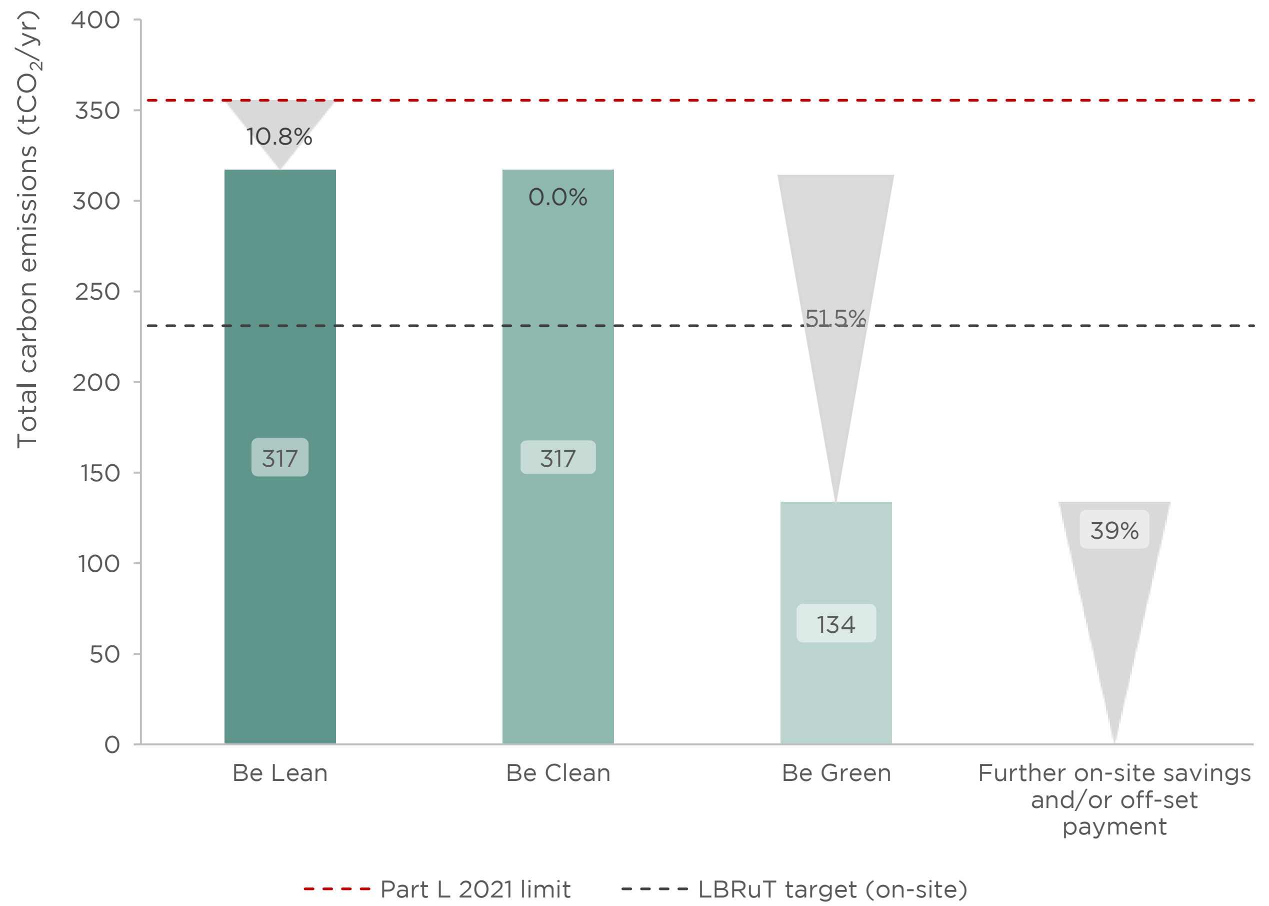


Figure 1-2 CO_2 emissions after each stage of the energy hierarchy for the site

In conclusion, though a combination of passive design measures, low carbon systems design, onsite generation and off-set payment, the Proposed Development seeks to achieve operational carbon neutrality over a span of 30 years with respect to its regulated energy consumption.

2 Introduction

This Revised Energy Statement has been prepared by chapmanbdsp on behalf of Avanton Richmond Developments Ltd ('the Applicant') as an update report to supersede the previously submitted energy assessment work in support of the development of 84 Manor Road, North Sheen, London Borough of Richmond upon Thames ('the Site'). Planning permission was previously granted for the Site (Planning application no: 19/0510/FUL, GLA reference: GLA/4795/03).

The previously submitted Revised Energy Strategy was prepared in 2020. Since this time there have been minor amendments to the proposed scheme, alongside a number of policy, guidance and regulatory updates (as detailed in Section 3 of this statement).

The aim of this Revised Energy Statement is to demonstrate compliance with the latest national, regional and local policies and regulatory requirements. It identifies the applicable planning policies and measures that have been applied to the design of the development in response to these requirements.

2.1 Site Description

The site is located in the administrative area of the London Borough of Richmond upon Thames approximately 1.1km south of Kew Gardens and approximately 1.6km north of Richmond Park. The Thames is approximately 1.5km to the west. Planning permission was previously granted for the Site (Planning application no: 19/0510/FUL GLA reference: GLA/4795/03).

The site is bound to the north by Manor Road Circus (a roundabout where the A316 and B353 meet), to the east by Manor Road (with residential development and Sainsbury's beyond), to the south and west by the railway (with residential development beyond in both cases). The railway to the south is the South Western Railway main line and the railway to the west is part of the London Overground / Underground network.

The surrounding uses in the area are predominantly residential with some light industrial and retail uses. The closest Conservation Areas to the site are Sheendale Road (to the west) and Sheen Road (southwest of the site). There are a number of Buildings of Townscape Merit in the vicinity of the site (for example along Manor Grove to the east).

The site has a rating of PTAL 5 (very good). North Sheen station is approximately 50m to the south-east. Pedestrian, cyclist and vehicular access to the site is from Manor Road.

2.2 Proposed Development

In summary, full planning permission is sought for the following (herein referred to as 'the Proposed Development') is as follows:

"Demolition of existing buildings and structures and comprehensive phased residential-led redevelopment to provide 453 residential units (of which 173 units will be affordable), flexible retail, community and office uses, provision of car and cycle parking, landscaping, public and private open spaces and all other necessary enabling works."

The area schedule for the proposed uses is as below:

- Residential: 453 units / 37,248 square metres
- Commercial: 495 square meters

Full details and scope of the planning application is described in the submitted Planning Statement, prepared by Avison Young.


Figure 2-1 – Ground floor plan of the Proposed Development

2.3 Software and Modelling Information

The Proposed Development has been modelled using an approved software package. FSAP 10 was used to perform the analysis for the domestic assets and DSM calculations for the non-domestic assets were carried out using EDSL-Tas and the UK Building Regulations 2021 compliance license.

The calculations presented in this report are based on SAP 10.2 carbon factors as per the GLA's new Energy Assessment Guidance 2022.

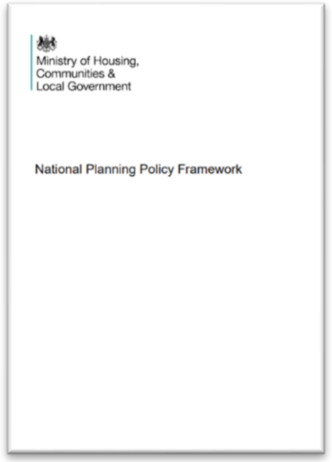
3 Sustainability Drivers

This section outlines the most appropriate set of sustainability targets that the project is required to adhere to.

3.1 National and Regional Policies

The following documents have formed an integral part of developing the energy strategy.

3.1.1 National Planning Policy Framework (July 2021)



The National Planning Policy Framework (NPPF) sets out the Government's planning policies for England and how these should be applied. It provides a framework within which locally prepared plans for housing and other development can be produced. Planning law requires that applications for planning permission be determined in accordance with the development plan unless material considerations indicate otherwise. The NPPF must be taken into account in preparing the development plan and is a material consideration in planning decisions. Planning policies and decisions must also reflect relevant international obligations and statutory requirements.

The purpose of the NPPF is to contribute to the achievement of sustainable development. At a very high level, the objective of sustainable development can be summarised as meeting the needs of the present without compromising the ability of future generations to meet their own needs. Achieving sustainable development means that the planning system has three overarching objectives, which are interdependent and need to be pursued in mutually supportive ways:

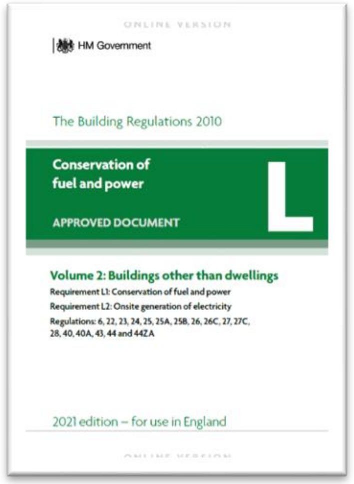
a) An economic objective – to help build a strong, responsive, and competitive economy, by ensuring that sufficient land of the right types is available in the right places and at the right time to support growth, innovation, and improved productivity; and by identifying and coordinating the provision of infrastructure.

b) A social objective – to support strong, vibrant, and healthy communities, by ensuring that a sufficient number and range of homes can be provided to meet the needs of present and future generations; and by fostering a well-designed and safe built environment, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being.

c) An environmental objective – to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.

This statement has been developed in line with NPPF and alongside the suite of documents submitted as part of this application fulfils the requirements of the NPPF.

3.1.2 The Building Regulations Approved Document Part L 2021



Part L of the Building Regulations is the mechanism by which the Government is driving reductions in the regulated CO_2 emissions from new buildings.

As part of the introduction of Building Regulations Part L 2021, GLA have issued an updated Energy Assessment Guidance along with a cover note, this Revised Energy Statement have been prepared using Part L 2021 methodology as per GLA's energy assessment guidance and cover note.

Part L 2021 considers 12 sections which must be satisfied as follows:

Section 1: Calculating the Target Primary Energy Rate and Target Emission Rate

The first section of the AD L states that "A new building must be built to a minimum standard of total energy performance. This is evaluated by comparing calculations of the performance of the 'actual building' against calculations of the performance of a theoretical building, called the 'notional building'. This must be carried out both at the design stage and when work is complete."

The energy performance of the notional building is described by the Target Primary Energy Factor (kgCO2/(m2.yr)) and by the Target Emission Rate (kgCO2/(m2.yr)). These two values shall be assessed using a calculation tool in the approved methodology. This can be either Simplified Building Energy Model (SBEM) or any other software approved under the Notice of Approval.

Section 2: Calculating the Building Primary Energy Rate and Building Emission Rate

This section states that the same tool used to assess CO_2 emissions shall be used to assess the Target Primary Energy Rate – TPER, the Target Emission Rate – TER, the Building Primary Energy Rate – BPER, the Building Emission Rate – BER.

The above shall be assessed before works start using design values and when the work is complete using figures for the building as built, including any occurred changes and the measured tested air permeability.

At both stages the following must be achieved: BER<TER and the BPER<TPER

Section 3: Consideration of High-efficiency Alternative Systems

The building regulation asks to analyse the technical, environmental, and economic feasibility of using high-efficiency alternative systems in the building design, before building work starts on a new non-domestic building. BCB – building control body shall be notified and the output available to be verified.

Regulation 25A of Building Regulation 2010 (consideration of high-efficiency alternative systems for new buildings) also applies.

Section 4: Limiting Heat Gains and Losses

The section focuses on U-values which shall be assessed using conventions and method set out in BR443, on Limiting standards for new or replacement elements and Limiting standards for renovated and retained elements which shall not be less than those specified in tables 4.1 & 4.2. These cover continuity of insulation, airtightness in existing buildings, limiting the effects of solar gains in summer, limiting heat losses and gains from building services.

Section 5: Minimum Building Services Efficiencies and Controls – General Guidance

This section states that for each new fixed building service in a new or existing building, the efficiency shall not be lower than those stated in section 6 tables. Efficiencies shall be based on the appropriate test standard and the test data should be certified by a notified body.

Section 6: System Specific Guidance

This section sets out minimum standards for specific types of building services. These efficiencies are set out based on documented manufacturers' test data. Equipment should be designed, specified and installed with the aim of maximising its efficiency when installed.

Section 7: Air Permeability and Pressure Testing
It is mandatory to meet the minimum standard for air permeability in new buildings. This should be supported with evidence, in particular that the test equipment has been calibrated using a UKAS-accredited facility. This shall be reported to the BCB – Building Control Body.
Section 8: Commissioning
Fixed building services must be commissioned with the aim of ensuring that no more fuel and power than reasonable is used, and in-use performance is optimised. A commissioning manager shall be appointed for large complex buildings and their competency shall meet the minimum requirement set out under CIBSE Commissioning Code M.

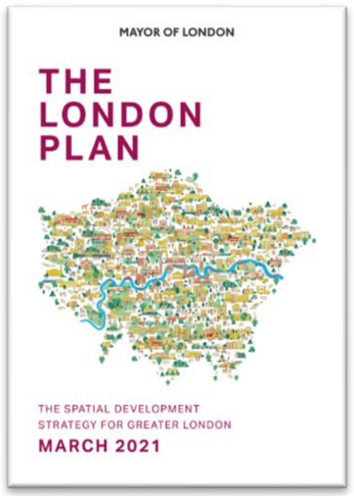
Section 9: Providing Information
This section outlines how O+M operations and maintenance instructions logbook (compliance with CIBSE TM31 guidance) should be provided to building users/operators.

Section 10: New Elements in Existing Buildings, Including Extensions
This guidance covers new or replacement thermal elements (opaque envelope, windows, doors, rooflights, etc.), for extending an existing building (i.e., adding a conservatory, extension, porch, etc.).

Section 11: Work to Fabric Elements in Existing Buildings
This is a guidance for renovations of existing elements, making a change of use or any other change that constitutes a change to energy status in existing buildings.

Section 12: Consequential Improvements
This section refers to existing buildings with a total useful area of over 1000 sqm, and it concerns overall energy efficiency improvement if the proposed work consists of an extension, a provision of fixed building services for the first time, or an increase in their capacity. Consequential improvements are to ensure that the entire building complies with part L of Building Regulations.

3.1.3 The London Plan 2021



The London Plan 2021 is the Spatial Development Strategy for Greater London. It sets out a framework for how London will develop over the next 20-25 years and the Mayor's vision for Good Growth.

The Plan is part of the statutory development plan for London, meaning that the policies in the Plan should inform decisions on planning applications across the capital. A high-level summary of the policies affecting this Revised Energy Statement follows next.

Policy GG6 – Increasing Efficiency and Resilience

To help London become a more efficient and resilient city:

- Improve energy efficiency, move towards a low carbon, circular economy and target a zero-carbon city by 2050; and
- Ensure buildings and infrastructure are designed to adapt to a changing climate, making efficient use of water, reducing the impact from natural hazards such as flooding and heatwaves, while mitigating against the urban heat island effect.

Policy SI2 – Minimising Greenhouse Gas Emissions

Major developments should be "net zero-carbon". This means reducing greenhouse gas emissions in operation, and minimising both annual and peak energy demand in accordance with the following energy hierarchy:

- Be Lean: use less energy and manage demand during operation.
- Be Clean: exploit local energy resources and supply energy efficiently and cleanly.
- Be Green: maximize opportunities for renewable energy by producing, storing and using renewable energy on-site.
- Be Seen: monitor, verify and report on energy performance.

The London Plan 2021 sets minimum performance targets using regulated Carbon emissions which is measured in the form of a percentage improvement on Part L of the Building Regulations (2021) as follows:

- Residential developments should achieve **10%** savings through passive design and energy efficiency measures (Be Lean).
- Non-residential developments should achieve **15%** savings through passive design and energy efficiency measures (Be Lean).
- Target net zero regulated carbon emissions (100% savings beyond Building Regulations) with a minimum on-site reduction of at least 35%.

Major development proposals should calculate and minimize Carbon emissions from any other part of the development, including plant or equipment, that are not covered by Building Regulations, i.e., unregulated emissions. Policy SI2 is summarised in Figure 3- below:

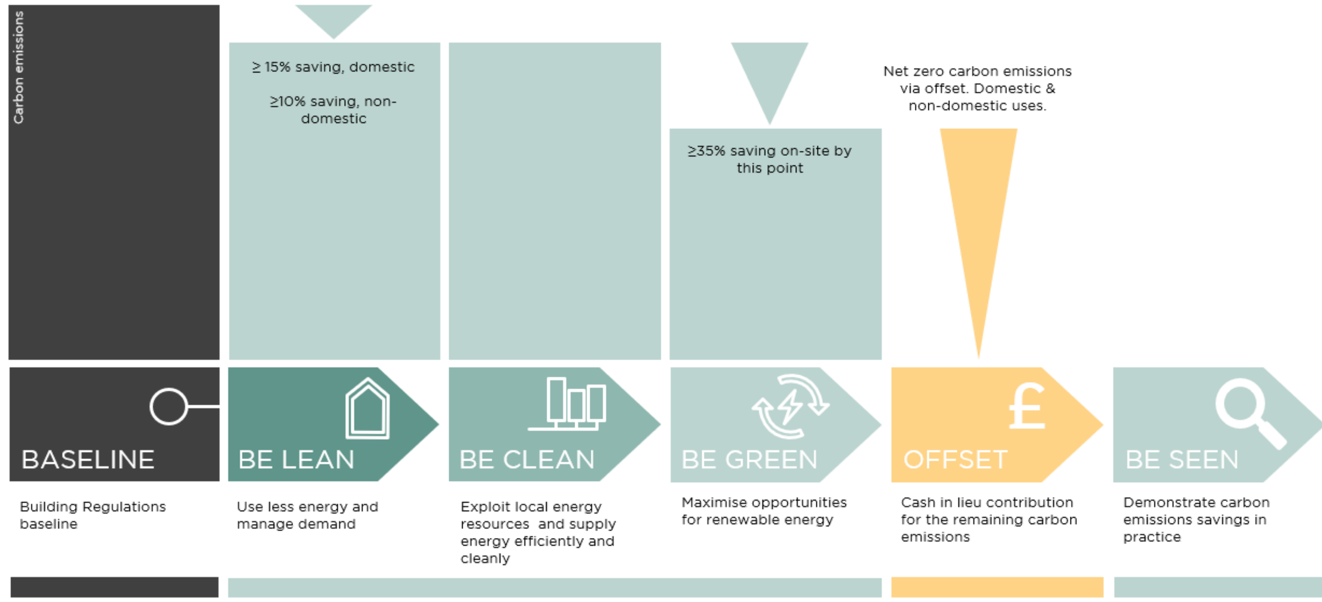


Figure 3-1 - The Energy Hierarchy with associated London Plan 2021 regulated carbon emissions targets.

While the above targets form the overarching framework that are followed in the preparation of this statement, a recognition exists that the non-domestic element of the Proposed Development might not be able to achieve these savings. As part of the formal introduction of Building Regulations Part L 2021 on the GLA have issued '15 June 2022 – Note to accompany GLA Energy Assessment Guidance 2022'. The cover note acknowledges that:

Initially, non-residential developments may find it more challenging to achieve significant on-site carbon reductions beyond Part L 2021 to meet both the energy efficiency target and the minimum 35 per cent improvement. This is because the new Part L baseline now includes low carbon heating for non-residential developments but not for residential developments. However, planning applicants will still be expected to follow the energy hierarchy to maximise the carbon savings before the offset is considered.

It continues to advise that:

Over time it is expected that performance against Part L 2021 will improve to enable these developments to achieve the closer alignment with the energy efficiency targets and the minimum 35 per cent on-site improvement due to technological improvements and as cost come down. We will monitor this progress and may update the benchmarks to reflect these improvements as appropriate. In the intervening period applicants should continue to aim to maximise on-site carbon reductions as far as possible.

Policy SI3 – Energy Infrastructure

Boroughs and developers should engage at an early stage with relevant energy companies and bodies to establish the future energy and infrastructure requirements arising from large-scale development proposals such as Opportunity Areas, Town Centres, other growth areas or clusters of significant new developments.
Major development proposals within Heat Network Priority Areas should have a communal low-temperature heating system and the heat source for the communal heating system should be selected in accordance with the following heating hierarchy:

- Connect to local existing or planned heat networks.
- Use zero-emission or local secondary heat sources (in conjunction with heat pump, if required).
- Use low-emission Combined Heat and Power (CHP), only where there is a case for CHP to enable the delivery of an area-wide heat network, meet the development's electricity demand and provide demand response to the local electricity network.
- Use ultra-low NOx gas boilers.
- CHP and ultra-low NOx gas boiler communal or district heating systems should be designed to ensure that they meet the requirements of policy SI1 – Improving air quality; and
- Where a heat network is planned but not yet in existence the development should be designed to allow for a cost-effective connection at a later date.

Policy SI4 – Managing Heat Risk

Development proposals should minimize adverse impacts on the urban heat island through design, layout, orientation, materials, and the incorporation of green infrastructure.

Major development proposals should demonstrate through an energy strategy how they will reduce the potential for internal overheating and reliance on air conditioning systems in accordance with the following cooling hierarchy:

- Reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation, and the provision of green infrastructure.
- Minimize internal heat generation through energy-efficient design.
- Manage the heat within the building through exposed internal thermal mass and high ceilings.
- Provide passive ventilation.
- Provide mechanical ventilation.
- Provide active cooling systems in a way that utilizes rejected heat locally.

3.1.4 GLA Energy Assessment Guidance, 2022

In June 2022, the GLA released a new guidance on preparing Energy Assessments as part of planning applications. Within this guidance, it states that Part L 2021 carbon factors are expected to be used for referable applications unless the development is expected to comply with London Plan Policy SI 3 – development in Heat Network Priority Area. In this case, developments should be provided with communal low-temperature heating system and the heat source shall be selected according to the below (most preferrable – least preferrable)

- Local existing / planned heat networks
- Heat source which uses zero-emission or local secondary heat source (in conjunction with heat pumps)
- Heat source which uses low-emission CHP
- Heat source which uses ultra-low nitrogen oxides (NOx)
- The above CO2 factors associated with the heat supplied by a network shall be obtained by the network operator and be provided in the energy assessment.

3.2 London Borough Richmond upon Thames Local Plan (July 2018)

LBRuT's Local Plan was adopted in July 2018. The Local Plan replaces (2018) replaces the previous Local Plan as well as the Local Development Management policies. Key policies relating to energy and sustainability are summarised below.

Policy LP 1 Local Character and Design Quality

The council will require all developments to be of high architectural and urban design quality. The high quality character and heritage of the borough and its Villages will need to be maintained and enhanced where opportunities arise. Development proposals will have to demonstrate a thorough understanding of the site and how it relates to its existing context, including character and appearance, and take opportunities to improve the quality and character of buildings, spaces and the local area.

Policy LP 8 Amenity and Living Conditions

Design and layout of buildings enables good standards of daylight and sunlight to be achieved in new developments and in existing properties affected by new developments.

Policy LP 10 Local Environmental Impacts, Pollution and Land Contamination

Development proposals should not lead to detrimental effects on the health, safety and amenity of existing and new users or occupiers of the development site, or the surrounding land. These potential impacts can include, but are not limited to, air pollution, noise and vibration, light pollution, odours and fumes, solar glare, solar dazzle and land contamination.

Policy LP 17 Green Roofs and Walls

Green/brown roofs should be incorporated into new major developments with roof plate areas of 100sqm or more where technically feasible and subject to considerations of visual impact. If it is not feasible to incorporate a green/brown roof, then a green wall should be incorporated.

Policy LP 20 Climate Change Adaptation

Developments will be encouraged to be fully resilient to the future impacts of climate change in order to minimise vulnerability of people and property.
New developments should minimise the effects of overheating in accordance with the cooling hierarchy.

Policy LP 22 Sustainable Design and Construction

LP22A Sustainable Design and Construction

1. Developments of 1 dwelling or more, or 100sqm or more of non-residential floor space (including extensions) will be required to comply with the Sustainable Construction Checklist SPD.
2. Developments with new dwellings must achieve a water consumption of 110l per person per day for homes.
3. New non-residential buildings over 100sqm must achieve BREEAM "Excellent"
4. Change of use residential should meet BREEAM Domestic Refurbishment "Excellent", where feasible.

LP22B Reducing Carbon Dioxide Emissions

1. All major residential developments should achieve zero carbon standards in line with London Plan policy.
2. All other new residential buildings should achieve 35% reduction.
3. All major non-residential buildings should achieve a 35% reduction. From 2019 all major non-residential should achieve zero carbon standards in line with London Plan Policy.

LP22D Decentralised Energy Networks

1. All new development required to connect to existing DE network where feasible (including planned DE networks operational within 5 years of development completion).
2. Major developments will need to provide an assessment of the provision of on-site DE networks and CHP.
3. Where feasible, major developments will need to provide on-site DE and CHP. Provision for future connection should be incorporated where required.

Policy LP 23 Water Resources and Infrastructure

Water resources and supplies will be protected by resisting proposals that would pose an unacceptable threat. Proposals that seek to increase water availability or protect and improve water quality will be encouraged.

Policy LP 30 Health and Wellbeing

Developments that support the following will be encouraged:

- Sustainable modes of travel
- Access to green infrastructure
- Access to local community facilities, services and shops
- Access to local healthy food
- Access to toilet facilities open to all
- Inclusive public realm layout

3.3 Emerging Policy

LBRuT are in the process of preparing a new Local Plan and currently anticipate consultation on the pre-publication (Regulation 19) will commence in early June 2023. Whilst the emerging plan is acknowledged, we note that it carries limited weight at this time due to its early stage of preparation and possibility for further amendments.

4 Establishing CO_2 Emissions

This section presents the baseline CO_2 emissions (TER – Target Emissions Rate) i.e., carbon emissions of the building regulations Part L compliant development from the 'be green' stage of the energy hierarchy as required by the GLA's Energy Assessment Guidance 2022.

Regulated CO_2 emissions were calculated using FSAP 10 for the domestic assets and EDSL-Tas for the non-domestic assets, outputs of which were then put into the GLA spreadsheet to establish the baseline carbon emissions.

Unregulated carbon emissions for domestic part of the development have been calculated using the methodology provided under SAP 10.2 Appendix L and for non-domestic part it has been calculated und the GLA Energy Assessment Guidance for operational energy (be seen).

A sample of apartments were individually modelled using FSAP 10 and these were then extended to include for the dwellings with exposed surfaces (floors to ground or non-domestic assets and roofs), allowing for an accurate average performance to be calculated in accordance with building regulations Part L guidance. All non-domestic uses were modelled in EDSL-Tas and with all proposed uses appropriately zoned with internal conditions in line with the National Calculation Methodology (NCM).

Baseline carbon emissions for the domestic and non-domestic assets of the building are summarised in Table 4-1 and 4-2 below. The BRUKL documents for the non-domestic part and the residential SAP compliance information can be found in Appendices 13.6 and 13.7.

Domestic Assets – Residential Units

	Carbon Dioxide Emissions for the Proposed building (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	353.4	144.3

Table 4-1 – Baseline CO_2 emissions for the domestic parts of the development

Non-Domestic assets – Commercial Spaces

	Carbon Dioxide Emissions for the Proposed building (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	2.0	1.4

Table 4-2 - Baseline CO_2 emissions for the non-domestic parts of the development

5 Demand Reduction (Be Lean)

This section presents the reduction in CO_2 emissions achieved through the implementation of the energy demand reduction measures.

The design approach for the Proposed Development has targeted demand reduction measures first, giving priority to the optimisation of the building fabric performance to reduce the need for heating, cooling, and lighting. The objective was to maximise efficiency ('lean') as much as possible and avoid reliance on complex active/mechanical systems to deliver a low carbon performance. The focus was to achieve a low energy building rather than just relying on carbon offsetting technologies. Studies were carried out at early design stages to inform the building envelope in terms of the envelope thermal performance with regards to airtightness and levels of insulation.

The current London Plan 2021 requires domestic developments to achieve at least a 10% improvement and non-domestic developments a 15% improvement on 2021 building regulations. The design team has made all possible endeavours to meet these targets, where feasible.

5.1 Passive Design Measures

There has been a key focus on reviewing the passive design of the building to reduce energy demand for both domestic and non-domestic areas of the development including:

- Optimising glazing to limit solar gains, maintain fabric performance, and encourage the benefits of daylighting
- High levels of thermal insulation for opaque elements, reducing heat loss.
- Thermal bridging mitigated in design detailing wherever possible to limit heat loss.
- High levels of airtightness, reducing heat loss and mitigating drafts.

5.1.1 Building Fabric

The proposed and target fabric performance for the non-domestic and domestic areas of the development is presented in the table below.

Building Element	Domestic	Non-Domestic
	U-Value (W/m².K)	U-Value (W/m².K)
External walls	0.13	0.13
Exposed roof	0.13	N/A
Exposed floor	0.11	0.11
Windows	U-Value W/m².K (g-Value / VLT)	U-Value W/m².K (g-Value / VLT)
Windows (including frame)	1.20 (G 0.35 / VLT 60%)	1.20 (G 0.35 / VLT60%)
Thermal bridging	0.05	0.25
Air permeability (m³/h/m²@50pa)	2.5	3

Table 5-1 – Fabric performance of domestic and non-domestic areas of the development

In addition to the requirements indicated in the table of building fabric assumptions, all fenestrations should achieve a centre-pane U-value of 1.0 W/m²K or lower.

5.2 Active Design Measures

Following from the passive measures that deal with fabric losses and gains balance, energy efficiency (active) measures have also been proposed to further reduce energy demand.

All dwellings would be provided with a high efficiency whole-house mechanical ventilation with minimum fresh air and very high heat recovery rate. The ventilation systems would have the capacity to provide enhanced ventilation.

Artificial lighting uses low-energy light fittings and efficient lighting controls that include presence/absence detection and daylight linked dimming, where appropriate in all buildings.

The residential and commercial spaces would benefit from systems in line with the efficiencies proposed in this report. The heat recovery would further reduce the energy demand of the spaces.

5.3 Demand Side Response

Advancement and commercialisation of smart technologies presents additional opportunities to manage and save energy. However, the rate of smart technology development means that specified equipment could be meaningfully improved by the time of procurement. Therefore, some scope flexibility is relevant at design stage in order to take advantage of this.

In this context, the following features may be considered during detailed design:

- Power, data and media infrastructure to deliver buildings which are smart enabled for future connectivity by occupants.
- Smart utility meters provided for all residential units. Commercial units equipped with smart metering via base build or fit-out.
- Dwelling heat interface units enabled for connection via domestic smart control systems
- Similarly, dwelling MVHR units enabled for connection to proprietary domestic smart control systems.
- These components may support the operational energy monitoring requirements.

5.4 'Be Lean' Results

The estimated energy demand reductions for the domestic and non-domestic elements of the development are shown in Table 5-2 and Table 5-3.

Domestic Assets – Residential Units

	Carbon Dioxide Emissions for the Proposed building (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	353.4	144.3
After energy demand reduction (be lean)	315.0	144.3

	Regulated carbon dioxide savings for the Proposed building	
	(Tonnes CO_2 per annum)	(%)
Be Lean savings	38.4	11%

Table 5-2 – Proposed domestic building CO_2 emissions after the lean stage of the energy hierarchy

Non-Domestic assets – Commercial Spaces

	Carbon Dioxide Emissions for the Proposed building (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	2.0	1.4
After energy demand reduction (be lean)	2.0	1.4

	Regulated carbon dioxide savings for the Proposed building	
	(Tonnes CO_2 per annum)	(%)
Be Lean savings	0.1	3%

Table 5-3 – Proposed non-domestic CO_2 emissions after the lean stage of the energy hierarchy

The new draft London Plan requires all major domestic and non-domestic developments to achieve an improvement of 10% and 15% improvement, respectively. Updated building regulations have proposed onerous targets for fabric performance which will help to accelerate the push to net-zero.

While the above targets form the overarching framework that are followed in the preparation of this statement, a recognition exists that the non-domestic element of the Proposed Development might not be able to achieve these savings. The Proposed domestic and non-domestic areas achieve an energy saving demand of 11% and 3% respectively. This is contributed by the combination of passive measures and active measures discussed in 5.1 and 5.2.

5.5 Dwelling Fabric Energy Efficiency

	Target Fabric Energy Efficiency (kWh/m^2)	Dwelling Fabric Energy Efficiency (kWh/m^2)	Improvement (%)
Development total	26.03	22.98	12%

Table 5-4 – Dwelling Fabric Efficiency Improvement

5.6 Energy Use Intensity & Space Heating Demand

	EUI (kWh/m^2/year)	Space heating demand (kWh/m^2/year)	EUI benchmark (kWh/m^2/year)	Space heating demand benchmark (kWh/m^2/year) (excluding
Domestic Areas	26.9	8.2	35	15
Non-Domestic Areas	53.5	2.6	35	15

Table 5-5 – Proposed non-domestic Energy Use Intensity

The early-stage energy use intensity calculations have been produced considering SAP, and NCM inputs for unregulated energy which have provided worst case scenario results. Further investigation would be done at post-planning stage to produce detailed operational energy calculations.

Note that the latest SAP 10.2 software is unable to support many of the GLA requirements and internal calculations have been produced to determine the EUI. The SAP methodology is unable to predict a realistic space heating demand due to the limits of the latest SAP 10.2 software.

6 Cooling Hierarchy

6.1.1 The Good Homes Alliance Early Stage Overheating Risk Tool

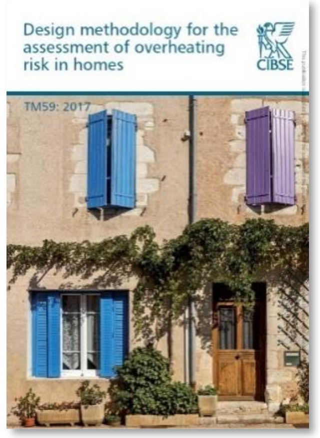
The Good Homes Alliance (GHA) Early Stage Overheating Risk Tool was used early in the design process to identify potential overheating risk. The completed tool can be found in section 12.1. It concluded that a further detailed assessment was required for the Site.

6.1.2 Detailed Overheating Risk Analysis

In line with the London Plan policy, detailed overheating analysis was undertaken for the proposed Site. For the purpose of the study, the following assessment methods were followed:

- Approved Document Part O: Overheating (2021)
- CIBSE TM59: Design methodology for the assessment of overheating risk in homes (2017).

CIBSE TM59: Design Methodology for the Assessment of Overheating Risk in Homes



Residential areas of the proposed development are assessed against the CIBSE TM59: Design Methodology for the Assessment of Overheating Risk in Homes criteria. This uses an adaptive approach in which occupants' thermal comfort is affected by their experience over the previous days.

An additional criterion is assessed at night. This criterion assesses whether night-time temperatures will be greater than 26ºC – the temperature above which sleep disruption is likely to occur.

Criteria allows for an amount of deviation from the criteria as shown in the following table.

	Assessment Criteria	Target / acceptable deviation
Criterion A	Living rooms, kitchens, bedrooms & studios Frequency of occupied hours when $\Delta T \geq 1$ °C (Internal temperature vs external running mean)	3% of occupied hours during May -September, i.e. *<110 hrs for bedrooms & studios* *<59 hrs for living rooms*
Criterion B	Bedrooms & studios: Frequency of occupied hours when operative temperature ≥ 26 °C	1% of annual hours from 10pm to 7am, i.e. *<32 hrs for bedrooms & studios*

Table 6.1: CIBSE TM59 assessment criterion

Approved Document O – Overheating (ADO)

Part O 2021 took effect on 15th June 2022 and has been applied to this project assessment. The approach to assessing overheating risk and mitigation very much aligns with the GLA's cooling hierarchy. The simplified method was also used in Stage 2 to guide and inform the facades designs.

Part O dynamic thermal modelling method employs CIBSE TM59 with modifications.

a. When a room is occupied during the day (8am to 11pm), openings should be modelled to do all of the following.

I. Start to open when the internal temperature exceeds 22°C.
II. Be fully open when the internal temperature exceeds 26°C.
III. Start to close when the internal temperature falls below 26°C.
IV. Be fully closed when the internal temperature falls below 22°C.

b. At night (11pm to 8am), openings should be modelled as fully open if both of the following apply.

I. The opening is on the first floor or above and not easily accessible.
II. The internal temperature exceeds 23°C at 11pm.

Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits.

a. 40dB LAeq,T, averaged over 8 hours (between 11pm and 7am).
b. 55dB LAFmax, more than 10 times a night (between 11pm and 7am).

Acoustic Criteria

Detailed acoustics analysis has been carried out for the Proposed Development into three zones: High Risk Areas, Low/Medium Risk Areas and Negligible Risk Areas.

It is considered that the 'high risk' areas will require bedroom windows to be closed at night. In the 'low/medium risk' areas, it is likely that noise levels inside bedrooms would exceed the levels detailed in ADO. In the 'negligible risk' areas, it is considered that opening windows in bedrooms at night would be acceptable.

Please refer to the Acoustic Technical Note prepared by RBA Acoustics (reference: 11695.ATN03.ADO1).

6.1.3 Measures to Mitigate Overheating Risk and Reduce Cooling Demand

As part of the drive to reduce demand for energy highlighted by Mayor's Cooling Hierarchy set out in the London Plan, the design of Manor Road has considered a number of passive and active measures that help reduce the cooling demand in the dwellings. The proposed approach is summarised in the table below.

London Plan Cooling Hierarchy	Measures
Minimise internal heat generation through energy efficient design	• Low energy lighting specified throughout with the inclusion of presence detection, where feasible. • Availability of natural light is maximised to discourage the use of artificial lighting. • Energy Efficiency appliances are proposed along with guidance to occupants via the Building/Home User Guides • Communal pipework will be insulated to mitigate distribution losses
Reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls	• Building fabric has high levels of insulation and good levels of airtightness limiting heat ingress. • Optimised glazing areas to limit solar gain. • Recessed glazing to provide solar protection. • Solar control glazing to limit solar gain. • Measures have been implemented without the use of blinds therefore providing a resilient solution that doesn't rely on human intervention to be successful.
Manage the heat within the building through exposed internal thermal mass and high ceilings	• High thermal mass of the slab and façade structure stabilises daytime internal temperature fluctuations.
Passive ventilation	• Natural daytime and night-time ventilation enabled via openable windows and balcony doors. The window control assumptions are listed in Table 4.8 – Proposed cooling hierarchy for the domestic rooms assessed under CIBSE TM59.
Mechanical ventilation	• Standard Part F ventilation rate provided by a mechanical ventilation with heat recovery system under summer bypass mode.
Active cooling	• By the nature of the proposed ambient loop system, the facility to reverse the refrigeration to provide peak lopping cooling is available to all dwellings (with a capacity of up to 20 W/sqm). This is considered to be the most appropriate solution for the Site where large number of dwellings have noise restrictions.

Table 6.2 – Cooling hierarchy at Manor Road

The well insulated envelope combined with openable windows provide the potential for very effective daytime and night-time natural ventilation with high level of occupant air flow control. This would be complemented by a combination of MVHR, with the capability of peak lopping cooling. All systems within the dwellings would be compliant with Building Regulations Part F and CIBSE guidelines.

The orientation of the building, façade details and surrounding context contributes to provide self-shading and minimise direct solar radiation. Detailed overheating analysis has been carried out using IES-VE for the residential and commercial areas and these are detailed in the following sections.

6.2 Overheating Modelling Assumptions

Overheating assessments have been completed for domestic areas of the building by assessing a representative sample of apartments across the Site.

Overheating assessments have been carried out for the domestic areas using TM59 and Approved Document O (ADO) criteria. The following assumptions have been made:

- All occupied domestic areas of the development have been assessed.
- The analysis have been carried out using Dynamic Thermal Modelling software; IES-VE 2022.2.0.0. This software tool is fully compliant with the CIBSE Applications Manual 11: Building Energy and Environment Modelling.
- Surrounding buildings have been modelled to take into account the neighbouring building's over-shading.
- Trees are excluded from dynamic thermal models, in line with ADO.
- As the site is located centrally, the weather file that has been used for the overheating assessment is CIBSE London Heathrow DSY1 for 2020s, high emissions, 50% percentile scenario.
- Additional iterations have been done for CIBSE TM49 extreme weather files for London Heathrow DSY2 2020 High Emissions 50th Percentile (DSY2) and London Heathrow DSY3 2020 High Emissions 50th Percentile (DSY3). The results have been included in the Appendix 13.1 and 13.2.
- Thermal elements performance (U-values and glazing g-values) are presented in Table 5.1.
- Occupancy patterns and internal gains for the domestic areas are prescribed by the CIBSE TM59 methodology with additional guidance from ADO.
- Windows of the domestic areas are openable during the day when the internal temperature exceeds 22°C to a maximum of 90° at an internal temperature of 26°C in line with CIBSE TM 59 guidelines. Considering the extent of noise restrictions, bedroom windows have been modelled as closed at night.
- Any window and/or balcony door that faces onto a balcony will be fully openable at the times proposed.

6.3 Domestic Overheating Results

An overheating assessment has been carried out for the domestic areas using CIBSE Guide A for free running buildings. In this case the buildings should be designed to limit the risk of overheating, in accordance with Overheating: Approved Document O (ADO), which builds upon the adaptive comfort methodology outlined in CIBSE TM59: Design methodology for the assessment of overheating risk in homes.

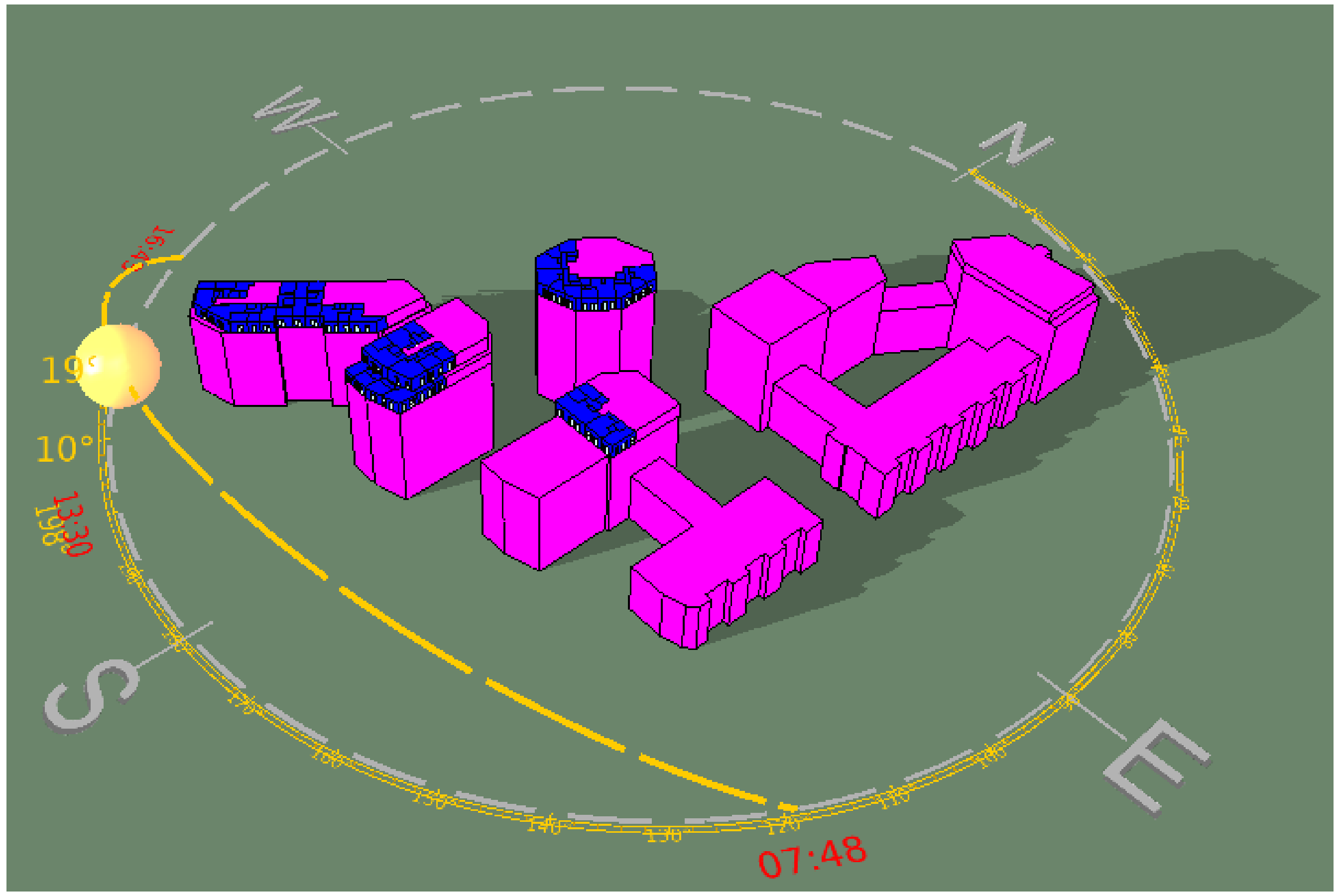


Figure 6-1 IES Model of the Proposed Development

Templates for typical domestic space types are provided by TM59, with ADO providing further instruction for modelling parameters which gives clear instruction on several items such as:

- Window opening profile
- Appropriate shading devices
- Night purge
- Tolerances for pollution such as air pollution and noise pollution

The limitations on window openability due to safety precautions and noise pollution, on top of the consideration for current and future climate conditions in a sub-urban location, mean that peak lopping cooling will be required to ensure appropriate thermal comfort for residents. However, considerable analysis has been conducted at early design stage to ensure that overheating risk has been mitigated through passive measures.

DSY1 results can be summarised as follows:

	No. Tested	Pass	Fail
Bedrooms	31	31	0
Living rooms/Kitchens	18	18	0

Table 6.3 - Overheating results for the dwellings during a moderately warm summer (DSY1 2020 50% percentile)

Please refer to Appendix 12.1 for the full results for both free-running building and building with peak lopping, along with the results for DSY2 and DSY3 weather files.

7 Heating Infrastructure (Be Clean)

7.1 Local District Heating Networks

A desktop-based study was undertaken using London Heat Map to identify if there are any district energy networks that the Proposed Development could connect to. No existing or proposed district heat networks in the local area has been identified.

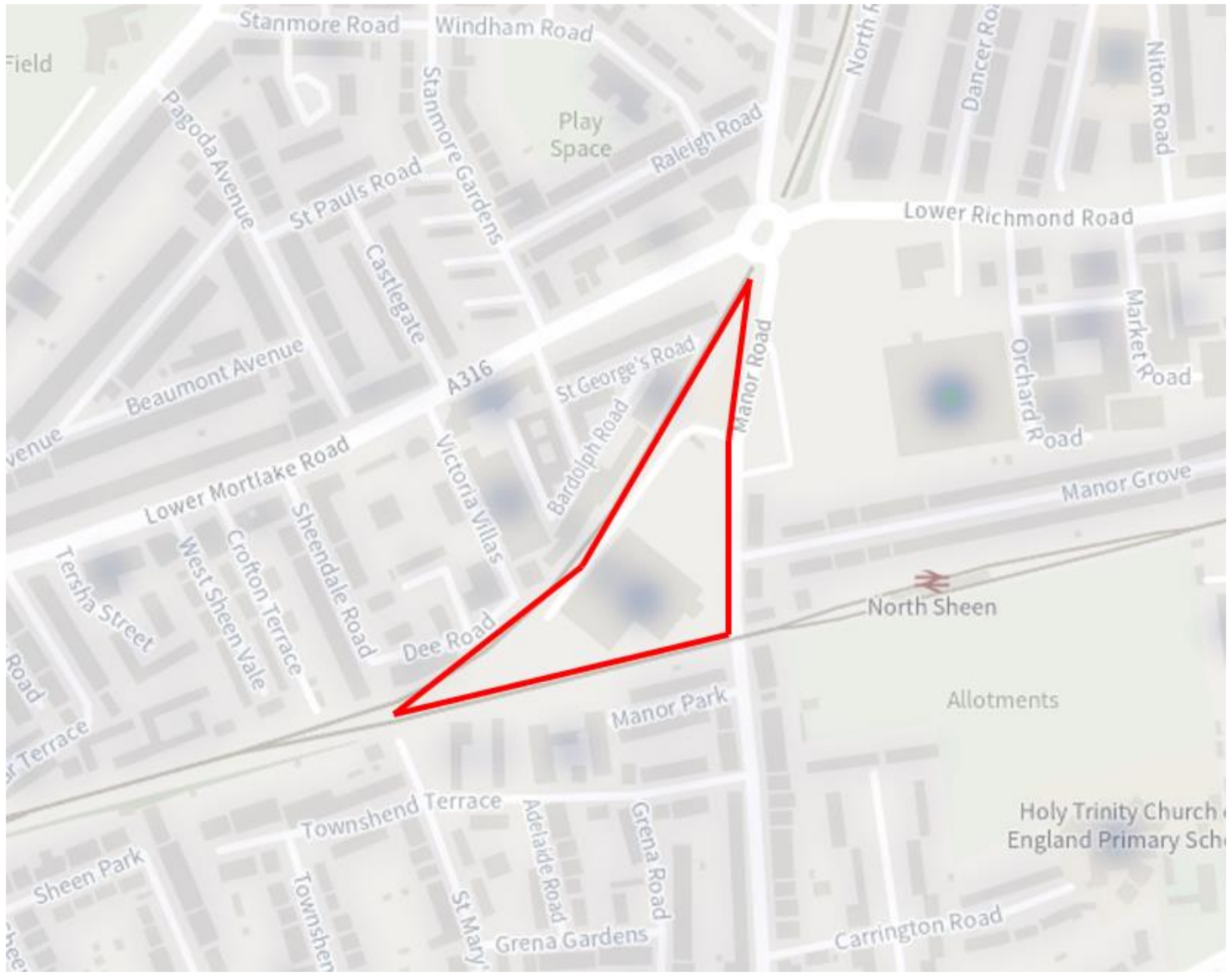


Figure 7-1 – Heat Map of Manor Road site (red – the Site)

7.2 'Be Clean' Results

Table 7-1 and 7-2 show the expected carbon emissions and reductions at this stage of the energy hierarchy. As there is no opportunity to connect to a district network and CHP is no longer considered a viable low carbon technology in the new GLA guidance, there are no improvements at this stage.

Domestic Assets – Residential Units

	Carbon Dioxide Emissions (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	353.4	144.3
After energy demand reduction (be lean)	315.0	144.3
After heat network connection (be clean)	315.0	144.3

	Regulated carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be Lean savings	38.4	11%
Be Clean savings	0	0%

Table 7-1 – Proposed domestic building CO_2 emissions after the clean stage of the energy hierarchy

Non-Domestic assets – Commercial Spaces

	Carbon Dioxide Emissions (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	2.0	1.4
After energy demand reduction (be lean)	2.0	1.4
After heat network connection (be clean)	2.0	1.4

	Regulated carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be Lean savings	0.1	3%
Be Clean savings	0	0%

Table 7-2 – Proposed non-domestic CO_2 emissions after the clean stage of the energy hierarchy

7.3 Future Proofing

Proposal for this development includes an energy centre with community heating network for each building tower. Each of the building energy centres could be connected to zero carbon heat generators or district network in the future. 2050 is over 25 years away, during which time the energy landscape could evolve significantly, especially when the rates of change are considered.

The Government's 'Clean Growth Strategy' report, produced to support 'Climate Change Act' commitments, declares that technological breakthroughs that will help deliver the carbon budgets and targets cannot be exactly predicted. The 'pathways' illustrated in the strategy are based on current technologies. For buildings, the proposals include the following:

- Virtually zero carbon electricity grid by 2050
- Smart electricity grids
- Low carbon sources of heating through district heating
- Hydrogen fuel for heating

Advancements in existing and emerging technologies are accelerating, resulting in even further synergies and discoveries. The rate, as well as the nature and magnitude of change are expected to increase. Building level technologies which will be available to facilitate zero carbon operation cannot be exactly predicted now.

However, it is safe to speculate, that when the Government achieves these targets, then this development will be plugged into a zero-carbon infrastructure. It is envisaged that any residual carbon will be mitigated by the building level technology available at that time.

8 Renewable Energy (Be Green)

The third step in the energy hierarchy requires the generation of energy by renewable energy technologies, to be examined in line with the London Plan Policy SI 2, and LBRuT.

The following technologies have been investigated:

- Photovoltaic panels
- Solar water heating
- Wind turbines
- Heat pumps
- Alternative fuels including biomass and biofuels

Key parameters which have been considered in this feasibility study include:

- Current and future planning policies/aspirations
- Opportunities of the site and energy demand/profile of the development
- Practical implementation considerations
- Installation and maintenance issues
- Implications for internal arrangement and space allocation, infrastructure and site layout
- Public acceptability
- Environmental and visual impact
- Deliverability
- Security and availability of fuel supply
- Capital and life cycle costs, payback and grants
- Carbon contribution and cost per CO_2 saving
- Interactions of the technologies with one another

Air Source Heat Pump (ASHP)

A feasibility study for various LZC technologies established that in light of the decarbonisation of the grid, new SAP 10 factors and emerging technologies, a reverse cycle air source heat pump (ASHP) would be an appropriate low and zero carbon technology for the development.

The details of the seasonal efficiency of the heat pumps and design basis is detailed in Appendix 13.8.

Photovoltaic panels

Photovoltaic (PV) panels directly convert sunlight into electrical current using semiconductors. The output of a cell is directly proportional to the intensity of the light received by the active surface of the cell.

For the Proposed Development, this strategy shows a significant potential particularly due to the high unobstructed rooftop of the Proposed Development.

A total of 380 sqm of photovoltaic panels are being proposed at the roof levels. The roof areas were selected as it is unobstructed from any neighbouring buildings. Imposed shading onto the each of the proposed blocks have been mitigated by the buildings orientations and locations relative to each other. Moreover site layout design provides sufficient spacing between the blocks.

8.1 'Be Green' Results

The strategy is based on each block having separate centralised heat pump solutions and photovoltaic panels on the roofs. The details of all active and low carbon measures are presented in Appendix 12.2. The Be Green stage carbon dioxide emissions and savings are presented in the tables below.

Domestic Assets – Residential Units Energy Hierarchy

	Carbon Dioxide Emissions (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Part L 2021 Compliant Building	353.4	144.3
After energy demand reduction	315.0	144.3
After heat network connection	315.0	144.3
After renewable energy	131.9	144.3

	Regulated domestic carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be Lean	38.4	11%
Be Clean	0.0	0%
Be Green	183.1	52%
Cumulative on-site savings	**221.5**	**63%**
Annual savings from off-set payment	131.9	-

Cumulative savings for off-set payment	3,956 tCO2/annum
Cash in-lieu contribution (£)	**£ 375,863**

Table 8-1 - Regulated CO_2 savings from each stage of the energy hierarchy for domestic buildings

Non-Domestic assets – Commercial Space Energy Hierarchy

	Carbon Dioxide Emissions (Tonnes CO2 per annum)	
	Regulated	Unregulated
Part L 2021 Compliant Building	2.0	1.4
After energy demand reduction	2.0	1.4
After heat network connection	2.0	1.4
After renewable energy	1.9	1.4

	Regulated non-domestic carbon dioxide savings for	
	(Tonnes CO_2 per annum)	(%)
Be Lean	0.1	3%
Be Clean	0.0	0%
Be Green	0.1	5%
Cumulative on-site savings	**0.2**	**8%**
Annual savings from off-set payment	1.9	-

Cumulative savings for off-set payment	56 tCO2/annum
Cash in-lieu contribution (£)	**£ 5,301**

Table 8-2 - CO_2 emissions after each stage of the energy hierarchy for non-domestic buildings

Site Wide Energy Hierarchy

	Total regulated carbon dioxide savings		
	Total (Tonnes CO_2 per annum)	CO_2 savings (Tonnes CO_2 per annum)	(%)
Part L 2021 Baseline	355.4	-	-
Be Lean	316.9	38.5	11%
Be Clean	316.9	38.5	0%
Be Green	133.7	183.2	52%
Total savings	**-**	**221.7**	**62%**
	-	CO_2 savings off-set (Tonnes CO_2)	-
Off-set	**-**	**4,012.3**	**-**

Cumulative savings for off-set payment	4,012 tCO2/annum
Cash in-lieu contribution (£)	**£ 381,164**

Table 8-1 CO_2 emissions after each stage of the energy hierarchy for the site

9 Deliver the Savings in Practice (Be Seen)

The Mayor of London has declared a climate emergency and has set an ambition for London to be net zero-carbon. To truly achieve net zero-carbon buildings, a better understanding of their actual operational energy performance is required. Although Part L calculations give an indication of the theoretical performance of buildings, it is well established that there is a 'performance gap' between design theory and measured reality. The London Plan has introduced the 'Be Seen' framework as an attempt to bridge this gap.

For the purposes of complying with the 'Be Seen' policy, a development is split into several 'reportable units' (RUs) which applicants will need to report against individually. These are illustrated in the figure below.

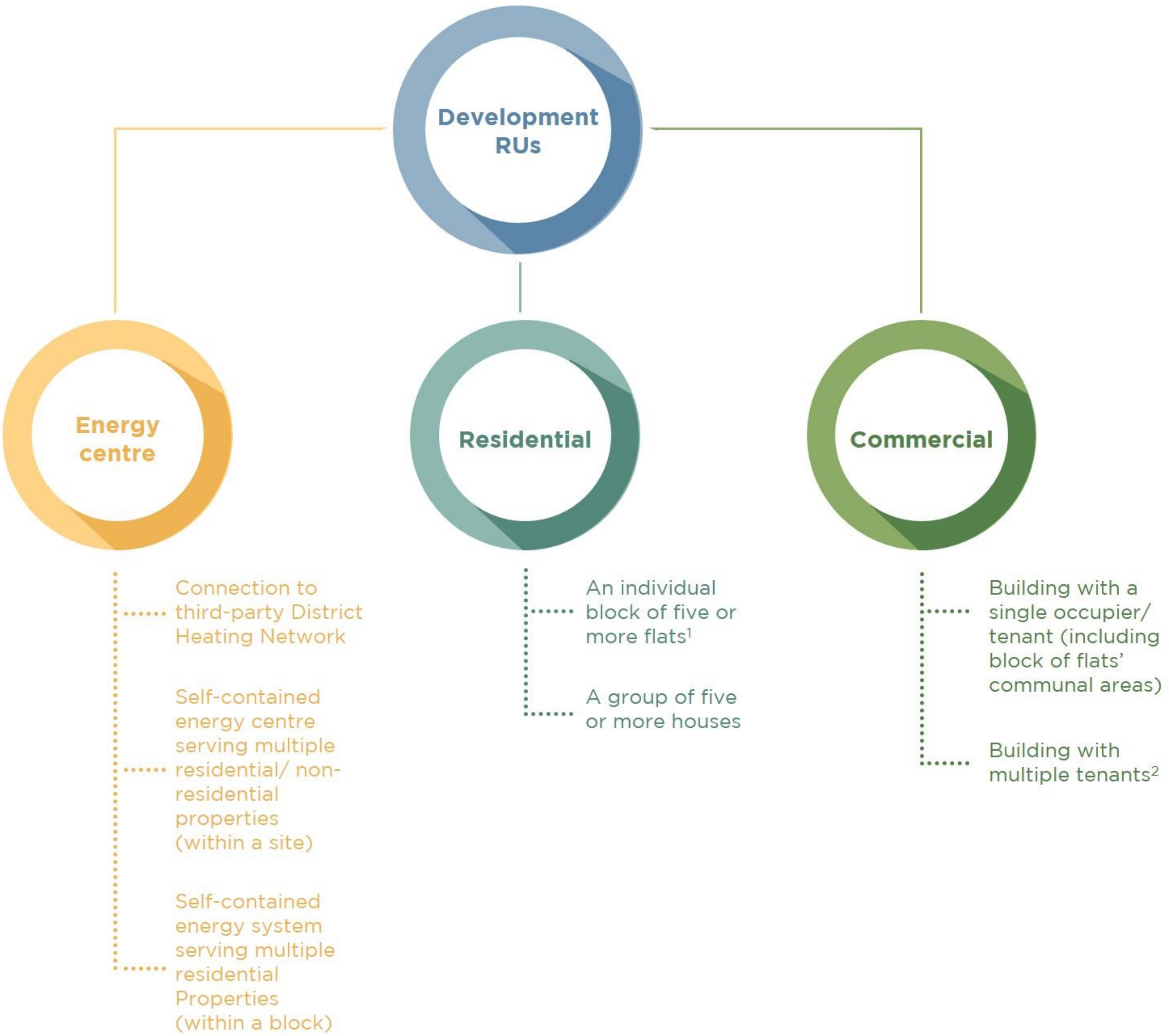


Figure 10-1 – Visual representation of a development's Reportable Units (RUs)

Note that a de minimis threshold applies, where the gross internal floor area of a RU is less than 250 m^2 and/or the expected emissions for the unit are less than 5% of the development's total emissions. De minimis buildings are only required to report energy generation from renewable energy technologies.

Planning Stage

The evidence being requested at the planning stage should be generated via the analysis conducted as part of the energy assessment submission.

For residential uses, the methodology for reporting energy consumption (kWh/m^2) and carbon emissions (tonnes CO_2/m^2) estimates should follow a Building Regulations Part L compliant methodology using the Standard Assessment Procedure (SAP) tool; these are already reported in this document.

For non-residential uses, energy consumption (kWh/m^2) and carbon emissions (tonnes CO_2/m^2) estimates should be informed and reported using two separate methodologies.

Once planning approval has been granted, the applicant will endeavour to provide estimates of each of the performance indicators listed in the table below using the 'be seen' spreadsheet.

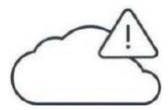
Performance indicator group	Description
 **Contextual data**	• Location Unique Property Reference Number (UPRN) or Address (if no UPRN available) • Site plan • Typology / Planning Use Class (all included) • GIA (m^2) for each Typology / Use Class • Anticipated target dates for each 'Be Seen' reporting stage
 **Building energy use**	• Grid electricity consumption (kWh) • Gas consumption (kWh) • Other fuels consumption (kWh) • Energy generation (kWh) • District heating/cooling consumption (kWh) (if applicable) • Confirm that metering plans that will enable the in-use energy performance reporting are in place
 **Carbon emissions**	• Carbon emissions estimates (tonnes CO_2/m^2) for residential and non-residential uses separately as well as the whole development • Carbon shortfall for the entire development (tonnes CO_2)

Table 10- 1 – Planning stage performance indicators

11 Conclusion

The Proposed Development is supported by this robust Revised Energy Statement which demonstrates a firm commitment to the latest industry guidelines and policies.

The energy strategy has followed the energy hierarchy and has set out the CO_2 emissions savings for both the domestic and non-domestic areas of the development. Carbon emissions reductions at each energy hierarchy are highlighted below:

Domestic Assets – Residential Units Energy Hierarchy

	Carbon Dioxide Emissions (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Part L 2021 Compliant Building	353.4	144.3
After energy demand reduction	315.0	144.3
After heat network connection	315.0	144.3
After renewable energy	131.9	144.3

	Regulated domestic carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be Lean	38.4	11%
Be Clean	0.0	0%
Be Green	183.1	52%
Cumulative on-site savings	**221.5**	**63%**
Annual savings from off-set payment	131.9	-

Cumulative savings for off-set payment	3,956 tCO2/annum
Cash in-lieu contribution (£)	**£ 375,863**

Table 11-1 - Regulated CO_2 savings from each stage of the energy hierarchy for domestic buildings

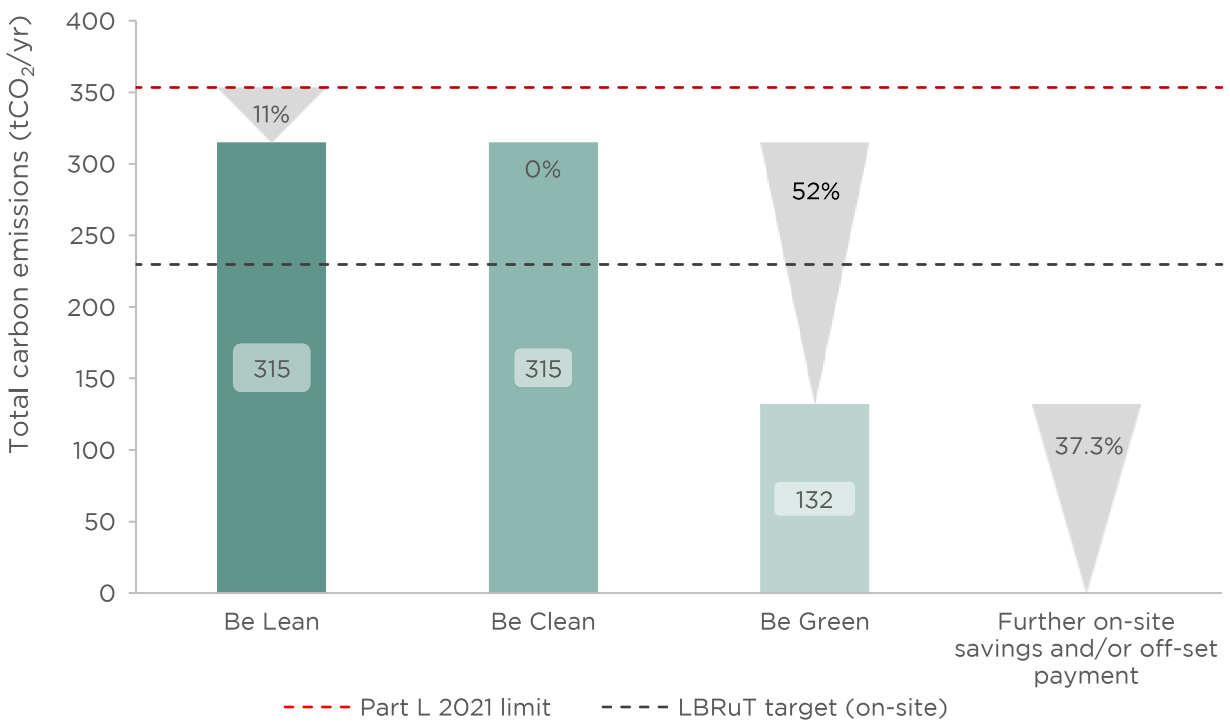


Figure 11-1 - Regulated CO_2 savings from each stage of the energy hierarchy for domestic buildings

Non-Domestic assets – Commercial Space Energy Hierarchy

	Carbon Dioxide Emissions (Tonnes CO2 per annum)	
	Regulated	Unregulated
Part L 2021 Compliant Building	2.0	1.4
After energy demand reduction	2.0	1.4
After heat network connection	2.0	1.4
After renewable energy	1.9	1.4

	Regulated non-domestic carbon dioxide savings for	
	(Tonnes CO_2 per annum)	(%)
Be Lean	0.1	3%
Be Clean	0.0	0%
Be Green	0.1	5%
Cumulative on-site savings	**0.2**	**8%**
Annual savings from off-set payment	1.9	-

Cumulative savings for off-set payment	56 tCO2/annum
Cash in-lieu contribution (£)	**£ 5,301**

Table 11-2 - CO_2 emissions after each stage of the energy hierarchy for non-domestic buildings

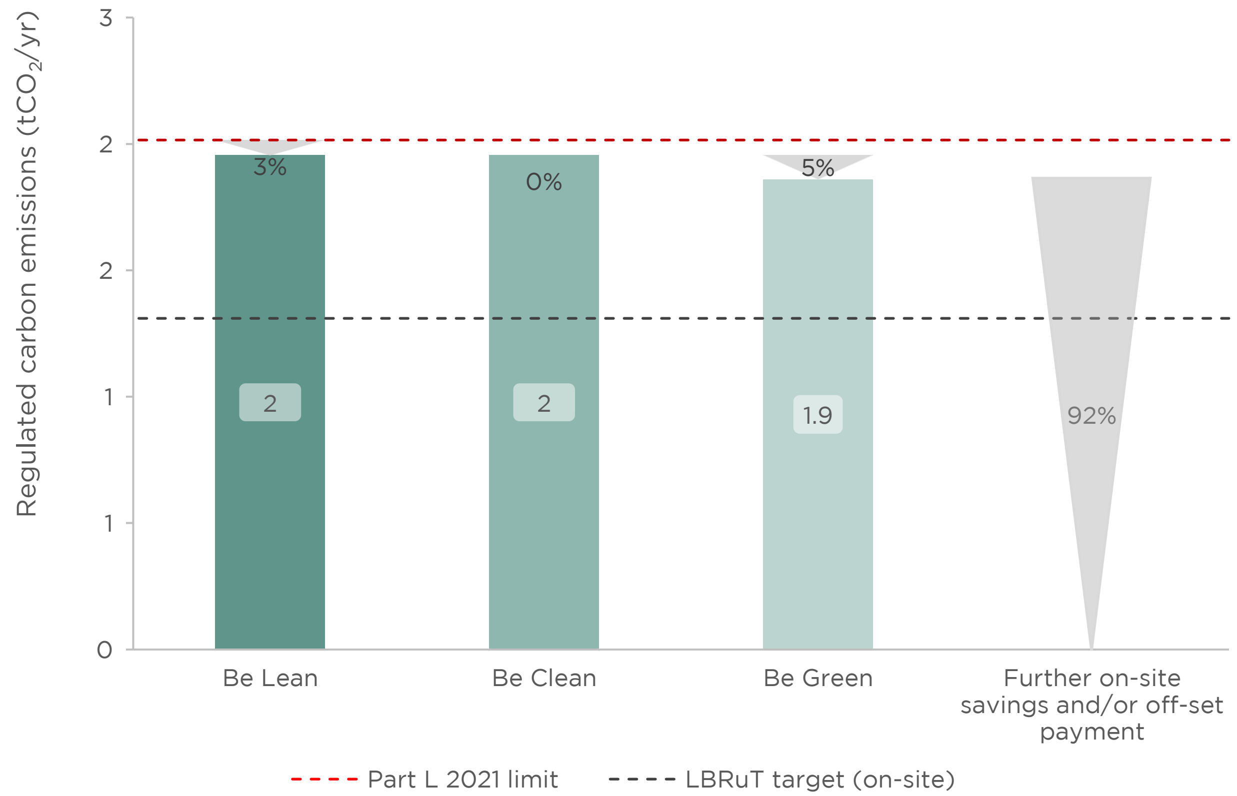


Figure 11-2 - Regulated CO_2 savings from each stage of the energy hierarchy for non-domestic buildings

Site Wide Energy Hierarchy

	Total regulated carbon dioxide savings		
	Total (Tonnes CO_2 per annum)	CO_2 savings (Tonnes CO_2 per annum)	(%)
Part L 2021 Baseline	355.4	-	-
Be Lean	316.9	38.5	11%
Be Clean	316.9	38.5	0%
Be Green	133.7	183.2	52%
Total savings	**-**	**221.7**	**62%**
	-	CO_2 savings off-set (Tonnes CO_2)	-
Off-set	**-**	**4,012.3**	**-**

Cumulative savings for off-set payment	4,012 tCO2/annum
Cash in-lieu contribution (£)	**£ 381,164**

Table 11-3 CO_2 emissions after each stage of the energy hierarchy for the site

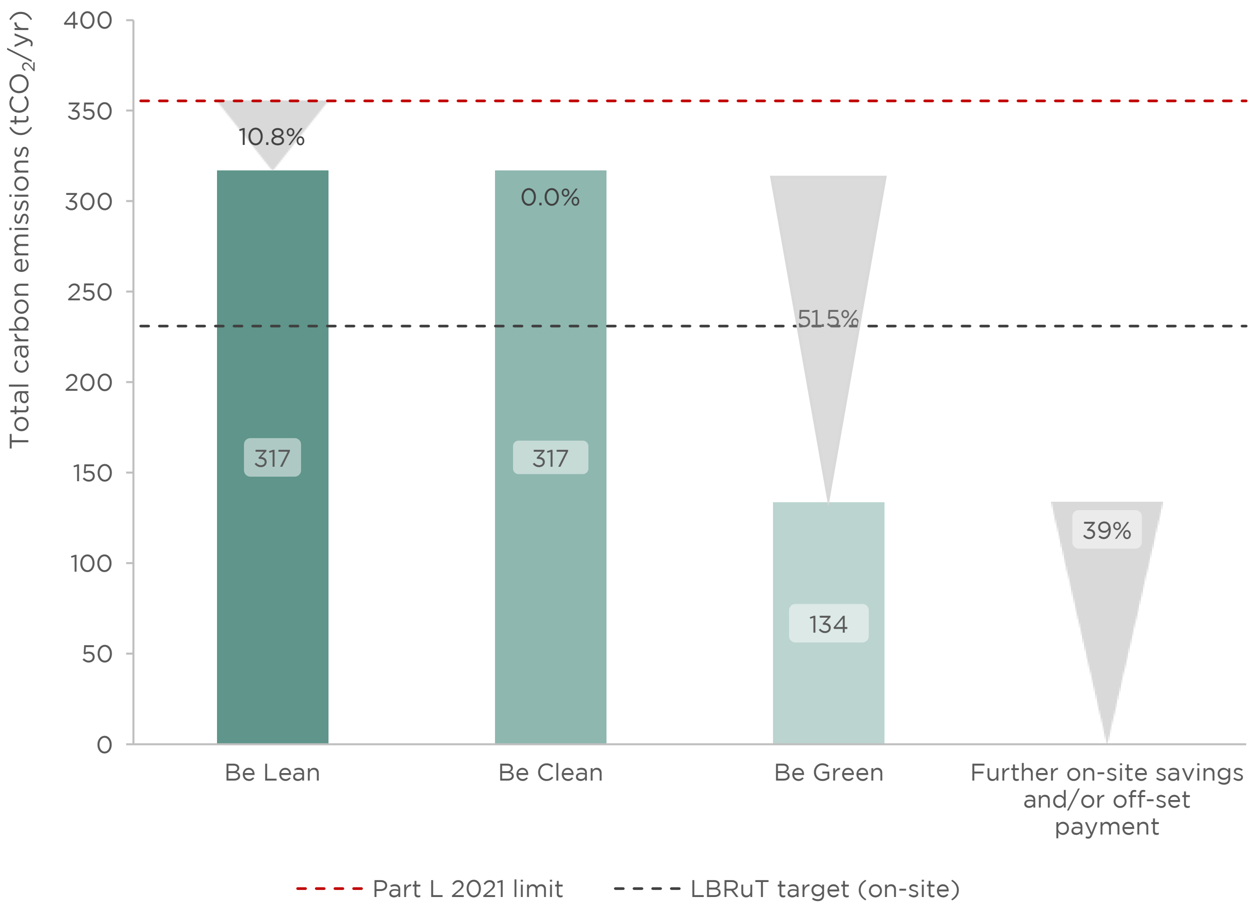


Figure 11-3 - Regulated CO_2 savings from each stage of the energy hierarchy for the Site

The Proposed Development has targeted demand reduction measures, giving priority to the optimisation of the building fabric to reduce the need for heating and cooling. The design is focused on achieving a low-energy building rather than relying on carbon offsetting mechanisms, committing to the priorities set in the London Plan as well as the LBRuT Local Plan 2018.

According to the London Heat map there is no existing or proposed district heat networks in the local area. Nevertheless this proposed development could be connected to zero carbon heat generators or district network in the future.

The renewable obligation for the project will be met by utilising highly efficient air source heat pump technology alongside photovoltaic panels. This is estimated to contribute to 52% and 5% CO_2 emission reduction (Be Green stage of the energy hierarchy) in the domestic areas and the non-domestic areas, respectively. In the context of the site setting, other opportunities for on-site renewable energy generation were explored but not deemed appropriate due to site constraints.

Although the non-domestic areas of the Proposed Development does not achieve the GLA reduction in regulated emissions target of 35% beyond Part L 2021 of Building Regulations, it is evident that the Proposed Development has followed the energy hierarchy to maximise carbon savings before offsetting is considered, in line with the GLA Part L 2021 and the Energy assessment Guidance 2022 – cover note (June 2022).

It should be noted that there is a significant reduction in the carbon offset payment when compared to the previously submitted Revised Energy Strategy. This is due to the lower SAP 10.2 carbon factors in Part L 2021 as a result of the grid decarbonisation.

Taking into account restrictions onsite, detailed overheating assessment has been carried out for the Proposed Development which demonstrated compliance with the Approved Document Part O.

This Proposed Development clearly demonstrates a major commitment to reducing CO_2 emissions resulting in a 62% reduction in sitewide regulated CO_2 emissions. As with all projects, the predicted level of CO_2 emission reductions for the Proposed Development will potentially vary as the project moves forwards since the current predictions are based on concept design information. However, the key design aspirations as set out in this and other supporting documents for the Proposed Development will remain in place.

12 Appendices

12.1 Overheating Analysis

London LHR DSY1 2020s High 50% percentile – Free Running Building

Zone Name	Room Use	Max. % Exceedable Hours	Criterion 1: #Hours Exceeding Comfort Range	Max Exceedable Night Hours	Criterion 2: Number of Night Hours Exceeding 26 °C for Bedrooms.	Result
BA-10-01-LK1	LDK	3	2.8	N/A	N/A	Pass
BA-10-02-LK2	LDK	3	3.8	N/A	N/A	Fail
BA-10-03-LK2	LDK	3	4	N/A	N/A	Fail
BA-10-06-LK2	LDK	3	3.5	N/A	N/A	Fail
CA-08-04-LK1	LDK	3	3.7	N/A	N/A	Fail
CA-08-05-LK1	LDK	3	3.7	N/A	N/A	Fail
CA-08-06-LK1	LDK	3	3.9	N/A	N/A	Fail
CA-08-07-LK2	LDK	3	4.5	N/A	N/A	Fail
CA-09-03-LK2	LDK	3	3.2	N/A	N/A	Fail
CA-09-04-LK1	LDK	3	3.4	N/A	N/A	Fail
CA-09-05-LK1	LDK	3	3.1	N/A	N/A	Fail
CB-07-01-LK2	LDK	3	2.8	N/A	N/A	Pass
CB-07-02-LK2	LDK	3	3.5	N/A	N/A	Fail
CC-07-01-LK2	LDK	3	3.4	N/A	N/A	Fail
CC-07-02-LK3	LDK	3	3.4	N/A	N/A	Fail
CC-07-03-LK3	LDK	3	3.6	N/A	N/A	Fail
DB-07-01-LK1	LDK	3	3.5	N/A	N/A	Fail
DB-07-02-LK2	LDK	3	3.6	N/A	N/A	Fail
BA-10-01-BD	Bedroom	3	2	32	20	Pass
BA-10-02-BD1	Bedroom	3	1.7	32	22	Pass
BA-10-02-BD2	Bedroom	3	2.3	32	14	Pass
BA-10-03-BD1	Bedroom	3	2	32	22	Pass
BA-10-03-BD2	Bedroom	3	2.4	32	16	Pass
BA-10-06-BD1	Bedroom	3	1.6	32	22	Pass
BA-10-06-BD2	Bedroom	3	2.1	32	14	Pass
CA-08-04-BD	Bedroom	3	2	32	23	Pass
CA-08-05-BD	Bedroom	3	1.9	32	22	Pass
CA-08-06-BD	Bedroom	3	2	32	21	Pass
CA-08-07-BD1	Bedroom	3	2.2	32	28	Pass
CA-08-07-BD2	Bedroom	3	2.5	32	24	Pass
CA-09-03-BD1	Bedroom	3	1.9	32	20	Pass
CA-09-03-BD2	Bedroom	3	1.8	32	22	Pass
CA-09-04-BD	Bedroom	3	1.9	32	23	Pass
CA-09-05-BD	Bedroom	3	1.7	32	24	Pass
CB-07-01-BD	Bedroom	3	1.5	32	22	Pass
CB-07-01-SB	Bedroom	3	2	32	22	Pass
CB-07-02-BD1	Bedroom	3	1.8	32	22	Pass
CB-07-02-BD2	Bedroom	3	1.7	32	24	Pass
CC-07-01-BD1	Bedroom	3	2	32	21	Pass
CC-07-01-BD2	Bedroom	3	1.8	32	22	Pass
CC-07-02-BD1	Bedroom	3	1.6	32	22	Pass
CC-07-02-BD2	Bedroom	3	2	32	22	Pass
CC-07-02-SB	Bedroom	3	1.9	32	22	Pass
CC-07-03-BD1	Bedroom	3	1.9	32	21	Pass
CC-07-03-BD2	Bedroom	3	1.8	32	23	Pass
CC-07-03-SB	Bedroom	3	2.2	32	14	Pass
DB-07-01-BD	Bedroom	3	2	32	13	Pass
DB-07-02-BD1	Bedroom	3	2	32	22	Pass
DB-07-02-BD2	Bedroom	3	2.2	32	21	Pass

Table 12.1 – Domestic overheating results for the Bedrooms and LDKs for DSY1 2020s high 50% (free running building)

London LHR DSY1 2020s High 50% percentile – Building with Peak Lopping

Zone Name	Room Use	Max. % Exceedable Hours	Criterion 1: #Hours Exceeding Comfort Range	Max Exceedable Night Hours	Criterion 2: Number of Night Hours Exceeding 26 °C for Bedrooms.	Result
BA-10-01-LK1	LDK	3	0.7	N/A	N/A	Pass
BA-10-02-LK2	LDK	3	1.6	N/A	N/A	Pass
BA-10-03-LK2	LDK	3	1.9	N/A	N/A	Pass
BA-10-06-LK2	LDK	3	1.3	N/A	N/A	Pass
CA-08-04-LK1	LDK	3	0.6	N/A	N/A	Pass
CA-08-05-LK1	LDK	3	0.9	N/A	N/A	Pass
CA-08-06-LK1	LDK	3	1	N/A	N/A	Pass
CA-08-07-LK2	LDK	3	0.6	N/A	N/A	Pass
CA-09-03-LK2	LDK	3	0.6	N/A	N/A	Pass
CA-09-04-LK1	LDK	3	0.7	N/A	N/A	Pass
CA-09-05-LK1	LDK	3	0.3	N/A	N/A	Pass
CB-07-01-LK2	LDK	3	0.3	N/A	N/A	Pass
CB-07-02-LK2	LDK	3	0.2	N/A	N/A	Pass
CC-07-01-LK2	LDK	3	0.4	N/A	N/A	Pass
CC-07-02-LK3	LDK	3	0.6	N/A	N/A	Pass
CC-07-03-LK3	LDK	3	1.8	N/A	N/A	Pass
DB-07-01-LK1	LDK	3	1.1	N/A	N/A	Pass
DB-07-02-LK2	LDK	3	1.1	N/A	N/A	Pass
BA-10-01-BD	Bedroom	3	0.6	32	12	Pass
BA-10-02-BD1	Bedroom	3	0.5	32	13	Pass
BA-10-02-BD2	Bedroom	3	1.3	32	16	Pass
BA-10-03-BD1	Bedroom	3	0.7	32	14	Pass
BA-10-03-BD2	Bedroom	3	1	32	16	Pass
BA-10-06-BD1	Bedroom	3	0.5	32	11	Pass
BA-10-06-BD2	Bedroom	3	1	32	16	Pass
CA-08-04-BD	Bedroom	3	0.3	32	9	Pass
CA-08-05-BD	Bedroom	3	0.4	32	8	Pass
CA-08-06-BD	Bedroom	3	0.5	32	12	Pass
CA-08-07-BD1	Bedroom	3	0.2	32	10	Pass
CA-08-07-BD2	Bedroom	3	0.3	32	12	Pass
CA-09-03-BD1	Bedroom	3	0.3	32	8	Pass
CA-09-03-BD2	Bedroom	3	0.3	32	8	Pass
CA-09-04-BD	Bedroom	3	0.4	32	11	Pass
CA-09-05-BD	Bedroom	3	0.1	32	6	Pass
CB-07-01-BD	Bedroom	3	0.2	32	7	Pass
CB-07-01-SB	Bedroom	3	0.3	32	8	Pass
CB-07-02-BD1	Bedroom	3	0.1	32	8	Pass
CB-07-02-BD2	Bedroom	3	0.2	32	7	Pass
CC-07-01-BD1	Bedroom	3	0.2	32	7	Pass
CC-07-01-BD2	Bedroom	3	0.2	32	10	Pass
CC-07-02-BD1	Bedroom	3	0.2	32	6	Pass
CC-07-02-BD2	Bedroom	3	0.4	32	9	Pass
CC-07-02-SB	Bedroom	3	0.4	32	9	Pass
CC-07-03-BD1	Bedroom	3	0.8	32	15	Pass
CC-07-03-BD2	Bedroom	3	0.8	32	17	Pass
CC-07-03-SB	Bedroom	3	1.2	32	17	Pass
DB-07-01-BD	Bedroom	3	0.9	32	14	Pass
DB-07-02-BD1	Bedroom	3	0.5	32	11	Pass
DB-07-02-BD2	Bedroom	3	0.5	32	12	Pass

Table 12.2 – Domestic overheating results for the Bedrooms and LDKs for DSY1 2020s high 50% (peak lopping)

London LHR DSY2 2020s High 50% percentile – Free Running Building

Zone Name	Room Use	Max. % Exceedable Hours	Criterion 1: #Hours Exceeding Comfort Range	Max Exceedable Night Hours	Criterion 2: Number of Night Hours Exceeding 26 °C for Bedrooms.	Result
BA-10-01-LK1	LDK	3	3.7	N/A	N/A	Fail
BA-10-02-LK2	LDK	3	4.5	N/A	N/A	Fail
BA-10-03-LK2	LDK	3	4.5	N/A	N/A	Fail
BA-10-06-LK2	LDK	3	4.2	N/A	N/A	Fail
CA-08-04-LK1	LDK	3	4.3	N/A	N/A	Fail
CA-08-05-LK1	LDK	3	4.3	N/A	N/A	Fail
CA-08-06-LK1	LDK	3	4.4	N/A	N/A	Fail
CA-08-07-LK2	LDK	3	4.4	N/A	N/A	Fail
CA-09-03-LK2	LDK	3	4.1	N/A	N/A	Fail
CA-09-04-LK1	LDK	3	4.2	N/A	N/A	Fail
CA-09-05-LK1	LDK	3	3.6	N/A	N/A	Fail
CB-07-01-LK2	LDK	3	3.8	N/A	N/A	Fail
CB-07-02-LK2	LDK	3	4.2	N/A	N/A	Fail
CC-07-01-LK2	LDK	3	4.1	N/A	N/A	Fail
CC-07-02-LK3	LDK	3	4.3	N/A	N/A	Fail
CC-07-03-LK3	LDK	3	4.5	N/A	N/A	Fail
DB-07-01-LK1	LDK	3	4.2	N/A	N/A	Fail
DB-07-02-LK2	LDK	3	4.4	N/A	N/A	Fail
BA-10-01-BD	Bedroom	3	2.5	32	23	Pass
BA-10-02-BD1	Bedroom	3	2.2	32	26	Pass
BA-10-02-BD2	Bedroom	3	2.7	32	22	Pass
BA-10-03-BD1	Bedroom	3	2.2	32	26	Pass
BA-10-03-BD2	Bedroom	3	2.7	32	22	Pass
BA-10-06-BD1	Bedroom	3	2	32	26	Pass
BA-10-06-BD2	Bedroom	3	2.5	32	22	Pass
CA-08-04-BD	Bedroom	3	2.4	32	27	Pass
CA-08-05-BD	Bedroom	3	2.3	32	26	Pass
CA-08-06-BD	Bedroom	3	2.6	32	25	Pass
CA-08-07-BD1	Bedroom	3	2.1	32	34	Fail
CA-08-07-BD2	Bedroom	3	2.4	32	27	Pass
CA-09-03-BD1	Bedroom	3	2.3	32	23	Pass
CA-09-03-BD2	Bedroom	3	2.2	32	25	Pass
CA-09-04-BD	Bedroom	3	2.3	32	31	Pass
CA-09-05-BD	Bedroom	3	2	32	33	Fail
CB-07-01-BD	Bedroom	3	2.2	32	28	Pass
CB-07-01-SB	Bedroom	3	2.5	32	27	Pass
CB-07-02-BD1	Bedroom	3	2.3	32	28	Pass
CB-07-02-BD2	Bedroom	3	2.2	32	34	Fail
CC-07-01-BD1	Bedroom	3	2.3	32	25	Pass
CC-07-01-BD2	Bedroom	3	2.3	32	28	Pass
CC-07-02-BD1	Bedroom	3	2.2	32	26	Pass
CC-07-02-BD2	Bedroom	3	2.4	32	27	Pass
CC-07-02-SB	Bedroom	3	2.4	32	27	Pass
CC-07-03-BD1	Bedroom	3	2.2	32	25	Pass
CC-07-03-BD2	Bedroom	3	2.2	32	31	Pass
CC-07-03-SB	Bedroom	3	2.6	32	23	Pass
DB-07-01-BD	Bedroom	3	2.5	32	18	Pass
DB-07-02-BD1	Bedroom	3	2.3	32	27	Pass
DB-07-02-BD2	Bedroom	3	2.6	32	26	Pass

Table 12.3 – Domestic overheating results for the Bedrooms and LDKs for DSY2 2020s high 50% (free running building)

London LHR DSY2 2020s High 50% percentile – Building with Peak Lopping

Zone Name	Room Use	Max. % Exceedable Hours	Criterion 1: #Hours Exceeding Comfort Range	Max Exceedable Night Hours	Criterion 2: Number of Night Hours Exceeding 26 °C for Bedrooms.	Result
BA-10-01-LK1	LDK	3	2.2	N/A	N/A	Pass
BA-10-02-LK2	LDK	3	3.2	N/A	N/A	Fail
BA-10-03-LK2	LDK	3	3.4	N/A	N/A	Fail
BA-10-06-LK2	LDK	3	3.1	N/A	N/A	Fail
CA-08-04-LK1	LDK	3	1.9	N/A	N/A	Pass
CA-08-05-LK1	LDK	3	2.6	N/A	N/A	Pass
CA-08-06-LK1	LDK	3	2.6	N/A	N/A	Pass
CA-08-07-LK2	LDK	3	1.9	N/A	N/A	Pass
CA-09-03-LK2	LDK	3	1.9	N/A	N/A	Pass
CA-09-04-LK1	LDK	3	2.1	N/A	N/A	Pass
CA-09-05-LK1	LDK	3	1.4	N/A	N/A	Pass
CB-07-01-LK2	LDK	3	1.5	N/A	N/A	Pass
CB-07-02-LK2	LDK	3	1.6	N/A	N/A	Pass
CC-07-01-LK2	LDK	3	1.7	N/A	N/A	Pass
CC-07-02-LK3	LDK	3	2.1	N/A	N/A	Pass
CC-07-03-LK3	LDK	3	3.3	N/A	N/A	Fail
DB-07-01-LK1	LDK	3	3	N/A	N/A	Pass
DB-07-02-LK2	LDK	3	2.5	N/A	N/A	Pass
BA-10-01-BD	Bedroom	3	1.7	32	33	Fail
BA-10-02-BD1	Bedroom	3	1.5	32	38	Fail
BA-10-02-BD2	Bedroom	3	2.2	32	41	Fail
BA-10-03-BD1	Bedroom	3	1.6	32	39	Fail
BA-10-03-BD2	Bedroom	3	1.9	32	41	Fail
BA-10-06-BD1	Bedroom	3	1.3	32	33	Fail
BA-10-06-BD2	Bedroom	3	2	32	39	Fail
CA-08-04-BD	Bedroom	3	1.1	32	30	Pass
CA-08-05-BD	Bedroom	3	1.3	32	31	Pass
CA-08-06-BD	Bedroom	3	1.5	32	34	Fail
CA-08-07-BD1	Bedroom	3	0.8	32	30	Pass
CA-08-07-BD2	Bedroom	3	1	32	29	Pass
CA-09-03-BD1	Bedroom	3	1	32	28	Pass
CA-09-03-BD2	Bedroom	3	0.9	32	32	Pass
CA-09-04-BD	Bedroom	3	1.2	32	29	Pass
CA-09-05-BD	Bedroom	3	0.7	32	25	Pass
CB-07-01-BD	Bedroom	3	0.9	32	33	Fail
CB-07-01-SB	Bedroom	3	1	32	29	Pass
CB-07-02-BD1	Bedroom	3	0.9	32	28	Pass
CB-07-02-BD2	Bedroom	3	0.9	32	31	Pass
CC-07-01-BD1	Bedroom	3	1	32	29	Pass
CC-07-01-BD2	Bedroom	3	0.9	32	41	Fail
CC-07-02-BD1	Bedroom	3	1.1	32	31	Pass
CC-07-02-BD2	Bedroom	3	1.3	32	33	Fail
CC-07-02-SB	Bedroom	3	1.2	32	34	Fail
CC-07-03-BD1	Bedroom	3	1.6	32	39	Fail
CC-07-03-BD2	Bedroom	3	1.6	32	44	Fail
CC-07-03-SB	Bedroom	3	2	32	39	Fail
DB-07-01-BD	Bedroom	3	1.9	32	37	Fail
DB-07-02-BD1	Bedroom	3	1.3	32	35	Fail
DB-07-02-BD2	Bedroom	3	1.3	32	33	Fail

Table 12.4 – Domestic overheating results for the Bedrooms and LDKs for DSY2 2020s high 50% (peak lopping)

London LHR DSY3 2020s High 50% percentile – Free Running Building

Zone Name	Room Use	Max. % Exceedable Hours	Criterion 1: #Hours Exceeding Comfort Range	Max Exceedable Night Hours	Criterion 2: Number of Night Hours Exceeding 26 °C for Bedrooms.	Result
BA-10-01-LK1	LDK	3	5.4	N/A	N/A	Fail
BA-10-02-LK2	LDK	3	6.8	N/A	N/A	Fail
BA-10-03-LK2	LDK	3	6.9	N/A	N/A	Fail
BA-10-06-LK2	LDK	3	6.2	N/A	N/A	Fail
CA-08-04-LK1	LDK	3	6.3	N/A	N/A	Fail
CA-08-05-LK1	LDK	3	6.7	N/A	N/A	Fail
CA-08-06-LK1	LDK	3	6.7	N/A	N/A	Fail
CA-08-07-LK2	LDK	3	7.2	N/A	N/A	Fail
CA-09-03-LK2	LDK	3	6.2	N/A	N/A	Fail
CA-09-04-LK1	LDK	3	6.2	N/A	N/A	Fail
CA-09-05-LK1	LDK	3	5.4	N/A	N/A	Fail
CB-07-01-LK2	LDK	3	5.4	N/A	N/A	Fail
CB-07-02-LK2	LDK	3	6.3	N/A	N/A	Fail
CC-07-01-LK2	LDK	3	5.9	N/A	N/A	Fail
CC-07-02-LK3	LDK	3	6.2	N/A	N/A	Fail
CC-07-03-LK3	LDK	3	6.7	N/A	N/A	Fail
DB-07-01-LK1	LDK	3	6.4	N/A	N/A	Fail
DB-07-02-LK2	LDK	3	6.5	N/A	N/A	Fail
BA-10-01-BD	Bedroom	3	3.7	32	38	Fail
BA-10-02-BD1	Bedroom	3	3.3	32	41	Fail
BA-10-02-BD2	Bedroom	3	4	32	37	Fail
BA-10-03-BD1	Bedroom	3	3.4	32	43	Fail
BA-10-03-BD2	Bedroom	3	3.9	32	37	Fail
BA-10-06-BD1	Bedroom	3	3.1	32	41	Fail
BA-10-06-BD2	Bedroom	3	3.7	32	37	Fail
CA-08-04-BD	Bedroom	3	3.7	32	43	Fail
CA-08-05-BD	Bedroom	3	3.5	32	41	Fail
CA-08-06-BD	Bedroom	3	3.8	32	39	Fail
CA-08-07-BD1	Bedroom	3	3.3	32	52	Fail
CA-08-07-BD2	Bedroom	3	3.9	32	44	Fail
CA-09-03-BD1	Bedroom	3	3.5	32	38	Fail
CA-09-03-BD2	Bedroom	3	3.4	32	41	Fail
CA-09-04-BD	Bedroom	3	3.6	32	48	Fail
CA-09-05-BD	Bedroom	3	3.1	32	47	Fail
CB-07-01-BD	Bedroom	3	3.2	32	45	Fail
CB-07-01-SB	Bedroom	3	3.6	32	43	Fail
CB-07-02-BD1	Bedroom	3	3.5	32	45	Fail
CB-07-02-BD2	Bedroom	3	3.2	32	50	Fail
CC-07-01-BD1	Bedroom	3	3.5	32	38	Fail
CC-07-01-BD2	Bedroom	3	3.5	32	44	Fail
CC-07-02-BD1	Bedroom	3	3.3	32	42	Fail
CC-07-02-BD2	Bedroom	3	3.8	32	41	Fail
CC-07-02-SB	Bedroom	3	3.6	32	41	Fail
CC-07-03-BD1	Bedroom	3	3.4	32	38	Fail
CC-07-03-BD2	Bedroom	3	3.3	32	48	Fail
CC-07-03-SB	Bedroom	3	3.9	32	33	Fail
DB-07-01-BD	Bedroom	3	3.8	32	28	Fail
DB-07-02-BD1	Bedroom	3	3.5	32	42	Fail
DB-07-02-BD2	Bedroom	3	3.8	32	41	Fail

Table 12.5 – Domestic overheating results for the Bedrooms and LDKs for DSY3 2020s high 50% (free running building)

London LHR DSY3 2020s High 50% percentile – Building with Peak Lopping

Zone Name	Room Use	Max. % Exceedable Hours	Criterion 1: #Hours Exceeding Comfort Range	Max Exceedable Night Hours	Criterion 2: Number of Night Hours Exceeding 26 °C for Bedrooms.	Result
BA-10-01-LK1	LDK	3	3	N/A	N/A	Pass
BA-10-02-LK2	LDK	3	5.5	N/A	N/A	Fail
BA-10-03-LK2	LDK	3	5.5	N/A	N/A	Fail
BA-10-06-LK2	LDK	3	4	N/A	N/A	Fail
CA-08-04-LK1	LDK	3	3.3	N/A	N/A	Fail
CA-08-05-LK1	LDK	3	4	N/A	N/A	Fail
CA-08-06-LK1	LDK	3	3.9	N/A	N/A	Fail
CA-08-07-LK2	LDK	3	3.3	N/A	N/A	Fail
CA-09-03-LK2	LDK	3	3.4	N/A	N/A	Fail
CA-09-04-LK1	LDK	3	3.1	N/A	N/A	Fail
CA-09-05-LK1	LDK	3	2.3	N/A	N/A	Pass
CB-07-01-LK2	LDK	3	2.6	N/A	N/A	Pass
CB-07-02-LK2	LDK	3	3.3	N/A	N/A	Fail
CC-07-01-LK2	LDK	3	3.2	N/A	N/A	Fail
CC-07-02-LK3	LDK	3	3.3	N/A	N/A	Fail
CC-07-03-LK3	LDK	3	5.4	N/A	N/A	Fail
DB-07-01-LK1	LDK	3	4.4	N/A	N/A	Fail
DB-07-02-LK2	LDK	3	3.9	N/A	N/A	Fail
BA-10-01-BD	Bedroom	3	2.5	32	47	Fail
BA-10-02-BD1	Bedroom	3	2.3	32	52	Fail
BA-10-02-BD2	Bedroom	3	3.7	32	54	Fail
BA-10-03-BD1	Bedroom	3	2.4	32	53	Fail
BA-10-03-BD2	Bedroom	3	3.2	32	55	Fail
BA-10-06-BD1	Bedroom	3	2.1	32	47	Fail
BA-10-06-BD2	Bedroom	3	3.2	32	55	Fail
CA-08-04-BD	Bedroom	3	2.1	32	41	Fail
CA-08-05-BD	Bedroom	3	2	32	42	Fail
CA-08-06-BD	Bedroom	3	2.2	32	47	Fail
CA-08-07-BD1	Bedroom	3	1.4	32	42	Fail
CA-08-07-BD2	Bedroom	3	1.9	32	41	Fail
CA-09-03-BD1	Bedroom	3	2.2	32	42	Fail
CA-09-03-BD2	Bedroom	3	2.2	32	46	Fail
CA-09-04-BD	Bedroom	3	1.8	32	44	Fail
CA-09-05-BD	Bedroom	3	1.2	32	36	Fail
CB-07-01-BD	Bedroom	3	1.6	32	44	Fail
CB-07-01-SB	Bedroom	3	1.7	32	41	Fail
CB-07-02-BD1	Bedroom	3	1.8	32	45	Fail
CB-07-02-BD2	Bedroom	3	1.7	32	49	Fail
CC-07-01-BD1	Bedroom	3	2	32	43	Fail
CC-07-01-BD2	Bedroom	3	2	32	62	Fail
CC-07-02-BD1	Bedroom	3	1.9	32	41	Fail
CC-07-02-BD2	Bedroom	3	2.2	32	46	Fail
CC-07-02-SB	Bedroom	3	2.1	32	47	Fail
CC-07-03-BD1	Bedroom	3	2.6	32	52	Fail
CC-07-03-BD2	Bedroom	3	2.4	32	57	Fail
CC-07-03-SB	Bedroom	3	3.3	32	55	Fail
DB-07-01-BD	Bedroom	3	3.3	32	50	Fail
DB-07-02-BD1	Bedroom	3	2.1	32	47	Fail
DB-07-02-BD2	Bedroom	3	2.4	32	46	Fail

Table 12.6 – Domestic overheating results for the Bedrooms and LDKs for DSY3 2020s high 50% (peak lopping)

12.2 Low and Zero Carbon Technology Feasibility Study

Source	Low Zero Carbon Technology	Lifespan (years)	Lifecycle Carbon Savings* (tCO2/yr)	Applicable Grants	Life Cycle Cost*	Space Use	Local Planning Criteria	Noise	Feasibility of Export	Technology Appropriate for the site	Reasons for Inclusion/Exclusion
Solar	Photovoltaics	25	Low (325 kgCO2/yr per 1 kWpel)	-	Medium	Suitable (roof spaces available)	Suitable	Suitable	Possible (export of power to the local grid)	Yes	Solar photovoltaic cells (PV) convert sunlight into usable electricity. Due to the relatively low efficiencies of this system, a large area is often required to provide a reasonable quantity of power. PV cells also provide their peak power (referred to as kept) during the summer months and therefore larger installations need to be carefully considered. Paybacks are now within a reasonable range of 11 to 15 years with the available feed-in tariffs. The use of the energy on-site remains a priority to achieve the payback as the rate at which surplus power can be sold to the grid is low. 60kWp of PVs totalling approximately $380m^2$ at a 30° inclination across multiple roofs are proposed to maximise the development's renewable energy generation capability.
	Solar thermal	20	Low	Renewable Heat Incentive (RHI)	Low	Suitable (roof spaces available)	Suitable	Suitable	Possible export of heat to future district heat network	No	Solar water heating is traditionally one of the more simplistic and affordable renewable technologies. Solar energy is converted to heat via panels that absorb the high-frequency heat radiation emitted from the sun. Advanced technology utilising 'heat pipes' (tubes utilising refrigerant technology) maximise useful heat extraction even on cold, cloudy days. However, the carbon saving of solar hot water depends on the fuel being displaced. The installation of photovoltaic panels is prioritised on available roof space, while inconsistent load profiles will require significant solar thermal storage and associated plant space. This technology is not considered appropriate for the development.
Wind power	Wind turbines	20	Low (0.5 t/kWe per yr)	-	High	Not suitable (suitable space for stand-alone of a roof-mounted wind turbine cannot be found for the scheme)	Not Suitable due to height restriction, significant visual impact, flicker.	Potentially not suitable due to noise from the turbine's generator.	Possible (export of power to the local grid)	No	Wind turbines produce electrical energy by absorbing wind energy. They are typically available in a vertical or horizontal axis. The quantity of energy generated is directly related to the 'swept area' of the blades and as such size is of immense importance. However, smaller systems are becoming increasingly more common as well as more accepted and have been used to power schools, sports centres and business parks. For wind turbines to operate effectively, the average wind speed for the site needs to be above a threshold level of 6 m/s. Wind speeds in built-up urban areas are not reliable and therefore this technology is not considered suitable for the scheme.
Hydro, wave & tidal	Hydro power	-	-	-	-	-	-	-	-	-	No suitable water sources near the development
	Tidal power	-	-	-	-	-	-	-	-	-	
	Wave power	-	-	-	-	-	-	-	-	-	
Biofuels	Biomass boilers	20	Medium	RHI	Low-Medium	Not suitable (large space required for fuel storage)	Not suitable due to potential air quality issues	Vehicle noise during regular fuel deliveries and also removal of ash from combustion	Possible export of heat to future district heat network	No	Biomass is an organic matter of recent origin which can be replenished at the rate at which it is used. It does not include fossil fuels, which have formed over millions of years and thus of finite supply. The CO_2 released when energy is generated from biomass is balanced by that absorbed during the fuel's production. This is termed a carbon-neutral process, but only when the source of the fuels is renewable, as a sustainable rotation coppice woodland. Such fuels include logs, compressed sawdust pellets, vegetable oil and ethanol. On-site fuel storage requirements requiring additional space, along with regular access to the on-site fuel storage area. Biomass/Biofuel Boiler is not considered viable as high load requirements (peak heating load) would require big biofuel/biomass storage for this scheme. Biofuel CHP with smaller capacity (consequently smaller biofuel/biomass tank) appears to be more suitable Due to the intensive nature of biofuel use on-site in respect of deliveries, maintenance, dust and equipment responsiveness, Biofuels are not considered appropriate for this site and have been discounted in favour of more reliable fit and forget equipment.
	Biomass Co-generation (CHP)	20	Medium-High	ROCs & RHI	Medium	Not suitable (large space required for fuel storage)	Not suitable due to potential air quality issues	Vehicle noise during regular fuel deliveries and also removal of ash from combustion	Possible export of heat to future district heat network	No	

Source	Low Zero Carbon Technology	Lifespan (years)	Lifecycle Carbon Savings* (tCO_2/yr)	Applicable Grants	Life Cycle Cost*	Space Use	Local Planning Criteria	Noise	Feasibility of Export	Technology Appropriate for the site	Reasons for Inclusion/Exclusion
District heating & cooling	District heating and cooling (based on gas-fired CHP/ CCHP)	25+	Medium-High	Renewable Heat Incentive (RHI) + possible Feed-In Tariff (FiT)	Medium	Suitable	Suitable	Suitable	n/a	No	There is currently no district heating network in the vicinity of the proposed development. The development will be provided with a reasonable space allowance in order to facilitate the future connection on a proposed heat network.
Heat pumps	Ground source heat pumps (closed-loop system)	25 (50+ earth heat exchangers)	Medium (30-50% compared to a gas heating system)	Renewable Heat Incentive (RHI)	Medium-High	Not suitable (space not sufficient for a horizontal or vertical system)	Suitable	Suitable	Possible but unlikely	No	Ground source heat pumps are an established technology which operates like a refrigerator, consisting of a vapour compression cycle heat pump, linked to a heat exchanger buried in the ground. Heat pumps utilising low-grade heat from the ground as a thermal resource have been reviewed in the context of this proposed scheme. They are not considered viable for this scheme for the following key reasons: - There is insufficient space around the building for a horizontal system; and - It is not considered economically or practically feasible to integrate pile/loop under the building (space not sufficient to allow for required distance between bore-holes). Ground source heat pumps are therefore not proposed for this scheme.
	Ground source heat pumps (open loop system)	25 (50+ boreholes)	Medium (40-60% compared to a gas heating system)	Renewable Heat Incentive (RHI)	Medium	Not suitable (space not sufficient to allow for required distance between boreholes)	Suitable	Suitable	Possible but unlikely	No	
	Air source heat pumps	20	Low-Medium (20-40% compared to a gas heating system)	N/A	Low	Suitable	Not suitable due to connection to district heating network	Suitable (Acoustically insulated engine)	Possible but unlikely	Yes	Air source heat pump systems can efficiently elevate low-grade environmental heat from the air to the level required for space heating and even domestic hot water system (albeit at low efficiency). Heat pumps work much more efficiently at lower temperatures than standard boiler systems and are hence more suitable to "low-energy" underfloor heating systems or larger low-temperature radiator and fan-coil systems that are also considered low-response systems as they give out heat at lower temperatures over longer periods of time. Air source heat pumps are an established technology which operates as a refrigerator by extracting heat from the outside air and are operable even at low temperatures. Although run on electricity, the heat extracted from the air is constantly being renewed naturally. Air source heat pumps are proposed for the domestic and non-domestic areas. They are considered particularly suitable for the scheme for the following reasons: - They can provide simultaneously space heating and cooling in a very efficient way; - Heat pumps are relatively quiet in operation and are typically contained within plant spaces without any significant impact on the local environment; - Lower corridor overheating risk due to at near ambient temperature within the pipework; and - Heat pump systems are inherently a renewable source of energy
Co Generation	Gas-fired Co-generation (CHP)	15	Medium (30% CO_2 reduction compared to condensing boilers)	N/A	Low-Medium	Suitable	Not suitable due to potential air quality issues	Suitable (acoustically insulated engine)	Possible export of heat to future district heat network	No	A CHP engine produces both heating and electrical power for a building. The benefit of generating the electricity on-site is that the waste heat that is usually rejected at power stations can be used to serve the heating and power requirements of a building or wider community. Smaller single-site systems generally utilise fossil fuels such as gas to operate a spark-ignition engine or turbine to turn a generator. Biodiesels can be used which includes correctly processed waste vegetable oil. The main vital pre-requisite of a CHP system is that demand for both power and heat is required at the same time and a baseload exists for CHP plant to operate efficiently and cost-effectively. CHP plant often has an impact on local air quality. The proposed development seeks to minimise the generation of air pollution by pursuing a heat pump led heating system as such a system not only provides an efficient source of heat energy but does not contribute to local air pollution whilst in operation.
Heat recovery &	Waste heat recovery	15	Low-Medium	N/A	Low	Not suitable	Suitable	Suitable	N/A	No	Insufficient waste heat available.

Source	Low Zero Carbon Technology	Lifespan (years)	Lifecycle Carbon Savings* (tCO2/yr)	Applicable Grants	Life Cycle Cost*	Space Use	Local Planning Criteria	Noise	Feasibility of Export	Technology Appropriate for the site	Reasons for Inclusion/Exclusion
energy storage	Energy storage	15 (50+ for seasonal storage)	Low-Medium (technology dependent)	N/A	Medium-High (dependant on technology)	Not suitable	Suitable	Suitable	Possible (integration within district network)	No	Large space required, energy use such that storage is required is not applicable.

Payback period

Low: 1-7 years
Medium: 7-15 years
High: 15+ years

* From industry standards and case studies (e.g. CIBSE, EST, Carbon Trust, etc.)

12.3 Non-Domestic Part L calculations

Be Lean Case BRUKL

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Manor Road

As designed

Date: Fri Feb 24 14:41:25 2023

Administrative information

Building Details

Address: Richmond,

Certifier details

Name:

Telephone number:

Address: , ,

Certification tool

Calculation engine: TAS

Calculation engine version: "v9.5.4"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.5.4

BRUKL compliance check version: v6.1.b.0

Foundation area [m²]: 456.66

The CO_2 emission and primary energy rates of the building must not exceed the targets

Target CO_2 emission rate (TER), $kgCO_2/m^2$annum	4.41	
Building CO_2 emission rate (BER), $kgCO_2/m^2$annum	4.28	
Target primary energy rate (TPER), kWh/m²annum	48.27	
Building primary energy rate (BPER), kWh/m²annum	47.15	
Do the building's emission and primary energy rates exceed the targets?	BER =< TER	BPER =< TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.13	0.13	External wall spandrel
Floors	0.18	0.13	0.13	Ground Floor
Pitched roofs	0.16	-	-	No pitched roofs in project
Flat roofs	0.18	0.13	0.13	Exposed roof 1_block A
Windows** and roof windows	1.6	-	1.08	Window + Blind
Rooflights***	2.2	-	-	No rooflights in project
Personnel doors^	1.6	0.96	1.19	W17 door window
Vehicle access & similar large doors	1.3	-	-	No vehicle access or similar large doors in project
High usage entrance doors	3	-	-	No high usage entrance doors in project

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m²K)]
$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [W/(m²K)]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]
* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.
** Display windows and similar glazing are excluded from the U-value check.
*** Values for rooflights refer to the horizontal position.
^ For fire doors, limiting U-value is 1.8 W/m²K
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
m³/(h.m²) at 50 Pa	8	3

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- New HVAC System (12 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.5	-	-	1.6	0.8
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.

1- New HWS Circuit

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0
Standard value	1	N/A

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter

NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
Retail 1	-	-	-	1.6	-	-	-	0.2	-	-	N/A
Retail 2	-	-	-	1.6	-	-	-	0.2	-	-	N/A
Retail 3	-	-	-	1.6	-	-	-	0.2	-	-	N/A
Retail 4	-	-	-	1.6	-	-	-	0.2	-	-	N/A
Retail 5	-	-	-	1.6	-	-	-	0.2	-	-	N/A
Retail 6	-	-	-	1.6	-	-	-	0.2	-	-	N/A
Retail BOH 1	-	-	-	1.6	-	-	-	0.2	-	-	N/A
Retail BOH 2	-	-	-	1.6	-	-	-	0.2	-	-	N/A
Retail BOH 3	-	-	-	1.6	-	-	-	0.2	-	-	N/A
Retail BOH 4	-	-	-	1.6	-	-	-	0.2	-	-	N/A
Retail BOH 5	-	-	-	1.6	-	-	-	0.2	-	-	N/A
Retail BOH 6	-	-	-	1.6	-	-	-	0.2	-	-	N/A

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value	95	80	0.3
Retail 1	-	100	-
Retail 2	-	100	-
Retail 3	-	100	-
Retail 4	-	100	-
Retail 5	-	100	-
Retail 6	-	100	-
Retail BOH 1	130	-	-
Retail BOH 2	130	-	-
Retail BOH 3	130	-	-
Retail BOH 4	130	-	-
Retail BOH 5	130	-	-
Retail BOH 6	130	-	-

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Retail 1	NO (-1%)	YES
Retail 2	NO (-7%)	YES
Retail 3	NO (-8%)	YES
Retail 4	NO (-42%)	YES
Retail 5	NO (-24%)	YES
Retail 6	NO (-34%)	YES
Retail BOH 1	N/A	N/A
Retail BOH 2	N/A	N/A
Retail BOH 3	N/A	N/A
Retail BOH 4	N/A	N/A
Retail BOH 5	N/A	N/A
Retail BOH 6	N/A	N/A

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m²]	457	457
External area [m²]	866	866
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	3	3
Average conductance [W/K]	238	255
Average U-value [W/m²K]	0.28	0.29
Alpha value* [%]	35.87	20.87

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
100	**Retail/Financial and Professional Services**
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger Terminals
	Others: Emergency Services
	Others: Miscellaneous 24hr Activities
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	1	1.13
Cooling	4.55	3.89
Auxiliary	10.83	11.78
Lighting	13.84	14.1
Hot water	1.91	1.91
Equipment*	23.07	23.07
TOTAL**	**32.13**	**32.81**

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	93.67	76.14
Primary energy [kWh/m²]	47.15	48.27
Total emissions [kg/m²]	4.28	4.41

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Fan coil systems, [HS] GSHP/WSHP, [HFT] Electricity, [CFT] Electricity										
	Actual	9.2	84.4	1.1	4.8	11.4	2.45	4.9	2.5	5
	Notional	11.1	64.8	1.2	4.1	12.4	2.64	4.4	----	----

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Manor Road As designed

Date: Fri Feb 24 14:53:22 2023

Administrative information

Building Details

Address: Richmond,

Certifier details

Name:

Telephone number:

Address: , ,

Certification tool

Calculation engine: TAS

Calculation engine version: "v9.5.4"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.5.4

BRUKL compliance check version: v6.1.b.0

Foundation area [m²]: 456.66

The CO_2 emission and primary energy rates of the building must not exceed the targets

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	4.41	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	4.07	
Target primary energy rate (TPER), $kWh/m^2.annum$	48.27	
Building primary energy rate (BPER), $kWh/m^2.annum$	44.74	
Do the building's emission and primary energy rates exceed the targets?	BER =< TER	BPER =< TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.13	0.13	External wall spandrel
Floors	0.18	0.13	0.13	Ground Floor
Pitched roofs	0.16	-	-	No pitched roofs in project
Flat roofs	0.18	0.13	0.13	Exposed roof 1_block A
Windows** and roof windows	1.6	-	1.08	Window + Blind
Rooflights***	2.2	-	-	No rooflights in project
Personnel doors^	1.6	0.96	1.19	W17 door window
Vehicle access & similar large doors	1.3	-	-	No vehicle access or similar large doors in project
High usage entrance doors	3	-	-	No high usage entrance doors in project

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m²K)]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]
$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [W/(m²K)]
* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.
** Display windows and similar glazing are excluded from the U-value check.
*** Values for rooflights refer to the horizontal position.
^ For fire doors, limiting U-value is 1.8 W/m²K
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
m³/(h.m²) at 50 Pa	8	3

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- New HVAC System (12 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4	-	-	1.6	0.8
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system	YES				

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.

1- New HWS Circuit

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0
Standard value	1	N/A

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter

NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
Retail 1	-	-	-	1.6	-	-	-	0.2	-	-	N/A
Retail 2	-	-	-	1.6	-	-	-	0.2	-	-	N/A
Retail 3	-	-	-	1.6	-	-	-	0.2	-	-	N/A
Retail 4	-	-	-	1.6	-	-	-	0.2	-	-	N/A
Retail 5	-	-	-	1.6	-	-	-	0.2	-	-	N/A
Retail 6	-	-	-	1.6	-	-	-	0.2	-	-	N/A
Retail BOH 1	-	-	-	1.6	-	-	-	0.2	-	-	N/A
Retail BOH 2	-	-	-	1.6	-	-	-	0.2	-	-	N/A
Retail BOH 3	-	-	-	1.6	-	-	-	0.2	-	-	N/A
Retail BOH 4	-	-	-	1.6	-	-	-	0.2	-	-	N/A
Retail BOH 5	-	-	-	1.6	-	-	-	0.2	-	-	N/A
Retail BOH 6	-	-	-	1.6	-	-	-	0.2	-	-	N/A

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value	95	80	0.3
Retail 1	-	100	-
Retail 2	-	100	-
Retail 3	-	100	-
Retail 4	-	100	-
Retail 5	-	100	-
Retail 6	-	100	-
Retail BOH 1	130	-	-
Retail BOH 2	130	-	-
Retail BOH 3	130	-	-
Retail BOH 4	130	-	-
Retail BOH 5	130	-	-
Retail BOH 6	130	-	-

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Retail 1	NO (-1%)	YES
Retail 2	NO (-7%)	YES
Retail 3	NO (-8%)	YES
Retail 4	NO (-42%)	YES
Retail 5	NO (-24%)	YES
Retail 6	NO (-34%)	YES
Retail BOH 1	N/A	N/A
Retail BOH 2	N/A	N/A
Retail BOH 3	N/A	N/A
Retail BOH 4	N/A	N/A
Retail BOH 5	N/A	N/A
Retail BOH 6	N/A	N/A

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m²]	457	457
External area [m²]	866	866
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	3	3
Average conductance [W/K]	238	255
Average U-value [W/m²K]	0.28	0.29
Alpha value* [%]	35.87	20.87

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
100	**Retail/Financial and Professional Services**
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger Terminals
	Others: Emergency Services
	Others: Miscellaneous 24hr Activities
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	0.62	1.13
Cooling	3.25	3.89
Auxiliary	10.83	11.78
Lighting	13.84	14.1
Hot water	1.91	1.91
Equipment*	23.07	23.07
TOTAL**	**30.45**	**32.81**

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	93.67	76.14
Primary energy [kWh/m²]	44.74	48.27
Total emissions [kg/m²]	4.07	4.41

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Fan coil systems, [HS] GSHP/WSHP, [HFT] Electricity, [CFT] Electricity										
	Actual	9.2	84.4	0.7	3.4	11.4	3.92	6.86	4	7
	Notional	11.1	64.8	1.2	4.1	12.4	2.64	4.4	----	----

Key to terms

Heat dem [MJ/m2] = Heating energy demand
Cool dem [MJ/m2] = Cooling energy demand
Heat con [kWh/m2] = Heating energy consumption
Cool con [kWh/m2] = Cooling energy consumption
Aux con [kWh/m2] = Auxiliary energy consumption
Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER = Cooling system seasonal energy efficiency ratio
Heat gen SSEFF = Heating generator seasonal efficiency
Cool gen SSEER = Cooling generator seasonal energy efficiency ratio
ST = System type
HS = Heat source
HFT = Heating fuel type
CFT = Cooling fuel type

12.4 Sample SAP Output

The summary of results from the GLA spreadsheet for each of the stages of energy hierarchy are as below:

Sample SAP Unit - Be Lean

Sample SAP Unit - Be Green

12.5 GLA Carbon Emissions Reporting Spreadsheet

GLA spreadsheet to be submitted separately as a standalone spreadsheet alongside the full application.