OCTOBER 2022

Sustainability & Energy Statement

Haydon House, 296 Joel Street, HA5 2PY

Iceni Projects Limited on behalf of
Hyde Park Construction Ltd

October 2022

ICENI PROJECTS LIMITED
ON BEHALF OF HYDE PARK
CONSTRUCTION LTD

Sustainability & Energy Statement
HAYDON HOUSE, 296 JOEL STREET, HA5 2PY

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CONTENTS

1. EXECUTIVE SUMMARY

1.1 Iceni Projects Ltd has been commissioned by Hyde Park Construction Limited to produce a Sustainability & Energy Statement to support the proposed redevelopment of Haydon House, 296 Joel Street, HA5 2PY.

1.2 The application proposes the demolition of the existing office building on the site to provide 13 residential dwellings from the ground to third floor level.

1.3 Sustainability is a core consideration of the application and has been incorporated from the project outset. Energy and water efficiency measures have been maximised, whilst the production of waste and pollution is to be minimised, thus ensuring the impact of the proposals on its immediate surroundings and environment as a whole is reduced.

1.4 By designing to rigorous energy standards, employing air source heat pump (ASHP) technology to serve the space heating and cooling demand of the proposals, and integrating rooftop photovoltaic (PV) panels the application will respond directly to the Climate Emergency declared by the Council in January 2020. These measures combine to provide a minimum carbon dioxide emissions saving of 35%, compared to the Part L:2021 baseline, significantly exceeding the requirements of the London Borough of Hillingdon Council.

1.5 Consideration has been given to the Hillingdon Local Plan Part 1: Strategic Policies in the overall formulation of this strategy, aiming to minimise the environmental impact of the proposed development during construction and operation, and to ensure the development is constructed to rigorous sustainability standards.

1.6 The proposed strategy has been based around the objectives of the Local Plan strategic objectives 8, 10, 11 and 13, and policy EM1. In summary, based on this strategy, the proposed development:

- will develop a brownfield site;
- is in a location with good access to public transport;
- will promote cycling and walking, and deter private car ownership;
- will minimise internal water consumption to 105 litres per person per day;
- will incorporate measures to improve site biodiversity, including biodiverse planting;
- will not increase the risk of surface water flooding onsite;

- will incorporate low-impact materials, according to the BRE Green Guide to Specification;
- will minimise waste production during construction and maximise the proportion of waste to be diverted from landfill;
- will minimise energy demand through the specification of low U-values and low air permeability to reduce heat loss;
- will utilise air source heat pump (ASHP) technology to serve the space and water heating demand of the proposed dwellings; and
- will employ rooftop photovoltaic (PV) panels to generate zero carbon electricity on-site.

1.7 By designing to rigorous energy standards, omitting the use of fossil fuels for heating and hot water, and implementing a rooftop array of solar photovoltaic panels, the proposed development will achieve a minimum 35% reduction in CO_2 emissions, following the Energy Hierarchy methodology. The remaining 213 tonnes of CO_2 per annum of domestic emissions from the development will be offset through a cash-in-lieu contribution.

Figure 1.1 Carbon dioxide emissions after each stage of the Energy Hierarchy

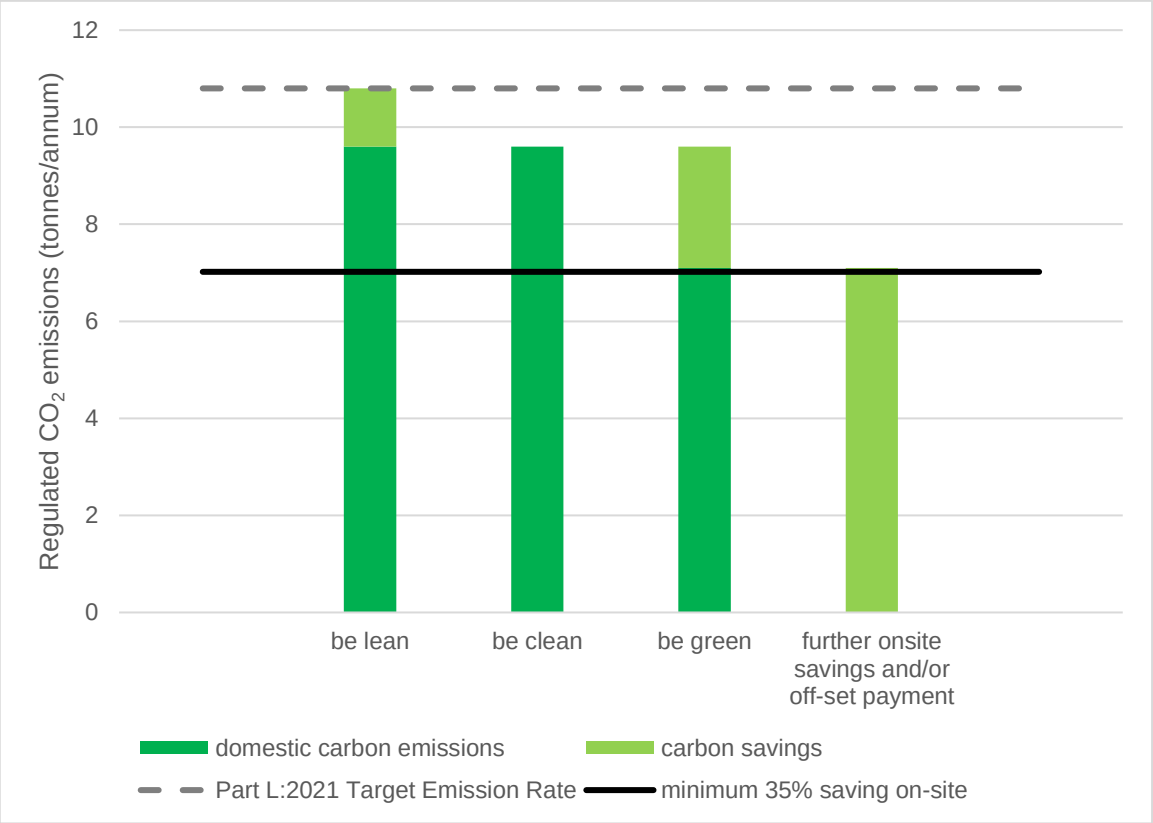


Table 1.1 Carbon dioxide emissions after each stage of the Energy Hierarchy

	Site-wide carbon dioxide emissions (Tonnes CO_2 per annum)
Baseline: Part L 2021 of the Building Regulations Compliant Development	10.8
After energy demand reduction	9.6
After renewable energy	7.0

Table 1.2 Regulated carbon dioxide savings from each stage of the Energy Hierarchy

	Regulated carbon dioxide savings	
	Tonnes CO_2 per annum	**%**
Savings from energy demand reduction	1.2	11%
Savings from renewable energy	2.6	24%
Cumulative on-site savings	3.8	35%
Annual savings from offset payment	7.0	-
	Tonnes CO_2	
Cumulative savings for offset payment	213	-
Cash-in-lieu contribution	£20,193	-

1.8 Overall, the proposals constitute sustainable development in accordance with national, regional and local policy requirements and will provide a development that seeks to promote these principles in operation.

2. INTRODUCTION

2.1 Iceni Projects Ltd has been commissioned by Hyde Park Construction Limited to produce a Sustainability & Energy Statement to support the application for the proposed redevelopment of the of Haydon House, 296 Joel Street, HA5 2PY.

Report Objective

2.2 This document details the sustainable design and construction measures adopted by the proposed development and gives an overview of the design proposals that will ensure the development operates in a sustainable manner over the lifespan of the scheme. The Sustainability & Energy Statement report headlines will provide a framework for the project team to operate consistently within sustainability guidelines set out by the London Borough of Hillingdon Council.

2.3 The report is structured to meet these guidelines as follows:

- Section 3 discusses the planning context and policies which are relevant to sustainability;
- Section 4 discusses the development response to the policy drivers for sustainability;
- Section 5 sets out the development's energy strategy to minimise CO_2 emissions; and
- Section 6 summarises the development's design response.

Site and Surroundings

2.4 The application site (Appendix A1) is located within the London Borough of Hillingdon, within the ward of Pinner. The site is bound by Joel Street (B472) to the east, and residential dwellings to the north, south and west. Deerings Drive is located beyond the adjacent residential dwellings to the south. Haydon Hall Park, an area of open space, is located to the east of the site, on the opposite side of Joel Street. The site itself is currently occupied by an existing office building.

2.5 The surrounding area is characterised by residential dwellings in all compass directions. A number of retail and leisure services are located on Pinner Road (A404), approximately 1.5 km (22-minute walk), to the north of the site.

The Proposed Development

2.6 The proposal seeks to demolish the existing office building on-site to erect a new four-storey building, comprising 13 residential dwellings of high-quality design and sustainability credentials.

2.7 The images below show sample plans and elevations of the scheme, based on the information provided by CIAO Architects in October 2022.

Figure 1.1 Ground floor plan

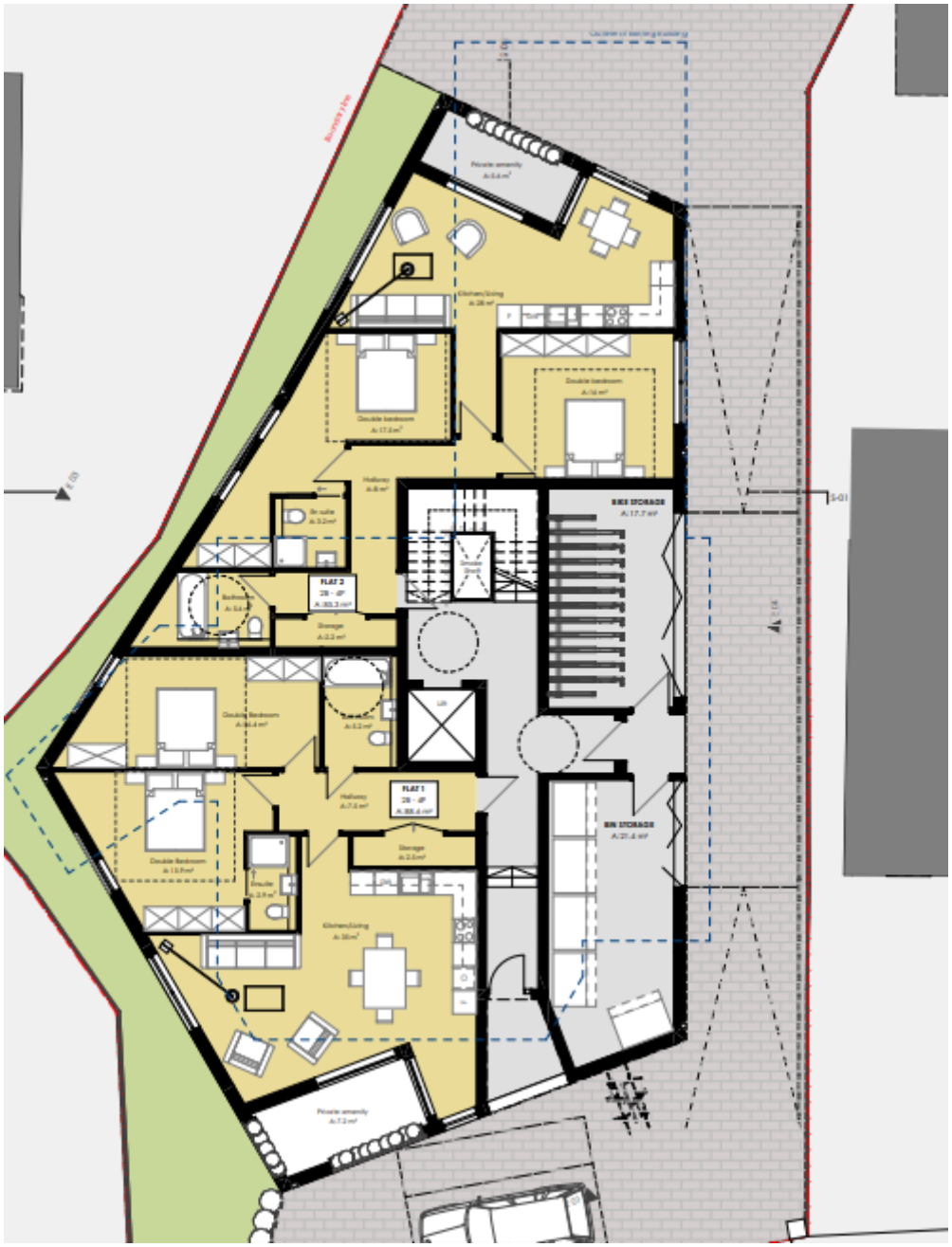


Figure 1.2 Proposed north elevation

Figure 1.3 Proposed east elevation

Figure 1.4 Proposed south elevation

Figure 1.5 Proposed west elevation

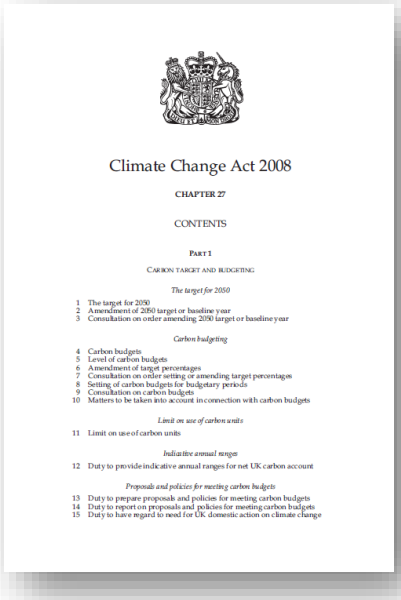
3. PLANNING AND REGULATORY CONTEXT

3.1 Built environment sustainability is incorporated within policy and regulation at a national and local level, as set out below.

National

Climate Change Act 2008

3.2 On 26th November 2008, the UK Government published the Climate Change Act 2008; the world's first long-term legally binding framework to mitigate against climate change. Within this framework, the Act sets legally binding targets to increase greenhouse gas emission reductions through action in the UK and abroad from the 60% target set out in the Energy White Paper, to 80% by 2050.



Climate Change Act 2008

CHAPTER 27

CONTENTS

PART 1

CARBON TARGET AND BUDGETING

The target for 2050

1 The target for 2050
2 Amendment of 2050 target or baseline year
3 Consultation on order amending 2050 target or baseline year

Carbon budgeting

4 Carbon budgets
5 Level of carbon budgets
6 Amendment of target percentages
7 Consultation on order setting or amending target percentages
8 Setting of carbon budgets for budgetary periods
9 Consultation on carbon budgets
10 Matters to be taken into account in connection with carbon budgets

Limit on use of carbon units

11 Limit on use of carbon units

Indicative annual ranges

12 Duty to provide indicative annual ranges for net UK carbon account

Proposals and policies for meeting carbon budgets

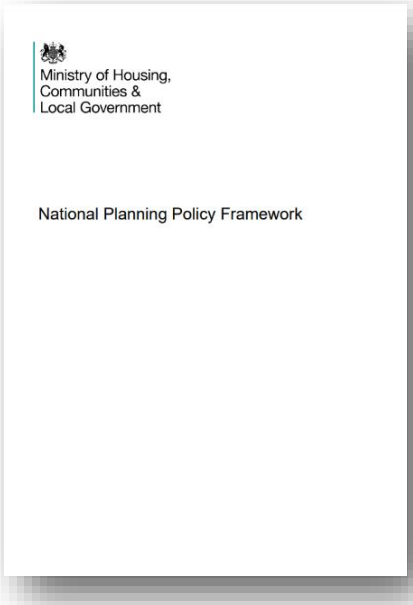
13 Duty to prepare proposals and policies for meeting carbon budgets
14 Duty to report on proposals and policies for meeting carbon budgets
15 Duty to have regard to need for UK domestic action on climate change

3.3 As required under Section 34 of the Climate Change Act, the Sixth Annual Carbon Budget was accepted by the Government in April 2021. This sets out a budget for UK emissions for the period 2033 – 2037.

3.4 Following a commitment in June 2019, the Climate Change Act has been amended to target net zero carbon emissions by 2050.

National Planning Policy Framework

3.5 The Ministry of Housing, Communities & Local Government determines national policies on different aspects of planning and the rules that govern the operation of the system. Accordingly, the National Planning Policy Framework (NPPF), which came into force in March 2012 and was updated in February 2019, aims to strengthen local decision making. Additional updates have since been made through the latter half of 2020 and in January and July 2021 to reflect changes related to use classes, permitted development rights, the calculation of housing need, and requirements to achieve beauty alongside sustainability.



Ministry of Housing, Communities & Local Government

National Planning Policy Framework

3.6 Paragraphs 10 and 11 of the NPPF confirm that at the heart of this document is a "*presumption in favour of sustainable development*", and that development proposals that accord with an up-to-date development plan should be approved without delay.

3.7 Paragraph 7 states that the purpose of the planning system 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.

3.8 Achieving sustainable development means that the planning system has three overarching activities, which are interdependent and need to be pursued in mutually supportive ways, so that opportunities can be taken to secure net gains across each of the different objectives:

- **An Economic Role –** ensuring the provision of land and infrastructure needed to help build a *strong, responsive and competitive economy.*

- **A Social Role –** supplying the required amount of housing while at the same time ensuring and building *strong, vibrant and healthy communities.* Ensuring that the built environment is sited around accessible local services which help support a community's *health, social and cultural well-being.*

- **An Environmental Role –** ensuring development contributes to the protection and enhancement of the *natural, built and historic environment* through the improvement of biodiversity, minimising the use of natural resources and production of pollution / waste, and guaranteeing sufficient adaptation to climate change.

Future Homes Standard

3.9 Within the Spring Statement 2019, the Chancellor announced the future introduction of the Future Homes Standard 2025. The Standard will mandate the end of fossil fuel heating systems in new homes from 2025, and target "world-leading levels of energy efficiency". In doing this, the Standard aims to utilise green technology to reduce environmental impacts, as well as reducing consumer energy bills.


Ministry of Housing, Communities & Local Government

The Future Homes Standard

2019 Consultation on changes to Part L (conservation of fuel and power) and Part F (ventilation) of the Building Regulations for new dwellings

3.10 This Standard is expected to build on the Prime Minister's Clean Growth Grand Challenge missions, which aims to at least halve the energy usage of new build properties by 2030. It also looks to halve the costs of renovating existing buildings to achieve a similar standard of energy efficiency as new buildings, whilst improving their quality and safety.

Part L:2021 of the Building Regulations

3.11 Part L of the Building Regulations relates to the conservation of fuel and power, and applies to both new and existing buildings. The current edition covers the energy efficiency requirements of the building regulations as set out in Part L of Schedule 1 to the Building Regulations. Technical guidance is contained in four Part L Approved Documents and two building services compliance guides.

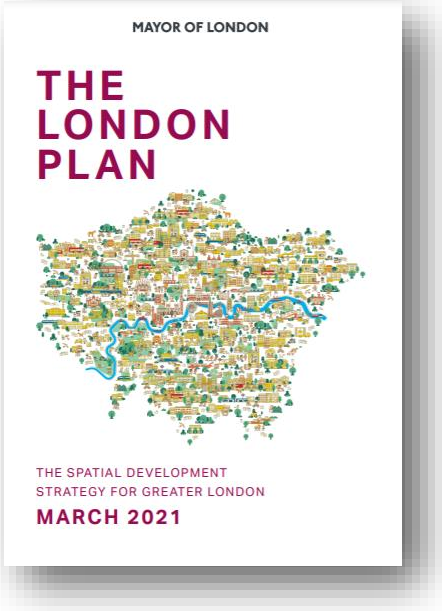
3.12 The documents of relevance to this scheme include:

- **Approved Document L Volume 1: Dwellings.** This provides the methodology for new build, domestic buildings to meet current energy efficiency standards, including backstop U-values, carbon dioxide emissions calculations and minimising the risk of overheating. Carbon dioxide emissions reductions are prescribed for 'regulated' emissions only, and relate to heating, hot water, lighting, auxiliary and cooling (where specified). Emissions from domestic appliances (cooking, for example) are considered to be unregulated emissions, and are excluded from the analysis.

Regional

3.13 Within Greater London, key sustainable development principles for economic, environmental and social improvement are set out below:

The London Plan (March 2021)



3.14 The London Plan is the overall strategic plan for London and includes policies for sustainable development and energy within Chapter 9 (London's response to climate change). Key policies of relevance to this scheme are as follows:

- **Policy SI2 Minimising Greenhouse Gas Emissions.** This states that major development proposals should be net zero-carbon, by reducing greenhouse gas emissions in operation and minimising both annual and park energy demand in accordance with the following energy hierarchy:

    1. Be lean: use less energy
    2. Be clean: supply energy efficiently
    3. Be green: use renewable energy
    4. Be seen: monitor, verify and report on energy performance

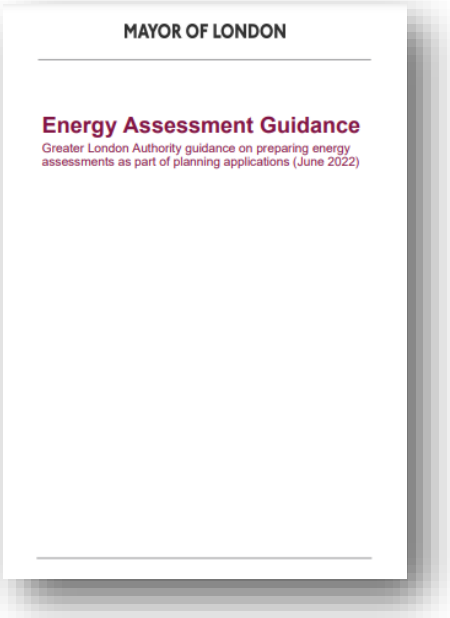
- **Policy SI3 Energy Infrastructure.** This policy recognises that combined heat and power installations can have negative effects on London's air quality and shifts the focus of decentralised energy networks to the use of waste or secondary heat sources, where available. The policy also recognises that, compared to increasingly decarbonised electricity generation, gas-fired heat will become comparatively more carbon intensive as the electricity grid is further decarbonised.

- **Policy SI4 Managing Heat Risk.** This policy sets states that development proposals should minimise adverse impacts on the urban heat island through design, layout, orientation, materials and the incorporation of green infrastructure.

- **Policy SI5 Water Infrastructure.** This states that major development proposals should achieve at least the BREEAM excellent standard for the 'WAT 01' water category or equivalent (commercial development).

- **Policy SI7 Reducing Waste and Supporting the Circular Economy.** This states that resource conservation, waste reduction, increases in material re-use and recycling, and reductions in waste going for disposal will be achieved, in part, through designing developments with adequate, flexible and easily accessible storage space and collection systems.

Energy Planning – GLA guidance on preparing energy assessments (June 2022)



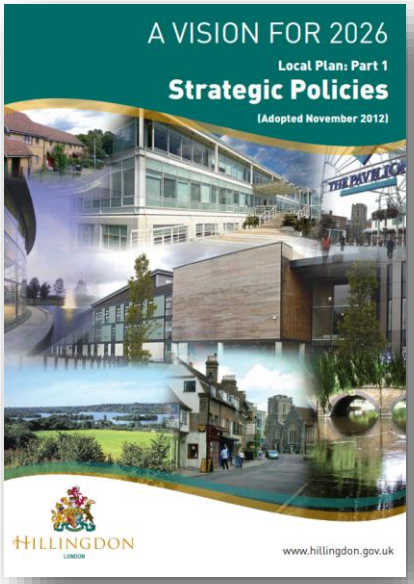
3.15 The guidance note provides further detail on addressing the London Plan's energy hierarchy through the provision of an energy assessment to accompany planning applications. The document sets out the expected carbon dioxide emissions targets for different building types.

3.16 The guidance outlines the requirement for all major application within London to achieve a minimum 35% carbon dioxide emissions savings over the Part L:2021 baseline through on-site means alone. The guidance also sets out the requirement to report the Energy Use Intensity (EUI) and the space heating demand of the development using the GLA's carbon emissions reporting spreadsheet.

Local

3.17 In determining the local context, London Borough of Hillingdon Local Plan Part 1: Strategic Policies (November 2012) sets out policy relevant to sustainable development.

London Borough of Hillingdon Local Plan Part 1: Strategic Policies (Novemer 2012)



3.18 The Local Plan demonstrates the importance the local authority places on maintaining and enhancing the natural environment, outlining a number of strategic objectives and policies to achieve this. The objectives and policies of relevance to the proposed development are outlined below.

3.19 **Strategic Objective 8:** Protect and enhance biodiversity to support the necessary changes to adapt to climate change. Where possible, encourage the development of wildlife corridors.

3.20 **Strategic Objective 10:** Improve and protect air and water quality, reduce adverse impacts from noise including the safeguarding of quiet areas and reduce the impacts of contaminated land.

3.21 **Strategic Objective 11:** Address the impacts of climate change, and minimise emissions of carbon and local air quality pollutants from new development and transport.

3.22 **Strategic Objective 13:** Support the objectives of sustainable waste management.

3.23 **Policy EM1: Climate Change Adaptation and Mitigation.** The Council will ensure that climate change mitigation is addressed at every stage of the development process by:

- Prioritising higher density development in urban and town centres that are well served by sustainable forms of transport.
- Promoting a modal shift away from private car use and requiring new development to include innovative initiatives to reduce car dependency.
- Ensuring development meets the highest possible design standards whilst still retaining competitiveness within the market.
- Working with developers of major schemes to identify the opportunities to help provide efficiency initiatives that can benefit the existing building stock.

- Promoting the use of decentralised energy within large scale development whilst improving local air quality levels.

- Targeting areas with high carbon emissions for additional reductions through low carbon strategies. These strategies will also have an objective to minimise other pollutants that impact on local air quality. Targeting areas of poor air quality for additional emissions reductions.

- Encouraging sustainable techniques to land remediation to reduce the need to transport waste to landfill. In particular developers should consider bioremediation as part of their proposals.

- Encouraging the installation of renewable energy for all new development in meeting the carbon reduction targets savings set out in the London Plan. Identify opportunities for new sources of electricity generation including anaerobic digestion, hydroelectricity and a greater use of waste as a resource.

The Borough will ensure that climate change adaptation is addressed at every stage of the development process by:

- Locating and designing development to minimise the probability and impacts of flooding.

- Requiring major development proposals to consider the whole water cycle impact which includes flood risk management, foul and surface water drainage and water consumption.

- Giving preference to development of previously developed land to avoid the loss of further green areas.

- Promoting the use of living walls and roofs, alongside sustainable forms of drainage to manage surface water run-off and increase the amount of carbon sinks.

- Promoting the inclusion of passive design measures to reduce the impacts of urban heat effects.

Other Considerations

Declaration of a Climate Emergency (January 2020)

3.24 On the 16th January 2020, the London Borough of Hillingdon Council declared a climate change emergency, agreeing to extend the Council's climate change targets beyond those set at the time to become carbon neutral across the Council's services by 2030, and to achieve 100% clean energy across the Council's services by 2030. The Council resolved that, to meet these targets practically and to be accountable to residents for them:

- Recognise that, initially, they will span the Council's direct services and, subject to future review by the Cabinet, may grow to encompass the Council's wider commercial supply chain;

- The Cabinet Member for Housing and the Environment, in consultation with the Leader of the Council assumes a new Executive responsibility within the Council's Constitution for climate change strategy;

- Responsibility for oversight and scrutiny of the Council's efforts in relation to climate change be given to the Corporate Services, Commerce and Communities Policy Overview Committee to review as they see fit and engage the community;

- The Chief Executive designate a lead officer to act corporately on climate change an in pursuit of the above targets;

- An annual action plan be submitted to Cabinet, aligned with the budget, to monitor achievement. Furthermore, a review of environmental performance reporting be undertaken to actively engage staff in ways to tackle climate change in their service areas and communicate progress more widely to residents.

4. SUSTAINABILITY STATEMENT

4.1 The Sustainability & Energy Statement for the proposed development is divided into two main parts.

4.2 The sustainability strategy for the proposed development has been assessed in line with the guidance set out within relevant policies of the London Borough of Hillingdon Local Plan Part 1: Strategic Policies. This enables a holistic sustainability approach to be set out for the proposed development. The London Borough of Hillingdon Local Plan requires that all new development provides sustainable, high quality and inclusive design, and this therefore represents best practice guidance to meet high standards of sustainable design and construction.

4.3 The carbon dioxide (CO_2) emissions reduction strategy for the proposed building to be delivered as part the development is based on the energy hierarchy to provide a rigorous methodology, which maximises cost-effective opportunities for emissions reduction, as detailed in Section 5.

Sustainable Design and Construction

4.4 In line with the guidance provided in the London Borough of Hillingdon Local Plan, the sustainability features of the proposed development are outlined below.

4.5 Issues related to energy conservation, renewables and reducing greenhouse gases follow in a dedicated section.

Making Effective Use of Land

4.6 As shown below in Figure 4.1 below, the site currently comprises a three-storey office building.

Figure 4.1 View of the existing site

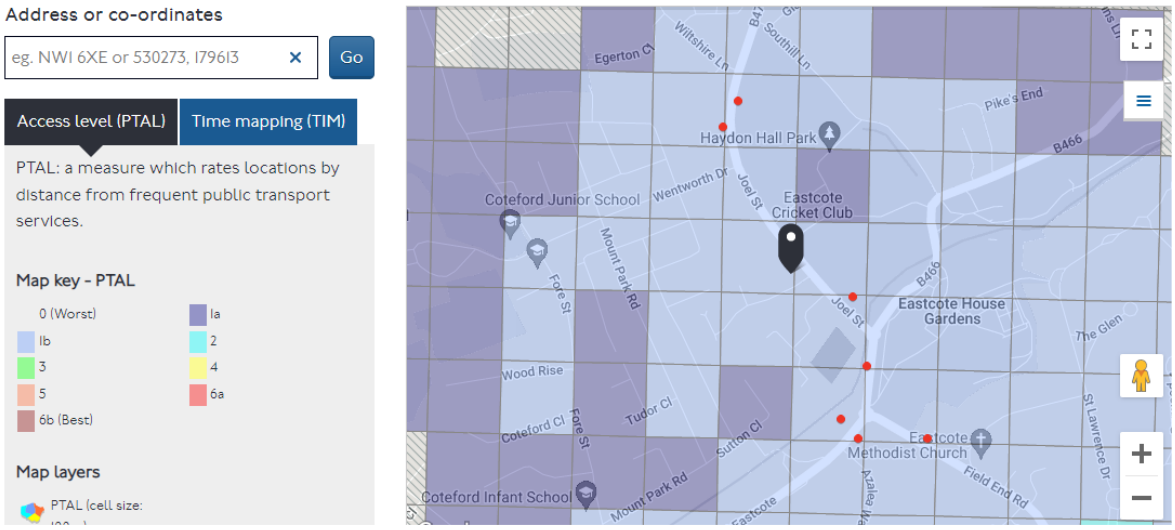
Approximate site boundary

4.7 The site is therefore considered to have been previously developed, and the proposed scheme will provide new residential dwellings in a sustainable location within the London Borough of Hillingdon.

Location and Transport

4.8 According to the Transport Assessment, produced by RGP in August 2022, the site has public transport connections for the London bus network, with the site scoring a PTAL rating of 1b. The site is served by a number of bus stops, including one located to the south-east of the site on Joel Street and one to the south on High Road Eastcote, both of which are served by the 282 bus service.

Figure 4.2 Extract from TfL PTAL map



4.9 Access to the site will be via the eastern boundary from Joel Street. A total of seven car parking spaces will be provided, located to the rear of the building, in line with the location of the parking provision in the existing case. This provision will include for one disabled persons space, and two spaces provided with active electric vehicle (EV) charging. The remaining five spaces will be provided with passive EV charging infrastructure. This is in compliance with the requirements of the London Plan.

4.10 A bike storage area will be provided at the ground floor level of the proposed development, which will be accessible both via an internal access point, and an external point. A total of 22 cycle parking spaces will be provided. In addition, a single Sheffield cycle stand will be provided externally, with the capacity to accommodate two bicycles for short-stay purposes. This is in line with the minimum requirements set out within the London Plan.

Reducing Water Consumption

4.11 The city often consumes more water than is available during dry weather. As the population of London continues to grow, this situation will be further exacerbated, with greater pressure on the supply of potable water.

4.12 In order to actively mitigate against this, water saving fittings and appliances shall be installed to target an internal water consumption rate of 105 litres or less per person per day, based on the DCLG water efficiency calculator for the residential dwellings. Full details of the water calculation are provided in Appendix A2.

4.13 The following form a basis for the residential element of the proposals, subject to change at later detailed design stages:

- Low volume dual flush toilets of 6 / 3 litres;
- Water consumption levels not higher than 3 litres / minute in wash hand basins and 4 litres / minute in kitchen sink taps;
- Bath with a capacity to overflow not higher than 180 litres; and
- Showers with a flow rate of 8 litres / minute using a flow restrictor.

Materials and Waste

4.14 Selection of materials is determined by a variety of factors, such as the architectural context, design rationale, embodied carbon and maintenance requirements. For the proposed development, consideration will be given to the lifecycle environmental performance, with materials selected in consideration of the BRE's Green Guide to Specification, aiming for A or B rated materials wherever possible.

4.15 During detailed design of the building fabric, consideration will be given to minimising the impact of materials, by selecting non-toxic and robust materials to ensure longevity and a minimal impact on the health of occupants.

4.16 Timber will be selected and purchased in consideration of sustainability certification. It is intended that all structural timber elements, along with any timber used for temporary uses such as scaffolding, will be sustainably sourced (e.g. from FSC and/or PEFC sources).

4.17 During the construction phase, the principal contractor will be required to implement a Site Waste Management Plan (SWMP), which will detail who will be responsible for resource management, what types of waste will be generated, how the waste will be managed (e.g. reduced, reused or recycled), which contractors will be used, and how the quantity of waste generated by the project will be measured. Demolition contractors will incorporate best practice measures to maximise the recovery of materials from the demolition site for reuse or recycling, in line with the guidance set out by the Institute of Civil Engineers' (ICE) "Demolition Protocol".

4.18 To encourage a greater proportion of the operational waste to be diverted from landfill, it is proposed to provide a dedicated space of sufficient size, and in convenient locations. Internal storage will be considerate of the Building Regulations, Council and other relevant requirements. A dedicated waste storage area for the residential elements of the scheme for refuse and recycling has been located within the curtilage of the building at the ground floor level, with access for residents from within the building, and for waste operatives via the proposed access route from Joel Street.

Tackling Increased Temperatures and Drought

4.19 In order to protect the development against overheating in the future, a number of key design features have been proposed to ensure the proposals are resilient to increased temperatures, which may be experienced as a result of climate change and the urban heat island effect. A summary of the measures included to reduce overheating risk is provided below.

4.20 The design of the dwellings has been developed in line with the GLA's recommended 'Cooling Hierarchy' approach, detailed in London Plan policy SI4. This applies a similar principle to the thorough decision-making process of the Energy Hierarchy, with the aim of reducing CO_2 emissions from cooling and minimising the risk of overheating where no cooling is present:

Minimisation of internal heat generation through energy efficient design

- Heat gain from lighting is kept to a minimum as a result of an energy-efficient lighting design solution.
- The availability of natural light is maximised by optimising the light transmittance of the glass elements of the façade.
- The scheme will use air source heat pumps for heating and hot water. This is a low temperature distribution system, leading to lower internal heat gains from distribution pipework.

Reduction of the amount of heat entering the building in the summer

- The building's facades will have a limited amount of glazing to mitigate direct solar heat gain while optimising daylight penetration.
- The use of balconies will provide solar shading to apartments.

Management of the heat within the building through exposed thermal mass and high ceilings

- Due to the dense nature of the proposed development, there is little external exposed thermal mass within the building structures, minimising thermal transmission.

Passive ventilation

- Openable windows on multiple aspect spaces will provide a passive ventilation strategy that utilises crossflow ventilation to maximise the potential for natural ventilation within the scheme.

- All dwellings have multiple aspects to assist with crossflow ventilation.

Mechanical and active cooling

- Cooling is not proposed for the dwellings.

4.21 An overheating assessment for the dwellings has been carried out using dynamic thermal modelling. This assessment has employed the guidance set out in CIBSE TM59 to model overheating in residential properties, including urban heat island effects. The overheating assessment made use of the Design Summer Year weather data for London Heathrow, representing a peri-urban location to predict overheating risk for three different scenarios:

- DSY1. 1989: a moderately warm summer (current design summer year).
- DSY2. 1976: a year with a prolonged period of sustained warmth.
- DSY3. 2003: a year with a very intense single warm spell.

4.22 The risk of overheating has been assessed using the guidance contained in CIBSE TM52, which details the limits of thermal comfort.

4.23 Full details of the overheating assessment are provided in Appendix A3, and a summary of results is given below. A natural ventilation strategy was applied when modelling overheating risk to demonstrate the potential of the scheme to minimise overheating risk, without mechanical cooling.

4.24 All dwellings pass the TM59 overheating criteria for the DSY1 weather file, therefore meeting the requirements of the GLA.

4.25 For the additional assessments employing the DSY2 and DSY3 scenarios, moderate failures are predicted due to temperatures exceeding the limits dictated by CIBSE TM52. However, the GLA guidance acknowledges that this can be expected given the more extreme temperatures required to be assessed in the DSY2 and DSY3 weather files.

4.26 For the DSY2 scenario, the maximum living room exceedance was predicted to be 7.3%, compared with a 3.0% target, and the maximum bedroom exceedance was predicted to be 4.3%, compared with a 3.0% target for Criterion 1 and 3.5% compared with a 1.0% target for Criterion 2.

4.27 For the DSY3 scenario, the maximum living room exceedance was predicted to be 4.8%, compared with a 3.0% target, and the maximum bedroom exceedance was predicted to be 3.2%, compared with a 3.0% target for Criterion 1 and 2.3% compared with a 1.0% target for Criterion 2.

4.28 In terms of future occupation of these dwellings, if overheating was found to be an issue, the following mitigation measures should be explored, which would allow for a further reduction in internal temperatures, and relevant information will be set out to future residents as part of the home user guides:

- Retrofitted solar control film to minimise solar gain
- Additional external shading to limit solar gain
- Improved blinds to reduce solar gain
- Increased MVHR flow rates for additional purge ventilation
- Use of free standing fans to improve air movement

Nature Conservation and Ecology

4.29 The Preliminary Ecological Appraisal (PEA), prepared by Tim Moya Associates in October 2022, confirms that there are no statutory or non-statutory nature conservation designations present within the site. A total of 31 statutory designations are located within 7km of the proposed development site, and a further 19 non-statutory designations within 2km of the site. These sites include: Ruislip Woods Site of Special Scientific Interest (SSSI) and National Nature Reserve (NNR), located 0.3km west of the site; Ruislip Local Nature Reserve (LNR) located 0.6km south; River Pinn near Eastcote Site of Importance for Nature Conservation (SINC) located 0.01km north-east of the site; Haydon Hall Meadows SINC, 0.24km north-east; Ruislip Woods and Poor's Field SINC, 0.31kmk west; and Fore Street Meadows SINC, located 0.4km to the north-west of the site. It is concluded that, due to the scale of the proposed works, there is unlikely to be a direct impact on any identified statutory and non-statutory designated sites. It is noted that there is potential for some level of increased recreational pressure on these sites, particularly when considering the proposed development in combination with other local developments in the area, however these sites are already managed as amenity resources for public use. It is therefore concluded that the impact of any additional recreational users arising from the proposed development would be low.

4.30 As part of the survey of the site, the following habitat types were observed: buildings, hard standing, introduced shrubs, short perennial vegetation, bare ground and trees. Whilst none of these habitats are listed as Habitats of Principal Importance, it is noted that the trees present on the site are considered to be of notable biodiversity value in the context of the site and its surroundings. With respect to protected species, the habitats present on the site are not considered suitable to support populations of Great Crested Newt, reptiles, dormice, water vole, otter, white-clawed crayfish and badger. The existing building on the site was assessed as having low potential to support roosting bats, although the trees present on the site are considered to have negligible potential to support roosting bats. Whilst the habitats within the site and local area are likely to be used to only a limited extent by foraging and commuting bats, there is potential that bats may cross the area occasionally.

In addition, it is noted that the existing building and trees present on the site may be suitable for nesting birds, and there are habitats present on the site that may be suitable for hedgehogs.

4.31 A number of mitigation measures are outlined within the PEA to minimise the disruption of species using the site, including:

- As all the existing trees on the site are due to be removed for the proposed development, it is recommended that replacement planting be provided wherever possible, with native species that are found locally prioritised where practicable.

- A nocturnal emergence and re-entry survey should be undertaken for the existing building between May and August, inline with Bat Conservation Trust Survey Guidelines, in order to ascertain whether the building is used by roosting bats. Additional surveys may be required should it be confirmed that the building is used by roosting bats. Any proposed works that may disturb bats or damage bat roosts may only be undertaken once a Natural England Mitigation Licence has been obtained, which would require a detailed bat mitigation strategy and the provision of alternative roosting features on the site.

- The implementation of a sensitive lighting strategy within the development to minimise disruption to nocturnal species. This is discussed in more detail in the pollution section below.

- Building demolition and vegetation removal should only be undertaken outside the bird nesting season (typically March to August, inclusive). Where this is not possible, checks must be carried out by a suitably experience ecologist prior to the commencement of works. If bird nests are discovered within buildings or vegetation to be removed, they must be left in place until all young have fledged.

- Where possible, boundary habitats should be implemented instead of or adjacent to fences and walls to provide shelter, nest sites and foraging opportunities to hedgehogs. Should the removal of boundary vegetation be required, this should be undertaken with care to avoid harm to hedgehogs.

4.32 The following Ecological enhancements are also recommended for incorporation within the proposed development:

- Installation of wildlife boxes, including those for: birds (general), swallows, swifts, house sparrows, and bats. Bird boxes should be installed at least 2m above the ground, and in locations that are sheltered from strong sunlight and wet winds. Bat boxes may be installed either on existing mature trees or external building walls, or may be in-built to the structure of new buildings. They should be located in sheltered areas, away from artificial light, at least 3m above the ground, and ideally facing south.

- To enhance the site for hedgehogs, nest boxes or domes should be incorporated within undisturbed locations across the site, and it is recommended that all garden fences installed on the site include a gap at the ground level to facilitate the commuting of hedgehogs.

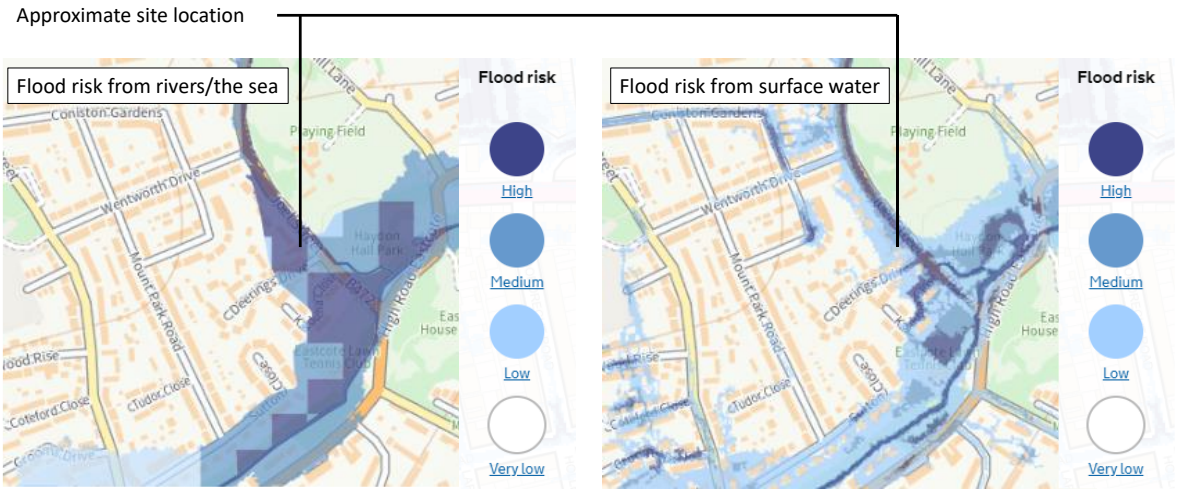
- As detailed above, it is recommended that additional tree and shrub planting be provided within the site where possible to increase feeding resources and connectivity for wildlife. It is recommended that shrub planting include a variety of species listed on the Royal Horticultural Society's Plants for Pollinators' lists, and that native tree species be provided where practicable. It is also recommended that informal meadow grassland be incorporated within the site where possible, and that wildlife corridors be created through the provision of hedgerows and tree lines where practicable.

Reducing Flood Risk and Surface Water Run-off

4.33 As detailed within the Flood Risk Assessment prepared by Herrington Consulting Limited in September 2022, and confirmed in Figure 4.3 below, the site is located partially within Flood Zone 2 and partially within Flood Zone 3, indicating a medium to high risk of flooding from tidal and fluvial sources. This is due to the proposed development site's location within proximity to the River Pinn. In order to mitigate the risk to people posed by potential flood water that may be present on the site during a 1 in 100-year event, it is proposed that the ground floor level of the scheme will be raised 600mm above the design flood level, to 45.01 mAOD. This is in line with the guidance provided by the Environment Agency (EA), which requires that all sleeping accommodation be raised a minimum of 600mm above the design flood level, which has been calculated as 44.71 mAOD at the proposed development site. Further to this, it is proposed that the ground floor of the scheme and the under-croft voids to be implemented below the ground floor level be designed using flood resilient construction techniques in order to reduce the impact of flood water on the structure. Finally, it is recommended that the future residents of the proposed development sign up to the EA's Flood Warning Service, to ensure sufficient warning is provided prior to a flood event to allow future residents and visitors to safely evacuate the site.

4.34 The vast majority of the site is also shown to be at low risk of flooding from pluvial (surface water) sources. There are also areas at high risk of surface water flooding within the surrounding road network. Whilst this risk is anticipated to be contained within the road network, the use of landscaping and the integration of an effective drainage strategy is proposed to ensure surface water is managed on the site to reduce burden on the surrounding drainage infrastructure. The Flood Risk Assessment undertaken for the proposed development confirms that the site is at low risk of flooding from groundwater, sewer and artificial sources.

Figure 4.3 Extract from the Environment Agency's online flood map



4.35 As part of the proposed surface water management strategy, also detailed within the Flood Risk Assessment prepared by Herrington Consulting Limited, it is intended that a combination of sustainable drainage (SuDS) features will be incorporated, including rainwater harvesting butts, a combined green-blue roof system, and permeable paving with below-ground attenuation crates. It is intended that rainwater falling on the flat portion of the roof of the proposed building will be stored within a combined green-blue roof before being drained via downpipes to an area of permeable paving adjacent to the building. This area of permeable paving will be underlain by geo-cellular attenuation crates, with sufficient storage capacity for rainfall falling both on the roof of the proposed building, and on the areas of hardstanding to be delivered on the site. Rainwater attenuated within the proposed surface water drainage system will then be discharged at a restricted flow rate of 2.0 l/s to the surface water sewer running along Joel Street to the east of the site. It is intended that the existing drainage infrastructure will be employed where feasible, with a vortex flow control device utilised to restrict the rate at which attenuated water is discharged from the site. The achievement of a discharge rate of 2.0 l/s from the site in the post-development context will be equivalent to a 94% improvement over the existing case, thereby aiding to mitigate the risk of surface water flooding both within the proposed development site and the immediate surroundings. Further details of the proposed surface water drainage strategy are provided in the Flood Risk Assessment prepared by Herrington Consulting Limited.

Air Pollution

4.36 The Environment Act 1995 requires all Local Authorities to review air quality within their districts. If it appears that any air quality 'Objective; prescribed in the regulations and in the National Air Quality Strategy is not likely to be achieved, then the local authority must designate the affected area as an Air Quality Management Area (AQMA).

4.37 The site location, and the area from the southern boundary of the London Borough of Hillingdon to the border defined by the A40 corridor, is specified as an AQMA due to excessive levels of nitrogen

dioxide (NO_2) resulting from road transport. It is noted, however that the proposed development falls outside of this AQMA.

4.38 Figure 4.4 below, taken from the London Air Annual Pollution Maps, shows the levels of NO_2, PM_{10} and $PM_{2.5}$ measured at the site in 2016. The images below indicate that the levels of NO_2, PM_{10} and $PM_{2.5}$ present at the site in 2016 would have been below both the National Air Quality Objective (NAQO) and World Health Organisation (WHO) guidelines.

Figure 4.4 Maps indicating annual levels of NO_2 (left), PM_{10} (middle) and $PM_{2.5}$ (right) exposure

4.39 An Air Quality Assessment of the proposed development has been undertaken by Aether in August 2022, which confirms that the site is not located within the London Borough of Hillingdon's declared AQMA. As part of this assessment, a construction dust assessment has been undertaken in accordance with Greater London Authority (GLA) and Institute of Air Quality Management (IAQM) guidance on the assessment of dust from demolition and construction. Mitigation measures have been proposed for construction traffic and stationary plant associated with the construction of the proposed development, including the erection of solid screens or barriers around dusty activities or the site boundary, the switching off of engines when stationary, the avoidance of diesel- or petrol-powered generators, and the covering of all loads entering and leaving the site. Following the successful implementation of the specific mitigation measures for construction dust, it is considered that the impact of the demolition and construction phase of the proposed development on local air quality will be minimised.

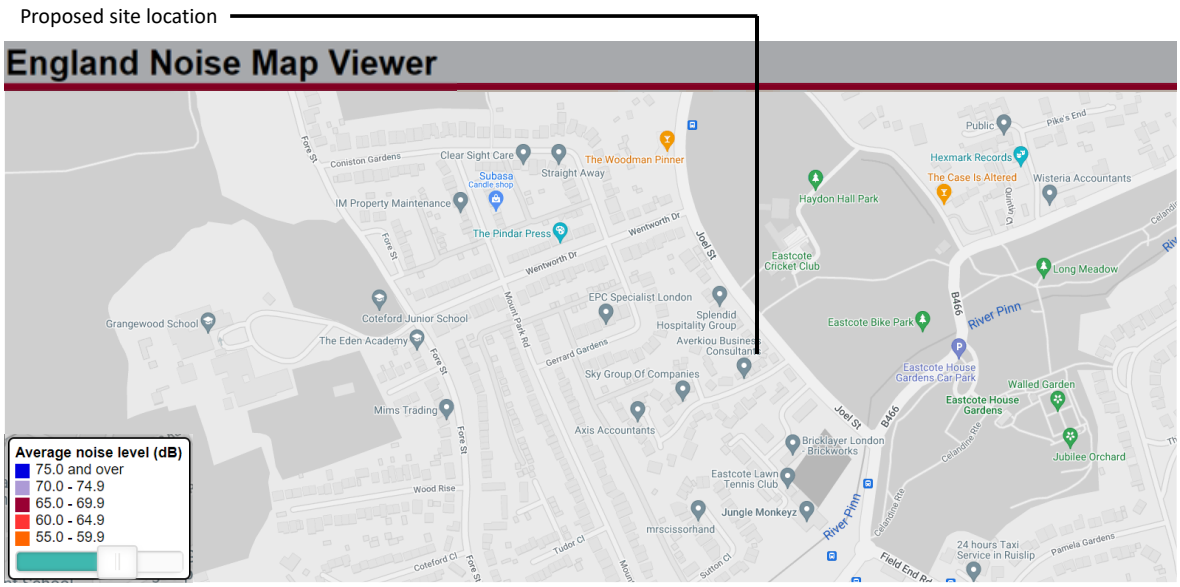
4.40 The Air Quality Assessment concludes that the predicted traffic associated with the proposed development is unlikely to result in a detrimental pollution impact upon the local road network and the current pollution levels. In addition, the proposed development has been assessed to be compliant with the GLA's 'air quality neutral' guidance for new development. It is noted, however, that the proposed development does not meet the transport emissions benchmark, and it is therefore

recommended that a re-assessment of trip generation is undertaken to provide a trip rate estimate that considers the impact of the Travel Plan.

Noise and Vibration

4.41 The development is not located within proximity to transport noise sources. The closest roads to the proposed development site are Joel Street (B472) and Deerings Drive. The map below indicates that there is unlikely to be impact in terms of noise on future site users arising from traffic present on these roads.

Figure 4.5 Road traffic noise map



4.42 A Noise Impact Assessment has been undertaken by KP Acoustics in August 2022. This confirms that the acoustic climate at the site primarily comprises of traffic noise from the surrounding road network. The noise levels measured at the site are likely to be acceptable, as long as a detailed acoustic design is implemented. Proposed mitigation measures include the development of a robust glazing specification and the employment of building fabric with a sufficient sound reduction index.

4.43 The use of double-glazed windows has been included for within the Energy Strategy detailed below. In addition, it is proposed that dwellings will employ mechanical ventilation with heat recovery (MVHR). This will ensure fresh air is supplied to the dwellings without the need to open windows. It should be noted that all dwellings will be served by openable windows, which will enable future residents to open windows to provide natural or purge ventilation should they wish. In this instance it is important that any self-noise (i.e. noise from the fans) and external noise intrusion through the ducted system must not cause internal sound levels to exceed the design requirements. Suitable MVHR systems will also incorporate a summer bypass mode to minimise the potential for overheating during summer months.

4.44 The systems which are to be specified to serve the space and water heating demands of the dwellings should be quiet in operation. As the design progresses, acoustic measures should be considered to further limit the noise generated by the outside units of the system where deemed necessary

4.45 The Assessment concludes that, with the implementation of the specified mitigation strategy, sound levels across the proposed development can be readily attenuated to achieve acceptable internal sound levels.

Land Contamination

4.46 As detailed within the Phase I Contaminated Land Assessment, undertaken by Earth & Marine Environmental Consultants Ltd (EAME) in April 2022, the ground conditions at the site are likely to comprise Alluvium (Clay, Silt and Sand), underlain by the Lambeth Group. It is noted that both the Alluvium present within the superficial deposits, and the Lambeth Group within the bedrock deposits have been designated as Secondary A Aquifers. The site is not located within a Source Protection Zone (SPZ) and there are no groundwater abstraction licences associated with the site.

4.47 Based on the historical and current land use at the site, the Phase I Contaminated Land Assessment concludes that the potential for significant contamination to have arisen at the site is very low. This is due to the historic use of the site as an open field and, later, structures and buildings, and the fact that no potentially significant pollutant linkages have been identified. Whilst the potential for the site to be contaminated is considered to be low, it is recommended that a watching brief be applied to the excavation and relaying of the existing car park in case hydrocarbon impacted ground is encountered. It is noted, however, that there is no visible evidence to suggest that hydrocarbon impacted ground will be present.

Light Pollution

4.48 As outlined in the Preliminary Ecological Appraisal (PEA), prepared by Tim Moya Associates in October 2022, to avoid a detrimental impact on bats using the site, there should be no increased light spillage on to suitable habitats where bats are likely to commute and forage. Lighting should be restricted to the interior of the site, and kept at a low level. To achieve this, it is recommended that the following measures be implemented within the lighting scheme:

- Minimisation of light spill through careful positioning, selection of luminaires, and column heights;
- Use of LES luminaires where possible, due to lower intensity and dimming capacity;
- Elimination of upward light spill;
- Use of warm white luminaires, and the avoidance of UV lighting;

- Reduction of lighting intensity to the minimum required for safety and security; and
- Use of triggers to illuminate security lighting, and the automated switching-off of this lighting after a short period.

Water Pollution

4.49 The implementation of the proposed sustainable drainage system (SuDS), prepared by Herrington Consulting Ltd in September 2022, will include appropriate pollution control measures to minimise the risk of pollution entering the ground from surface water runoff from the development. An appropriate SuDS treatment train, consisting of permeable paving and raingarden elements, has been incorporated within the design to treat surface water before it is discharged to the public sewer network.

4.50 Additional measures will also be adopted during construction to minimise the risk of ground and surface water pollution, including:

- Oil separators;
- Clear marking and signage of drainage stems;
- Any on-site fuel or oil delivery areas will be fully bunded;
- Areas for cleaning activities will also be bunded; and
- Appropriate best practice measures shall be implemented in line with the GLA's SPG 'The Control of Dust and Emissions from Construction and Demolition' (July 2014).

5. ENERGY STRATEGY

5.1 With reference to the policy requirements, guidance and industry best practice detailed in Section 3, an energy and carbon dioxide (CO_2) emissions strategy has been defined for the proposed development. The proposed energy performance of the scheme has been analysed and evaluated to target a high level of CO_2 emissions performance when assessed against Part L:2021 of the Building Regulations and associated policies, accounting for economic, technical and functional feasibility.

5.2 The following section includes a breakdown of potential measures proposed at each level of the Energy Hierarchy (below), including a renewable energy generation options study.

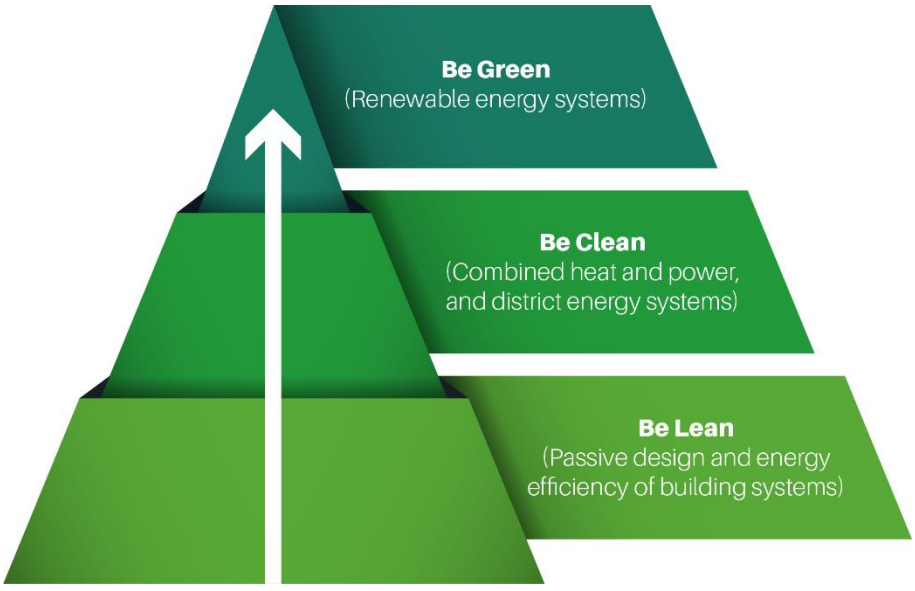
The Energy Hierarchy

5.3 The proposed energy strategy is based upon the principles of the Energy Hierarchy on the basis that it is preferable to reduce carbon dioxide emissions through reduced energy consumption above decarbonisation through alternative energy sources.

5.4 The tiers of the Energy Hierarchy are:

- Be Lean Use less energy
- Be Clean Supply energy efficiently
- Be Green Use renewable energy

Figure 5.1 The Energy Hierarchy



‘Be Lean’ (Use Less Energy)

5.5 Within the first stage of the energy hierarchy, it is proposed to incorporate high levels of passive and energy efficient design measures in order to reduce the development’s energy consumption and associated CO_2 emissions.

5.6 It is technically possible to exceed Building Regulations requirements through demand reduction measures alone and it is an expectation that applications achieve at least 10% reduction via the ‘Be Lean’ stage for residential uses.

5.7 Passive design utilises daylight, solar energy, shading and stack or wind driven ventilation to illuminate, heat, shade and, where necessary, ventilate/cool the building, thus requiring less (mechanical) energy to achieve the performance standards for health and wellbeing of the occupants.

5.8 Site characteristics relating to local climate, surroundings, scale and size of the development therefore influence the potential energy requirements and savings that can be achieved through the consideration of this. The parameters that most influence the potential to utilise sunlight and solar gains are the orientation and layout of buildings, however these are typically driven by factors other than energy efficiency or bioclimatic design considerations, with the form of industrial buildings driven principally by function. The massing and orientation of the individual dwellings are constrained by the overall masterplan in terms of delivering the required density, preventing overlooking and ensuring daylight and sunlight provision. Despite this, passive design of the apartments includes a number of specific energy efficiency features.

5.9 U-values are a measure of the rate of heat transfer through a building element over a given area, under standardised conditions. They measure the rate at which heat is lost or gained through a fabric.

5.10 The following U-values are proposed as a means of limiting heat loss through the proposed building fabric.

Table 5.1 Proposed building fabric U-values

Building Fabric Element	Part L:2021 backstop U-values (W/m²K)	Proposed U-values (W/m²K)
Ground floor	0.18	0.13
External wall	0.26	0.18
Roof	0.18	0.11
Windows	1.60 (including frame)	1.20 (including frame)
Doors	1.60 (including frame)	1.20 (including frame)

5.11 It is proposed that the glazing will be double glazed, argon filled with a low emissivity coating. Although this has yet to be formally specified, it is expected that window U-values will be 1.20 W/m²K or better (including frame), with a g-value of 0.3, and light transmission of ~70% to improve natural daylight penetration.

5.12 A high level of air tightness is proposed, where a level equal to or below 5 $m^3/h/m^2$ @ 50Pa shall be targeted, meaning that air infiltration between the internal and the external environment will be largely controlled, and space heating/cooling demand further reduced.

5.13 The other significant means of heat loss from dwellings is due to thermal (or cold) bridging. This is typically a construction detail which has higher thermal conductivity than the surrounding materials, creating a path of least resistance for heat transfer. Thermal bridges result in an overall reduction in thermal resistance of the building elements and should be designed out where possible to minimise unwanted heat loss. In order to minimise heat loss through thermal bridges, accredited construction details have been assumed, with an equivalent y-value of 0.05 for each dwelling

5.14 High efficiency plant, equipment and controls are proposed to limit the energy consumed in order to provide the required level of indoor environmental performance and control. Performance efficiency values have been specified in line with the requirements of the Building Regulations in order to minimise carbon dioxide emissions as far as possible through the 'Be Lean' stage.

- Low energy LED lighting will be installed throughout the residential apartments.

- In order to meet the requirements of the GLA's Energy Planning Guidance document under the 'Be Lean' scenario, space and wate heating has been specified as gas-fired boilers with an efficiency of 93%.

- Although residential units are provided with opening windows to mitigate against overheating, outside air will be provided via mechanical ventilation with heat recovery (MVHR), with a specific fan power (SFP) of 0.59 W/l/s. A heat exchanger with an efficiency of 90% has also been specified. These efficiencies are higher than those set out in Part L of the Building Regulations.

- Heating will be controlled via the suitable arrangement of plumbing and electrical services.

5.15 Energy modelling of the proposed scheme has been undertaken using the Standard Assessment Procedure (SAP) for four of the proposed units. These are shown in the images below, with further details given in Table 5.2.

5.16 Based on the energy analysis of the proposed spaces, the total energy demand for the development is shown below.

Figure 5.2 Sample dwellings modelled

Table 5.2 Sample dwellings modelled

Dwelling Reference	Dwelling Type	Floor	Aspect
Flat 1	2-bedroom 4-person apartment	Ground	N, NE, SE
Flat 3	1-bedroom 2-person apartment	First	SE, SW
Studio 8	Studio	Second	SW, W
Flat 13	2-bedroom 3-person apartment	Third	NW

5.17 Carbon dioxide emissions results from the apartments detailed above have been extrapolated to match the total number of dwellings proposed, as detailed in Table 5.3 below.

Table 5.3 Dwelling mix

Dwelling Type	No. Dwellings
Studio	2
1-bedroom 2-person apartment	5
2-bedroom 3-person apartment	1
2-bedroom 4-person apartment	5
Total	**13**

5.18 The carbon dioxide emissions for the residential component of the proposed development, under the 'Be Lean' tier of the Energy Hierarchy are shown below. BREL worksheets showing the 'Be Lean' performance of each of the sample dwellings modelled are provided in Appendix A4.

Figure 5.3 Domestic carbon dioxide emissions (Be Lean)

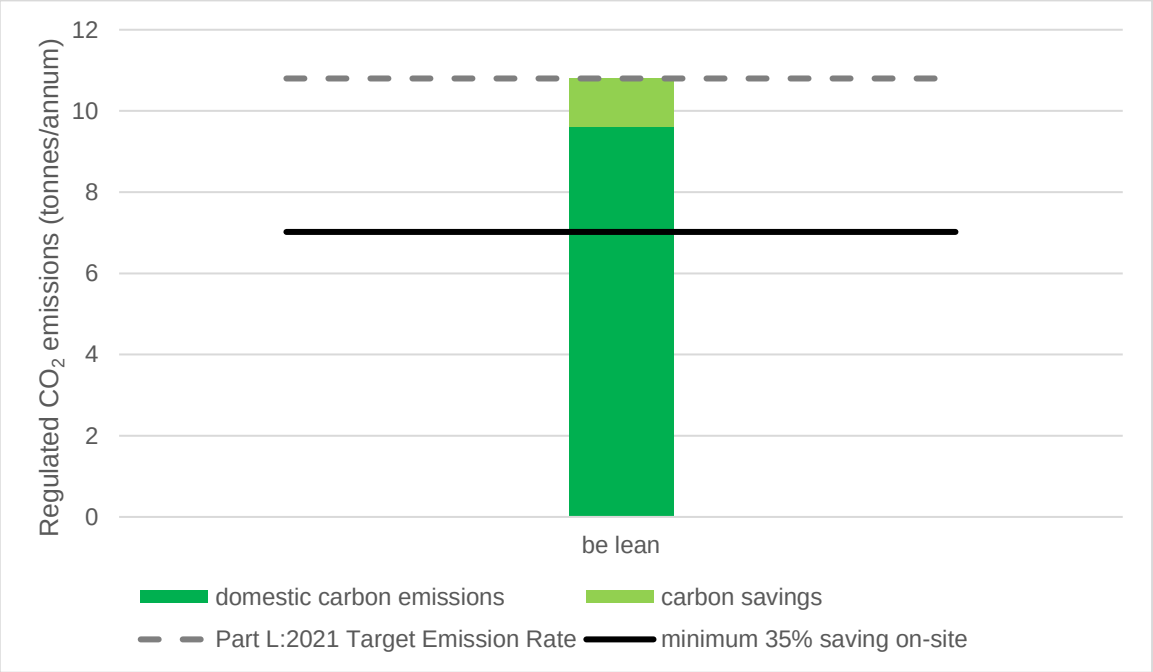


Table 5.4 Domestic carbon dioxide emissions (Be Lean)

TER: Baseline: Part L:2021 Emissions (tonnes CO_2 per annum)	DER: Proposed 'Be Lean' Emissions (tonnes CO_2 per annum)	Emissions Savings (tonnes CO_2 per annum)	Emissions Savings (%)
10.8	9.6	1.2	11%

5.19 The above analysis shows that the domestic element of the proposed development achieves a carbon dioxide emissions saving of 11% through energy efficiency measures alone, under the 'Be Lean' scenario.

‘Be Clean’ (Supply Energy Efficiently)

5.20 The potential for the proposed development to incorporate a low carbon heating/cooling system has been reviewed for the scheme, in line with the hierarchy presented in the London Plan policy SI2, copied below:

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

5.21 The London Heat Map is a tool provided by the Mayor of London to identify opportunities for decentralised energy projects in London. It builds on the 2005 London Community Heating Development Study.

5.22 The image below is an extract from the London Heat Map, showing the area in the vicinity of the site. It illustrates;

- Heat demand (areas of heat demand are shown in red, with areas with a high density of heat demand appearing more opaque, and areas of zero heat demand appearing transparent);
- Existing heat networks (shown as red lines);
- Proposed heat networks (shown as orange lines);
- Heatmap study areas (shown as transparent white circles); and
- Potential heat supply sites (shown as purple dots).

Figure 5.4 Extract from the London Heat Map

5.23 The extract above indicates that the proposed development site is located within an area of low heat density. There are no existing district heat networks located within the surrounding area, and there are no planned district heat networks. In addition, the proposed development site is shown to fall outside a Heatmap Study Area, with the closest Heatmap Study Area being located to the south of the site.

5.24 Furthermore, it is considered that the establishment of a new heat network would not be economically feasible for the proposed development considering the nature, scale and density of the scheme. In addition, the use of CHP is also considered to be unviable for the proposed site, based on the most up-to-date GLA energy guidance, which looks to move away from the use of natural gas to meet space and water heating demands. It is therefore recommended that individual air source heat pump (ASHP) systems are employed to service the residential elements of the proposed scheme. The incorporation of heat pump technology is discussed in greater detail in the ‘Be Green’ section.

‘Be Green’ (Utilise Renewable Technologies)

5.25 The proposed development has given consideration to renewable energy technologies that may be applicable to deliver the required level of carbon dioxide savings over the Part L:2021 baseline, and the likely local effects on the environment.

5.26 A full review of potentially applicable renewable technologies has been carried out, considering both the effectiveness and viability of the different technologies. Full details of the assessment and outcomes are provided in Appendix A5.

5.27 Given the site location, lack of local existing or proposed heat networks, it is proposed that air source heat pump (ASHP) technology is employed to serve the heating and cooling demands of the development.

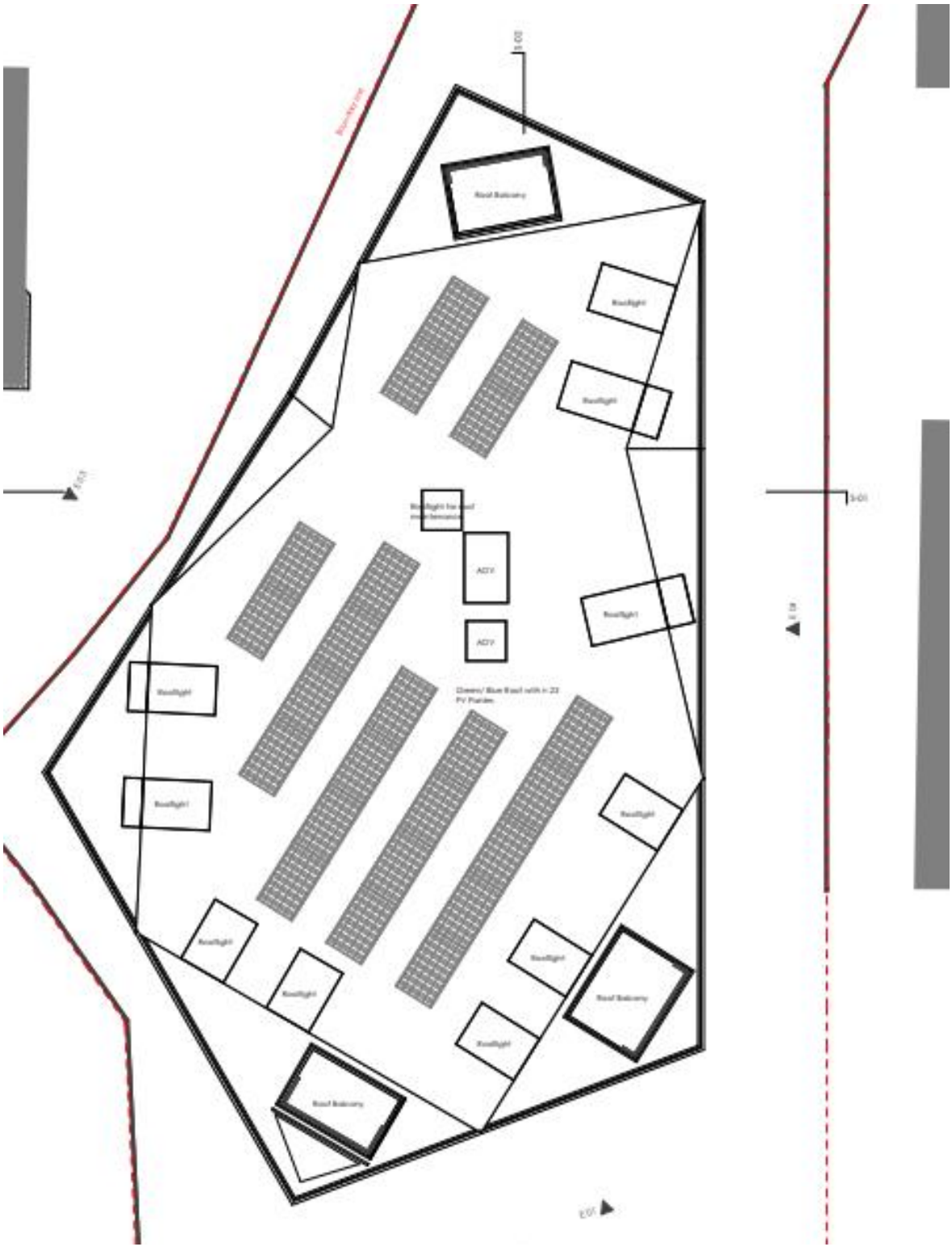
5.28 It is intended that highly efficient individual air source heat pump (ASHP) systems will be employed to serve both the space and water heating demand. Typical manufacturer specifications for the proposed system quote a heating coefficient of performance of 4.03, and a hot water coefficient of performance of 2.95. Whilst the specified system operates quietly, as the design progresses, acoustic-measures to further limit the noise generated by the outside unit of the system during operation will be considered.

5.29 Individual ASHPs have been selected over a communal system for the residential element of the scheme as they will offer a number of benefits, including:

- Great spatial efficiency providing more new homes due to lower plant space requirements;
- Reduced external noise emissions due to smaller units operating independently;
- Reduced visual impact of external plant from smaller individual units;
- Absence of central plant and distribution network leads to lower capital costs;
- Easier metering and billing; and
- Greater system efficiency due to reduced system heat loss and lower pumping energy.

5.30 Rooftop photovoltaic (PV) technology is also proposed to generate renewable electricity onsite. The location of the proposed arrays is highlighted on the roof plan displayed below, based on the drawings produced by CIAO Architects. It should be noted that this plan is indicative at this stage, and demonstrates the proposed location of the PV arrays. This area, on the southern-facing section of the roof, has been selected to be free from overshading from neighbouring buildings, and rooftop lift overruns.

Figure 5.5 Proposed rooftop PV panel locations



5.31 The roof area selected, which has been maximised based on the available roof space when taking the requirements for plant space into account, is proposed to house 23 PV panels. The PV coverage extends to all reasonably available roof space that is unshaded and not used by building plant. Standard PV panels have been assumed, with an output of 400W per panel, an efficiency of ~20%

and a dimension of 1.1 x 1.7m. Panels will be oriented between 15° and 30° to the horizontal and will face due south to maximise output per panel.

5.32 It is estimated that the 23 PV panels will produce approximately 7,273 kWh of renewable electricity per year, equating to a carbon dioxide saving of 1.0 tonne of CO_2 per year using the SAP 10 electricity emissions factor of 0.136 kgCO_2/kWh.

5.33 The carbon dioxide emissions for the proposed development, under the 'Be Green' tier of the Energy Hierarchy, are shown below. BREL worksheets showing the 'Be Green' performance of the modelled spaces are provided in Appendix A4.

Figure 5.5 Domestic carbon dioxide emissions (Be Green)

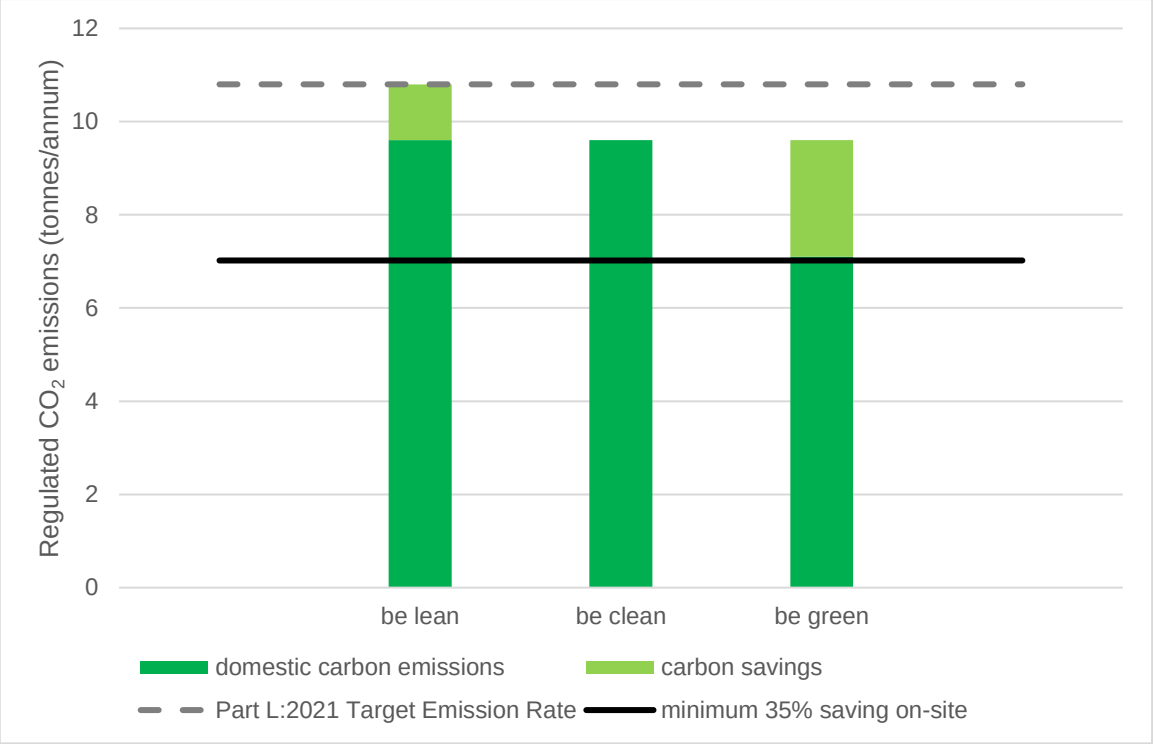


Table 5.5 Domestic carbon dioxide emissions (Be Green)

TER: Baseline: Part L:2021 Emissions (tonnes CO_2 per annum)	DER: Proposed 'Be Green Emissions (tonnes CO_2 per annum)	Emissions Savings (tonnes CO_2 per annum)	Emissions Savings (%)
10.8	7.0	3.8	35%

The above analysis shows that the proposed development will achieve a minimum on-site carbon dioxide emissions saving of 35% through energy efficiency measures and renewable technologies, under the 'Be Green' scenario.

Table 5.6 Carbon dioxide emissions after each stage of the Energy Hierarchy

	Site-wide carbon dioxide emissions (Tonnes CO_2 per annum)
Baseline: Part L 2021 of the Building Regulations Compliant Development	10.8
After energy demand reduction	9.6
After renewable energy	7.0

Table 5.7 Carbon dioxide emissions savings after each stage of the Energy Hierarchy

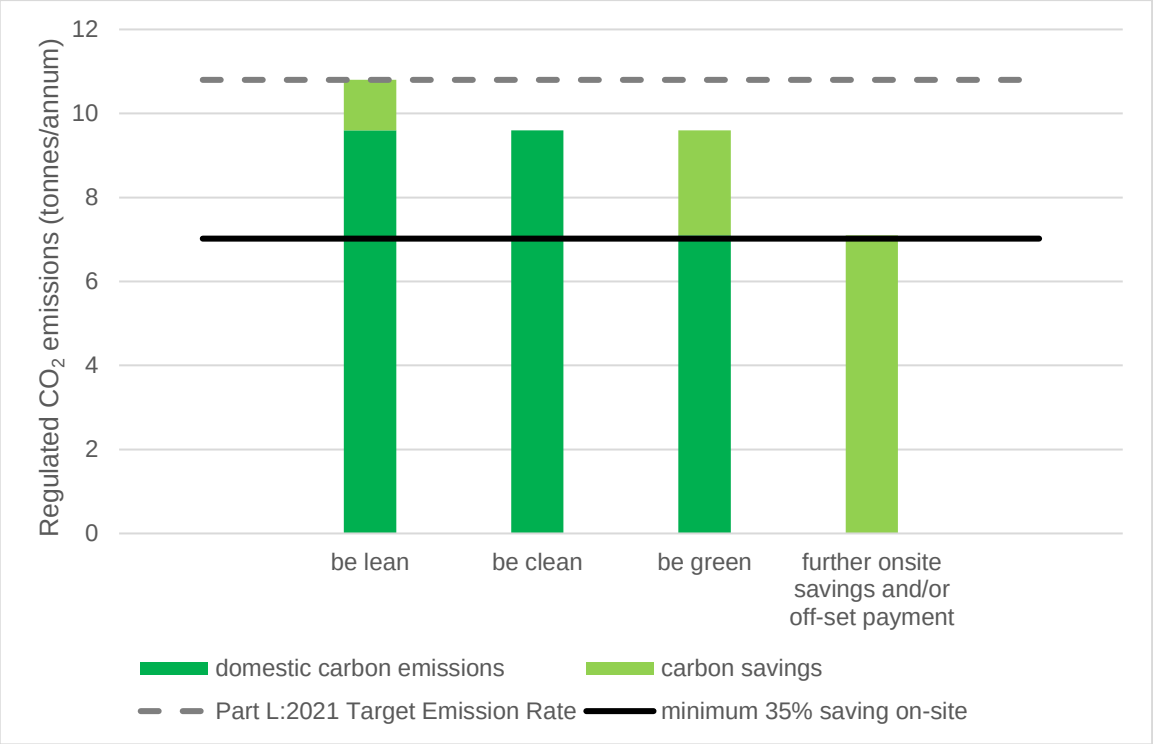
	Regulated carbon dioxide emissions	
	Tonnes CO_2 per annum	**%**
After energy demand reduction	1.2	11%
After renewable energy	2.6	24%
Cumulative onsite savings	3.8	35%

Carbon Offsetting

5.34 As per the requirements of London Plan policy SI2, new build developments are expected to meet a zero-carbon target. Where a development is unable to meet the zero-carbon target through on-site means alone, the remaining regulated carbon dioxide emissions, to 100%, are to be offset through a cash-in-lieu contribution to local authorities to be ringfenced to secure delivery of carbon dioxide savings elsewhere.

5.35 Based on the information presented in Tables 5.6 and 5.7 above, a total of 231 tonnes of residual carbon dioxide are required to be offset from the domestic component over a period of 30 years. As the London Borough of Hillington do not have an established price for carbon dioxide, a figure of £95 per tonne over a 30-year period has been used to calculate the offsetting cost. The 231 tonnes therefore result in an offset cost of £20,193.

Figure 5.6 Carbon dioxide emissions after offsetting



'Be Seen' (Monitor and Record Energy Usage)

5.36 Smart meters will be provided to all dwellings to allow residents to monitor their energy usage in real time. Due to the scale of development proposed, there will be no need to monitor and record centralised energy used for either heat or electricity.

6. SUMMARY

6.1 This Sustainability & Energy Statement provides an overview as to how the proposed development of the Haydon House, 296 Joel Street, HA5 2PY contributes to sustainable development in the context of the strategic, design and construction considerations.

6.2 Consideration has been given to the Hillingdon Local Plan Part 1: Strategic Policies in the formulation of this statement. The overall development has been assessed using the guidance outlined in strategic objectives 8, 10, 11 and 13, and policy EM1 (Climate Change Adaptation and Mitigation) of the Local Plan, providing a holistic sustainability approach for the proposals.

6.3 By designing to rigorous energy standards and employing air source heat pump (ASHP) technology to serve the space heating and cooling demand of the proposals, the application will respond directly to the Climate Emergency declared by the Council in January 2020. These measures combine to provide a minimum carbon dioxide emissions saving of 35%, compared to the Part L:2021 baseline, significantly exceeding the requirements of London Borough of Hillingdon Council.

6.4 Sections 4 and 5 of this statement demonstrate that the siting and design of the proposals support relevant policies relating to sustainable development. This shows that the proposed development:

- will develop a brownfield site;
- is in a location with good access to public transport;
- will promote cycling and walking, and deter private car ownership;
- will minimise internal water consumption to 105 litres per person per day;
- will incorporate measures to improve site biodiversity, including biodiverse planting;
- will not increase the risk of surface water flooding onsite;
- will incorporate low-impact materials, according to the BRE Green Guide to Specification;
- will minimise waste production during construction and maximise the proportion of waste to be diverted from landfill;
- will minimise energy demand through the specification of low U-values and low air permeability to reduce heat loss; and
- will utilise air source heat pump (ASHP) technology to serve the space and water heating demand of the proposed dwellings; and

- will employ rooftop photovoltaic (PV) panels to generate zero carbon electricity on-site.

6.5 By designing to rigorous energy standards, omitting the use of fossil fuels for heating and hot water, and implementing a rooftop array of solar photovoltaic panels, the proposed development will achieve a minimum 35% reduction in CO_2 emissions, following the Energy Hierarchy methodology. The remaining 213 tonnes of CO_2 pe annum of domestic emissions from the development will be offset through a cash-in-lieu contribution.

Figure 1.1 Carbon dioxide emissions after each stage of the Energy Hierarchy

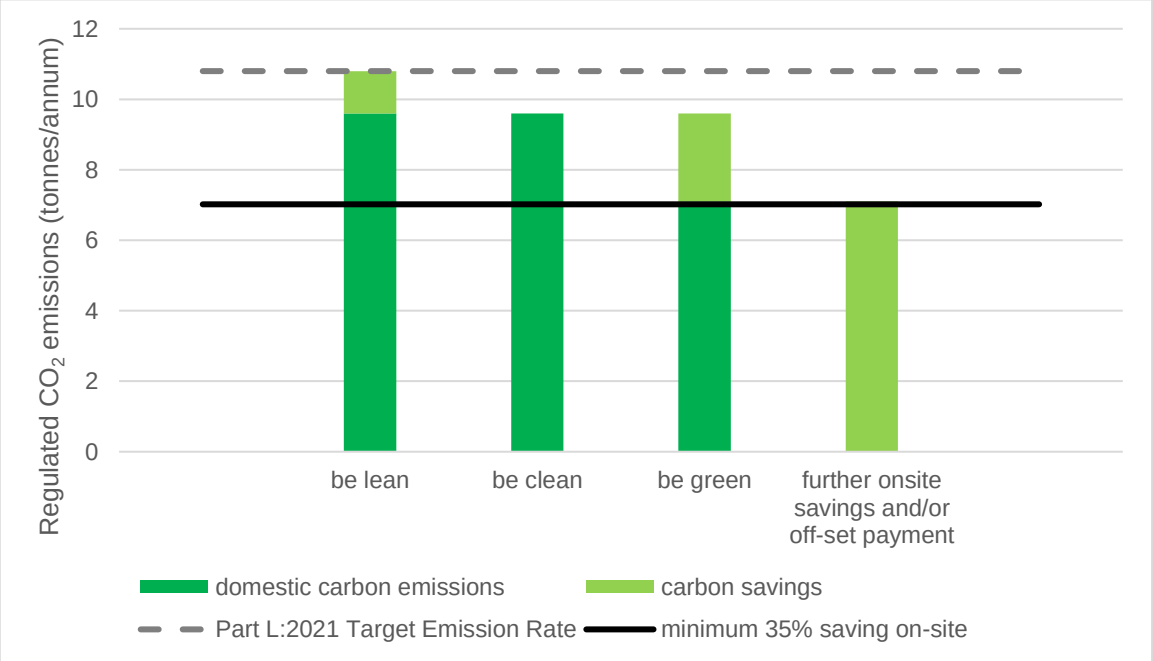


Table 6.1 Carbon dioxide emissions after each stage of the Energy Hierarchy

	Site-wide carbon dioxide emissions (Tonnes CO_2 per annum)
Baseline: Part L 2021 of the Building Regulations Compliant Development	10.8
After energy demand reduction	9.6
After renewable energy	7.0

Table 6.2 Regulated carbon dioxide savings from each stage of the Energy Hierarchy

	Regulated carbon dioxide savings	
	Tonnes CO_2 per annum	**%**
Savings from energy demand reduction	1.2	11%
Savings from renewable energy	2.6	24%
Cumulative on-site savings	3.8	35%
Annual savings from offset payment	7.0	-
	Tonnes CO_2	
Cumulative savings for offset payment	213	-
Cash-in-lieu contribution	£20,193	-

6.6 Overall, the proposals for the scheme are in line with the principles of sustainable development as well as the policy requirements of the NPPF, the London Plan and the London Borough of Hillingdon, and will provide a development that promotes these principles in operation.

A1. SITE PLAN

PROPOSED SITE PLAN
Scale 1:200

0 2.0 4.0 10.0 20.0

Notes
1. All dimensions to be checked on site.
2. All dimensions are to masonry unless otherwise stated (ie not plaster finishes)
3. All information is to be checked and verified by the contractors and sub-contractors for accuracy and fit.
4. Discrepancies or omissions to be brought to the attention of **CIAO** prior to construction.
5. This drawing has been drawn to scale,as shown, for the purpose of obtaining local authority approval
6. For General Notes refer to Drawing No. 4GN-01

Rev	Date	Notes

Client: Westgold Holdings LTD
Stage: Planning
Date: 07/10/2022
Project: Haydon House, 296 Joel Street, HA5 2PY
Project Ref. No: 166
Scale: 1:200@A3
Drawing title: Proposed site plan
Drawing number: 166-3GA-00
Drawn By: LP
Checked By: AP

203-213 Mare Street
London, E8 3JS

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CIAO
Creative Ideas & Architecture Office

A2. WATER USAGE CALCULATOR

breglobal

Job no:	22-IF022
Date:	19/08/2022
Assessor name:	
Registration no:	N/A
Development name:	Haydon House

PRINTING: before printing please make sure that in "Page Setup" you have selected the page to be as "Landscape" and that the Scale has been set up to 70% (maximum)

WATER EFFICIENCY CALCULATOR FOR NEW DWELLINGS - (BASIC CALCULATOR)

	House Type:	Type 1		Type 2		Type 3		Type 4		Type 5		Type 6		Type 7		Type 8		Type 9		Type 10	
	Description:	Typical Unit																			
Installation Type	**Unit of measure**	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day
Is a dual or single flush WC specified?		Dual		Select option:		Select option:		Select option:		Select option:		Select option:		Select option:		Click to Select		Click to Select		Click to Select	
WC	Full flush volume	6	8.76		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
	Part flush volume	3	8.88		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Taps (excluding kitchen and external taps)	Flow rate (litres / minute)	3	6.32		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Are both a Bath & Shower Present?		Bath & Shower		Select option:		Select option:		Select option:		Select option:		Select option:		Select option:		Select option:		Select option:		Select option:	
Bath	Capacity to overflow	180	19.80		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Shower	Flow rate (litres / minute)	8	34.96		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Kitchen sink taps	Flow rate (litres / minute)	4	12.12		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Has a washing machine been specified?		No		Select option:		Select option:		Select option:		Select option:		Select option:		Select option:		Select option:		Select option:		Select option:	
Washing Machine	Litres / kg		17.16		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Has a dishwasher been specified?		No		Select option:		Select option:		Select option:		Select option:		Select option:		Select option:		Select option:		Select option:		Select option:	
Dishwasher	Litres / place setting		4.50		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Has a waste disposal unit been specified?		No	0.00	Select option:	0.00	Select option:	0.00	Select option:	0.00	Select option:	0.00	Select option:	0.00	Select option:	0.00	Select option:	0.00	Select option:	0.00	Select option:	0.00
Water Softener	Litres / person / day		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
	Calculated Use		112.5		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0
	Normalisation factor		0.91		0.91		0.91		0.91		0.91		0.91		0.91		0.91		0.91		0.91
Code for Sustainable Homes	**Total Consumption**		**102.4**		**0.0**		**0.0**		**0.0**		**0.0**		**0.0**		**0.0**		**0.0**		**0.0**		**0.0**
	Mandatory level		**Level 3/4**		-		-		-		-		-		-		-		-		-
Building Regulations 17.K	External use		5.0		5.0		5.0		5.0		5.0		5.0		5.0		5.0		5.0		5.0
	Total Consumption		**107.4**		**0.0**		**0.0**		**0.0**		**0.0**		**0.0**		**0.0**		**0.0**		**0.0**		**0.0**
	17.K Compliance?		**Yes**		-		-		-		-		-		-		-		-		-

A3. DOMESTIC OVERHEATING ASSESSMENT

Introduction

A3.1 Policy SI4 of the London Plan 'Overheating and Cooling' seeks to reduce the impact of the urban heat island effect in London and encourages the design of places and spaces to avoid overheating and excessive heat generation and to reduce overheating due to the impacts of climate change and the urban heat island effect on an area wide basis.

A3.2 In order to reduce overheating and reliance on air conditioning, the design of the proposed scheme at Haydon House has followed the Cooling Hierarchy detailed in Policy SI4:

1. Minimise internal heat generation through energy efficient design;
2. Reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and walls;
3. Manage the heat within the building through exposed internal thermal mass and high ceilings;
4. Passive ventilation;
5. Mechanical ventilation;
6. Active cooling systems.

Cooling Hierarchy

A3.3 The methods used to minimise overheating and excessive heat generation in line with the cooling hierarchy are outlined below.

Minimisation of internal heat generation through energy efficient design

- Heat gain from lighting is kept to a minimum as a result of an energy-efficient lighting design solution.
- The availability of natural light is maximised by optimising the light transmittance of the glass elements of the façade.
- The scheme will use air source heat pumps for heating and hot water. This is a low temperature distribution system, leading to lower internal heat gains from distribution pipework.

Reduction of the amount of heat entering the building in the summer

- The building's facades will have a limited amount of glazing to mitigate direct solar heat gain while optimising daylight penetration.
- The use of balconies will provide solar shading to apartments.

Management of the heat within the building through exposed thermal mass and high ceilings

- Due to the dense nature of the proposed development, there is little external exposed thermal mass within the building structures, minimising thermal transmission.

Passive ventilation

- Openable windows on multiple aspect spaces will provide a passive ventilation strategy that utilises crossflow ventilation to maximise the potential for natural ventilation within the scheme.

- All dwellings have multiple aspects to assist with crossflow ventilation.

Mechanical and active cooling

- Cooling is not proposed for the dwellings.

Overheating Criteria

A3.4 TM59:2017 is a design methodology for the assessment of overheating risk in homes, published by the Chartered Institution of Building Services Engineers (CIBSE), in April 2017.

A3.5 This is a standardised approach to predict overheating risk for residential building designs using dynamic thermal analysis. It provides a baseline which includes specific weather files, defined internal gains and a set of profiles that represent reasonable usage patterns for a home suitable for evaluating overheating risk. In addition, defined thresholds to provide a pass / fail result are clearly provided as detailed below.

A3.6 Compliance is based on passing both of the following two criteria:

1. For living rooms, kitchen and bedrooms: the number of hours during which the temperature difference between the inside and outside is greater than or equal to one degree (K) during the period May to September inclusive shall not be more than 3% of occupied hours.
2. For bedrooms only: to guarantee comfort during the sleeping hours the operative temperature in the bedroom from 22:00 to 07:00 shall not exceed 26 °C for more than 1% of annual hours. (Note: 1% of the annual hours between 22:00 and 07:00 for bedrooms is 32 hours, therefore 33 or more hours above 26 °C will be recorded as a failure).

A3.7 Both criteria (1) and (2) above should be met for all relevant rooms.

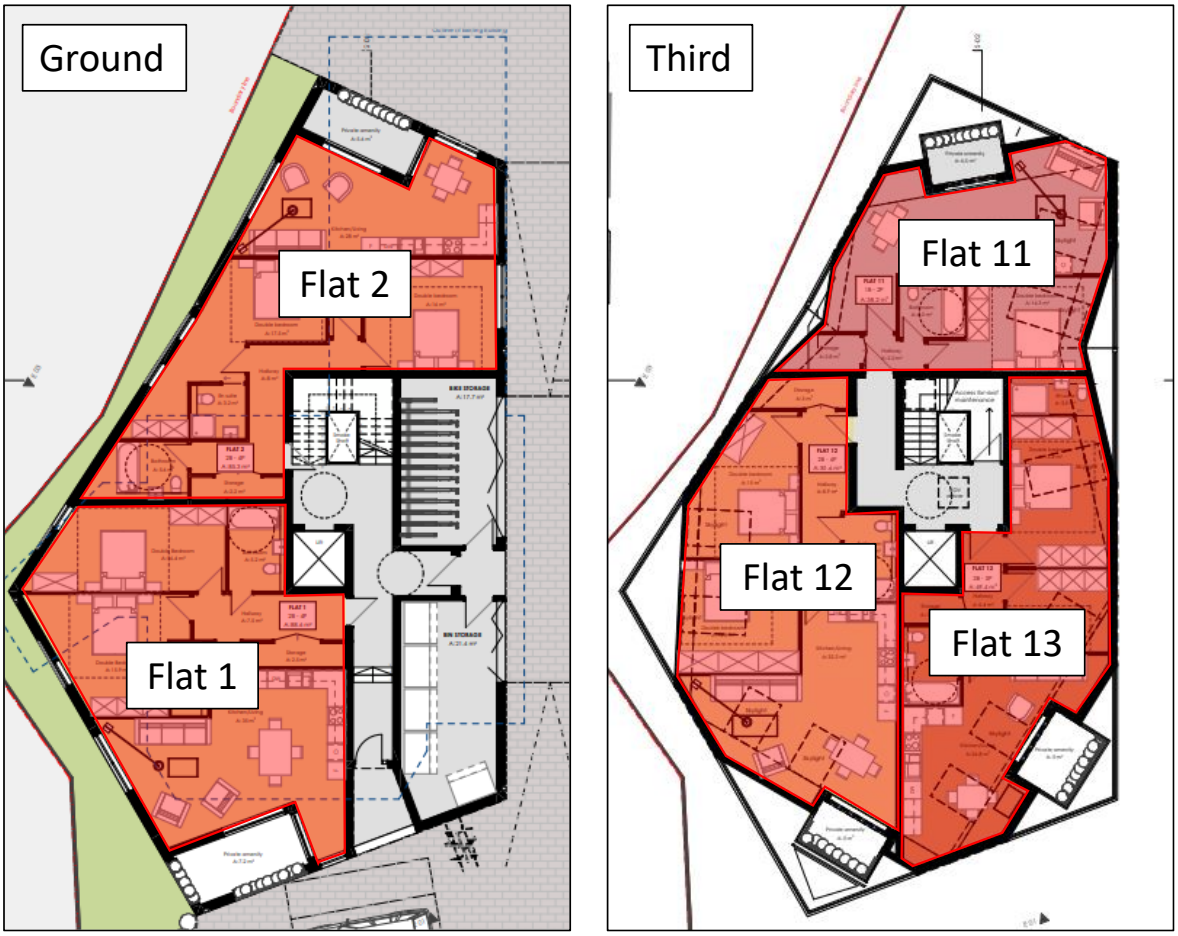
Methodology

A3.8 The TM59 methodology provides a baseline and guidance for a domestic overheating risk assessment. In line with this methodology, this section includes model inputs used to assess overheating risks to the proposed sample dwellings of the proposed development at Haydon House.

A3.9 Five apartments were selected for this overheating risk assessment, which were deemed to be at the highest risk of overheating within the development due to their location at the ground floor level, which may restrict the number of hours windows and doors can be left open as a result of safety concerns, and on the top floor, which limits external shading opportunities and has higher than average heat gains through the roof structure.

A3.10 The image below shows the locations of the tested dwellings.

Figure A3.1 Locations of tested dwellings



A3.11 The table below provides additional details on the sampled dwellings.

Table A3.1 Sampled dwellings

Dwelling Reference	Floor	Aspect
Flat 1	Ground	N, NE, SE
Flat 2	Ground	SE, SW, W
Flat 11	Third	SW, with rooflights
Flat 12	Third	NE, with rooflights
Flat 13	Third	NW, with rooflights

A3.12 The model was created in EDSL TAS to simulate the internal conditions in each of the occupied spaces highlighted in the above images and the geometry has been modelled based on planning submission issue drawings from CIAO Architects. It should be noted that, flat roofs have been modelled due to the limitations of modelling the proposed hipped roofs and a worst-case scenario in terms of solar heat gains has been considered. The room heights of the upper floors have been averaged according to the roof heights, the u-values applied averaged to represent the u-value that would be achieved for external wall elements contained within a roof space, and the proposed roof windows configured horizontally.

A3.13 The weather files used for simulation have been based on the guidance contained within CIBSE TM49:2014 (Design Summer Years for London) as follows:

- Design summer year weather file for London Heathrow, based on a peri-urban location for 1989 (DSY1), has been used on the simulations as required by TM49 methodology. The CIBSE DSY1 represents a moderately warm summer under 2020s high emissions scenario, 50th percentile.
- Design summer year weather file for London Heathrow, based on a peri-urban location for 1976 (DSY2), has been used on the simulations as required by TM49 methodology. The CIBSE DSY2 represents summer with a long period of persistent warmth under 2020s high emissions scenario, 50th percentile.
- Design summer year weather file for London Heathrow, based on a peri-urban location for 2003 (DSY3), has been used on the simulations as required by TM49 methodology. The CIBSE DSY3 represents a summer with a single intense warm spell under 2020s high emissions scenario, 50th percentile.

A3.14 The building fabric parameters have been based on the same level of performance as that detailed in the energy strategy. A summary of the thermal envelope values used in the assessment is shown in Table 5.1.

A3.15 In line with the TM59 methodology, the following internal gains and time periods have been employed for this analysis.

Table A3.2 Occupancy heat gains

Room	Sensible heat gain (W/person)	Latent heat gain (W/person)	Occupancy period
Kitchen/Living Room	75	55	Full gains from 9am-10pm
Bedroom	52.5	38.5	70% gains from 11pm to 8am; 100% gains from 8am to 9am and from 10pm to 11pm; 50% gains from 9am to 10pm.

Table A3.3 Equipment heat gains

Room	Heat gain (W)	Occupancy period
Kitchen/Living Room	450 W 200 W 110 W 85 W	6pm to 8pm 8pm to 10pm 9am to 6pm and 10pm to 12pm All other times
Bedroom	80 W 10 W	9am to 11pm All other times
Cupboard	20 W (from heat interface unit)	24 hours

A3.16 A lighting gain of 2 W/m^2 has been applied from 7pm to 11pm to all occupiable rooms.

A3.17 Passive ventilation was modelled based on information provided by CIAO Architects as part of the planning submission documentation. The openable windows for each apartment tested were set out as per the drawings provided above in Figure A3.1.

A3.18 The openable areas of windows were modelled in accordance with drawings provided by CIAO Architects, with windows providing an approximate 25% to 60% maximum opening area. Rooflights have been modelled with an assumed 60% opening area.

A3.19 Doors onto balconies were assumed to be either sliding doors or to have a single opening door, with a 50% maximum opening area.

A3.20 Due to the height of the dwellings tested at the top-floor level, it was assumed the windows could be opened throughout the day without any security concerns. Doors and windows at the ground floor level were modelled to be openable between 9 AM and 11 PM. This is in line with the requirements of Part O of the Building Regulations.

A3.21 An infiltration rate of 0.25 air changes per hour has been used for all dwellings, and has been derived from CIBSE Guide A (2015) for a dwelling with an air permeability of 5 m^3/hr per m^2 @ 50Pa for low rise and high-rise dwellings.

A3.22 Background mechanical ventilation will be provided by MVHR units as required by Part F of the Building Regulations. The ventilation rate included in the model is 1.5 air changes per hour for all rooms.

A3.23 As stated above mechanical cooling is not proposed for the residential elements of the scheme.

Results

A3.24 The table below shows the results of the simulation incorporating the inputs described above.

Table A3.4 DSY1 Results

Room	Criterion 1		Criterion 2		Result
	Max. Exceedable Hours	Hours Exceeded	Max. Exceedable Night Hours	Night Hours Exceeded	Pass / Fail
Flat 1, Bedroom 1	110	22	32	32	Pass
Flat 1, Bedroom 2	110	21	32	29	Pass
Flat 1, Living Room/Kitchen	59	28	N/A	N/A	Pass
Flat 2, Bedroom 1	110	31	32	30	Pass
Flat 2, Bedroom 2	110	52	32	30	Pass
Flat 2, Living Room/Kitchen	59	58	N/A	N/A	Pass
Flat 11, Bedroom 1	110	62	32	11	Pass
Flat 11, Living Room/Kitchen	59	59	N/A	N/A	Pass
Flat 12, Bedroom 1	110	59	32	9	Pass
Flat 12, Bedroom 2	110	73	32	9	Pass
Flat 12, Living Room/Kitchen	59	58	N/A	N/A	Pass
Flat 13, Bedroom 1	110	77	32	9	Pass
Flat 13, Bedroom 2	110	55	32	9	Pass
Flat 13, Living Room/Kitchen	59	32	N/A	N/A	Pass

Table A3.5 DSY2 Results

Room	Criterion 1		Criterion 2		Result
	Max. Exceedable Hours	Hours Exceeded	Max. Exceedable Night Hours	Night Hours Exceeded	Pass / Fail
Flat 1, Bedroom 1	110	82	32	114	Fail
Flat 1, Bedroom 2	110	89	32	102	Fail
Flat 1, Living Room/Kitchen	59	93	N/A	N/A	Fail
Flat 2, Bedroom 1	110	104	32	100	Fail
Flat 2, Bedroom 2	110	132	32	101	Fail
Flat 2, Living Room/Kitchen	59	137	N/A	N/A	Fail
Flat 11, Bedroom 1	110	143	32	33	Fail
Flat 11, Living Room/Kitchen	59	145	N/A	N/A	Fail
Flat 12, Bedroom 1	110	135	32	30	Fail
Flat 12, Bedroom 2	110	148	32	27	Fail
Flat 12, Living Room/Kitchen	59	136	N/A	N/A	Fail
Flat 13, Bedroom 1	110	158	32	24	Fail
Flat 13, Bedroom 2	110	131	32	33	Fail
Flat 13, Living Room/Kitchen	59	91	N/A	N/A	Fail

Table A3.6 DSY3 Results

Room	Criterion 1		Criterion 2		Result
	Max. Exceedable Hours	Hours Exceeded	Max. Exceedable Night Hours	Night Hours Exceeded	Pass / Fail
Flat 1, Bedroom 1	110	58	32	75	Fail
Flat 1, Bedroom 2	110	58	32	69	Fail
Flat 1, Living Room/Kitchen	59	67	N/A	N/A	Fail
Flat 2, Bedroom 1	110	69	32	69	Fail
Flat 2, Bedroom 2	110	79	32	68	Fail
Flat 2, Living Room/Kitchen	59	93	N/A	N/A	Fail

Flat 11, Bedroom 1	110	87	32	23	Pass
Flat 11, Living Room/Kitchen	59	95	N/A	N/A	Fail
Flat 12, Bedroom 1	110	88	32	21	Pass
Flat 12, Bedroom 2	110	98	32	18	Pass
Flat 12, Living Room/Kitchen	59	88	N/A	N/A	Fail
Flat 13, Bedroom 1	110	102	32	16	Pass
Flat 13, Bedroom 2	110	80	32	21	Pass
Flat 13, Living Room/Kitchen	59	67	N/A	N/A	Fail

A3.25 All dwellings pass the TM59 overheating criteria for the DSY1 weather file, therefore meeting the requirements of the GLA.

A3.26 For the additional assessments employing the DSY2 and DSY3 scenarios, moderate failures are predicted due to temperatures exceeding the limits dictated by CIBSE TM52. However, the GLA guidance acknowledges that this can be expected given the more extreme temperatures required to be assessed in the DSY2 and DSY3 weather files.

A3.27 For the DSY2 scenario, the maximum living room exceedance was predicted to be 7.3%, compared with a 3.0% target, and the maximum bedroom exceedance was predicted to be 4.3%, compared with a 3.0% target for Criterion 1 and 3.5% compared with a 1.0% target for Criterion 2.

A3.28 For the DSY3 scenario, the maximum living room exceedance was predicted to be 4.8%, compared with a 3.0% target, and the maximum bedroom exceedance was predicted to be 3.2%, compared with a 3.0% target for Criterion 1 and 2.3% compared with a 1.0% target for Criterion 2.

A3.29 The building design and building services design have maximised all available measures to minimise heat generation within the dwellings, to reduce the amount of heat entering the building, and to passively and mechanically ventilate the dwellings in line with the cooling hierarchy in Policy SI4 of the London Plan.

Conclusion

A3.30 This study has shown how the proposed development at Haydon House has been designed to minimise the risk of overheating. The strategy has followed the cooling hierarchy in Policy SI4 of the London Plan.

A3.31 TM59:2017 has been adopted for this overheating study as it is the recommended methodology for the assessment of overheating risk in dwellings.

A3.32 The new methodology aims to produce a test that encourages good design that is comfortable within sensible limits, without being so stringent that it over-promotes the use of mechanical cooling.

A3.33 Five apartments were selected for this overheating risk assessment, which were deemed to be at the highest risk of overheating within the development due to their location at the ground floor level, which may restrict the number of hours windows and doors can be left open as a result of safety concerns, and on the top floor, which limits external shading opportunities and has higher than average heat gains through the roof structure.

A3.34 A dynamic thermal model was created in EDSL TAS to simulate the internal conditions in each of the occupied spaces within the selected sample dwellings.

A3.35 The modelling incorporated inputs provided within the TM59 methodology guidance and information provided by CIAO Architects.

A3.36 The building design and building services design have maximised all available measures to minimise heat generation within the dwellings, to reduce the amount of heat entering the building, and to passively and mechanically ventilate the dwellings in line with the cooling hierarchy in Policy SI4 of the London Plan.

A3.37 The results were then compared to the CIBSE TM59 overheating criteria for the three weather files specified in CIBSE TM49, as required by the GLA.

A3.38 All dwellings pass the TM59 overheating criteria for the DSY1 weather file, therefore meeting the requirements of the GLA.

A3.39 For the additional assessments employing the DSY2 and DSY3 scenarios, moderate failures are predicted due to temperatures exceeding the limits dictated by CIBSE TM52. However, the GLA guidance acknowledges that this can be expected given the more extreme temperatures required to be assessed in the DSY2 and DSY3 weather files.

A3.40 For the DSY2 scenario, the maximum living room exceedance was predicted to be 7.3%, compared with a 3.0% target, and the maximum bedroom exceedance was predicted to be 4.3%, compared with a 3.0% target for Criterion 1 and 3.5% compared with a 1.0% target for Criterion 2.

A3.41 For the DSY3 scenario, the maximum living room exceedance was predicted to be 4.8%, compared with a 3.0% target, and the maximum bedroom exceedance was predicted to be 3.2%, compared with a 3.0% target for Criterion 1 and 2.3% compared with a 1.0% target for Criterion 2.

A3.42 Whilst the proposed development is demonstrated to achieve the recommended criteria, in line with the CIBSE guidance, should overheating be an issue within the proposed dwellings in the future, the following additional measures may be explored. These measures would allow for a further reduction in internal temperatures, and relevant information will be set out to future residents as part of the home user guides:

- Retrofitted solar control film to minimise solar gain
- Additional external shading to limit solar gain
- Improved blinds to reduce solar gain
- Increased MVHR flow rates for additional purge ventilation
- Use of free standing fans to improve air movement

A3.43 Overall, it is considered that the proposals will be resilient to projected climate change, and will provide a development that will mitigate the risk of overheating through passive means.

A4. BREL COMPLIANCE REPORTS

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Stroma SAP 10.2 SAP 10 program, 10.2

Date: Tue 30 Aug 2022 16:04:21

Project Information			
Assessed By	Test User	Building Type	Flat, Mid-terrace
OCDEA Registration	STRO000006	Assessment Date	2022-08-02

Dwelling Details			
Assessment Type	As designed	Total Floor Area	89 m^2
Site Reference	Flat 01_Be Lean	Plot Reference	Flat 01_Be Lean
Address	Haydon House, 296 Joel Street, NORTHWOOD, HA5 2PY		

Client Details	
Name	Not Provided
Company	Not Provided
Address	Not Provided, Not Provided

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Mains gas	
Target carbon dioxide emission rate	*12.18 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	12.52 $kgCO_2/m^2$	**FAIL**
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*64.29 kWh_{PE}/m^2*	
Dwelling primary energy	78.97 kWh_{PE}/m^2	**FAIL**
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*34.2 kWh/m^2*	
Dwelling fabric energy efficiency	38.2 kWh/m^2	**FAIL**

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m^2K]***	**Dwelling average U-Value [W/m^2K]**	**Element with highest individual U-Value**	
External walls	*0.26*	0.18	ExternalWall (0.18)	**OK**
Party walls	*0.2*	0	PartyWall (0)	**N/A**
Curtain walls	*1.6*	0	N/A	**N/A**
Floors	*0.18*	0.13	Not Provided (0.13)	**OK**
Roofs	*0.16*	N/A	N/A	**N/A**
Windows, doors, and roof windows	*1.6*	1.2	1 (1.2)	**OK**
Rooflights	*2.2*	N/A	N/A	**N/A**

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	**Net area [m^2]**	**U-Value [W/m^2K]**
Exposed wall: ExternalWall	31.194	0.18
Exposed wall: WalltoCorridor	17.5	0.167
Party wall: PartyWall	21.39	0 **(!)**
Ground floor: Not Provided	88.61	0.13
Exposed roof: Exposed Roof	0	0 **(!)**

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m^2]**	**Orientation**	**Frame factor**	**U-Value [W/m^2K]**
1, Windows (1)	7.32	North	0.7	1.2
2, Windows (1)	2.16	South West	0.7	1.2
3, Windows (1)	11.076	West	0.7	1.2

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))
Building part **1 - Main Dwelling**: SAP default y-value (0.2 W/m^2K) used for thermal bridging

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	*8 m^3/hm^2*	
Dwelling air permeability at 50Pa	5 m^3/hm^2, Design value	**OK**
Air permeability test certificate reference	Not Provided	

4 Space heating		
Main heating system 1: Boiler with radiators or underfloor heating - Mains gas		
Efficiency	93.8%	
Emitter type	Radiators	
Flow temperature	45°C	
System type		
Manufacturer		
Model		
Commissioning		
Secondary heating system: N/A		
Fuel	N/A	
Efficiency	N/A	
Commissioning		

5 Hot water		
Cylinder/store - type: Cylinder		
Capacity	150 litres	
Declared heat loss	1.63 kWh/day	
Primary pipework insulated	N/A	
Manufacturer		
Model		
Commissioning		
Waste water heat recovery system 1 - type: N/A		
Efficiency		
Manufacturer		
Model		

6 Controls		
Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: Cylinder thermostat and HW separately timed		
Manufacturer		
Model		

7 Lighting		
Minimum permitted light source efficacy	*75 lm/W*	
Lowest light source efficacy	75 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	*1.5 W/(l/s)*	
Specific fan power	0.59 W/(l/s)	OK
Minimum permitted heat recovery efficiency	*73%*	
Heat recovery efficiency	89%	OK
Manufacturer/Model		
Commissioning	Not Provided / Not Provided	

9 Local generation
N/A

10 Heat networks
N/A

11 Supporting documentary evidence
N/A

12 Declarations

a. Assessor Declaration

This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.	

Signed:	Assessor ID:
Name:	Date:

b. Client Declaration

N/A

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Stroma SAP 10.2 SAP 10 program, 10.2

Date: Tue 30 Aug 2022 16:13:17

Project Information			
Assessed By	Test User	Building Type	Flat, Mid-terrace
OCDEA Registration	STRO000006	Assessment Date	2022-08-02

Dwelling Details			
Assessment Type	As designed	Total Floor Area	54 m^2
Site Reference	Flat 03_Be Lean	Plot Reference	Flat 03_Be Lean
Address	Haydon House, 296 Joel Street, NORTHWOOD, HA5 2PY		

Client Details	
Name	Not Provided
Company	Not Provided
Address	Not Provided, Not Provided

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Mains gas	
Target carbon dioxide emission rate	*12.92 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	13.32 $kgCO_2/m^2$	**FAIL**
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*68.68 kWh_{PE}/m^2*	
Dwelling primary energy	86.37 kWh_{PE}/m^2	**FAIL**
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*26.1 kWh/m^2*	
Dwelling fabric energy efficiency	31.6 kWh/m^2	**FAIL**

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m^2K]***	**Dwelling average U-Value [W/m^2K]**	**Element with highest individual U-Value**	
External walls	*0.26*	0.17	ExternalWall (0.18)	**OK**
Party walls	*0.2*	0	PartyWall (0)	**N/A**
Curtain walls	*1.6*	0	N/A	**N/A**
Floors	*0.18*	N/A	N/A	**N/A**
Roofs	*0.16*	N/A	N/A	**N/A**
Windows, doors, and roof windows	*1.6*	1.2	1 (1.2)	**OK**
Rooflights	*2.2*	N/A	N/A	**N/A**

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	**Net area [m^2]**	**U-Value [W/m^2K]**
Exposed wall: ExternalWall	30.86	0.18
Exposed wall: WalltoCorridor	28.5	0.167
Party wall: PartyWall	15.75	0 **(!)**
Exposed roof: Exposed Roof	0	0 **(!)**

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m^2]**	**Orientation**	**Frame factor**	**U-Value [W/m^2K]**
1, Windows (1)	9.48	South West	0.7	1.2
2, Windows (1)	5.16	South East	0.7	1.2

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))
Building part **1 - Main Dwelling**: SAP default y-value (0.2 W/m^2K) used for thermal bridging

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	*8 m^3/hm^2*	
Dwelling air permeability at 50Pa	5 m^3/hm^2, Design value	**OK**
Air permeability test certificate reference	Not Provided	

4 Space heating		
Main heating system 1: Boiler with radiators or underfloor heating - Mains gas		
Efficiency	93.8%	
Emitter type	Radiators	
Flow temperature	45°C	
System type		
Manufacturer		
Model		
Commissioning		
Secondary heating system: N/A		
Fuel	N/A	
Efficiency	N/A	
Commissioning		

5 Hot water		
Cylinder/store - type: Cylinder		
Capacity	150 litres	
Declared heat loss	1.63 kWh/day	
Primary pipework insulated	N/A	
Manufacturer		
Model		
Commissioning		
Waste water heat recovery system 1 - type: N/A		
Efficiency		
Manufacturer		
Model		

6 Controls		
Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: Cylinder thermostat and HW separately timed		
Manufacturer		
Model		

7 Lighting		
Minimum permitted light source efficacy	*75 lm/W*	
Lowest light source efficacy	75 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	*1.5 W/(l/s)*	
Specific fan power	0.52 W/(l/s)	OK
Minimum permitted heat recovery efficiency	*73%*	
Heat recovery efficiency	90%	OK
Manufacturer/Model		
Commissioning	Not Provided / Not Provided	

9 Local generation
N/A

10 Heat networks
N/A

11 Supporting documentary evidence
N/A

12 Declarations

a. Assessor Declaration

This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.	

Signed:	Assessor ID:
Name:	Date:

b. Client Declaration

N/A

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Stroma SAP 10.2 SAP 10 program, 10.2

Date: Wed 31 Aug 2022 07:49:27

Project Information			
Assessed By	Test User	Building Type	Flat, Mid-terrace
OCDEA Registration	STRO000006	Assessment Date	2022-08-02

Dwelling Details			
Assessment Type	As designed	Total Floor Area	39 m^2
Site Reference	Studio 08_Be Lean	Plot Reference	Studio 08_Be Lean
Address	Haydon House, 296 Joel Street, NORTHWOOD, HA5 2PY		

Client Details	
Name	Not Provided
Company	Not Provided
Address	Not Provided, Not Provided

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Mains gas	
Target carbon dioxide emission rate	*15.55 kgCO_2/m^2*	
Dwelling carbon dioxide emission rate	15.43 kgCO_2/m^2	OK
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*83.21 kWh$_{PE}$/m^2*	
Dwelling primary energy	100.18 kWh$_{PE}$/m^2	FAIL
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*28.4 kWh/m^2*	
Dwelling fabric energy efficiency	34.5 kWh/m^2	FAIL

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m^2K]***	**Dwelling average U-Value [W/m^2K]**	**Element with highest individual U-Value**	
External walls	*0.26*	0.17	ExternalWall (0.18)	OK
Party walls	*0.2*	0	PartyWall (0)	**N/A**
Curtain walls	*1.6*	0	N/A	**N/A**
Floors	*0.18*	N/A	N/A	**N/A**
Roofs	*0.16*	N/A	N/A	**N/A**
Windows, doors, and roof windows	*1.6*	1.2	1 (1.2)	OK
Rooflights	*2.2*	N/A	N/A	**N/A**

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	**Net area [m^2]**	**U-Value [W/m^2K]**
Exposed wall: ExternalWall	20.02	0.18
Exposed wall: WalltoCorridor	17.75	0.167
Party wall: PartyWall	24.5	0 **(!)**
Exposed roof: Exposed Roof	0	0 **(!)**

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m^2]**	**Orientation**	**Frame factor**	**U-Value [W/m^2K]**
1, Windows (1)	7.32	East	0.7	1.2
2, Windows (1)	5.16	South East	0.7	1.2

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))
Building part **1 - Main Dwelling**: SAP default y-value (0.2 W/m^2K) used for thermal bridging

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	*8 m^3/hm^2*	
Dwelling air permeability at 50Pa	5 m^3/hm^2, Design value	OK
Air permeability test certificate reference	Not Provided	

4 Space heating		
Main heating system 1: Boiler with radiators or underfloor heating - Mains gas		
Efficiency	93.8%	
Emitter type	Radiators	
Flow temperature	45°C	
System type		
Manufacturer		
Model		
Commissioning		
Secondary heating system: N/A		
Fuel	N/A	
Efficiency	N/A	
Commissioning		

5 Hot water		
Cylinder/store - type: Cylinder		
Capacity	150 litres	
Declared heat loss	1.63 kWh/day	
Primary pipework insulated	N/A	
Manufacturer		
Model		
Commissioning		
Waste water heat recovery system 1 - type: N/A		
Efficiency		
Manufacturer		
Model		

6 Controls		
Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: Cylinder thermostat and HW separately timed		
Manufacturer		
Model		

7 Lighting		
Minimum permitted light source efficacy	*75 lm/W*	
Lowest light source efficacy	75 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	*1.5 W/(l/s)*	
Specific fan power	0.52 W/(l/s)	OK
Minimum permitted heat recovery efficiency	*73%*	
Heat recovery efficiency	90%	OK
Manufacturer/Model		
Commissioning	Not Provided / Not Provided	

9 Local generation
N/A

10 Heat networks
N/A

11 Supporting documentary evidence
N/A

12 Declarations

a. Assessor Declaration

This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.	

Signed:	Assessor ID:
Name:	Date:

b. Client Declaration

N/A

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Stroma SAP 10.2 SAP 10 program, 10.2

Date: Wed 31 Aug 2022 07:50:34

Project Information			
Assessed By	Test User	Building Type	Flat, Mid-terrace
OCDEA Registration	STRO000006	Assessment Date	2022-08-02

Dwelling Details			
Assessment Type	As designed	Total Floor Area	68 m^2
Site Reference	Flat 13_Be Lean	Plot Reference	Flat 13_Be Lean
Address	Haydon House, 296 Joel Street, NORTHWOOD, HA5 2PY		

Client Details	
Name	Not Provided
Company	Not Provided
Address	Not Provided, Not Provided

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Mains gas	
Target carbon dioxide emission rate	*13.7 kgCO_2/m^2*	
Dwelling carbon dioxide emission rate	13.13 kgCO_2/m^2	OK
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*72.75 kWh$_{PE}$/m^2*	
Dwelling primary energy	84.02 kWh$_{PE}$/m^2	FAIL
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*34 kWh/m^2*	
Dwelling fabric energy efficiency	34.4 kWh/m^2	FAIL

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m^2K]***	**Dwelling average U-Value [W/m^2K]**	**Element with highest individual U-Value**	
External walls	*0.26*	0.18	ExternalWall (0.18)	OK
Party walls	*0.2*	0	PartyWall (0)	**N/A**
Curtain walls	*1.6*	0	N/A	**N/A**
Floors	*0.18*	N/A	N/A	**N/A**
Roofs	*0.16*	0.11	Roof (0.11)	OK
Windows, doors, and roof windows	*1.6*	1.2	1 (1.2)	OK
Rooflights	*2.2*	N/A	N/A	**N/A**

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	**Net area [m^2]**	**U-Value [W/m^2K]**
Exposed wall: ExternalWall	47.59	0.18
Exposed wall: WalltoCorridor	26.75	0.167
Party wall: PartyWall	25.6	0 **(!)**
Exposed roof: Roof	63.91	0.11

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m^2]**	**Orientation**	**Frame factor**	**U-Value [W/m^2K]**
1, Windows (1)	5.16	North	0.7	1.2
2, Roof windows (1)	2	North	0.7	1.2
3, Roof windows (1)	2	East	0.7	1.2

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))
Building part **1 - Main Dwelling**: SAP default y-value (0.2 W/m^2K) used for thermal bridging

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	*8 m^3/hm^2*	
Dwelling air permeability at 50Pa	5 m^3/hm^2, Design value	OK
Air permeability test certificate reference	Not Provided	

4 Space heating		
Main heating system 1: Boiler with radiators or underfloor heating - Mains gas		
Efficiency	93.8%	
Emitter type	Radiators	
Flow temperature	45°C	
System type		
Manufacturer		
Model		
Commissioning		
Secondary heating system: N/A		
Fuel	N/A	
Efficiency	N/A	
Commissioning		

5 Hot water		
Cylinder/store - type: Cylinder		
Capacity	150 litres	
Declared heat loss	1.63 kWh/day	
Primary pipework insulated	N/A	
Manufacturer		
Model		
Commissioning		
Waste water heat recovery system 1 - type: N/A		
Efficiency		
Manufacturer		
Model		

6 Controls		
Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: Cylinder thermostat and HW separately timed		
Manufacturer		
Model		

7 Lighting		
Minimum permitted light source efficacy	*75 lm/W*	
Lowest light source efficacy	75 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	*1.5 W/(l/s)*	
Specific fan power	0.59 W/(l/s)	OK
Minimum permitted heat recovery efficiency	*73%*	
Heat recovery efficiency	89%	OK
Manufacturer/Model		
Commissioning	Not Provided / Not Provided	

9 Local generation
N/A

10 Heat networks
N/A

11 Supporting documentary evidence
N/A

12 Declarations

a. Assessor Declaration

This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.	

Signed:	Assessor ID:
Name:	Date:

b. Client Declaration

N/A

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Stroma SAP 10.2 SAP 10 program, 10.2

Date: Tue 30 Aug 2022 16:05:04

Project Information			
Assessed By	Test User	Building Type	Flat, Mid-terrace
OCDEA Registration	STRO000006	Assessment Date	2022-08-02

Dwelling Details			
Assessment Type	As designed	Total Floor Area	89 m^2
Site Reference	Flat 01_Be Green	Plot Reference	Flat 01_Be Green
Address	Haydon House, 296 Joel Street, NORTHWOOD, HA5 2PY		

Client Details	
Name	Not Provided
Company	Not Provided
Address	Not Provided, Not Provided

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Electricity	
Target carbon dioxide emission rate	*11.77 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	6.66 $kgCO_2/m^2$	OK
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*62.12 kWh_{PE}/m^2*	
Dwelling primary energy	71.68 kWh_{PE}/m^2	FAIL
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*34.2 kWh/m^2*	
Dwelling fabric energy efficiency	38.2 kWh/m^2	FAIL

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m^2K]***	**Dwelling average U-Value [W/m^2K]**	**Element with highest individual U-Value**	
External walls	*0.26*	0.18	ExternalWall (0.18)	OK
Party walls	*0.2*	0	PartyWall (0)	**N/A**
Curtain walls	*1.6*	0	N/A	**N/A**
Floors	*0.18*	0.13	Not Provided (0.13)	OK
Roofs	*0.16*	N/A	N/A	**N/A**
Windows, doors, and roof windows	*1.6*	1.2	1 (1.2)	OK
Rooflights	*2.2*	N/A	N/A	**N/A**

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	**Net area [m^2]**	**U-Value [W/m^2K]**
Exposed wall: ExternalWall	31.194	0.18
Exposed wall: WalltoCorridor	17.5	0.167
Party wall: PartyWall	21.39	0 **(!)**
Ground floor: Not Provided	88.61	0.13
Exposed roof: Exposed Roof	0	0 **(!)**

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m^2]**	**Orientation**	**Frame factor**	**U-Value [W/m^2K]**
1, Windows (1)	7.32	North	0.7	1.2
2, Windows (1)	2.16	South West	0.7	1.2
3, Windows (1)	11.076	West	0.7	1.2

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))
Building part **1 - Main Dwelling**: SAP default y-value (0.2 W/m^2K) used for thermal bridging

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	*8 m^3/hm^2*	
Dwelling air permeability at 50Pa	5 m^3/hm^2, Design value	OK
Air permeability test certificate reference	Not Provided	

4 Space heating		
Main heating system 1: Heat pump with warm air distribution - Electricity		
Efficiency	130.3%	
Emitter type	Underfloor	
Flow temperature	35°C	
System type		
Manufacturer		
Model		
Commissioning		
Secondary heating system: N/A		
Fuel	N/A	
Efficiency	N/A	
Commissioning		

5 Hot water		
Cylinder/store - type: Cylinder		
Capacity	150 litres	
Declared heat loss	1.63 kWh/day	
Primary pipework insulated	Yes	
Manufacturer		
Model		
Commissioning		
Waste water heat recovery system 1 - type: N/A		
Efficiency		
Manufacturer		
Model		

6 Controls		
Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: Cylinder thermostat and HW separately timed		
Manufacturer		
Model		

7 Lighting		
Minimum permitted light source efficacy	*75 lm/W*	
Lowest light source efficacy	75 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	*1.5 W/(l/s)*	
Specific fan power	0.59 W/(l/s)	OK
Minimum permitted heat recovery efficiency	*73%*	
Heat recovery efficiency	89%	OK
Manufacturer/Model		
Commissioning	Not Provided / Not Provided	

9 Local generation	
Technology type: **Photovoltaic system (1)**	
Peak power	0.97 kWp
Orientation	South
Pitch	30°
Overshading	Modest
Manufacturer	Not Provided
MCS certificate	

10 Heat networks
N/A

11 Supporting documentary evidence
N/A

12 Declarations	
a. Assessor Declaration	
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.	
Signed: Name:	Assessor ID: Date:
b. Client Declaration	
N/A	

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Stroma SAP 10.2 SAP 10 program, 10.2

Date: Tue 30 Aug 2022 16:12:51

Project Information			
Assessed By	Test User	Building Type	Flat, Mid-terrace
OCDEA Registration	STRO000006	Assessment Date	2022-08-02

Dwelling Details			
Assessment Type	As designed	Total Floor Area	54 m^2
Site Reference	Flat 03_Be Green	Plot Reference	Flat 03_Be Green
Address	Haydon House, 296 Joel Street, NORTHWOOD, HA5 2PY		

Client Details	
Name	Not Provided
Company	Not Provided
Address	Not Provided, Not Provided

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Electricity	
Target carbon dioxide emission rate	*12.43 kgCO_2/m^2*	
Dwelling carbon dioxide emission rate	9.67 kgCO_2/m^2	OK
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*66.04 kWh$_{PE}$/m^2*	
Dwelling primary energy	102.75 kWh$_{PE}$/m^2	FAIL
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*26.1 kWh/m^2*	
Dwelling fabric energy efficiency	31.6 kWh/m^2	FAIL

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m^2K]***	**Dwelling average U-Value [W/m^2K]**	**Element with highest individual U-Value**	
External walls	*0.26*	0.17	ExternalWall (0.18)	OK
Party walls	*0.2*	0	PartyWall (0)	**N/A**
Curtain walls	*1.6*	0	N/A	**N/A**
Floors	*0.18*	N/A	N/A	**N/A**
Roofs	*0.16*	N/A	N/A	**N/A**
Windows, doors, and roof windows	*1.6*	1.2	1 (1.2)	OK
Rooflights	*2.2*	N/A	N/A	**N/A**

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	**Net area [m^2]**	**U-Value [W/m^2K]**
Exposed wall: ExternalWall	30.86	0.18
Exposed wall: WalltoCorridor	28.5	0.167
Party wall: PartyWall	15.75	0 **(!)**
Exposed roof: Exposed Roof	0	0 **(!)**

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m^2]**	**Orientation**	**Frame factor**	**U-Value [W/m^2K]**
1, Windows (1)	9.48	South West	0.7	1.2
2, Windows (1)	5.16	South East	0.7	1.2

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))
Building part **1 - Main Dwelling**: SAP default y-value (0.2 W/m^2K) used for thermal bridging

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	*8 m^3/hm^2*	
Dwelling air permeability at 50Pa	5 m^3/hm^2, Design value	OK
Air permeability test certificate reference	Not Provided	

4 Space heating		
Main heating system 1: Heat pump with warm air distribution - Electricity		
Efficiency	63.6%	
Emitter type	Underfloor	
Flow temperature	35°C	
System type		
Manufacturer		
Model		
Commissioning		
Secondary heating system: N/A		
Fuel	N/A	
Efficiency	N/A	
Commissioning		

5 Hot water		
Cylinder/store - type: Cylinder		
Capacity	150 litres	
Declared heat loss	1.63 kWh/day	
Primary pipework insulated	Yes	
Manufacturer		
Model		
Commissioning		
Waste water heat recovery system 1 - type: N/A		
Efficiency		
Manufacturer		
Model		

6 Controls		
Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: Cylinder thermostat and HW separately timed		
Manufacturer		
Model		

7 Lighting		
Minimum permitted light source efficacy	*75 lm/W*	
Lowest light source efficacy	75 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	*1.5 W/(l/s)*	
Specific fan power	0.52 W/(l/s)	OK
Minimum permitted heat recovery efficiency	*73%*	
Heat recovery efficiency	90%	OK
Manufacturer/Model		
Commissioning	Not Provided / Not Provided	

9 Local generation	
Technology type: **Photovoltaic system (1)**	
Peak power	0.59 kWp
Orientation	South
Pitch	30°
Overshading	Modest
Manufacturer	Not Provided
MCS certificate	

10 Heat networks
N/A

11 Supporting documentary evidence
N/A

12 Declarations

a. Assessor Declaration

This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.	

Signed:	Assessor ID:
Name:	Date:

b. Client Declaration

N/A

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Stroma SAP 10.2 SAP 10 program, 10.2

Date: Wed 31 Aug 2022 07:50:06

Project Information			
Assessed By	Test User	Building Type	Flat, Mid-terrace
OCDEA Registration	STRO000006	Assessment Date	2022-08-02

Dwelling Details			
Assessment Type	As designed	Total Floor Area	39 m^2
Site Reference	Studio 08_Be Green	Plot Reference	Studio 08_Be Green
Address	Haydon House, 296 Joel Street, NORTHWOOD, HA5 2PY		

Client Details	
Name	Not Provided
Company	Not Provided
Address	Not Provided, Not Provided

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Electricity	
Target carbon dioxide emission rate	*15.2 kgCO_2/m^2*	
Dwelling carbon dioxide emission rate	12.75 kgCO_2/m^2	**OK**
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*81.32 kWh$_{PE}$/m^2*	
Dwelling primary energy	134.48 kWh$_{PE}$/m^2	**FAIL**
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*28.4 kWh/m^2*	
Dwelling fabric energy efficiency	34.5 kWh/m^2	**FAIL**

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m^2K]***	**Dwelling average U-Value [W/m^2K]**	**Element with highest individual U-Value**	
External walls	*0.26*	0.17	ExternalWall (0.18)	**OK**
Party walls	*0.2*	0	PartyWall (0)	**N/A**
Curtain walls	*1.6*	0	N/A	**N/A**
Floors	*0.18*	N/A	N/A	**N/A**
Roofs	*0.16*	N/A	N/A	**N/A**
Windows, doors, and roof windows	*1.6*	1.2	1 (1.2)	**OK**
Rooflights	*2.2*	N/A	N/A	**N/A**

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	**Net area [m^2]**	**U-Value [W/m^2K]**
Exposed wall: ExternalWall	20.02	0.18
Exposed wall: WalltoCorridor	17.75	0.167
Party wall: PartyWall	24.5	0 **(!)**
Exposed roof: Exposed Roof	0	0 **(!)**

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m^2]**	**Orientation**	**Frame factor**	**U-Value [W/m^2K]**
1, Windows (1)	7.32	East	0.7	1.2
2, Windows (1)	5.16	South East	0.7	1.2

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))
Building part **1 - Main Dwelling**: SAP default y-value (0.2 W/m^2K) used for thermal bridging

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	*8 m^3/hm^2*	
Dwelling air permeability at 50Pa	5 m^3/hm^2, Design value	**OK**
Air permeability test certificate reference	Not Provided	

4 Space heating		
Main heating system 1: Heat pump with warm air distribution - Electricity		
Efficiency	44.4%	
Emitter type	Underfloor	
Flow temperature	35°C	
System type		
Manufacturer		
Model		
Commissioning		
Secondary heating system: N/A		
Fuel	N/A	
Efficiency	N/A	
Commissioning		

5 Hot water		
Cylinder/store - type: Cylinder		
Capacity	150 litres	
Declared heat loss	1.63 kWh/day	
Primary pipework insulated	Yes	
Manufacturer		
Model		
Commissioning		
Waste water heat recovery system 1 - type: N/A		
Efficiency		
Manufacturer		
Model		

6 Controls		
Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: Cylinder thermostat and HW separately timed		
Manufacturer		
Model		

7 Lighting		
Minimum permitted light source efficacy	*75 lm/W*	
Lowest light source efficacy	75 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	*1.5 W/(l/s)*	
Specific fan power	0.52 W/(l/s)	OK
Minimum permitted heat recovery efficiency	*73%*	
Heat recovery efficiency	90%	OK
Manufacturer/Model		
Commissioning	Not Provided / Not Provided	

9 Local generation	
Technology type: **Photovoltaic system (1)**	
Peak power	0.43 kWp
Orientation	South
Pitch	30°
Overshading	Modest
Manufacturer	Not Provided
MCS certificate	

10 Heat networks
N/A

11 Supporting documentary evidence
N/A

12 Declarations

a. Assessor Declaration

This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.	

Signed:	Assessor ID:
Name:	Date:

b. Client Declaration

N/A

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Stroma SAP 10.2 SAP 10 program, 10.2

Date: Wed 31 Aug 2022 07:51:05

Project Information			
Assessed By	Test User	Building Type	Flat, Mid-terrace
OCDEA Registration	STRO000006	Assessment Date	2022-08-02

Dwelling Details			
Assessment Type	As designed	Total Floor Area	68 m^2
Site Reference	Flat 13_Be Green	Plot Reference	Flat 13_Be Lean
Address	Haydon House, 296 Joel Street, NORTHWOOD, HA5 2PY		

Client Details	
Name	Not Provided
Company	Not Provided
Address	Not Provided, Not Provided

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Electricity	
Target carbon dioxide emission rate	*13.38 kgCO_2/m^2*	
Dwelling carbon dioxide emission rate	8.69 kgCO_2/m^2	OK
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*71.05 kWh$_{PE}$/m^2*	
Dwelling primary energy	92.53 kWh$_{PE}$/m^2	FAIL
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*35.1 kWh/m^2*	
Dwelling fabric energy efficiency	34.1 kWh/m^2	OK

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m^2K]***	**Dwelling average U-Value [W/m^2K]**	**Element with highest individual U-Value**	
External walls	*0.26*	0.18	ExternalWall (0.18)	OK
Party walls	*0.2*	0	PartyWall (0)	**N/A**
Curtain walls	*1.6*	0	N/A	**N/A**
Floors	*0.18*	N/A	N/A	**N/A**
Roofs	*0.16*	0.11	Roof (0.11)	OK
Windows, doors, and roof windows	*1.6*	1.2	1 (1.2)	OK
Rooflights	*2.2*	N/A	N/A	**N/A**

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	**Net area [m^2]**	**U-Value [W/m^2K]**
Exposed wall: ExternalWall	47.59	0.18
Exposed wall: WalltoCorridor	26.75	0.167
Party wall: PartyWall	25.6	0 **(!)**
Exposed roof: Roof	63.91	0.11

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m^2]**	**Orientation**	**Frame factor**	**U-Value [W/m^2K]**
1, Windows (1)	5.16	North	0.7	1.2
2, Roof windows (1)	2	North	0.7	1.2
3, Roof windows (1)	2	East	0.7	1.2

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))
Building part **1 - Main Dwelling**: SAP default y-value (0.2 W/m^2K) used for thermal bridging

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	*8 m^3/hm^2*	
Dwelling air permeability at 50Pa	5 m^3/hm^2, Design value	OK
Air permeability test certificate reference	Not Provided	

4 Space heating		
Main heating system 1: Heat pump with warm air distribution - Electricity		
Efficiency	85.0%	
Emitter type	Underfloor	
Flow temperature	35°C	
System type		
Manufacturer		
Model		
Commissioning		
Secondary heating system: N/A		
Fuel	N/A	
Efficiency	N/A	
Commissioning		

5 Hot water		
Cylinder/store - type: Cylinder		
Capacity	150 litres	
Declared heat loss	1.63 kWh/day	
Primary pipework insulated	Yes	
Manufacturer		
Model		
Commissioning		
Waste water heat recovery system 1 - type: N/A		
Efficiency		
Manufacturer		
Model		

6 Controls		
Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: Cylinder thermostat and HW separately timed		
Manufacturer		
Model		

7 Lighting		
Minimum permitted light source efficacy	*75 lm/W*	
Lowest light source efficacy	75 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	*1.5 W/(l/s)*	
Specific fan power	0.59 W/(l/s)	OK
Minimum permitted heat recovery efficiency	*73%*	
Heat recovery efficiency	89%	OK
Manufacturer/Model		
Commissioning	Not Provided / Not Provided	

9 Local generation	
Technology type: **Photovoltaic system (1)**	
Peak power	0.74 kWp
Orientation	South
Pitch	30°
Overshading	Modest
Manufacturer	Not Provided
MCS certificate	

10 Heat networks
N/A

11 Supporting documentary evidence
N/A

12 Declarations

a. Assessor Declaration

This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.	

Signed:	Assessor ID:
Name:	Date:

b. Client Declaration

N/A

A5. RENEWABLE ENERGY FEASIBILITY ASSESSMENT

A5.1 In line with GLA London Plan requirements, a feasibility assessment of potential renewable energy technologies has been undertaken, and the results from this are presented below.

Technology	Appraisal	Included in Development?
Biomass	This technology is not considered a practical solution for reducing carbon dioxide emissions, in the view of storage space requirements for the combustible material, accessibility of the site for regular deliveries of the material and the transport related carbon emissions which are not normally accounted for within energy modelling. Furthermore, high nitrous oxide (NOx) and particulate matter (PMx) emissions are associated with the use of biomass fuel, and as the proposed development falls within an Air Quality Management Area (AQMA), permitted emissions will be restricted.	✗
Air source heat pump	This technology is deemed appropriate to provide both space heating and cooling to the proposed dwellings. Full details of the proposed system efficiencies and associated carbon dioxide savings are provided in Section 5.	✓
Ground source heat pump	Ground investigation and borehole drilling are likely to be cost prohibitive and may not yield a suitable energy source. In addition to this, the carbon dioxide and energy cost savings arising from the use of this technology are unlikely to be significant when compared to that of the energy efficient gas-fired boilers proposed for the development, particularly as high-grade heat is required to generate domestic hot water. The use of ground source heat pumps for the proposed development is therefore not considered viable, and it is intended that air source heat pump (ASHP) technology will be employed instead.	✗

Photovoltaics (PV)	As detailed above in Section 5, the use of PV panels is considered appropriate for this scheme, and its use has been maximised in accordance with the roof space available following the incorporation of plant at the roof level. Full details of the proposed PV arrays, areas, locations, outputs and associated carbon dioxide savings are provided in Section 5.	
Solar thermal hot water (STHW)	This technology is presently rejected as hot water is proposed to be provided by highly efficient direct electric point of use water heaters. In addition to this, hot water demand is considered to be outside the energy generating period for the solar thermal panels, meaning its ability to significantly reduce carbon emissions during operation is limited. For the purposes of this Energy Strategy, the use of STHW technology has therefore not been specified. However, should this technology be incorporated in the future, details of its location, efficiency, outputs and associated carbon dioxide emissions savings should be provided as part of a Reserved Matters Application.	
Wind turbines	This technology is rejected on the basis of its potential impact on visual amenity and relatively low efficiency from unpredictable, turbulent wind conditions in urban locations.	

A6. GENERAL NOTES

A6.1 The report is based on information available at the time of the writing and discussions with the client during any project meetings. Where any data supplied by the client or from other sources have been used it has been assumed that the information is correct. No responsibility can be accepted by Iceni Projects Ltd for inaccuracies in the data supplied by any other party.

A6.2 The review of planning policy and other requirements does not constitute a detailed review. Its purpose is as a guide to provide the context for the development and to determine the likely requirements of the Local Authority.

A6.3 No site visits have been carried out, unless otherwise specified.

A6.4 This report is prepared and written in the context of an agreed scope of work and should not be used in a different context. Furthermore, new information, improved practices and changes in guidance may necessitate a re-interpretation of the report in whole or in part after its original submission.

A6.5 The copyright in the written materials shall remain the property of Iceni Projects Ltd but with a royalty-free perpetual licence to the client deemed to be granted on payment in full to Iceni Projects Ltd by the client of the outstanding amounts.

A6.6 The report is provided for sole use by the client and is confidential to them and their professional advisors. No responsibility whatsoever for the contents of the report will be accepted to any person other than the client, unless otherwise agreed.

A6.7 These terms apply in addition to the Iceni Projects Ltd "Standard Terms of Business" (or in addition to another written contract which may be in place instead thereof) unless specifically agreed in writing. (In the event of a conflict between these terms and the said Standard Terms of Business the said Standard Terms of Business shall prevail.). In the absence of such a written contract the Standard Terms of Business will apply.