Energy and Sustainability Statement (including thermal comfort analysis TM59)

Arie Kapteijn

21 Belsize Park
LONDON
NW3 4DU

Version	Revision	Date	Author	Reviewer	Project Manager
1	A	18.11.2021	Sophie Hopwood Nikolaos Protogeros	Malcolm Maclean	Sophie Hopwood
1	B	26.11.2021	Sophie Hopwood	-	Sophie Hopwood

The figures within this report may be based on indicative modelling and an assumed specification outlined within the relevant sections. Therefore, this modelling may not represent the as built emission or energy use of the Proposed Development and further modelling may need to be undertaken at detailed design stage to confirm precise performance figures. Please contact SRE should you have any questions, or should you wish further modelling to be undertaken post planning.

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Executive Summary

This Energy and Sustainability Statement has been written to demonstrate the measures incorporated into the design of the Proposed Development at 21 Belsize Park, London, which will deliver lower energy and water use, lower carbon emissions and therefore, lower operational costs than an equivalent Building Regulations compliant design.

Three energy strategies have been assessed by following the GLA Energy Hierarchy of Lean, Clean, Green and Seen. The energy strategies include Lean passive and active design measures which aim to meet and exceed the relevant planning policy requirements of a minimum 19% energy efficiency improvement over Building Regulations Part L1B Notional Building (Baseline), with an additional 20% improvement through Green LZC technologies.

The calculations undertaken demonstrate that the Proposed Development will successfully exceed the 19% CO_2 improvement set out in the Camden Local Plan through passive and active design measures. However, due to this site being located within the 'Belsize Conservation Area', consideration has been taken into account regarding the building aesthetics and general onsite conservation. This has resulted in difficulties meeting the 20% improvement through renewable technologies as set out in the Camden Local Plan. According to Part L1B Building Regulations, buildings in a conservation area are exempt from meeting the energy efficiency requirements where compliance would unacceptably alter the character or appearance of the building. Thus, upgrades to building elements have been implemented where possible and three different Green energy strategies have been investigated:

1. Gas Boiler with PV slates
2. ASHP with PV slates
3. Integrated Gas Boiler & ASHP with PV slates

The results shown below in Table 1 suggest Option 2 - ASHP and PV slates is the most energy efficient solution for this site. However, installation of an ASHP in a conservation area raises concerns. Although the ASHP can be positioned out of site from public view, due to the neighbouring buildings in close proximity, any potential noise pollution created would need to be mitigated. Therefore, the recommended energy strategy for this site would be Option 1 – Gas Boiler with PV slates. This would avoid issues relating to noise pollution whilst still having renewable energies present onsite. Aesthetically, PV slates are a discreet solar solution which have the appearance of a natural slate tiles, thus, blending into the surrounding built environment.

		CO_2 emissions (t/yr)	Improvement (%)	Improvement over Baseline (%)
Baseline		21.56		
Lean		17.15	20.45	20.45
Clean		17.15	0.00	20.45
Green	Gas Boiler with PV	15.07	12.13	30.10
	ASHP with PV	13.84	19.30	35.81
	Integrated Gas Boiler & ASHP with PV	13.86	19.18	35.71

Table 1 - Summary of regulated carbon dioxide savings

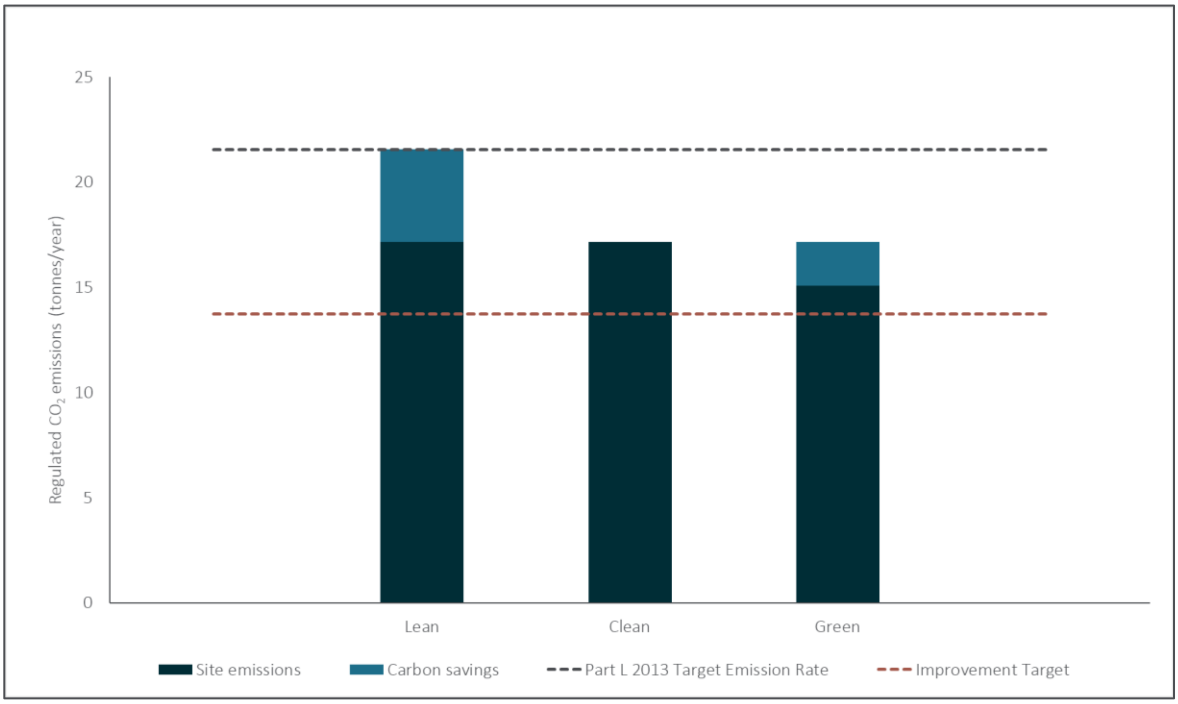

Figure 1 - Summary of regulated carbon dioxide savings – Option 1 – Gas Boiler with PV

Proposed Energy Strategy

In delivering the Green energy strategy (Option 1), the Proposed Development provides:

- Enhanced building fabric where possible according to conservation requirements
- High efficiency gas-fired boiler to supply space heating and hot water
- A maximum 6.1kWp PV slate system

Thermal Comfort Analysis

Simulation results of the Proposed Development indicate that with the proposed ventilation strategy, all the occupied rooms meet the relevant criteria outlined in CIBSE TM59, therefore the overheating risk is minimal under current weather with extreme summer conditions.

Additional simulations using future weather files have also been conducted. With 10 no. out of 13 no. rooms that pass the assessment, the results indicate that overheating may arise in future summer periods and adaptive measures will only have to be put in place for occupants to feel comfortable in 3 no. occupied rooms.

Introduction

1.0 Introduction

This Energy and Sustainability Statement has been written by SRE on behalf of DP9 for Arie Kapteijn (the End Client) to demonstrate the measures incorporated into the design of 21 Belsize Park, London (the Proposed Development) which will deliver lower energy and water use, lower carbon emissions and lower operational costs than an equivalent Building Regulations Compliant design.

The statement compares the predicted actual building energy requirement with a Building Regulations Part L1B compliant design, taking into account passive and active design measures, and the suitability of low and zero carbon (LZC) technologies specific to this site to address the relevant planning policy requirements.

The statement analyses how the Proposed Development will continue to integrate with its surrounding environment within the context of sustainability to ensure it benefits the surrounding area socially, environmentally and economically.

The Proposed Development consists of a conversion of a Victorian property - developed in the mid 1850's – from a small hotel and garden flat, into a 6-bed residential home situated over five floors. The site is located on the North-West side of Belsize Park, close to the junction of Belsize Terrace, Belsize Avenue and Belsize Park Gardens. It lies within the 'Belsize Conservation Area', therefore, building aesthetics and conservation have been considered when developing the energy strategy for this site. Improvements to the building fabric have been undertaken to improve the overall performance of the building, whilst retaining elements to be sympathetic to the architecture of the local area.

Figure 2 - Existing Development – 21 Belsize Park

<table>
<tr><th>Planning Policy</th><th>Requirement</th></tr>
<tr><td rowspan="2">Camden Local Plan (2017)</td><td><u>Policy CC1 Climate change mitigation</u>

The energy hierarchy – new developments designed to minimise energy use and CO_2 emissions in operation through the application of the energy hierarchy.

All new residential developments will be required to demonstrate a 19% reduction below Part L 2013 Building Regulations (in addition to any requirements for renewable energy).

The Council will expect developments of five or more dwelling and/or more than 500 sqm of any gross internal floorspace to achieve a 20% reduction in carbon dioxide emissions from on-site renewable energy generation (which can include sources of site related decentralised renewable energy), unless it can be demonstrated that such provision is not feasible.

We will expect all developments, whether for refurbishment or redevelopment, to optimise resource efficiency by:
• reducing waste;
• reducing energy and water use during construction;
• minimising materials required;
• using materials with low embodied carbon content; and
• enabling low energy and water demands once the building is in use</td></tr>
<tr><td><u>Policy CC2: Adapting to climate change</u>

All development should adopt appropriate climate change adaptation measures such as:

a. the protection of existing green spaces and promoting new appropriate green infrastructure;

b. not increasing, and wherever possible reducing, surface water runoff through increasing permeable surfaces and use of Sustainable Drainage Systems;

c. incorporating bio-diverse roofs, combination green and blue roofs and green walls where appropriate; and

d. measures to reduce the impact of urban and dwelling overheating, including application of the cooling hierarchy.</td></tr>
</table>

	Policy H3: Protecting existing homes The Council will aim to ensure that existing housing continues to meet the needs of existing and future households by: a. resisting development that would involve a net loss of residential floorspace b. protecting housing from permanent conversion to short-stay accommodation intended for occupation for periods of less than 90 days; and c. resisting development that would involve the net loss of two or more homes (from individual or cumulative proposals)
The New London Plan (2021)	Policy S1 2: Minimising greenhouse gas emissions A Reducing greenhouse gas emissions in operation and minimising both annual and peak energy demand in accordance with the following energy hierarchy: 1) be lean: use less energy and manage demand during operation 2) be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly 3) be green: maximise opportunities for renewable energy by producing, storing and using renewable energy on-site 4) be seen: monitor, verify and report on energy performance. B Major development proposals should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy. C A minimum on-site reduction of at least 35 per cent beyond Building Regulations is required for major development. Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures. Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, in agreement with the borough, either: 1) through a cash in lieu contribution to the borough's carbon offset fund, or 2) off-site provided that an alternative proposal is identified and delivery is certain.

	<u>Policy S1 5: Water Infrastructure</u> A In order to minimise the use of mains water, water supplies and resources should be protected and conserved in a sustainable manner. B Development Plans should promote improvements to water supply infrastructure to contribute to security of supply. This should be done in a timely, efficient and sustainable manner taking energy consumption into account. C Development proposals should: 1) through the use of Planning Conditions minimise the use of mains water in line with the Optional Requirement of the Building Regulations (residential development), achieving mains water consumption of 105 litres or less per head per day (excluding allowance of up to five litres for external water consumption) 2) achieve at least the BREEAM excellent standard for the 'Wat 01' water category160 or equivalent (commercial development) 3) incorporate measures such as smart metering, water saving and recycling measures, including retrofitting, to help to achieve lower water consumption rates and to maximise future-proofing.

Table 2 - Summary of local planning policy requirements

The Proposed Development is not deemed to be a Major Development in accordance with the requirements of the London Plan. Therefore, the energy and CO_2 emissions target for the site can be taken from the Camden Local Plan.

As outlined above, the requirements within the Camden Local Plan indicate the following energy and CO_2 requirements:

- Min 19% improvement through energy efficiency measures over Building Regulations 2013 Standards
- Additional 20% reduction in CO_2 emission from on-site renewable energy generation

However, as stated in the Part L1B Building Regulations Approved document, buildings in conservation areas are exempt from meeting the energy efficiency requirements where compliance would unacceptably alter the character or appearance of the building.

All figures within this report have been calculated using SAP 2012 carbon factors as the new version (SAP 10) of Building Regulations has yet to be formally introduced. The output from the GLA SAP 10 conversion tool have been included in Appendix E for reference.

Energy

2.0 Energy

2.1 Method

The energy strategy design follows national policy guidance[1] and seeks to be:

Lean
minimise the overall environmental impact and energy use through energy efficiency measures

Clean
ensure that energy systems on-site (heat & power) are efficient & produce minimal CO_2 emissions

Green
Implement suitable technologies to provide renewable and emission free energy sources

Seen
incorporate monitoring through SMART metering and accessible displays

CO_2 Conversion Factors (Table 3) have been taken from Building Regulations 2013.

	CO_2 Conversion Factor ($kgCO_2/kWh$)
Electricity (mains)	0.519
Electricity (offset)	-0.519
Gas (mains)	0.216
Heating Oil	0.298
Wood Pellets	0.039

Table 3 - CO_2 conversion factors by energy source

The energy modelling for the Proposed Development has been calculated using SAP 2012 software in accordance with Building Regulations 2013 Part L1B. The notional building provides the energy baseline and is the exact size and shape of the Proposed Development but based on existing and notional U-values and heating specifications outlined in Approved Document L1B and the Domestic Building Services Compliance Guide.

	CO_2 emissions (t/yr)
Baseline	21.56

Table 4 - Baseline CO_2 emissions

[1]The draft New London Plan https://www.london.gov.uk/what-we-do/planning/london-plan/new-london-plan

2.2 LEAN – Demand Reduction

The lean scenario can achieve a 20.45% reduction in CO_2 emissions using passive and active design measures, exceeding the planning policy requirement stated within the Camden Local Plan.

	CO_2 emissions (t/yr)	Improvement (%)
Baseline	21.56	-
Lean	17.15	20.45

Table 5 - Lean CO_2 emissions and improvement over Baseline

2.2.1 Passive Design Measures

All glazed areas of the building will have elements of shading provided by the building form or internal curtains or blinds. The positioning of habitable rooms within the building will be designed to maximise natural light and positive solar gains. The majority of glazing on the North elevation will be upgraded to Low E double glazing which will minimise overall heat loss.

In line with conservation requirements, the property will have no noticeable visual changes to the external envelope, with the main solid brick and render structure being retained, which means the embodied carbon on site will be low (see Section 4.5 for more details).

Parts of the existing structure will be stripped back and upgraded, with the exact construction method yet to be determined, however, all improvements will meet or exceed the Part L1B Building Regulations compliant U-values. Proposed U-values are provided within Table 6 below. The overall building will have a medium thermal mass as construction is load-bearing masonry. A medium thermal mass will balance providing high energy efficiency and limiting overheating during the summer months.

Element	Notional Compliance (U-value)	Proposed (U-value)
External Brick & Rendered Walls	0.30 - 1.70	0.26 - 1.70
Boiler/Guest Room Wall Upgrade	0.30	0.28
Loft Dwarf Walls	0.30	0.28
Retained Roofs	0.68	0.68
Upgraded Roofs	0.16 - 0.18	0.16 - 0.18
Ground Floor	0.41	0.41
Exposed Floor	0.34	0.34
Windows and Rooflights New	1.60	1.40
Windows Retained	4.80	4.80

Solid Door New	1.8	1.4
Solid Door Retained	3.00	3.00
Air Tightness @ 50 N/m^2	15 ($m^3/hr/m^2$)	15 ($m^3/hr/m^2$)
Thermal Bridge	Not Applicable	Not Applicable

Table 6 - Fabric energy efficiencies

2.2.2 Active Design Measures

The Proposed Development will utilise 100% low energy/LED lighting in excess of Building Regulation requirements.

Time and temperature zone controls will be installed as a minimum to allow the control of individual zones/rooms throughout the building.

Heating and hot water will be provided through a high efficiency gas boiler which will be located in the existing boiler/utility room, connecting to the existing heating system.

Extract ventilation will be provided to the kitchen and all wet-rooms, and openable windows will provide fresh air and purge ventilation where this is needed.

2.2.3 Cooling

The cooling hierarchy has been used to ensure that passive building design has been optimised to reduce the cooling load for the Proposed Development.

Cooling Hierarchy	Potential Design Measures
Minimising internal heat generation through energy efficient design	All primary pipework to be insulated, therefore low system losses. Low energy lighting throughout with minimal heat output. High specification hot water cylinder installed with low heat loss.
Reducing the amount of heat entering the building in summer	All windows on the side and rear elevations (excluding bay windows and dormer windows) will be upgraded to Low E glass windows which will minimise solar gain in addition to internal blinds. All upgraded walls are to be well insulated.
Use of thermal mass and high ceilings to manage the heat within the building	Thermal mass is anticipated to be medium with some element of exposed mass (party wall).
Passive Ventilation	Openable windows will be provided to all habitable rooms and cross ventilation is possible.
Mechanical Ventilation	Standard extract.

Table 7 - Design measures following the cooling hierarchy

Active cooling is not proposed.

2.3 CLEAN – Heating Infrastructure

Connection of the Proposed Development to a district heat network is not currently feasible, hence it has not been proposed. However, this property is located within a Heat Network Priority Area, so the retention of a 'wet' heating system, especially with the proposed plant room located to the front of the property, would mean it could easily connect to a new network in the future. Since there are currently no proposals for a network nearby, there will be no further improvement of 'Clean' measures above the 'Lean' scenario.

	CO_2 emissions (t/yr)	Improvement (%)
Lean	17.15	-
Clean	17.15	0.00

Table 8 - Clean CO_2 emissions and improvement over Lean

District Heat Networks

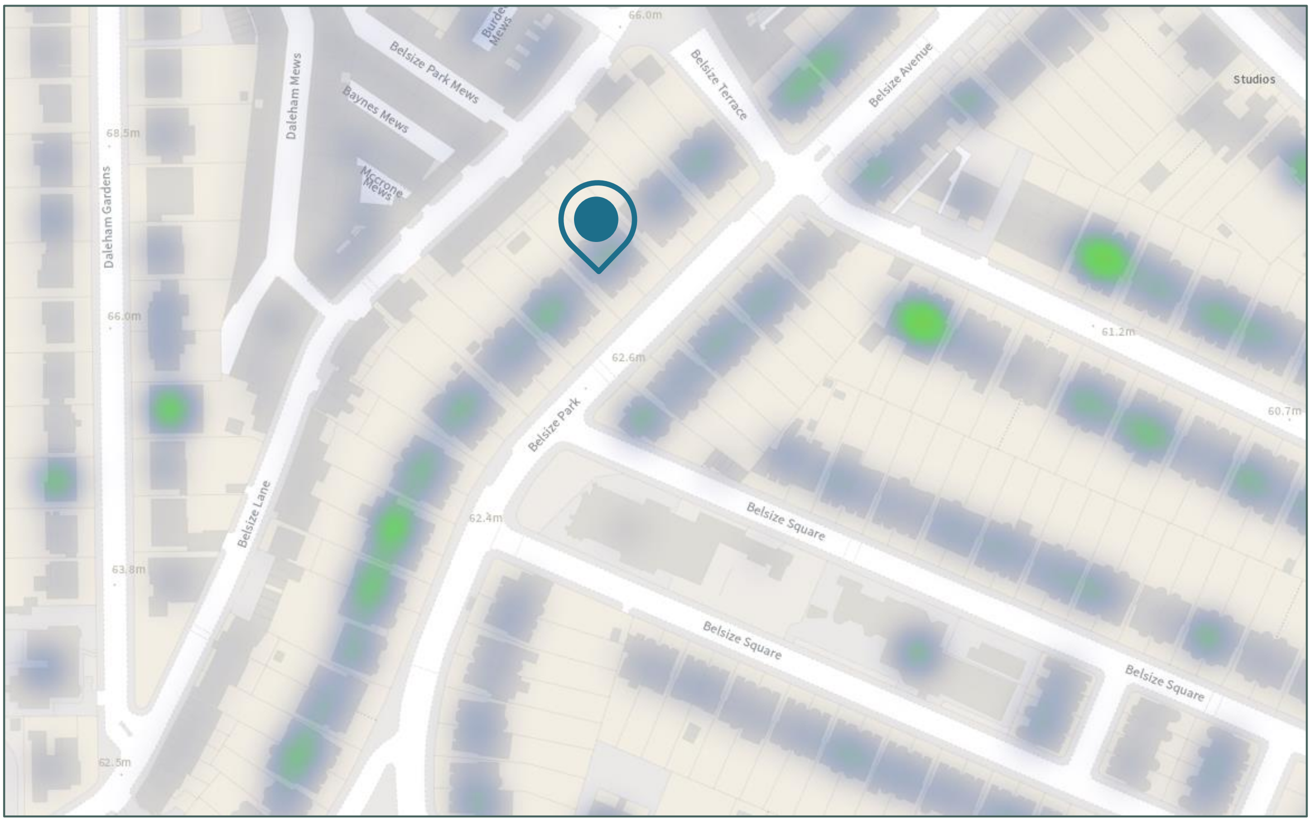

Figure 3 - London Heat Map (maps.london.gov.uk/heatmap/)

The London Heat Map shows that the Proposed Development is within an area of low heat density. While the area could benefit from the installation of a district-wide network, there is not yet one installed or planned.

2.4 GREEN – Low Carbon and Renewable Energy

The addition of 'Green' technologies proves difficult for this development, being located within the 'Belsize Conservation Area'. A number of energy strategies have been assessed for this site with the following Options:

1. Gas-fired boiler with PV slates
2. ASHP with PV slates
3. Integrated ASHP & Gas boiler with PV slates

All options can provide a reduction in CO_2 emissions, however, the 20% improvement through the use of Green LZC technologies alone is not possible to achieve. Generally, including an ASHP and PV slates will provide the greatest improvement in CO_2 emissions, being <1% off the planning policy requirement.

		CO_2 emissions (t/yr)	Improvement (%)
Clean		17.15	-
Green	Gas Boiler with PV	15.07	12.13
	ASHP with PV	13.84	19.30
	Integrated Gas Boiler & ASHP with PV	13.86	19.18

Table 9 - Green CO_2 emissions and improvement over Clean

2.4.1 Air Source Heat Pumps

All Heat Pump systems consume electricity to operate - the Coefficient of Performance (CoP) of the system is the ratio of electrical energy consumed, to heat energy emitted. Generally, a CoP of 3 or 4 can be achieved, meaning 3 or 4 units of thermal energy are produced for each unit of electricity consumed.

Heat pumps will only deliver low grade heat (up to ~50°C) efficiently, and therefore HP systems alone are generally relatively inefficient in providing hot water, as this requires additional electrical input (immersion or increased compressor use).

There are proposed energy strategies which include air-to-water heat pumps, providing space heating - via a mix of underfloor heating and radiators - and hot water. Due to the size of the property and limited upgrades to thermal elements, an oversized ASHP will be required to ensure heating requirements are met. Both options will have time and temperature zone controls to allow both heating times and temperatures to be controlled in different zones of the property independently. Option 3 consists of a hybrid heat pump, which consists of a combination of a gas condensing technology and an air-to-water heat pump - this is ideal for renovated properties. This gas boiler will provide a back-up source of energy when the ASHP cannot provide sufficient heating to the development, thus, will ensure a comfortable and healthy environment is kept for the building occupants.

ASHPs need to be located outdoors to work efficiently, however, these systems tend to generate some noise and are not aesthetically pleasing which may result in issues due to the site being within a conservation area. Therefore, if implemented, the ASHP would be positioned behind the existing screen wall (adjacent to the internal store areas), so that it will not be seen from surrounding public areas. Additionally, to prevent any potential disturbances to the occupants of this property and the neighbouring buildings, the ASHP would either be contained in an acoustic enclosure or be an ultra-quiet model; however, these solutions cannot completely eliminate the generated noise.

2.4.2 Photovoltaics

Photovoltaic (PV) panels convert energy from daylight into direct (DC) electrical current. These are generally roof mounted and provide electrical generation which can either be utilised directly on-site (or nearby), stored in batteries, or exported back to the National Grid.

The installation of PV could be used to offset electrical demand within the Proposed Development. PV slates would be recommended for this development being a discreet solar panel with the appearance of a natural slate tile. Additionally, these are compatible with traditional slates, thus, can be fitted into a traditional roof construction. Aesthetically, the implementation of PV slates would be ideal within the Belsize Conservation Area, since compared to standard PV arrays, these slates will blend into the surrounding built environment. The PV slates will be connected together using industry standard connectors and wired back to an electrical system via an inverter.

Noise will not be an issue – A PV system does not feature moving parts and is silent during operation.

An indicative investigation into the roof area of the Proposed Development shows that there is approximately 89m^2 of available roof area, highlighted in red within Figure 4. This available area is on the South-West facing roof only; the South-East facing roof should not be touched due to conservation concerns, and the North-West facing roof would not be recommended for PV slate installation due to the limited solar potential. However, these PV slates require a border of natural or infill slates which will account for 0.5m around all edges, rooflights and chimneys. Therefore, this reduces the available area for PV installation to approximately 44m^2.

Based on a 25W PV slate (~0.18m^2 in area), an indicative proposed 6.1kWp PV system is to be installed - equivalent to 244 no. PV slates. Considering the proximity of the neighbouring building and the large existing tree in the rear garden of 21 Belsize Park, these PV slates are expected to have modest shading. Due to the limited available space for PV, the addition of PV to all three Green energy strategies will not meet the required 20% CO_2 reduction through the use of on-site renewables. However, PV slates will significantly reduce the CO_2 emissions onsite so would be highly recommended.

Proposed Array (kWp)	Approximate no. Panels @300W	Active Area (m^2)	Pitch (degrees)	Orientation	Annual Generation (kWh/yr)
6.1	244	43.92	30	South-West	4,018

Table 10 - Proposed PV Array Summary

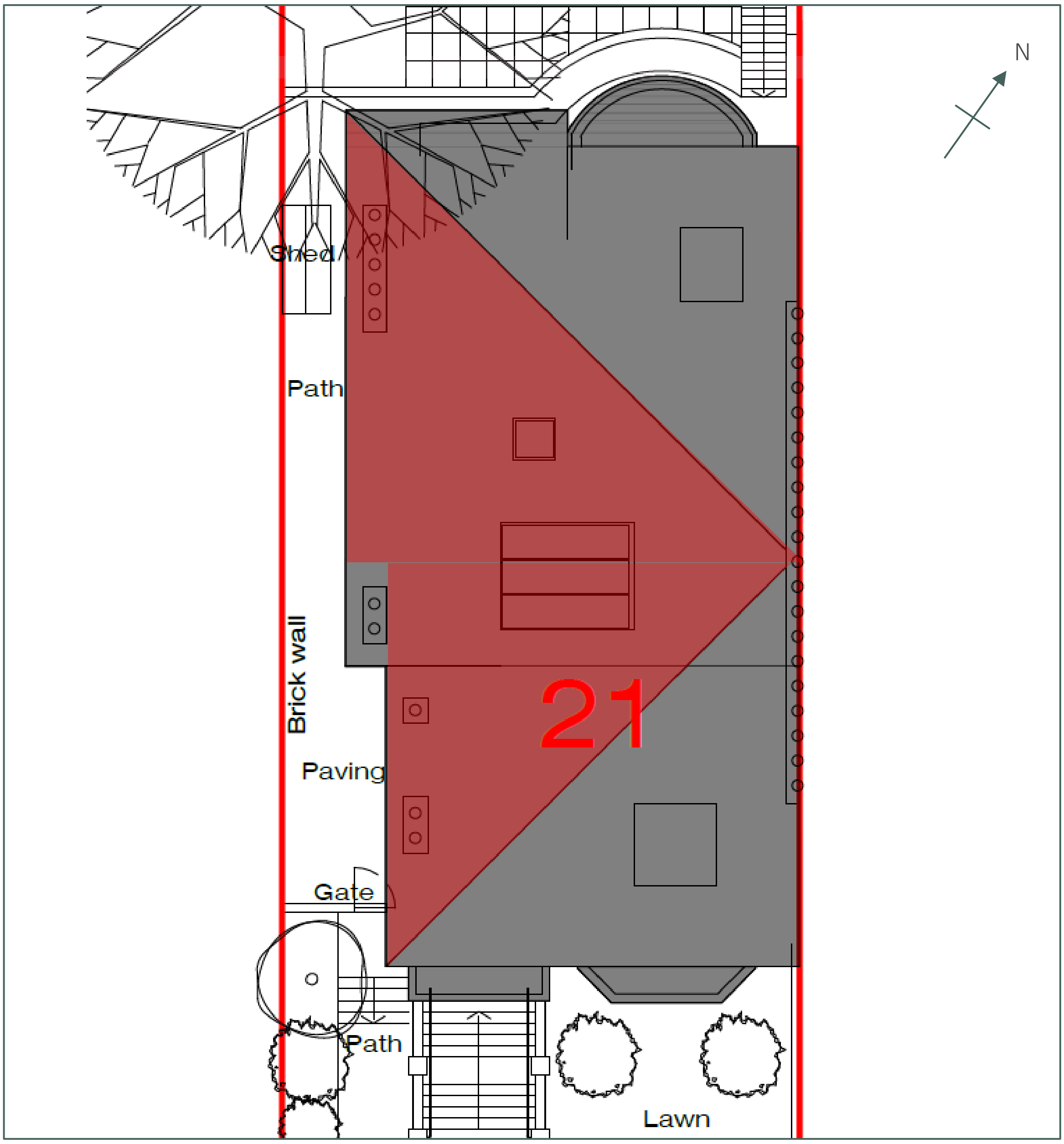

Figure 4 –Roof space at the Proposed Development – area available for PV highlighted in red

2.4.3 Energy Storage

Although it is believed that the PV generation will not exceed usage at the site, the development could have a battery energy store linked to the PV slates which will enable building occupants to use this energy at any required time. Battery storage can also capture power from the grid and use this at times of peak demand. The building occupants can ultimately save money by storing grid energy at certain times of the day when it is cheaper.

2.5 SEEN – In-use monitoring

It is recommended that the Proposed Development will be supplied with a Smart Meter (where available from the utility supplier) along with an associated internal energy display. This will further improve energy efficiency by allowing the residents to observe their energy use in 'real time' and manage it more effectively.

2.6 Energy Summary

The Proposed Development at will deliver passive and active measures along with low and zero carbon technologies in order to reduce energy demand and associated CO_2 emissions resulting from its operation.

The calculations undertaken demonstrate that the Proposed Development will successfully exceed the 19% CO_2 improvement set out in the Camden Local Plan through passive and active design measures. However, due to concerns surrounding building aesthetics and conservation, it will not be possible to achieve a further 20% reduction using Green LZC technologies. Part L1B Building Regulations state that buildings in conservation areas are exempt from meeting the energy efficiency requirements where compliance would unacceptably alter the character or appearance of the building. Thus, improvements to building elements will be undertaken where possible and three Green energy strategies have been investigated.

The most energy efficient strategy is Option 2 – ASHP and PV slates, achieving a 19.30% improvement through the use of renewable technologies. However, installation of an ASHP in a conservation area raises concerns. Although the ASHP can be positioned out of site from public view, due to the neighbouring buildings in close proximity, any potential noise pollution created would need to be mitigated. Therefore, the recommended energy strategy for this site would be Option 1 – Gas Boiler with PV slates. This would avoid issues relating to noise pollution whilst still having renewable energies present onsite. Aesthetically, PV slates are a discreet solar solution which have the appearance of a natural slate tiles, thus, blending into the surrounding built environment.

		CO_2 emissions (t/yr)	Improvement (%)	Improvement over Baseline (%)
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	Integrated Gas Boiler & ASHP with PV	13.86	19.18	35.71

Table 11 - Summary of CO_2 emissions, incremental improvement and improvement over Baseline

In delivering the Green energy strategy (Option 1), the Proposed Development provides:

- Enhanced building fabric where possible according to conservation requirements
- High efficiency gas-fired boiler to supply space heating and hot water
- A maximum 6.1kWp PV slate system

Thermal Comfort Analysis

3.0 Thermal Comfort Analysis

3.1.1 CIBSE Guide A: Environmental Design

CIBSE Guide A 'Environmental Design' (2015) gives general guidance and recommendations for buildings on suitable winter and summer temperatures for a range of room and building types.

Table 12 summarises the comfort criteria for relevant room types within the Proposed Development.

		Bedroom	Kitchen/Living/Dining
Winter period (Oct-Apr)	Operative	17-19	22-23
	Activity (met)	0.9	1.1
	Clothing (clo)	2.5	1.0
Summer period (May-Sep)	Operative	23-25	23-25
	Activity (met)	0.9	1.1
	Clothing (clo)	1.2	0.65

Table 12 - CIBSE Guide A, recommended comfort criteria

3.1.2 CIBSE TM52: The limits of thermal comfort: avoiding overheating in European buildings

CIBSE TM52 is a Technical Memorandum (TM) about predicting overheating in buildings. It outlines the approach adopted by CIBSE to ensure that a building is comfortable for its occupants and how the likelihood of discomfort due to overheating can be predicted.

As summarised in Table 13, TM52 outlines three criteria to identify overheating in free-running buildings. A room that fails any two of the three criteria is classed as overheating.

Criterion	Definition
1	Hours of exceedance (H_e): The number of hours (H_e) during which the operative temperature is greater than the threshold comfort temperature by 1°C during the period May to September inclusive shall not be more than 3 per cent of the occupied hours.
2	Daily weighted exceedance (W_e): The weighted exceedance (W_e) shall be less than or equal to 6 in any one day.
3	Upper limit temperature (T_{upp}): The indoor operative temperature shall not exceed the threshold comfort temperature by 4°C.

Table 13 - CIBSE TM52 Overheating Criteria

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

The performance standards set in CIBSE TM59: 2017 have been used to assess the overheating risk within the Proposed Development. Compliance is based on passing both of the following two criteria:

1. For living rooms, kitchens and bedrooms: the number of hours during which the operative temperature exceeds the threshold comfort temperature by 1°C during the period May to September inclusive shall not be more than 3% of occupied hours. (CIBSE TM52 Criterion 1: Hours of exceedance).
2. For bedrooms only: the operative temperature in the bedroom from 10 pm to 7 am shall not exceed 26°C for more than 1% of occupied hours. (Note: 1% of occupied hours between 22:00 and 07:00 for bedrooms is 32 hours, so 33 or more hours will be recorded as a fail).

The overheating risk of the spaces are assessed under the CIBSE design summer year (DSY) weather files. A pass is required using the DSY1 2020s, high emissions, 50th percentile weather file. Other files including the more extreme DSY2 and DSY3 files, as well as future files (i.e. 2050s or 2080s), should be used to further test designs of particular concern, but a pass is not mandatory.

3.2 Dynamic Model

The thermal modelling has been carried out using IES-VE 2021. IES-VE is a fully dynamic analysis tool which is compliant with CIBSE Applications Manual AM11. A 3D thermal model of the Proposed Development has been created based on the architectural drawings provided by the design team.

The following images are taken from the 3D IES-VE model and show the full geometry of the Proposed Development within the thermal model. As with any modelling exercise, some approximations have to be made, but care has been taken to ensure that the scale and dimensions of the model are as close as practicable to the design drawings, and that glazing areas are accurately represented.

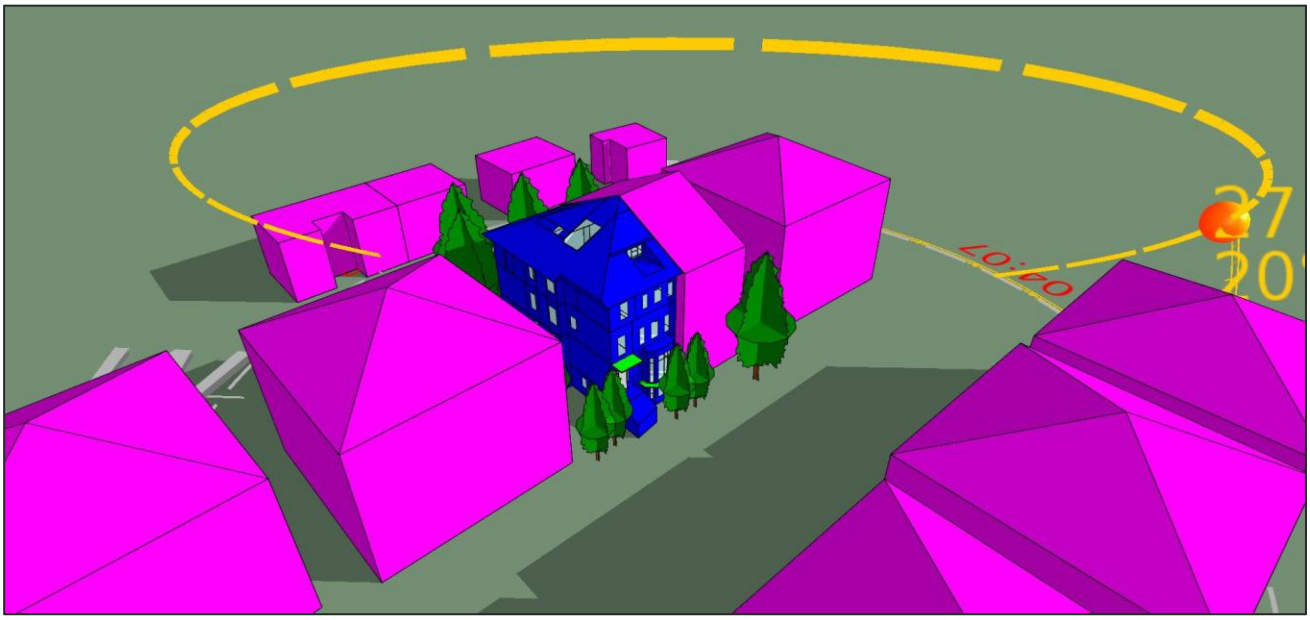


Figure 5 - Image of the 3D model in the IES-VE 2021 software, from the South

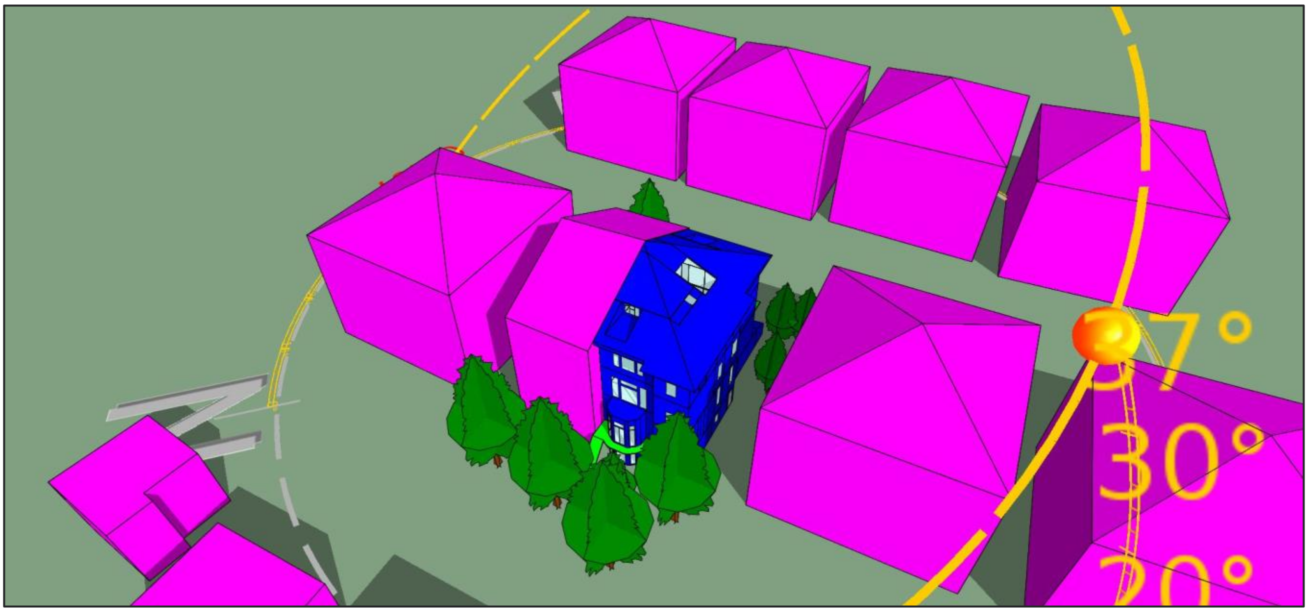


Figure 6 – Image of the 3D model in the IES-VE 2021 software, from the Northwest

For the purpose of this assessment, all 13 no. habitable rooms within the proposed Development are included in the detailed analysis.

The building has been divided into different zones in relation to use. Appropriate profiles and internal gains have been assigned in all different areas, but only the results of the main occupied spaces have been assessed in this study. Secondary spaces, occupied only briefly (less than 30 minutes), such as toilets, bathrooms, and cupboards are outside the scope of this study. Figure 7 shows the assessed zones. The coloured spaces indicate the different thermal and occupancy profiles applied.

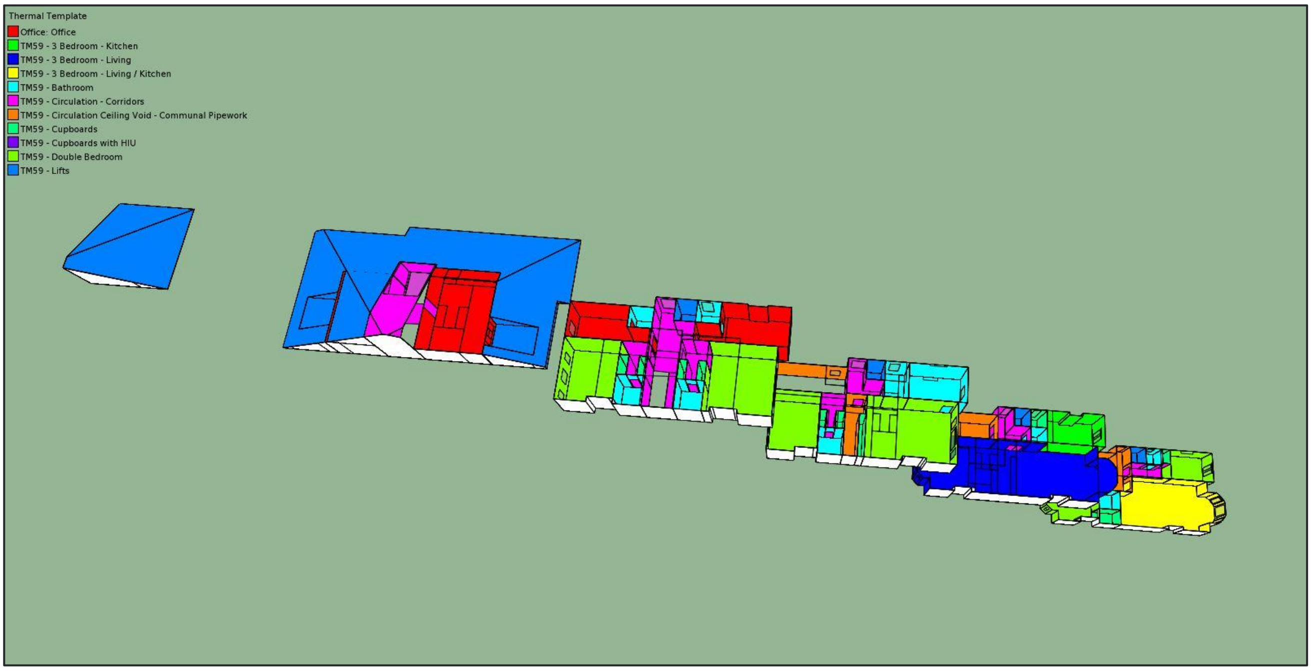


Figure 7 - Thermal zones of the assessed rooms in the Proposed Development

3.3 Occupancy and internal gain profiles

Based on CIBSE Guide A, a maximum sensible heat gain of 75W/person and a maximum latent heat gain of 55 W/person are assumed in occupied spaces in the assessment.

In addition, heat gains from equipment are also included in the assessment, which are summarised in Table 14. Lighting load of 2 W/m^2 is applied for all occupied spaces.

Usage	Peak Load (W)
Bedroom	80
Combined Living / Kitchen	450

Table 14 - Equipment peak load for different usages

The occupancy and internal gain profiles have been based on the methodology described in CIBSE TM59 standard profiles according to usage, which can be seen in Table 15.

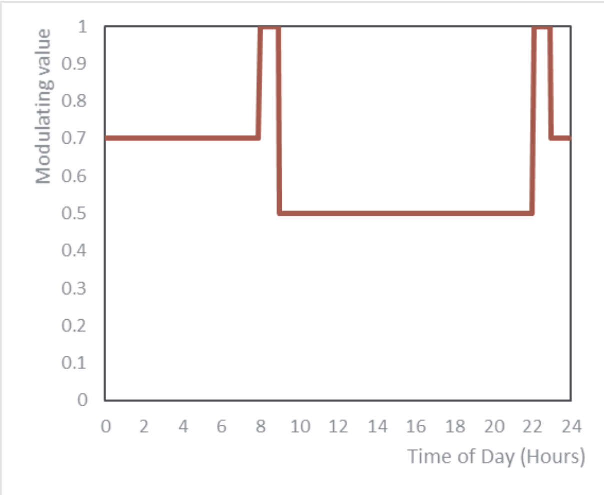
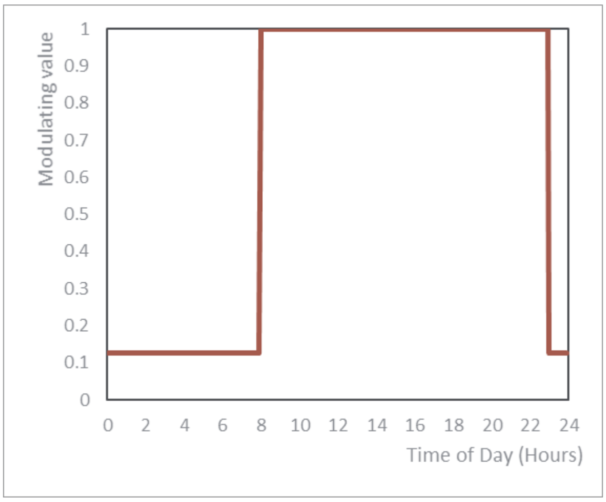
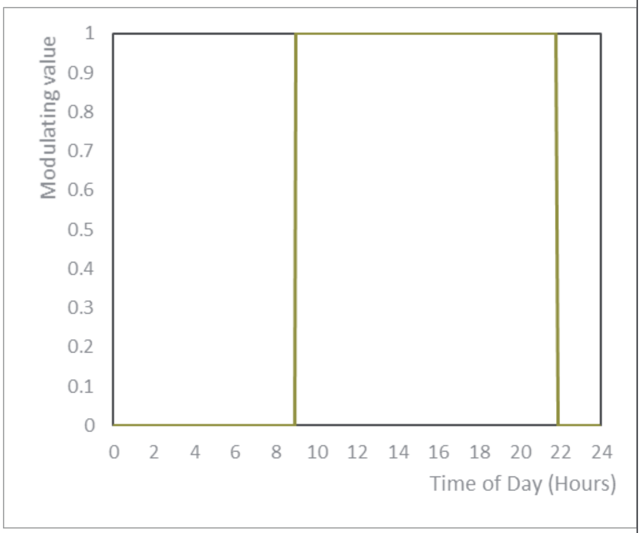
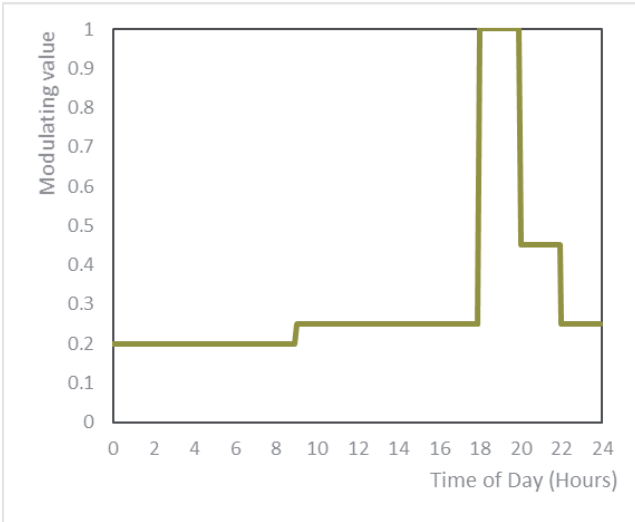
Double Bedroom Occupancy	Double Bedroom Equipment
	
Living/Kitchen Occupancy	**Living/Kitchen Equipment**
	

Table 15 - Occupancy and equipment profiles for the occupied space

These profiles represent a robust test that ensures the key aspects of overheating are captured, which include the following characteristics:

- Bedrooms are set with a 24-hour occupancy profile: one person is always considered in each bedroom during the daytime and two people in each double bedroom at night.

- Kitchens/living rooms are unoccupied during the sleeping hours and occupied during the rest of the day.
- No differences between weekdays and weekends are considered and the dwelling is modelled as occupied for 24 hours.

3.4 Air Exchange

The infiltration rate is assumed at 0.25 ach.

3.5 Window Openings

Based on the information supplied by the Architect and taking into account acoustic considerations to minimise window openings, the specification for the opening areas are summarised in Table 16. Figure 8 shows the openable windows of the thermal model.

Opening type	Opening category	Openable area	Max. opening angle
Sash Window	Sash	40	-
Side Hung Window	Side hung	100	90
Bottom Hung Window	Bottom hung	100	30
Glazed Doors	Side Hung	100	90
Fixed Window	-	0	-

Table 16 - Glazing specification - openable areas

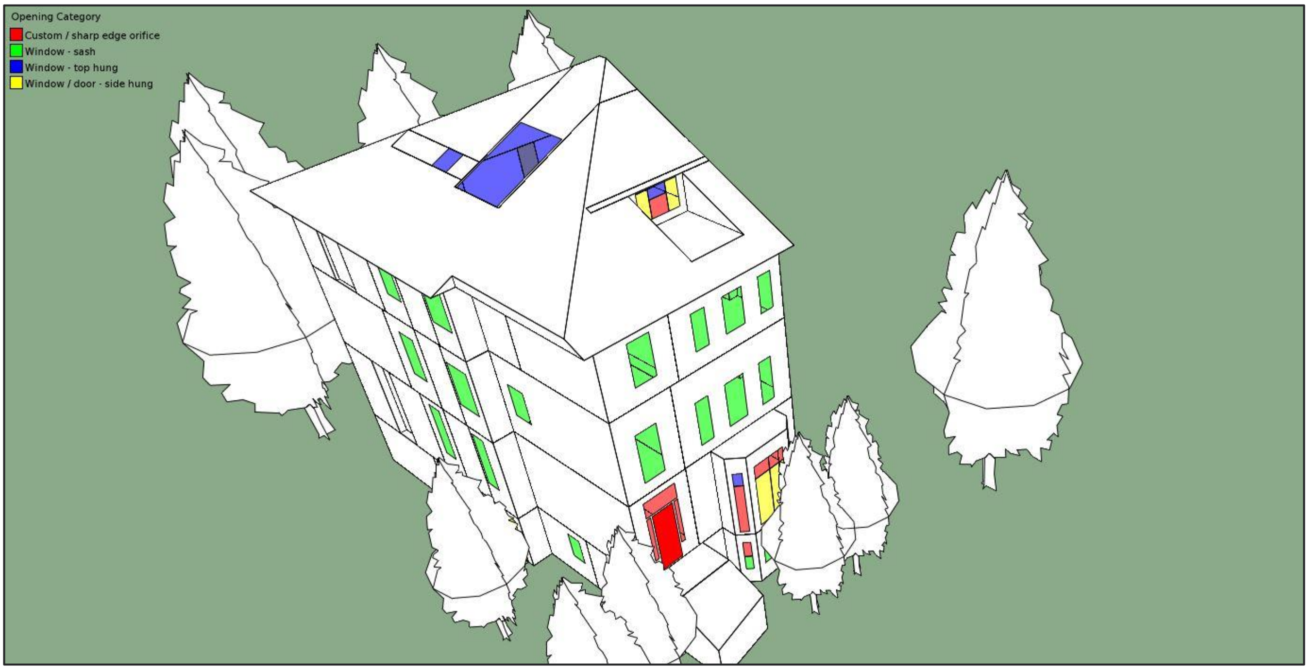


Figure 8 - Openable and fixed windows of the assessed spaces in the Proposed Development, view from the Southwest

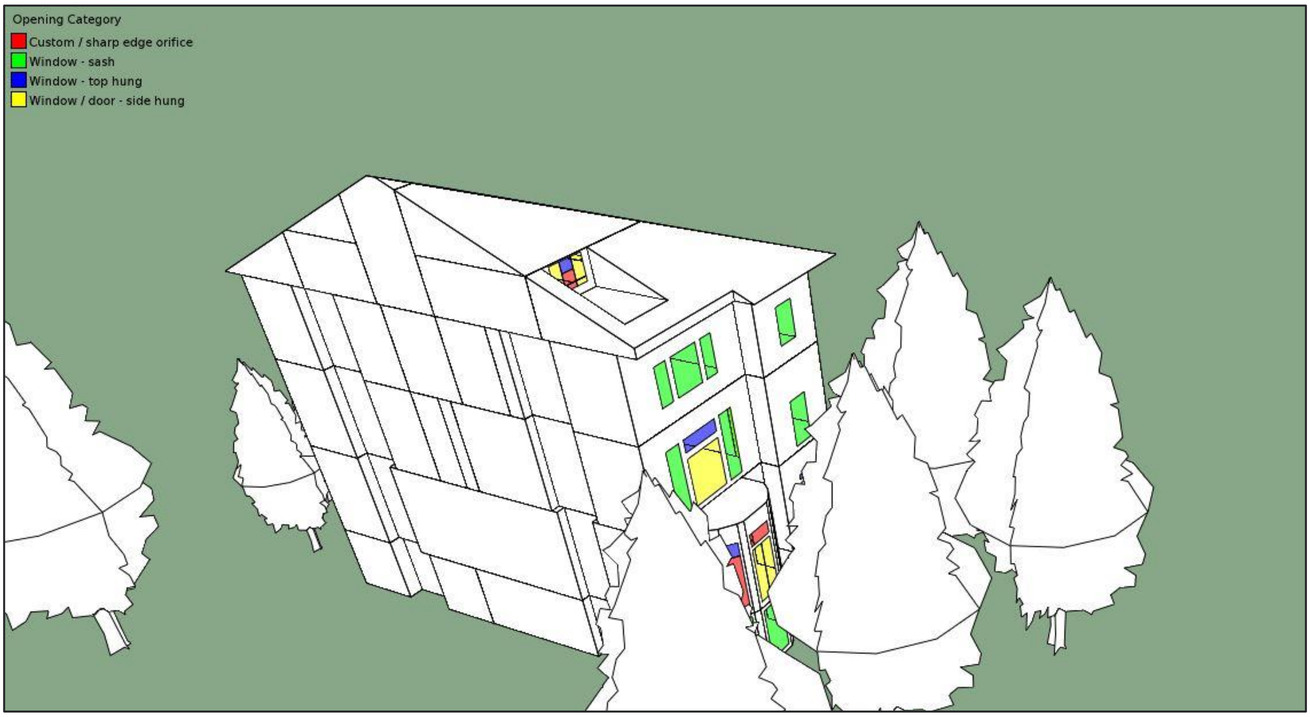


Figure 9 - Openable and fixed windows of the assessed spaces in the Proposed Development, view from the Northeast

Openable windows/doors to balcony in occupied spaces are modelled to be fully open for purge ventilation when the internal temperature reaches 24°C and the internal temperature is higher than the external temperature during occupied hours.

3.6 Shading devices

Internal curtains are applied in all non openable windows to reduce solar gains during the daytime. The curtains are assumed to be light-coloured curtain or roller blinds with a shading coefficient of 0.4 and a short-wave radiant fraction of 0.3.

3.7 Weather File

The thermal comfort analysis is conducted under both current and projected future climate conditions, based on the below weather files:

Current condition:

- London LHR DSY1 2020s high emissions 50th percentile

Future condition:

- London LHR DSY1 2050s high emissions 50th percentile

The solar gains are calculated within the IES software based on the weather file, the building's geometry and orientation of its facades, surrounding obstacles, transmission coefficients of the glazing and the solar angles.

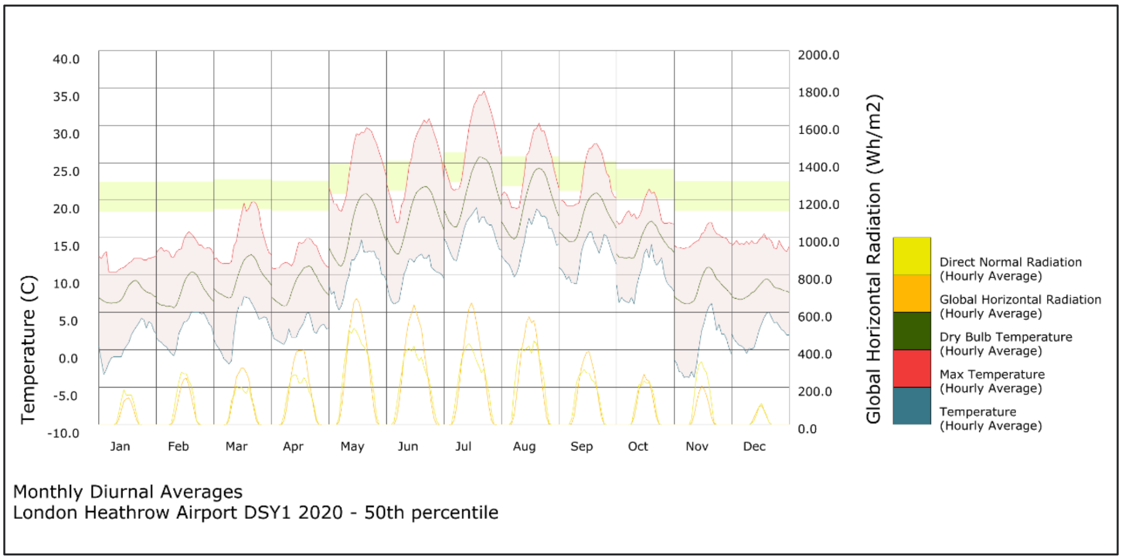


Figure 10 - Monthly diurnal averages, whole year, DSY1 2020, high emissions, 50th percentile weather file

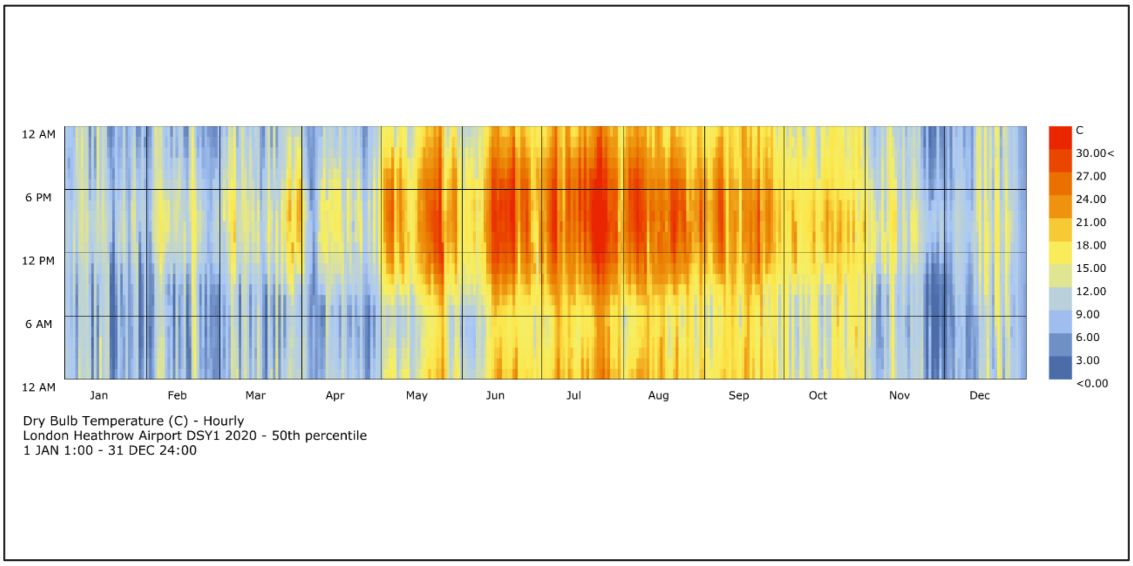


Figure 11 - Dry-Bulb Temperature, May - September, DSY1 2020, high emissions, 50th percentile weather file

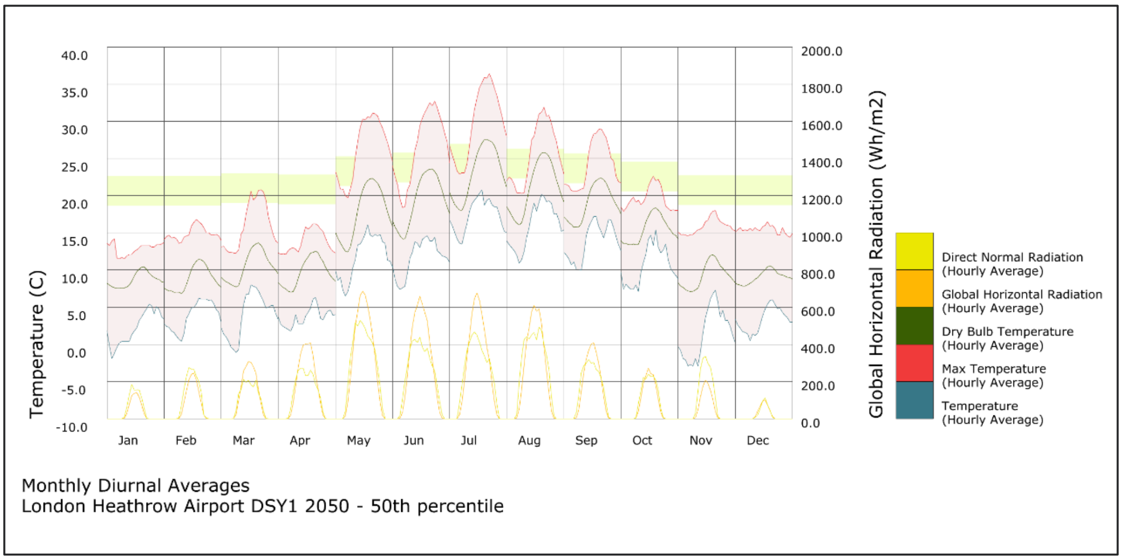


Figure 12 - Monthly diurnal averages, whole year, DSY1 2050, high emissions, 50th percentile weather file

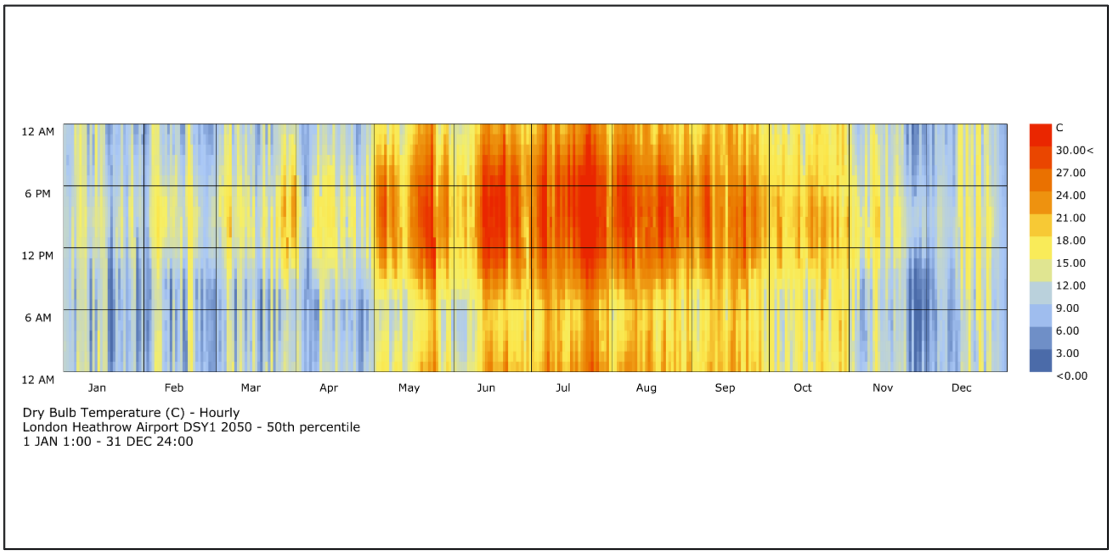


Figure 13 - Dry-Bulb Temperature, May - September, DSY1 2050, high emissions, 50th percentile weather file

3.8 Results – Thermal Comfort

According to CIBSE TM59, the overheating assessment has been undertaken for the summer period, from 1st May to 30th September. The air speed is set at 0.15 m/s to generate operative temperature, and the thermal comfort category is assumed to be Category II (new building) in the assessment.

Environmental design conditions have been selected from CIBSE Guide A 'Environmental Design', giving general guidance and recommendations for buildings on suitable summer temperatures and comfort criteria for relevant room types within the Proposed Development.

3.9 Current Weather File – 2020s DSY1

Dynamic thermal simulation hase been conducted with the settings described in Section 3.2. Results for current weather conditions using London LHR DSY1 2020s high emissions 50th percentile are presented in Table 17.

As demonstrated, all 16 no. of assessed rooms pass the assessment under the current weather file. Summertime overheating is therefore unlikely to arise and building users will generally feel comfortable in summer periods, based on the predicated data from the current weather file.

Space	Criterion 1 (% hours top-max>=1K)	Criterion 2 (hours operative temp. >26°C)	Pass / Fail
LG - Geust Bedroom 1	0	10	Pass
LG - Geust Bedroom 2	0	11	Pass
LG - Family Room/Kitchen	0	-	Pass
GF - Dining Room/Living	0	-	Pass
GF - Kitchen	0	-	Pass
FF - Bedroom 1	0	12	Pass
FF - Bedroom 2	0	22	Pass
SF – Office 1	0	-	Pass
SF – Office 2	0	-	Pass
SF - Bedroom 3	0	13	Pass

SF - Bedroom 4	0	23	Pass
TF - Gym	0	-	Pass
TF - Cinema Room	0	-	Pass

Table 17 – Simulation results summary for the assessed habitable rooms in top floor units– using the current DSY1 2020 weather file

3.10 Future Weather File – 2050s DSY1

In order to further test the robustness of the design, further simulations have been carried out under future weather file DSY1 2050s high emissions 50th percentile. It should be noted that a pass is not mandatory under the future weather scenario (Table 18).

Space	Criterion 1 (% hours top-max>=1K)	Criterion 2 (hours operative temp. >26°C)	Pass / Fail
LG - Geust Bedroom 1	0	37	Fail
LG - Geust Bedroom 2	0	32	Pass
LG - Family Room/Kitchen	0	-	Pass
GF - Dining Room/Living	0	-	Pass
GF - Kitchen	0	-	Pass
FF - Bedroom 1	0	25	Pass
FF - Bedroom 2	0.5	44	Fail
SF – Office 1	0	-	Pass
SF – Office 2	0	-	Pass
SF - Bedroom 3	0	23	Pass
SF - Bedroom 4	0	48	Fail
TF - Gym	0	-	Pass
TF - Cinema Room	0	-	Pass

Table 18 – Simulation results summary for assessed habitable rooms in top floor units - using the future DSY1 2050 weather file

As demonstrated, only 3 no. out of the 13 no. of assessed rooms fail the assessment under the future weather file in the 2nd criterion only (night time operative temperature), with remaining 10 no. rooms passing. Therefore, summertime overheating may arise in a few of the assessed spaces and adaptive measures will have to be put in place for good levels of thermal comfort conditions to be achieved during severe heat waves in the future. With the inclusion of retrofit measures such as replacing the external windows with low g-value in all the failing rooms (where possible), this will help minimise overheating risks in the future. It should be noted that a pass is not mandatory under future weather conditions.

3.11 Overheating Summary

This Overheating Analysis has assessed the risks of overheating and the thermal comfort conditions in the occupied areas.

Simulation results of the 'worst-case' top floor units of the Proposed Development indicate that with the proposed ventilation strategy, all the occupied rooms meet the relevant criteria outlined in CIBSE TM52 and TM59 and therefore the overheating risk is minimal under current weather with extreme summer conditions.

Additional simulations using future weather files have also been conducted. With 10 no. out of 13 no. rooms that pass the assessment, the results indicate that overheating may arise in future summer periods and adaptive measures will only have to be put in place for occupants to feel comfortable in 3 no. occupied rooms.

Sustainability

4.0 Sustainability

The World Commission on Environment and Development (WCED) report: Our Common Future, describes Sustainable Development as development that:

"meets the needs of the present without compromising the ability of future generations to meet their own needs."

4.1 Pollution

Air

The Proposed Development will aim to limit its contribution to local air pollution by either installing a low NOx gas boiler and/or an ASHP which is electric so will not contribute to onsite emissions. If a gas boiler is chosen, this will have NOx emissions rates of <40mg/kWh in line with best practice.

PV slates have also been proposed which will produce renewable electricity which is expected to be used onsite. As the NOx emissions resulting from the production of electricity decreases at the national scale, the resulting theoretical emissions from the Proposed Development will do also. Furthermore, the use of PV slates will decrease the import of electricity from the national grid and replace it with PV electricity which produces no emissions during operation.

The Proposed Development is located within a high NOx emissions area as defined by the UK NOx emissions map, see Figure 14.

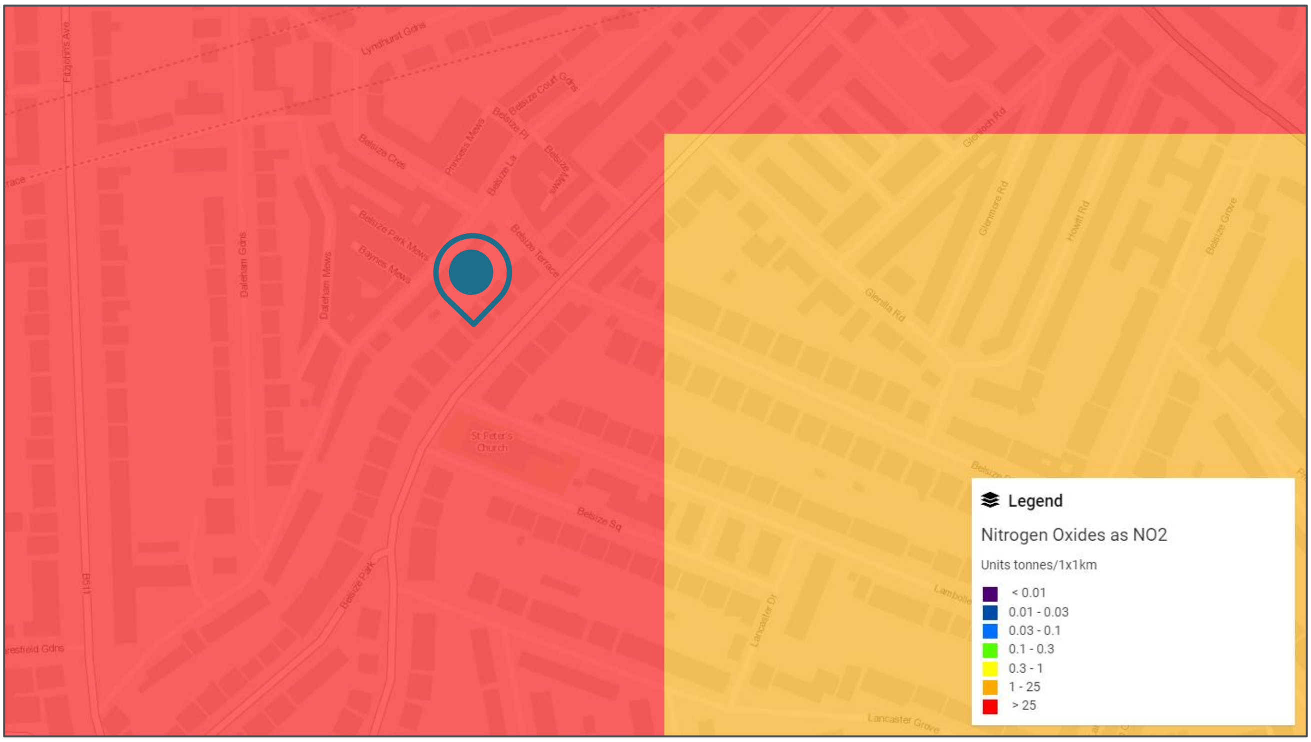


Figure 14 - UK Air Pollution Map showing pollution from Nitrogen Oxides as NO2 (https://naei.beis.gov.uk/emissionsapp/)

Noise

The Proposed Development is located on the site of an existing Victorian property which was previously used as a small hotel and garden flat. Therefore, the Proposed Development will not produce any greater noise pollution than was generated during the operation of the previous building. Furthermore, the Proposed Development will have some building elements upgraded to be well insulated which should reduce noise from inside the building below that of the existing.

The Proposed Development does not have any off-road car parking for the building, and the residents will only be using on-road parking for one electric car. This encourages the use of public transport and sustainable transport methods - such as cycling – rather than personal vehicles which will reduce general noise pollution in the area and reduce any impacts which may have resulted from increased transportation.

Light

The design and layout of the habitable spaces for practical use has been considered while trying to maximise internal daylight levels. All spaces occupied by residents will have glazing to provide natural daylight, and light-coloured curtains or roller blinds will be provided to enable glare control and privacy.

Light Pollution will be minimised where possible through the careful specification and positioning of external lighting around the Proposed Development, ensuring minimal light pollution from the site. Special attention will be given to security lighting (where fitted) to ensure it is appropriately focussed and controlled.

All external space lighting will be provided through low energy fittings, with security lighting being PIR and daylight/timer controlled.

4.2 Flood Risk

The selected site is at no risk of flooding from rivers or the sea, however, it is at medium risk of flooding from surface water (Figure 15), with the surrounding roads generally at low risk of flooding from surface water.

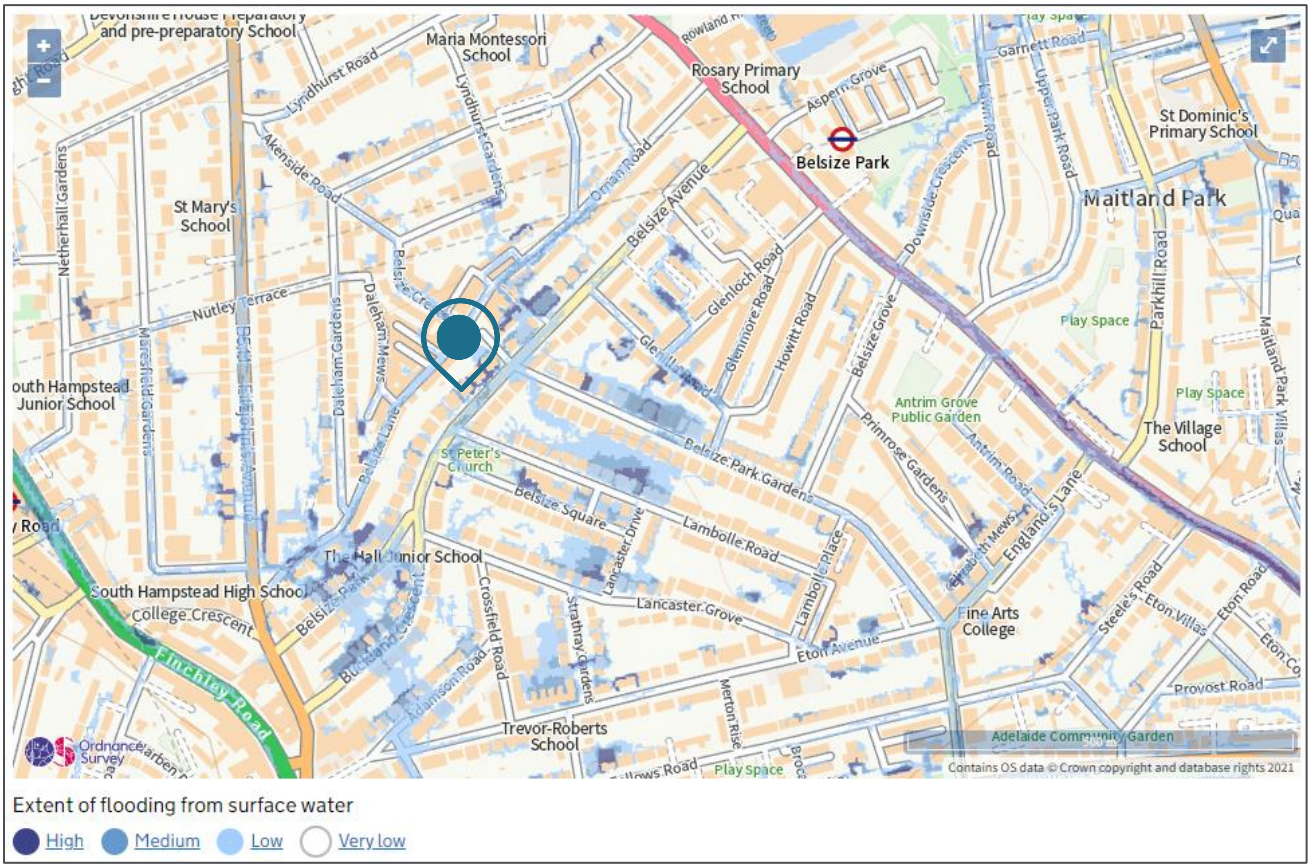


Figure 15 - Flood map showing risk of flooding from surface water (https://flood-warning-information.service.gov.uk/long-term-flood-risk/map)

The surface water is expected to build up along the hard side path, connecting the front and rear gardens. This is not a concern since the site is naturally ramped with the flow of water heading towards the main road and into the local public drainage network.

4.3 Transport

Public Transport

The site has multiple bus stops in the surrounding area, with 2 no. stops within a 2-minute walk on Belsize Park and Belsize Avenue, and stops on Fitzjohn's Avenue and College Crescent, within a 10-minute walk to the West. Table 19 below shows the bus numbers available along with their destinations.

Bus No.	Destination
46	Paddington
	City of London
268	Golders Green
	South Hampstead
603	Muswell Hill

Table 19 – Public bus services close to Proposed Development

The nearest train station for overground services is South Hampstead, a 14-minute walk to the South-West. While the closest underground service is Swiss Cottage Station (Jubilee line), an 8-minute walk to the South.

Parking

The existing development has two allocated on-road parking spaces, one parking permit will be retained for the Proposed Development and no off-road parking will be available at this site. This will promote the use of public transport by the residents and visitors.

Electric Vehicle Charging

Although 1 no. electric vehicle will be used by the residents, due to there being no off-road parking, charging at this site is not possible without a cable going across a public pavement. Therefore, the residents will use public electric vehicle (EV) charging points within the Belsize Park area. The nearest charging station is 330 feet away at the 'ubitricity Charging Station', Belsize Avenue, NW3 4AU.

Car-Pooling

There is a car-pooling service provided by Enterprise Car Club, located 246 feet away on Belsize Avenue. To use this service, you must register to become a member of Enterprise Car Club – a variety of payment plans are available. Once a member, users will be able to access to the car sharing vehicles with the phone App or using a contactless card. Proximity to a car-pooling service will allow the residents access to further cars without the need to own more.

Alternatively, there is another car-pooling service provided by Zip Car, located 390 feet away on Belsize Park. To use this service, you must be a member of the Zip Car scheme (join online for free).

Cycle Storage

The Proposed Development has an unheated storage area to the front of the property which will be used for bike storage and will include a charging point. The residents will store 3 no. bikes at the property which will encourage sustainable local travelling.

Cycle Rental

The nearest 'Santander Cycle' point is located on Finchley Road, 1.4 miles (a 27-minute walk) to the South.

4.4 Biodiversity

Biodiversity is generally considered to be the variety of life forms within a certain ecosystem. The Proposed Development is within the 'Belsize Conservation Area', thus, - amongst other considerations - ecological mitigation is of high importance. This site contains several trees and scrubs, and no alternations will be made to the landscaping onsite in both the front and rear gardens.

Urban Greening

Urban Greening is a process of providing additional green spaces, planting and grassland within an urban environment. The addition of 'green' elements within a town or city will assist with urban cooling through evaporative cooling and the shading of concrete and other building materials that contribute to urban heat island.

An Urban Greening factor can be applied to a site based on the proposed makeup of the development, with benchmarks set as to which score is required by the site.

Camden Local Plan outlines local requirements to protect existing green spaces. There is a large amount of existing greenery onsite, therefore, the front and rear gardens are going to retained and protected, and due to the limited space, no new vegetation will be introduced. There are no benchmarks stated for individual developments, however, a calculation based on the guidance for Greater London Authority has been undertaken to give an indication of the Proposed Development's impact on urban greening.

Current indicative calculations show that the Proposed Development has an Urban Greening Factor of 0.44, which is exceeding the GLA benchmark of 0.4.

Therefore, this site provides a good level of greening in line with local and national policy. The calculations can be viewed in Appendix F.

4.5 Resource efficiency

Construction Phase Waste Management

The Proposed Development will aim to minimise the waste produced from the site during any refurbishment works.

A comprehensive Construction Management Plan will be implemented from the outset of the refurbishment works and will follow the principles of the waste hierarchy with an aim of diverting 85% or greater of construction waste from landfill in line with best practice.

The construction waste generated as part of the redevelopment will be segregated and monitored as per best practice, with suitable materials being recycled as part of this process, either to be reused on site or introduced back into the supply chain through recycling by a Licensed Contractor, therefore minimising the amount of waste being disposed of in landfill sites.

The original property is to be retained; however, some areas of the building fabric will be enhanced to improve the overall energy efficiency of the building. By retaining the existing materials on site, this will reduce the embodied energy of the development by using the energy that already exists in that material. Compared to removing elements of the existing building and providing completely new building elements, this is a less carbon intensive approach over the long term. Transportation of new material to the site will be limited as a result, reducing the CO_2 emissions associated with transportation and material manufacture.

Where waste will need to be disposed of, this will be done in line with the Waste Hierarchy, with as much as practicable being recycled, and the remainder being dealt with through a specialist waste recycling contractor. Nominal construction waste should be sent to landfill or for incineration unless this is unavoidable due to the materials found on the existing site.

The Circular Economy

The circular economy ethos is driving the move away from a 'Take – Make – Use – Discard' economy to a 'Re-make and Use Again' economy.

For building development, the impacts to the circular economy can be categorised into the following sections:

- Fabric removal and reclamation
- Design and construction impacts
- Site waste and its management
- Operational waste storage
- End of life disassembly and re-use

Impacts at each of these stages are required to be considered and mitigated as much as possible to ensure that the impact is minimised, and materials are fed back into the supply chain to be re-used.

Resource Management

None the less, all materials on site will be managed in accordance with the waste hierarchy (Figure 16) with as much as possible of the removed structure being re-used and recycled. Key items being reused and recycled are as follows:

- Construction timbers where these are able to be re-used,
- Internal finishes (Stone flooring etc.) where these can be reclaimed,
- Roofing tiles where these are undamaged

Policies will be put in place for management of site impacts such as air and water pollution in line with industry best practice. Monitoring and reporting on carbon emissions and water use from site related activities will take place in line with national benchmarks.

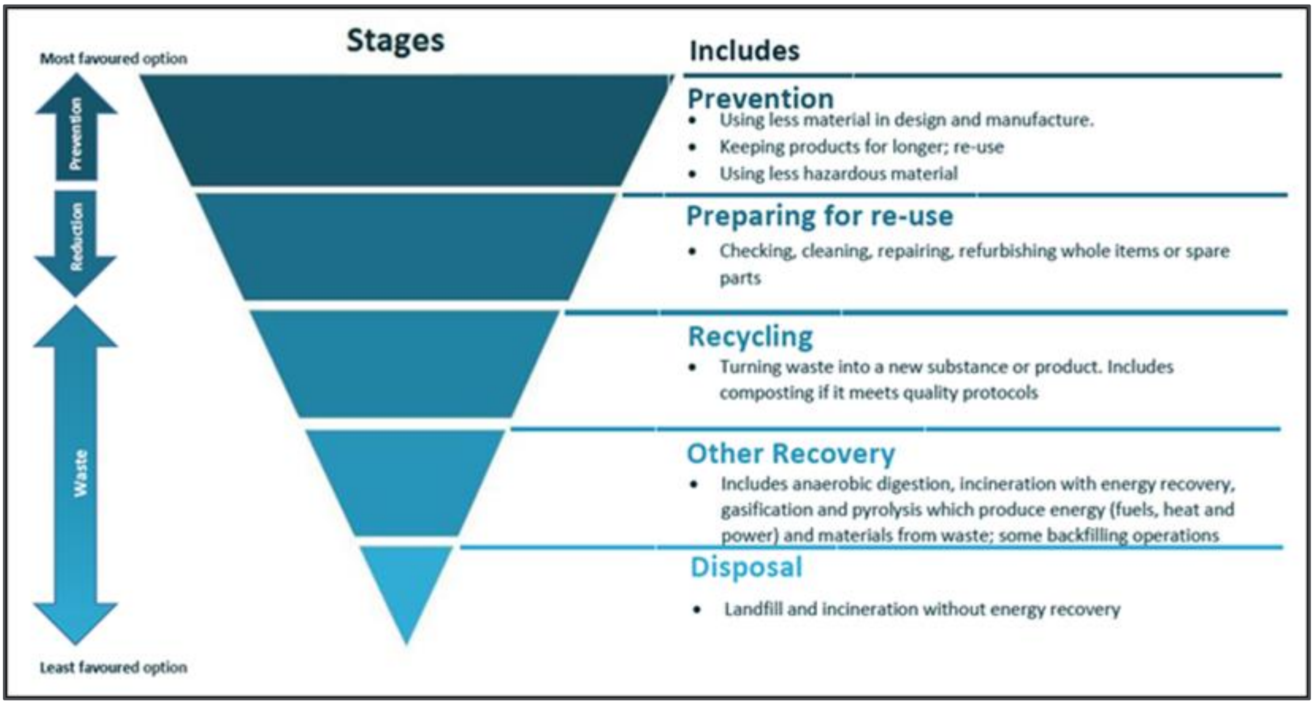


Figure 16 - The waste hierarchy

Materials

The Proposed Development is to upgrade parts of the existing building using high quality, low impact materials in order to minimise the overall impact on the environment as far as possible, and to be sympathetic to the architecture of the local area.

All timber materials for finishing elements will be sourced from FSC and/or PEFC sources and all other materials sourced from suppliers who have an accredited Environmental Management System (EMS) (ISO14001, BS8555 or BES6001) for the extraction and process stages of the material manufacturing, ensuring that any environmental impact caused by the building materials is analysed and mitigated where possible.

All timber and timber-based products used on-site will be legally sourced with appropriate Chain of Custody certification to confirm this.

As standard industry best-practice, all insulation on the site will have an Ozone Depletion Potential (ODP) of zero, and a Global Warming Potential (GWP) of <5, further minimising the Proposed Developments effect on global Climate Change.

Water

Areas of the South-East of England have been declared areas of 'serious water stress', particularly Greater London. Water is a vital resource and efficient usage should be encouraged in all new buildings. The Proposed Development aims to significantly reduce mains water use through a combination of efficiency measures, including the use of fittings with a low capacity or flow restrictors to reduce water use and PIR sensors linked to water shut-offs valves to reduce the chances of water waste.

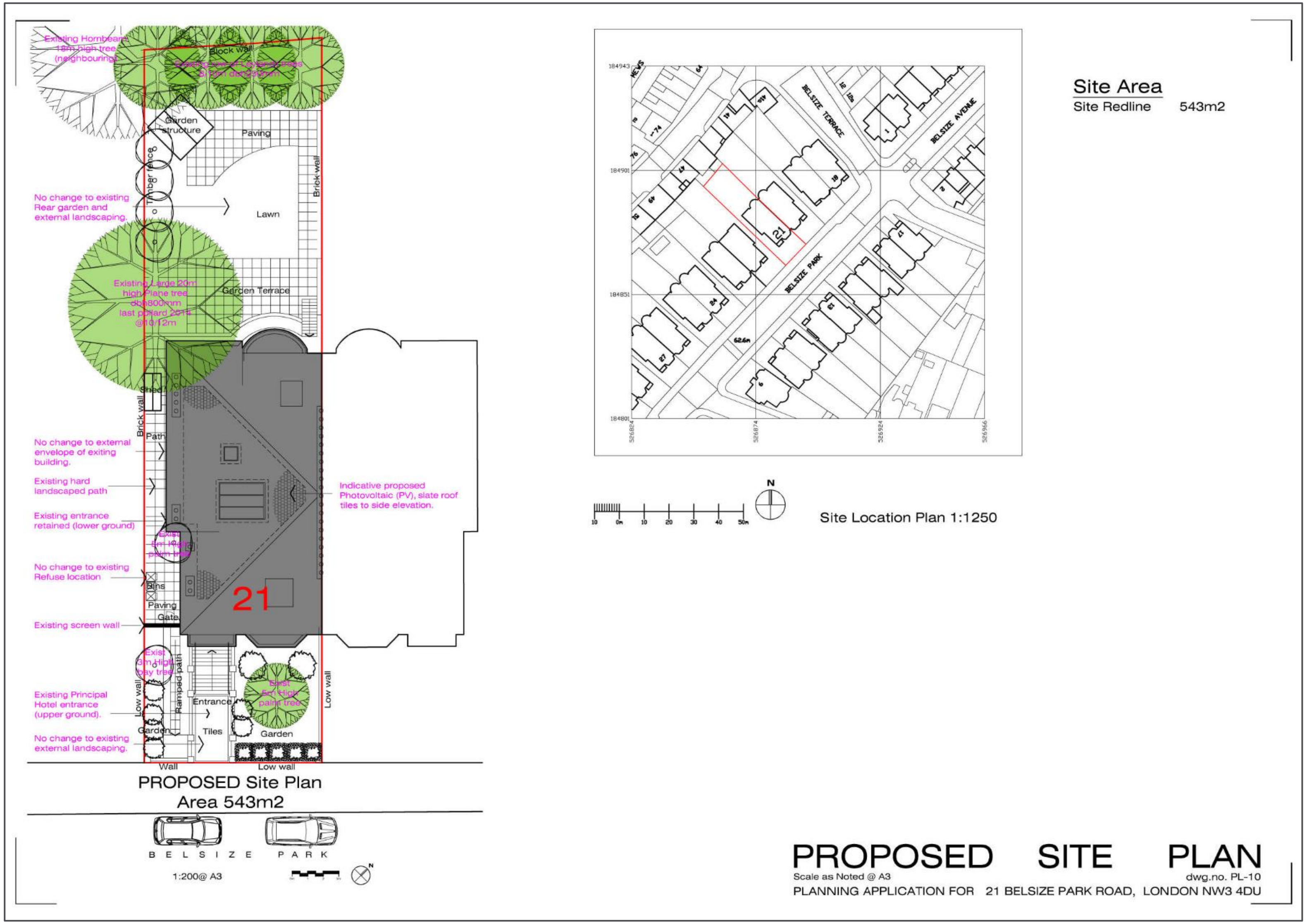
This scheme will implement the following strategy for water use reduction, and result in internal water use of <105 litres per person, per day, in line with best practice and planning policy requirements:

- W/Cs: Dual Flush 4/2.6 litres flush volume
- Baths: Max. 175 litres to overflow
- Showers: 8 litres/minute flow rate

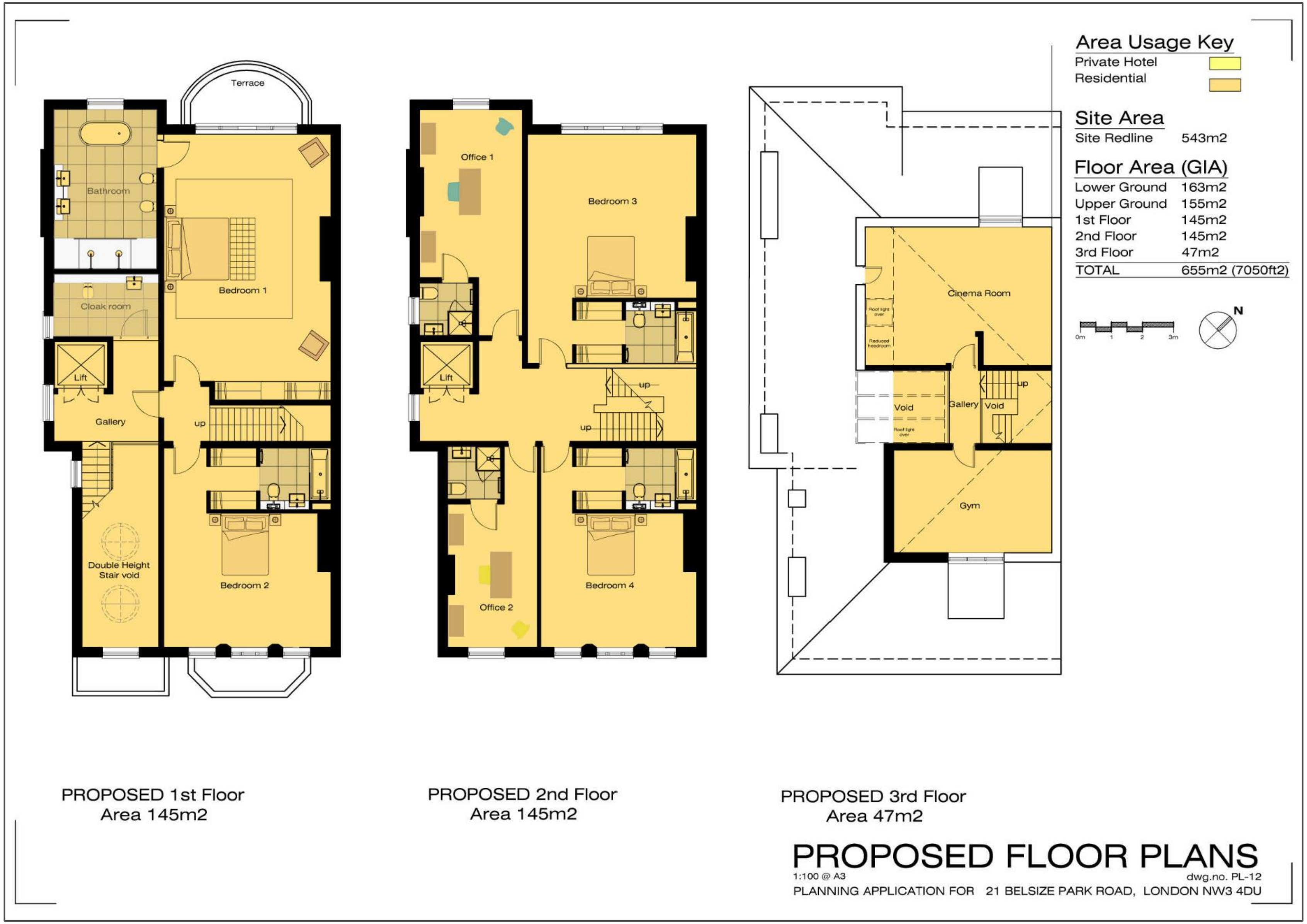
- Kitchen Taps: 5 litres/minute flow rate
- All Other Taps: 4 litres/minute flow rate
- Washing Machines: 8.17 litres/kg dry load water use
- Dishwashers: 1.25 litres/place setting water use

Appendices

Appendix A – Site Plan



Appendix B – Floor Plans


Area Usage Key
Private Hotel
Residential
Site Area
Site Redline 543m2
Floor Area (GIA)
Lower Ground 163m2
Upper Ground 155m2
1st Floor 145m2
2nd Floor 145m2
3rd Floor 47m2
TOTAL 655m2 (7050ft2)
N
Terrace
Bathroom
Bedroom 1
Cloak room
Lift
Gallery
up
Double Height Stair void
Bedroom 2
Office 1
Bedroom 3
Lift
up
up
Office 2
Bedroom 4
Cinema Room
Void
Gallery
Void
up
Gym
PROPOSED 1st Floor
Area 145m2
PROPOSED 2nd Floor
Area 145m2
PROPOSED 3rd Floor
Area 47m2
PROPOSED FLOOR PLANS
1:100 @ A3
dwg.no. PL-12
PLANNING APPLICATION FOR 21 BELSIZE PARK ROAD, LONDON NW3 4DU

Appendix C – SAP 2012 Summary Sheet

20211118 Building Performance Specification and SAP Summary Report_21 Belsize Park Part L1B V1RevB

21 Belsize Park, London

SRE

BRegs: L1B 2013

Option	Wall Type 1 - 2	Wall Type 3	Wall Type 4-5	Wall Type 6	Roof Type 1-2 & 5	Roof Type 3	Roof Type 4	Floor Type 1	Floor Type 2	New Windows/ Doors	Retained Windows	Retained Doors	Boiler	Secondary Heating	HW Cylinder	Renewables (PV)	Renewables (Area)	Heat Emitters	Mechanical Ventilation	SAP 2012 Improvement - Baseline to Lean	SAP 2012 Improvement - Lean to Green
Type	U Value	U Value	U Value	U Value	U Value	U Value	U Value	U Value	U Value	U Value	U Value	U Value	Make	Y/N	(litres)	(kWp)	m^2		Type	%	%
Semi-Detached House	1.7	0.26	0.28	2.5	0.68	0.18	0.16	0.41	0.3	1.4	4.8	3.0	Vaillant ecoFIT sustain 430	N	570.00	6.10	43.92	Radiators & Underfloor	n/a	20.45	12.13

Element	U Values	L1b Requirements	Description
Sand&Cement Rendered External Brick Wall Retained Wall Type 1	1.70	*1.70*	Solid Brick Wall (assumed 330mm) with sand and cement render
Brick Wall Retained Wall Type 2	1.70	*1.70*	Solid Brick Wall (assumed 330mm)
External Brick Wall Upgraded Wall Type 3	0.26	*0.30*	330mm Brick outer leaf, 25mm Low E unventilated cavity with softwood timber studs, 60mm Kingspan K112 Insulation (thermal conductivity of 0.018), 12.5mm Plasterboard - assumed by SRE
Boiler Room/Guest Bed 1 Wall Upgraded Wall Type 4	0.28	*0.30*	12.5mm Acoustic/fire resistance plasterboard, 90mm Brickshield Façade Ultra Insulation (thermal conductivity of 0.04), 25mm Low E cavity with softwood timber studs, 210mm Brick inner leaf (shelter resistance of 0.68 applied) - assume by SRE
Loft Dwarf Walls Upgraded Wall Type 5	0.28	*0.30*	180mm Mineral wool with softwood timber battens, 12.5mm Plasterboard - assumed by SRE
Dormer Cheeks Retained Wall Type 6	2.50	*2.50*	Timber framed dormer cheeks - assumed by SRE
Bay Windows Roof Retained Roof Type 1	0.68	*0.68*	Tiled Roof with felt, 10mm Plywood, 100mm Cavity with 50mm Insulation, 12.5mm Plasterboard - assume by SRE
Pitched Roof above Cinema Room Retained Roof Type 2	0.68	*0.68*	Tiled Roof with felt, 10mm Plywood, 100mm Cavity with 50mm Insulation, 12.5mm Plasterboard - assume by SRE
Pitched Roof Upgraded Roof Type 3	0.18	*0.18*	Tiled Roof with felt, 10mm Plywood, 50mm Slightly ventilated cavity with softwood timber studs, 50mm Rockwool Flexi with softwood timber studs, 12.5mm Plasterboard, 75mm Kingspan K118 Insulated board, 12.5mm Plasterboard - assume by SRE
Loft Insulation Upgraded Roof Type 4	0.16	*0.16*	50mm RW3 Rockwool Insulation with softwood timber studs, 160mm RW3 Rockwool Insulation, 12.5mm Plasterboard (shelter resistance of 0.50 applied) - assumed by SRE
Dormer Roof Retained Roof Type 5	0.68	*0.68*	Tiled Roof with felt, 10mm Plywood, 100mm Cavity with 50mm Insulation, 12.5mm Plasterboard - assume by SRE
Ground Floor Retained Floor Type 1	0.41	*0.41*	200mm Concrete Floor - assumed by SRE
Exposed Floor Retained Floor Type 2	0.34	*0.34*	7mm Floor covering, 22m chipboard flooring, 160mm Unventilated Cavity with softwood timber studs, 50mm Rockwool Flexi Insulation with softwood timber studs (shelter resistance of 0.68 applied), 12.5mm Acoustic/fire resistant plasterboard - assumed by SRE
Windows / Glazed Doors New	1.40	*1.60*	Double Glazed, LowE (Whole window U-Value of 1.4, g-value of 0.63 windows and 0.72 doors) - assumed by SRE
Windows / Glazed Doors Retained	4.80	*4.80*	Single Glazed, (Whole window U-Value of 4.8)
Roof Lights New	1.40	*1.60*	Double Glazed, LowE (Whole window U-Value of 1.4, g-value of 0.72) - assumed by SRE
Solid Door Retained	3.00	*3.00*	Solid door, U-value of 3
Solid Door New	1.40	*1.80*	Solid door, U-value of 1.4
Construction Details (PSI values)	-	-	**Non-standard Construction Details assumed** - therefore psi-values not assessed
Boiler	-	-	Gas Boiler - Vaillant ecoFIT sustain 430 VU 306/6-3 OV (H-GB) (SAP Efficiency: 89.8)
Controls	-	-	Time and Temperature Zone Control - assumed by SRE
Heating Emitters	-	-	Radiators and Underfloor Heating - assumed by SRE
HW Cylinder	-	-	570 Litre Hot Water Cylinder, Standing Heat Loss: 2.44kWh\day - assumed by SRE
Secondary Heating	-	-	n/a
Mechanical Ventilation	-	-	n/a
Lighting	-	-	100% Low Energy Lighting - CFL or LED - assumed by SRE
Renewables	-	-	Maximum 6.1kWp PV slate system proposed - equivalent to 244 slate panels (~0.18m² each) - on South-West facing roof with modest shading
Overheating	-	-	TBC from overheating study - based on SAP calculations windows have been modelled as slightly open with no significant risk of overheating
Notes			Architect to review above specification and state any products or build-ups that need to be changed

Sign Off of details	**Name**	**PP M Maclean**	**Date**	**18.11.2021**	**On behalf of the contractor/client:**	**Name**		**Date**	
	Sign	**(on behalf of SRE)**				**Sign**			

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18/11/2021

Appendix D – Unfeasible Low and Zero Carbon Technologies

Biomass Boiler

Biomass boilers generate heat from the burning of renewable or 'waste' fuels. They require a regular feed of fuel and regular heat demand to operate efficiently. A flue taller than the surrounding buildings must be incorporated into the design to minimise air pollution impacts at ground level from particulate emissions.

The use of a biomass boiler system to supply space heating and DHW has been deemed unsuitable due to the high level of particulates emitted from their use. The use of such a system would negatively impact the air quality of the surrounding area and furthermore, the site is within an Air Quality Management Area (AQMA) so biomass heating cannot be permitted.

Wind Power

Wind power is a developed and productive method of renewable energy generation, however the main limiting factor to its implementation is opposition at a local public and local government level.

To generate a meaningful amount of electricity, large-scale turbines are required which have noise and the visual impacts for the local area. The use of wind turbines has therefore been deemed unsuitable.

Solar Water Heating

Solar Water Heating (SWH) can be used to offset a proportion of the domestic hot water demand (DHW) within a building.

However, due to the limited available roof space available, it is believed this space would be better utilised for photovoltaics to minimise CO_2 emissions.

Ground Source Heat Pump

As with ASHP, ground source heat pump (GSHP) systems consume electricity in order to operate.

Beyond 1m below ground level, an average temperature of 15^{o}C is maintained throughout the year. Because of the ground's high thermal mass, it stores heat from the sun during the summer. GSHP can transfer this heat from the ground into a building to provide space heating by a similar process to an air source system.

Due to the Proposed Development being located within the 'Belsize Conservation Area', the installation of a GSHP would not be recommended due to the extensive groundworks needed to install either 'slinky' ground loops or 50-100m deep boreholes. Additionally, the primary heat source that GSHP relies on is solar derived, and since some areas of this site are shaded by existing trees, this could affect the 're-charge' rate of the ground within which the ground loop is laid. This can affect year-on-year CoPs, steadily increasing running costs and reducing CO_2 offset.

Appendix E – GLA SAP 10 tables

SAP10 PERFORMANCE

Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for domestic buildings

	Carbon Dioxide Emissions for domestic buildings (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	21	
After energy demand reduction	16	
After heat network / CHP	16	
After renewable energy	15	

Table 2: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for domestic buildings

	Regulated domestic carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Savings from energy demand reduction	4	20%
Savings from heat network / CHP	0	0%
Savings from renewable energy	1	5%
Cumulative on site savings	**5**	**25%**
Annual savings from off-set payment	15	-
	(Tonnes CO2)	
Cumulative savings for off-set payment	**463**	-
Cash in-lieu contribution (£)	**27,760**	

Option 1: Gas Boiler with PV slates

SAP10 PERFORMANCE

Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for domestic buildings

	Carbon Dioxide Emissions for domestic buildings (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	21	
After energy demand reduction	16	
After heat network / CHP	16	
After renewable energy	6	

Table 2: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for domestic buildings

	Regulated domestic carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Savings from energy demand reduction	4	20%
Savings from heat network / CHP	0	0%
Savings from renewable energy	10	49%
Cumulative on site savings	**14**	**70%**
Annual savings from off-set payment	6	-
	(Tonnes CO2)	
Cumulative savings for off-set payment	**186**	-
Cash in-lieu contribution (£)	**11,182**	

Option 2: ASHP with PV slates

SAP10 PERFORMANCE

Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for domestic buildings

	Carbon Dioxide Emissions for domestic buildings (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	21	
After energy demand reduction	16	
After heat network / CHP	16	
After renewable energy	6	

Table 2: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for domestic buildings

	Regulated domestic carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Savings from energy demand reduction	4	20%
Savings from heat network / CHP	0	0%
Savings from renewable energy	10	49%
Cumulative on site savings	**14**	**70%**
Annual savings from off-set payment	6	-
	(Tonnes CO2)	
Cumulative savings for off-set payment	**187**	-
Cash in-lieu contribution (£)	**11,201**	

Option 3: Integrated Gas Boiler & ASHP with PV slates

Appendix F – Urban Greening

SRE URBAN GREENING FACTOR CALCULATOR

London Plan 2021
Policy G5 Urban Greening:

A. Major development proposals should contribute to the greening of London by including urban greening as a fundamental element of site and building design, and by incorporating measures such as high-quality landscaping (including trees), green roofs, green walls and nature-based sustainable drainage.

B. Boroughs should develop an Urban Greening Factor (UGF) to identify the appropriate amount of urban greening required in new developments. The UGF should be based on the factors set out in Table 8.2, but tailored to local circumstances. In the interim, the Mayor recommends a target score of 0.4 for developments that are predominately residential, and a target score of 0.3 for predominately commercial development (excluding B2 and B8 uses).

C. Existing green cover retained on site should count towards developments meeting the interim target scores set out in (B) based on the factors set out in Table 8.2.

DEVELOPMENT TYPE:	Predominantly Residential			
Urban Greening Factor Target	From GLA			
PROJECT ADDRESS:	Version:	1	Rev:	A
Red Gables, Sanderstead, LB Croydon	DATE:		18.11.2021	

Surface Cover Type	UG Factor	Area (sqm)	UGF
Semi-natural vegetation (e.g. trees, woodland, species-rich grassland) maintained or established on site	1	126	126
Wetland or open water (semi-natural; not chlorinated) maintained or established on site.	1	0	0
Intensive green roof or vegetation over structure. Substrate minimum settled depth of 150mm – see livingroofs.org for descriptions.	0.8	0	0
Standard trees planted in connected tree pits with a minimum soil volume equivalent to at least two thirds of the projected canopy area of the mature tree – see Trees in Hard Landscapes for overview	0.8	0	0
Extensive green roof with substrate of minimum settled depth of 80mm (or 60mm beneath vegetation blanket) – meets the requirements of GRO Code 2014.C	0.7	0	0
Flower-rich perennial planting – see RHS perennial plants for guidance	0.7	0	0
Rain gardens and other vegetated sustainable drainage elements – See CIRIA for case-studies	0.7	0	0
Hedges (line of mature shrubs one or two shrubs wide) – see RHS for guidance	0.6	18.71	11.226
Standard trees planted in pits with soil volumes less than two thirds of the projected canopy area of the mature tree.	0.6	0	0
Green wall –modular system or climbers rooted in soil – see NBS Guide to Façade Greening for overview	0.6	0	0
Groundcover planting – see RHS Groundcover Plants for overview	0.5	0	0
Amenity grassland (species-poor, regularly mown lawn).	0.4	163.63	65.452
Extensive green roof of sedum mat or other lightweight systems that do not meet GRO Code 2014	0.3	0	0
Water features (chlorinated) or unplanted detention basins.	0.2	0	0
Permeable paving – see CIRIA for overview	0.1	93.6	9.36
Sealed surfaces (e.g. concrete, asphalt, waterproofing, stone).	0	75.61	0
SITE AREA:		477.55	sqm
Urban Greening Factor Target (From GLA)	0.4		
URBAN GREENING FACTOR	**0.444012145**		

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