

# Energy and Sustainability Statement

Alistair & Paula Flutter

11 & 11a View Road  
London Borough of Haringey  
N6 4DJ



| Version | Revision | Date       | Author          | Reviewer            | Project Manager |
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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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A large, teal-colored abstract graphic on the left side of the page. It consists of several overlapping geometric shapes, including a large rectangle with rounded corners and a smaller, more complex shape that fits into the top-left corner of the larger one. The overall effect is a modern, minimalist design element.

## Executive Summary

## Executive Summary

This Energy and Sustainability Statement has been written to demonstrate the measures incorporated into the design of the Proposed Development at 11 & 11a View Road, Haringey, London which will deliver lower energy and water use, lower carbon emissions and lower operational costs than a Building Regulations compliant design.

The energy strategy has been developed by following the GLA Energy Hierarchy of Lean, Clean, Green and Seen. The chosen energy strategy includes Lean passive and active design measures and Green LZC technologies to achieve a 75% improvement over Baseline CO<sub>2</sub> emissions.

| SAP 10    | Energy Hierarchy | CO <sub>2</sub> emissions (t/yr) | Improvement | Improvement over baseline |
|-----------|------------------|----------------------------------|-------------|---------------------------|
| Site-wide | Baseline         | 4.8                              |             |                           |
|           | Lean             | 3.3                              | 31.25%      | 31.25%                    |
|           | Clean            | 3.3                              | -           | 31.25%                    |
|           | Green            | 1.2                              | 63.64%      | 75%                       |

Table 1 - Summary of regulated carbon dioxide savings

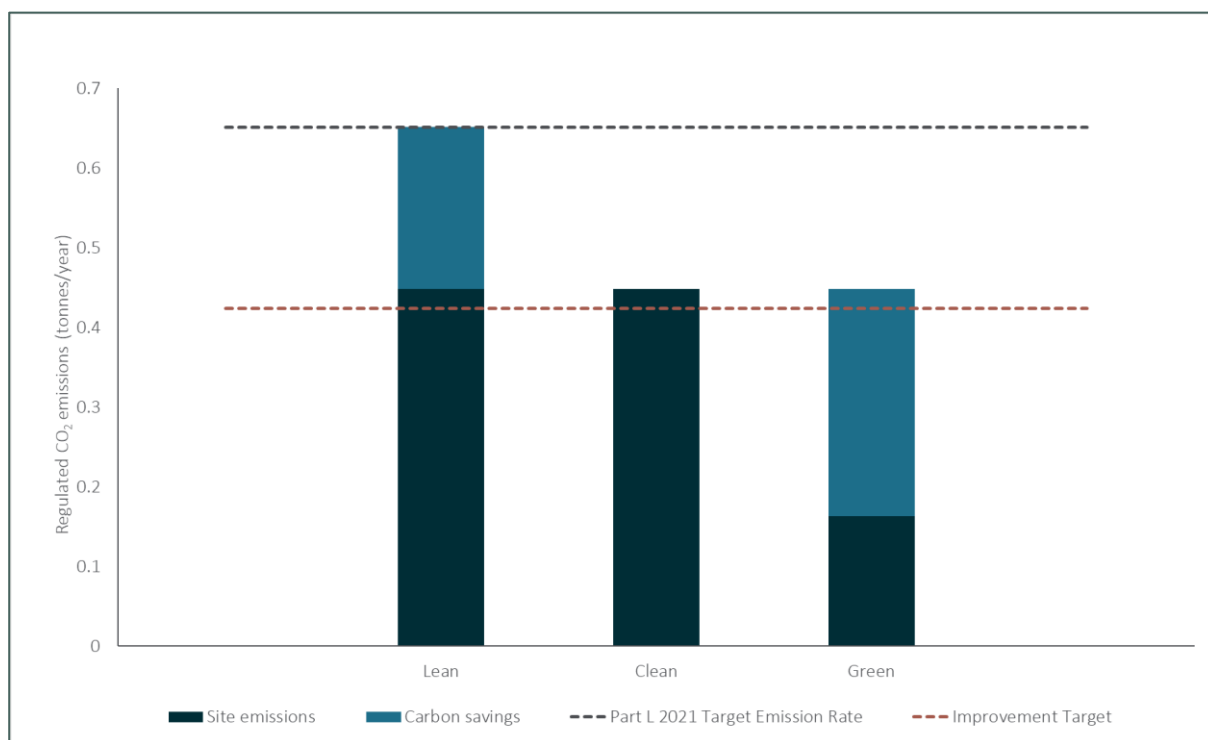


Figure 1 - Summary of regulated carbon dioxide savings

### Proposed Energy Strategy

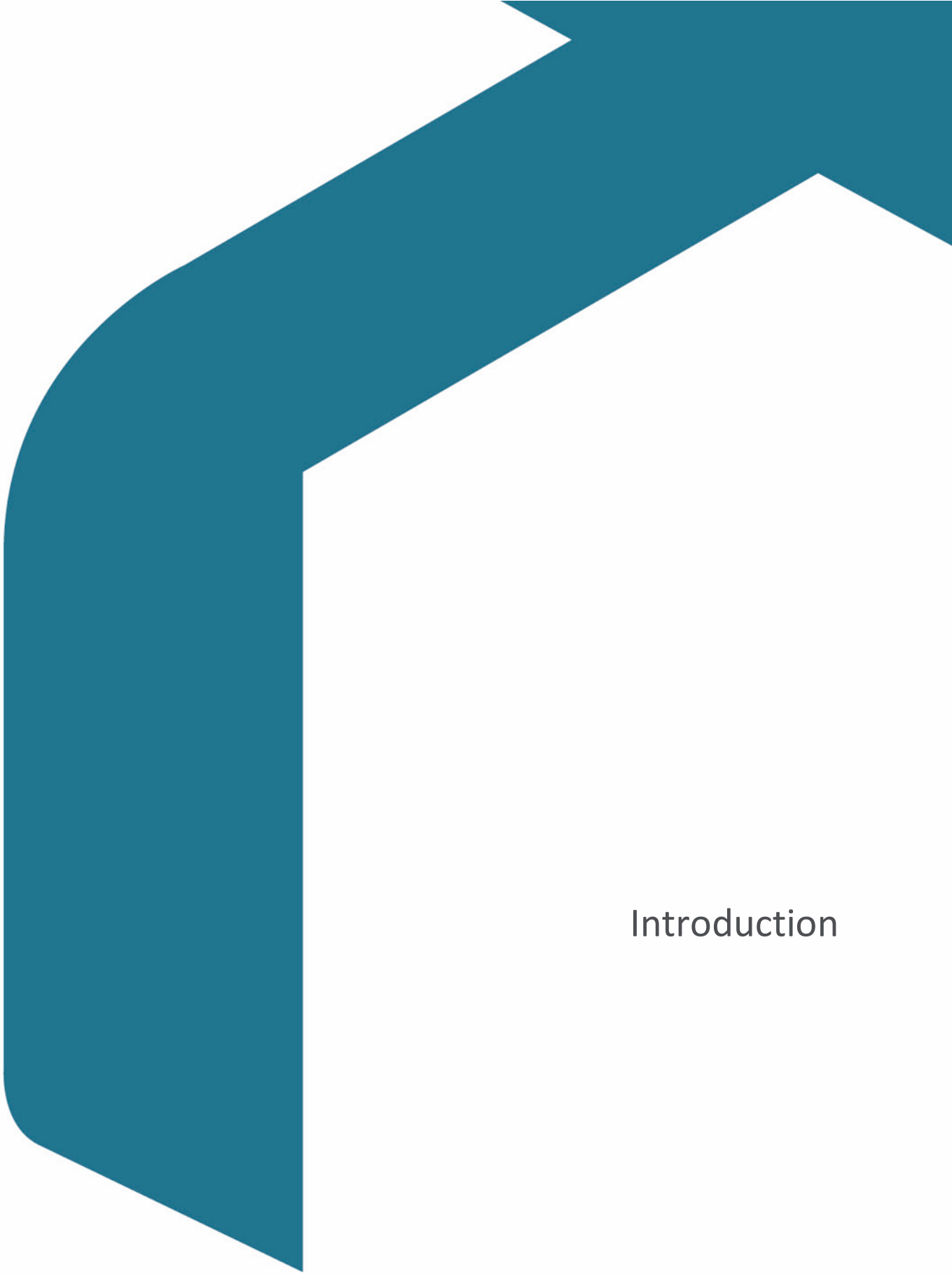
- Enhanced fabric efficiency
- Mechanical Ventilation with Heat Recovery (MVHR)
- Enhanced thermal bridging and air tightness values
- 100% low energy lighting
- High efficiency ASHP system to provide heating and domestic hot water
- Installation of a 4kWp PV array

|       | CO <sub>2</sub> emissions<br>(t/yr) | Fabric Energy<br>Efficiency<br>(kWh/m <sup>2</sup> /yr) | Primary Energy<br>Rate<br>(kWh/m <sup>2</sup> /yr) |
|-------|-------------------------------------|---------------------------------------------------------|----------------------------------------------------|
| Green | 1.2                                 | 40.91                                                   | 13.73                                              |

Table 2 - Green emissions summary

The scheme will be able to achieve an overall 75% improvement in CO<sub>2</sub> emissions when compared to a 2021 Building Regulations compliant scheme. As per the London Borough of Haringey Local Plan the residual emissions are required to offset, where a payment of £3420 will need to be made to the local Carbon Offset Fund.

The sustainability assessment with section 3.0 demonstrates how the design of the Proposed Development benefits the surrounding area environmentally along with complying with local planning policy.



## Introduction

## 1.0 Introduction

This Energy and Sustainability Statement has been written by SRE on behalf of Alistair & Paula Flutter (the Client) to demonstrate the measures incorporated into the design of 11 & 11a View Road, Haringey, London (the Proposed Development) which will deliver lower energy and water use, lower carbon emissions and lower operational costs than a Building Regulations 2021 Compliant design.

The statement compares the predicted actual building energy use with a Building Regulations compliant design, outlines passive and active design measures, and assesses 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 integrate with its surrounding environment within the context of sustainability to ensure it benefits the surrounding area socially, environmentally and economically.

The Proposed Development is located on View Road and consists of a three-storey house, on-site parking and associated landscaping.



Figure 2 – Street view of the proposed development (Charlton Brown Architects & Interiors)

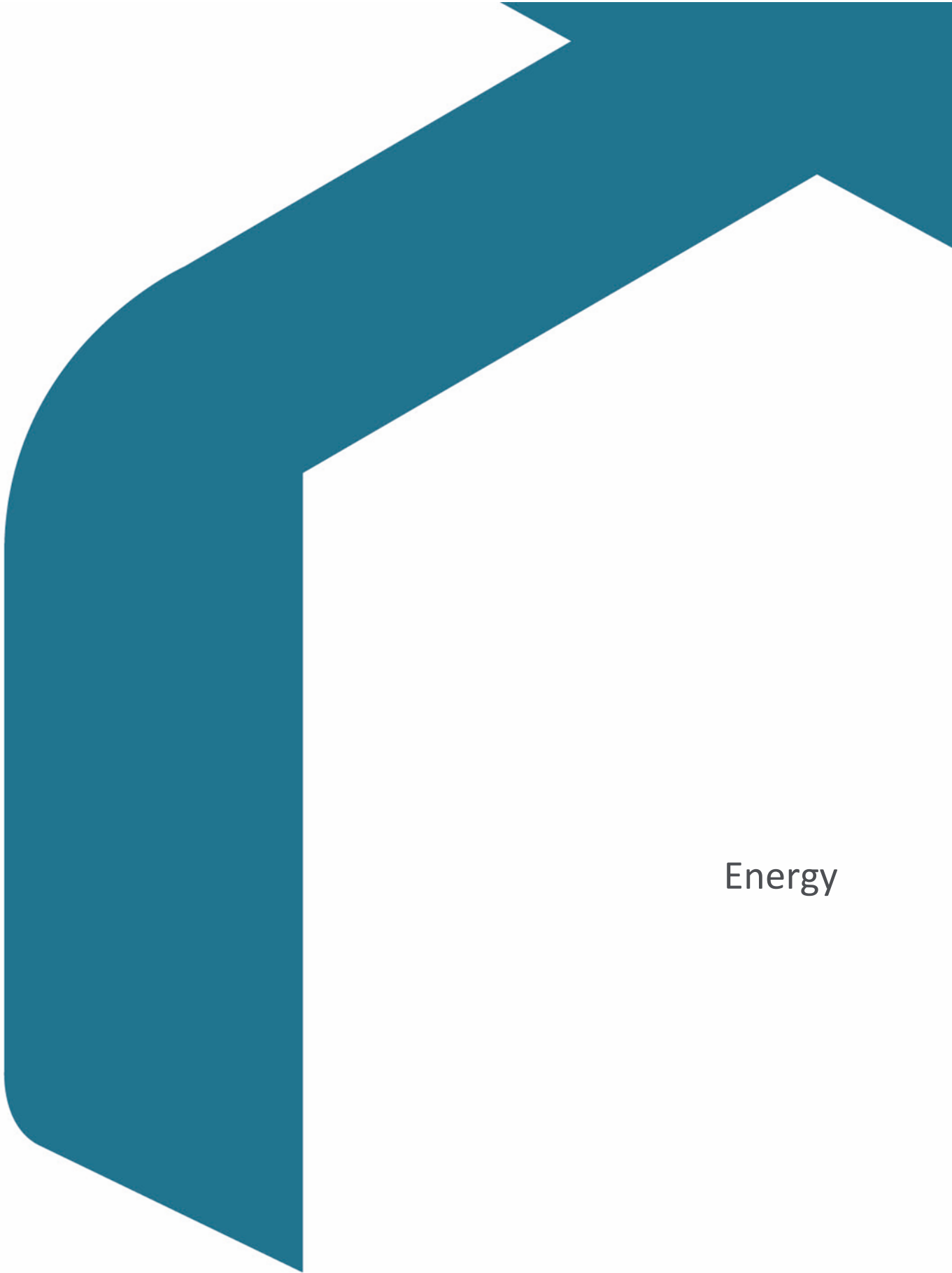
| Planning Policy                                           | Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Adopted London Borough of Haringey Local Plan (2013-2026) | <p><u>Policy SP4:</u></p> <p>In line with London Plan policy, the Council will promote and require all new developments to take measures to reduce energy use and carbon emissions during design, construction and occupation, by incorporating the following measures:</p> <p>a. From 2011 onwards, all new residential development will achieve a minimum 25% reduction in total (regulated) CO2 emissions in line with Code for Sustainable Homes Level 4 energy standards, and should aim to achieve Level 6. All new residential development shall be zero carbon from 2016 onwards; and</p> <p>b. From 2011 onwards all new non-residential development shall be built to at least BREEAM “very good” standard and should aim to achieve BREEAM “excellent” or the current nationally agreed standard. All new non-residential development shall be zero carbon from 2019.</p>                                                                                        |
|                                                           | <p>The Council will promote low- and zero-carbon energy generation through the following measures:</p> <p>a. Requiring all developments to assess, identify and implement, where viable, site-wide and area-wide decentralised energy facilities including the potential to link into a wider network;</p> <p>b. Establishing local networks of decentralised heat and energy facilities by requiring developers to prioritise connection to existing or planned networks where feasible;</p> <p>c. Working with neighbouring boroughs and other partners to explore ways of implementing sub-regional decentralised energy networks including the potential in the Upper Lee Valley Opportunity Area; and</p> <p>d. All new developments are required, where viable, to achieve a reduction in predicted carbon dioxide emissions of 20% from on-site renewable energy regeneration, which can include connections to local sources of decentralised renewable energy.</p> |
| Adopted London Plan (2021)                                | <u>Policy SI 2</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

|  |                                                                                                                                                                                                                                                                                                                                                              |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>A minimum on-site reduction of at least 35% beyond Building Regulations is required for major developments. Residential developments should achieve 10% through energy efficiency measures.</p> <p><u>Policy SI 4</u><br/>Minimising adverse impacts on the urban heat island through design, layout, orientation, materials and green infrastructure</p> |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Table 3 - Summary of local planning policy requirements

## 1.2 Applicability to Proposed Development

As this building is considered a minor development, it is not required to follow the London Plan Policy SI 2 but as per the London Borough of Haringey local plan new developments are required as of 2016 to demonstrate net-zero carbon dioxide emissions and should aim for code for sustainable homes level 6.

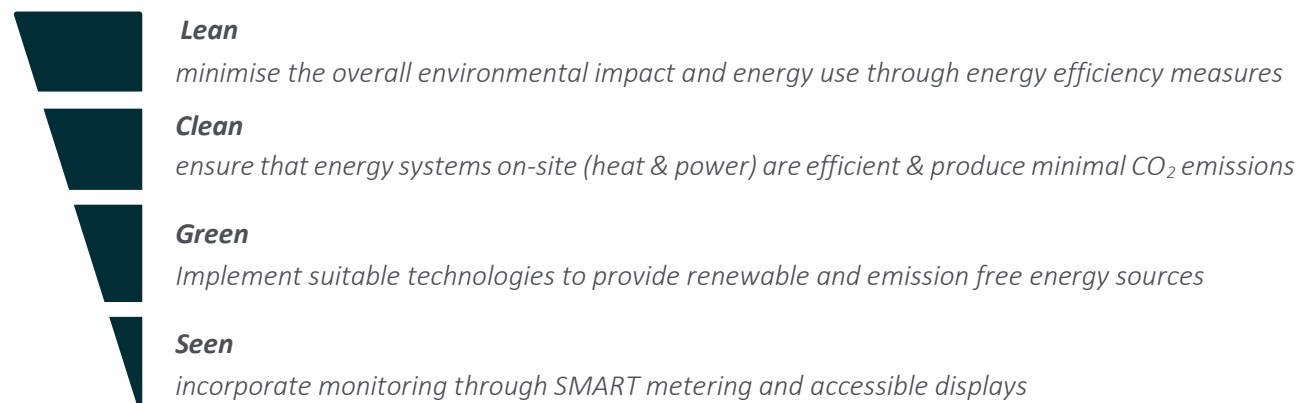


Energy

## 2.0 Energy

### 2.1 Method

The energy strategy design follows national policy guidance<sup>1</sup> and seeks to be:



The CO<sub>2</sub> Conversion Factors have been taken from the new Building Regulations 2021 which are based on standard yearly figures taken from the Government SAP Guidance<sup>2</sup> and outlined below in Table 3. Within the SAP10 modelling, the CO<sub>2</sub> conversion factor for electricity vary over the course of the year due to the changing mix of inputs to the electricity grid, i.e. increased PV generation in the summer months.

|                      | CO <sub>2</sub> Conversion Factor (kgCO <sub>2</sub> /kWh) |
|----------------------|------------------------------------------------------------|
| Electricity (mains)  | 0.136                                                      |
| Electricity (offset) | -0.136                                                     |
| Gas (mains)          | 0.210                                                      |

Table 4 - CO<sub>2</sub> conversion factors by energy source

The energy modelling for the Proposed Development has been calculated using SAP10 software in accordance with Building Regulations 2021 Part L V1<sup>3</sup>. The notional building provides the energy baseline and is the exact size and shape of the Proposed Development but is based on existing and notional U-values and heating specifications outlined in Approved Document L.

| SAP 10    | Energy Hierarchy | CO <sub>2</sub> emissions (t/yr) | Fabric Energy Efficiency (kWh/m <sup>2</sup> /yr) | Primary Energy Rate (kWh/m <sup>2</sup> /yr) |
|-----------|------------------|----------------------------------|---------------------------------------------------|----------------------------------------------|
| Site-wide | Baseline         | 4.8                              | 43.79                                             | 39.95                                        |

Table 5 - Baseline CO<sub>2</sub> emissions

<sup>1</sup>The New London Plan <https://www.london.gov.uk/what-we-do/planning/london-plan/new-london-plan>

<sup>2</sup>The Government Standard Assessment Procedure for Energy Rating of Dwellings Version 10.2 (Table 12, Pg 182): <https://files.bregroup.com/SAP/SAP%2010.2%20-%2017-12-2021.pdf>

<sup>3</sup> Approved Document Part L: Conservation of fuel and power, Volume 1: Dwellings

## 2.2 LEAN – Demand Reduction

Passive and active design measures have been incorporated as part of the Lean scenario, resulting in a 6.58% improvement in fabric energy efficiency above the Baseline scenario. With the new 2021 Building Regulations, the Notional specification includes PV therefore the GLA Carbon Emission Reporting spreadsheet has been used to calculate the Lean against baseline emissions without PV in the notional building

| SAP 10    | Energy Hierarchy | CO <sub>2</sub> emissions (t/yr) | Improvement |
|-----------|------------------|----------------------------------|-------------|
| Site-wide | Baseline         | 4.8                              |             |
|           | Lean             | 3.3                              | 31.25%      |

Table 6 - Lean CO<sub>2</sub> emissions and improvement over Baseline

| SAP 10    | Energy Hierarchy | Fabric Energy Efficiency (kWh/m <sup>2</sup> /yr) | Improvement |
|-----------|------------------|---------------------------------------------------|-------------|
| Site-wide | Baseline         | 43.79                                             |             |
|           | Lean             | 40.91                                             | 6.58%       |

Table 7 - Lean fabric performance over Baseline (Site-wide)

### 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 building orientation and design will maximise natural light and positive solar gains with glazing on the South, East and north elevations. Solar gains will be further controlled through Low E glazing. In order to address overheating risk the triple glazed windows will have a low g-value of 0.4

Proposed U-values are provided within Table 8. The overall building should have a relatively high thermal mass as construction will be load bearing masonry.

| Element                | Proposed (U-value) |
|------------------------|--------------------|
| External Walls         | 0.16               |
| Roof                   | 0.10               |
| Rooflights             | 1.20               |
| Windows and rooflights | 1.00               |
| External Doors         | 1.00               |
| Floors                 | 0.08               |

|                                     |                                        |
|-------------------------------------|----------------------------------------|
| Air Tightness @ 50 N/m <sup>2</sup> | 3 (m <sup>3</sup> /hr/m <sup>2</sup> ) |
| Thermal Bridge                      | Independently assessed                 |

Table 8 - 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, with a luminance efficacy of 85 lm/W. All external lighting will be positioned to avoid excessive light pollution and be supported by PIR/daylight sensor and time controls with a maximum lamp capacity of 150W (equivalent) for essential security lighting.

Time, temperature and optimum start/stop controls for heating system will be installed as a minimum to allow the control of individual zones/rooms throughout the building.

As part of the 'Lean' scenario and in line with the 'notional' building specification in SAP10 high efficiency gas boilers with time and temperature zone control have been modelled to provide heating and hot water<sup>4</sup>.

In modern air-tight buildings, careful consideration needs to be given to the specification of ventilation systems to ensure moisture is removed and ventilation standards are met to ensure a healthy standard of internal air.

Mechanical Extract Ventilation with Heat Recovery is provided to all continuously occupied and wet-rooms throughout the Proposed Development, along with passive trickle ventilation and openable windows providing fresh air.

Instantaneous electric showers are specified in order to minimise system losses and provide hot water at point of requirement.

### 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. High specification hot water cylinder installed with low heat loss. Low energy lighting throughout. |
| Reducing the amount of heat entering the building in summer                  | Low E glass windows with g-value of 0.40 are to be provided to minimize solar gain. All 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 high with some element of exposed mass.                                                                                              |

<sup>4</sup> The high efficiency gas boiler is proposed for only modelling the 'Lean' scenario. This system is not part of the final proposal.

|                     |                                                                                     |
|---------------------|-------------------------------------------------------------------------------------|
| Passive Ventilation | Openable windows will be provided to all rooms with potential for cross ventilation |
|---------------------|-------------------------------------------------------------------------------------|

Table 9 - Design measures following the cooling hierarchy

MVHR is to be installed within all the continuously occupied rooms to aid moisture removal and lower internal pollution levels; this would aid in bringing down initial temperatures.

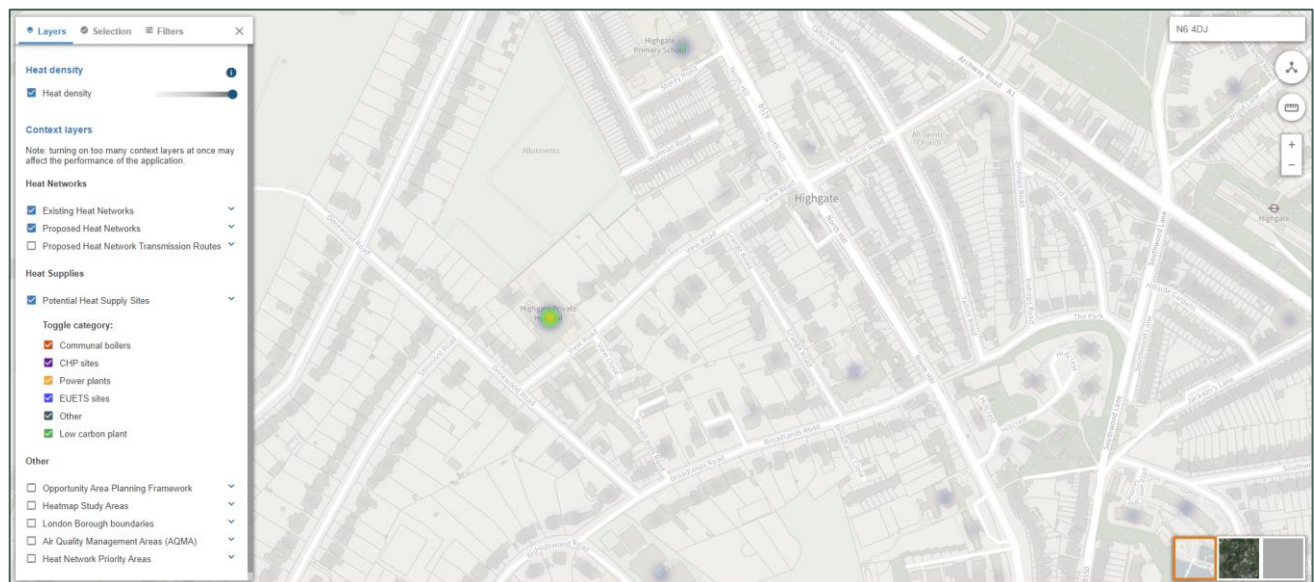
## 2.3 CLEAN – Heating Infrastructure

Due to the nature of the proposed development being a single dwelling, communal systems have not been suggested and it would be impractical. There is currently no present district heating network also; however the installation of a proposed wet system ASHP will allow for connection to a district heating network in the future should be present.

| SAP 10    | Energy Hierarchy | CO <sub>2</sub> emissions (t/yr) | Improvement |
|-----------|------------------|----------------------------------|-------------|
| Site-wide | Lean             | 3.3                              |             |
|           | Clean            | 3.3                              | -           |

Table 10 - Clean CO<sub>2</sub> emissions and improvement over Lean

### 2.3.1 District Heat Networks

Figure 3 - London Heat Map ([maps.london.gov.uk/heatmap/](https://maps.london.gov.uk/heatmap/))

The London Heat Map shows that the Proposed Development is within an area of high heat density and as such there is potential for a centralised district-heating network. While the area could benefit from the installation of a district-wide network, there is not yet one installed or planned. Therefore, the use of a building level centralised 'wet' system will allow easy adaptation to connect to a future network if it is installed in the area.

## 2.4 GREEN – Low Carbon and Renewable Energy

The addition of 'Green' technologies can provide a significant reduction in CO<sub>2</sub> emissions and enable the Proposed Development to surpass compliance over Baseline emissions by 75%. However as per the London Plan and London Borough of Haringey Policy SP4 new developments are to have net-zero carbon dioxide unless an offset payment is paid to the Local Council at a rate of £95 per tonne of CO<sub>2</sub>.

| SAP 10    | Energy Hierarchy | CO <sub>2</sub> emissions (t/yr) | Improvement |
|-----------|------------------|----------------------------------|-------------|
| Site-wide | Clean            | 3.3                              |             |
|           | Green            | 1.2                              | 63.64%      |

Table 11 - Green CO<sub>2</sub> 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). It is also important to note that the flow temperatures for ASHP systems is typically <45°C which is lower than that of a gas boiler system, and therefore these generally perform better with underfloor heating or when radiators are over-sized. The use of a centralised air source heat pump system has been proposed as a 'Green' LZC technology to provide space heating and hot water via a communal air-to-water heat pump system. ASHPs efficiently extract energy from the external air and transfer it to internal air/water for heating.

ASHPs tend to generate some noise and therefore will be located in a concealed acoustic enclosure on site to prevent visual impact or noise disturbances to the building's occupants. Specifications of the ASHP used for modelling has been specified in the summary sheet in Appendix B. The final ASHP chosen for installation will comply with the minimum standards outlined in the Enhanced Capital Allowances (ECA) product criteria and other relevant issues as outlined in the Microgeneration Certification Heat Pump Product Certification Requirements documents<sup>5</sup>

The installation of ASHP provides an overall improvement of 51.52% over the Clean.

<sup>5</sup> [www.mcscertified.com](http://www.mcscertified.com)

| SAP 10    | Energy Hierarchy  | CO <sub>2</sub> emissions (t/yr) | Improvement |
|-----------|-------------------|----------------------------------|-------------|
| Site-wide | Clean             | 3.3                              |             |
|           | Green (ASHP only) | 1.6                              | 51.52%      |

Table 12 - Green CO2 emissions and improvement over Baseline where no solar PV is present

### 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. The PV array would be connected into the electrical system via an inverter or series of inverters, depending on system size and setup.

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

Based on a 400W monocrystalline module (~1.7m<sup>2</sup> in area) there is the potential for 4kWp electricity to be installed. A pitch of 45 degrees has been assumed.

| Proposed Array (kWp) | Approximate no. Panels @400W | Active Area (m <sup>2</sup> ) | Pitch (degrees) | Orientation | Annual Generation (kWh/yr) |
|----------------------|------------------------------|-------------------------------|-----------------|-------------|----------------------------|
| 4                    | 10                           | 17                            | 45              | South       | 3,393                      |

Table 13 - Proposed PV Array Summary

### 2.4.3 Energy Storage

The development will have a battery energy store linked to the PV panels 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. This means building occupants can ultimately save money since grid energy can be stored at certain times of the day when it is cheaper.

Further to this an export cable can be installed within the Proposed Development allowing for energy not used in the development and not stored in the battery to be exported back into the grid at a set fee per kWh exported. The exact price per kWh exported will vary and is agreed upon by various providers of the scheme.

With the addition of Energy Storage, PV and export cable metering a total improvement of 63.64% can be achieved over the Clean scenario.

| SAP 10    | Energy Hierarchy | CO <sub>2</sub> emissions (t/yr) | Improvement |
|-----------|------------------|----------------------------------|-------------|
| Site-wide | Clean            | 3.3                              |             |
|           | Green            | 1.2                              | 63.64%      |

Table 14 - Green scenario improvements over the Clean scenario

#### 2.4.4 Carbon Offsetting

The London Borough of Haringey requires all developments to reach net zero CO<sub>2</sub> emissions or incur an offset fee of £95 per tonne of CO<sub>2</sub>. As the Proposed Development does not achieve net zero it will have to pay an offset payment of £3420

**Carbon Offset Payment: 1.2 tonnes \* £95 per ton \* 30 years = £3420**

#### 2.5 SEEN – In-use monitoring

The ‘Be Seen’ stage requires the monitoring and reporting of actual operational energy performance of major developments for at least five years.

This works to ensure the alignment of actual and estimated energy and carbon performance, as well as help identify methods for improving energy performance from the project inception stage and throughout the building’s lifetime.

The reporting of energy performance data should be reported in three stages. The legal owner of the development at each reporting stage is responsible for providing the data. This is summarised in below:

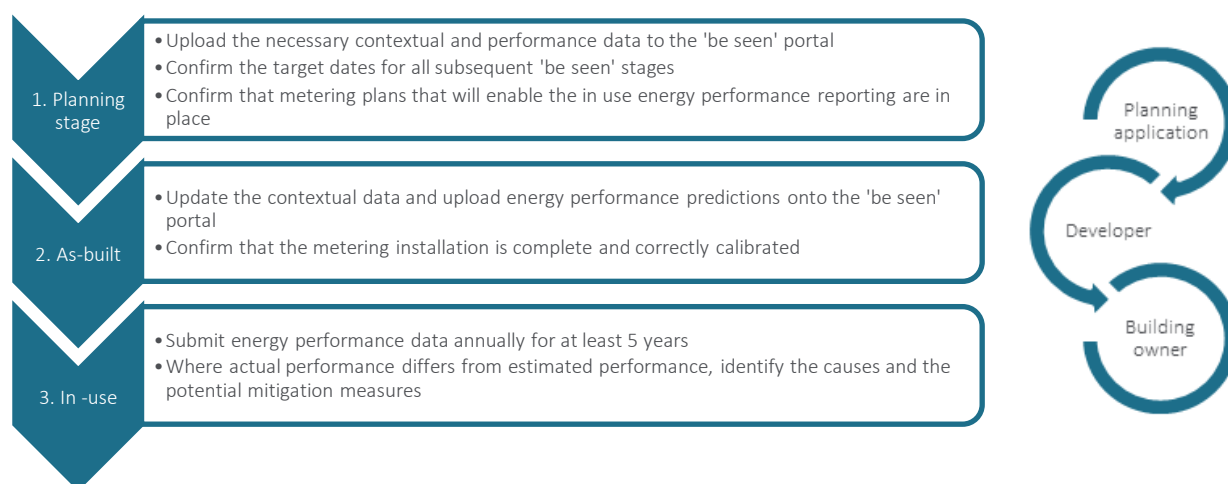


Figure 4 - 'Be Seen' process and responsibilities

At the planning stage reporting is done for the entire development as a whole, whereas at the as-built and in-use stages, the development is split into a number of ‘reportable units’ (RUs) which applicants will need to report against individually to allow comprehensive reporting.

Third-party quality assurance mechanisms should be adopted to ensure accuracy in submissions of both predicted and measured performance. The allocation of the same person/team/organisation from design to in-use operation who will oversee the monitoring process for all different stages and who will be familiar with the intricacies of each project would be beneficial.

Accurate estimates of performance indicators (summarised below) at each stage of the process (planning, as-built, and in-use) will be provided through the ‘Be Seen’ reporting webforms available on the webpage of GLA website<sup>6</sup>.

<sup>6</sup> ‘Be seen’ energy monitoring guidance | London City Hall

| Performance indicator group                                                                                   | Description                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <br>Contextual data          | Non-energy information such as data on location and typology/use of buildings.                                                                                                                                                                                                                                                                                            |
| <br>Building energy use      | The energy and fuel imports including data from national energy grids and district heating connections. This will enable the building owner to report on the amount of energy being consumed.                                                                                                                                                                             |
| <br>Renewable energy         | The renewable energy generation within the development will identify how much energy is being generated on-site and where this is used.                                                                                                                                                                                                                                   |
| <br>Energy storage equipment | Data on the building's energy storage equipment.                                                                                                                                                                                                                                                                                                                          |
| <br>Plant parameters       | The performance of heat or cooling generation plant within energy centres that form part of a development.                                                                                                                                                                                                                                                                |
| <br>Carbon emissions       | <p>The development's estimated carbon emissions at planning stage based on the appropriate carbon emission factors, as set out in the GLA's Energy Assessment Guidance.</p> <p>When on-site carbon reductions have been maximised, but a carbon shortfall still exists, the carbon offsetting contribution to the relevant local authority's fund should be reported.</p> |

Figure 5 - 'Be Seen' Performance indicator groups

The Proposed Development will be supplied with Smart Meters and a building energy management system (BEMS) along with associated internal energy displays. This will further improve energy efficiency by allowing building managers/occupants to observe their energy use in 'real time' and manage it more effectively.

## 2.6 Energy Conclusions

The Proposed Development will deliver passive and active energy demand reduction measures along with low and zero carbon technologies in order to reduce energy demand and associated CO<sub>2</sub> emissions resulting from the Proposed Development's operation.

The calculations undertaken demonstrate that the Proposed Development will successfully exceed Building Regulations Part L 2021 compliance by 75% and with an offset payment of £3420 to comply with the London Borough of Haringey local planning policy.

| SAP 10    | Energy Hierarchy | CO <sub>2</sub> emissions (t/yr) | Improvement (%) | Improvement over baseline (%) |
|-----------|------------------|----------------------------------|-----------------|-------------------------------|
| Site-wide | Baseline         | 4.8                              |                 |                               |
|           | Lean             | 3.3                              | 31.25%          | 31.25%                        |
|           | Clean            | 3.3                              | -               | 31.25%                        |
|           | Green            | 1.2                              | 63.64%          | 75%                           |

Table 15 - Summary of CO<sub>2</sub> emissions, incremental improvement and improvement over Baseline

## 2.7 Green Energy Strategy Summarised

The overall improvements provided by the scheme can be seen in Table 16, Table 17

| SAP 10    | Energy Hierarchy | CO <sub>2</sub> emissions (t/yr) | Improvement |
|-----------|------------------|----------------------------------|-------------|
| Site-wide | Baseline         | 4.8                              |             |
|           | Green            | 1.2                              | 75%         |

Table 16 - Summary of the Improvement of the Green Scenario over the Baseline scenario

| SAP 10    | Energy Hierarchy | Fabric Energy Efficiency (kWh/m <sup>2</sup> /yr) | Improvement |
|-----------|------------------|---------------------------------------------------|-------------|
| Site-wide | Baseline         | 43.79                                             |             |
|           | Green            | 40.91                                             | 6.58%       |

Table 17 - Summary of building fabric improvements over the Baseline scenario

| SAP 10    | Energy Hierarchy | Primary Energy Rate (kWh/m <sup>2</sup> /yr) | Improvement |
|-----------|------------------|----------------------------------------------|-------------|
| Site-wide | Baseline         | 39.95                                        |             |
|           | Green            | 13.73                                        | 65.63%      |

In delivering the Green energy strategy, the Proposed Development provides:

- Enhance fabric efficiency
- Mechanical Ventilation with Heat Recovery (MVHR)
- Enhanced thermal bridging and air tightness values
- 100% low energy lighting
- High efficiency ASHP system to provide heating and domestic hot water
- Installation of a 4kWp PV array

A large, teal-colored abstract graphic on the left side of the page. It consists of a thick, curved line that starts from the top left, curves downwards and to the right, and then continues as a straight line towards the bottom right. The shape is reminiscent of a stylized letter 'L' or a corner of a building.

Sustainability

### 3.0 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.”

#### 3.1 Pollution

##### Air

The Proposed Development will aim to limit its contribution to local air pollution by not installing gas boilers, rather installing heat pumps to provide heating and hot water, in addition to the installation of a PV array. The heat pump will emit no onsite NO<sub>x</sub> emissions but will consume grid electricity (when not consuming electricity generated by the PV). As the NO<sub>x</sub> 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 panels will decrease the import of electricity from the national grid and replace it with PV generated electricity which produces no emissions during operation.

The Proposed Development is located within a low NO<sub>x</sub> emissions area as defined by the UK NO<sub>x</sub> emissions map, see Figure 6.

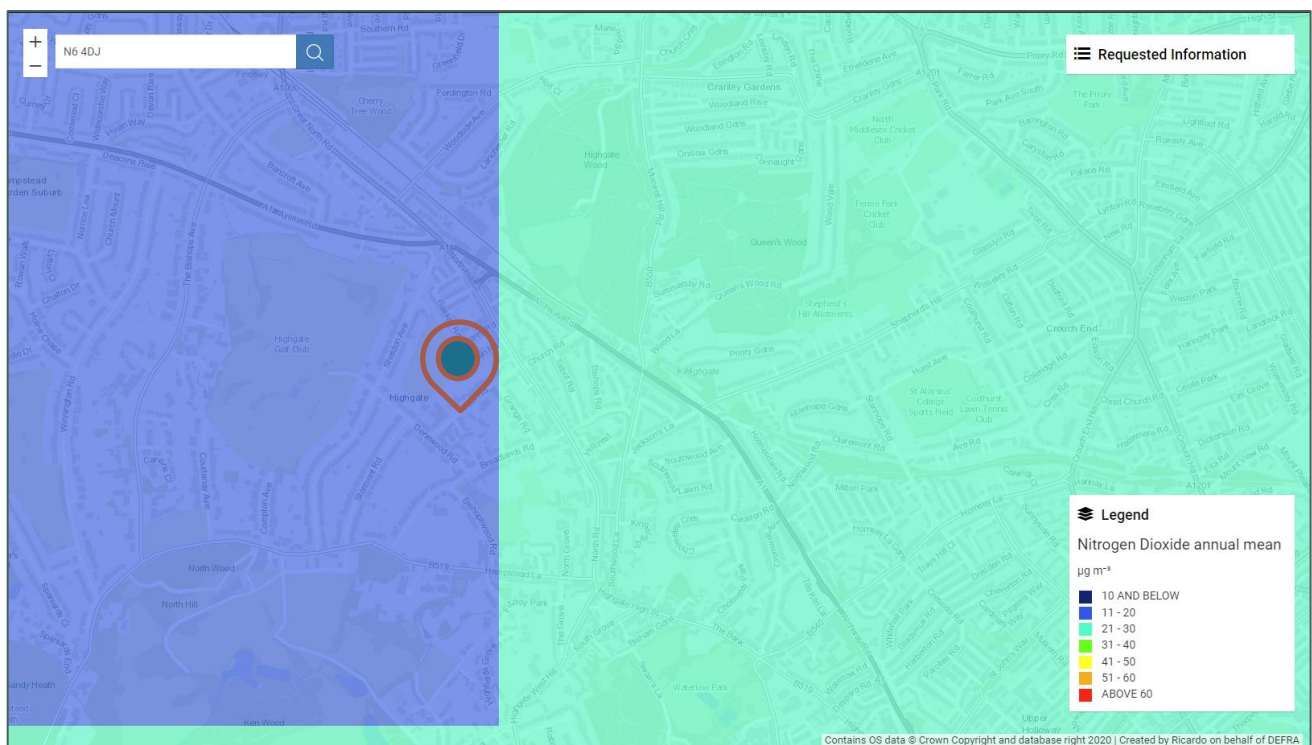


Figure 6 - UK Air Pollution Map showing pollution from Nitrogen Oxides as NO<sub>2</sub> (<https://uk-air.defra.gov.uk/data/gis-mapping/>)

## Noise

The installation of an Air Source Heat Pump will likely generate additional background noise in the Proposed Development. This noise can be mitigated with the installation of an acoustic enclosure over the ASHP. The acoustic enclosure will increase the overall size of the ASHP unit but will mitigate much of the additional noise.

## Light

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 focused and controlled.

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

## 3.2 Flood Risk

The selected site has no risk of flooding from rivers and seas (Figure 7) and while the surrounding area has several roads shown as at high risk of flooding from surface water, the roads adjacent are mainly at very low and low risk.

The actual site is not shown as at risk of flooding from surface water (Figure 8).

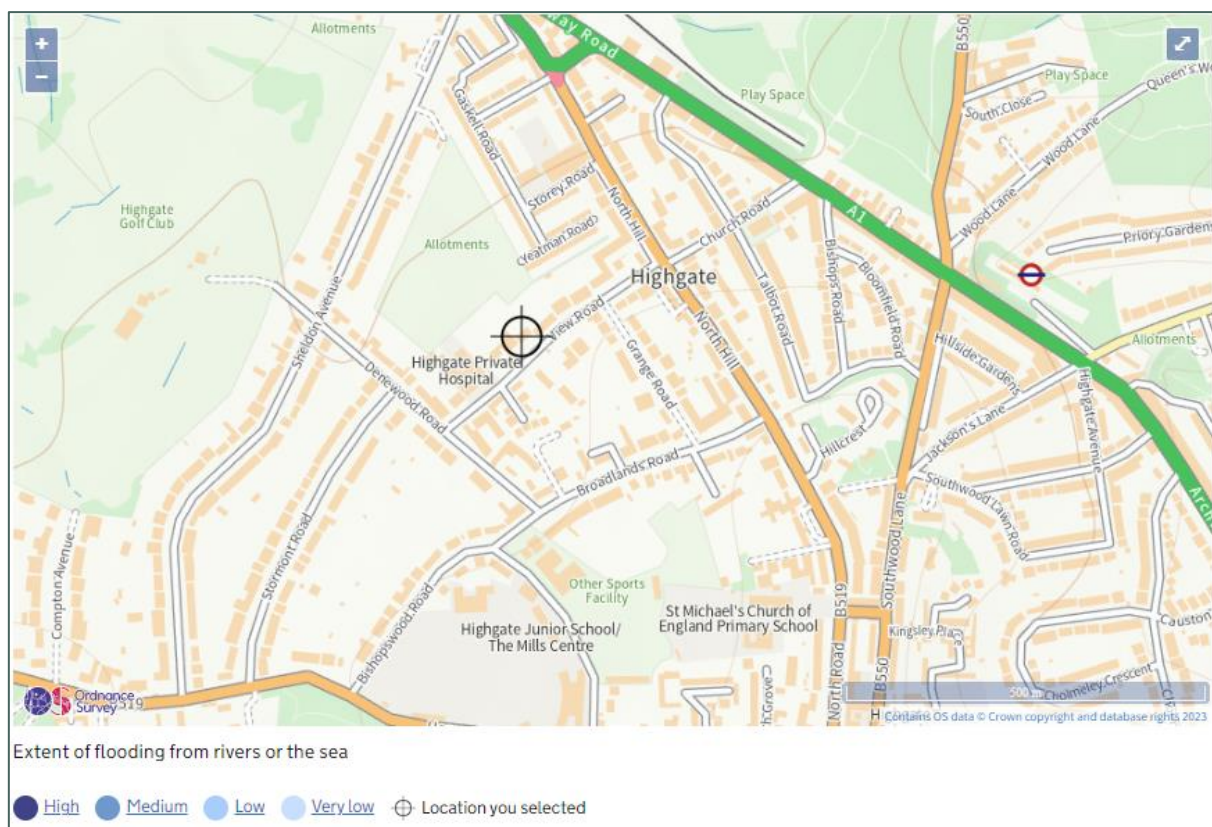


Figure 7 - Flood map showing risk of flooding from rivers or the sea (<https://flood-warning-information.service.gov.uk/long-term-flood-risk/map>)

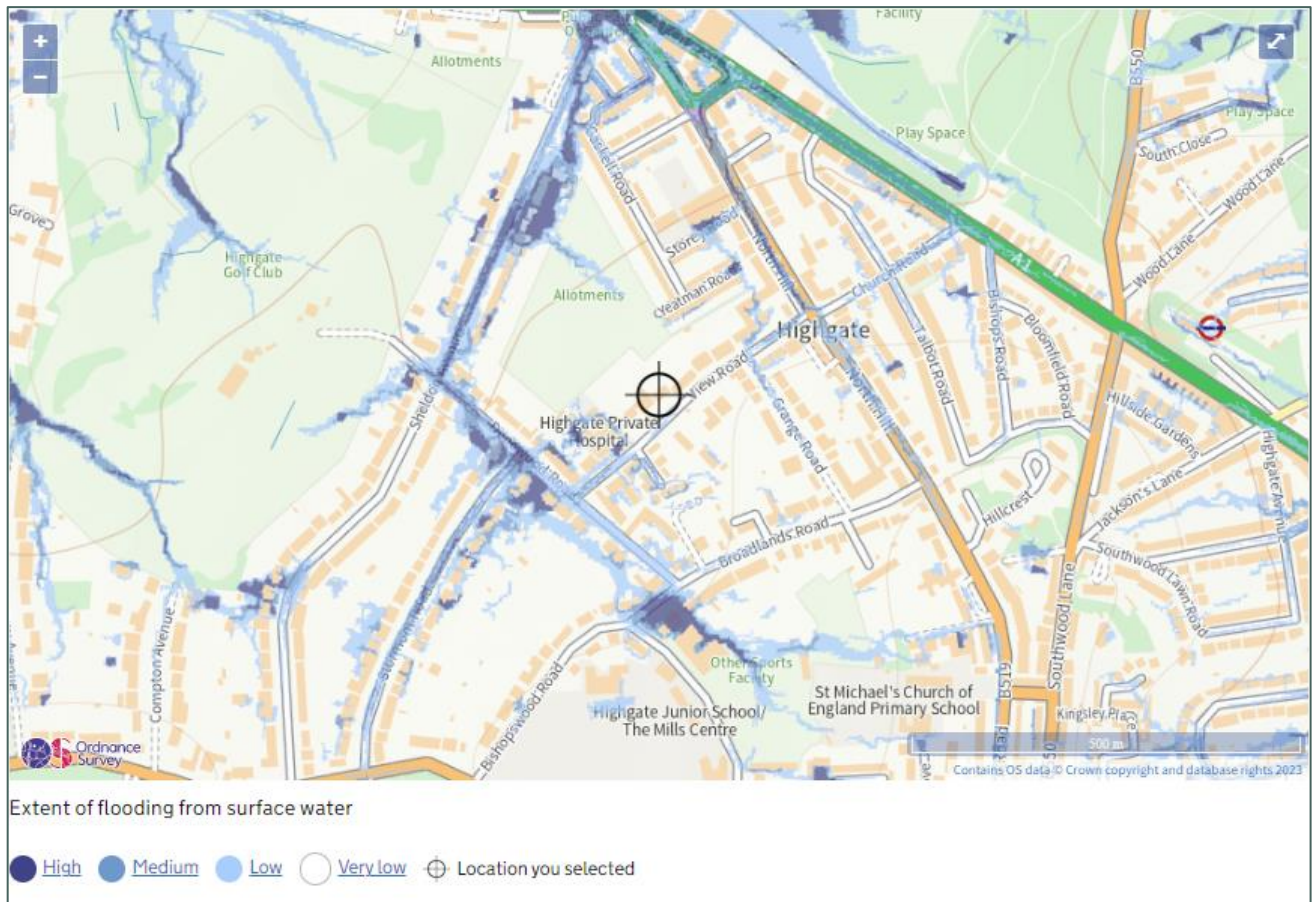


Figure 8 - Flood map showing risk of flooding from surface water (<https://flood-warning-information.service.gov.uk/long-term-flood-risk/map>)

In order to further reduce the risk of flooding the Proposed Development will have a soakaway in the rear garden along with permeable hard landscaping.

### 3.3 Transport

#### Public Transport

The site is in close proximity to multiple bus stops and is 0.5 miles from the Highgate tube station, allowing access to a variety of areas within London.

#### Parking

Within the development there is a garage containing space for a car and potential for cycle storage. Further to this, the garage contains an EV charging point to allow for the recharging of a possible EV.

### 3.4 Biodiversity

The Proposed Development will incorporate 35m<sup>2</sup> of green roof and install bat boxes to maintain and enhance the local biodiversity when compared to the current existing development.

### 3.5 Resource efficiency

#### Construction Phase Waste Management

The Proposed Development will aim to minimise the waste produced from the site during the construction phase through a mix of site policies and effective and efficient design and construction processes.

A comprehensive Construction Management Plan will be implemented from the outset of site works and will follow the principles of the waste hierarchy. Targets have been set in relation to volume of construction waste and diversion from landfill, with performance monitored by the Contractor to ensure exceedance of these levels is achieved.

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.

Reusing materials on site will reduce the embodied energy of the development through the reuse of the energy that exists in that material. Transportation of new material to the site will be reduced, thus reducing the CO<sub>2</sub> 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.

#### Resource Management

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.

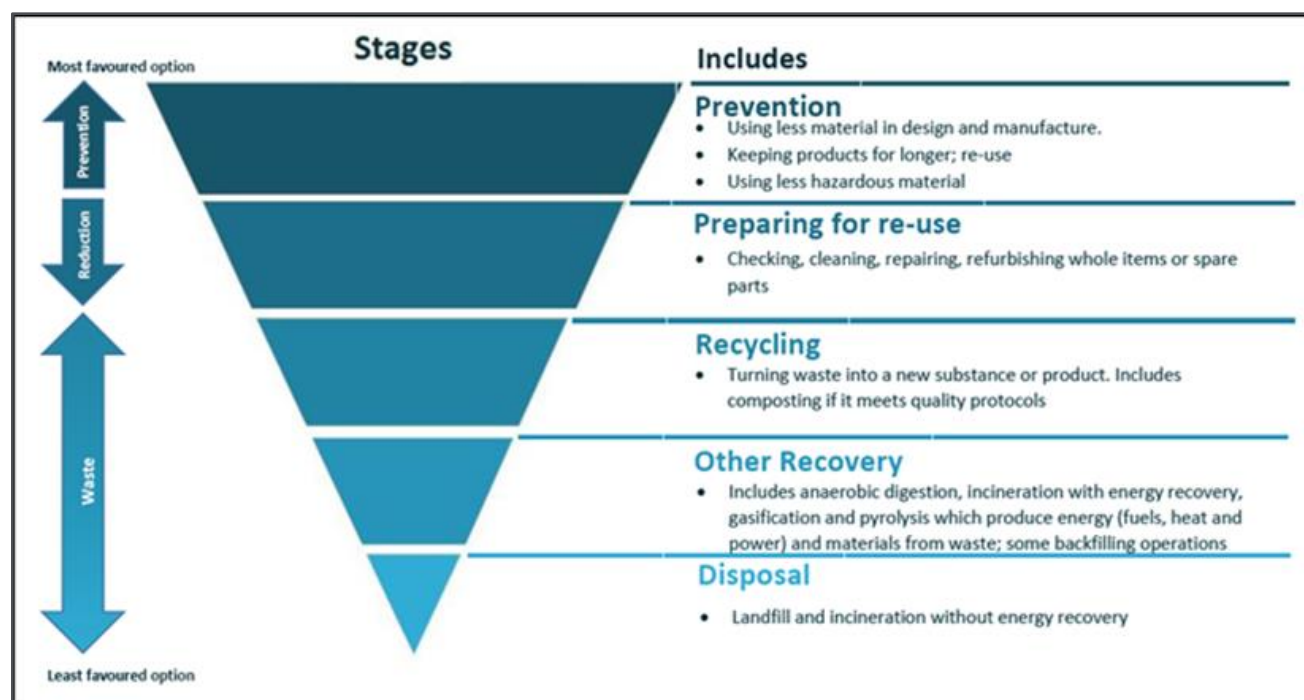


Figure 9 - The waste hierarchy

The overall management of the construction waste will be monitored through the Considerate Constructors Scheme as part of Best Practice Site Management.

## Materials

The Proposed Development is to use high quality, low impact materials in order to minimise the overall impact on the environment as far as possible. The form of construction is anticipated to be traditional at this stage.

All other materials will be 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 onsite will be legally sourced (FSC and/or PEFC) 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

The South East of England has been declared an area of 'serious water stress' by the Environment Agency. Climate change is the main driver creating unpredictable extreme weather conditions, making it difficult to plan for the future. Added to which, meeting the water demand of a growing UK population over the next 30 years means sourcing an extra 1 billion litres of water every day<sup>7</sup>.

Water is a vital resource and efficient usage should be encouraged in all new buildings. The average water consumption in London is 149 litres/person/day<sup>8</sup> – around 8 litres above the national average. As a result, the Proposed Development aims to significantly reduce mains water use through a combination of efficiency measures. This will include the use of fittings with a low capacity or flow restrictors.

Internal water use will be reduced in line with Local and Regional Planning policy and will result in an internal water use of <105 litres/person/day (exc. 5 litres/person/day for external use). Below is an indicative specification to meet these requirements:

- WCs: 4/2.6 litre Dual Flush -Full/Part volume
- Wash hand basin taps: 4 litres/minute
- Kitchenette taps (inc. utility): 6 litres/minute
- Showers: 6 litres/minute
- Baths: Max. 140 litres to overflow
- Washing Machines: Max. 8.17 litres/Kg dry load capacity
- Dishwashers: 1.25 litres/place setting

## Sustainability Summary

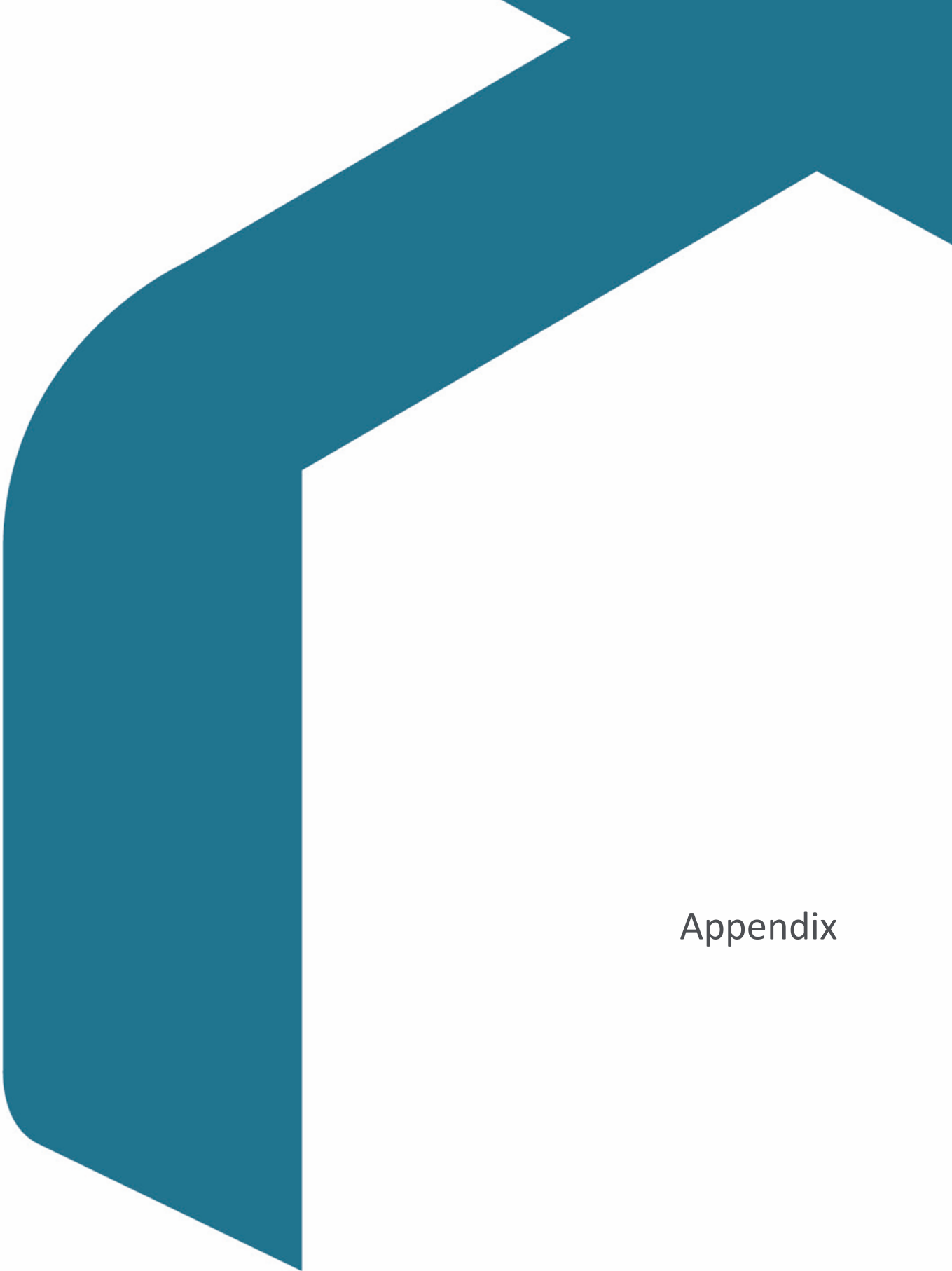
Through a considered approach to sustainability through all aspects of the scheme's design and conception, the Proposed Development will significantly reduce its overall impact on both the local and global environment.

Overall, the Proposed Development has aimed to significantly minimise its impact on the environment at both construction and operational phases and will provide a sustainable residential dwelling which responds positively to its surroundings, as well as Building Regulations and planning policies.

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<sup>7</sup> <https://www.gov.uk/government/publications/water-stressed-areas-2021-classification>

<sup>8</sup> [The New London Plan](#)

A large, teal-colored abstract graphic on the left side of the page. It consists of a thick, curved line that starts from the top left, curves downwards and to the right, then turns back to curve downwards and to the left, ending in a pointed shape at the bottom left. The rest of the page is white.

## Appendix

## Appendix A – Site Plan



## Appendix B – SAP Summary Sheet

| View Road (11), London                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 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-|---|-------------------------------------------------------------------|-------------|------|-------------------------------------------------------------------|-----------------------|------|-------------------------------------------------------------------|----------------|------|---------------------------------|-----------------------------------|---|-------------------------------------------------------------------------------------------------------------------|-----------|---|-------------------------------------------------|----------|---|-------------------------------------------------------|------------------|---|-----------|-------------|---|--------------------------|------|---|-----|-------------------|---|-----|------------------------|---|------------------------------------------------------------------------------------------------|----------------------|---|------------------------------------------------------------|----------|---|----------------------------------------------------------------------------------------|-------------------|---|-------------------------------------|--------------------------------|---|------------------------------------------------------------------------------------|-------------|---|-------------------------|-------------|---|-------------------------------|-------|---------------------------------------------------------------------------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---------------------|--|------|--|--------------|--|------|--|------------|--|------|--|------|--|--|--|--|--|--|--|--|--|--|--|------|--|--------------------|--|--|--|--|--|-------------------------------------|--|------|--|--|--|--|--|--|--|--|--|
| SRE Part 5 V1 2021                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     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 | Secondary Heating | HW Cylinder                         | Heat Loss | Smart Meter | Renewables (kW) | Number of Solar Panels | Battery Capacity (kWh) | Mechanical Ventilation | Air Permeability                  | DER vs TIER Improvement | DER vs TIER Improvement | DER vs TIER Improvement |         |          |             |               |      |                                                                                       |                                      |      |                                                                                                                                                                         |                                     |      |                                                                                                                           |              |      |                                                                                                                         |                             |   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 | Y/N               | (litres)                            | kWh/day   |             | (kWp)           | Qty.                   | N/A                    | Type                   | m <sup>3</sup> /hr/m <sup>2</sup> | %                       | %                       | %                       |         |          |             |               |      |                                                                                       |                                      |      |                                                                                                                                                                         |                                     |      |                                                                                                                           |              |      |                                                                                                                         |                             |   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| 11 View Road                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 0.16                                                                                              | 0.10                                                                                                                                                                    | 0.10                        | 0.08               | 1.00                 | 1.20        | 1.00          | Wet System 45C ASHP | N                 | 300                                 | 1.5       | Y           | 4kWp            | 10                     | 15                     | MVHR                   | 3                                 | 72.66                   | 6.58                    | 49.19                   |         |          |             |               |      |                                                                                       |                                      |      |                                                                                                                                                                         |                                     |      |                                                                                                                           |              |      |                                                                                                                         |                             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| <table border="1"> <thead> <tr> <th>Element</th> <th>U Values</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>External Wall</td> <td>0.16</td> <td>Brick outer leaf, unventilated 50mm air space, Kingspan K10B 100mm, plasterboard 25mm</td> </tr> <tr> <td>Pitched Roofs (insulated at rafters)</td> <td>0.10</td> <td>Softwood Timber + Ventilated Air Layer 50mm, Softwood Timber + Phenolic Insulation Board (0.018W/mK) 150mm, Vapour Membrane, Phenolic Insulation Board (0.018W/mK) 70mm</td> </tr> <tr> <td>Pitched Roofs (insulated at joists)</td> <td>0.10</td> <td>Phenolic Insulation Board (0.018W/mK) 275mm, Softwood Timber + Phenolic Insulation Board (0.018W/mK), plasterboard 12.5mm</td> </tr> <tr> <td>Ground Floor</td> <td>0.08</td> <td>Phenolic Insulation Board (0.018W/mK) 175mm, Thermalite Floorblock 200mm, Ventilated Air Layer 50mm, Concrete Slab 50mm</td> </tr> <tr> <td>Intermediate floor/ ceiling</td> <td>-</td> <td>25mm Plasterboard, metal stud, 10mm glass wool, 25mm Plasterboard</td> </tr> <tr> <td>Roof Lights</td> <td>1.20</td> <td>Double Glazed, Low E, Whole Window U-value of 1.20 (G-value 0.40)</td> </tr> <tr> <td>Windows &amp; Patio Doors</td> <td>1.00</td> <td>Triple Glazed, Low E, Whole Window U-value of 1.00 (G-value 0.40)</td> </tr> <tr> <td>Entrance Doors</td> <td>1.00</td> <td>External doors, U-value of 1.00</td> </tr> <tr> <td>Construction Details (PSI values)</td> <td>-</td> <td>PSI values have been determined using LAB3, and using Notional as a standard for independently assessed junctions</td> </tr> <tr> <td>Heat Pump</td> <td>-</td> <td>Samsung Electronics AE080KX0DEQ, Wet System 45c</td> </tr> <tr> <td>Controls</td> <td>-</td> <td>Programmer, Room thermostat and TRVs - Assumed by SRE</td> </tr> <tr> <td>Heating Emitters</td> <td>-</td> <td>Radiators</td> </tr> <tr> <td>HW Cylinder</td> <td>-</td> <td>300 L / 1.5 kWh/day loss</td> </tr> <tr> <td>WWHR</td> <td>N</td> <td>N/A</td> </tr> <tr> <td>Secondary Heating</td> <td>N</td> <td>N/A</td> </tr> <tr> <td>Mechanical Ventilation</td> <td>-</td> <td>Balanced Mechanical Ventilation with Heat Recovery (MVHR), modelled based Vectra MAXPLUS/BV/AT</td> </tr> <tr> <td>Pressure Test Method</td> <td>-</td> <td>Blower - Designed AP50.2 m<sup>3</sup>/hr/m<sup>2</sup></td> </tr> <tr> <td>Lighting</td> <td>-</td> <td>100% Low Energy Lighting - CFL or LED - Power: 10W, Efficacy: 85 lm/W, Capacity: 850lm</td> </tr> <tr> <td>Electrical Tariff</td> <td>-</td> <td>Assumed standard electricity tariff</td> </tr> <tr> <td>Renewables and Battery Storage</td> <td>-</td> <td>4kWp (17m<sup>2</sup> total area), 15 kWh battery capacity and Export Cable Meter</td> </tr> <tr> <td>Smart Meter</td> <td>-</td> <td>Smart meters are fitted</td> </tr> <tr> <td>Shower Type</td> <td>-</td> <td>Instantaneous electric shower</td> </tr> <tr> <td>Notes</td> <td colspan="20">GLA requires offset payments for buildings not achieving net zero carbon emissions @£95 per tonne</td> </tr> <tr> <td colspan="2">Sign Off of details</td> <td colspan="2">Name</td> <td colspan="2">PP M Maclean</td> <td colspan="2">Date</td> <td colspan="2">18.01.2023</td> <td colspan="2">Name</td> <td colspan="2">Date</td> <td colspan="2"></td> <td colspan="2"></td> <td colspan="2"></td> <td colspan="2"></td> </tr> <tr> <td colspan="2"></td> <td colspan="2">Sign</td> <td colspan="2">(on behalf of SRE)</td> <td colspan="2"></td> <td colspan="2"></td> <td colspan="2">On behalf of the contractor/client:</td> <td colspan="2">Sign</td> <td colspan="2"></td> <td colspan="2"></td> <td colspan="2"></td> <td colspan="2"></td> </tr> </tbody> </table> |                                                                                                   |                                                                                                                                                                         |                             |                    |                      |             |               |                     |                   |                                     |           |             |                 |                        |                        |                        |                                   |                         |                         |                         | Element | U Values | Description | External Wall | 0.16 | Brick outer leaf, unventilated 50mm air space, Kingspan K10B 100mm, plasterboard 25mm | Pitched Roofs (insulated at rafters) | 0.10 | Softwood Timber + Ventilated Air Layer 50mm, Softwood Timber + Phenolic Insulation Board (0.018W/mK) 150mm, Vapour Membrane, Phenolic Insulation Board (0.018W/mK) 70mm | Pitched Roofs (insulated at joists) | 0.10 | Phenolic Insulation Board (0.018W/mK) 275mm, Softwood Timber + Phenolic Insulation Board (0.018W/mK), plasterboard 12.5mm | Ground Floor | 0.08 | Phenolic Insulation Board (0.018W/mK) 175mm, Thermalite Floorblock 200mm, Ventilated Air Layer 50mm, Concrete Slab 50mm | Intermediate floor/ ceiling | - 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| Element                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                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| External Wall                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 0.16                                                                                              | Brick outer leaf, unventilated 50mm air space, Kingspan K10B 100mm, plasterboard 25mm                                                                                   |                             |                    |                      |             |               |                     |                   |                                     |           |             |                 |                        |                        |                        |                                   |                         |                         |                         |         |          |             |               |      |                                                                                       |                                      |      |                                                                                                                                                                         |                                     |      |                                                                                                                           |              |      |                                                                                                                         |                             |   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| Pitched Roofs (insulated at rafters)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0.10                                                                                              | Softwood Timber + Ventilated Air Layer 50mm, Softwood Timber + Phenolic Insulation Board (0.018W/mK) 150mm, Vapour Membrane, Phenolic Insulation Board (0.018W/mK) 70mm |                             |                    |                      |             |               |                     |                   |                                     |           |             |                 |                        |                        |                        |                                   |                         |                         |                         |         |          |             |               |      |                                                                                       |                                      |      |                                                                                                                                                                         |                                     |      |                                                                                                                           |              |      |                                                                                                                         |                             |   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| Pitched Roofs (insulated at joists)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 0.10                                                                                              | Phenolic Insulation Board (0.018W/mK) 275mm, Softwood Timber + Phenolic Insulation Board (0.018W/mK), plasterboard 12.5mm                                               |                             |                    |                      |             |               |                     |                   |                                     |           |             |                 |                        |                        |                        |                                   |                         |                         |                         |         |          |             |               |      |                                                                                       |                                      |      |                                                                                                                                                                         |                                     |      |                                                                                                                           |              |      |                                                                                                                         |                             |   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| Ground Floor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 0.08                                                                                              | Phenolic Insulation Board (0.018W/mK) 175mm, Thermalite Floorblock 200mm, Ventilated Air Layer 50mm, Concrete Slab 50mm                                                 |                             |                    |                      |             |               |                     |                   |                                     |           |             |                 |                        |                        |                        |                                   |                         |                         |                         |         |          |             |               |      |                                                                                       |                                      |      |                                                                                                                                                                         |                                     |      |                                                                                                                           |              |      |                                                                                                                         |                             |   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| Intermediate floor/ ceiling                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | -                                                                                                 | 25mm Plasterboard, metal stud, 10mm glass wool, 25mm Plasterboard                                                                                                       |                             |                    |                      |             |               |                     |                   |                                     |           |             |                 |                        |                        |                        |                                   |                         |                         |                         |         |          |             |               |      |                                                                                       |                                      |      |                                                                                                                                                                         |                                     |      |                                                                                                                           |              |      |                                                                                                                         |                             |   |                                                                   |             |      |                                                                   |                       |      |                                                                   |                |      |                                 |                                   |   |                                                                                                                   |           |   |                                                 |          |   |                                                       |                  |   |           |             |   |                          |      |   |     |                   |   |     |                        |   |                                                                                                |                      |   |                                                            |          |   |                                                                                        |                   |   |                                     |                                |   |                                                                                    |             |   |                         |             |   |                               |       |                                                                                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                     |  |      |  |              |  |      |  |            |  |      |  |      |  |  |  |  |  |  |  |  |  |  |  |      |  |                    |  |  |  |  |  |                                     |  |      |  |  |  |  |  |  |  |  |  |
| Roof Lights                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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 |                   |                                     |           |             |                 |                        |                        |                        |                                   |                         |                         |                         |         |          |             |               |      |                                                                                       |                                      |      |                                                                                                                                                                         |                                     |      |                                                                                                                           |              |      |                                                                                                                         |                             |   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| Windows & Patio Doors                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  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 |                   |                                     |           |             |                 |                        |                        |                        |                                   |                         |                         |                         |         |          |             |               |      |                                                                                       |                                      |      |                                                                                                                                                                         |                                     |      |                                                                                                                           |              |      |                                                                                                                         |                             |   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| Entrance Doors                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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| Construction Details (PSI values)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | -                                                                                                 | PSI values have been determined using LAB3, and using Notional as a standard for independently assessed junctions                                                       |                             |                    |                      |             |               |                     |                   |                                     |           |             |                 |                        |                        |                        |                                   |                         |                         |                         |         |          |             |               |      |                                                                                       |                                      |      |                                                                                                                                                                         |                                     |      |                                                                                                                           |              |      |                                                                                                                         |                             |   |                                                                   |             |      |                                                                   |                       |      |                                                                   |                |      |                                 |                                   |   |                                                                                                                   |           |   |                                                 |          |   |                                                       |                  |   |           |             |   |                          |      |   |     |                   |   |     |                        |   |                                                                                                |                      |   |                                                            |          |   |                                                                                        |                   |   |                                     |                                |   |                                                                                    |             |   |                         |             |   |                               |       |                                                                                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                     |  |      |  |              |  |      |  |            |  |      |  |      |  |  |  |  |  |  |  |  |  |  |  |      |  |                    |  |  |  |  |  |                                     |  |      |  |  |  |  |  |  |  |  |  |
| Heat Pump                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | -                                                                                                 | Samsung Electronics AE080KX0DEQ, Wet System 45c                                                                                                                         |                             |                    |                      |             |               |                     |                   |                                     |           |             |                 |                        |                        |                        |                                   |                         |                         |                         |         |          |             |               |      |                                                                                       |                                      |      |                                                                                                                                                                         |                                     |      |                                                                                                                           |              |      |                                                                                                                         |                             |   |                                                                   |             |      |                                                                   |                       |      |                                                                   |                |      |                                 |                                   |   |                                                                                                                   |           |   |                                                 |          |   |                                                       |                  |   |           |             |   |                          |      |   |     |                   |   |     |                        |   |                                                                                                |                      |   |                                                            |          |   |                                                                                        |                   |   |                                     |                                |   |                                                                                    |             |   |                         |             |   |                               |       |                                                                                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                     |  |      |  |              |  |      |  |            |  |      |  |      |  |  |  |  |  |  |  |  |  |  |  |      |  |                    |  |  |  |  |  |                                     |  |      |  |  |  |  |  |  |  |  |  |
| Controls                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | -                                                                                                 | Programmer, Room thermostat and TRVs - Assumed by SRE                                                                                                                   |                             |                    |                      |             |               |                     |                   |                                     |           |             |                 |                        |                        |                        |                                   |                         |                         |                         |         |          |             |               |      |                                                                                       |                                      |      |                                                                                                                                                                         |                                     |      |                                                                                                                           |              |      |                                                                                                                         |                             |   |                                                                   |             |      |                                                                   |                       |      |                                                                   |                |      |                                 |                                   |   |                                                                                                                   |           |   |                                                 |          |   |                                                       |                  |   |           |             |   |                          |      |   |     |                   |   |     |                        |   |                                                                                                |                      |   |                                                            |          |   |                                                                                        |                   |   |                                     |                                |   |                                                                                    |             |   |                         |             |   |                               |       |                                                                                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                     |  |      |  |              |  |      |  |            |  |      |  |      |  |  |  |  |  |  |  |  |  |  |  |      |  |                    |  |  |  |  |  |                                     |  |      |  |  |  |  |  |  |  |  |  |
| Heating Emitters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | -                                                                                                 | Radiators                                                                                                                                                               |                             |                    |                      |             |               |                     |                   |                                     |           |             |                 |                        |                        |                        |                                   |                         |                         |                         |         |          |             |               |      |                                                                                       |                                      |      |                                                                                                                                                                         |                                     |      |                                                                                                                           |              |      |                                                                                                                         |                             |   |                                                                   |             |      |                                                                   |                       |      |                                                                   |                |      |                                 |                                   |   |                                                                                                                   |           |   |                                                 |          |   |                                                       |                  |   |           |             |   |                          |      |   |     |                   |   |     |                        |   |                                                                                                |                      |   |                                                            |          |   |                                                                                        |                   |   |                                     |                                |   |                                                                                    |             |   |                         |             |   |                               |       |                                                                                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                     |  |      |  |              |  |      |  |            |  |      |  |      |  |  |  |  |  |  |  |  |  |  |  |      |  |                    |  |  |  |  |  |                                     |  |      |  |  |  |  |  |  |  |  |  |
| HW Cylinder                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | -                                                                                                 | 300 L / 1.5 kWh/day loss                                                                                                                                                |                             |                    |                      |             |               |                     |                   |                                     |           |             |                 |                        |                        |                        |                                   |                         |                         |                         |         |          |             |               |      |                                                                                       |                                      |      |                                                                                                                                                                         |                                     |      |                                                                                                                           |              |      |                                                                                                                         |                             |   |                                                                   |             |      |                                                                   |                       |      |                                                                   |                |      |                                 |                                   |   |                                                                                                                   |           |   |                                                 |          |   |                                                       |                  |   |           |             |   |                          |      |   |     |                   |   |     |                        |   |                                                                                                |                      |   |                                                            |          |   |                                                                                        |                   |   |                                     |                                |   |                                                                                    |             |   |                         |             |   |                               |       |                                                                                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                     |  |      |  |              |  |      |  |            |  |      |  |      |  |  |  |  |  |  |  |  |  |  |  |      |  |                    |  |  |  |  |  |                                     |  |      |  |  |  |  |  |  |  |  |  |
| WWHR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   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| Secondary Heating                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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| Mechanical Ventilation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | -                                                                                                 | Balanced Mechanical Ventilation with Heat Recovery (MVHR), modelled based Vectra MAXPLUS/BV/AT                                                                          |                             |                    |                      |             |               |                     |                   |                                     |           |             |                 |                        |                        |                        |                                   |                         |                         |                         |         |          |             |               |      |                                                                                       |                                      |      |                                                                                                                                                                         |                                     |      |                                                                                                                           |              |      |                                                                                                                         |                             |   |                                                                   |             |      |                                                                   |                       |      |                                                                   |                |      |                                 |                                   |   |                                                                                                                   |           |   |                                                 |          |   |                                                       |                  |   |           |             |   |                          |      |   |     |                   |   |     |                        |   |                                                                                                |                      |   |                                                            |          |   |                                                                                        |                   |   |                                     |                                |   |                                                                                    |             |   |                         |             |   |                               |       |                                                                                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                     |  |      |  |              |  |      |  |            |  |      |  |      |  |  |  |  |  |  |  |  |  |  |  |      |  |                    |  |  |  |  |  |                                     |  |      |  |  |  |  |  |  |  |  |  |
| Pressure Test Method                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | -                                                                                                 | Blower - Designed AP50.2 m <sup>3</sup> /hr/m <sup>2</sup>                                                                                                              |                             |                    |                      |             |               |                     |                   |                                     |           |             |                 |                        |                        |                        |                                   |                         |                         |                         |         |          |             |               |      |                                                                                       |                                      |      |                                                                                                                                                                         |                                     |      |                                                                                                                           |              |      |                                                                                                                         |                             |   |                                                                   |             |      |                                                                   |                       |      |                                                                   |                |      |                                 |                                   |   |                                                                                                                   |           |   |                                                 |          |   |                                                       |                  |   |           |             |   |                          |      |   |     |                   |   |     |                        |   |                                                                                                |                      |   |                                                            |          |   |                                                                                        |                   |   |                                     |                                |   |                                                                                    |             |   |                         |             |   |                               |       |                                                                                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                     |  |      |  |              |  |      |  |            |  |      |  |      |  |  |  |  |  |  |  |  |  |  |  |      |  |                    |  |  |  |  |  |                                     |  |      |  |  |  |  |  |  |  |  |  |
| Lighting                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | -                                                                                                 | 100% Low Energy Lighting - CFL or LED - Power: 10W, Efficacy: 85 lm/W, Capacity: 850lm                                                                                  |                             |                    |                      |             |               |                     |                   |                                     |           |             |                 |                        |                        |                        |                                   |                         |                         |                         |         |          |             |               |      |                                                                                       |                                      |      |                                                                                                                                                                         |                                     |      |                                                                                                                           |              |      |                                                                                                                         |                             |   |                                                                   |             |      |                                                                   |                       |      |                                                                   |                |      |                                 |                                   |   |                                                                                                                   |           |   |                                                 |          |   |                                                       |                  |   |           |             |   |                          |      |   |     |                   |   |     |                        |   |                                                                                                |                      |   |                                                            |          |   |                                                                                        |                   |   |                                     |                                |   |                                                                                    |             |   |                         |             |   |                               |       |                                                                                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                     |  |      |  |              |  |      |  |            |  |      |  |      |  |  |  |  |  |  |  |  |  |  |  |      |  |                    |  |  |  |  |  |                                     |  |      |  |  |  |  |  |  |  |  |  |
| Electrical Tariff                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | -                                                                                                 | Assumed standard electricity tariff                                                                                                                                     |                             |                    |                      |             |               |                     |                   |                                     |           |             |                 |                        |                        |                        |                                   |                         |                         |                         |         |          |             |               |      |                                                                                       |                                      |      |                                                                                                                                                                         |                                     |      |                                                                                                                           |              |      |                                                                                                                         |                             |   |                                                                   |             |      |                                                                   |                       |      |                                                                   |                |      |                                 |                                   |   |                                                                                                                   |           |   |                                                 |          |   |                                                       |                  |   |           |             |   |                          |      |   |     |                   |   |     |                        |   |                                                                                                |                      |   |                                                            |          |   |                                                                                        |                   |   |                                     |                                |   |                                                                                    |             |   |                         |             |   |                               |       |                                                                                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                     |  |      |  |              |  |      |  |            |  |      |  |      |  |  |  |  |  |  |  |  |  |  |  |      |  |                    |  |  |  |  |  |                                     |  |      |  |  |  |  |  |  |  |  |  |
| Renewables and Battery Storage                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -                                                                                                 | 4kWp (17m <sup>2</sup> total area), 15 kWh battery capacity and Export Cable Meter                                                                                      |                             |                    |                      |             |               |                     |                   |                                     |           |             |                 |                        |                        |                        |                                   |                         |                         |                         |         |          |             |               |      |                                                                                       |                                      |      |                                                                                                                                                                         |                                     |      |                                                                                                                           |              |      |                                                                                                                         |                             |   |                                                                   |             |      |                                                                   |                       |      |                                                                   |                |      |                                 |                                   |   |                                                                                                                   |           |   |                                                 |          |   |                                                       |                  |   |           |             |   |                          |      |   |     |                   |   |     |                        |   |                                                                                                |                      |   |                                                            |          |   |                                                                                        |                   |   |                                     |                                |   |                                                                                    |             |   |                         |             |   |                               |       |                                                                                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                     |  |      |  |              |  |      |  |            |  |      |  |      |  |  |  |  |  |  |  |  |  |  |  |      |  |                    |  |  |  |  |  |                                     |  |      |  |  |  |  |  |  |  |  |  |
| Smart Meter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | -                                                                                                 | Smart meters are fitted                                                                                                                                                 |                             |                    |                      |             |               |                     |                   |                                     |           |             |                 |                        |                        |                        |                                   |                         |                         |                         |         |          |             |               |      |                                                                                       |                                      |      |                                                                                                                                                                         |                                     |      |                                                                                                                           |              |      |                                                                                                                         |                             |   |                                                                   |             |      |                                                                   |                       |      |                                                                   |                |      |                                 |                                   |   |                                                                                                                   |           |   |                                                 |          |   |                                                       |                  |   |           |             |   |                          |      |   |     |                   |   |     |                        |   |                                                                                                |                      |   |                                                            |          |   |                                                                                        |                   |   |                                     |                                |   |                                                                                    |             |   |                         |             |   |                               |       |                                                                                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                     |  |      |  |              |  |      |  |            |  |      |  |      |  |  |  |  |  |  |  |  |  |  |  |      |  |                    |  |  |  |  |  |                                     |  |      |  |  |  |  |  |  |  |  |  |
| Shower Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | -                                                                                                 | Instantaneous electric shower                                                                                                                                           |                             |                    |                      |             |               |                     |                   |                                     |           |             |                 |                        |                        |                        |                                   |                         |                         |                         |         |          |             |               |      |                                                                                       |                                      |      |                                                                                                                                                                         |                                     |      |                                                                                                                           |              |      |                                                                                                                         |                             |   |                                                                   |             |      |                                                                   |                       |      |                                                                   |                |      |                                 |                                   |   |                                                                                                                   |           |   |                                                 |          |   |                                                       |                  |   |           |             |   |                          |      |   |     |                   |   |     |                        |   |                                                                                                |                      |   |                                                            |          |   |                                                                                        |                   |   |                                     |                                |   |                                                                                    |             |   |                         |             |   |                               |       |                                                                                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                     |  |      |  |              |  |      |  |            |  |      |  |      |  |  |  |  |  |  |  |  |  |  |  |      |  |                    |  |  |  |  |  |                                     |  |      |  |  |  |  |  |  |  |  |  |
| Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | GLA requires offset payments for buildings not achieving net zero carbon emissions @£95 per tonne |                                                                                                                                                                         |                             |                    |                      |             |               |                     |                   |                                     |           |             |                 |                        |                        |                        |                                   |                         |                         |                         |         |          |             |               |      |                                                                                       |                                      |      |                                                                                                                                                                         |                                     |      |                                                                                                                           |              |      |                                                                                                                         |                             |   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| Sign Off of details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                   | Name                                                                                                                                                                    |                             | PP M Maclean       |                      | Date        |               | 18.01.2023          |                   | Name                                |           | Date        |                 |                        |                        |                        |                                   |                         |                         |                         |         |          |             |               |      |                                                                                       |                                      |      |                                                                                                                                                                         |                                     |      |                                                                                                                           |              |      |                                                                                                                         |                             |   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 |                   | On behalf of the contractor/client: |           | Sign        |                 |                        |                        |                        |                                   |                         |                         |                         |         |          |             |               |      |                                                                                       |                                      |      |                                                                                                                                                                         |                                     |      |                                                                                                                           |              |      |                                                                                                                         |                             |   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## Appendix C – 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, could impact the usability of the roof terrace amenity.

### 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 low DHW demand at the Proposed Development it is likely to provide minimal CO<sub>2</sub> emissions reductions, while taking up roof-space, better utilised for photovoltaics.

### 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°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.

It is recommended that the ground conditions of the site be assessed in detail (through consultation with a GSHP manufacturer and/or purchase of a Ground Conditions report from the British Geological Survey) before a system is installed – the primary heat source that GSHP relies on is solar derived, and shading can affect the 're-charge' of the ground within which the ground loop is laid. This can affect year-on-year CoPs, steadily increasing running costs and reducing CO<sub>2</sub> offset.

Although GSHP can provide a greater efficiency performance than ASHP, it comes at a significantly higher capital cost, due to the extensive groundworks needed to install either 'slinky' ground loops or 50-100m deep boreholes at 5m separation from each other.

The significantly higher capital costs of installing a GSHP system and additional surveying and formatting required, as GSHP has not been recommended at this time

## Appendix D - SAP Calculation Summary Sheet

## Building Regulations England Part L (BREL) Compliance Report

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

Date: Thu 19 Jan 2023 09:31:54

| Project Information |                 |                 |                 |
|---------------------|-----------------|-----------------|-----------------|
| Assessed By         | Malcolm Maclean | Building Type   | House, Detached |
| OCDEA Registration  | EES/022689      | Assessment Date | 2023-01-19      |

| Dwelling Details |             |                  |                    |
|------------------|-------------|------------------|--------------------|
| Assessment Type  | As designed | Total Floor Area | 673 m <sup>2</sup> |
| Site Reference   | House       | Plot Reference   | Green              |
| Address          |             |                  |                    |

| Client Details |                                                        |
|----------------|--------------------------------------------------------|
| Name           | Charlton Browns                                        |
| Company        | Charlton Browns                                        |
| Address        | The Belvedere, 2 Back Lane, Hampstead, London, NW3 1HL |

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                | 7.28 kgCO <sub>2</sub> /m <sup>2</sup> |  |    |
| Dwelling carbon dioxide emission rate              | 1.99 kgCO <sub>2</sub> /m <sup>2</sup> |  | OK |

| 1b Target primary energy rate and dwelling primary energy |                                         |  |    |
|-----------------------------------------------------------|-----------------------------------------|--|----|
| Target primary energy                                     | 39.95 kWh <sub>PE</sub> /m <sup>2</sup> |  |    |
| Dwelling primary energy                                   | 20.3 kWh <sub>PE</sub> /m <sup>2</sup>  |  | OK |

| 1c Target fabric energy efficiency and dwelling fabric energy efficiency |                         |  |    |
|--------------------------------------------------------------------------|-------------------------|--|----|
| Target fabric energy efficiency                                          | 43.8 kWh/m <sup>2</sup> |  |    |
| Dwelling fabric energy efficiency                                        | 40.9 kWh/m <sup>2</sup> |  | OK |

| 2a Fabric U-values               |                                                        |                                               |                                         |     |
|----------------------------------|--------------------------------------------------------|-----------------------------------------------|-----------------------------------------|-----|
| Element                          | Maximum permitted average U-Value [W/m <sup>2</sup> K] | Dwelling average U-Value [W/m <sup>2</sup> K] | Element with highest individual U-Value |     |
| External walls                   | 0.26                                                   | 0.16                                          | Walls (1) (0.16)                        | OK  |
| Party walls                      | 0.2                                                    | N/A                                           | N/A                                     | N/A |
| Curtain walls                    | 1.6                                                    | N/A                                           | N/A                                     | N/A |
| Floors                           | 0.18                                                   | 0.08                                          | Heatloss Floor 1 (0.08)                 | OK  |
| Roofs                            | 0.16                                                   | 0.1                                           | Roof (1) (0.1)                          | OK  |
| Windows, doors, and roof windows | 1.6                                                    | 1.03                                          | Opening (1.2)                           | OK  |
| Rooflights                       | 2.2                                                    | 1.2                                           | Opening, South (1.2)                    | OK  |

| 2b Envelope elements (better than typically expected values are flagged with a subsequent (!)) |                            |                              |
|------------------------------------------------------------------------------------------------|----------------------------|------------------------------|
| Name                                                                                           | Net area [m <sup>2</sup> ] | U-Value [W/m <sup>2</sup> K] |
| Exposed wall: Walls (1)                                                                        | 198.81                     | 0.16                         |
| Exposed wall: Walls (2)                                                                        | 153.76                     | 0.16                         |
| Exposed wall: Walls (3)                                                                        | 9.6                        | 0 (!)                        |
| Ground floor: Heatloss Floor 1, Heatloss Floor 1                                               | 337.32                     | 0.08 (!)                     |
| Exposed roof: Roof (1)                                                                         | 92.94                      | 0.1 (!)                      |
| Exposed roof: Roof (2)                                                                         | 109.83                     | 0.1 (!)                      |
| Exposed roof: Roof (3)                                                                         | 23.9                       | 0.1 (!)                      |
| Exposed roof: Roof (4)                                                                         | 188.28                     | 0.1 (!)                      |

| 2c Openings (better than typically expected values are flagged with a subsequent (!)) |                        |             |              |                              |
|---------------------------------------------------------------------------------------|------------------------|-------------|--------------|------------------------------|
| Name                                                                                  | Area [m <sup>2</sup> ] | Orientation | Frame factor | U-Value [W/m <sup>2</sup> K] |
| Opening, Opening Type 1                                                               | 2                      | South West  | N/A          | 1 (!)                        |
| Opening, Opening Type 2                                                               | 12.42                  | South West  | 0.7          | 1 (!)                        |
| Opening, Opening Type 2                                                               | 5.78                   | North       | 0.7          | 1 (!)                        |
| Opening, Opening Type 3                                                               | 7.06                   | South       | 0.7          | 1.2                          |
| Opening, Opening Type 1                                                               | 2                      | North East  | N/A          | 1 (!)                        |
| Opening, Opening Type 2                                                               | 21.07                  | North East  | 0.7          | 1 (!)                        |
| Opening, Opening Type 1                                                               | 2                      | South       | N/A          | 1 (!)                        |
| Opening, Opening Type 2                                                               | 17.27                  | South       | 0.7          | 1 (!)                        |
| Opening, Opening Type 1                                                               | 13.88                  | North East  | N/A          | 1 (!)                        |

| Name                    | Area [m <sup>2</sup> ] | Orientation | Frame factor | U-Value [W/m <sup>2</sup> K] |
|-------------------------|------------------------|-------------|--------------|------------------------------|
| Opening, Opening Type 2 | 11.4                   | South West  | 0.7          | 1 (!)                        |
| Opening, Opening Type 2 | 2.8                    | North       | 0.7          | 1 (!)                        |
| Opening, Opening Type 2 | 3.58                   | South       | 0.7          | 1 (!)                        |
| Opening, Opening Type 3 | 9.3                    | North East  | 0.7          | 1.2                          |
| Opening, Opening Type 2 | 9.3                    | South West  | 0.7          | 1 (!)                        |

| 2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))                     |                                                   |                                              |                  |                     |
|-------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|----------------------------------------------|------------------|---------------------|
| Building part 1 - Main Dwelling: Thermal bridging calculated from linear thermal transmittances for each junction |                                                   |                                              |                  |                     |
| Main element                                                                                                      | Junction detail                                   | Source                                       | Psi value [W/mK] | Drawing / reference |
| External wall                                                                                                     | E5: Ground floor (normal)                         | Calculated by person with suitable expertise | 0.097            |                     |
| External wall                                                                                                     | E2: Other lintels (including other steel lintels) | Calculated by person with suitable expertise | 0.022 (!)        |                     |
| External wall                                                                                                     | E3: Sill                                          | Calculated by person with suitable expertise | 0.027 (!)        |                     |
| External wall                                                                                                     | E4: Jamb                                          | Calculated by person with suitable expertise | 0.021 (!)        |                     |
| External wall                                                                                                     | E6: Intermediate floor within a dwelling          | Calculated by person with suitable expertise | 0 (!)            |                     |
| External wall                                                                                                     | E8: Intermediate floor within a dwelling          | Calculated by person with suitable expertise | 0 (!)            |                     |
| External wall                                                                                                     | E13: Gable (insulation at rafter level)           | Calculated by person with suitable expertise | 0.073            |                     |

| 3 Air permeability (better than typically expected values are flagged with a subsequent (!)) |                                                      |    |
|----------------------------------------------------------------------------------------------|------------------------------------------------------|----|
| Maximum permitted air permeability at 50Pa                                                   | 8 m <sup>3</sup> /hm <sup>2</sup>                    |    |
| Dwelling air permeability at 50Pa                                                            | 3 m <sup>3</sup> /hm <sup>2</sup> , Design value (!) | OK |
| Air permeability test certificate reference                                                  |                                                      |    |

| 4 Space heating                                                                     |                      |
|-------------------------------------------------------------------------------------|----------------------|
| Main heating system 1: Heat pump with radiators or underfloor heating - Electricity |                      |
| Efficiency                                                                          | 327.6%               |
| Emitter type                                                                        | Radiators            |
| Flow temperature                                                                    | 45°C                 |
| System type                                                                         | Heat Pump            |
| Manufacturer                                                                        | Kensa Heat Pumps Ltd |
| Model                                                                               | Evo K070-S1H-0K      |
| Commissioning                                                                       |                      |
| Secondary heating system: N/A                                                       |                      |
| Fuel                                                                                | N/A                  |
| Efficiency                                                                          | N/A                  |
| Commissioning                                                                       |                      |

| 5 Hot water                                    |             |
|------------------------------------------------|-------------|
| Cylinder/store - type: Cylinder                |             |
| Capacity                                       | 300 litres  |
| Declared heat loss                             | 1.5 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: Programmer, room thermostat and TRVs |  |
| Function                                                    |  |
| Ecodesign class                                             |  |
| Manufacturer                                                |  |
| Model                                                       |  |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                |    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----|
| <b>Water heating</b> - type: Cylinder thermostat                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                |    |
| Manufacturer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                |    |
| Model                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                |    |
| <b>7 Lighting</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                |    |
| Minimum permitted light source efficacy                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 75 lm/W        |    |
| Lowest light source efficacy                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 85 lm/W        | OK |
| External lights control                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | N/A            |    |
| <b>8 Mechanical ventilation</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                |    |
| <b>System type:</b> Balanced whole-house mechanical ventilation with heat recovery                                                                                                                                                                                                                                                                                                                                                                                                               |                |    |
| Maximum permitted specific fan power                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1.5 W/(l/s)    |    |
| Specific fan power                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 0.78 W/(l/s)   | OK |
| Minimum permitted heat recovery efficiency                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 73%            |    |
| Heat recovery efficiency                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 85%            | OK |
| Manufacturer/Model                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | MAXIPLUS/BY/AT |    |
| Commissioning                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |    |
| <b>9 Local generation</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |    |
| Technology type: Photovoltaic system (1)                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                |    |
| Peak power                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 4 kWp          |    |
| Orientation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | South          |    |
| Pitch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 30°            |    |
| Overshading                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Modest         |    |
| Manufacturer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                |    |
| MCS certificate                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                |    |
| <b>10 Heat networks</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                |    |
| N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                |    |
| <b>11 Supporting documentary evidence</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |    |
| N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                |    |
| <b>12 Declarations</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |    |
| <b>a. Assessor Declaration</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                |    |
| 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>b. Client Declaration</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                |    |
| N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                |    |

## Appendix E – GLA SAP 10 tables

**Residential****Table 1:** Carbon Dioxide Emissions after each stage of the Energy Hierarchy for residential buildings

|                                                                         | Carbon Dioxide Emissions for residential buildings<br>(Tonnes CO <sub>2</sub> per annum) |             |
|-------------------------------------------------------------------------|------------------------------------------------------------------------------------------|-------------|
|                                                                         | Regulated                                                                                | Unregulated |
| Baseline: Part L 2021 of the Building Regulations Compliant Development | 4.8                                                                                      |             |
| After energy demand reduction (be lean)                                 | 3.3                                                                                      |             |
| After heat network connection (be clean)                                | 3.3                                                                                      |             |
| After renewable energy (be green)                                       | 1.2                                                                                      |             |

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

|                                               | Regulated residential carbon dioxide savings |            |
|-----------------------------------------------|----------------------------------------------|------------|
|                                               | (Tonnes CO <sub>2</sub> per annum)           | (%)        |
| Be lean: savings from energy demand reduction | 1.5                                          | 30%        |
| Be clean: savings from heat network           | 0.0                                          | 0%         |
| Be green: savings from renewable energy       | 2.1                                          | 45%        |
| <b>Cumulative on site savings</b>             | <b>3.6</b>                                   | <b>75%</b> |
| Annual savings from off-set payment           | 1.2                                          | -          |
|                                               | <b>(Tonnes CO<sub>2</sub>)</b>               |            |
| <b>Cumulative savings for off-set payment</b> | <b>35</b>                                    | -          |
| <b>Cash in-lieu contribution (£)</b>          | <b>3,370</b>                                 |            |



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