# Clarkson Row – Residential Development

## Energy and Sustainability Statement

## Penhallow Investments Ltd

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# Executive Summary

In accordance with the Camden Council's planning requirements and the GLA's London Plan, the following Energy and Sustainability Statement has been developed for the proposed Clarkson Row – Residential Development, in Clarkson Row, London.

The proposed development will involve the construction of 8 No. residential apartments.

Low environmental impact is central to the design of the proposed Clarkson Row – Residential Development. This Energy and Sustainability Statement outlines the development's approach to sustainability, energy efficiency and renewable energy strategies in order to meet the targets set out in the National Planning Policy Framework (NPPF), the GLA's London Plan and the Camden Planning Guidance.

The following energy efficiency measures and sustainable features have been considered for the development:

**Energy**

The design of the proposed scheme has been developed to reduce its annual energy consumption, provide energy in an environmentally friendly way, and to minimize its annual $CO_2$ footprint. To achieve this, the Statement follows the GLA's Energy Hierarchy.

**Be Lean Summary**

The building's envelope will be designed to perform significantly better than the Building Regulation standards with low U-values, G-values, Y-values and a low air permeability to control heat transfer through the envelope.

Passive solar considerations have formed an integral part of the design for the Proposed Development. Analysis has been carried out to optimise the facades so that the solar gains and associated cooling loads are reduced, providing a more comfortable internal environment for occupants.

Ventilation to domestic aspects will be provided by localised MVHR (in combination with natural ventilation systems).

All spaces will include highly efficient Light Emitting Diode. Electrical and mechanical systems will be tightly metered and controlled.

The application of passive and active design measures achieves a 14.15% reduction over the Part L1A 2013 TER. Therefore, the Be Lean performance achieve a 10% reduction over the Part L TERs.

The 'Be Lean' SAP can be found in Appendix B.

**Be Clean Summary**

An investigation into the feasibility of connecting to an existing or proposed district network indicates that there is not an existing district heating network within a feasible distance. However, space will be allocated to the scheme to connect to a district network should that eventuate.

Combined Heat & Power is also unfeasible due to the air quality issues inherent with these systems. In addition, gas-fired CHPs are no longer offering high carbon savings over electric systems as a result of the more up to date SAP10 emission factors.

Therefore, no decentralised system is included in the energy strategy.

**Be Green Summary**

An analysis of a range of Low and Zero Carbon technologies has been conducted to determine which offer feasible carbon emissions savings.

The analysis found that the highest potential for savings was enabled through the following measures:

- A centralised a low temperature heat loop feeding all dwellings. Thermal energy for the heat loop will first be generated centrally by ASHPs. Then at the local level, the heat will be upgraded using WSHP in each dwelling. This will deliver space heating, cooling and DHW demands.

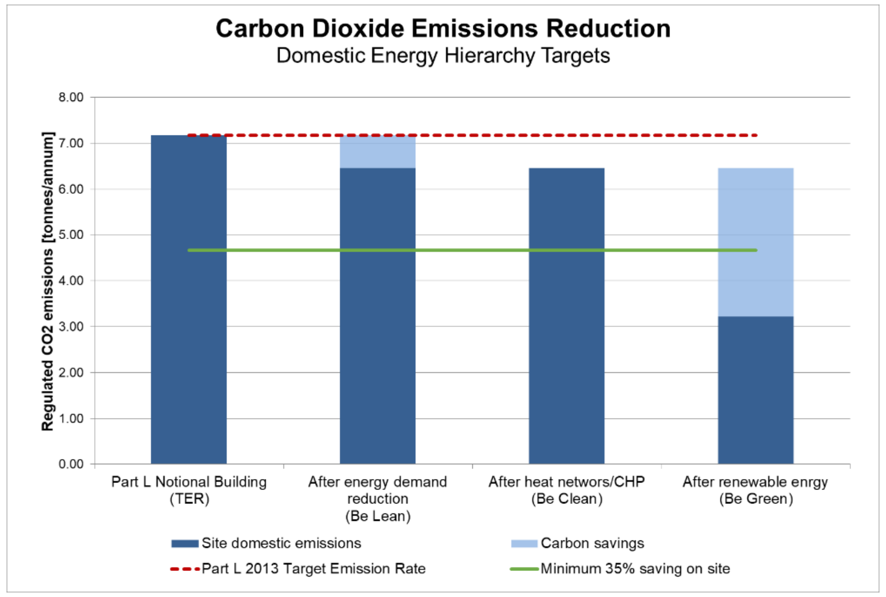
The 'Be Green' SAP documents can be found in Appendix C.

**Results**

The regulated $CO_2$ emissions and savings for the proposed domestic building elements are presented below.

| Regulated Domestic Carbon Dioxide Savings | | |
|---|---|---|
| | (Tonnes CO2 per annum) | (%) |
| Savings from energy demand reduction | 0.71 | 10% |
| Savings from heat network / CHP | 0.00 | 0% |
| Savings from renewable energy | 3.24 | 45% |
| **Cumulative on site savings** | **3.96** | **55%** |
| | | |
| **Cumulative savings for off-set payment** | N/a due to the scale of development | |

The supporting GLA spreadsheet can be provided upon request.




**Materials**

- Building materials, where possible, will be sourced locally to reduce transportation pollution and support the local economy.
- All timber will be procured from responsible forest sources.

**Water**

- Water use will be minimised by the specification of water efficient taps, dual flush toilets and low water use appliances.
- Water metering will be installed to monitor and minimise wastage.
- Minimise surface water run-off in the site.

**Waste**

- The construction site will be managed in an environmentally sound manner in terms of resource use, storage, waste management, pollution.
- Recycling facilities will be provided on site for construction and operational waste.

**Transport**

- The site benefits from excellent transport links, reducing reliance on personal cars and local pollutants.
- Secure cycling parking facilities have been provided.

# Contents

# 1.0

# Introduction

# 1.0 Introduction

### 1.1 Purpose of Statement

This Sustainability Statement has been prepared in support of the planning application for the Clarkson Row – Residential Development, located in Camden, London. It responds to the sustainable design and construction principles, and climate change adaptation requirements of the London Borough of Camden and the Greater London Authority (GLA).

The format of the statement is intended to reflect and respond to the issues raised in the GLA's 'Spatial Development Strategy for Greater London' - the 'London Plan'. The principal objectives are to reduce the site's contribution to the causes of climate change by reducing the site's needs for energy, minimising the emissions of $CO_2$, minimising waste generation and limiting consumption of finite resources.

### 1.2 Methodology – The Energy Hierarchy

The design of the proposed scheme has been developed to reduce its annual energy consumption, provide energy in an environmentally friendly way, and to minimize its annual $CO_2$ footprint. To achieve this, the Statement follows the 'Energy Hierarchy' as set forth by the GLA, illustrated below.

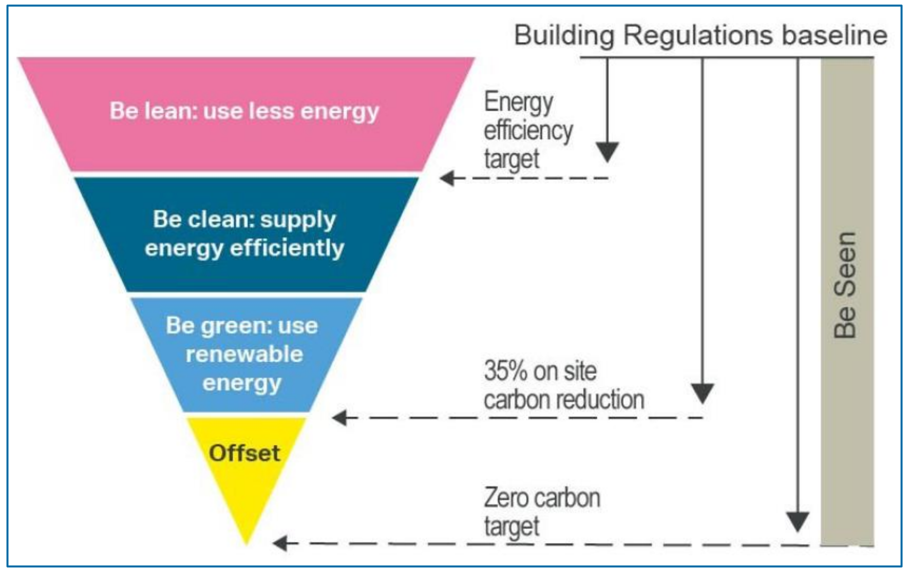



*Figure 1-1 'Energy Hierarchy' steps to low carbon buildings.*

To calculate carbon emissions and reductions, the design will be assessed under 'Part L 2013: Conservation of Fuel and Power' of the UK Building Regulations, using the National Calculation Methodology (NCM). A detailed energy model will be created using the Standard Assessment Procedure (SAP) through Government approved software, Elmhurst Energy 2012, in line with CIBSE AM11. The model will be revised for each of the steps of the Energy Hierarchy to establish expected performance and satisfaction of the policy requirements. As per the GLA Energy Assessment Guidance (April 2020) document, calculations will incorporate SAP 10 emission factors, as opposed to the outdated National level emission factors.

Further to the energy considerations of the Proposed Development wider sustainability issues have also been summarised in this document.

### 1.3 Existing Site

The site is located in Clarkson Row, London, falling within the jurisdiction of London Borough of Camden. The site is situated on the north side of Clarkson Row Lane and in close proximity to Camden town centre. The site is currently vacant.

### 1.4 Proposed Development

The proposed development consists of the erection of a 3-storey building fronting Clarkson Row Lane.

| Unit Type | Total per type | NIA (sqm) |
|---|---|---|
| Unit 1 – GF Studio | 1 | 44 |
| Unit 2 - GF 1 Bed | 1 | 54 |
| Unit 3 – 1F 1 Bed | 1 | 50 |
| Unit 4 – 1F 2 Bed | 1 | 66 |
| Unit 5 – 2 F 1 Bed | 1 | 50 |
| Unit 6 – 2 F 2 Bed | 1 | 66 |
| Unit 7 – 3F 1 Bed | 1 | 50 |
| Unit 8 – 3F 2 Bed | 1 | 72 |
| Total | 8 | 452 |


*Figure 1-2 Front view of the Proposed Development*

### 1.5 Planning Policy

The following statutory requirements are being addressed and/ or used as guidance to the development of this statement.

| | Policy Reference |
|---|---|
| National | National Planning Policy Framework – February 2019 |
| Regional | Greater London Authority (GLA):<br>New London Plan – March 2021<br>GLA Energy Assessment Guidance – April 2020 |
| Local | Camden Local Plan |

Further details regarding specific policies relevant to energy and sustainability have been detailed in Appendix A.

# 2.0

## ‘Be Lean’ Demand Reduction

# 2.0 'Be Lean' Demand Reduction

Under Policy SI 2 of the new London Plan (March 2021) certain levels of emissions savings should be achieved at the Be Lean stage of the energy hierarchy. This is represented as a reduction in emissions from the Part L 2013 Notional Building Target Emissions Rate (TER) to the development's design represented by the Dwelling Emissions Rate (DER – residential) The reductions targeted are as follows:

- Residential developments should achieve a 10% saving over the TER;

### 2.1 Passive Design

Substantial reductions in energy usage for the scheme, together with improved occupancy comfort, will be achieved through consideration of the passive elements of the design. The design team have looked to optimise the passive solar design and building envelope performance as described in the following sections.

#### 2.1.1 Passive Solar Design

Maintaining adequate levels of natural light but at the same time limiting the solar heat gains inside the building has been an essential part of the project's design philosophy. All glazing in the development will be specified with a low solar transmission (g-value) to control solar gains and a high visible light transmission (VLT) to enable effective daylighting. The specified g-value means that solar gains into the spaces are limited, reducing the cooling demand required to keep the zones within acceptable comfort levels and limiting the risk of overheating.

#### 2.1.2 Building Fabric

Improving the thermal insulation standards beyond the Building Regulation standards will help to reduce the annual $CO_2$ emissions associated with the building's heating and cooling systems, by limiting the heat loss though the building's fabric. The following thermal performance specifications will be targeted.

| Fabric Thermal Performance – Part L1A Domestic elements | Minimum Standards | Proposed Design |
|---|---|---|
| Floor area weighted U-value (W/m$^2$K) | 0.25 | 0.12 |
| Roof area weighted U-value (W/m$^2$K) | 0.20 | 0.18 |
| External wall area weighted U-value (W/m$^2$K) | 0.30 | 0.18 |
| External wall to unheated spaces area weighted U-value (W/m$^2$K) | 0.30 | 0.18 |
| Pedestrian doors U-value (W/m$^2$K) | 2.20 | 1.40 |
| Window (inc frame) area weighted U-value (W/m$^2$K) | 2.20 | 1.40 |
| External glazing total solar transmission G-value | - | 0.4 |
| Air permeability @ 50 Pascals (m$^3$/(hr.m$^2$)) | 10.0 | 3.0 |
| Thermal bridging Y-values as per the NCM Notional building y-value- 0.05 | | |

### 2.2 Thermal Bridging

Linear thermal bridge Ψ values have been carefully considered and are included in the U-value calculations. Should there be any other elements of the building envelope that lead to potential thermal bridging, these will be considered and designed to a high standard, according to enhanced construction details.

Refer to Appendix D for details on Accredited Construction Details.

### 2.3 Air Permeability

An air leakage rate of 3m$^3$/hr/m$^2$ at 50Pa should be targeted for all aspects of the development. This is in comparison with 10m$^3$/hr/m$^2$ at 50Pa maximum under the Building Regulation minimum standards. Good air tightness can be achieved by prefabrication of several key building components under factory conditions, robust detailing of junctions and good building practices on site.

### 2.4 Energy Efficient Systems

After assessing the contribution of the passive elements to the overall energy balance, the aim is to further reduce $CO_2$ emissions by selecting efficient mechanical, electrical and control systems to manage the energy use during operation. On the basis of good practice, the following principles will be adopted throughout the Proposed Development where possible.

#### 2.4.1 Low-energy Lighting

Installing efficient low energy light fittings internally and externally can significantly reduce a building's overall lighting load hence lowering its annual $CO_2$ emissions. The development will reduce the energy consumption by the specification of low energy, high efficacy, LED luminaires in all areas.

#### 2.4.2 Heating and Cooling

In accordance with the GLA's guidance, the 'Be Lean' scenario utilises a centralised gas-fired boiler system to deliver the space heating and domestic hot water requirements to all areas. Similarly, cooling will be provided by an electric chiller. These heating and cooling systems will be replaced by the actual building design systems in the following Be Green sections.

#### 2.4.3 Ventilation

The dwellings will utilise localised mechanical ventilation heat recovery (MVHR) units in each apartment.

All MVHR units will incorporate heat recovery with at least the minimum Energy Related Products (ErP) 2018 efficiencies to reduce space heating loads and will utilise low specific fan powers with variable speed drives.

A dynamic simulation overheating assessment has been undertaken and methodology and results are presented in Section 5.

#### 2.4.4 HVAC Plant Efficiencies

The design team will specify all equipment and plant to exceed the minimum requirements of the Building Services Compliance Guide. This document provides guidance on the means of complying with the requirements of Part L1A for conventional space heating/ cooling systems, hot water systems and ventilation systems.

#### 2.4.5 Controls

The heating and cooling systems for the dwellings shall be appropriately zoned, with local fast responding controls. Appropriate lighting controls, including timers, occupancy controls, and dimming shall be specified where applicable for all internal and external lighting.

#### 2.4.6 Commissioning

Commissioning is a systematic process, which configures a building's HVAC system and integrated control systems to operate at peak performance. Commissioning building systems can provide significant benefits such as improving occupant comfort, reducing energy cost, improving indoor air quality, enhancing building operations and extending equipment life. Hence, an extensive commissioning exercise will be incorporated in the project programme, with time allowed for reconfiguring plant and equipment if needed.

#### 2.4.7 Energy Metering

Separate metering systems of the energy uses within the development will help the building users identify areas of excessive consumption and highlight potential energy-saving measures for the future. This will enable on-going reduction of annual $CO_2$ emissions from these systems. This will also align with Camden council's requirement for ongoing monitoring as per the GLA Be Seen guidance.

### 2.5 Demand Reduction- Results

The following parameters were assigned to the residential development to assess compliance with Part L1A, as per London Plan guidance:

- Centralised, high efficiency gas-fired boilers generating low temperature hot water for distribution around a site wide network (Not included in final proposals);
- Mechanical ventilation through a balanced unit with a specific fan power of less than 0.57W/l/s and heat exchanger thermal efficiency of at least 90;
- Hot water daily usage to be less than 125l/person/day;
- All ductwork to be rigid, all hot water pipework to be fully insulated;
- All light fittings to be low energy light (L.E.L.) fittings.

Refer to Appendix E for more details on the building services systems.

| Part L1A 2013 End-uses Breakdown (kgCO2/m2) | | |
|---|---|---|
| End-use | TER | BER (Be Lean) |
| Heating | 6.59 | 4.53 |
| DHW | 7.93 | 7.78 |
| Cooling | 0.00 | 0.22 |
| Auxiliary | 0.30 | 0.69 |
| Lighting | 1.06 | 1.06 |
| Renewables | 0.00 | 0.00 |
| Total | 15.87 | 14.29 |
| **Improvement over TER** | | 10% |
| **Part L Status (BER<TER)** | | **PASS** |

The proposed residential development could achieve a **10%** reduction in $CO_2$ emissions over the Part L TER by energy efficiency alone.

# 3.0

## ‘Be Clean’ Heating Infrastructure

## 3.0 ‘Be Clean’ Heating Infrastructure

### 3.1 District Heating Networks

A district heating network can be utilised to provide low carbon heat to both water-based systems: space heating and domestic hot water supplies. In a development with high heating and DHW loads – such as residential or leisure centre developments – a heating network can deliver significant $CO_2$ savings potential. In an office or retail-based development, where heating requirements are relatively minimal, the heating network carbon savings potential is not as significant.

The feasibility of connecting to an existing district network has been investigated for the site in accordance with SI 3 Energy Infrastructure of the London Plan.

An analysis of the London Heat Map (www.londonheatmap.org) indicates that there are no existing and proposed district heating networks nearby to the project site. There does appear to be a future network to the West of the development, however due to the distance and scale of this development it is not viable to look to extend this network. To facilitate future connection, space will be earmarked at the basement level to host a plate heat exchanger, pump and calorifier should a district energy network be commissioned at a later date.

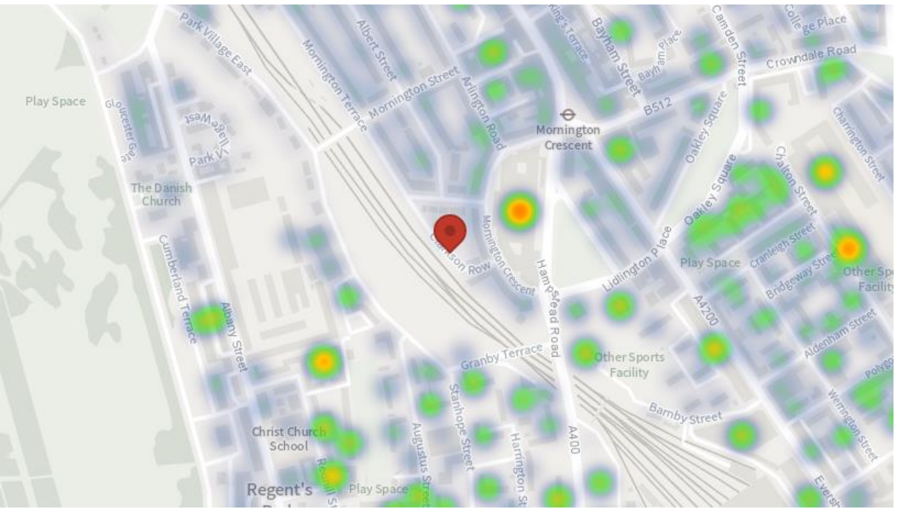


*Figure 3-1 London Heat Map illustrating the existing heat networks (red) and proposed heat networks (orange) near the project site (red pin).*

### 3.2 Combined Heat and Power (CHP)

In accordance with the NPPF, the potential to integrate a new decentralised heating network utilising a combined heat and power unit was investigated.

As with a district heating network, a CHP system can provide significant carbon savings in high heating demand buildings.

The Proposed Development includes a range of dwelling types which generally have high and consistent space and domestic hot water heating demands. This means that a CHP system would be well suited to this development in terms of energy and emissions efficiency.

However, CHP plant generates harmful NOx and SOx emissions which can be detrimental to human health more directly than $CO_2$ emissions. This negative contribution to the local air would directly conflict with the new London Plan.

Further to the substantial health issues above, when utilising the SAP 10 emissions factors as required by the GLA’s energy guidance, CHP systems no longer result in any $CO_2$ savings compared to electric options.

For these reasons, a combined heat and power unit is not considered feasible for the Proposed Development.

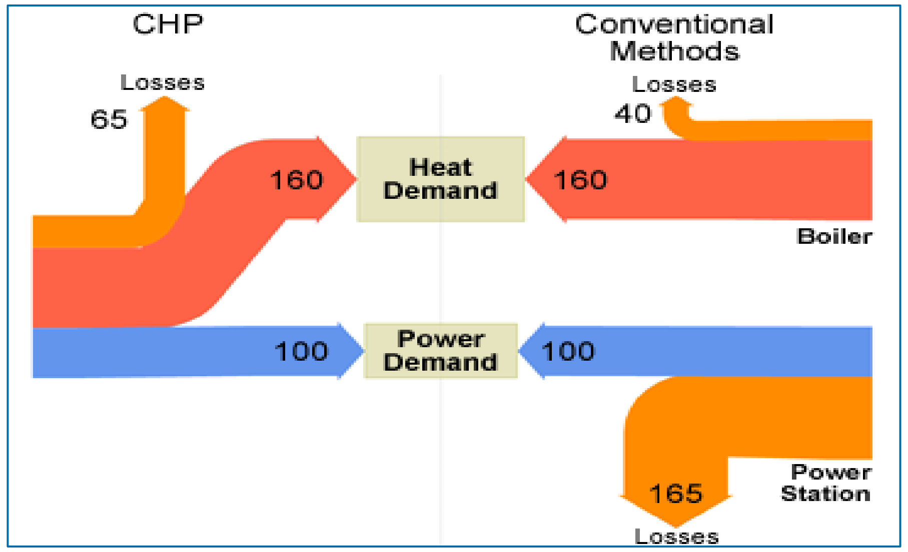



*Figure 3-2 Sankey diagram illustrating the energy flows and benefits of CHP vs boiler heating.*

### 3.3 ‘Be Clean’ Part L Performance Results

A decentralised source of heat and power is not compatible with the Proposed Development. Therefore, the Part L results are unchanged from the Be Lean step of the energy hierarchy.

# 4.0

## ‘Be Green’ Renewable Energy

# 4.0 'Be Green' Renewable Energy

Policy SI 2 of the London Plan (March 2021) and the latest GLA Energy Assessment Guidance (April 2020) require that major developments seek to maximise reduction of $CO_2$ emissions through onsite renewable energy generation, wherever feasible.

The following technologies have been considered for supplying a portion of each development's energy demand. The feasibility of each of the energy sources listed has been assessed with regard to the potential contribution each could make to supply a proportion of the development's delivered energy requirement, whilst considering relevant technical, planning, land use and financial issues.

### 4.1 Biomass Heating

Biomass in the form of logs, wood chips and wood pellets are classified as a renewable source of energy since the carbon dioxide emitted when the biomass is burned has been taken out of the atmosphere by the growing plants. Even allowing for emissions of carbon dioxide in planting, harvesting, processing and transporting the fuel they will typically reduce net $CO_2$ emissions by over 90%.

Biomass boilers require comprehensive maintenance policies to ensure smooth operation and supply chains to be set up to supply the boilers with a constant stream of fuel. They also require significant space for storage and delivery of fuel.

A major issue for biomass boilers is air quality due to the NOx and SOx emissions they generate. These pollutants can be detrimental to human health and should be avoided where population density is high.

Despite a substantial heating demand on this scheme, the air quality and logistics issues associated with biomass heating make it an unfavourable strategy for this development. As such, it is not proposed as part of the energy strategy.

### 4.2 Solar Hot Water Collectors (SHWC)

Solar hot water collectors (SHWC) utilise solar radiation to heat water for use in buildings. The optimum orientation for a solar collector in the UK is a south-facing surface, tilted at an angle of 30º from the horizontal.

Solar collectors are typically designed to meet a development's base heat load, associated with its domestic hot water requirements. For residential development, this usually equates to 60-70% of the total DHW annual load, with the natural gas-fired boilers meeting the remainder of the load. For office and retail developments, the hot water demand is usually a lower proportion of the overall heating demand, unless there are comprehensive changing facilities with showers. Therefore, the advantages of solar thermal collectors are limited for this type of developments as the domestic hot water load is limited.

As the Barbara Speake development includes a significant domestic demise, a SHWC system offers potential for emissions savings.

However, SHWC require substantial roof space to generate enough hot water for a development of this scale. This will compete with air source heat pumps, which are the preferred source of heat generation, for the limited roof space.

For this reason, solar hot water collectors are not considered viable for the Proposed Development.

### 4.3 Air Source Heat Pumps (AHSP)

Air source heat pumps exchange heat between the outside air and a building to provide space heating in winter and cooling in the summer months. The efficiency of these systems is inherently linked to the ambient air temperatures.

Heat pumps supply more energy than they consume, by extracting heat from their surroundings. Heat pump systems can supply as much as 4kW of heat output for just 1kW of electrical energy input.

Analysis indicates that using heat pump systems for heating, hot water and cooling in the development could reduce $CO_2$ emissions significantly. Therefore, a heat pump-based system is the preferred means of delivering thermal energy for the development.

Below is an outline of assumptions and performance for the heat pump system:

- ASHPs will provide thermal energy for a central low temperature heat loop, which will feed all domestic spaces for heating, hot water and cooling demands.
- The ASHPs would provide 100% of the annual heating and hot water requirement.
- The expected heating and cooling cost per residential unit is estimated to be roughly £200/year;
- A full BEMS system will be included to supply end-users with regular information to control and operate the system. The performance of the ASHP systems will be monitored at post-construction to ensure they are achieving the expected performance.

Full details of the low temperature heat loop are provided in Appendix F.

### 4.4 Ground Source Heat Pumps (GHSP)

Ground source heat pumps differ from air source heat pumps in that they extract heat from the ground and pump it into a building to provide space heating and to pre-heat domestic hot water. In the summer months, this process can be reversed, rejecting heat to the ground, to meet the cooling requirements.

GSHPs rely on the stable temperature of the ground of between 10-14ºC. In winter when the ambient air temperatures are below this ground source heat pumps have higher CoPs than air source heat pumps (as there is more thermal energy in the ground).

A GSHP is not considered a viable solution in this development as it does not have balanced cooling and heating load. In addition, as the proposed development is located on a constrained site and with limited ground space it would not be possible to install any ground coupled system and hence GSHP have been discounted from this proposal.

### 4.5 Wind Turbines

The output from wind turbines is highly sensitive to wind speed. Hence it is essential that turbines should be sited away from obstructions, with a clear exposure, or fetch, for the prevailing wind.

In urban environments, it is difficult to achieve high wind speeds that would make the operation of turbines viable. Turbines need to be located at a site where wind is channelled and is of a consistently high speed and laminar flow. The most likely option for this is on top of a tall building, clear of the urban canopy layer, where obstructions and surrounding buildings don't interfere with the wind flow.

The location of the Proposed Development within a densely built-up urban environment would result in a turbulent flow regime across the site, which would reduce the potential electrical output from wind turbines. It is also unlikely to be acceptable in townscape terms and as such it is not proposed to include wind turbines as part of the development.

### 4.6 Photovoltaics (PV)

Photovoltaic solar cells convert solar energy directly into electricity. The cells consist of two layers of silicon with a chemical layer between. The incoming solar energy charges the electrons held within the chemical. The energised electrons move through the cell into a wire creating an electrical current. Another advantage of PV systems is once they are installed, they require minimal maintenance over their operational life and have no primary fuel requirements.

In an urban environment it is key to locate the solar PV away from any potential shading, which typically means at roof level. However, there is insufficient space to accommodate a solar PV array with the roof plan showing the area is required for the building services plant and amenity space. As such no solar PV is proposed for the development.

### 4.7 Renewables Summary

It is proposed that heat pumps are used to provide the majority of the thermal energy (space heating and DHW) aspects of the development. This will be delivered via a central low temperature heat loop with distributed heat pumps located in the dwellings.

The combination of these renewable technologies ensures the development maximises carbon emissions savings in line with Policy SI 2 of the London Plan (March 2021) and the latest GLA Energy Assessment Guidance (2020).

The Be Green Part L results are presented in the following section.

### 4.8 'Be Green' Part L Performance Results

In accordance with Policy SI 2 of the London Plan (march 2021), investigations into providing a proportion of the site's energy requirements through renewables was undertaken.

In accordance with the Camden Borough Council and the Mayor's Energy Hierarchy, an energy assessment has been carried out for the entire development with the aforementioned passive design and energy efficiency measures.

The tables below present the $CO_2$ emissions of the site at each stage of the energy hierarchy.

#### 4.8.1 Results

The preliminary energy assessment for the proposed domestic aspects is based on the requirements of Part L1A (2013) of the Building Regulations. The analysis indicates that the proposed Be Green Dwelling Emissions Rate (DER) is performing significantly better than the TER and achieves an improvement of 58.1% as highlighted below.

| Part L1A 2013 End-uses Breakdown (kgCO2/m2) | | |
|---|---|---|
| End-use | TER | BER (Be Green) |
| Heating | 6.59 | 1.89 |
| DHW | 7.93 | 3.25 |
| Cooling | 0.00 | 0.22 |
| Auxiliary | 0.30 | 0.56 |
| Lighting | 1.06 | 1.06 |
| Renewables | 0.00 | 0.00 |
| Total | 15.87 | 6.99 |
| **Improvement over TER** | | **56%** |
| **Part L Status (BER<TER)** | | **PASS** |

| Carbon Dioxide Emissions for Domestic Buildings (Tonnes CO2 per annum) | | |
|---|---|---|
| | Regulated | Unregulated |
| Baseline: Part L 2013 of the Building Regulations Compliant Development | 7.17 | 2.27 |
| After energy demand reduction | 6.46 | 2.27 |
| After heat network / CHP | 6.46 | 2.27 |
| After renewable energy | 3.22 | 2.27 |

| Regulated Domestic Carbon Dioxide Savings | | |
|---|---|---|
| | (Tonnes CO2 per annum) | (%) |
| Savings from energy demand reduction | 0.71 | 10% |
| Savings from heat network / CHP | 0.00 | 0% |
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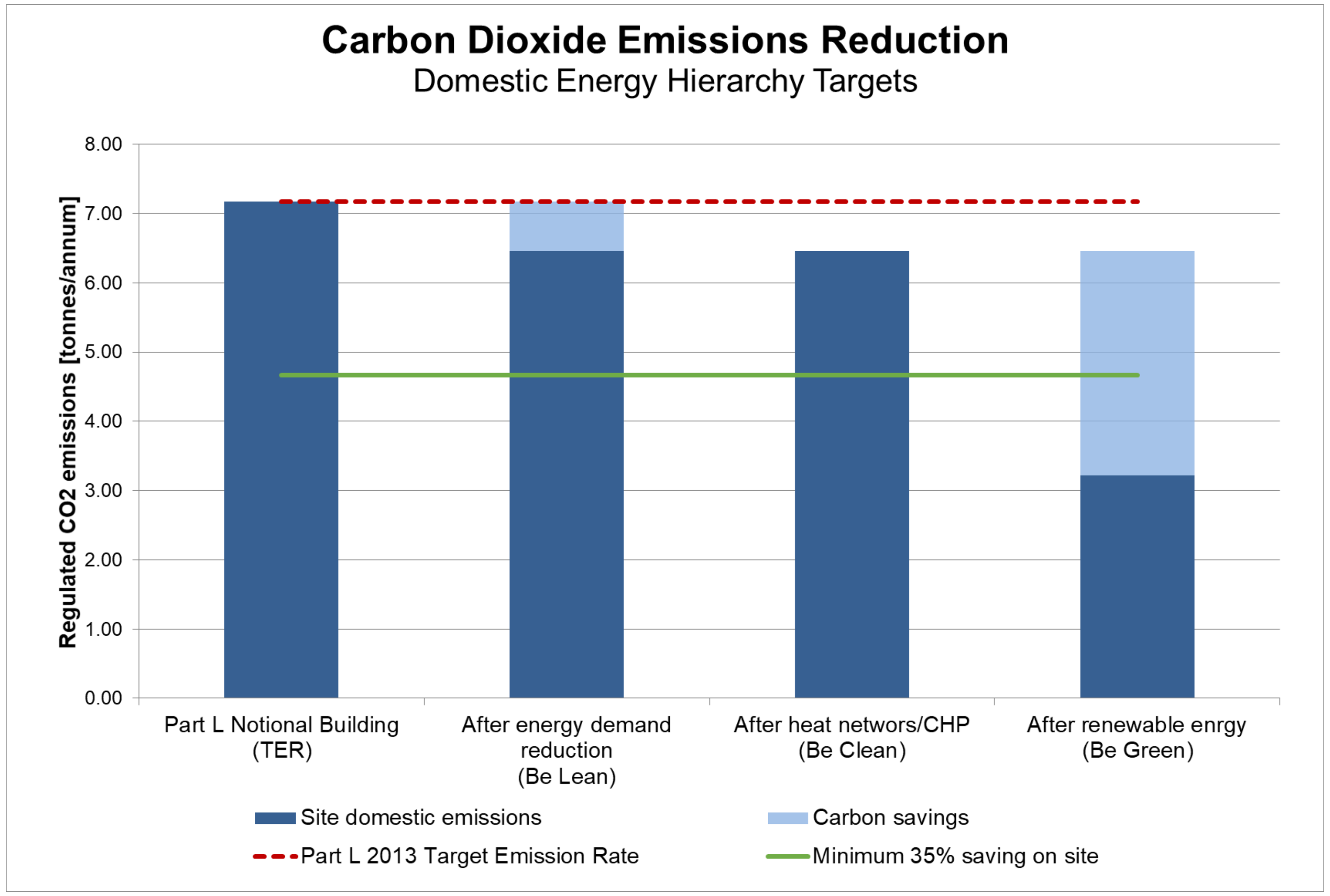
| **Cumulative savings for off-set payment** | N/a due to the scale of development | |



# 5.0

## Cooling and Overheating

## 5.0 Cooling and Overheating

### 5.1 GLA Cooling Hierarchy

As per Policy SI 4 of the London Plan (March 2021), proposals should minimise adverse impacts on the urban heat island through design, layout, orientation, materials and the incorporation of green infrastructure. Proposals should demonstrate through an Energy Strategy how they will reduce the potential for internal overheating and reliance on air conditioning systems in accordance with the cooling hierarchy. The following is an outline of how the development has been designed in line with the cooling hierarchy.

| GLA's Cooling Hierarchy | Proposals |
|---|---|
| 1. Reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation, and the provision of green infrastructure | The glazing to wall ratio and orientation of the dwellings have struck a balance between provision of good internal daylighting and limiting excessive summer solar gain. The high-performance façade and careful select of glazing properties will limit the amount of heat entering the building. External shading has also been provided where dwellings do not have a overhanging balcony above. |
| 2. Minimise internal heat generation through energy efficient design | The heating and hot water strategy is utilising the latest 5th generation heat loop within the building. This means the circulating hot water is at a much lower temperature than a traditional heating system and as such do not provide unwanted heat into the occupied spaces during summer. Thus, minimising the internal heat generation. |
| 3. Manage the heat within the building through exposed internal thermal mass and high ceilings | The design proposals look to utilise the thermal mass of the building to aid the management of heat. Additionally, to this the volume of the spaces mean the heat build up will not be so intense. |
| 4. Provide passive ventilation | All dwelling will have openable windows which will be easily operated by the occupants. Openable areas have been considered and maximise to offer the greatest ventilation possible. The design has look to limit the number of single aspect dwelling to encourage cross ventilation in the occupied spaces. Side hung balcony doors have been selected over sliding door to maximise the opening area. Where sliding doors are not present, opening are being designed to provide an effective area that is equal to 10% of the equivariant gross internal floor area of the room. To demonstrate the passive ventilation strategy will be capable of providing adequate relief from overheating CIBSE TM59 modelling has been undertaken. |
| 5. Provide mechanical ventilation | To provide adequate background fresh air ventilation, particularly in winter, mechanical ventilation with heat recovery is being utilised. This will only provide background ventilation rates and not solely address the overheating ventilation requirements |
| 6. Provide active cooling systems. | The design proposals have looked to negate the need for air conditioning. However, due to the acoustic constraints preventing the opening of windows, air conditioning will need to be provided. The opening window configuration will still be adopted on the building to provide user choice and it the hope that the local noise levels will reduce in the future and enable a passive strategy to limiting the risk of overheating. |

### 5.2 Overheating Risk Analysis

In line with GLA's planning requirements, all developments are required to undertake an analysis of overheating risk and cooling demands. The following sections present various methods for quantifying this risk.

#### 5.2.1 Dynamic Overheating Simulation

The Chartered Institution of Building Services Engineers (CIBSE) has produced guidance on assessing and mitigating overheating risk in buildings. TM59 should be used for domestic developments. In addition, TM49 guidance and datasets should also be used to ensure that all new development is designed for the climate it will experience over its design life.

Thermal modelling has been conducted to investigate and mitigate the risk of overheating within the Proposed Development.

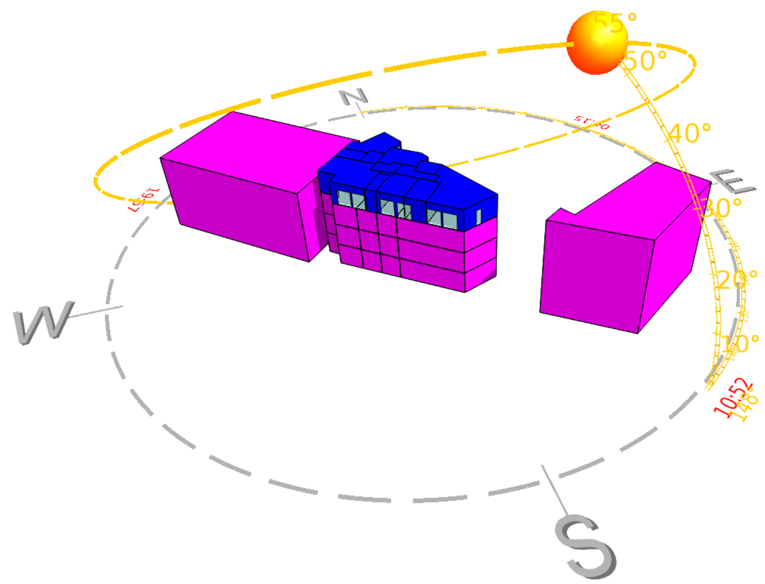
In accordance with CIBSE AM11: Building Energy and Environmental Modelling, approved software IES:VE 2019 was used for this exercise.

To demonstrate the passive ventilation strategy will be capable of providing adequate relief from overheating CIBSE TM59 modelling has been undertaken. This is based upon a representative sample of the dwellings most at risk of overheating. These have been selected due to the orientation, size and exposure of the units. All inputs were as per CIBSE TM59 and the overheating compliance is being assessed using the London_LWC_DSY1_2020High50 weather file.

CIBSE TM59 outlines two criteria under which to assess overheating:

1. For living rooms, kitchens, and bedrooms, the number of hours (He) that ΔT is greater than or equal to 1K from May to September inclusive shall not exceed 3% of occupied hours. ΔT represents the difference between the zone operative temperature and the maximum allowable temperature set with reference to recent ambient conditions.
2. For bedrooms only, to guarantee comfort during the sleeping hours the operative temperature in the bedroom from 10 pm to 7 am shall not exceed 26 °C for more than 1% of annual hours.

#### 5.2.2 Overheating Results




The results indicate that under the DSY1 scenario, the spaces tested are expected to comply with the TM59 requirements.

In addition, the analysis was run under the DSY2 and DSY3 weather files to emulate a short intense heat wave, and a long less intense warm spell, respectively. It should be noted that these sets of results are for information only and compliance with them is not mandatory. It is noted that GLA guidance confirms it is very difficult to achieve a pass result when testing using the DSY 2 and DSY 3 weather files, but in accordance with the guidance we note that occupants will be able to mitigate overheating through use of local fans and shutting internal blinds during the particularly long or particularly intense hot periods represented by these files.

The full set of assessment results and required equivalent areas; as well as results for circulation zones, DSY2 and DSY3, can be found in Appendix H.

# 6.0

## Sustainability Strategy

# 6.0 Sustainability Strategy

### 6.1 Materials

Building and construction activities worldwide consume 3 billion tonnes of raw material each year, which account for approximately 50% of total global consumption. Using green/sustainable building materials and products promotes conservation of dwindling non-renewable resources. In addition, integrating sustainable building materials into building projects can help reduce the environmental impacts associated with the extraction, transport, processing, fabrication, installation, reuse, recycling, and disposal of these source materials.

The Clarkson Row – Residential Development can reduce embodied carbon emissions through reuse of the existing site materials and structure and careful selection of new building materials. The opportunity to reuse certain elements means that $CO_2$ emissions associated with the procurement, manufacture and transportation of new materials can be reduced.

#### 6.1.1 Environmental Impact of Materials

Materials with low overall environmental impact will be chosen and advice from the Green Guide to Specification will be taken into consideration for the selection. The Green Guide rates the environmental impact of different materials and components, considering factors like toxicity, ozone depletion, ease of recycling, and waste disposal (core issues marked with an asterisk under Environmental Issue). Where viable, at least 80% (by area) of the main elements in the building, fabric & building services insulation should be specified to achieve the best performing “A” and “A+” ratings from the Green Guide.

| Environmental Issue |
| --- |
| Climate Change* |
| Water extraction |
| Mineral extraction |
| Stratospheric ozone depletion* |
| Human toxicity |
| Ecotoxicity to freshwater |
| Higher level nuclear waste |
| Ecotoxicity to land |
| Waste disposal |
| Fossil fuel depletion |
| Eutrophication* |
| Photochemical ozone creation* |
| Acidification* |

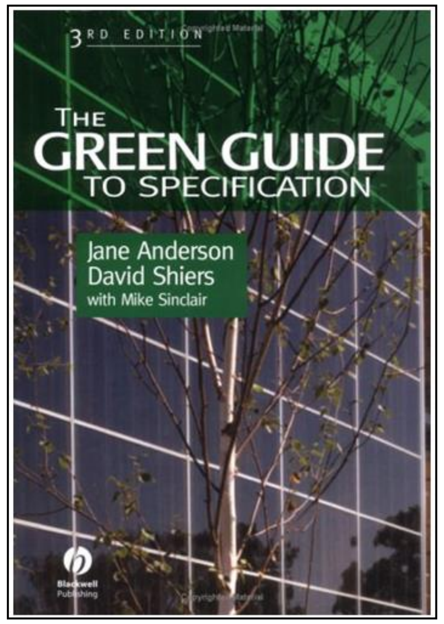



*Figure 6-1: Green Guide to Specification, to be included in the Green Fit-Out Guide*

#### 6.1.2 Sustainable Timber

All timber used for basic or finishing building elements in the scheme will be sourced from responsibly managed and sustainable forests or plantations. Such timber products are the only truly renewable construction material in common use and the responsible management of forests for timber helps to lock in $CO_2$.

By maximising the use of timber for structural or finishing purposes the embodied carbon impact of the development can be reduced.

#### 6.1.3 Locally Sourced Materials

A building that is truly sustainable must be constructed using locally sourced, sustainable materials i.e. materials that can be supplied without any adverse effect on the environment. Therefore, where practical, materials should be sourced from local suppliers, reducing the environment impacts and $CO_2$ emissions associated with transportation to the site.

#### 6.1.4 Recycled Materials

Scope for increased recycling will be incorporated by specifying recycled materials where possible and ensuring that even where new materials are used, as much as possible can be recycled at the end of the building’s life.

Specifying materials with a high-recycled content is also another method of saving processing or manufacturing energy. The recycled content of a material can be described as either post-consumer or post-industrial to indicate at what point in the life cycle a material is reclaimed.

#### 6.1.5 Ozone Depletion and Global Warming

CFCs and HCFCs, compounds commonly used in insulation materials and refrigerants, can cause long-term damage to the Earth’s stratospheric ozone layer, exposing living organisms to harmful radiation from the sun. They also significantly increase global-warming if they leak into the atmosphere. Following the Montreal Protocol, production and use of CFCs is no longer permitted. However, products that replaced these gases are often still potent global warming contributors.

All insulation materials specified for the proposed scheme will have zero Ozone Depleting Potential and low Global Warming Potential, (GWP<5) in either manufacture or composition. This will include insulation for building elements (ceiling, internal & external walls, and floor – including foundations) as well as insulation for hot water vessels and pipe or duct work.

#### 6.1.6 Relevant Policy

It is anticipated that the above contributes to the requirements for:

- London Plan Policy 5.17 Waste Capacity;
- New London Plan SI1

### 6.2 Water Conservation

Water consumption in the UK has risen by 70% over the last 30 years. Trying to meet the increasing demand by locating new sources of water supply is both expensive and damaging to the environment. Therefore, the design team have focused on reducing the demand for water and managing the existing resources.

#### 6.2.1 Water Demand Reduction and Water Efficiency

The aim is to minimise internal and external potable water use within the development. Good water management can contribute to reducing the overall level of water consumption maintaining a vital resource and having environmental as well as cost benefits in the life-cycle of the building. The dwelling will be design to limit operational water consumption to less than 125 litres/person/day. The following water saving measures are being considered:

***Dual Flush Cisterns on WC’s*** - These units have the ability to provide a single flush of 3L and/or a full flush of 6L. It is proposed that these are used throughout the development in order to minimise water consumption.

***Flow Restrictors to Taps*** - Flow restrictors reduce the volume of water discharging from the tap. Spray taps have a similar effect and are recommended to reduce both hot and cold-water consumption. Low flow taps in one of the above forms will be installed in all of areas.

***Low Flow Showers -*** The average shower uses 15 litres of water a minute, by restricting the output of the showers in the development to a maximum of 9 litres/ min a 40% water saving can be achieved. Flow rate can be reduced down to 6 litres/ minute without compromising on water pressure and hence will be considered as the design develops.

***Water Meters*** - In 1995 approximately 33,200 million litres of water a day were extracted in England and Wales, this increased to 44,130 million litres/day in 2001, and much of this was for domestic water supply. To reduce this figure, accurate information on usage is required for management of a building’s consumption. Water meters will be specified on the main supply and sub-metering.

### 6.2.2 Sustainable Urban Drainage

The Environment Agency's Flood Map indicates that the site is in Flood Zone 1. This means that the development does not require a flood risk assessment as there is a low probability of flooding – less than a 1 in 1,000 annual probability of river or sea flooding.

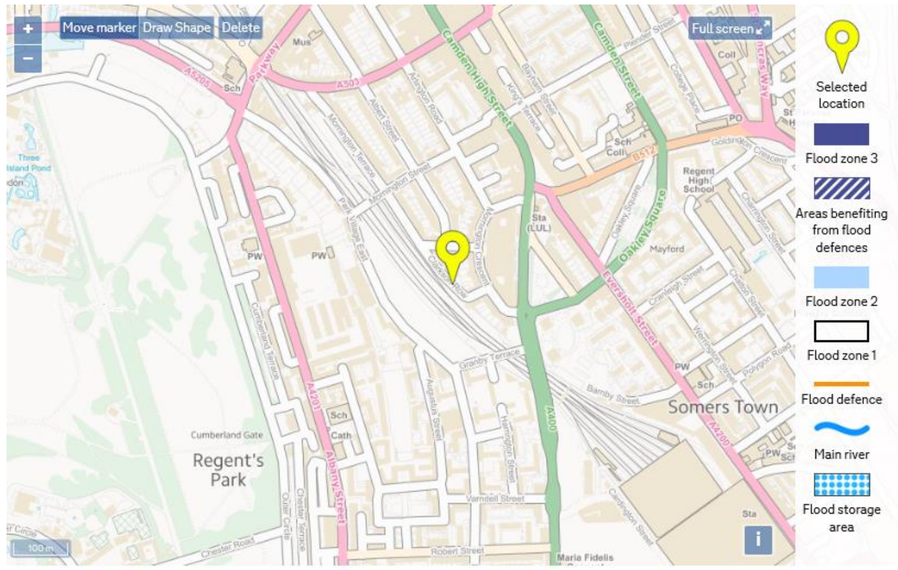



*Figure 6-2. Flood Map of Clarkson Row – Residential Development marking the site in a low-risk area*

The site is currently completely impermeable with hard landscaping and building areas. The main aim of the drainage strategy is to make surface water run-off no worse than it was previously.

The landscaping proposal have looked to utilise natural drainage strategies. Full details of the proposed drainage strategy can be found in BP Civils planning documentation. Not only do these nature-based solutions manage surface water on the site, they also positively contributes to the site's biodiversity. This has resulted in a Urban Greening Factor (UGF) of 0.41 exceeding the London Plan Policy G5. Full details of the UGF can be found in the Design & Access Statement.

### 6.2.3 Relevant Policy

It is anticipated that the above contributes to the requirements for:

- London Plan Policy 5.12 Flood Risk Management, Policy 5.13 Sustainable Drainage, Policy 5.15 Water Use and Supplies;
- New London Plan SI12, SI13, G5

## 6.3 Waste Management

Buildings and building sites produce a significant amount of waste per year. Most of the waste produced in the UK is disposed of in landfill sites and only a small percentage of it is recycled or reused.

### 6.3.1 Waste Targets

Under EU legislation the UK will have to ensure that less than a third of its waste is sent for burial in landfill sites by 2020 and the figure at present is about 80%. To achieve this target several measures are implemented, including landfill tax, aiming to discourage disposal of waste to landfill. Good waste management is a key component of sustainable development and is an important means of:

- Reducing unnecessary expenditure;
- Reducing the amount of natural resources for production of new materials;
- Reducing energy for waste disposal;
- Reducing levels of contamination and pollution arising from waste disposal.

### 6.3.2 Construction

During the on-site phase a large amount of waste material will be generated through the demolition and construction procedures. In building construction, the primary waste products in descending percentages are wood, asphalt/concrete/masonry, drywall, roofing, metals, and paper products.

An appropriate pre-demolition audit should be carried out to maximise the recycling and recovery rates of the development. A compliant resource management plan covering the waste arisings from the development should be developed and implemented that complies with the requirements of current legislation. This plan will identify the local waste haulers and recyclers, determine the local salvage material market, identify and clearly label site spaces for various waste material storage and require a reporting system that will quantify the results and set targets.

### 6.3.3 Waste Management in Operation

The detailed design phases will identify the potential waste streams that the development will produce. As a minimum, plans will be formulated to handle the separation, collection, and storage of common recyclable materials such as paper, glass, plastics, and metals. The collection points will be easily accessible to all users.

The main aim will be to recycle as much waste as possible, this will be achieved by making sure that waste recycling facilities are strategically placed in convenient locations.

Dedicated storage space for recyclable materials generated by the site during occupation, will include the following:

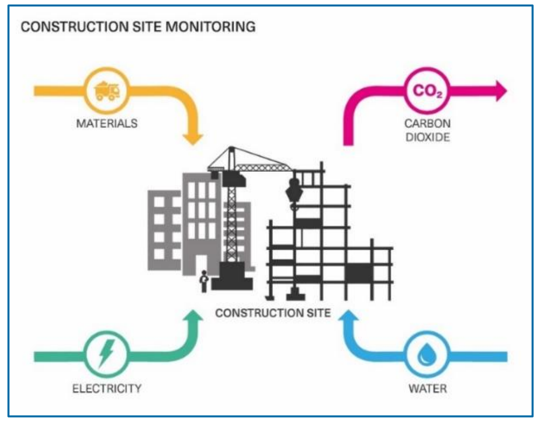
- Be clearly labelled for recycling;
- Be placed within accessible reach of the buildings;
- Be in a location with good vehicular access to facilitate collections.

A section will be included in the Building User Guide outlining the options for recycling on site and explaining the different waste streams for the end user.


### 6.3.4 Construction Environmental Management

Construction sites are responsible for significant impacts, especially at a local level. These arise from noise, potential sources of pollution, waste and other disturbances. Impacts such as increased energy and water use are also significant. Therefore, attention is being given to site-related parameters with the aim to protect and enhance the existing site and its ecology.

The aim is to have a construction site managed in an environmentally sound manner in terms of resource use, storage, waste management, pollution and good neighbourliness. To achieve this, there will be a commitment to comply with the Considerate Constructors Scheme.




#### 6.3.4.1 Considerate Construction Scheme

Areas that can be taken into consideration in order to minimise the impact of the construction site on its surroundings and the global environment as follows:

- Monitor, report and set targets for $CO_2$ or energy usage from site activities;
- Monitor, report and set targets for $CO_2$ or energy usage arising from transport to and from site;
- Monitor, report and set targets for water consumption from site activities;
- Monitor construction waste on site, sorting and recycling construction waste where applicable;
- Adopt best practice policies in respect of air and water pollution arising from site activities;

- Operates an Environmental Management System;
- Additionally, all timber used on site will be responsibly sourced.

CONSIDERATE CONSTRUCTORS

### 6.3.5 Relevant Policy

It is anticipated that the above contributes to the requirements for:

- London Plan Policy 5.17 Waste Capacity;
- New London Plan SI7

## 6.4 Pollution

Global concern for environmental pollution has risen in recent years, as concentrations of harmful pollutants in the atmosphere are increasing. Buildings have the potential to create major pollution both from their construction and operation, largely through pollution to the air (dust emissions, NOx emissions, ozone depletion and global warming) but also through pollution to watercourses and ground water. The proposed development will aim to minimise the above impacts, both at the design stage and onsite.

### 6.4.1 Ozone Depletion

CFCs and HCFCs, compounds commonly used in insulation materials and refrigerants, can cause long-term damage to the Earth's stratospheric ozone layer, exposing living organisms to harmful radiation from the sun. They also significantly increase global-warming if they leak into the atmosphere. Following the Montreal Protocol, production and use of CFCs is no longer permitted. However, products that replaced these gases are often still potent global warming contributors. Where refrigerants are used for air-conditioning and comfort cooling, they will be CFC and HCFC-free.

### 6.4.2 Internal pollutants

Volatile organic compounds (VOCs) are emitted as gases (commonly referred to as off-gassing) from certain solids or liquids. VOCs include a variety of chemicals, some of which are known to have short-term and long-term adverse health effects. Concentrations of many VOCs are consistently higher indoors (up to ten times higher) than outdoors.

VOCs are emitted by a wide array of products numbering in the thousands. Examples include: paints and lacquers, paint strippers, cleaning supplies, pesticides, building materials, furnishings, adhesives, Urea-formaldehyde foam insulation (UFFI), pressed wood products (hardwood plywood wall panelling, particleboard, fibreboard) and furniture made with these pressed wood products.

'No' or 'low' VOC paints are available from most standard mainstream paint manufacturers. There 'eco-friendly' paints are made from organic plant sources and also powdered milk-based products.

The design team will seek to select internal finishes and fittings with low or no emissions of VOCs and comply with European best practice levels as a minimum.

### 6.4.3 Night Sky Pollution

The intention is to be a good neighbour and not to introduce nuisance glare or light pollution of the night sky from miss directed or unnecessary lighting. Feature lighting, where required, will be focussed to the task/ subject. Where necessary luminaires will be further screened in cases where there may be an issue of close proximity and light spill to the adjacent neighbouring residential areas, although the intention is to avoid this situation arising wherever possible from the outset. The external lighting design will take into consideration the relevant guidance from the British Standards and other recommended documents including the following Standards and Design Guides:

- CIBSE Lighting Guide for the Outdoor Environment;
- BS5489 Code of Practice for the Design of Road Lighting;
- BS EN 13201-1 Road Lighting, Selection of Lighting Classes;
- BSEN 13201-2 Road Lighting, Performance requirements;

### 6.4.4 Relevant Policy

It is anticipated that the above contributes to the requirements for:

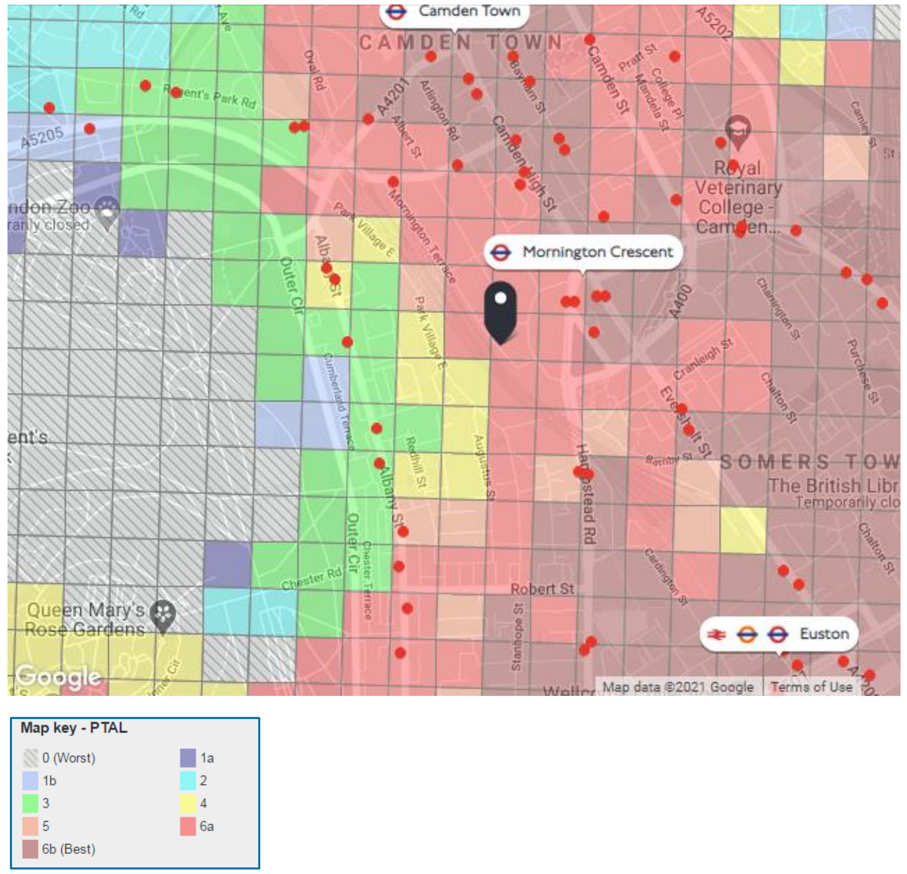
- New London Plan SI1

## 6.5 Transport

The transport of people between buildings is the second largest source of $CO_2$ emissions in the UK after energy use in buildings and remains the main source of many local pollutants. Energy use and emissions from transport are growing at 4% per year, while the effects of climate change are becoming more severe.

### 6.5.1 Site Location

The existing site offers multiple public transport options within an easily walkable distance. The London Public Transport Accessibility Level (PTAL) for the site is 2, however to the East in very close proximity the PTAL rating is 6a (very good).




### 6.5.2 Cycling Facilities

Details of the dwelling's cycle storage options can be found within the Design and Access statement, however the floor plans detail secure and convenient cycle storage spaces are proposed as part of the development.

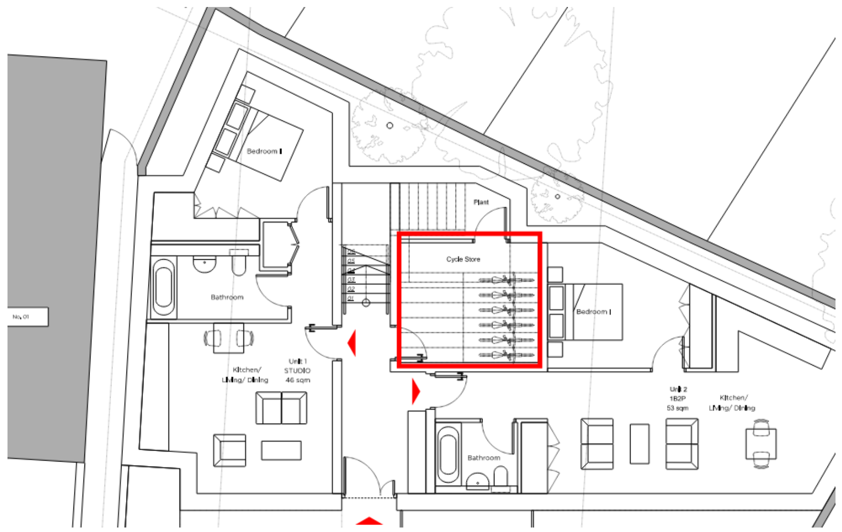


*Figure 6-4 Cycling storage spaces at ground floor*

### 6.5.3 Relevant Policy

It is anticipated that the above contributes to the requirements for:

- London Plan Policy 6.9 Cycling;
- New London Plan T3, T5

# Appendices

# Appendix A – Planning Policy

**National Policy**

The revised National Planning Policy Framework (NPPF) was published in February 2019 and sets out the government's planning policies for England and states a clear presumption in favour of sustainable development. The revised Framework replaces the previous NPPF published in March 2012.

The NPPF supports the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change, and encourages the reuse of existing resources, including conversion of existing buildings, and encourages the use of renewable resources.

The NPPF, Section 9 outlines the transport issues that should be considered from the earliest stages of plan-making and development proposals.

The NPPF, Section 14 outlines its energy and climate change policies. New development should be planned for in ways that:

- Avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure; and
- Can help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national standards.

To support the move to a low carbon future, local planning authorities should:

- Plan for development in ways which reduce greenhouse gas emissions.
- Actively support energy efficiency improvements to existing buildings; and
- When setting any local requirement for a building's sustainability, do so in a way consistent with the Government's zero carbon buildings policy and adopt nationally described standards.

The NPPF states that in determining planning applications, local planning authorities should expect new development to:

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

When determining planning applications for renewable and low carbon development, local planning authorities should:

- Not require applicants to demonstrate the overall need for renewable or low carbon energy, and recognise that even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions; and
- Approve the application if its impacts are (or can be made) acceptable49. Once suitable areas for renewable and low carbon energy have been identified in plans, local planning authorities should expect subsequent applications for commercial scale projects outside these areas to demonstrate that the proposed location meets the criteria used in identifying suitable areas.

The key focus of the NPPF is to support local and regional planning authorities.

**Regional Policy**

The Greater London Authority (GLA) London Plan 2016 and the GLA's Guidance on Preparing Energy Assessments October 2018 document are the benchmark for London planning regulation. Together they provide a useful tool to undertake energy and sustainability assessments.

**GLA Energy Assessment Guidance (April 2020)**

The GLA Energy Assessment Guidance looks to standardise how energy assessments for developments within London are presented and reported. As part of the this process the guidance from January 2019 referable developments are encouraged to use the updated SAP 10 emissions factors while continuing to use the current Building Regulation methodology.

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**New London Plan (March 2021)**

In March 2021, the Mayor released a new London Plan. In relation to energy and sustainability the Plan looks to further push the requirements on referable developments. The policies considered in the preparation of the statement are mainly under Chapter 9: Sustainable Infrastructure and Chapter 10: Transport.

The Greater London Authority (GLA) new London Plan 2021 and the GLA's Guidance on Preparing Energy Assessments October 2018 document are the benchmark for London planning regulation. Together they provide a useful tool to undertake energy and sustainability assessments. A draft GLA Guidance on Preparing Energy Assessments release in April 2020 with intension to replace the old guidance.

The GLA Energy Assessment Guidance looks to standardise how energy assessments for developments within London are presented and reported. As part of the this process the guidance from January 2019 referable developments are encouraged to use the updated SAP 10 emissions factors while continuing to use the current Building Regulation methodology.

**Policy SI 1: Improving Air Quality**

Major developments should seek opportunities to improve local air quality and should not reduce air quality benefits from the Mayor's or boroughs' activities.

Proposals must be submitted with an Air Quality Assessment, outlining how air quality neutral will be achieved. At a minimum, proposals must be at least Air Quality Neutral.

Development proposals in Air Quality Focus Areas or that are likely to be used by large numbers of people particularly vulnerable to poor air quality, such as children or older people should demonstrate that design measures have been used to minimise exposure.

Masterplans and development briefs for large-scale development proposals subject to an Environmental Impact Assessment should consider how local air quality can be improved across the area of the proposal as part of an air quality positive approach.

In order to reduce the impact on air quality during the construction and demolition phase development proposals must demonstrate how they plan to comply with the Non-Road Mobile Machinery Low Emission Zone and reduce emissions from the demolition and construction of buildings following best practice guidance.

**Policy SI 2: Minimising Greenhouse Gases**

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

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

Major development proposals should include a detailed Energy Strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy. Carbon emissions should be minimised on site as far as is practical and feasible.

A minimum on-site reduction of at least 35% beyond Building Regulations is required for major development (Be Green). Residential development should achieve 10%, and non-residential development should achieve 15% through energy efficiency measures (Be Lean). Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, in agreement with the borough, either:

- Through a cash in lieu contribution to the borough's carbon offset fund, or
- Off-site provided an alternative proposal is identified and delivery is certain.

Boroughs must establish, administer and regularly review a carbon offset fund. Offset fund payments must be ring-fenced to implement projects that deliver carbon reductions. Where London Boroughs have not established an offset rate, the GLA figure should be used. The GLA's suggested carbon offset price is currently £95 per tonne; this will be updated in future guidance.

Major development proposals should calculate and minimise unregulated carbon emissions from any other part of the development that are not covered by Building Regulations.

Development proposals referable to the Mayor should calculate whole life-cycle carbon emissions through a nationally recognised Whole Life-Cycle Carbon Assessment and demonstrate actions taken to reduce life-cycle carbon emissions.

**Policy SI 3: Energy Infrastructure**

Energy masterplans should be developed for large-scale development locations (such as Town centres, Opportunity areas other growth areas) which establish the most effective energy supply options. Energy masterplans should identify any opportunities to generate, utilise and share otherwise wasted heat.

**Policy SI 4: Managing Heat Risk**

Development proposals should minimise adverse impacts on the urban heat island through design, layout, orientation, materials and the incorporation of green infrastructure. Proposals should demonstrate through an energy strategy how they will reduce the potential for internal overheating and reliance on air conditioning systems in accordance with the Cooling Hierarchy. Section 6 provides full details of the overheating and cooling strategy and analysis.

**Policy SI 5: Water Infrastructure**

In order to minimise the use of mains water, water supplies and resources should be protected and conserved in a sustainable manner. Development proposals should:

- Through the use of Planning Conditions minimise the use of mains water in line with the Optional Requirement of the Building Regulations (residential development), achieving mains water consumption of 105 litres or less per head per day.
- Achieve at least the BREEAM excellent standard for the 'Wat 01' water category or equivalent (commercial developments).
- Incorporate measures such as smart metering, water saving and recycling measures, including retrofitting, to help to achieve lower water consumption rates and to maximise futureproofing.

**Policy SI 7: Reducing Waste and Supporting Circular Economy**

The Mayor and waste planning authorities will encourage waste prevention, reuse and minimisation, as well as promote a more circular economy that improves resource efficiency by supporting proposals which demonstrate how the following waste targets will be achieved:

- Construction and demolition – 95% reuse/recycling/recovery.
- Excavation – 95% beneficial use.

Referable applications should promote circular economy outcomes and aim to be net zero-waste and submit a Circular Economy Statement in support.

**Policy SI 12: Flood Risk Management**

Current and expected flood risk from all sources across London should be managed in a sustainable and cost-effective way in collaboration with the Environment Agency, the Lead Local Flood Authorities, developers and infrastructure providers.

Development Plans should use the Mayor's Regional Flood Risk Appraisal and their Strategic Flood Risk Assessment as well as Local Flood Risk Management Strategies to identify flood risk issues and develop mitigation measures.

Natural flood management methods should be employed in development proposals due to their multiple benefits including increasing flood storage and creating recreational areas and habitat.

**Policy SI 13: Sustainable Drainage**

Development proposals should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible. There should also be a preference for green over grey features, in line with the following drainage hierarchy:

- Rainwater resource (e.g. rainwater harvesting, blue roofs for irrigation).
- Rainwater infiltration to ground at or close to source.
- Rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens).
- Rainwater discharge direct to a watercourse (unless not appropriate).
- Controlled rainwater discharge to a surface water sewer or drain.
- Controlled rainwater discharge to a combined sewer.

Development proposals for impermeable surfacing should normally be resisted unless they can be shown to be unavoidable, including on small surfaces such as front gardens and driveways.

Drainage should be designed and implemented in ways that promote multiple benefits including increased water use efficiency, improved water quality, and enhanced biodiversity, urban greening, amenity and recreation.

**Policy GG 6: Increasing Efficiency and Resilience**

To help London become a more efficient and resilient city, those involved in planning and development must:

- Seek to improve energy efficiency and support the move towards a low carbon circular economy, contributing towards London becoming a zero-carbon city by 2050.
- Ensure buildings and infrastructure are designed to adapt to a changing climate, making efficient use of water, reducing impacts from natural hazards like flooding and heatwaves, while mitigating and avoiding contributing to the urban heat island effect.

**Local Policy – Camden Borough Council**

Camden's Local Plan is a collection of documents that set out how the borough will develop out to 2026. It is aligned to the London Plan and therefore conformity to the London Plan is required. Key local plan documentation that has been consulted as part of energy and sustainability strategy development include:

- Camden Planning Guidance: Energy efficiency and adaptation March 2019
- Camden Local Plan, July 2017
- Camden Local Plan Policies Map Alterations, June 2017

# Appendix B – Be Lean Output Documents

**Be Lean – Domestic**

# Appendix C – Be Green Output Documents

**Be Green – Domestic**

# Appendix D – Accredited Construction Details

Accredited Construction Details for Part L have been developed to assist the construction industry achieve the performance standards required to demonstrate compliance with Part L. They provide a set of standard details which represent good practice within the industry. When these details are used in construction, the thermal bridge values associated with each can be used in compliance calculations. This provides a significant improvement over the standard 'default' values, and can take the onus from other elements of the design such as system efficiencies and renewables.

The following table shows the values associated with the accredited construction details. Generally, the accredited details will need to be incorporated in the design in order to meet the required overall equivalent Y-value of no greater than 0.05W/m$^2$K, which must be proven through calculation once the construction details are further developed.

**Table K1 : Values of Ψ for different types of junctions**

| | Ref | Junction detail | Accredited Ψ (W/m·K) | Default Ψ (W/m·K) |
|---|---|---|---|---|
| **Junctions with an external wall** | E1 | Steel lintel with perforated steel base plate | 0.50 | 1.00 |
| | E2 | Other lintels (including other steel lintels) | 0.30 | |
| | E3 | Sill | 0.04 | 0.08 |
| | E4 | Jamb | 0.05 | 0.10 |
| | E5 | Ground floor | 0.16 | 0.32 |
| | E6 | Intermediate floor within a dwelling | 0.07 | 0.14 |
| | E7 | Intermediate floor between dwellings (in blocks of flats) [a] | 0.07 | 0.14 |
| | E8 | Balcony within a dwelling [b] | 0.00 | 0.00 * |
| | E9 | Balcony between dwellings [a) b)] | 0.02 | 0.04 * |
| | E10 | Eaves (insulation at ceiling level) | 0.06 | 0.12 |
| | E11 | Eaves (insulation at rafter level) | 0.04 | 0.08 |
| | E12 | Gable (insulation at ceiling level) | 0.24 | 0.48 |
| | E13 | Gable (insulation at rafter level) | 0.04 | 0.08 |
| | E14 | Flat roof | 0.04 | 0.08 |
| | E15 | Flat roof with parapet | 0.28 | 0.56 |
| | E16 | Corner (normal) | 0.09 | 0.18 |
| | E17 | Corner (inverted – internal area greater than external area) | -0.09 | 0.00 |
| | E18 | Party wall between dwellings [a] | 0.06 | 0.12 |
| **Junctions with a party wall** [a] | P1 | Ground floor | 0.08 | 0.16 |
| | P2 | Intermediate floor within a dwelling | 0.00 | 0.04 |
| | P3 | Intermediate floor between dwellings (in blocks of flats) | 0.00 | 0.04 |
| | P4 | Roof (insulation at ceiling level) | 0.12 | 0.24 |
| | P5 | Roof (insulation at rafter level) | 0.02 | 0.04 |

a) Value of Ψ is applied to each dwelling

b) This is an externally supported balcony (the balcony slab is not a continuation of the floor slab) where the wall insulation is continuous and not bridged by the balcony slab

* Value valid only if balcony support does not penetrate the wall insulation. If it does so penetrate, either a Ψ-value must be calculated for the junction, or the SAP calculation uses the default overall thermal bridging of y = 0.15

# Appendix E – Services Input

The table below provides a summary of the fixed building services inputs for the 'Be Lean' and 'Be Green' scenario.

| Fixed Building Services | Be Lean | Be Green (Proposed) |
|---|---|---|
| Energy Loop Heat Source | N/A | ASHP & WSHP |
| Energy Loop Source Efficiency | N/A | 250% |
| Space heating type | Boiler | Heat loop |
| Space heating emitters | FCUs | FCUs |
| Space heating fuel | Natural gas | Electric |
| Space heating efficiency | 94% | 250% |
| Space Cooling type | Chiller | Heat loop |
| Space Cooling emitters | FCUs | FCUs |
| Space Cooling fuel | Electricity | Electric |
| Space Cooling efficiency | 260% | As per heat loop |
| DHW heating type | Boiler | heat loop |
| DHW heating fuel | Natural gas | Electric |
| DHW heating efficiency | 94% | 250% |
| DHW Storage Volume (L) | 150 | 180 |
| DHW Storage Loss (kWh/day) | 1.39 | 1.85 |
| Communal Heating Distribution Efficiency | piping system 1991, post-insulated, low temp, variable | 1.05 |
| Hot water daily usage | < 125 l/p/day | < 125 l/p/day |
| Controls | Community Charging system linked to usage<br>Programmer<br>Two room stats | Community Charging system linked to usage<br>Programmer<br>Two room stats |
| Ventilation type | MVHR | MVHR |
| MVHR Unit name | 500423 | 500423 |
| Ventilation minimum heat recovery efficiency | 90% | 90% |
| Ventilation maximum SFP (W/l/s) | 0.57 | 0.57 |
| Duct Type | Rigid | Rigid |
| Low energy light fittings | 100% | 100% |

*Table 0-1 Building services performance*

# Appendix F – Heat Loop Details

### System Description

The low temperature heat loop strategy will serve the dwellings. Roof-mounted air source heat pumps will generate the heat energy, which will be feed down to the buffer tanks at ground level before being distributed around the building via the primary heat loops. At the core, risers will branch off and up the risers where it is distributed across each floor. Each dwelling will have its own local internal water source heat pump which will upgrade the heat from the main system to effective heating temperatures within the dwellings.

### Operation

Losses across the system will be minimised through the following mechanisms:

- Heat pumps sized appropriately to modulate through load ranges up to peak;
- Buffer vessels used and sized to effectively store thermal energy and smooth supply of heat to the wider system;
- Heat loop temperatures will be kept low to minimize the deltaT between LTHW and ambient spaces. Heat source and primary heat loop operating temperature range 40°C - 35°C; Secondary heat loop and distribution to each apartment operating range 25°C - 15°C.
- Equipment will be included in the system to monitor and regulate temperature and flow control across the system;
- Plant efficiencies and pipework insulation beyond the standards required by the Domestic Building Services Compliance Guides;

### Heating Performance

Heating costs for occupants have been minimised through measures including:

- Extremely high-performance thermal envelope with low u-values, thermal bridging and air permeability, ensuring space heating loads are significantly lower than typical residential buildings.
- The low temperature heat loop using high efficiency heat pumps provides LTHW efficiently to all occupants.
- Low flow water fittings will enable reductions on domestic hot water usage compared to standard fittings.
- Specific metering strategies of energy use will ensure occupants are billed only for the heat they use.
- Based on the SAP calculations and assuming £0.12/kWh of electricity, the estimated heating cost (space + DHW) is calculated to range between roughly £120 and £350 depending on apartment type. This works out to be approximately £200 on average per apartment per year, which is significantly lower than typical costs.

### Metering and Monitoring

The central heat loop system will be metered, monitored and reported to enable the high level of performance to be achieved during operation as per the design.

A central automatic control and energy monitoring system will be provided to control, monitor and record main items of plant and monitor all meters and sub-meters. This consists of the digital control of all central plant including starting and stopping of the plant, temperature control system monitoring and energy metering, all provided by a specialist controls contractor.

Each apartment is to be provided with an apartment control panel (APC) housing the outstation controllers in a Form 2 enclosure. The panel is to be fitted with a facia mounted touch screen display screen and laptop connection point.

The landlord's plant is to be provided with Form 2 plant control panels (PCP) housing the outstations to control and manage the shell and core plant.

The landlord is to be able to view and log the energy consumption and plant alarms from each of the apartments systems via a Bacnet over IP network serving the BMS throughout the building.

The controls platform and communications protocol used will utilise Ethernet BACnet IP with Modbus monitoring of meters via a Synapsis SIP module.

A remote common alarm output will also be provided to draw the attention of maintenance staff to any major problem with the system, including safety systems (location of remote alarm to be determined).

A web connection is to be configured to allow the system to be controlled and overridden from the central building managers BMS and remotely via a suitably password protected web browser interface.

The below datasheets represent likely options for the equipment selection, however these are subject to review, further technical design and procurement review.

### Products and Efficiencies

Following are a range of technical details that were used to model the heat loop system outlined in the diagram above.

Chillers

Product Information

**e-Series Modular Chiller** (90-1,080kW)
Cooling Only or Heat Pump

Making a World of Difference

| MODEL | | | EAHV-P900YA-N Heating/Cooling | EAHV-P1500YBL-N Heating/Cooling | EAHV-P1800YBL-N Heating/Cooling |
|---|---|---|---|---|---|
| POWER SOURCE | | | 3-phase 4-wire 380-400-415v, 50/60Hz | 3-phase 4-wire 380-400-415v, 50/60Hz | 3-phase 4-wire 380-400-415v, 50/60Hz |
| COOLING CAPACITY *1 WATER | | kW | 90.0 | 150.0 | 180.0 |
| | | kcal/h | 77,400 | 129,000 | 154,800 |
| | | BTU/h | 307,080 | 511,800 | 614,160 |
| | Power Input | kW | 30.6 | 45.1 | 59.01 |
| | EER (Pump input is not included) | | 3.30 | 3.33 | 3.05 |
| | IPLV *5 | | 6.34 | 6.55 | 6.33 |
| | Water Flow Rate | m³/h | 15.5 | 25.8 | 31 |
| COOLING CAPACITY (EN14511)*2 WATER | | kW | 90 | 148.6 | 177.8 |
| | | kcal/h | 77,400 | 127,779 | 152,874 |
| | | BTU/h | 307,080 | 506,955 | 606,517 |
| | Power Input | kW | 29.2 | 46.52 | 61.25 |
| | EER | | 2.94 | 3.19 | 2.90 |
| | Eurovent Efficiency Class | | B | A | B |
| | ESEER *6 | | 4.71 | 4.74 | 4.45 |
| | SEER (ηsc) (BS EN14825) | | 4.88 (192%) | 4.62 (181%) | 4.58 (180%) |
| | Water Flow Rate | m³/h | 15.5 | 25.8 | 31.0 |
| | Minimum Water Circuit Volume | L | 780 | 1450 | 1450 |
| HEATING CAPACITY *3 | | kW | 90.0 | 150 | 180 |
| | | kcal/h | 77,400 | 129,000 | 154,800 |
| | | BTU/h | 307,080 | 511,800 | 614,160 |
| | Power Input *3 | kW | 25.71 | 44.59 | 55.68 |
| | COP | | 3.50 | 3.36 | 3.23 |
| | Water Flow Rate | m³/h | 15.5 | 25.8 | 31.0 |
| HEATING CAPACITY (EN14511)*4 | | kW | 90.0 | 151.42 | 182.24 |
| | | kcal/h | 77,400 | 130,221 | 156,726 |
| | | BTU/h | 307,080 | 516,645 | 621,803 |
| | Power Input *3 | kW | 27.6 | 46.01 | 57.92 |
| | COP | | 3.25 | 3.29 | 3.15 |
| | Eurovent Efficiency Class | | A+ | A | B |
| | SCOP Low/Medium | | 3.66 (143%) / 2.89 (113%) | 3.24 (127%) / 2.85 (112%) | 3.24 (127%) / 2.85 (112%) |
| | Water Flow Rate | m³/h | 15.5 | 25.8 | 31.0 |
| CURRENT INPUT | Cooling Current 380 - 400 - 415V *1 | A | 46.0 - 43.7 - 42.3 | 77 - 73 - 70 | 77 - 73 - 70 |
| | Heating Current 380 - 400 - 415V *3 | A | 43.4 - 41.2 - 39.7 | 76 - 72 - 69 | 76 - 72 - 69 |
| | Maximum Current Input | A | 61 | 111 | 111 |
| WATER PRESSURE DROP *1 | Water | kPa | 135 | 114 | 164 |
| TEMP RANGE | Cooling Water | °C | Outlet water 5 ~ 25 | Outlet water 5 ~ 30 | Outlet water 5 ~ 30 |
| | Heating | °C | Outlet water 30 ~ 55 | Outlet water 30 ~ 55 | Outlet water 30 ~ 55 |
| | Outdoor | °C | -15 ~ 43 | -15 ~ 43 | -15 ~ 43 |
| CIRCULATING WATER VOLUME | | m³/h | 15.5 | 25.8 | 31 |
| SOUND PRESSURE LEVEL (measured in anechoic room) at 1m *1 | | dB(A) | 65 | 66 | 68 |
| SOUND POWER LEVEL (measured in anechoic room) *1 | | dB(A) | 77 | 84 | 86 |
| DIAMETER OF WATER PIPE (Standard piping) | Inlet | mm | 100A housing type joint | 150A housing joint type | 150A housing joint type |
| | Outlet | mm | 100A housing type joint | 150A housing joint type | 150A housing joint type |
| EXTERNAL FINISH | | | Polyester powder coated steel plate | Polyester powder coated steel plate | Polyester powder coated steel plate |
| EXTERNAL DIMENSION | Width x Depth x Height | mm | 2250 x 900 x 2450 | 3400 x 1080 x 2350 | 3400 x 1080 x 2350 |

Ability

Glen Dimplex HEATING & VENTILATION

# Zeroth Apartment Heat Pump with integrated cylinder

4 and 6 KW Heating & Cooling models

2 - Zeroth WSHP

The Zeroth Heat Pump comes in two sizes, 4kW and 6kW. The integrated cylinder is made from Stainless Steel with a Heat Pump mounted underneath, in a removable module. The outer casing is made from painted white steel formed around a rigid frame, with adjustable feet. The heat pump can produce heating, cooling or hot water very efficiently as it extracts energy from an energy loop at between 15 and 25 degrees. The end user controls are mounted flush on the front and all pipework and cable entries are on the top, except for a drain hose connected at the back and the discharge which can be piped left or right, through the knockout.

Provides DHW, Heating and Cooling for new build dwellings

Energy recovery features as standard by utilising simultaneous cooling and DHW

Compact unit with 550mm x 550mm footprint, ideal for integrated kitchen or cupboard installation

Stainless steel tank with no requirement for sacrificial anode.

Very quiet operation due to free swinging compressor base plate, inverter compressor, variable speed pumps, acoustic insulation and flexible pipework connections.

Use with an energy loop reduces overheating risk and improves building energy performance

Prewired and Pre-plumbed, simplifying the installation

2 year manufacturers guarantee, which can be extended to 5 years.

| Heat pump performance | | ZHP4-180C | ZHP6-180C |
|---|---|---|---|
| Cooling Capacity | kW | 3 | 5 |
| Required Capacity from Loop (Cool) | kW | 4 | 6 |
| Heating Capacity | kW | 4 | 6 |
| Required Capacity from Loop (Heat) | kW | 3.2 | 4.8 |
| Energy Efficiency Ratio. Cooling | W25/W14 | 4.1 | 4.4 |
| Coefficient of performance. Heating | W25/W35 | 8 | 8.3 |
| Coefficient of performance. Heating | W25/W55 | 4 | 4.3 |
| Nominal Flow Rate from loop | $m^3/h$ | 0.7 | 1.03 |
| Loop operating range | °C | 15-25 on a 5K delta T | |
| Maximum Static Pressure Rating | Bar | 10 | |
| Heating/Cooling flow rate | $m^3/h$ | 0.7 | 1.03 |
| Max Heating Flow Temperature | °C | 55 | |
| Min Cooling Flow Temperature | °C | 10 | |
| Sound power level at 1m | dB(A) | 43 | |
| Refrigerant | Type/kg | R410A/0.82 | |
| Available Pump Head (Heat/Cool) | kPa | 53 | 39 |
| Available Pump Head (Loop) | kPa | 45 | 23 |
| **Dimensions and connections** | | | |
| Dimensions | mm | 550 x 550 x 2000 | |
| Weight when filled | kg | 363 | |
| Weight without packaging (empty) | kg | 178 or 110/68 split | |
| Loop connections | mm | 22 copper stub | |
| Heating/Cooling connections | mm | 22 copper stub | |
| Discharge Drain | mm | 1.5m length supplied loose | |
| Discharge (G3 T and P Valve) | mm | 15 | |
| Cold Mains inlet to cylinder | mm | 22 copper stub | |
| Hot Water outlet/return | mm | 22 copper stub | |
| IP rating | | IPX4 | |
| Expansion Vessel (heating/cooling) | Litre | 8 | |
| **Electrical** | | | |
| Nominal Power Consumption Heat Pump, inc pumps (W25/W35) | kW | 0.6 | 0.82 |
| Electrical supply Immersion (230v) | A/Rating | 9A with 10A Type B RCBO | |
| Electrical supply HP Module (230v) | A/Rating | 13A with 16A Type C RCBO | |
| Number of Electrical supplies | | 2 | |
| **Hot water cylinder** | | | |
| Type | | Unvented | |
| Material | | Stainless Steel | |
| Insulation | | EPS Foam | |
| T&P Valve Rating | | 6 Bar or 95°C | |
| Maximum water inlet pressure | bar | 6 | |
| Capacity | L | 180 | |
| Integrated electric immersion | kW | 2 | |
| Maximum temperature with immersion | °C | 70 | |
| Water regulations | | G3 KIWA approval to EN12897 | |
| T&P valve | | Factory fitted | |
| Standing heat loss | kWh/24h | 1.85 | |
| Cylinder heat up time (from 10 to 60°C) | hrs | 2.5 | 1.7 |
| Accessories Supplied Loose | | Tundish, pre-formed discharge pipework, 1.5m hose, adjustable feet | |

GlenDimplex. have developed a guidance document in conjunction with the BRE detailing how their Zeroth heat loop system should be entered into NCM software. Manufacturer technical data has also been obtained which outlines the efficiencies modelled can be achieved by their products. Confirmation directly from the manufacturer has also been obtained which indicates the system seasonal efficiency could in fact be higher than what the guidance has stated and has been modelled. This has been deemed to be a reasonable and conservative approach to the exercise.

zeroth energy system

## Zeroth and putting the solution through SAP (2012)

Glen Dimplex Heating and Ventilation are currently undertaking in depth consultation with the Building Research Establishment (BRE) on how to correctly model the Zeroth Energy System within SAP. This document outlines two interim methods, which have been approved by the BRE, for use while the SAP methodology is suitably amended for SAP 10.

### Route 1: Zeroth with Heat Pumps

One of the most energy efficient ways to use Zeroth is with heat pumps as the central plant. The method provided by the BRE requires the assessor to either model the heat network with a default efficiency for heat pumps at 300% or if the ASHP SCOP is known (calculated to BSEN 14825) then this can be added to the box, as manufacturer declared. The value shown is for the Dimplex LA 60 TU or LA 60 TUR+ models. A distribution loss factor of 1.05 can be adopted for the network efficiency.

### General considerations

When modelling the Zeroth Energy System, it is important to remember that hot water services are provided using a cylinder. Therefore, the SAP assessor will need to enter the relevant values:

- Cylinder in dwelling
- Cylinder Volume – 180L
- Heat loss from cylinder – manufacturer declared
- Value – 1.85 kwh/day

## Appendix H – Full Overheating Results

**TM59 Compliance Results – DSY1**

| Occupied Zones | Criterion 1 (%Hrs Top-Tmax>=1K) | Night-time overheating criteria for bedrooms | Status |
|---|---|---|---|
| | Limit 3 | Limit 32 | |
| 02_2B3PLiving 02 | 2.1 | N/A | Pass |
| 02_2B3PBathroom 01 | 0 | N/A | Pass |
| 02_2B3PBathroom 03 | 0 | N/A | |
| 02_2B3PHall 01 | 0 | N/A | Pass |
| 02_2B3PDouble Bed 03 | 2.3 | 22 | Pass |
| 02_2B3PSingle Bed 02 | 1.4 | 22 | Pass |
| 02_1B2PLiving 01 | 2.3 | N/A | Pass |
| 02_1B2PBathroom 02 | 0 | N/A | Pass |
| 02_1B2PHall 02 | 0 | N/A | Pass |
| 02_1B2PDouble Bed 01 | 0 | 20 | Pass |

**TM59 Compliance Results – DSY2**

| Occupied Zones | Criterion 1 (%Hrs Top-Tmax>=1K) | Night-time overheating criteria for bedrooms |
|---|---|---|
| | Limit 3 | Limit 32 |
| 02_2B3PLiving 02 | 3.1 | N/A |
| 02_2B3PBathroom 01 | 0 | N/A |
| 02_2B3PBathroom 03 | 0 | N/A |
| 02_2B3PHall 01 | 0 | N/A |
| 02_2B3PDouble Bed 03 | 2.6 | 25 |
| 02_2B3PSingle Bed 02 | 2.1 | 31 |
| 02_1B2PLiving 01 | 3.1 | N/A |
| 02_1B2PBathroom 02 | 0 | N/A |
| 02_1B2PHall 02 | 0 | N/A |
| 02_1B2PDouble Bed 01 | 0 | 25 |

**TM59 Compliance Results – DSY3**

| Occupied Zones | Criterion 1 (%Hrs Top-Tmax>=1K) | Night-time overheating criteria for bedrooms |
|---|---|---|
| | Limit 3 | Limit 32 |
| 02_2B3PLiving 02 | 3.6 | N/A |
| 02_2B3PBathroom 01 | 0 | N/A |
| 02_2B3PBathroom 03 | 0 | N/A |
| 02_2B3PHall 01 | 0 | N/A |
| 02_2B3PDouble Bed 03 | 3.9 | 40 |
| 02_2B3PSingle Bed 02 | 2.9 | 50 |
| 02_1B2PLiving 01 | 3.8 | N/A |
| 02_1B2PBathroom 02 | 0 | N/A |
| 02_1B2PHall 02 | 0 | N/A |
| 02_1B2PDouble Bed 01 | 0 | 38 |

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