Integration

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City House
Energy & Sustainability Statement

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—	20.12.23	Draft Issue for comment	Oscar Akam	Alan Harries
1	30.01.24	Issue for planning	Oscar Akam	Alan Harries
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Contents

Executive Summary

This Energy Assessment and Sustainability Statement has been prepared by Integration Consultancy Limited in support of the full planning application for the proposed City House new-build development in the London Borough of Sutton comprising a part 13-storey and part 5-storey building, for 70 'build to rent' residential apartments (Class C3), 191m^2 (NIA) office space (Class E(g)(i)) and associated landscape and public realm improvements.

CARBON PERFORMANCE

The London Plan has a zero-carbon target with a minimum onsite contribution of 35% below Part L. The minimum energy efficiency ("Be Lean") onsite contribution is 10% for residential areas and 15% for commercial areas.

In relation to these targets, this development has been shown to have:

- 65% total onsite improvement in carbon dioxide (CO_2) emissions over the Target Emission Rate (TER) outlined in the national Building Regulations 2021 - compared to the target of 35%.
- 14% dwelling energy efficiency (Be Lean) contribution to the improvement in carbon dioxide (CO_2) emissions over the Be Lean Target Emission Rate (TER) - compared to the target of 10%.
- 18% non-domestic energy efficiency (Be Lean) contribution to the improvement in carbon dioxide (CO2) emissions over the Be Lean Target Emission Rate (TER) - compared to the target of 15%.

The proposed design achieves this via high performance building fabric, passive low energy design and low energy building services systems such as mechanical ventilation with heat recovery (MVHR), LED lighting and demand-led controls such as CO_2 sensor control in commercial areas to ensure high air quality for the minimum amount of energy.

Following a Low and Zero Carbon (LZC) Technology feasibility study it is proposed to provide 7.5kWpeak of solar photovoltaic (PV) modules located at roof level and 100% space heating and hot water via centralised air source heat pumps.

The table below shows the sitewide regulated and unregulated energy use.

Carbon dioxide emissions (Tonnes CO2 per annum)	**Regulated**	**Unregulated**
Baseline: Part L 2021 (Building Regulations) Compliance	66.6	34.0
After "Be Lean" (energy demand reduction)	57.5	34.0
After "Be Clean" (heat network / CHP)	57.5	34.0
After "Be Green" (renewable energy)	23.6	34.0

Table 1: Sitewide regulated and unregulated CO_2 emissions after each stage of the energy hierarchy

This performance can be expressed as savings between each stage in the energy hierarchy.

Regulated carbon dioxide emissions (Tonnes CO2 per annum)	**(Tonnes CO_2 per annum)**	**(%)**
Savings from "Be Lean" (energy demand reduction)	9.1	14%
Savings from "Be Clean" (heat network / CHP)	0.0	0%
Savings from "Be Green" (renewable energy)	33.9	51%
Total cumulative on-site savings	43.0	65%
Shortfall to 35% below Part L (annual)	23.6	-
Shortfall over 30 years	709	-
Carbon Offset Fund (@£95/tonne)	£67,260	-

Table 2: CO_2 emissions savings after each stage of the energy hierarchy

SUSTAINABILITY PERFORMANCE

In addition to the low carbon performance set out above, the scheme benefits from several sustainability aspects. These include the use of water saving devices to achieve 105 litre per person per day in residential areas and BREEAM 'Excellent' in the commercial area. Health and wellbeing is supported by aspects such as high levels of fresh air provided by mechanical ventilation with heat recovery, ensuring the design meets the TM59/TM52 overheating standards and through the provision of amenity and play space facilities on the roof terrace. The non-domestic areas have been shown to meet the BREEAM "Excellent" sustainability standard as show in the BREEAM pre-assessment appended to this report. In terms of sustainable travel, the scheme has covered bicycle storage and electric vehicle charging and is an 8-minute walk to Sutton Train Station.

A circular economy workshop has taken place as part of the design process to ensure aspects such as material use and waste is minimised by design, the details of which is summarised in the circular economy statement and whole life carbon reporting.

The scheme supports a future connection to a heat network through the provision of a low temperature centralised heat network and space provision in the plant room for a heat exchanger. The scheme is also demand side response (DSR) enabled through the provision of a centralised electric-powered heat pump systems with energy storage vessels in order to work with National Grid signalling / time of use tariffs. This supports the transition to low carbon electricity and reduce energy costs for residents.

A residents' guide will be created to help residents reduce energy, water and waste, avoid overheating and keep air quality high as well as other aspects such as taking advantage of sharing economy opportunities and local transport facilities.

1 Introduction

Integration Consultancy Limited has been appointed to undertake an Energy and Sustainability Assessment in support of the full planning application for the proposed City House development in Sutton, London. The report is one of several that accompany the planning application and should be read in conjunction with these documents.

The importance of developing a robust well-considered energy and sustainability strategy cannot be overstated. This strategy sets out the roadmap for the entire project and ultimately the success of the strategy will translate into the success of the building's performance on practical completion and throughout its lifecycle.

Underpinning the energy strategy is the 'Be Lean', 'Be Clean', 'Be Green' and 'Be Seen' design framework which has been adopted by the London Plan.

- 'Be Lean' (energy demand minimisation through 'passive' and 'active' design measures)
- 'Be Clean' (efficient energy supply)
- 'Be Green' (renewable energy generation)
- 'Be Seen' (energy performance and monitoring)

This report sets out the scheme's energy and sustainability aspirations and demonstrates, via the approved calculation methodologies, how these will be achieved through the detailed design and construction stages.

As part of this exercise, the feasibility of implementing a variety of low carbon technologies and renewable energy systems is considered based on aspects such as site location and climate, potential carbon savings, economic viability, environmental impacts and practical aspects such as integration and maintenance considerations.

1.1 THE DEVELOPMENT SITE

The site is located at City House, Sutton Park Road, Sutton SM1 2AE.

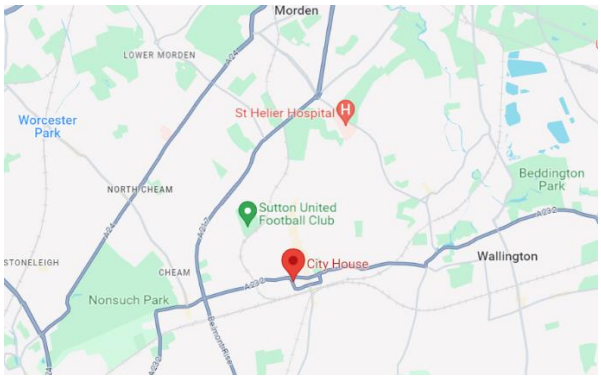

Figure 1: Site Location

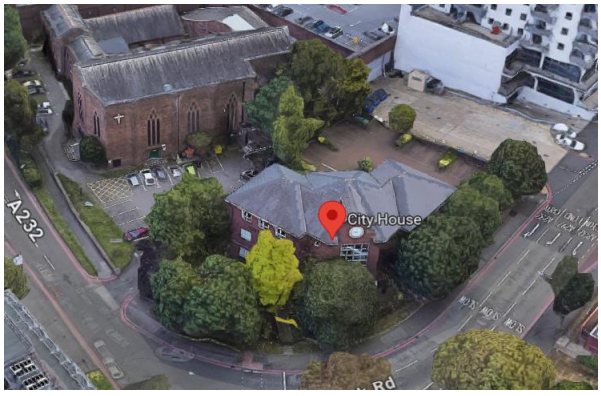

Figure 2: Aerial view of site.

1.2 PROPOSED DEVELOPMENT OVERVIEW

The development comprises the demolition of the existing building and replacement with a part 13-storey and part 5-storey building, for 70 'build to rent' residential apartments (Class C3), 191m^2 (NIA) office space (Class E(g)(i)) and associated landscape and public realm improvements.

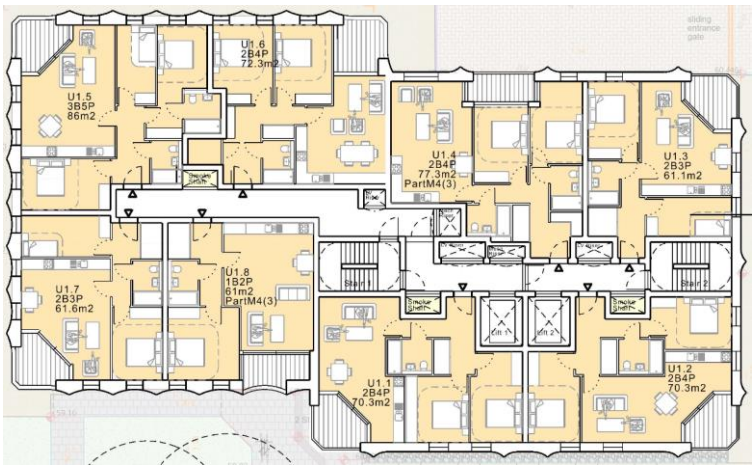

Figure 3: Proposed development scheme, typical 'low' floor

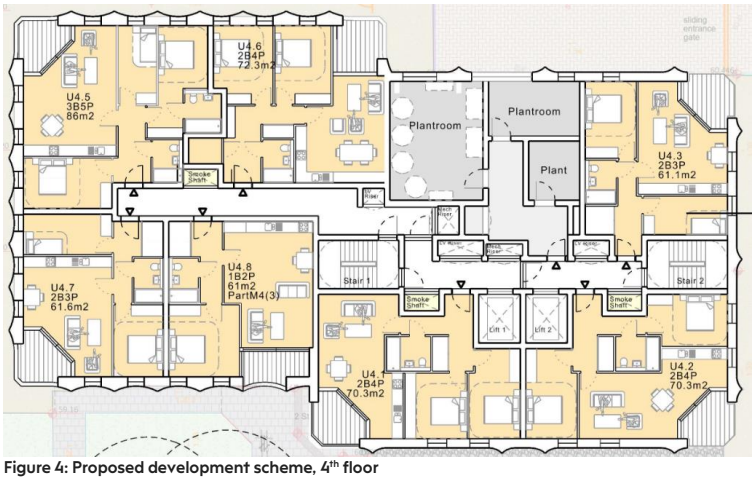

Figure 4: Proposed development scheme, 4th floor

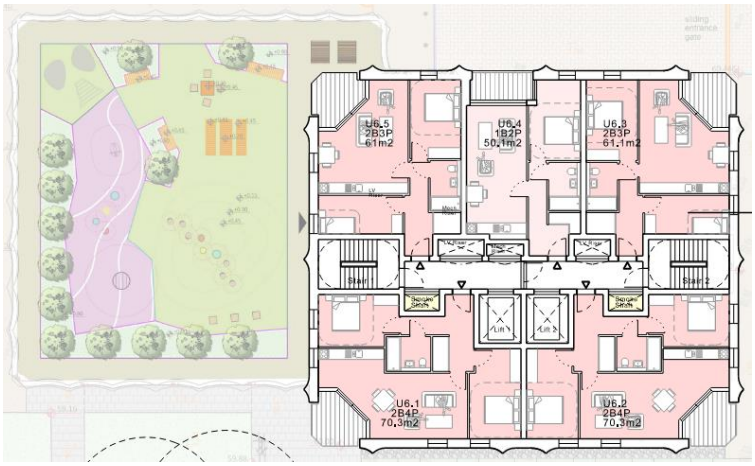

Figure 5: Proposed development scheme, typical 'high' floor

Figure 6: Proposed development scheme: North Elevation (left), South Elevation (right)

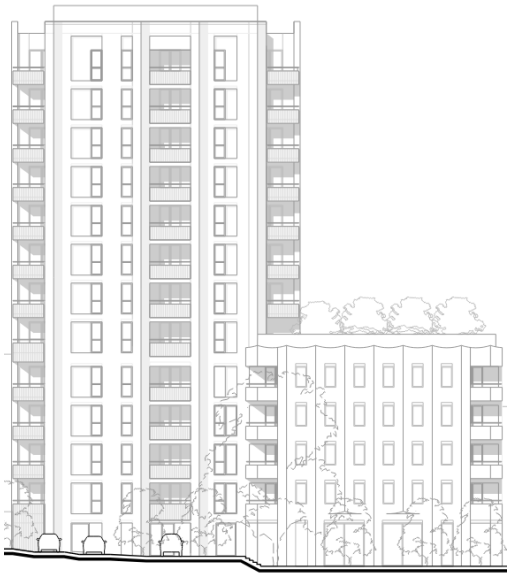

Figure 7: Proposed development scheme, East Elevation

The proposed accommodation is summarised below.

Ref	Type	Area (m²)
Level 12	Residential units	312.8
Level 11	Residential units	312.8
Level 10	Residential units	312.8
Level 9	Residential units	312.8
Level 8	Residential units	312.8
Level 7	Residential units	312.8
Level 6	Residential units	312.8
Level 5	Residential units	274.3
Level 4	Residential units	485.8
Level 3	Residential units	563.0
Level 2	Residential units	563.0
Level 1	Residential units	563.0
Ground Floor	Commercial space	254.6

Table 3: Accommodation Summary

1.3 ENERGY AND SUSTAINABILITY ASPIRATIONS

The scheme has adopted energy and sustainability targets in line with the national and local policy as detailed in section 2. These include:

Zero CO_2 emissions: Achieve zero carbon (100% below Part L) with a minimum on-site contribution of 35% below Part L.

Energy Efficient: Achieve a minimum energy efficiency ("Be Lean") onsite contribution of 10% for residential areas and 15% for commercial areas.

Low Water Use: Achieve at least 105l/p/d for residential areas and BREEAM excellent standard for the 'Wat 01' water category for commercial areas.

Climate Adaption: Exceed the CIBSE TM59 and TM52 standards for residential and commercial overheating performance.

Sustainable Transport: Promoting sustainable transport and cycle use.

Zero Fossil Fuels on site: In order to achieve zero carbon on-site by 2050 the scheme aims not to use any fossil fuels on site.

Sustainability: BREEAM "Excellent".

2 Policy Review

2.1 NATIONAL PLANNING POLICY FRAMEWORK (NPPF – DECEMBER 2023)

2.1.1 Sustainable Development

The NPPF is very clear on the importance of sustainable development with the first line of the first main chapter stating "*The purpose of the planning system is to contribute to the achievement of sustainable development". Sustainable development meaning:*

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

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

d. an environmental objective – to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.

At the heart of the Framework is a presumption in favour of sustainable development.

2.1.2 Meeting the Challenge of Climate Change

Section 14 of the NPPF relates to the challenge of climate change. Paragraph 157 states:

"The planning system should support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change. It should help to: shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure."

The importance of renewable energy is also highlighted by paragraph 160 and 161.

2.1.3 National Carbon Targets

The UK government declared a Climate Emergency and amended the Climate Change Act in June 2019 to set a legally-binding carbon emission target for the UK of "at least 100% of 1990 levels by 2050" i.e. net zero carbon emissions[1]. Around 20% of the UK's emissions come directly from residential energy use and government has set out a consultation process leading up to the Future Homes Standard which will define how the housing sector will respond to the emergency. This will replace Building Regulations in 2025.

2.2 LONDON PLAN 2021

Regional policy in London is controlled by The Greater London Authority and is set out in The London Plan adopted on 2nd March 2021 which provides policy and guidance in the London context. One of the key overarching goals for London is to become a zero-carbon city by 2030.

The plan states that all 'major' developments (greater than 1,000m^2 or 10 units or more) must achieve net zero carbon (100% below Part L) with a minimum on site contribution of 35% below Part L. The remaining regulated carbon dioxide emissions to 100% can be off-set using a cash-in-lieu contribution to the local borough, to secure carbon dioxide savings elsewhere.

Chapter 9 (Sustainable Infrastructure) of the London Plan sets out a range of policies in relation to sustainability, including air quality improvement, reducing greenhouse gas emissions, managing infrastructures, minimising waste and protecting waterways. Some of the key aspects to note are summarised below:

- Zero carbon residential and commercial. 100% below part L for 'major' development (>1000m^2 or 10 units +) with minimum onsite contribution of 35% below Part L.
- Energy efficiency ('Be lean') of residential areas to achieve 10% below Part L and commercial to achieve 15% below Part L

[1] Climate Change Act 2008 (c. 27) as amended by The Climate Change Act 2008 (2050 Target Amendment) Order 2019 [SI 2019 No. 1056]

- Overheating studies TM59 (residential and TM52 (commercial) compulsory for 'major' schemes
- 'Be Seen' energy monitor requirement for 5 years via the GLA online portal
- Carbon tax increased to £95/tCO2 (from £60tCO2)
- Energy cost considerations.
- Future strategy. Details of how the scheme will achieve zero-carbon on-site emissions onsite by 2050.
- Demand-Side Response proposals for carbon reduction via demand side response.
- Communal low-temperature heating. 'Major' schemes within Heat Network Priority Areas should have low temperature central systems.
- Lifecycle Carbon Assessment. LCA required for "referable" schemes (150 residential units or more / over 30 metres tall)

The details of the main London Plan policy requirement are given below:

POLICY SI 2 – MINIMISING GREENHOUSE GAS EMISSIONS

a. *Major development 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.*

b. *Mayor development proposals should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy.*

c. *A minimum on-site reduction of at least 35 per cent beyond Building Regulations is required for major development. Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures. Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, in agreement with the borough, either:*
   - *through a cash in lieu contribution to the borough's carbon offset fund, or*
   - *off-site provided that an alternative proposal is identified and delivery is certain.*

d. *Boroughs must establish and administer a carbon offset fund. Offset fund payments must be ring-fenced to implement projects that deliver carbon reductions. The operation of offset funds should be monitored and reported on annually.*

e. *Major development proposals should calculate and minimise carbon emissions from any other part of the development, including plant or equipment, that are not covered by Building Regulations, i.e. unregulated emissions.*

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

Other key policies within the London Plan applicable to the proposed development and addressed in this report are:

POLICY SI 4 – MANAGING HEAT RISK

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

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

c. *Reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure*

d. *Minimise internal heat generation through energy efficient design*

e. *Manage the heat within the building through exposed internal thermal mass and high ceilings*

f. *Provide passive ventilation*

g. *Provide mechanical ventilation*

h. *Provide active cooling systems.*

The Chartered Institution of Building Services Engineers (CIBSE) has produced guidance on assessing and mitigating overheating risk in new developments, which can also be applied to refurbishment projects. TM 59 should be used for domestic developments and TM 52 should be used for non-domestic developments. In addition, TM 49 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.

POLICY SI 5 – WATER INFRASTRUCTURE

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

b. *Development Plans should promote improvements to water supply infrastructure to contribute to security of supply. This should be done in a timely, efficient and sustainable manner taking energy consumption into account.*

c. *Development proposals should:*

- *through the use of Planning Conditions minimise the use of mains water in line with the Optional Requirement of the Building Regulations (residential development), achieving mains water consumption of 105 litres or less per head per day (excluding allowance of up to five litres for external water consumption)*
- *achieve at least the BREEAM excellent standard for the 'Wat 01' water category 160 or equivalent (commercial development)*
- *incorporate measures such as smart metering, water saving and recycling measures, including retrofitting, to help to achieve lower water consumption rates and to maximise future-proofing.*

2.3 GREATER LONDON AUTHORITY GUIDANCE ON PREPARING ENERGY ASSESSMENTS AS PART OF PLANNING APPLICATIONS (JUNE 2022)

- *Energy Assessment Guidance from the GLA was updated in June 2022 to explain how London Plan policies apply to Part L and Part O 2021 which came into effect on 15th June 2022. The guidance state that there is a requirement to:*
- *Meet a minimum onsite carbon reduction 35% below part L (2021) for all major developments, with net zero carbon (100% below Part L) achieved through offset payment where required.*
- *Refer to an additional benchmark target of 50% below Part L 2021 for major residential developments.*
- *In mixed use scheme, ensure both residential and commercial developments meet targets separately.*
- *Meet 10% below Part L 2021 for residential Be Lean*
- *Meet 15% below Part L 2021 for non-domestic Be Lean*
- *Use the GLA reporting spreadsheet and submit in excel format.*
- *Report the Energy Use Intensity (EUI) and Space Heating Demand (SHD) using the GLA spreadsheet.*
- *Fully comply with Policies SI 2 to SI 4 inclusive of the London Plan.*
- *Demonstrate connection to existing or planned heat networks has been prioritized and provide correspondence to support this.*
- *Minimise the number of energy centers and provide a single point of connection to a district heat network.*
- *Demonstrate the cooling hierarchy has been followed and provide TM59/52 studies.*
- *Maximise renewables (including the potential for storage) on site.*
- *Report on flexibility / demand side response initiatives and energy storage capacity.*
- *Referable Applications (e.g. 150 units + / >30m in height) to calculate and reduce whole life-cycle carbon emissions.*

2.4 SUTTON LOCAL POLICY

Policy 31: Carbon and Energy

a Proposed developments should meet the following targets for reducing CO2 emissions expressed as a percentage improvement over Part L of the 2013 Building Regulations:

All residential buildings forming part of major developments should achieve 'zero carbon' standards, by:

(i) achieving at least a 35% reduction in regulated CO2 emissions on site.

(ii) offsetting the remaining regulated emissions (to 100%) through the delivery of CO2 reduction measures elsewhere through a Section 106 contribution to the council's carbon offset fund priced at £60 per tonne over 30 years.

- *all major non-residential developments should achieve at least a 35% reduction in regulated CO2 emissions on site.*
- *all minor residential developments should achieve at least a 35% reduction in regulated CO2 emissions on site.*

b In seeking to minimise CO2 emissions in line with the above targets, all proposed developments will apply the Mayor's energy hierarchy by:

- *achieving the highest standards of energy efficient design and layout.*
- *supplying energy efficiently in line with the following order of priority:*

(i) being designed to connect to existing or planned district heating and/or cooling networks supplied by low or zero-carbon energy, unless it can be demonstrated through whole life cycle evidence that connection is not reasonably possible. All major developments located within identified Decentralised Energy Opportunity Areas (Maps 10.1 and 10.2) should apply the council's 'Decentralised Energy Protocol' (Schedule 10.A).

(ii) site wide heating and/or cooling network supplied by low or zero-carbon energy.

(iii) communal heating and cooling.

- *l using renewable energy generated on-site. Major developments will be expected to achieve at least a 20% reduction in total CO2 emissions (regulated and unregulated) through renewables with minor developments achieving a reduction of at least 10%.*

c All planning applications for new dwellings or major non-residential developments should be supported by an Energy Statement incorporating 'as-designed' Building Regulations Part L outputs to demonstrate how the relevant targets for reducing CO2 emissions will be met. The Energy Statement should include calculations of energy demand and emissions at each stage of the Mayor's energy hierarchy for both regulated and non-regulated elements in line with GLA 'Guidance on Preparing Energy Assessments' as amended.

d The council will collaborate with potential heat suppliers, energy service companies, major developers and the community to deliver district heating networks to serve new and existing developments in Hackbridge and within other identified 'Decentralised Energy Opportunity Areas' over the plan period.

e All major non-residential developments should achieve BREEAM 'Excellent'. For Decentralised Energy Opportunity Areas see Appendix 10, Maps 10.1 and 10.2 and Policies Map.

P31.16 All Energy Statements submitted in support of major residential developments must include 'as-designed' Building Regulations Part L outputs to show that the proposed energy strategy will deliver at least a 35% reduction in regulated CO2 emissions on site compared to the target emission rate (TER). In order to deliver the council's 'zero carbon' standard, this information should form the basis for calculating the remaining CO2 emissions to be offset (to 100%) through carbon reduction measures elsewhere. P31.17 In line with the GLA's 'Guidance on Preparing Energy Assessments', the delivery of offsite carbon reduction measures will be secured through a Section 106 contribution to the council's carbon offset fund priced at £60 per tonne over 30 years (£1,800 per tonne). Details of carbon reduction measures to be implemented by the council through carbon offset funding, including costs and timescales, are available on the Sutton website.

3 Design Approach - Sustainability

3.1 WATER USE

For accommodation areas the development adopts equipment specification in line with the higher water use standard of 105 l/p.day. The development will meet the London Plan target of achieving at least the BREEAM excellent standard for the 'Wat 01' water category for commercial areas.

Fitting	Water Consumption (residential)	Water Consumption (Commercial)
WC	4 / 2.6 litres dual flush	3.75 litres
Shower	8 litres / minute	6 litres / minute
Washbasin	5 litres / minute	5 litres / minute
Kitchen sink	6 litres / minute	6 litres / minute
Dishwasher	1.25 litres/place setting	12 litres / cycle
Washing machine	8.17 litres/kg	-

Table 4: Minimum water fitting standards for units.

The feasibility of grey water recycling has been considered. The piping infrastructure to collect water for each shower would be very high with a corresponding high embodied carbon. Therefore, grey water recycling is not considered feasible.

3.2 AIR QUALITY

Air quality is a priority for London and Policy SI 1 "Improving Air" states that developments proposals must be at least Air Quality Neutral.

The scheme supports air quality by:

- The use of air-source heat pumps for all space heating and hot water use which means no fossil fuel combustion on site.
- Mechanical ventilation with heat recovery (MVHR) offers a means for occupants to filter fresh air.
- Construction environmental management plan (CEMP) to incorporate best practice for air quality and dust control.

3.3 NOISE

Quality of life is improved by reducing the number of people adversely affected by noise and promoting more quiet and tranquil spaces. The scheme supports low noise impacts:

- High air tightness and MVHR reduces external noise ingress for occupants.
- Ensuring noise emissions from air source heat pump system are mitigated by a means of a suitably designed acoustic enclosure (refer to the acoustic report for more details).

3.4 BIODIVERSITY & URBAN GREENING

Policy G5 states that major development should include urban greening as a fundamental element of site and building design, by incorporating measures such as high-quality landscaping (including trees), green roofs, green walls and nature-based sustainable drainage.

In response to this, the scheme introduces a variety of landscaping as depicted below and described in the landscaping report. As part of the landscaping, the scheme also introduces play and amenity areas on the roof terrace areas.

Figure 8: Ground level and roof terrace landscape and play areas

3.5 SUSTAINABLE MATERIALS & MINIMISING WASTE

A circular economy and whole life carbon workshop has taken place as part of the preplanning design process to ensure aspects such as material use and waste are minimised by design and that sustainable materials are used. Please refer to the circular economy statement and whole life carbon assessment for full details.

3.6 SUSTAINABLE TRANSPORT

The site has links to low energy public transportation e.g. 7 minute walk to Sutton Train Station which provides connections to the Thameslink and Southern Service. Bus stop T provides bus services on route 413 to Morden which provides a connection to the London Underground Northern Line.

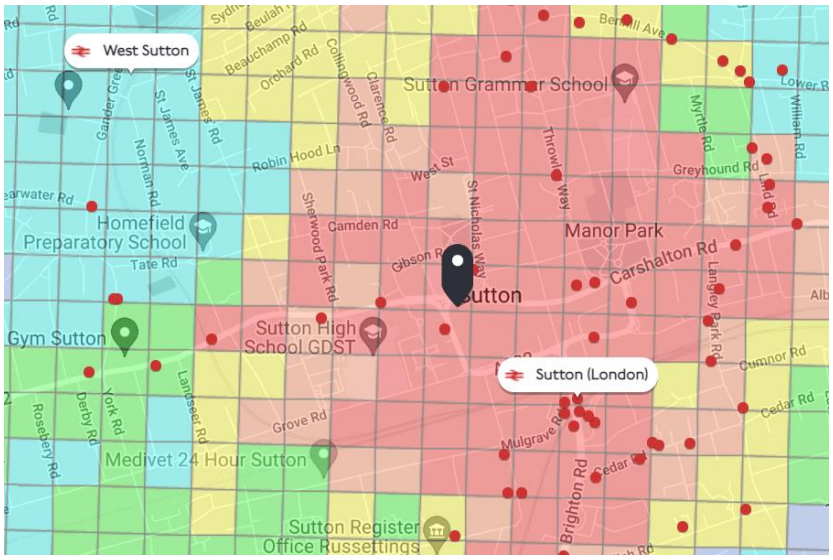

Figure 9: PTAL map showing the area achieves PTAL score 6a.

In addition, as part of the scheme, electric charging will be integrated in all parking bays to support the future transition to low carbon electric vehicles. The scheme also provides full covered, secure cycle storage facilities.

3.7 DEMAND SIDE RESPONSE

Demand-side response / flexibility initiatives are encouraged by the London Plan, as referred to in Policy SI 2 Minimising greenhouse gas emissions. Demand side flexibility refers to the ability of a system to reduce or increase energy consumption for a period of time in response to an external driver (e.g. energy prices or signals from network managers).

Smart buildings have been identified and acknowledged as key enablers of future energy systems for which there will be a larger share of distributed and renewable power and heat generation. Demand-side flexibility can allow demand/supply matching and make best use of existing network connections and local renewable energy generation capacity.

The scheme facilitates the use of Demand Side Response and reduces peak energy demand by:

- The use of electrical equipment such as heat pumps which can be turned up/down.
- A large central energy store integrated into the centralised heat pumps system
- Additional energy storage capacity via exposed thermal mass.
- Limiting demand such as peak solar gains (refer to cooling and overheating section).
- The installation of smart meters and Be Seen Monitoring.
- The use of on-site generation, solar PV.

A summary of the site-wide peak demand, capacity and flexibility potential is shown below.

	Electrical	Heat	Enabled through...
Estimated peak demand (MW)	0.4	0.16	Heat peak demand obtained from mechanical load calculation. Electrical peak demand obtained from electrical load calculation.
Available capacity (MW)	0.55	0.17	Available electrical peak capacity has been confirmed by engagement with UKPN. Available heat / cooling capacity met by appropriate equipment selection.
Flexibility potential (MW)	-	-	No electrical energy storage has been specified as all PV generation will be used on site, without need for storage. Thermal storage has been specified, see table below for details.

Table 5: Summary of site-wide peak demand, capacity and flexibility potential (Table 9, GLA Energy Assessment Guidance)

To minimise peak demands several interventions were investigated, these are outlined in the table below.

Flexibility achieved through:	Yes/No	Details
Electrical energy storage (kWh) capacity	NA	All solar PV generation will be used on site.
Heat energy storage (kWh) capacity	139kWh	Thermal stores form part of central heat pump system.
Renewable energy generation (load matching)	Yes	All solar PV generation will be used on site.
Gateway to enable automated demand response	NA for residential buildings	
Smart systems integration (e.g. smart charge points for EV, gateway etc.)	No	

Table 6: Summary of interventions for achieving flexibility (Table 10, GLA Energy Assessment Guidance)

3.8 BREEAM

To assist the design process and evaluate the performance of the scheme in relation to sustainability, the Building Research Establishment Environmental Assessment Methodology (BREEAM) has been adopted. BREEAM was established in 1990 as the first accreditation scheme in this sector. It is now the world's leading sustainability assessment method for masterplanning, infrastructure and buildings.

A BREEAM Pre-assessment has been carried out for the non-domestic areas of the development and this shows it is on track to achieve the BREEAM 'Excellent' standard.

The category performance is summarized below and details of the selected credits are given in the Appendix.

Credit Categories	% Targeted	Weighting	Score
Management	83.0%	11.0%	9.16%
Health and Wellbeing	73.0%	8.0%	5.81%
Energy	42.0%	14.0%	5.89%
Transport	100.0%	11.5%	11.50%
Water	78.0%	7.0%	5.44%
Materials	64.0%	17.5%	11.25%
Waste	82.0%	7.0%	5.72%
Land Use and Ecology	92.0%	15.0%	13.84%
Pollution	75.0%	9.0%	6.75%
Innovation	10.0%	10.0%	1.00%
Total Score			76.3%
Rating			Excellent

Table 7: BREEAM pre-assessment rating summary

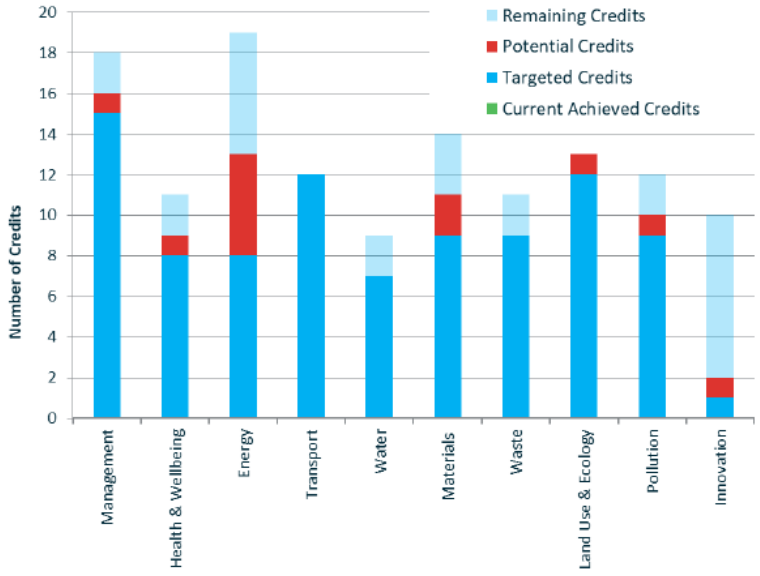

Figure 10: BREEAM pre-assessment score showing targeted (dark blue) and potential credit (red) summary

4 Design Approach - Energy

4.1 THE ENERGY HIERARCHY

The energy hierarchy, as referred to in the London Plan and illustrated below, sets out a four-stage approach to strategic decision-making for the reduction of energy and associated greenhouse gas emissions. The evaluation of the scheme's carbon emissions, as presented in the subsequent sections, follows this structure.

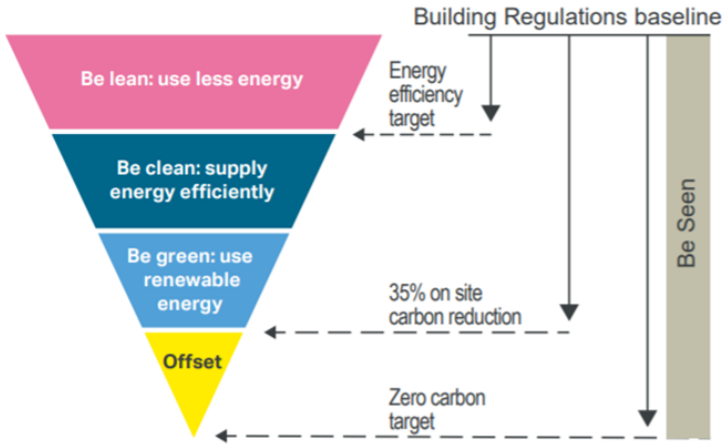

Figure 11: Energy Hierarchy Methodology

BE LEAN - Minimise Energy Demand
Passive design such as optimising form, orientation and site layout, natural ventilation with thermal mass, daylight and solar shading as well as active design measures such as LED lighting and efficient mechanical ventilation with heat recovery.

BE CLEAN - Deliver Energy Efficiently
Efficient energy provision for space heating and cooling infrastructure e.g. high efficiency cooling plant, combined heat and power (CHP) or, if available, connection to a district heating/cooling network.

BE GREEN - Use Renewable Energy
Energy supply derived from local renewable resources including solar irradiation, wind energy, hydropower and local heat sources such as geothermal energy. Provision of non-local options can also be considered.

BE SEEN – Control Energy
Monitor, verify and report on energy performance.

4.2 CLIMATE ANALYSIS

The London climate is heating dominated, hence the key passive measure to be implemented are high levels of insulation and air-tightness. Temperatures in the summer can occasionally rise above comfortable levels and this will tend to intensify as a consequence of climate change and further urbanisation.

The diurnal temperature variations are high with an average daily temperature swing of 8-10°C even during peak summer. This creates potential for passive summertime cooling using night-time cooling via openable windows or mechanical ventilation.

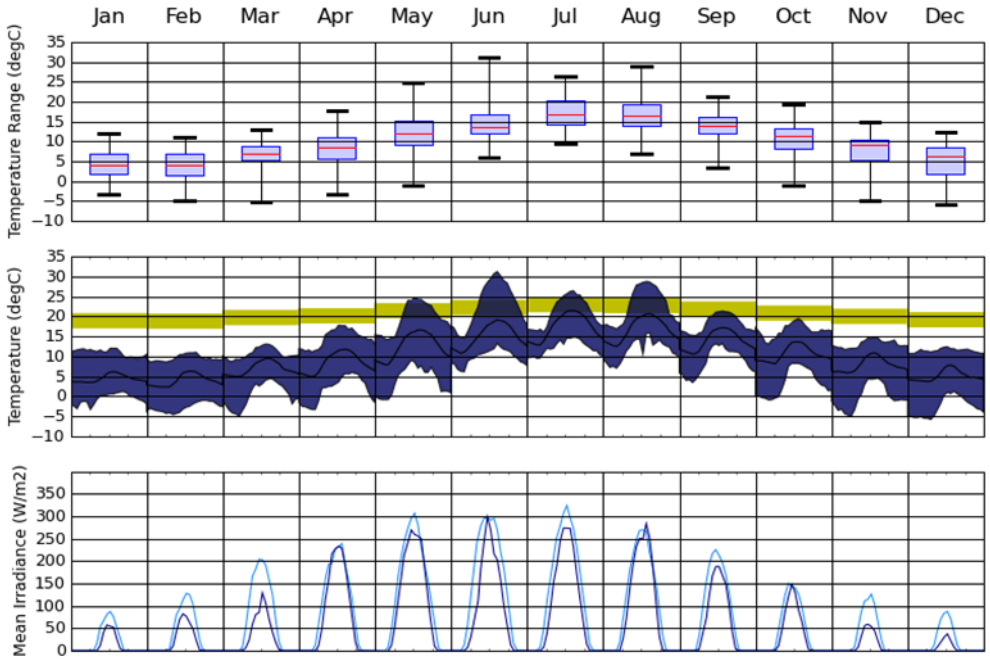

Figure 12: Average historic climate data for London

4.3 BUILDING FABRIC PERFORMANCE & INSULATION

High levels of insulation are proposed as summarised later in this section. The thermal performance of all exposed elements equals or exceeds the minimum requirements for Building Regulations 2021. This will significantly reduce energy consumption and ensure optimum occupant comfort all year round by retaining heat in the winter and reducing heat gains in the summer.

This is particularly relevant for glazed surfaces that can be a cause of overheating in summer or overcooling and condensation formation in winter. High-performance glazing will also improve occupant comfort by reducing radiant temperature asymmetry which can be a comfort issue especially during the winter months.

4.4 AIR TIGHTNESS, INFILTRATION AND THERMAL BRIDGING

A high target air-permeability rate has been selected as summarised later in this section. The key to achieving high levels of airtightness is the build quality of construction.

Minimising thermal bridging is an important aspect of the design, see table below for proposed Psi values.

Thermal Bridge	Thermal Transmittance (Ψ)	
	Residential (SAP)	Non domestic (SBEM)
Roof-wall	0.18	0.18
Wall-ground floor	-	0.24
Wall-wall (corner)	0.09	0.14
Wall-wall (inverted corner)	-0.09	-
Wall-party wall (party corner)	0.06	-
Wall-party wall (staggered party corner)	0.12	-
Wall-floor (not ground)	0.05	0.11
Lintel above window/door	0.25	0.3
Sill below window	0.04	0.08
Jamb at window/door	0.04	0.09
Balcony-wall	1	-

Table 8: Proposed Psi Values for residential and commercial areas

4.5 NATURAL VENTILATION & THERMAL MASS

Daytime natural ventilation can assist in removing excess heat during the mid-season and summer months and enables the provision of high air quality. When used in combination with exposed thermal mass, natural ventilation will reduce high internal daily temperature fluctuations and minimise the overheating risk in the summer. Therefore, occupant comfort can be maintained with reduced reliance on mechanical cooling systems.

The scheme takes advantage of the prevailing south-westerly wind through the large, exposed facade. The summer ventilation strategy includes large openable areas for windows/doors to allow for good natural ventilation and horizontal external shading from balconies. Night ventilation allows for pre-cooling of thermal mass. The strategy for mitigating overheating also includes narrow depths for south-facing single-sided units (depth < 2.5 x height).

4.6 SOLAR EXPOSURE & DAYLIGHT

Maximising exposure to solar energy and daylight is essential to reduce reliance on artificial lighting, reducing winter daytime heating requirements and to contribute to the general wellbeing of occupants.

The site has good access to solar energy and natural daylight, as there are minimal surrounding buildings that overshadow during the main solar hours. This makes the development roofs suitable for solar energy harvesting.

Fenestration on the facades maximises natural daylight to provide amenity and reduce artificial lighting energy use. Internal shading can be incorporated to minimise the risk of overheating and glare without overly compromising daylight availability.

4.7 ACTIVE BUILDING SERVICES SYSTEMS

Space heating and hot water will be provided via a central high-efficiency air-source heat pump system in conjunction with underfloor heating in residential units.

Energy use associated with domestic hot water (DHW) will be minimised by the use of water efficient fittings. The use of Heat Interface Units (HIU) eliminates hot water storage and thus allows reduced typical operating temperatures (from 60°C to around 42°C). This means the air source heat pumps can run more efficiently.

High-efficiency mechanical ventilation will be used with heat recovery. The system will have a summer bypass to support night-time free cooling of thermal mass. Supplementary cooling will be provided by the proposed mechanical ventilation system. Demand led control system will be implemented in commercial areas to control fan use based on CO_2 levels. This ensures that fresh air levels will be high (i.e. CO_2 below 1000ppm) and energy requirements will be reduced to the absolute minimum.

Low-energy fixed lighting, generally comprising of high-efficiency LED fittings, will be installed throughout the development with timer, daylight dimming, and motion-sensor control as appropriate.

All building services systems will be in accordance with and exceed the efficiency requirements outlined in the Building Service Compliance Guide.

4.8 COOLING & OVERHEATING

The cooling and overheating strategies are summarised in the table below using the cooling hierarchy which has been applied to the design.

The overheating performance of the scheme has been analysed using the CIBSE TM59/52 methodology which uses dynamic thermal modelling. The scheme has been shown to surpass these standards. Please refer to the overheating report for more details.

Hierarchy Measure	Application to proposed development
1. Minimise Internal Heat Gains	- Low energy LED lighting. - High insulation on hot water distribution and duct work.
2. Minimise External Heat Gains	- High level of fabric insulation. - Low G-value windows 0.4. - Balconies to provide solar shading.
3 & 4 Heat Management and Passive Ventilation	-High openable window area with general high exposure to prevailing south-westerly winds -Night time ventilation strategy -Internal blinds with light coloured external facing surfaces (with relatively high reflective properties).
5. Mechanical Ventilation	- Mechanical Ventilation with Heat Recovery (MVHR) is specified. System will have “heat recovery by-pass” mode in order to be operable in summer night-cooling mode. - Supplementary cooling will be provided to residential areas by the existing mechanical ventilation system to overcome acoustic restrictions to window openings.
6. Active Cooling Ensuring they are the lowest carbon options	- A VRF system will provide cooling in commercial areas during peak periods. Local solar PV will in part power the heat pump units during these periods.

Table 9: Cooling hierarchy

5 Carbon Emissions – Residential Dwellings

5.1 BASELINE

Energy demand and annual carbon emissions are calculated using BRE accredited energy compliance SAP 10.2 software.

The amount of carbon emission reductions achieved by the proposed scheme is compared to the notional Target Emission Rate (TER) which forms the baseline comparison target. This notional building/dwelling is produced by the energy model and intends to replicate the actual building in terms of area, form, orientation and usage. The fabric parameters and system efficiencies for this notional building meets and, in some parts, exceeds the minimum requirements for compliance with Part L of the 2021 Building Regulations as summarised in the table below.

For dwellings, within Part L1 of the Building Regulations (2021), the Target Fabric Energy Efficiency (TFEE) sits alongside the TER. The TFEE is the minimum fabric energy performance requirement for a new dwelling. The Dwelling Fabric Energy Efficiency (DFEE) rate is the actual fabric energy performance of the new dwelling. The DFEE must not exceed the TFEE. It is expressed as the amount of energy demand in kWh/(m^2.year). The notional dwelling is not prescriptive, and specifications can be varied provided that the TFEE and TER rate is achieved or bettered. To prevent poor performance of individual elements, limiting fabric values set out in approved document Part L1 and limiting building services efficiencies set out in the Domestic Building Services Compliance Guide, have been followed.

The Notional Building baseline values, which apply to new build residential areas, are:

Building Regulations 2021

Element	U Value (W/m2K)	G Value
External Walls	0.18	-
Floor	0.13	-
Roof	0.11	-
Windows	1.2	0.63 (0.4)
External opaque doors	1.0	-
External glazed doors	1.2	-
Air tightness	5.0 $m^3/m^2/h$ @50Pa	
Liner thermal transmittance	Standardised psi values SAP Appendix R	
Ventilation type	Natural with intermittent extract fans	
Air-conditioning	None	
Heating source	Mains Gas (89.5% SEDBUK 2009)	
Heating emitters and controls	Radiators. Time and temperature zone control. Weather compensation. Boiler interlock.	
Hot water storage	If cylinder, declared loss factor = 0.85 x (0.2 + 0.051 $V^{2/3}$) kWh/day where V is the volume of the cylinder in litres. Separate time control.	
Wastewater heat recovery (WWHR)	All showers connected to WWHR, including showers over baths. Instantaneous WWHR with 36% recovery efficiency utilisation of 0.98.	
Lighting	100% low energy lighting, (80lm/W)	
Photovoltaic (PV) system	For houses: kWp = 40% of ground floor area, including unheated spaces / 6.5 For flats: kWp = 40% of dwelling floor area / (6.5 x number of storeys in block) System facing south-east or south-west	

Table 10: Notional Dwelling (Building) Specification (Table 4 SAP 2021)

5.2 "BE LEAN EMISSIONS"

As part of the "Be Lean" approach, seeking to minimise energy demand, the building fabric has been specified to meet or exceed the minimum fabric parameters outlined in Part L of the Building Regulation 2021 as per table below.

Element	Proposed residential development
External walls U value W/m²/°C	0.15
Floor U value W/m²/°C	0.12
Roof U value W/m²/°C	0.12
Windows U value W/m²/°C	1.2 (g=0.4)
Doors W/m²/°C	1.0
Air tightness m³/m²/h @50Pa	3
Ventilation type	MVHR MRXBOXAB-ECO2
Heating	Central gas-fired boiler Note 'Be Green' use an air source heat pump SCOP 3.24
Hot water	Central gas-fired boiler Note 'Be Green' uses an air source heat pump SCOP 3.24
Cooling	Supplementary cooling provided by MVHR.
Lighting	95lm/W

Table 11: Proposed residential development and baseline comparison "Notional" building – Be Lean

5.2.1 "Be Lean" Total Carbon Emissions

The "Be Lean" CO_2 emissions associated with regulated energy consumption, the Dwelling Emissions Rate (DER) are given below in relation to the baseline TER (Target Emission Rate).

Unit type	Area (m^2)	TER ($kg.CO_2/m^2/yr.$)	DER ($kg.CO_2/m^2/yr.$)
Unit 1	70.3	13.92	12.59
Unit 2	91.2	11.23	9.69
Unit 3	77.2	12.53	11.00
Unit 4	61.2	14.01	12.98
Unit 5	61.4	14.68	13.73
Unit 6	61	13.48	12.38
Unit 7	70.4	14.41	12.45
Unit 8	70.4	13.74	11.88
Unit 9	61.1	15.48	13.75
Unit 10	50.1	14.73	13.69
Unit 11	61.1	14.79	13.57
Unit 12	61.1	15.48	13.98
Unit 13	61.1	14.79	13.57

Table 12: Be Lean regulated Emissions for dwellings

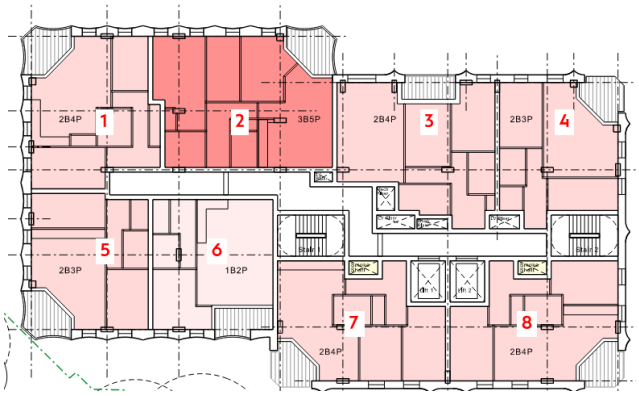

Figure 13: Typical Low Floor naming convention

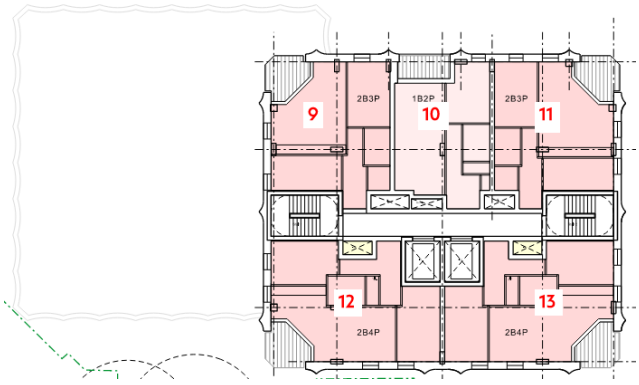

Figure 14: Typical High Floor naming convention

5.3 "BE CLEAN" EMISSIONS

5.3.1 Connection to Third Party Heat Networks

Heat networks are encouraged by the London Plan and the Mayor has identified Heat Network Priority Areas as shown in the map below. Where developments are proposed within Heat Network Priority Areas but are beyond existing heat networks, the heating system should be designed to facilitate cost-effective future connection.

The London Heat Map tool[2] shows that the site is within the heat network priority area, with a proposed connection routed to the development. Sutton Decentralised Energy Network Ltd. were contacted to assess the viability of connecting to the proposed network, details of which can be found in the Appendix. Despite the proximity, a completion date for the proposed network could not be given, hence a connection is not currently proposed for this development. To ensure a viable connection in future, the scheme will include aspects such as allocating space in plant rooms for heat exchangers and thermal stores, safeguarding suitable routes for pipework from the site boundary and making provision for connections to the future network at the site boundary. See appendix for further details.

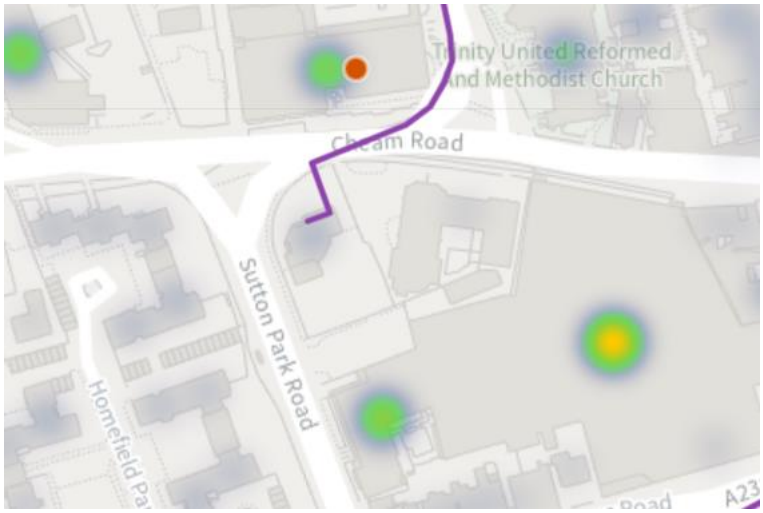

Figure 15: London Heat Map tool showing proposed heat networks (purple).

5.3.2 CHP Combined Heat and Power

The London Plan limits the role of CHP to low-emission CHP and only in instances where it can support the delivery of an area-wide heat network at large, strategic sites, according to the Energy Assessment Guidance Greater London Authority guidance on preparing energy assessments as part of planning applications. Therefore, CHP has not been adopted.

[2] https://www.london.gov.uk/what-we-do/environment/energy/london-heat-map/view-london-heat-map

5.4 "BE GREEN" EMISSIONS

A renewable energy feasibility exercise has been carried out in order to determine the most viable option(s) for the development (see Appendix A). The viable technology option, air source heat pumps is presented below.

5.4.1 Air Source Heat Pumps

Air source heat pumps (ASHP) extract heat energy from the air which is naturally replenished by renewable solar energy. A ASHP can create around 3kW of renewable energy for every 1kW of electrical power it consumes, which makes it one of the lowest carbon reliable heating technologies available.

Heat pumps are most efficient when used in conjunction with low temperature heat delivery systems such as underfloor heating. As such the proposed heat pump will work well with the proposed underfloor heating system.

Centralised air source heat pumps are proposed which are located on the roof in an acoustic enclosure. The details of efficiencies used in the calculation can be found in the appendix.

5.4.2 "Be Green" Total Carbon Emissions

The CO_2 emissions associated with regulated energy consumption are given below.

Unit type	Area (m^2)	TER ($kg.CO_2/m^2/yr.$)	DER ($kg.CO_2/m^2/yr.$)
Unit 1	70.3	13.92	5.03
Unit 2	91.2	11.23	3.87
Unit 3	77.2	12.53	4.39
Unit 4	61.2	14.01	5.11
Unit 5	61.4	14.68	5.44
Unit 6	61	13.48	4.84
Unit 7	70.4	14.41	4.82
Unit 8	70.4	13.74	4.71
Unit 9	61.1	15.48	5.53
Unit 10	50.1	14.73	5.28
Unit 11	61.1	14.79	5.45
Unit 12	61.1	15.48	5.63
Unit 13	61.1	14.79	5.45

Table 13: Be Green Carbon Emissions for residential units.

5.5 CARBON EMISSIONS SUMMARY (DWELLINGS)

The predicted total annual CO_2 emissions of the proposed development following the introduction of energy efficiency measures, passive and active design (Be Lean), low carbon supply technologies (Be Clean) and renewable energy systems (Be Green) are summarised below in the format recommended by the GLA.

The table below shows the regulated and unregulated energy use.

Carbon dioxide emissions (Tonnes CO_2 per annum)	**Regulated**	**Unregulated**
Baseline: Part L 2021 (Building Regulations) Compliance	65.6	32.5
After "Be Lean" (energy demand reduction)	56.7	32.5
After "Be Clean" (heat network / CHP)	56.7	32.5
After "Be Green" (renewable energy)	23.5	32.5

Table 14: Summary of new build carbon emissions for new build dwelling areas

This performance can be expressed as savings between each stage in the energy hierarchy.

Regulated carbon dioxide savings	**(Tonnes CO_2 per annum)**	**(%)**
Savings from "Be Lean" (energy demand reduction)	8.9	14%
Savings from "Be Clean" (heat network / CHP)	0.0	0%
Savings from "Be Green" (renewable energy)	33.2	51%
Total cumulative on-site savings	42.1	64%
Shortfall to 100% below Part L (annual)	23.5	-
Shortfall over 30 years	706	
Carbon Offset Fund (@£95/tonne)	£67.068	

Table 15: Residential regulated CO_2 emissions savings after each stage of the Energy Hierarchy

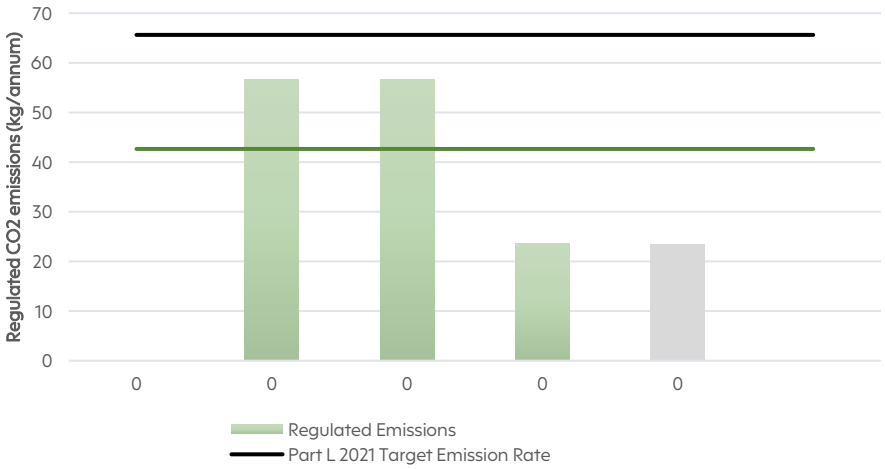

Figure 16: Summary of new build dwellings target and energy savings for each stage of the energy hierarchy

6 Carbon Emissions – Non - Domestic

6.1 BASELINE

Energy demand and annual carbon emissions are calculated using BRE accredited energy compliance software SBEM for the non-domestic areas.

The amount of carbon emission reductions achieved by the proposed scheme is compared to the notional Target Emission Rate (TER) which forms the baseline comparison target. This notional building/dwelling is produced by the energy model and intends to replicate the actual building in terms of area, form, orientation and usage. The fabric parameters and system efficiencies for this notional building meets and, in some parts, exceeds the minimum requirements for compliance with Part L of the Building Regulations as summarised in the table below.

The benchmark values, which apply to new build non-domestic areas, are:

Element	Building Regulations L2 2021
External walls limiting U value	0.26 W/m^{2}K
Floor limiting U value	0.18 W/m^{2}K
Roof limiting U value	0.16 W/m^{2}K (pitched roofs) 0.18 W/m^{2}K (flat roofs)
Windows limiting U value	1.6 W/m^{2}K
Doors limiting U value	3 for high usage, 1.6 pedestrian doors and 1.3 for vehicle access doors
Air tightness	8.0 m^3/m^2/h @50Pa
Ventilation type	Central with heat recovery 70% efficiency
Heating	Gas fired boiler 93% efficient. ASHP: hot water 286%, heating 264% (for renewable energy scenario)
Cooling (SEER/SSEER)	Cooling/ air-con 4.5/3.6, Mixed mode 2.7
Lighting	95 lm/W
Demand control (mech ventilation)	Yes via CO_2 sensors

Table 16: Notional Building Specification for Non Domestic (Part L2 2021)

6.2 "BE LEAN" EMISSIONS

As part of the "Be Lean" approach, seeking to minimise energy demand, the building fabric has been specified to meet or exceed the minimum fabric parameters outlined in Part L of the Building Regulation 2021 as per table below.

Element	Proposed non-domestic development
Roof U-value W/m²/°C	0.12
Windows U-value W/m²/°C	1.2 (g=0.4)
External walls U-value W/m²/°C	0.15
Ground floor U-value W/m²/°C	0.12
External doors U-value W/m²/°C	1.0
Air Permeability m³/m²/h@50Pa	3
Primary space heating	VRF heating system
Controls	Time clock, room thermostat with zone controls
Emitters	Fan coils (0.3W/l/s specific fan power)
Hot water	Central ASHP system SCOP 2.86 Note 'Be Green' uses an air source heat pump SCOP 3.24
Ventilation	«C_Ventilation_Type»75% heat recovery. SFP 1.2W/l.s. Demand Led control in commercial space.
Cooling	SEER 6.33 in commercial space
Lighting	100lm/W
Lighting control	Daylight dimming in commercial space.

Table 17: Proposed non-domestic development (Be Lean)

6.2.1 "Be Lean" Total Carbon Emissions

The Be Lean CO_2 emissions associated with regulated energy consumption (Building Emissions Rate - BER) are given below in relation to the baseline TER (Target Emission Rate).

Area (m²)	TER (kg.CO_2/m²/yr.)	BER (kg.CO_2/m²/yr.)
260.5	3.78	3.11

Table 18: Be Lean non-domestic regulated emissions

6.3 "BE CLEAN" EMISSIONS

Please refer to the Be Clean commentary given for the residential carbon assessment.

6.4 "BE GREEN" EMISSIONS

6.4.1 Air source heat pumps

The commercial areas will have VRF heating and cooling systems with hot water supplied by a heat pump system. The efficiencies use in the calculation are given in the appendix.

6.4.2 Photovoltaic (PV) panels

The image below shows the amount of roof that is available within the development and that will be used to install photovoltaic modules.

Total installed capacity of the system:	7.5 kWp
Panel inclination:	15 degrees«Panel_inclination_»
Panel orientation:	South west
Energy generation:	4400 kWh/a
Carbon emission reduction:	0.6 tonnes of CO_2/y

Local shading is considered to be low.

The performance and output of the renewable energy systems will be monitored, in line with the "Be Seen" policy and relevant guidance document.

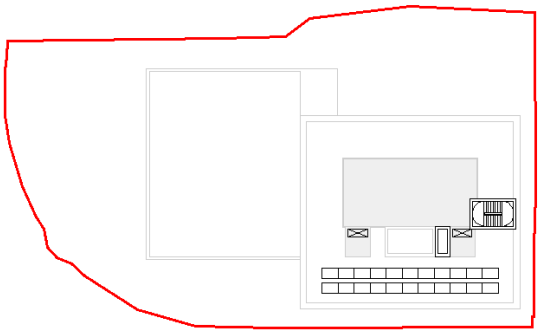

Figure 17: Solar PV layout

6.4.3 "Be Green" Total Carbon Emissions

The CO_2 emissions associated with non-domestic regulated energy consumption are given below.

Area (m^2)	TER (kg.CO_2/m^2/yr.)	BER (kg.CO_2/m^2/yr.)
260.5	3.78	0.44

Table 19: Be Green non-domestic carbon emissions

6.5 CARBON EMISSIONS SUMMARY (NON-DOMESTIC)

The predicted total annual CO_2 emissions of the proposed development following the introduction of energy efficiency measures, passive and active design (Be Lean), Low carbon supply technologies (Be Clean) and renewable energy systems (Be Green) are summarised below in the format recommended by the GLA.

The table below shows the regulated and unregulated energy use.

Carbon dioxide emissions (Tonnes CO2 per annum)	Regulated	Unregulated
Baseline: Part L 2021 (Building Regulations) Compliance	1.0	1.4
After "Be Lean" (energy demand reduction)	0.8	1.4
After "Be Clean" (heat network / CHP)	0.8	1.4
After "Be Green" (renewable energy)	0.1	1.4

Table 20: Summary of non-domestic carbon emissions for commercial areas

This performance can be expressed as savings between each stage in the energy hierarchy.

Regulated carbon dioxide savings	(Tonnes CO_2 per annum)	(%)
Savings from "Be Lean" (energy demand reduction)	0.2	18%
Savings from "Be Clean" (heat network / CHP)	0.0	0%
Savings from "Be Green" (renewable energy)	0.7	71%
Total cumulative on-site savings	0.9	88%
Shortfall to 100% below Part L (annual)	0.1	-
Shortfall over 30 years	3	
Carbon Offset Fund (@£95/tonne)	327	

Table 21: Regulated CO_2 emissions of savings after each stage of the Energy Hierarchy for commercial areas

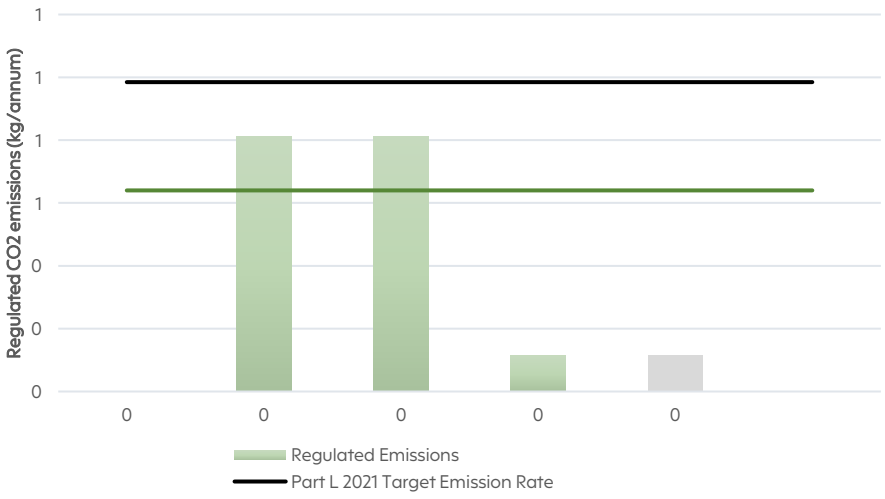

Figure 18: Summary of non-domestic development target and savings for each stage of the energy hierarchy

7 "Be Seen" Monitoring

To achieve net zero-carbon buildings there needs to be a better understanding of the actual operational energy performance. Although Part L calculations and Energy Performance Certificates (EPCs) give an indication of the theoretical performance of buildings, it is well established that there is a 'performance gap' between design theory and measured reality.

To address this gap the London Plan Policy SI 2 'Minimising greenhouse gas emissions' introduces a fourth stage to the energy hierarchy; the 'Be Seen' stage, which requires monitoring and reporting of the actual operational energy performance of major developments for at least five years via the Mayor's 'be seen' monitoring portal.

The 'Be Seen' policy establishes post-construction monitoring, enabling developers and building owners to better understand their buildings and identify methods for improving energy performance from the project inception stage and throughout the building's lifetime.

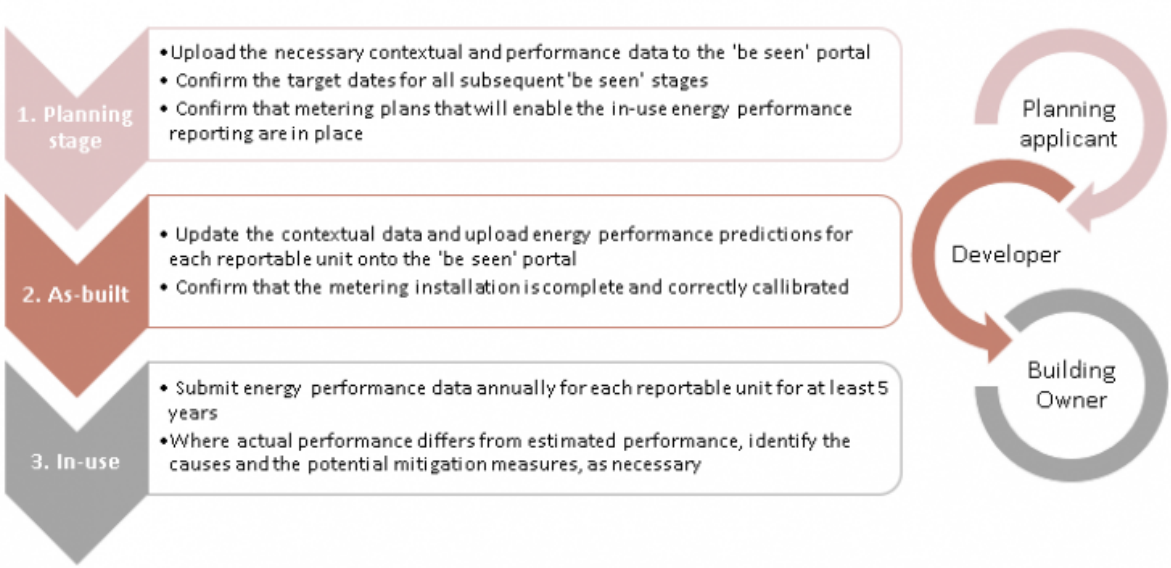

Figure 19: Be Seen process (source: *https://www.london.gov.uk/publications/be-seen-energy-monitoring-guidance*)

In relation to the Be Seen policy, the proposed development will be fully metered in order for its data to be contributed the GLA online Energy Portal as required. This includes renewable energy generation.

8 Summary

8.1 SUSTAINABILITY SUMMARY

In addition to the low carbon performance set out above, the scheme benefits from several sustainability aspects. These include the use of water saving devices to achieve 105 litre per person per day in residential areas and BREEAM 'Excellent' in the commercial areas. Health and wellbeing is supported by aspects such as high levels of fresh air provided by mechanical ventilation with heat recovery, ensuring the design meets the TM59/TM52 overheating standards and through the provision of amenity and play space facilities on the level 5 roof. The non-domestic areas have been shown to meet the BREEAM "Excellent" sustainability standard as show in the BREEAM pre-assessment appended to this report. In terms of sustainable travel, the scheme has covered bicycle storage and electric vehicle charging and is a 8 minute walk to Sutton Train Station.

A circular economy workshop has taken place as part of the design process to ensure aspects such as material use and waste is minimised by design, the details of which is summarised in the circular economy statement and whole life carbon reporting.

The scheme supports a future connection to a heat network through the provision of a low temperature centralised heat network and space provision in the plant room for a heat exchanger. The scheme is also demand side response (DSR) enabled through the provision of a centralised electric-powered heat pump systems with large energy storage vessels in order to work with National Grid signalling / time of use tariffs. This supports the transition to low carbon electricity and reduce energy costs for residents.

A residents' guide will be created to help residents reduce energy, water and waste, avoid overheating and keep air quality high as well as other aspects such as taking advantage of sharing economy opportunities and local transport facilities.

8.2 WHOLE DEVELOPMENT CARBON EMISSIONS SUMMARY

The predicted total annual CO_2 emissions of the proposed development following the introduction of energy efficiency measures, passive and active design (Be Lean), Low carbon supply technologies (Be Clean) and renewable energy systems (Be Green) are summarised below in the format recommended by the GLA.

The table below shows the total regulated and unregulated energy use.

Carbon dioxide emissions (Tonnes CO2 per annum)

	Regulated	Unregulated
Baseline: Part L 2021 (Building Regulations) Compliance	66.6	34.0
After "Be Lean" (energy demand reduction)	57.5	34.0
After "Be Clean" (heat network / CHP)	57.5	34.0
After "Be Green" (renewable energy)	23.6	34.0

Table 22: Summary of carbon emissions for the whole development

This performance can be expressed as savings between each stage in the energy hierarchy.

Regulated carbon dioxide emissions (Tonnes CO2 per annum)

	(Tonnes CO_2 per annum)	(%)
Savings from "Be Lean" (energy demand reduction)	9.1	14%
Savings from "Be Clean" (heat network / CHP)	0.0	0%
Savings from "Be Green" (renewable energy)	33.9	51%
Total cumulative on-site savings	43.0	65%
Shortfall to 100% below Part L (annual)	23.6	-
Shortfall over 30 years	709	-
Carbon Offset Fund (@£95/tonne)	£67,260	-

Table 23: Regulated CO2 emissions savings for the whole development after each stage of the Energy Hierarchy.

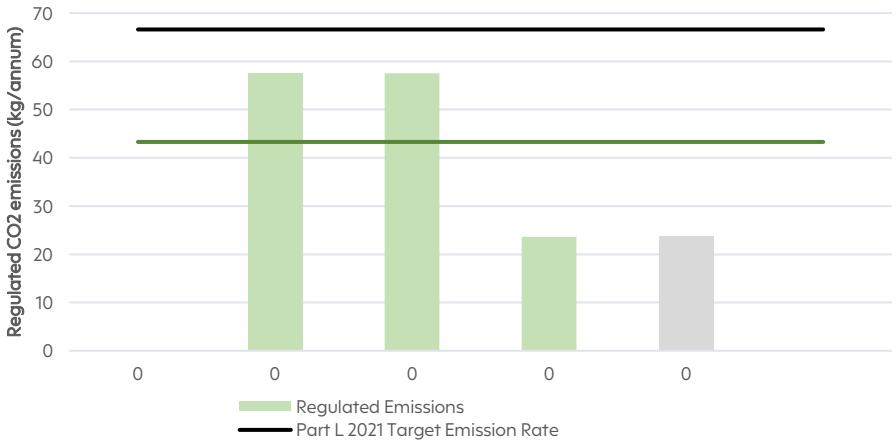

Figure 20: Summary of the whole development target and energy savings for the energy hierarchy method of assessment

8.3 FUTURE PROOFING TO 2050 SUMMARY

The site has been future-proofed to achieve zero carbon on-site emissions by 2050 through several mechanisms. The main strategy is by avoiding fossil fuels on site and use electricity for 100% of energy requirements. This means that as the UK electricity grid continues its decarbonisation towards the 2050 goal of net zero, the scheme will be able supplied by zero carbon electricity.

8.4 COST OF ENERGY SUMMARY

The scheme aims to protect the consumer from high prices by:

- Reducing energy demands.
- Generating energy onsite via solar PV.
- Monitoring energy demand (as part of 'Be Seen' commitments).
- Creating building user guides to help occupants to reduce energy bills.
- Promoting the use of smart energy tariff such to provide cheaper electricity during non-peak times. This means buffer vessel energy stores can be charged at night by the heat pump when electricity costs are much lower.
- Including quality assurances as described below.

8.5 QUALITY ASSURANCES

Quality assurance mechanisms are included as part of the energy strategy and include:

- Following quality standards (e.g. CIBSE Code of Practice)
- Gaining quality assurance accreditation (e.g. Heat Trust)
- Transparent billing, including separation of the ongoing maintenance and capital replacement aspects of the standing charge

Appendix A: Technology Feasibility Study Summary

The overall summary of the feasibility exercise is presented below.

Technology		Assessment/Viability	
	Wind Power	Wind turbine installed on the roof of the development.	Due to the high cost per kW for smaller building-mounted turbines and the impacts in terms of visual, noise and shadow flicker, wind turbines are not considered a viable technology for the development. CONCLUSION: NOT CONSIDERED FEASIBLE
	Ground Source Heat Pumps	Open or closed loop GSHP system requiring extraction of ground water and / or deep boreholes.	Ground-source heat pumps are one of the lowest carbon methods of providing reliable low-carbon heat and require low maintenance. However, they have high installation costs and there is limited space available for bore holes. CONCLUSION: NOT CONSIDERED FEASIBLE
	Air Source Heat Pumps	Electric powered external plant serving each unit providing heating and hot water	Air-source heat pumps are one of the lowest carbon methods of providing reliable low-carbon heat. They require low maintenance. External visual or noise impacts can be suitably mitigated by an acoustic enclosure. **CONCLUSION: CONSIDERED FEASIBLE**
	Solar Thermal Collectors	Roof-mounted solar thermal panels providing hot water heating	Roof areas have some potential for solar thermal energy collection. However, the integration with a heat pump would result is a complex system. Therefore, solar PV is preferred over solar thermal technology. CONCLUSION: NOT CONSIDERED FEASIBLE
	Solar Photovoltaic Panels	Roof mounted Photovoltaic panels (PV) provide electricity directly to the scheme, exporting any surplus production to the grid.	The roof has some potential for solar PV. This technology also supports air source heat pumps. **CONCLUSION: CONSIDERED FEASIBLE**
	Combined Heat & Power (CHP)	Gas powered turbine generating electricity on site. Waste heat is also made available for on-site use	Carbon offsetting potential of CHP is significantly reduced now that the UK's electricity grid is much cleaner after the increase in renewable energy deployment and decrease in coal generation. CONCLUSION: NOT CONSIDERED FEASIBLE
	Energy Storage	Energy Storage e.g. batteries	Battery scheme is not considered beneficial as there is significant daytime energy use on site. CONCLUSION: NOT CONSIDERED FEASIBLE
	Biomass Heating	Biomass-fired community heating system.	Biomass heating is an established technology but has high maintenance requirements, fuel storage and delivery issues and is a source of increase in pollution, notably particulates (PM10), SO2 and NOX emissions. CONCLUSION: NOT CONSIDERED FEASIBLE

Table A1: Summary of Low and Zero Carbon Study Analysis Results

Appendix B: Heat Network Connection Communications

Sutton Decentralised Energy Network Ltd. were contacted on 01/08/23 to determine the viability of connecting to the proposed "Sutton Town Centre Energy Centre" district heat network. The feedback from the SDEN heat network were unable to concluded the timeframe for connection. The communication is reproduced below:

Good afternoon Alan and thank you for enquiring about a connection to the SDEN heat network.

At this time we are evaluating a full business case for extending the current heat network from Hackbridge to Sutton town centre, however, I am unable to state an exact year that we would be able to provide heat.

The heat network is currently providing a supply to a residential development in Hackbridge and a full connection will be achieved to the Viridor ERF in due course which will then provide us with a heat supply of up to 15MW.

To help with your own evaluations for this connection, we suggest you use the Primary Energy Factors and Carbon Factors from SAP for heat from energy from waste. This is 0.15 kgCO2/kWh and for the primary network heat loss we estimate 7% losses due to the distance from the ERF to Sutton town centre.

Kind regards

David McIntyre
Managing Director
Sutton Decentralised Energy Network Ltd.
Environment, Housing & Neighbourhoods
London Borough of Sutton
Civic Offices, St. Nicholas Way, Sutton SM1 1EA
Email: *david.mcintyre@sden.org.uk*
www.sutton.gov.uk
Follow us on ***LinkedIn*** | ***Twitter*** | ***Facebook***

Sutton

---------- Forwarded message ---------
From: **Alan Harries** <*alan.harries@integrationuk.com*>
Date: Tue, 1 Aug 2023 at 17:06
Subject: Sutton Town Centre Energy Centre - City House
To: *contactus@sden.org.uk* <*contactus@sden.org.uk*>
Cc: Mike Spence <*mike.spence@integrationuk.com*>, Jon Moore <*jon.moore@integrationuk.com*>

Dear SDEN,

Can you please provide the latest details on the proposed "Sutton Town Centre Energy Centre" district heat network, as described on the London Heat Map (see below). The map shows a future connect to our development site City House at Sutton Park Road SM1 2AE (circled red in the image below) which is currently in development.

Please can you send any information you have on heat network connection requirements so that we can plan the project accordingly

Many thanks

Alan

Alan Harries
Director

52-54 Rosebery Avenue
London EC1R 4RP
+44 (0) 20 7183 8610
integrationuk.com

Disclaimers apply, for full details see :
(*https://www.sutton.gov.uk/info/200436/customer_services/1550/london_borough_of_sutton*)

Appendix C: Heat Network Connection Drawings

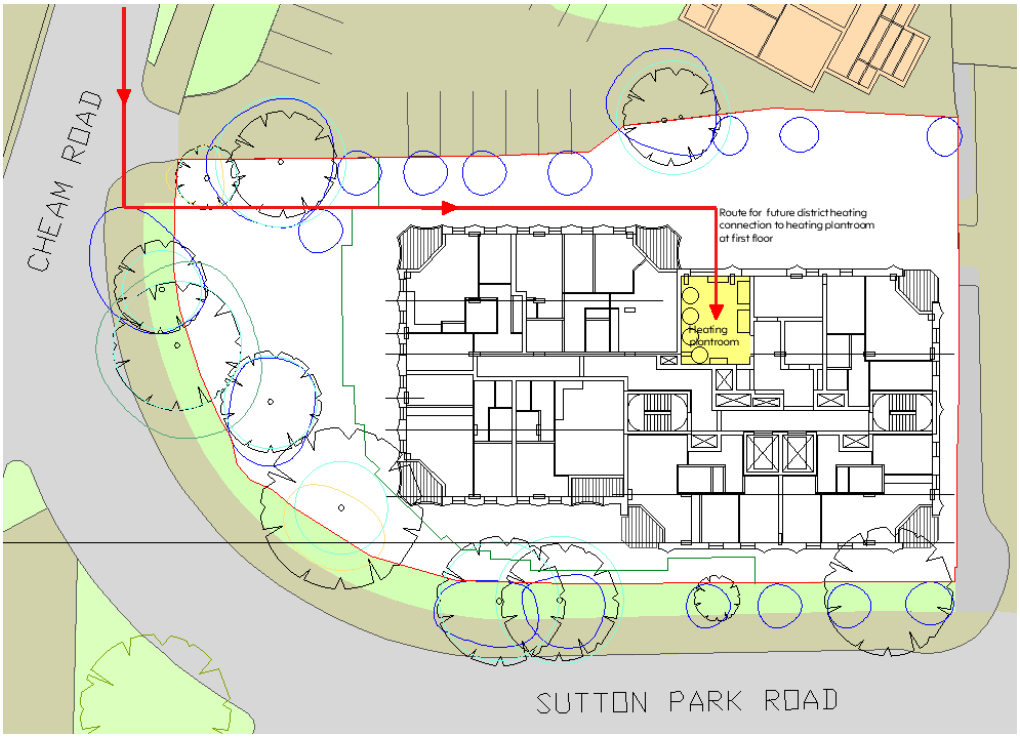

Figure 21: Plan showing indicative heat network connection route to central plant

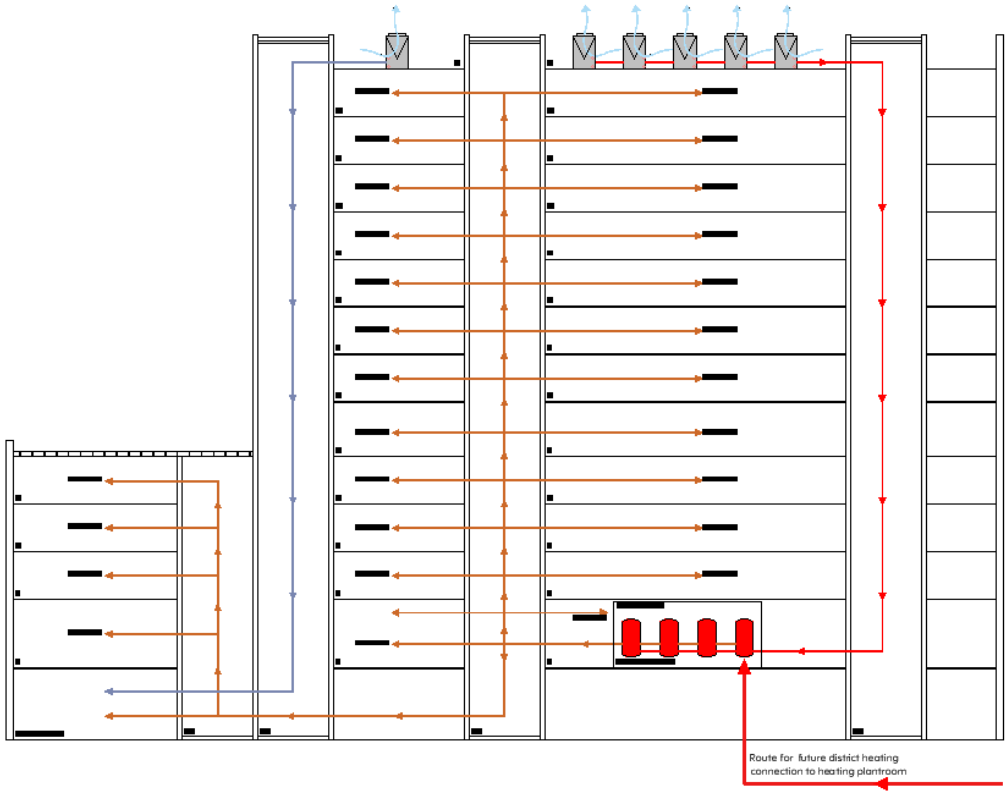

Figure 22: Plan showing indicative heat network connection route to central plant

Appendix D: SCOP Calculation

ASHP SCOP

High efficiency Mitsubishi Electric Air Source Heat Pumps have been selected to provide hot water and heating. The CAHV model will Provide hot water and heating (flow temperature 55˚C) with a seasonal coefficient of performance (SCOP) of 3.24. For reference see email from the manufacturer below:

From: Jarrald, Callum ‹*Callum.Jarrald@meuk.mee.com*›
Sent: Wednesday, December 20, 2023 9:26 AM
To: Oscar Akam ‹*oscar.akam@integrationuk.com*›
Subject: City House CAHV-Rs

Hi Oscar,

Following our recent call, please see the information below concerning efficiency for GLA carbon calculation using our equipment for the system variables you described. For the CAHV-R450YA-HPB it's based on EN14825:

Unit: CAHV-R450YA-HPB is air source heat pumps system
Supply flow temperature: 55C
Local storage for optimal loading / unit performance
SCOP: 3.24
I've attached the product sheet for this unit:
https://library.mitsubishielectric.co.uk/pdf/book/Ecodan_CAHV-R450YA-HPB_Product_Information_Sheet#page-2-3

Let me know if you need any more info

Regards,

Find equipment product sheet in our document library here: *https://library.mitsubishielectric.co.uk/*

MITSUBISHI ELECTRIC
Changes for the Better

CALLUM JARRALD
CONSULTANT ACCOUNT MANAGER

Cooling | Heating | Ventilation | Controls

MITSUBISHI ELECTRIC EUROPE B.V. UK BRANCH
Living Environment Systems Division

Mobile: 07748 180570
Email *callum.jarrald@meuk.mee.com*

Appendix E: BREEAM Pre-assessment

eight versa

Job No. 10450

City House

BREEAM Version 6 New Construction Score Summary

Targeted Score: 76.3% EXCELLENT
Score with potential credits: 86.7% OUTSTANDING

			Minimum Standards	Credits	Exemplary	Targeted	Potential	RIBA Stage 1-2 Criteria	Credit Overview
MANAGEMENT				18	0	15	1		
Man 01	Project brief and design	Project delivery planning		1	-	1		✓	Define roles, responsibilities and contributions of each team member before end of RIBA Stage 2. Evidence how stakeholder input influences initial project brief, project execution plan, communication strategy and concept design.
		Stakeholder consultation		1	-	1		✓	All third party stakeholders consulted with (e.g. local residents) / feedback given to consultees
		BREEAM AP (concept design)		1	-	1		✓	AP appointed at **RIBA Stage 1/2** and BREEAM targets set
		BREEAM AP (developed design)		1	-	1			AP monitor progress throughout design & report
Man 02	Life cycle cost and service life planning	Elemental LCC		2	-			✓	LCC **RIBA Stage 2** and LCC analysis shows: a) outline LCC plan - structure and envelope b) fabric and servicing strategy - services and fit out
		Component level LCC options appraisal		1	-	1			Component LCC plan developed by RIBA Stage 4 including: Envelope, Services Finishes and External Spaces
		Capital cost reporting		1	-	1			Report the capital cost for the building in £k/m2
Man 03	Responsible construction practices	*Prerequisite - Legally harvested & traded timber*		Yes	-	Yes			***Pre-requisite: All timber to be legally sourced***
		Environmental management		1	-	1			Contractors (who manage site) have an ISO 14001 EMS certificate and implement best practice pollution prevention in line with PPG 6
		BREEAM AP (site)		1	-	1			BREEAM AP during construction - monitoring on site
		Responsible construction management	1	2	-	2			Responsible construction management (e.g. CCS)
		Monitoring of construction site impacts - Energy & water		1	-	1			Monitor energy & water data monthly and set targets for expected consumption
		Transport of construction materials & waste		1	-	1			Monitor transport data monthly and set targets for expected consumption
Man 04	Commissioning and handover	Commissioning - Testing schedule and responsibilities	-	1	-	1			Commissioning in line with regulations / programme of commissioning
		Commissioning - Design and preparation		1	-	1			Specialist commissioning manager (who was not involved in the general installation works)
		Testing and inspecting building fabric		1	-		1		Thermographic survey and air tightness testing
		Handover	BUG	1	-	1			Non-technical and technical building user guides & training schedule covering BREEAM specific points
Man 05	Aftercare	Aftercare Support		-	-				Provide initial aftercare support to the building occupiers 12 months after handover
		Commissioning - Implementation	1	-	-				Seasonal commissioning of complex and simple Systems within first year of occupation at full load and part load
		Post Occupancy Evaluation (POE)		-	-				POE one year after initial building occupation by an independent 3rd party

HEALTH AND WELLBEING				11	0	8	1	
Hea 01	Visual comfort	Control of glare from sunlight		-	-			Identify areas at risk of glare using a glare control assessment. Glare control strategy to design out potential glare in all relevant building areas where risk has been identified.
		Daylighting		2	-	1		Daylighting factors of 2% are met as per BREEAM guidance AND uniformity ratio is at least 0.3; at least 80% of the room has a view of the sky from desk height
		View out		1	-	1		View Out - all workstations are 8m from window AND window area is at least 20% of surrounding wall area, OR window to room depths comply with Table 1.0 BS 8206: Part 2 (25% where >8m, 30% where >11m and 35% where >14m)
		Internal and external lighting levels, zoning and control		1	-	1		Lighting guidance met - SLL Code for Lighting 2012 and CIBSE Lighting Guide 7 for Offices
Hea 02	Indoor air quality	Prerequisite - Indoor air quality (IAQ) plan		Yes	-	Yes		***HEA 02 Pre-requisite: An IAQ Plan is carried out in accordance with BREEAM requirements to achieve any of the below credits:***
		Ventilation		1	-		1	Designed to provide fresh air whilst minimising air pollutants: air intakes and exhausts over 10m apart & intakes 10m horizontal distance from sources of external pollution (e.g. car parks / roads)
Hea 04	Thermal comfort	Thermal Modelling CIBSE AM11		1	-	1		Thermal Modelling (in accordance with CIBSE AM11), to comply with CIBSE Guide A
		Design for future thermal comfort		1	-	1		Thermal Modelling - As above for a projected climate change environment
		Thermal zoning and controls		-	-			Thermal Strategy produced as a result of the thermal model and installation of occupant control within 7m zones
Hea 05	Acoustic performance	Acoustic performance		1	-	1		Building meets appropriate acoustic performance standards (and testing reqs) for a) sound insulation; b) indoor ambient noise level; c) room acoustics.
Hea 06	Security	Security of site and building		1	-		✓	Security consultant appointed at design stage (RIBA Stage 2) to carry out a Security Needs Assessment
Hea 07	Safe and healthy surroundings	Safe access		1	-	1		Delivery routes do not cross pedestrian or cyclist routes. Separate access routes for cyclists, pedestrians and vehicles
		Outside space		1	-	1		There is an outside space providing building users with an external amenity area.
ENERGY				19	0	8	5	
Ene 01	Reduction of energy use & carbon emissions	Energy Performance	4	9	-	4		Energy Performance Ratio for New Construction (SBEM modelling)
		Prediction of operational energy consumption	-	4	-		4	Prediction of operational energy consumption: - Energy design workshop to be carried out at design stage with relevant members of design team - Energy modelling & reporting to predict operational energy consumption figures by end use, design assumptions and input data - Risk assessment to highlight any significant design, technical, and process risks
Ene 02	Energy monitoring	Sub-metering of end-use categories	-	1	-	1		Sub-meters with pulsed output for major energy consuming systems and high energy load areas: Space heating, Domestic hot water heating, Humidification, Cooling, Ventilation, i.e. fans (major), Pumps, Lighting, Small power, Renewable or low carbon systems (separately), Controls, Other major energy consuming systems or plant
		Sub-metering of high energy load & tenancy areas		1	-	1		Accessible BEMS or accessible sub-meters for tenancy areas / relevant function areas / departments
Ene 03	External lighting	External Lighting		1	-	1		Average luminous efficacy of at least 70 luminaire lumens per circuit Watt and controls for daylighting and PIR in areas of intermittent pedestrian traffic
Ene 04	Low carbon design	Passive Design Analysis		1	-		1	✓ Hea 04 achieved and a Passive Design Analysis produced outlining opportunities for passive design solutions
		Free Cooling		1	-			Above achieved / free cooling strategy implemented (or building naturally ventilated)
		LZC feasibility study		1	-	1		✓ Feasibility Study + LZC technology specified
Ene 05	Energy efficient cold storage	Refrigeration energy consumption		-	-			
		Indirect greenhouse gas emissions		-	-			
Ene 06	Energy efficient transport systems	Energy consumption			-			Transport demand analysis undertaken to determine correct number and size of lifts Lift comparison between at least 2 different lift types with the most energy efficient specified
		Energy efficient features - Lifts			-			Energy efficient features installed for system - standby mode for off peak periods, lift car lighting >70lm/W and variable speed, voltage and frequency. Regenerative drives where this is shown to be energy saving
		Energy efficient features - Escalators or moving walks		-	-			
Ene 07	Energy efficient laboratory systems	Design specification		-	-			
		Best practice energy efficient measures		-	-			
Ene 08	Energy efficient equipment	Energy efficient equipment		-	-			Where installed, equipment using a significant proportion of the total annual unregulated energy consumption of the building to meet BREEAM requirements (e.g. white goods / IT equipment)

TRANSPORT					12	0	12	0	
Tra 01	Transport assessment & travel plan	Travel Plan			2	-	2		✓	Develop a travel plan based on a site-specific travel assessment, including analysis of Accessibility Index
Tra 02	Sustainable transport measures	Transport options implementation			10	-	10			Identify the sustainable transport measures (e.g. cycle storage, cyclist facilities, electric car charging points, car share schemes, travel information point, new bus service, improved cycle / pedestrian routes)
WATER					9	0	7	0		
Wat 01	Water consumption	Water consumption	-		5	-	3			Percentage improvement on baseline - litres / person / day 12.5% (1) / 25% (2) / 40% (3) / 50% (4) / 55% (5) / 65% (exemplar)
Wat 02	Water monitoring	Water monitoring	1		1	-	1			Water meter on mains supply - pulsed output Sub-metering for areas expected to use more than 10% consumption
Wat 03	Water leak detection	Leak detection system			1	-	1			Water leak detection between boundary and building and within building - alarm must be audible and programmable
		Flow control devices			1	-	1			Cold water supply shut off valves linked to presence detectors in each WC area / facility
Wat 04	Water efficient equipment	Water efficient equipment			1	-	1			Mitigate significant unregulated water demands OR Where there is no significant water demand
MATERIALS					14	0	9	2		
Mat 01	Building life cycle assessment (LCA)	Superstructure			6	-	5		✓	Life cycle assessment: - Comparison with the BREEAM benchmark (office, retail & industrial only) and options appraisal - Integrate the LCA options appraisal activity within the wider design decision-making process **Early stage req:** For maximum credits: LCA must be submitted to BRE prior to planning application
		Substructure and hard landscaping options appraisal during Concept Design			1	-	1		✓	
Mat 02	Environmental Product Declarations (EPDs)	Specification of products with a recognised EPD			1	-				Specification of products with a recognised EPD within the life cycle analysis. Must be *at least* 14 EPDs to
Mat 03	Responsible sourcing construction products	Prerequisite - Legally harvested & traded timber	Yes	Yes	-	Yes				***Pre-requisite : all timber to be legally sourced***
		Enabling sustainable procurement			1	-		1	✓	Sustainable Procurement Plan in place - all materials for the project
		Measuring responsible sourcing			3	-	2			Responsible sourcing of materials (ISO / FSC etc)
Mat 04	Insulation	Not applicable in BREEAM 2018			-	-				
Mat 05	Design for durability & resilience	Design for durability and resilience			1	-	1			Protecting vulnerable parts of the building from damage / Protecting exposed parts of the building from material degradation
Mat 06	Material efficiency	Material efficiency			1	-		1	✓	Optimise the use of materials in building design, procurement, construction, maintenance and end of life
WASTE					11	0	9	0		
Wst 01	Construction waste management	Pre-demolition audit	-		1	-	1		✓	Determine whether refurbishment or reuse is feasible / maximise recovery of materials
		Construction resource efficiency			3	-	2			Amount of Waste per 100m2 of GIFA - SWMP
		Diversion of resources from landfill			1	-	1			Meet with diversion from landfill benchmarks
		RMP (Resource Management Plan) measuring and reporting			-	-				
Wst 02	Recycled & sustainably sourced aggregates	Prerequisite - Pre demolition audit			Yes	-	Yes		✓	Identify all aggregate uses / types on the project + total amounts (weight) and distance travelled - points calculated using Wst 02 calculator
		Project sustainable aggregate points			1	-	1			
Wst 03	Operational waste	Operational waste	1		1	-	1			Dedicated, recyclable waste storage area: 1. At least 2m² per 1000m² of net floor area for buildings < 5000m² 2. A minimum of 10m² for buildings ≥ 5000m² 3. An additional 2m² per 1000m² of net floor area where catering is provided (with an additional minimum of 10m² for buildings ≥ 5000m²).
Wst 04	Speculative finishes (offices only)	Speculative floor and ceiling finishes			1	-	1			Offices only: no floor or ceiling finishes are installed OR show areas are installed OR tenant confirms finishes to be installed
Wst 05	Adaptation to climate change	Resilience of structure, fabric, building services and renewables installation			1	-			✓	Conduct a climate change adaptation strategy appraisal for structural and fabric resilience by the end of Concept Design - RIBA Stage 2
Wst 06	Design for disassembly & adaptability	Design for disassembly and functional adaptability - recommendations			1	-	1		✓	Recommend a building-specific functional adaptation strategy - RIBA Stage 2
		Disassembly and functional adaptability – implementation			1	-	1			Disassembly and functional adaptability strategy to be implemented – RIBA Stage 4

ECOLOGY			13	0	12	1		
LE 01	Site selection	Previously Occupied Land	1	-	1			75% land pre-developed (building or hardstanding) in last 50 years
		Contaminated Land	1	-		1		Site investigation confirming contamination and remediation needed
LE 02	Ecological risks & opportunities	Prerequisite	Yes	-	Yes		✓	***Assessment route selection*** Determine Route 1 or Route 2 - GN 34 checklist
		Survey and evaluation and Determining the ecological outcomes for the site (route 1)	-	-				***Route 1 (one credit)*** - checklist must be carried out to determine 'ecological value' ***Route 2 (two credits)*** - desktop study and survey by Suitably Qualified Ecologist (SQE) confirming current and potential ecological value & condition to determine baseline, risks to ecological value and feasibility for enhancement, including determining the zone of influence.
		Survey and evaluation and Determining the ecological outcomes for the site(route 2)	2	-	2		✓	
LE 03	Managing impacts on ecology	Prerequisite - Achieved LE 02	Yes	-	Yes			***Prerequisite – ID risks and opportunities for the site*** LE 02 must be achieved + EU & UK legislation will be implemented
		Planning, liaison, implementation and data (route 1)	-	-	0			***Route 1 and Route 2 (one credit)*** - Planning to be carried out for activities during site clearance and construction, including: - Roles and responsibilities for managing negative impacts on the ecology have been identified. - Determine timescales for implementing on-site measures - Ensure contract requirements focus on reducing and managing potential knock-on impacts of works (e.g. pollution and disturbance)
		Planning, liaison, implementation and data (route 2)	1	-	1			
		Managing negative impacts of the project (route 1)	-	-	0			***Route 1 (one credit)*** - negative impacts are managed in accordance with mitigation hierarchy and no overall loss of ecological value ***Route 2 (Up to two credits)*** – Managing negative impacts of the project and construction works have been managed in accordance with the mitigation hierarchy One credit - minimising loss Two credits - no loss of ecological value
		Managing negative impacts of the project (route 2)	2	-	2			
LE 04	Ecological change & enhancement	Prerequisite - Achieved LE 03	Yes	-	Yes			***ID risks and opportunities for the site*** LE 03 must be achieved + EU & UK legislation will be implemented
		Ecological enhancement (route 2 only)	1	-	1			***Route 2 only*** - Liaison, implementation and data collation: Ecological measures have been implemented that enhance the sites ecological value. Measures are based on: a) SQE recommendations b) input from the project team / relevant stakeholders and c) data collected for LE 02
		Change and enhancement of ecology (route 1)	-	-				***Route 1 only*** - Locally relevant ecological measures have been implemented that enhance the sites ecological value. Measures are based on: a) local expert recommendations b) input from the project team / relevant stakeholders and c) data collected for LE 02
		Change and enhancement of ecology (route 2)	3	-	3			***Route 1*** - n/a ***Route 2*** Enhancement of ecology based on the change in ecological value, determined by a calculation carried out by the SQE
LE 05	Long term ecology management & maintenance	Prerequisite (route 1)	-	-				***Prerequisite: Route 1 - LE03 credit 'managing negative impacts of the project' is achieved***
		Prerequisite (route 2)	Yes	-	Yes			***Prerequisite: Route 2 - LE03 credit 'Managing negative impacts of the project' is achieved AND at least one LE 04 credit for 'Change and enhancement of ecology'***
		Management and maintenance - Landscape and ecology management plan (or similar) development (route 1)	-	-				***Route 1*** - Measures are implemented to manage and maintain ecology through the project to ensure optimal ecological outcomes agreed in LE 02 are met. Information made available to future building user on ecological values.
		Management and maintenance (route 2)	1	-	1			***Route 2*** - Measures are implemented to manage and maintain ecology through the project to ensure optimal ecological outcomes agreed in LE 02 are met. Information made available to future building user on ecological values.
		Landscape and ecology management plan (or similar) development (route 2)	1	-	1			Landscape and ecology management plan (or similar) development

POLLUTION			12	0	9	1	
Pol 01	Impact of refrigerants	No Refrigerants	-	-			
		Prerequisite - BS EN 378:2016 (ammonia)	Yes	-	Yes		***Pre-requisite : all systems with electric compressors comply with the requirements of BS EN 378:2016(207) (parts 2 and 3). Refrigeration systems containing ammonia comply with the Institute of Refrigeration Ammonia Refrigeration Systems code of practice (208).***
		Impact of refrigerant	2	-	1		GWP of 10 or less / DELC CO2e of 100 kgCO2/kW cooling capacity **OR** DELC CO2e of 1000 kgCO2/kW cooling capacity
		Leak detection	1	-			Refrigerant leak detection system provided
Pol 02	Local air quality	Local air quality	2	-	2		If all heating / hot water fed by electric - 2 credits achieved by default. Where heating / hot water fed by combustion plant (i.e. boiler), minimum emission levels must be met. Gas fired boilers: 1 credit: 27 mg / kWh 2 credits: 24 mg / kWh
Pol 03	Flood and surface water management	Prerequisite	Yes	-	Yes		***Prerequisite - an appropriate consultant must be appointed***
		Flood resilience	2	-	2		Flood risk assessment (FRA) required. 2 credits if low annual prob of flooding / 1 credit if medium/high annual prob of flooding
		Surface water run-off rate	1	-	1		***Surface Water Run-Off - Rate*** - Peak run off rate shows a 30% improvement - maintenance agreements - allowance for climate change
		Surface water run-off volume	1	-	1		***Surface Water Run-Off - Volume*** Where flooding will not occur in the event of local drainage failure Post-development run-off no greater than pre-development
		Minimum watercourse pollution	1	-		1	***Minimum water course Pollution*** No discharge from the developed site for rainfall up to 5 mm and SUDs / oil interceptors installed
Pol 04	Reduction of night time light pollution	Reduction of night time light pollution	1	-	1		External lighting in accordance with ILP guidance and connected to timer clock
Pol 05	Reduction of noise pollution	Reduction of noise pollution	1	-	1		External noise assessment if within 800m of a noise sensitive building

INNOVATION			-	10	1	1	
Inn 01	Man 03 - Responsible construction management	Man 03 - Responsible construction management	-	1	1		All responsible construction management criteria are met and evidenced by the Contractor
Inn 02	Hea 01 - Daylighting	Hea 01 - Daylighting	-	2			Daylighting levels achieved beyond standard BREEAM compliance
Inn 03	Hea 01 - Internal and external lighting levels,	Hea 01 - Internal and external lighting levels, zoning and control	-	-			Lighting in each zone can be manually dimmed by occupants down to 20% of the max. light output
Inn 04	Hea 02 - Minimising sources of air pollution - Emissions from construction products	Hea 02 - Minimising sources of air pollution - Emissions from construction products	-	-			Emission levels achieved beyond standard BREEAM compliance
Inn 05	Hea 06 - Security of site and building	Hea 06 - Security of site and building	-	1			A compliant risk based security rating scheme (SABRE) is used and confirmed by independent assessment and verification
Inn 06	Ene 01 - Beyond zero net regulated carbon	Ene 01 - Beyond zero net regulated carbon	-	2			Energy performance beyond standard BREEAM compliance
Inn 07	Ene 01 - Carbon negative	Ene 01 - Carbon negative	-	1			Energy performance carbon negative
Inn 08	Ene 01 - Post occupancy stage	Ene 01 - Post occupancy stage	-	2			Contractual agreement to carry out DEC
Inn 09	Wat 01 - Water consumption	Wat 01 - Water consumption	-	1			Water consumption performance beyond standard BREEAM compliance
Inn 10	Mat 01 - Core building services options appraisal during Concept Design	Mat 01 - Core building services options appraisal during Concept Design	-	1		1	✓ LCA including building services appraisal - must be carried out at concept design
Inn 11	Mat 01 - LCA and LCC alignment	Mat 01 - LCA and LCC alignment	-	1			✓ LCA and LCC carried out with same programme, and findings align
Inn 12	Mat 01 - Third party verification	Mat 01 - Third party verification	-	1			✓ LCA provider to provide third party verification of the LCA outputs
Inn 13	Mat 03 - Measuring responsible sourcing	Mat 03 - Measuring responsible sourcing	-	1			Responsible sourcing performance beyond standard BREEAM compliance
Inn 14	Wst 01 - Construction waste management	Wst 01 - Construction waste management	-	1			Waste consumption performance beyond standard BREEAM compliance
Inn 15	Wst 02 - Use of recycled and sustainably sourced	Wst 02 - Use of recycled and sustainably sourced aggregates	-	1			Waste aggregates performance beyond standard BREEAM compliance
Inn 16	Wst 05 - Responding to climate change	Wst 05 - Responding to climate change	-	1			Wst 05 credit achieved, **AND** credits for the following met: Hea 04; Ene 01 (6 credits); Ene 04 passive design; Wat 01 (3 credits); Mat 05 (environmental degradation); and Pol 03 (1 credit for resilience, 2 credits for surface water run off)
Inn 17	LE 02 - Determine the ecological outcomes for the site (sustainability-related activities)	LE 02 - Determine the ecological outcomes for the site (sustainability-related activities)	-	1			LE 02 credits achieved, **AND** achieve the following: Hea 07 (both credits); Pol 03 (surface water run off and minimising watercourse pollution credits); and Pol 05.

Targeted score: 76.3 EXCELLENT (Excellent Rating - 70% required)
Score with additional credits: 86.7 OUTSTANDING (Excellent Rating - 70% required)
Please note that we recommend a safety margin between 3-5%

Appendix F: SAP/SBEM Datasheets and GLA Spreadsheet

Please see the appended folder which contains the Be Lean and Be Green SAP datasheets, SBEM Brukl documents together with the completed GLA carbon spreadsheet.