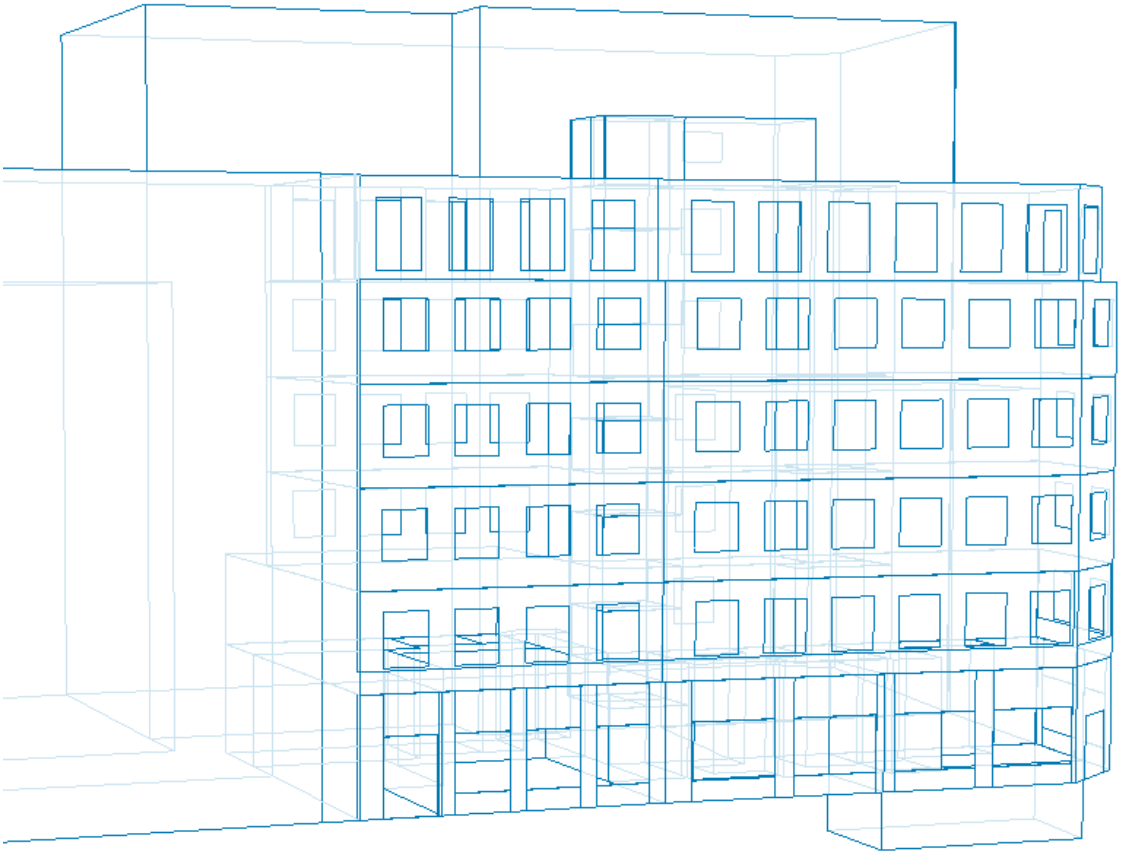

B0992 161 Drury Lane Development

Energy and Sustainability Report

Version: V2.0
Current Version Publish Date: 31/05/2023

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Contents

Version	Date	Reason for issue	Prepared By	Checked By
1.0	March-23	Planning	HI	AG
2.0	May-23	Updated results	HI	AG

1 Executive Summary

This development comprises of:

> *"Demolition of existing fourth floor, replacement of fourth floor and erection of an additional storey to the building, ground floor alterations including new entrances, single storey extension to the rear, removal of existing external fire escape stair to the rear, reconfiguration of existing external plant equipment and introduction of additional plant at roof level, including associated works. Planning use class E throughout the building."*

A review of planning requirements has been undertaken with the focus on sustainability and energy in line with the London Borough of Camden Local Plan 2017 and the London Plan 2021. The main elements of the scheme are listed below:

The office development will be assessed under BREEAM 2014 Non-Domestic Refurbishment & Fit Out with a predicted award level of Excellent.

The energy hierarchy has been followed, and in relation to the overall development, with a Be Lean reduction of 18% and a Total stage reduction of 61%. The strategy includes:

- Low thermal properties of the building envelope
- High Plant efficiencies
- Highly efficient VRF efficiencies
- ASHP (air-to-air) VRF technology for space heating
- ASHP (air-to water) technology for DHW

2 Introduction

This Energy Statement was commissioned by McAleer & Rushe Contracts UK Ltd to accompany a planning application for 161 Drury Lane, London.

The building is currently in use as an office and will maintain as a Class E building, with the refurbishment of the fourth floor and an additional floor added. The building will stand 5 storeys high with a basement.

The purpose of this Statement is to set out a sustainable approach of how energy will be handled, and the application of equipment and technologies in the way energy use is controlled. It is the intention to provide a development incorporating high quality systems to meet the needs of the current Approved Document L: Volume 2 and Development Plan Policies to provide a good indoor environment for occupants and neighbours and meet these objectives with low energy usage and consequent low environmental impact.

The statement is sectioned into two key parts: Part 1 focuses on the policy requirements set out within Camden Local Plan 2017, referencing all relevant documents to these policies. Following on from this is the London Plan 2021, the relevant policies are reviewed alongside the GLA energy statement guidance 2022 and any other relevant documents. Part 2 focuses on a more detailed approach to these policy requirements through dynamic simulation modelling and evaluation of low carbon technologies to conduct a feasibility study.

3 General Location

The development is located within the London Borough of Camden.

The location has advantages with access to utilities such as electricity and natural gas, connectivity to high-speed internet services and excellent transport options. District heating is not available within the are at present or the foreseeable future, however provisions have been put in place to allow for future potential connections.

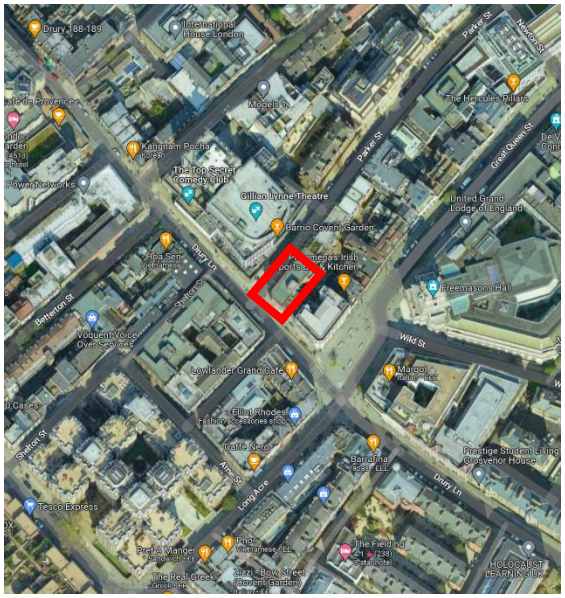

FIGURE 1 – GOOGLE MAP OF DEVELOPMENT LOCATION

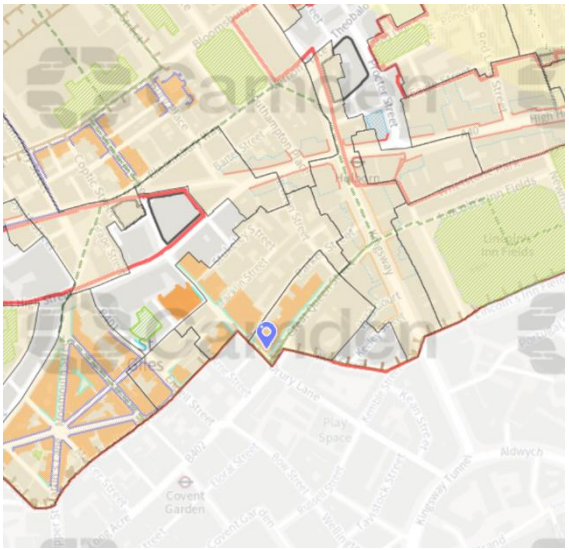

FIGURE 2 – DEVELOPMENT LOCATION ON CAMDEN POLICIES MAP 2021

3.1 Weather

The London area is classified by ASHARE as a 5A location i.e., Cool and Humid and by the Koeppen-Geiger[1] Classification system as Cfb i.e., Humid temperate (mild winters), Fully humid; no dry season, Warm summer (marine), Mild winters with heavy precipitation, warm/short/dry summers, on western continental coasts.

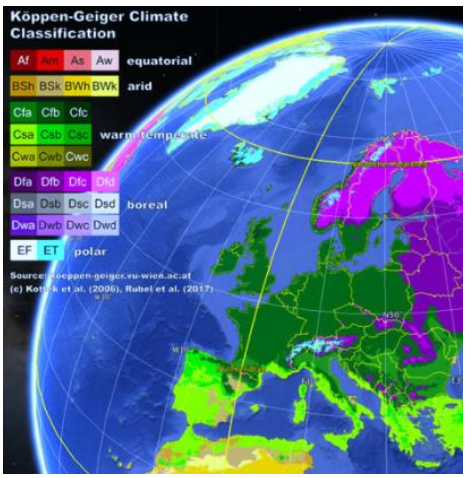

FIGURE 2 - CLASSIFICATION MAP - PRESENT CLIMATE

This classification is expected to remain, even with climate change predictions.

Therefore, the approach to sustainability can be informed by this and so winter is potentially most dominant in terms of energy. Although in global terms the summer is cool it can still have significant impact with the solar radiation on south/east/west walls and roof areas being significant.

Some metrics are shown in Figure 3 - Climate weather metrics, they show that the August is the warmest month and February the coldest. In recent years, the pace of climate change has been more noticeable with recent very hot spells and unpredictable cold weather. However, it is still expected that the general format of the metrics will remain.

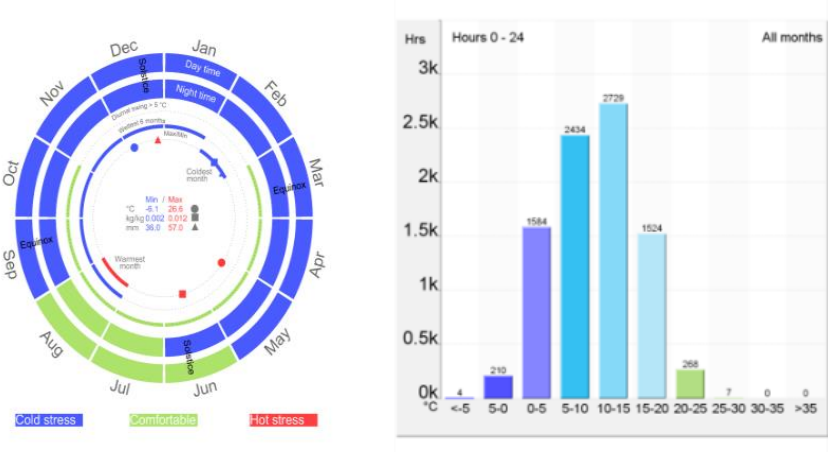

FIGURE 3 - CLIMATE WEATHER METRICS

[1] http://koeppen-geiger.vu-wien.ac.at/present.htm

4 Review of Planning Requirements

4.1 National Planning Policy Framework (2021)

The National Planning Policy Framework 2021 sets out the Government's planning policies for England. It provides a framework within which locally prepared plans for proposed developments can be used. The framework does not contain specific policies for projects but forms part of the wider planning system to contribute to the achievement of sustainable development. The United Nations defines Sustainable Development:

> *"As meeting the needs of the present without compromising the ability of future generations to meet their own needs."*

Sustainable Development is achieved through the 3 pillars of sustainable development, this is also referred to as the "triple bottom line of sustainability".

The 3 pillars are:

- *Social*
- *Economic*
- Environmental

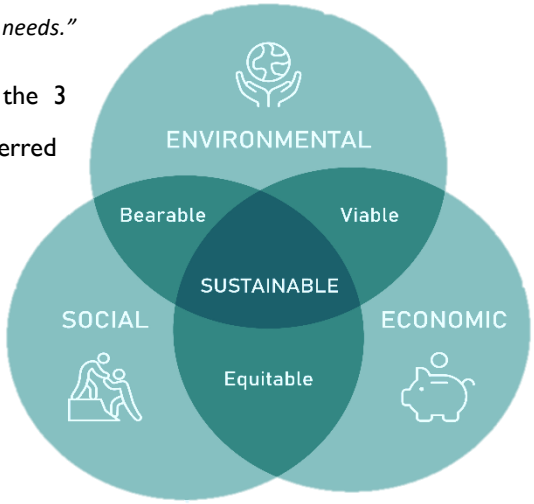

FIGURE 4 – PILLARS OF SUSTAINABILITY

4.2 Camden Local Plan Adopted 2017

This document is used to direct planning applications under the Camden Borough and sets out the vision and spatial strategy for the area.

4.2.1 Policy CC1 – Climate Change Mitigation

The aim of this policy is to tackle climate change within Camden as over 90% of the borough's carbon emission are produced by the operation of buildings. To ensure that any new developments are not contributing to these emissions the first step is to promote zero carbon development and follow the steps of the energy hierarchy which is referenced in both the Camden Planning Guidance on sustainability, as well as the London Plan 2021. To demonstrate this, an energy statement must be submitted indicating how the development has practiced the Be Lean, Be Clean and Be Green stages. It is expected that any development above 500sqm must achieve a 20% carbon reduction from onsite renewable energy generation unless it is infeasible to do so.

Due to the significant contribution that existing buildings in Camden have on the emissions it is favourable to retrofit existing developments to reduce waste and energy usage during construction. Furthermore, it is expected that all buildings enable low energy and water demands during operation.

Under this policy it is encouraged that any development over 500sqm conducts an embodied carbon assessment as part of the energy and sustainability statement. It is also expected that any new developments connect to existing decentralised energy networks where possible, using the London Heat Map to identify potential connections. If a connection is not feasible immediately then there should be considerations to connect in the near future, and finally if that is not possible then a site wide low carbon network must be provided which could, if feasible extend beyond the site boundary to other sites.

Monitoring real life building operations is fundamental in aiding the councils understanding of how effective implemented measures are in the borough, and therefore all low carbon technology and renewable must be monitored to meet the London Plan policy.

Response: This development has been designed and assessed under The London Plan 2021 Energy Hierarchy to demonstrate energy efficiency and this is shown in Section 5 – Sustainable Approach. In accordance with the Be Lean criteria, the development is expected to achieve over 15% carbon reduction solely though this adaptation and through the Be Green stage to achieve the 20% carbon reduction from onsite renewable energy generation.

As this building is undergoing a retrofit it is considered favourable under the CC1 policy by reducing the energy demand and waste in an existing building. Furthermore, an embodied carbon assessment has been undertaken as part of the energy and sustainability statement.

Where possible, it is expected to connect to a decentralised energy network, however regarding this development there is no feasible connection with 500m, however the development will be designed to allow for future connections.

Under the London Plan 2021 policy SI2, it is expected that all new developments follow the Be Seen requirement which establishes that there be post-construction monitoring as good practise. This is supported by having to upload annual energy data for at least five years, which holds the building owner accountable for energy monitoring. This has been discussed further in section 4.6.

4.2.2 *Policy CC2 – Adapting to Climate Change*

This policy recognises the importance of adapting to climate change and identifies three risks: Flooding, Drought and Overheating. To support the mitigation of these risks one of the requirements is that all developments must install green roofs, permeable landscaping, green walls and blue roofs where appropriate. It is also expected that the use of air conditioning is only used if other passive measures of cooling are not feasible. The development will be expected to demonstrate how the London Plan Cooling hierarchy has influenced the building design. Furthermore, the design of the building must take into account the ability to be sustainable and these principles must be addressed in the Energy and Sustainability statement.

This policy also states that BREEAM is expected on developments over 500sqm, and must achieve a rating of excellent, with encouragement to be zero carbon from 2019 onwards.

Response: (WIP) This development has been designed following the Cooling hierarchy as shown in section 4.5.6 and sustainability measures have been addressed through the energy hierarchy shown in section 5. BREEAM Excellent has been targeted for this development.

4.2.3 *Policy CC3 – Water and Flooding*

Developments included refurbishments are expected to meet BREEAM water efficiency credits. There is also the risk of flooding from surface water in Camden due to intense rainfall and these risks need to be considered. Certain criteria mentioned under this policy is used to identify whether flood risk assessments are required.

Response: Under BREEAM 2014 Non-Domestic Refurbishment & Fit Out the water efficiency credits will be achieved. As shown in the below maps in figure 5 and 6 the development is not in

FIGURE 5 – FLOOD RISK MAP FROM ENVIRONMENTAL AGENCY

a flood zone for both river flooding and surface flooding. Due to this a flood risk assessment is not required. Refer to separate report regarding flood risk for more detail.

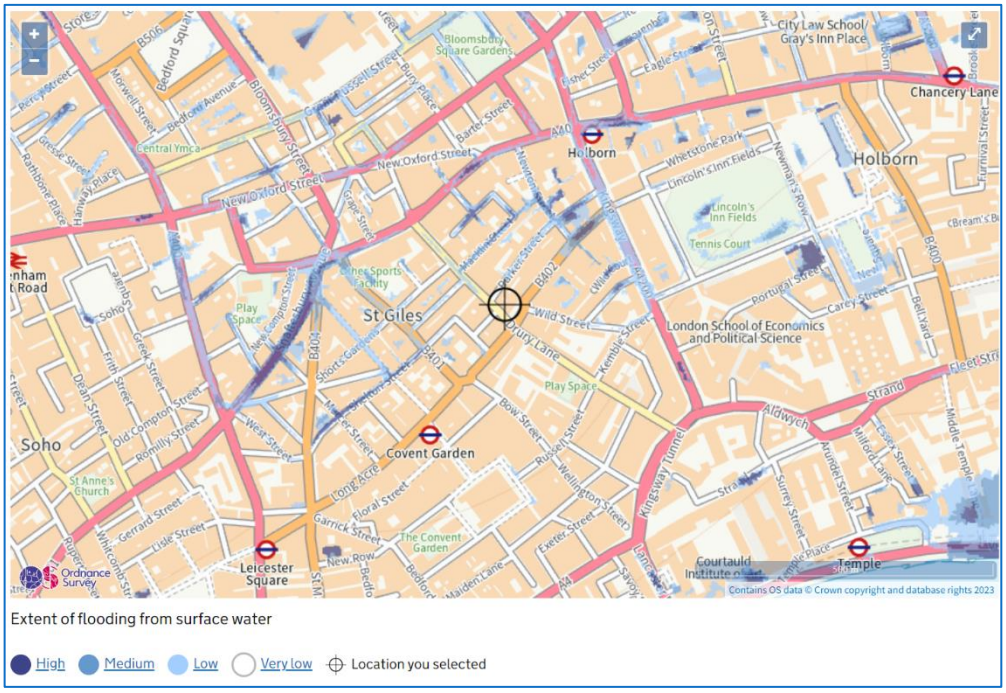

FIGURE 6 – SURFACE WATER FLOOD RISK MAP FROM ENVIRONMENTAL AGENCY

4.2.4 *Policy CC4 – Air Quality*

This policy recognises that Camden has some of the poorest air quality in London, and an air quality assessment is required where residents could be exposed to high levels of air pollution. Air quality assessments are also required if the commercial space floor space is over 2,500sqm.

Response: An air quality assessment will be undertaken, and a separate report will be issued to cover this policy.

4.2.5 *Policy CC5 – Waste*

Camden council aim to reduce waste and increase recycling, following the North London Waste Plan adopted July 2022. Furthermore, the council encourages a site waste management plan to be produced prior to construction.

Response: Under BREEAM 2014 Non-Domestic Refurbishment and Fit Out waste credits will be achieved, along with the criteria of the North London Waste plan. A separate waste strategy report offers more insight.

4.3 Camden Planning Guidance – Energy Efficiency and Adaption

This document was prepared and released in 2021 as a Supplementary Planning Document (SPD) for The Local Plan. It offers guidance for policies CC1 and CC2 and replaced the 2019 document.

4.3.1 Energy Hierarchy

As initially referenced in Policy CC1 of the Camden Local Plan 2017, the energy hierarchy must be followed to reduce carbon dioxide emissions. The following steps: Be Lean, Be Clean and Be Green ensure that the building design is prioritised to minimise energy consumption though passive measures such as fabric improvement and aim to use renewable sources.

4.3.2 Making buildings more Energy Efficient

This section relates to the Be Lean stage of the hierarchy and the main requirement is that non-residential developments achieve a 15% reduction in accordance with The London Plan 2021.

Specific criteria of the Be Lean stage includes, Making the most of the sunlight to provide warmth from the sun heat which decreases the heat requirement needed. Also, the natural light will limit the need for artificial lighting. However, it is important to be aware of the risk of overheating when designing a building and so considerations need to be made when picking glazing and shading options.

The thermal performance of the building relates to the heat loss through the fabric of the building, and high thermal performing building helps keep the building energy efficient. For this development the glazing is to be upgraded which will contribute to limiting overheating whilst still allowing solar gain into the space for natural lighting and winter heat. There are limitations regarding fabric improvement for this development as it is an existing building.

4.3.2.1 Energy Efficent Services

This section highlights the importance of energy efficient services such as heating, cooking and ventilation. Where possible direct electric systems for heating should be avoided unless a gas connection is not possible. Furthermore, a system should be designed so that it is able to connect to a decentralised heating network.

As previously mentioned in policy CC2, active cooling is discouraged and will only be allowed if thermal modelling shows that it is necessary, and the London Cooling Hierarchy is followed. Within this section there are many variables that should be considered such as having highlight efficient lighting with sensors and using heat recovery systems. Further evaluation of this is seen in section 4.5 which covers the London plan 2021 however the development has proposals of highly efficient services such as lighting at 95lm/w and an Air-source heat pump with a COP of 4.0.

4.3.3 *Decentralised Energy*

The second stage of the energy hierarchy: Be Clean encourages the use of efficient heating and power. Often the ways which are considered to meet the requirement of this stage is thought the Combined Heat and Power (CHP) and a Decentralised Energy Network (DEN). The benefit for CHP's has been disregarded for any which are deployed after 2023 and any developments which propose CHPs after this time which have not been designed to form a part of a wider decentralised energy network will not be considered feasible under Policy CC1.

Regarding decentralised energy connections, there are several existing networks within the borough shown in the London Heat Map. Any major developments in a proximity of 500m or less to an existing network should prioritise a connection and undertake a feasibility study. If no existing network is available it must be evident in the energy and sustainability statement that this was thoroughly checked. Furthermore, developments must demonstrate compliance with the Be Clean stage and overall carbon reduction expected over Part L.

There are no decentralised energy networks close by to the development and the council was contacted to look into this.

4.3.4 *Renewable Energy Technologies*

All developments are expected to conduct a feasibility study for onsite renewable generation, but this should be the final consideration of the energy hierarchy, falling under the third stage: Be Green. Particularly in areas of low air quality it is expected that if possible, the development produces zero emissions. Supporting the local plan there must be a 20% reduction in the Be Green stage. The BREEAM Low and Zero Carbon Feasibility Report must be submitted alongside the Energy and Sustainability Statement.

4.3.5 *Energy Statements*

The energy statement must follow the energy hierarchy and it should be presented in line with GLA Guidance on Preparing Energy Statements. For refurbishments the energy statement must show the existing baseline and Part L compliant baseline with improvements at each stage outlined.

The table below shows how the energy and sustainability statement has adhered to The London Plan 2021 and the sections relating to each policy. The Camden Planning Guidance – Energy Efficiency and Adaptation has outlined the areas and subjects of importance to this energy and Sustainability report, and these are further justified in the sections below, as well as the justifications of the Camden Local Plan in section 4.2.

Policy Overview	Section Covered
London Plan Policy SD4 The Central Activities Zones (CAZ)	Section 4.5.1
London Plan Policy D3 Optimising site capacity through the design-led approach	Section 4.5.2
London Plan Policy SI1 Improving Air Quality	Section 4.5.3
London Plan Policy SI 2 Minimising greenhouse gas emissions	Section 4.5.4
London Plan Policy SI 3 Energy infrastructure	Section 4.5.5
London Plan Policy SI 4 Managing heat risk	Section 4.5.6
'Be Seen' – Energy Monitoring Guidance (September 2021)	Section 4.6
Whole Life-Cycle Carbon Assessments Guidance (March 2022)	Section 4.7

4.4 *LETI Climate Emergency Retrofit Guide*

This document offers guidance for retrofitting buildings in a way to see effective energy reduction, in response to the climate emergency. The quick start guide lists six key principles which follow best practice.

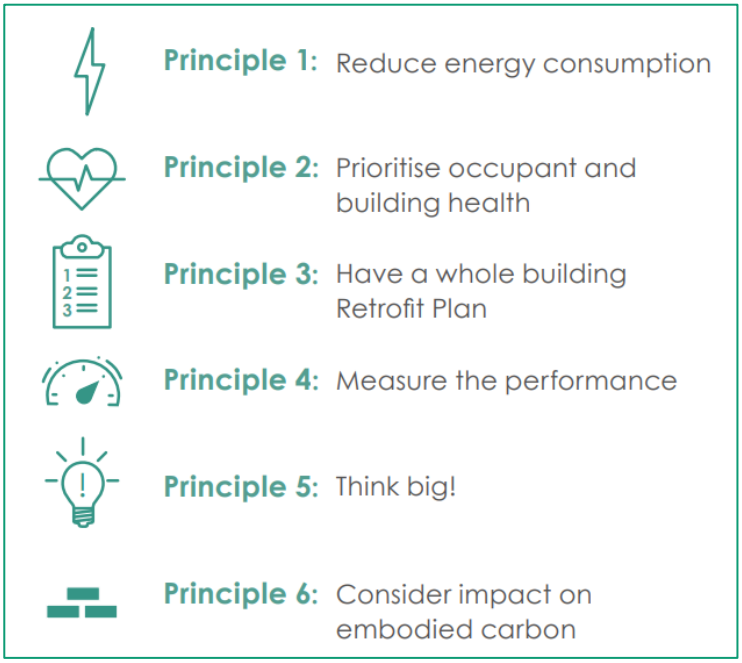

FIGURE 7 – LETI CLIMATE EMERGENCY RETROFIT GUID PRINCIPLES

In section 4.5 this guide indicates how it is important to have a 'whole building' plan. The guide is designed for domestic buildings and therefore key figures and modelling examples cannot be applied to this development. However, as this development is being retrofitted this report considers these six principles throughout. LETI is yet to release a non-domestic retrofit guide.

4.5 *The London Plan 2021 – with guidance from GLA Energy Assessment Guidance June 2022*

The London Plan is legally part of each London's Local Planning Authorities' Development Plan and must be considered when planning decisions are taken in any part of London. The plan provides the strategic, London-wide policy context for borough local development plans documents. This plan has replaced previous plans and has now been adopted as it evaluates all the relevant environmental and sustainable policies summarised below:

SD4 The Central Activities Zone (CAZ)	SI2 Minimizing greenhouse gas emissions
D3 Optimising site capacity through the design led approach	SI3 Energy Infrastructure
HC1 Heritage conservation and growth	SI4 Managing heat risk
SI1 Improving air quality	SI5 Water Infrastructure

4.5.1 *SD4 The Central Activities Zone (CAZ)*

The CAZ is considered a hub of activity for London and is home to more than 230,000 residents and as such holds specific requirements to maintain the environment. Section D there is emphasis on air quality due to the densely populated nature; this will be further evaluated in policy SI1. Other areas of interest include overheating and vulnerability to flooding, as the CAZ suffers from higher local temperatures than other surrounding parts of London and low-lying land.

Response: Regarding the flood risk, the area of the development is not in area that has been categorised as a flood risk and is therefore not vulnerable to this factor. Regarding overheating, further information can be found in sections 4.5.6 SI4 Managing Heat Risk. Air Quality is discussed in Policy SI1.

4.5.2 *D3 Optimising site capacity through the design led approach*

There is a small section under this policy that relates to the development in an energy usage and sustainability angle. The minimising of the use of new materials is encouraged to follow the circular economy principles. Furthermore, designing for longevity and adaptability is also encouraged.

Response: Following the circular economy, the development has retained most of its internal floors and the external façade. The building consists of office spaces, and retail on the ground floor – utilising the open plan space by creating conference rooms and meeting pods. There is also opportunity to connect the café and reception and overall it is a positive contribution to the local economy by providing space for businesses.

4.5.3 *SI1 Improving Air Quality*

The aim of this policy is to ensure that new developments are being designed to improve the local air quality and to the reduce the extent to which the public are exposed to poor air quality. Therefore, any new development should not cause any new exceedances to the legal air quality.

Response: The proposed development will encompass low emissions for heating and cooling and the energy requirements. As the development progresses further analysis will be undertaken to ensure that the impacts from emissions are prevented and minimised.

4.5.4 *SI2 Minimising greenhouse gas emissions*

This policy is a key criterion of this report as it discusses in detail the targets for carbon reduction, as well as the Energy Hierarchy. Following the GLA Energy Assessment Guidance 2022, this report should comply with policies SI2-SI4. As seen in figure 10 there are four key components to the energy hierarchy: Be Lean, Be Clean, Be Green and throughout all Be Seen. The Be Seen component has been evaluated in more detail in section 5.1.4.

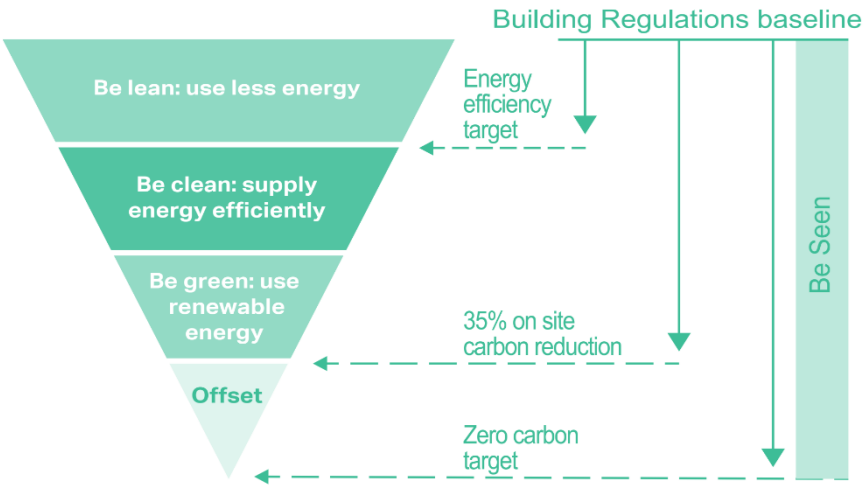

FIGURE 8 – LONDON PLAN ENERGY HIERARCHY

In section C of this policy there is a requirement for a minimum on site reduction of 35% beyond Approved Document L 2021. Furthermore, non-residential developments should achieve a 15% reduction through energy efficient measures alone. Where zero carbon cannot be achieved on site there is an offset that must be paid to accommodate for this.

Furthermore, any major developments should calculate and reduce carbon emissions from unregulated energy and a whole life cycle carbon assessment should be completed through a nationally recognised body.

Response: The Energy Hierarchy has been followed using dynamic simulation modelling to show these steps in section 5 and the model settings are shown in Appendix B. There is a 17% reduction in carbon from the Baseline and the Be Lean results which achieves the need to meet a minimum of 15% reduction through energy efficient measure alone. Furthermore, there is an overall carbon reduction of 61% which shows that the 35% on site reduction has been achieved. More details on this are discussed in section 5 as well as the Be Seen component in Section 4.9 and 5.1.4.

4.5.5 SI3 Energy Infrastructure

In this policy the development is encouraged to connect to local networks, should they be available or planned in the future. Following guidance from this policy indicates that at an early-stage developer should communicate with energy providers to find out energy and infrastructure requirements. There should be research done into the possibility of connecting to a heat network or energy centre, and if not, there should be opportunity to connect in the future.

Response: According to the London Heat Map there are no existing or future heat network connections near the development, see figure 11. The closest heat network is Whitehall and is approximately 0.9km away, there is a future connection across the river Thames which is 0.8km away but due to being the other side of the river this would not be feasible to connect to. The distance required to connect to the closest existing heat network would require significant civil engineering works. Although there are no viable connections, the development will still be provisioned to allow for a district heat connection when there is an economic and sustainable option to do so.

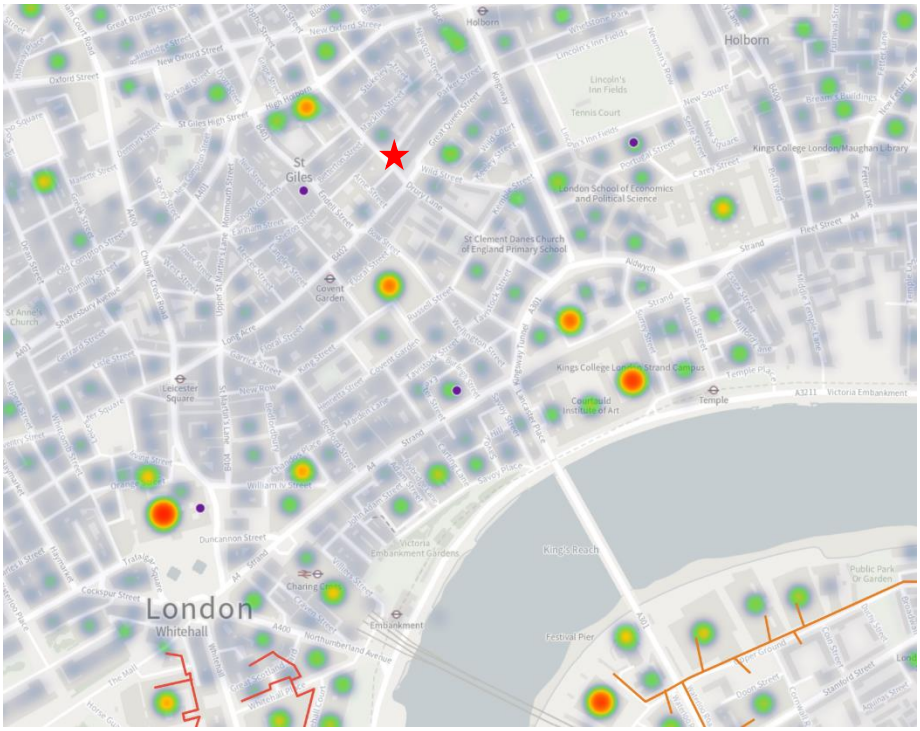

FIGURE 9 – LONDON HEAT MAP SHOWING EXISTING AND PROPOSED HEAT NETWORKS IN CONTEXT TO THE DEVELOPMENT (RED STAR)

4.5.5.1 *Heating Hierarchy*

As mentioned in the GLA energy assessment guidance 2022, the heating hierarchy must be adhered to in policy SI3. As such, in the response there is already evidence that a connection to a district heat network cannot be made. There will be a use of an ASHP for the DHW as well as VRF to serve the heating and cooling. This would make the energy use of the building entirely fossil fuel free as it is being served by electricity. Therefore, the last action is not considered as there is no use of gas on the site.

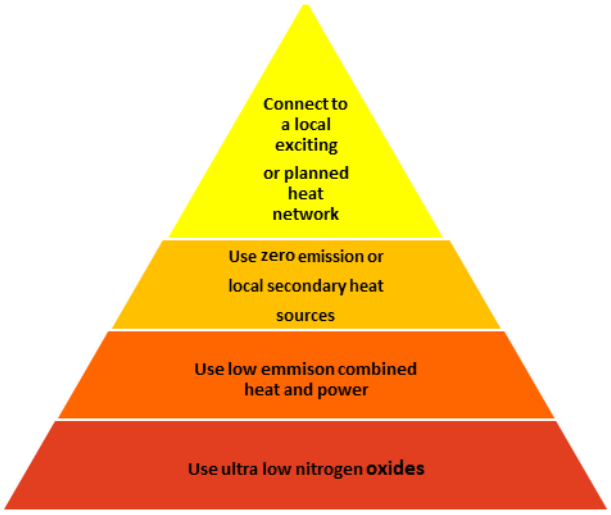

FIGURE 10 – HEATING HIERARCHY

4.5.6 *SI4 Managing Heat Risk*

Due to climate change, London is already experiencing much higher temperatures than historic averages, along with extreme heat waves. Due to this, developments must assume a high overheating risk.

This policy indicates how adverse effects on the urban heat island through design and infrastructure should be minimised. Ways this can be done include minimising heat generation through energy efficient designs of services, providing mechanical ventilation and active cooling systems. Assessment of this is undertaken through the CIBSE TM59 guidance for non-domestic developments.

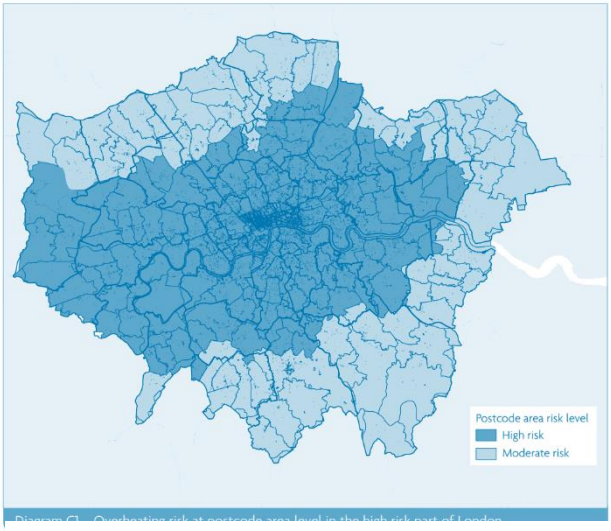

FIGURE 11 – APPROVED DOCUMENT O HEAT RISK MAP

Response: According to the Approved Document O map shown in figure 13, the area of this development is considered to have a high risk of overheating. Document O does not apply to this building however it is important to keep this in mind. Therefore, the development will follow the cooling hierarchy to mitigate overheating. In section 6.2 the cooling

results show that the actual building has a lower cooling demand than the notional.

4.5.6.1 *Cooling Hierarchy*

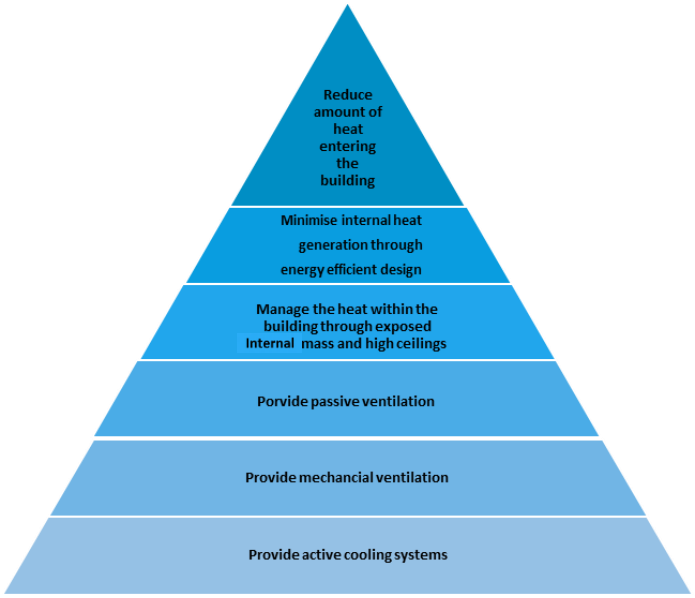

FIGURE 12 – COOLING HIERARCHY

To reduce the amount of heat entering the building the glazing has been upgraded. The second action to minimise internal heat can be achieved with energy efficient design through mechanical and electrical services which have been designed as such.

Like that of the first action of the cooling hierarchy, some of the internal mass is remaining and not much could be expected to be influential by this. However, there is likely to be both mechanical ventilation and active cooling systems to mitigate the overheating and these parameters should be effective enough to combat the high risks surrounding this central London development. Further discussion of the overheating risk and assessment is in section 6.2.

4.5.7 *SI5 Water Infrastructure*

This policy encourages developments to be sustainable regarding water supplies and the use of mains water. Certain requirements which are expected of this development include achieving a BREEAM Excellent standard for Wat 01, as well as the incorporation of smart metering to keep consumption low.

Response: This development will achieve the Wat 01 credit under the BREEAM Refurbishment Fit Out 2014 and is expected to have smart metering attached to water usage. As the area is in the low flood risk category there is no concern for water infrastructure capacity.

4.6 *'Be Seen' – Energy Monitoring Guidance (September 2021)*

As referenced under policy SI2 section 4.5.4, the Be Seen component is the fourth of the energy hierarchy and the newest edition. As implied, the aim of this component is to make sure that developments in London are monitoring their energy to maintain efficient use of the building.

There are three stages to the Be Seen process: At planning stage there must be confirmation of metering plans that will be in place to monitor in-use energy performance.

In the As-built stage energy performance predictions must be uploaded to the 'Be Seen' portal and there should be confirmation that metering has been installed and is ready to be used.

The third stage is the In-use section, and the energy performance data must be submitted annually for 5 years. Any differences between the estimated and predicted performance must be identified along with the causes and how these can be mitigated.

At this stage in the development, there can be confidence that as the design progresses there will be metering plans in place to monitor the building in use. Further on in process there will be more information made available regarding the energy monitoring strategy.

4.7 *Whole Life-Cycle Carbon Assessments Guidance (March 2022)*

This guidance is referenced under section 4.5.2 and mentioned in the GLA Energy statement guidance 2022 as support to policy SI2, section 4.5.4. A whole life Cycle carbon and Circular Economy report has been done in support of the planning application.

5 Sustainable Approach

5.1 Sustainable Approach

Our approach to sustainability follows the overarching sustainable hierarchy as illustrated below:

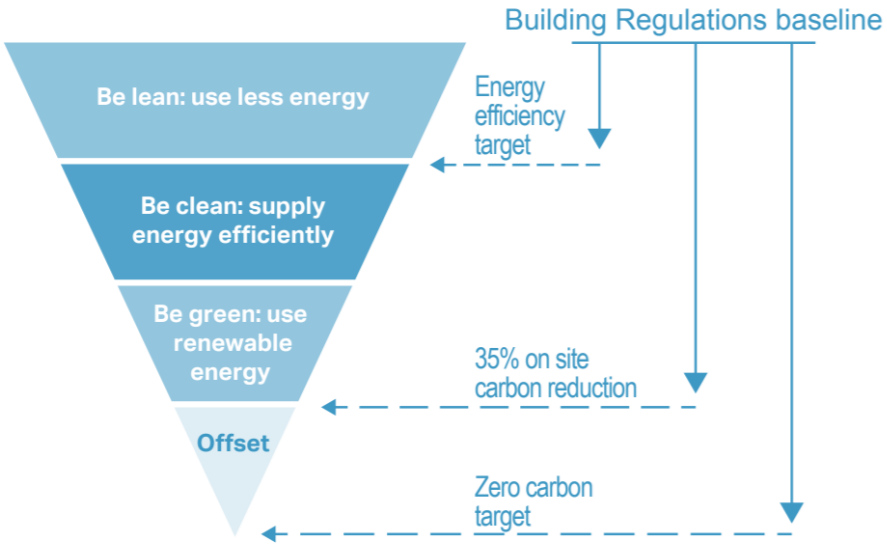

FIGURE 13 – CLEAN LEAN GREEN DIAGRAM

5.1.1 Baseline

When calculating regulated CO2 emissions for an Approved Document L 2021 compliant development, the energy assessment must first establish the regulated CO2 emissions - assuming the development complied with Approved Document L 2021 using Building Regulations approved compliance software. When determining this baseline, it should be assumed that the heating would be provided by gas boilers and that any active cooling would be provided by electrically powered equipment.

For this development a baseline model has been created using the GLA guidance for an existing building. As this development is retaining much of the external façade, the settings from Table 11 from the GLA Energy Assessment Guidance 2022 have been used for the settings where appropriate.

5.1.2 Be Lean (Demand Reduction) and Be Clean (Heating Infrastructure)

As there are no district heating networks in the vicinity of the development the calculations done at the Be Lean stage are the same as the Be Clean stage. At the Be Lean stage it is expected that there is a 15% carbon reduction compared to the Baseline. At this stage the glazing has been improved and the lighting has been replaced to meet the minimum 95lm/w.

A 17% reduction has been achieved through the improvement of fabrics where possible, as well as upgrading the fixed services. Full results of this can be seen in Appendix B.

5.1.3 *Be Green (Renewable Energy)*

At this stage a renewable energy technology should be added into the design to reduce the amount of carbon produced. A heat pump was added to serve the DHW, with a SCOP of 4. When adding this to the model, an 18% carbon reduction can be seen between the Be Lean and Be Green stage, with an overall carbon reduction of 48% on the baseline model.

5.1.4 *Be Seen*

The development will be designed to provide metering and facilities to enable the Be Seen process to be undertaken at practical completion for the initial energy prediction and the ability to interface with the GLA Be Seen Portal. Predicted loads will be provided at planning phases – planning stage and As Built stage, an official Be Seen spreadsheet will be supplied. A framework will be developed for in-use stage.

5.2 *Brief review of possible LZC solutions*

The use of low or zero carbon (LZC) technologies can have a positive impact on the development. It's important that any development does not simply provide LZC as a token and that each could be considered as a benefit to the environment and the building users. In the summary the use of heat pumps and PV is proposed.

5.2.1 *Heat pumps*

The use of Air-to-Air heat pumps is currently in the proposal to provide heating and cooling for the development. Heat pumps have advanced to a very high degree with improved efficiency at part load and most can overtake the ground source heat pump. An Air-to-Water heat pump will also be used to provide the full load for the domestic hot water system. These also reduce the energy demand of the development due to their very high efficiency drawing less energy than delivered.

The Seasonal Coefficient of Performance (SCOP) used in the model is based on typical commercially available products heating and represents the amount of energy provided in comparison with the energy drawn by the unit. System Seasonal Energy Efficiency Ratio (SSEER) is a similar figure is used for cooling energy This would be calculated in full once actual installed mix of internal units and external units are fixed during the technical design and construction stages. For building regulations calculations if SCOP is not available the use of COP is allowed as this is a worst-case scenario, similarly EER can be used instead of SSEER.

OUTDOOR UNITS		PURY-P200YNW-A
CAPACITY (kW)	Heating (nominal)	25.0
	Cooling (nominal)	22.4
	High Performance Heating (UK)	25.0
	COP Priority Heating (UK)	22.8
	Cooling (UK)	20.0
POWER INPUT (kW)	Heating (nominal)	4.71
	Cooling (nominal)	4.43
	High Performance Heating (UK)	5.93
	COP Priority Heating (UK)	4.71
	Cooling (UK)	2.57
COP / EER (nominal)		5.30 / 5.05
SCOP / SEER*		-

FIGURE 14 – MANUFACTURERS DATA

Above is an example of a manufacturer data showing COP and EER at 5.3 and 5.05 respectively. In this energy assessment the levels have been set at conservatively at 4 for both SCOP and SSEER 5 to allow for future design development flexibility.

The air-to-water heat pump is proposed for the 100% of the Domestic Hot Water System (DHW) an example system is illustrated below:

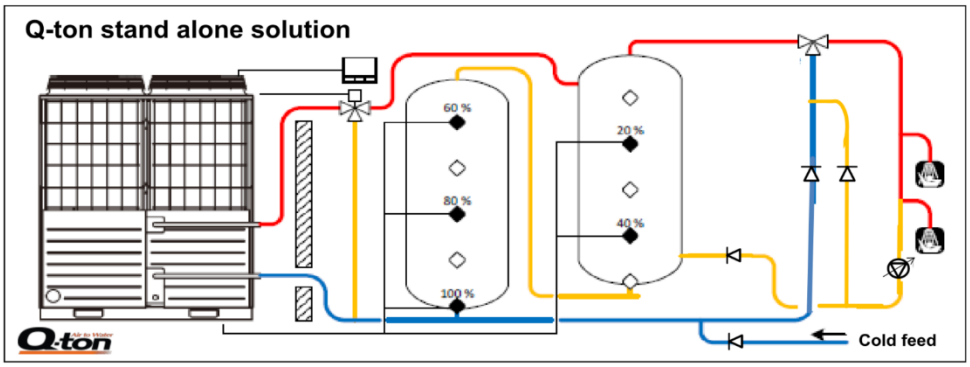

FIGURE 15 - TYPICAL HEAT PUMP ARRANGEMENT USED IN DHW

The SCOP is based on the external weather, and this will use a SCOP based on the external conditions and manufacturers data. An example from a similar student accommodation building is shown below.

The exact values would be determined based on the manufacturer installed, technical design and construction arrangement. The SCOP's used in the model are set conservatively with a SCOP of 4 to allow for future design development flexibility.

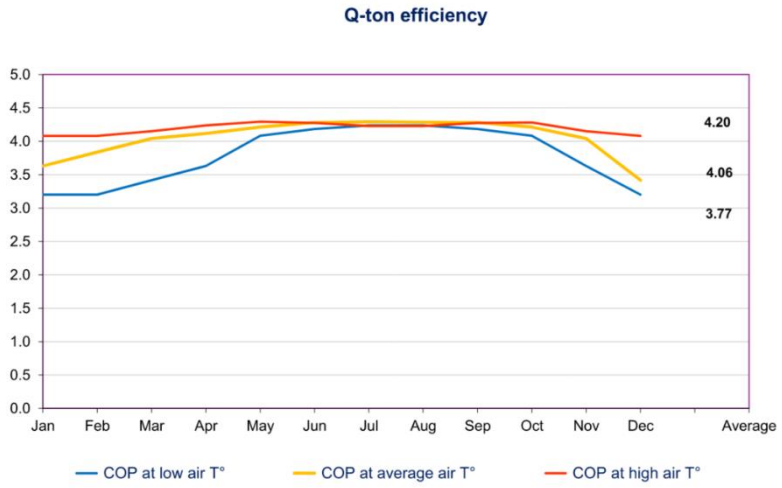

FIGURE 16 - EXAMPLE MANUFACTURERS COP VALUES OVER A YEAR

5.2.2 *Combined Heat and Power Plant (CHP)*

CHP is not currently in the proposal as the electricity generated would not result in a significant carbon reduction due to the SAP 10 carbon factors that this assessment is being carried out under. Also, the DHW ASHP is already meeting the main demand of the CHP.

5.2.3 *Wind Power:*

Significant wind power for this urban site is not practical due to limitations of the roof area and the lack of a consistent strong wind speed i.e. 3.7 m/s average less than 5 m/s average suggested for viable wind power.

5.2.4 *Solar thermal water heating*

Solar water heating has a potential use for the DHW demand however this will compete with the air source heat pump, which is anticipated to have higher carbon emission savings. Solar thermal water heating is not part of the development.

5.2.5 *Solar Photovoltaic*

Solar PV has the potential to feed into all electrical systems, the prime location for this technology is the roof. Due to concerns of the weight on the new level, PV is not being considered for the development.

5.2.6 *Biofuel*

Biomass can have a significant impact on carbon emissions however the location could impact on the air quality aspects of the biomass fuel emissions with respect to local pollution limits. The reaction times of biomass are slow and may suffer in responding to a spiked demand profile. Also, the deliveries of fuel would be problematic for plant areas. Bio diesel type solutions we consider to be not yet fully developed commercially and that the ethical issues surrounding energy crops are still to be fully resolved. Biomass is not proposed for the development.

5.2.7 *Green Energy Tariffs:*

Although not considered a renewable as part of any offsetting calculations the possibility for building occupants to avail of green energy tariffs can be considered during the assessment of utility providers.

6 Energy Demand and Approved Document L Calculations

6.1 Dynamic Simulation

The model involves refurbishment through fabric upgrades of the upper floor external walls and mansard. AM11 software was used to investigate compliance with the London Plan 2021.

IESVE software was used for the energy calculations to provide carbon efficiency and fabric efficiency for the development.

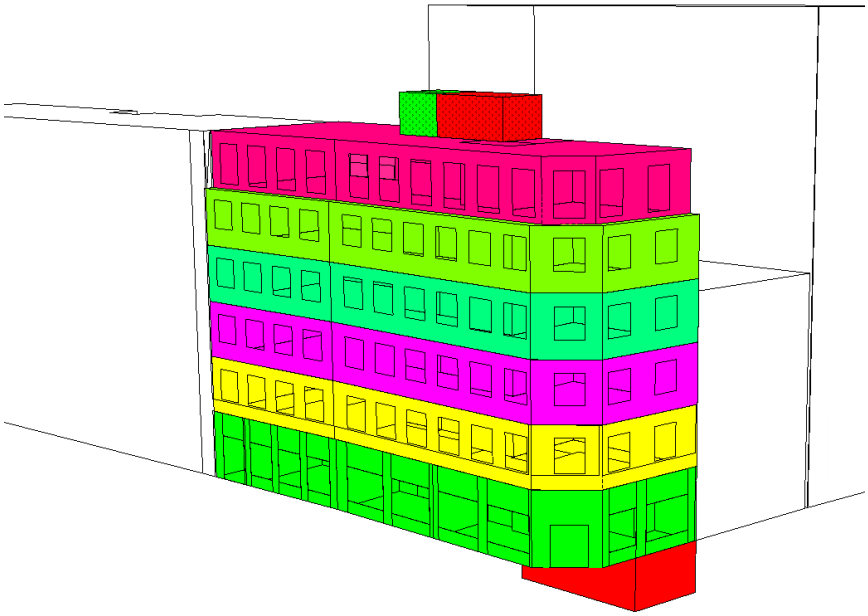

FIGURE 17 – IESVE DYNAMIC SIMULATION MODEL

6.2 Results

The following results have been taken from the GLA Carbon Emissions reporting spreadsheet 2022, using the data from the IES models for the Baseline, Be Lean, Be Clean and Be Green.

The figures below (19 & 20) show the results from using the energy hierarchy to show carbon reduction for this development. As seen from the table, the requirements at the Be Lean stage, and the total expected improvement have been achieved.

	Regulated non-residential carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be lean: savings from energy demand reduction	3.6	18%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	8.9	43%
Total Cumulative Savings	**12.6**	**61%**
Annual savings from off-set payment	8.2	-
	(Tonnes CO_2)	
Cumulative savings for off-set payment	**246**	-
Cash in-lieu contribution (£)	**23,349**	

FIGURE 19 – CARBON SAVINGS FROM ENERGY HIERARCHY

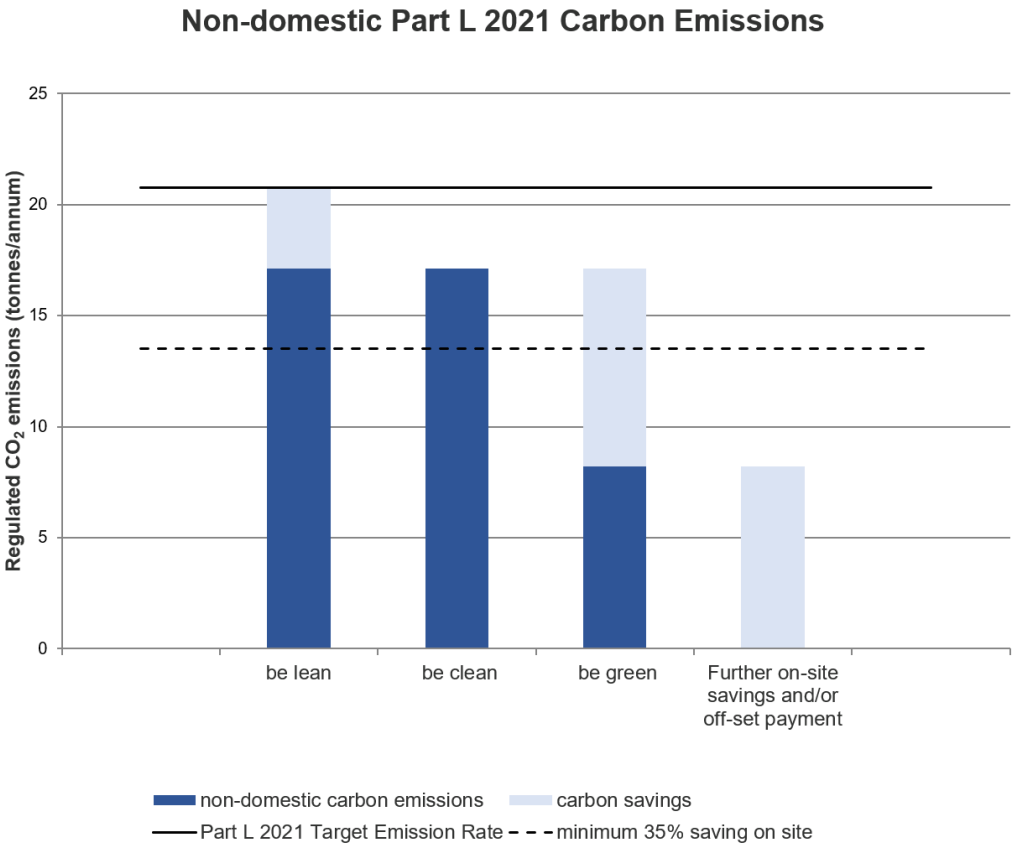

FIGURE 20 – GRAPH TO SHOW CARBON REDUCTIONS

As shown in figure below (21), the cooling demand of the actual building is lower than the notional building which indicates that less overheating occurs when the upgrades have been made.

	Area weighted non-residential cooling demand (MJ/m^2)	Total non-residential cooling demand (MJ/year)
Actual	52.95	19326.75
Notional	55.12	20118.8

FIGURE 21 – COOLING DEMAND NOTIONAL AND ACTUAL

7 Conclusion

This report reviewed the general location and planning requirements for the development. The London Plan 2021 sets a zero-carbon, with a minimum of 35% improvement for major developments. This was achieved by:

- A new roof.
- New glazing.
- Highly efficient ASHP for space heating and cooling.
- New LED lighting.
- ASHP (air-to-water) technology for DHW.

A review of the potential renewables and the feasibility of connecting to heat network has been undertaken. The development achieves a betterment of carbon reduction from the baseline specification in appendix B, following Energy assessment guidance. Local Planning Policies are also met using a mixture of passive design fabric elements, efficient plant, and services to provide a good indoor environment for occupants and neighbours.

A simple review on the overheating has been evaluated using the GLA spreadsheet which shows the actual building has a lower cooling demand than the notional (baseline) model.

Results from models show the Clean, Lean, Green process with an overall 48% improvement on the notional existing building, and a 30% reduction between the Baseline and the Be Lean alone. In conclusion, we have shown that this development complies with the planning policies and has incorporated sustainable, and energy efficient qualities and we consider that the development will provide a vibrant, sustainable, and carbon efficient contribution to Camden.

8 Appendix A – Climate Data

The following information relates to the climate date from London Clerkenwell Weather file:

ASHRAE 90.11 (calculated)	4A	Mixed humid
ASHRAE 90.11 (defined)	4A	

Koeppen-Geiger1 Cfb Humid temperate (mild winters), Fully humid; no dry season, Warm summer (marine), Mild winters with heavy precipitation, warm/short/dry summers, on western continental coasts

Chosen weather file is **London_TRY.epw**

Rainfall location: London - Kew, United Kingdom

Winter is potentially most dominant - the design must minimise heating energy.

Latitude is mid - solar radiation on south/east/west walls is significant. Solar radiation on roofs is significant.

Summer is cool. Summer also has a moderate diurnal range. Summer also has cool summer nights.

Winter is mild.

Winter prevailing winds typically from the north. Summer prevailing winds typically from the south. Wind patterns: Typically westerly winds.

Temperature2:

Warmest month Jul

Max annual temperature (Jul) 30.7 °C

Warmest six months Jul Aug Jun Sep May Oct

Coldest month Jan

Min annual temperature (Mar) -3.2 °C

Coldest six months Jan Feb Dec Mar Nov Apr

Number of months warmer than 10.0°C mean = 6

Diurnal temperature swing3:

0 months swing > 20 °C, of which 0 are in the warmest 6M

0 months swing 15 to 20 °C, of which 0 are in the warmest 6M

0 months swing 10 to 15 °C, of which 0 are in the warmest 6M

10 months swing 5 to 10 °C, of which 6 are in the warmest 6M

2 months swing < 5 °C

Moisture and humidity4:

Max. moisture content 0.013 kg/kg

Min. moisture content 0.002 kg/kg

Mean moisture content 0.007 kg/kg

Mean relative humidity 78.6 %

Wind5:

Annual mean speed 3.7 m/s

Annual mean direction E of N 240.3°

Precipitation6:

Annual rainfall 611.0 mm

Driest month Feb with 36.0 mm rainfall

Wettest month Dec with 57.0 mm rainfall

Wettest summer month Oct

Wettest winter month Nov

Driest summer month Jul

Driest winter month Feb

Wettest six months Dec Nov Oct Aug Sep Jan

Solar energy:

Annual hourly mean global radiation(a) 107.8 W/m2

Mean daily global radiation(b) 2581.5 Wh/m2

Annual solar resource(c) 944.4 kWh/m2.yr

Annual mean cloud cover(d) 5.5 oktas

Degree days8:

HDD(18.3) = 2608.3

CDD(10.0) = 1122.2

Notes on the figures

The climate report provides the headlines you need to know about the weather file you have selected

1. The Ashrae 90.1 climate classes are based around the Koeppen-Geiger classification system, but provide better definition in temperate and maritime zones. See also Koeppen Geiger and Kottek, Greiser,Beck, Rudolf and Rubel. Both the climate zone defined by ASHRAE and the climate zone calculated from the assigned weather data are displayed. The analysis in this report is based on the calculated climate zone.

2. Note the coincidence of wet or dry seasons and warm or cold seasons e.g. Wet summers, dry summers, wet winters etc

3. A good diurnal swing (monthly mean of the daily swing) during the warmest months indicates the potential for passive night time cooling and the use of thermal mass

4. Moisture content the nominal comfort range is 0.004-0.012 kg/kg If moisture content is 0.020 kg/kg or above either all year or in summertime it is an issue. High humidity high temp. cause comfort stress.

5. Wind speeds: less than 1.5 ms light and calm1.5-8 ms breeze8-14 ms strong breeze greater than 14 ms gale and above

6. Typically what does annual rainfall mean: Wet 1700mmTemperate 500 to 1500mmDry 300mmDesert 100mm

7. Globally what is the range:. 150 to 450b. 2000 to 6500c. 800 to 2200d. 1.5 to 8

8. Globally what is the range: HDD 0 to 8000CDD 0 to 6500

9 Appendix B – Main settings

Item	Baseline	Be Lean	Be Green
U-Values (W/m²K)			
Heat Loss Ground Floor Walls	0.5	As Baseline	As Baseline
Heat Loss Floors	0.25	As Baseline	As Baseline
Heat Loss Roofs	0.18	As Baseline	As Baseline
Window	2.2	1.6	As Be Lean
G Value	0.4	As Baseline	As Baseline
Air Permeability			
Air Test Score Q50	7 m3/hr.m2	As Baseline	As baseline
Thermal Mass			
Type	Medium	As Baseline	As Baseline
Thermal Bridging			
Type	Default	As Baseline	As Baseline
Heating System			
System Type	VRF	VRF	As Be Lean
SCOP/SEER	0.91/5	0.96/5	As Be Lean
Ventilation			
System Type	MVHR/AHU	MVHR/AHU	MVHR/AHU
SFP	2.3	1.6	As Be Lean
Heat Recovery	70%	75%	As Be Lean
DHW			
Source	Gas Boiler	As Baseline	ASHP
Efficiency	91%	96%	400%
Lighting			
Lighting Type	60lm/w	95lm/w	As Be Lean