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Royal College Street

Energy and Sustainability Statement

14/05/2020

REVISIONS

Document prepared by:	
Name	Jake Timothy-Dorward
Signature	JTD
Date	14/05/2021

Document checked by:	
Name	Scott Wilson
Signature	SW
Date	14/05/2021

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1	18/12/2020	Draft issue for comment	SW
2	13/05/2021	Expanded to include full sustainability statement	SW
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CONTENTS

1.0 Executive Summary

146-150 Royal College Street is the development of a four-storey office building adjacent to Regent's Canal in the Borough of Camden. The design provides a new building of four new floors of commercial office space (Class E use class/ 780m^2) including landscaping, associated mews improvements and cycle provision.

A range of measures to improve sustainability and reduce energy consumption have been included:

- The development will achieve a 77.2% carbon dioxide emissions reduction
- The development will achieve a minimum BREEAM rating of Excellent
- Heating and cooling are to be provided by high efficiency ASHPs
- Ventilation is to be provided by high efficiency fans incorporating heat recovery.
- Lighting is to be provided by high efficiency LED luminaires.
- Lighting will incorporate occupancy and daylight linked controls to reduce demand.
- A PV array is to be situated on the roof to supplement the building's electrical demand.
- The building is predicted to achieve an EPC rating of **A**
- In response to the ongoing decarbonisation of the grid, the site will remove all fossil fuels and be entirely serviced by electricity. This is likely to offer further carbon reductions in future years as the grid continues to improve.

The table below shows the total predicted annual CO_2 emissions at each stage of the hierarchy:

	Emissions (t.CO_2/annum)	Improvement (%)
Baseline	9.5	N/A
Be Lean Savings	4.5	47.7%
Be Clean Savings	0.0	0.0%
Be Green Savings	2.8	29.5%
Total Savings	**7.4**	**77.2%**

2.0 Introduction

This document has been produced to detail the energy and carbon reduction strategy at the Royal College Street in Borough of Camden.

2.1 Site Context

The project is the development of a four-storey office building adjacent to Regent's Canal in the Borough of Camden. The design provides a new building of four new floors of commercial office space (Class E use class/ 780m^2) including landscaping, associated mews improvements and cycle provision.

2.2 Sustainability Rating Tools

150 Royal College Street aims to achieve sustainability far in excess of minimum standards. To facilitate this and provide a metric against other buildings, BREEAM certification will be targeted.

2.2.1 BREEAM

BREEAM assesses a building against a range of sustainability categories:

- Management
- Health & Wellbeing
- Energy
- Transport
- Water
- Materials
- Waste
- Land Use and Ecology
- Pollution
- Innovation

The building will be assessed against BREEAM New Construction 2018 and will target a minimum rating of 'Excellent'.

3.0 Planning Policy

3.1 Camden Local Plan 2017

3.1.1 Policy CC1 Climate Change Mitigation

The Council will require all development to minimise the effects of climate change and encourage all developments to meet the highest feasible environmental standards that are financially viable during construction and occupation.

We will:

a. promote zero carbon development and require all development to reduce carbon dioxide emissions through following the steps in the energy hierarchy;

b. require all major development to demonstrate how London Plan targets for carbon dioxide emissions have been met;

c. ensure that the location of development and mix of land uses minimise the need to travel by car and help to support decentralised energy networks;

d. support and encourage sensitive energy efficiency improvements to existing buildings;

e. require all proposals that involve substantial demolition to demonstrate that it is not possible to retain and improve the existing building; and

f. f. expect all developments to optimise resource efficiency

For decentralised energy networks, we will promote decentralised energy by

g. working with local organisations and developers to implement decentralised energy networks in the parts of Camden most likely to support them;

h. protecting existing decentralised energy networks (e.g. at Gower Street, Bloomsbury, King's Cross, Gospel Oak and Somers Town) and safeguarding potential network routes; and

i. requiring all major developments to assess the feasibility of connecting to an existing decentralised energy network, or where this is not possible establishing a new network.

To ensure that the Council can monitor the effectiveness of renewable and low carbon technologies, major developments will be required to install appropriate monitoring equipment.

3.1.2 Policy CC2 Adapting to Climate Change

The Council will require development to be resilient to climate change.

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

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

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

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

d. measures to reduce the impact of urban and dwelling overheating, including application of the cooling hierarchy.

Any development involving 5 or more residential units or 500 sqm or more of any additional floorspace is required to demonstrate the above in a Sustainability Statement. Sustainable design and construction measures The Council will promote and measure sustainable design and construction by:

e. ensuring development schemes demonstrate how adaptation measures and sustainable development principles have been incorporated into the design and proposed implementation;

f. encourage new build residential development to use the Home Quality Mark and Passivhaus design standards;

g. encouraging conversions and extensions of 500 sqm of residential floorspace or above or five or more dwellings to achieve “excellent” in BREEAM domestic refurbishment; and

h. expecting non-domestic developments of 500 sqm of floorspace or above to achieve “excellent” in BREEAM assessments and encouraging zero carbon in new development from 2019

3.2 Camden Planning Guidance – Energy efficiency and adaptation (March 2019)

3.2.1 Policy 2.0 – Energy Hierarchy

Buildings aim to use lower cost passive design measures over higher cost active measures i.e. renewable technology. Paragraph 8.8 of the Local Plan requires developments with greater than 500sq m of floorspace to submit an energy statement demonstrating carbon dioxide emission reduction.

3.2.2 Policy 3.0 – Making Buildings More Energy Efficiency

All energy efficient designs require an integrated approach to solar gain, daylighting, insulation, thermal materials, and heating, ventilation, and air-conditioning (HVAC) whereby these aspects are considered in relation to each other. Good thermal performance of a building is important as it reduces energy usages, and improves health and wellbeing.

3.2.3 Policy 4.0 – Decentralised Energy

A centralised energy network feasibility assessment must be conducted for all major developments residing in the Borough of Camden. If no existing network is present, applicants must investigate whether there is one planned in the area. Where a network is planned, all major developments must be designed to connect to the proposed network in the future.

3.2.4 Policy 5.0 – Renewable Energy Technologies

On-site renewable technologies feasibility should be considered for all major developments. This is to be considered after passive demand reduction measures have been taken. If PV is installed, preference is for the technology to be flush to the roof/wall with greater importance on panel efficiency and visibility of sunlight. There must be safe access for maintenance of the PV.

3.2.5 Policy 7.0 – Energy Reduction

The development must achieve a 19% carbon dioxide reduction and a further 20% carbon dioxide reduction through the support of on-site renewable technologies. Offsetting carbon dioxide emissions is required where on-site renewables aren't feasible.

3.3 Camden Planning Guidance - Sustainability (March 2018)

3.3.1 Key Message – 3 Energy Efficiency: New Buildings

A cost-effective approach should be taken to minimise cost by considering natural systems, thermal performance, mechanical systems, and other efficient technology.

3.3.2 Key Principal – 6 Renewable Energy

There are a variety of renewable energy technologies available to utilise on-site. There is a target of 20% reduction in carbon dioxide emissions due to on-site renewables.

3.4 The London Plan 2021

Many of the requirements below are only required for a "major development". A non-domestic major development is one here the floor space is 1,000 square metres or more, or the the site area is 1 hectare or more. As the proposed building will have 780 m^2 of floor area and the site area is under 1 hectare, requirements for major developments are not applicable.

3.4.1 Policy SI 1 Improving air quality

A. Development Plans, through relevant strategic, site-specific and area based policies, should seek opportunities to identify and deliver further improvements to air quality and should not reduce air quality benefits that result from the Mayor's or boroughs' activities to improve air quality.

B. To tackle poor air quality, protect health and meet legal obligations the following criteria should be addressed:

1) Development proposals should not:

    a) lead to further deterioration of existing poor air quality

    b) create any new areas that exceed air quality limits, or delay the date at which compliance will be achieved in areas that are currently in exceedance of legal limits

    c) create unacceptable risk of high levels of exposure to poor air quality

2) In order to meet the requirements in Part 1, as a minimum

    a) development proposals must be at least Air Quality Neutral

    b) development proposals should use design solutions to prevent or minimise increased exposure to existing air pollution and make provision to address local problems of air quality in preference to post-design or retro-fitted mitigation measures

    c) major development proposals must be submitted with an Air Quality Assessment. Air quality assessments should show how the development will meet the requirements of B1

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

C. Masterplans and development briefs for large-scale development proposals subject to an Environmental Impact Assessment should consider how local air quality can be improved across the area of the proposal as part of an air quality positive approach. To achieve this a statement should be submitted demonstrating:

1) how proposals have considered ways to maximise benefits to local air quality, and

2) what measures or design features will be put in place to reduce exposure to pollution, and how they will achieve this.

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

E. Development proposals should ensure that where emissions need to be reduced to meet the requirements of Air Quality Neutral or to make the impact of development on local air quality acceptable, this is done on-site. Where it can be demonstrated that emissions cannot be further reduced by on-site measures, off-site measures to improve local air quality may be acceptable, provided that equivalent air quality benefits can be demonstrated within the area affected by the development.

3.4.2 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:

1) be lean: use less energy and manage demand during operation

2) be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly

3) be green: maximise opportunities for renewable energy by producing, storing and using renewable energy on-site

4) be seen: monitor, verify and report on energy performance.

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

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

1) through a cash in lieu contribution to the borough's carbon offset fund,

2) 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.

3.4.3 Policy SI 3 Energy Infrastructure

A. Boroughs and developers should engage at an early stage with relevant energy companies and bodies to establish the future energy and infrastructure requirements arising from large-scale development proposals such as Opportunity Areas, Town Centres, other growth areas or clusters of significant new development.

B. Energy masterplans should be developed for large-scale development locations (such as those outlined in Part A and other opportunities) which establish the most effective energy supply options. Energy masterplans should identify:

1) major heat loads (including anchor heat loads, with particular reference to sites such as universities, hospitals and social housing)
2) heat loads from existing buildings that can be connected to future phases of a heat network
3) major heat supply plant including opportunities to utilise heat from energy from waste plants]
4) secondary heat sources, including both environmental and waste heat
5) opportunities for low and ambient temperature heat networks
6) possible land for energy centres and/or energy storage
7) possible heating and cooling network routes
8) opportunities for futureproofing utility infrastructure networks to minimise the impact from road works
9) infrastructure and land requirements for electricity and gas supplies
10) implementation options for delivering feasible projects, considering issues of procurement, funding and risk, and the role of the public sector
11) opportunities to maximise renewable electricity generation and incorporate demand-side response measures.

C. Development Plans should:

1) identify the need for, and suitable sites for, any necessary energy infrastructure requirements including energy centres, energy storage and upgrades to existing infrastructure

2) identify existing heating and cooling networks, identify proposed locations for future heating and cooling networks and identify opportunities for expanding and inter-connecting existing networks as well as establishing new networks.

D. Major development proposals within Heat Network Priority Areas should have a communal low-temperature heating system:

1) the heat source for the communal heating system should be selected in accordance with the following heating hierarchy:

    a) connect to local existing or planned heat networks

    b) use zero-emission or local secondary heat sources (in conjunction with heat pump, if required)

    c) use low-emission combined heat and power (CHP) (only where there is a case for CHP to enable the delivery of an area-wide heat network, meet the development's electricity demand and provide demand response to the local electricity network)

    d) use ultra-low NOx gas boilers

2) CHP and ultra-low NOx gas boiler communal or district heating systems should be designed to ensure that they meet the requirements in Part B of Policy SI 1 Improving air quality

3) where a heat network is planned but not yet in existence the development should be designed to allow for the cost-effective connection at a later date.

E. Heat networks should achieve good practice design and specification standards for primary, secondary and tertiary systems comparable to those set out in the CIBSE/ADE Code of Practice CP1 or equivalent.

3.4.4 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:

1) reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure

2) minimise internal heat generation through energy efficient design

3) manage the heat within the building through exposed internal thermal mass and high ceilings

4) provide passive ventilation

5) provide mechanical ventilation

6) provide active cooling systems.

3.4.5 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:

   1) through the use of Planning Conditions minimise the use of mains water in line with the Optional Requirement of the Building Regulations (residential development), achieving mains water consumption of 105 litres or less per head per day (excluding allowance of up to five litres for external water consumption)

   2) achieve at least the BREEAM excellent standard for the 'Wat 01' water category or equivalent (commercial development)

   3) incorporate measures such as smart metering, water saving and recycling measures, including retrofitting, to help to achieve lower water consumption rates and to maximise future-proofing.

D. In terms of water quality, Development Plans should:

   1) promote the protection and improvement of the water environment in line with the Thames River Basin Management Plan, and should take account of Catchment Plans

   2) support wastewater treatment infrastructure investment to accommodate London's growth and climate change impacts. Such infrastructure should be constructed in a timely and sustainable manner taking account of new, smart technologies, intensification opportunities on existing sites, and energy implications. Boroughs should work with Thames Water in relation to local wastewater infrastructure requirements.

E. Development proposals should:

   1) seek to improve the water environment and ensure that adequate wastewater infrastructure capacity is provided

   2) take action to minimise the potential for misconnections between foul and surface water networks.

F. Development Plans and proposals for strategically or locally defined growth locations with particular flood risk constraints or where there is insufficient water infrastructure capacity should be informed by Integrated Water Management Strategies at an early stage.

3.4.6 Policy SI 6 Digital infrastructure

A. To ensure London's global competitiveness now and in the future, development proposals should:

1) ensure that sufficient ducting space for full fibre connectivity infrastructure is provided to all end users within new developments, unless an affordable alternative 1GB/s-capable connection is made available to all end users

2) meet expected demand for mobile connectivity generated by the development

3) take appropriate measures to avoid reducing mobile connectivity in surrounding areas; where that is not possible, any potential reduction would require mitigation

4) support the effective use of rooftops and the public realm (such as street furniture and bins) to accommodate well-designed and suitably located mobile digital infrastructure.

B. Development Plans should support the delivery of full-fibre or equivalent digital infrastructure, with particular focus on areas with gaps in connectivity and barriers to digital access.

3.4.7 Policy SI 7 Reducing waste and supporting the circular economy

A. Resource conservation, waste reduction, increases in material re-use and recycling, and reductions in waste going for disposal will be achieved by the Mayor, waste planning authorities and industry working in collaboration to:

1) promote a more circular economy that improves resource efficiency and innovation to keep products and materials at their highest use for as long as possible

2) encourage waste minimisation and waste prevention through the reuse of materials and using fewer resources in the production and distribution of products

3) ensure that there is zero biodegradable or recyclable waste to landfill by 2026

4) meet or exceed the municipal waste recycling target of 65 per cent by 2030

5) meet or exceed the targets for each of the following waste and material streams:

a) construction and demolition – 95 per cent reuse/recycling/recovery

b) excavation – 95 per cent beneficial use

6) design developments with adequate, flexible, and easily accessible storage space and collection systems that support, as a minimum, the separate collection of dry recyclables (at least card, paper, mixed plastics, metals, glass) and food.

3.4.8 Policy SI 12 Flood risk management

A. Current and expected flood risk from all sources (as defined in paragraph 9.2.12) across London should be managed in a sustainable and cost-effective way in collaboration with the Environment Agency, the Lead Local Flood Authorities, developers and infrastructure providers.

B. Development Plans should use the Mayor's Regional Flood Risk Appraisal and their Strategic Flood Risk Assessment as well as Local Flood Risk Management Strategies, where necessary, to identify areas where particular and cumulative flood risk issues exist and develop actions and policy approaches aimed at reducing these risks. Boroughs should cooperate and jointly address cross-boundary flood risk issues including with authorities outside London.

C. Development proposals should ensure that flood risk is minimised and mitigated, and that residual risk is addressed. This should include, where possible, making space for water and aiming for development to be set back from the banks of watercourses.

D. Developments Plans and development proposals should contribute to the delivery of the measures set out in Thames Estuary 2100 Plan. The Mayor will work with the Environment Agency and relevant local planning authorities, including authorities outside London, to safeguard an appropriate location for a new Thames Barrier.

E. Development proposals for utility services should be designed to remain operational under flood conditions and buildings should be designed for quick recovery following a flood.

F. Development proposals adjacent to flood defences will be required to protect the integrity of flood defences and allow access for future maintenance and upgrading. Unless exceptional circumstances are demonstrated for not doing so, development proposals should be set back from flood defences to allow for any foreseeable future maintenance and upgrades in a sustainable and cost-effective way.

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

3.4.9 Policy SI 13 Sustainable drainage

A. Lead Local Flood Authorities should identify – through their Local Flood Risk Management Strategies and Surface Water Management Plans – areas where there are particular surface water management issues and aim to reduce these risks. Increases in surface water run-off outside these areas also need to be identified and addressed.

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

1) rainwater use as a resource (for example rainwater harvesting, blue roofs for irrigation)

2) rainwater infiltration to ground at or close to source

3) rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens)

4) rainwater discharge direct to a watercourse (unless not appropriate)

5) controlled rainwater discharge to a surface water sewer or drain

6) controlled rainwater discharge to a combined sewer.

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

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

3.4.10 Policy SI 17 Protecting and enhancing London's waterways

A. Development Plans should support river restoration and biodiversity improvements.

B. Development proposals that facilitate river restoration, including opportunities to open culverts, naturalise river channels, protect and improve the foreshore, floodplain, riparian and adjacent terrestrial habitats, water quality as well as heritage value, should be supported. Development proposals to impound and narrow waterways should be refused.

C. Development proposals should support and improve the protection of the distinct open character and heritage of waterways and their settings.

D. Development proposals into the waterways, including permanently moored vessels, should generally only be supported for water-related uses or to support enhancements of water-related uses.

E. Development proposals along London's canal network, docks, other rivers and water space (such as reservoirs, lakes and ponds) should respect their local character, environment and biodiversity and should contribute to their accessibility and active water-related uses. Development Plans should identify opportunities for increasing local distinctiveness and recognise these water spaces as environmental, social and economic assets.

F. On-shore power at water transport facilities should be considered at wharves and residential moorings to help reduce air pollution.

4.0 Sustainability

4.1 Air Quality

4.1.1 Impact on local air quality

The proposed building will heated and cooled via electric air source heat pumps. There will be no use of fossil fuels and in particular, no combustion on site. As a result the operation of the building will not have a detrimental impact on the local air quality and the development can be considered “air quality neutral”.

4.1.2 Internal air quality

All occupied areas of the building will be mechanically ventilated to protect occupants from exposure to external pollutants The mechanical ventilation units will be fitted with high efficiency pleated G4 filters which will minimise the occupants’ exposure to existing air pollution.

4.1.3 Construction

A separate report Construction Impact Assessment has been produced with relation to air Quality. The key points are as follows:

- The results of the impact assessment have shown that the level of dust risk is low for dust soiling and negligible for human health and therefore no further action is required.
- However, a number of mitigation options for the construction activities have been provided, to ensure Best Practice is applied at all times during the construction work

Details of the recommended mitigation measures can be found in report – RFE-0271-19-01-AQ – Air Quality – Construction Impact Assessment produced by RF Environmental.

4.2 Energy and Carbon Emissions

While the requirements of London Plan policy SI 2 are not applicable as the proposed building is not a major development the London Plan Energy Statement methodology has been followed.

4.2.1 The London Plan – Energy Assessment

4.2.1.1 Introduction

The London Plan expects new and refurbished buildings to be evaluated using the following non-domestic energy hierarchy:

- Be Lean – passive design achieving demand reduction
- Be Clean – utilisation of local heat network or low carbon system
- Be Green – the inclusion of renewable technologies

The baseline for Part L2a will have input data which corresponds to the Building Regulations.

4.2.1.2 Baseline

The development is a new construction, with well-insulated fabrics and glazing, as well as efficient lighting and systems.

The baseline is a design used for comparative purposes to measure and determine the improvements in energy consumption and carbon dioxide emissions by the building services.

The development is considered a new development and as such, must follow Part L2A regulations. The Part L2A target emissions rate (TER) will be used as the baseline for the development.

4.2.1.3 Baseline Building - Fabric

Parameter	Proposed	Baseline	Maximum Part L2a
Roof (W/m^2K)	0.12	0.18	0.25
Wall (W/m^2K)	0.20	0.26	0.35
Floor (W/m^2K)	0.18	0.22	0.25
Window (W/m^2K)	1.80 / 1.0	1.6	2.20
Glazing G-value	0.35 / 0.23	0.4	N/A

4.2.1.4 Baseline Building – Air Permeability

The baseline building has an air permeability of 5 $m^2/m^2.hr$ @ Pa as per the approved Part L2a document.

4.2.1.5 Baseline Building – Hot Water System

Parameter	Proposed Performance	Criterion 2 Limits
Hot water generator type	Instantaneous hot water only	N/A
Hot water fuel type	Electricity	N/A
Hot water generator efficiency	100%	100%
Hot water delivery efficiency	95%	N/A
Hot water storage volume	1000L	N/A
Secondary circulation loop length	20m	N/A

4.2.1.6 Baseline Building - Lighting

Lighting has a luminaire efficacy of 60 lm/cW.

Occupancy Detection has been applied in the following zones:

Room Type	Control Type
Circulation Areas	None
Office	Presence Detection (Man-on-Auto-off)
WCs	Presence Detection (Man-on-Auto-off)
Stores	Presence Detection (Man-on-Auto-off)

In addition, the lighting has the following parameters:

- Daylight Dimming has also been applied to the perimeter office areas
- All sensors will have a maximum parasitic power of 0.3 W/m² of area served.

4.2.1.7 Baseline Building – Heating and Cooling

Parameter	Baseline Performance	NDBSCG* Limits
NCM system type	Central heating using water: radiators	N/A
Heat source	LTHW Boiler	N/A
Fuel	Natural Gas	N/A
Heating seasonal efficiency (SCOP)	0.96	2.5
Cooling system type	Heat pump (electric)	N/A
Cooling SEER	4.74	N/A
Cooling nominal EER	3.79	2.6
Cooling radiant fraction	0	N/A
Does the system have provisions for metering?	Yes	Yes
Does the metering warn “out of range values”?	Yes	N/A
Ventilation types	Centralised balanced A/C or mech vent	N/A
Ventilation SFP	1.8	1.8 W/l/s**
Heat Recovery Efficiency	70%	67%
Ductwork Leakage Rating	N/A	N/A
AHU Leakage Rating	L2	L2

**Non-Domestic Building Services Compliance Guide 2013 (NDBSCG).*
***Max allowable for a central balanced system with heating and heat recovery*

4.2.2 Be Lean

This section details the strategies and technologies that will be incorporated to minimise the building's energy consumption and therefore, its carbon dioxide (CO_2) emissions.

4.2.2.1 Building Fabric

All building fabric in the development will exceed the minimum requirements of Part L2A.

4.2.2.2 Heating

All space heating is to be provided by variable refrigerant flow (VRF) air source heat pumps (ASHP). When compared to traditional heating sources, such as a gas fired boiler, an ASHP can offer significant savings.

Air source heat pumps (ASHP) extract heat from the air and, through a cycle of expansion and compression, can extract heat from low external temperatures while still providing sufficient heat requirements. As the energy to heat the space is being extracted from the air, the amount of energy generated is greater than the electrical input. ASHPs can achieve a coefficient of performance (COP) in excess of 3, meaning that the heat output is three times the electrical input. ASHPs can use less than a third of the energy a gas fired boiler would use to heat the building.

4.2.2.3 Ventilation

Ventilation will be provided by high efficiency fans with low specific fan powers (SFP) to minimise the energy consumption associated with ventilation. To further reduce energy demand ventilation system will include heat recovery to capture waste heat and reduce the building's heating demand.

4.2.2.4 Hot Water

Heating is to be provided by air source heat pumps, which use considerably less energy than a system utilising a boiler to heat the water.

4.2.2.5 Lighting

All lighting will be provided by high efficiency light emitting diode (LED) luminaires. All lighting will have an efficacy of at least 100 lm/W which is significantly more efficient than minimum standards require.

To further reduce the energy consumption associated with artificial lighting, occupancy detection and daylight dimming will be included to ensure that lighting is only provided when required.

4.2.2.6 Removal of fossil fuels

Historically, gas fired systems would result in lower carbon emissions when compared to electric systems. This was due to a large reliance on coal and natural gas in the production of electricity.

The carbon emissions associated with grid supplied electricity has been steadily dropping whereas carbon emissions associated with natural gas have remained constant as shown in Figure 1.

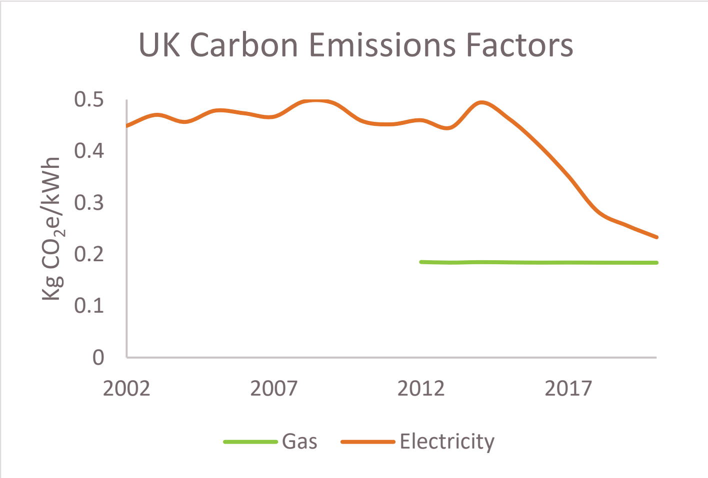

Figure 1 -UK carbon emissions factors

As shown in Figure 2, electricity in the UK is increasingly being produced by renewable technologies and this trend is expected to continue.

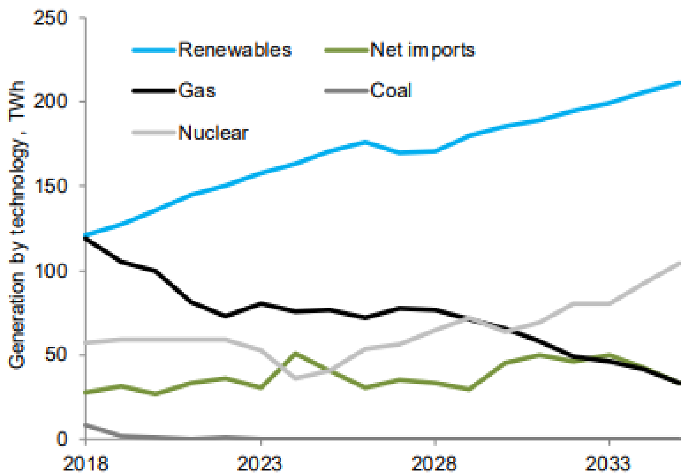

Figure 2 UK Government projections for electricity generation

For this reason, the development will remove any natural gas infrastructure and the building will be entirely services by electricity. When allowing for improved efficiencies that electrical heating and cooling systems this will produce fewer emissions than when compared gas fired systems. This is anticipated to continue to improve as the grid decarbonises further.

Furthermore, this will improve the local air quality as there will be no combustion on site, which can create harmful gases such as nitrogen oxides (NO_x) and sulphur oxides (SO_x).

4.2.2.7 Proposed Building – Air Permeability (Lean)

The air permeability considered for the development will be targeted at 3 $m^2/m^2.hr$ @ Pa.

4.2.2.8 Proposed Building – Lighting (Lean)

Lighting will be provided by high efficiency lighting with a luminaire efficacy of at least 100 lm/cW.

Occupancy Detection has been applied in the following zones:

Room Type	Control Type
Circulation Areas	Presence Detection (Auto-on-off)
Office	Presence Detection (Auto-on-off)
WCs	Presence Detection (Auto-on-off)
Stores	Presence Detection (Man-on-Auto-off)

In addition, the lighting has the following parameters:

- Daylight Dimming has also been applied to the perimeter office areas
- All sensors will have a maximum parasitic power of 0.1 W/m^2 of area served.
- Lighting systems have provision for metering and have the facility to warn “out of range” values.

4.2.2.9 Proposed Building – Hot Water System (Clean)

Parameter	Proposed Performance	Criterion 2 Limits
Hot water generator type	Instantaneous hot water only	N/A
Hot water fuel type	Electricity	N/A
Hot water generator efficiency	100%	100%
Hot water delivery efficiency	90%	N/A
Hot water storage volume	300L	N/A
Secondary circulation loop length	75m	N/A

4.2.2.10 Proposed Building – Heating and Cooling (Clean)

The building will be heated and cooled via a VRF system with the following parameters:

Variable	Proposed Performance	NDBSCG* Limits
NCM system type	Split or multi-split system	N/A
Heat source	Air source heat pump	N/A
Fuel	Electric	N/A
Heating seasonal efficiency (SCOP)	3.83	2.5
Heating radiant fraction	0	N/A
Cooling system type	Heat pump (electric)	N/A
Cooling SEER	5.99	N/A
Cooling nominal EER	3.70	2.6
Cooling radiant fraction	0	N/A
Does the system have provisions for metering?	Yes	Yes
Does the metering warn “out of range values”?	Yes	N/A
Ventilation types	Centralised balanced A/C or mech vent	N/A
Ventilation SFP	1.3	1.8 W/l/s**
Heat Recovery Efficiency	90%	67%
Ductwork Leakage Rating	N/A	N/A
AHU Leakage Rating	L2	L2

**Non-Domestic Building Services Compliance Guide 2013 (NDBSCG).*
***Max allowable for a central balanced system with heating and heat recovery*

4.2.3 Be Clean

The London heat map has been referred to and there are currently no existing heat networks within the vicinity of the site. There is a proposed Camden network approximately 90m from the site.

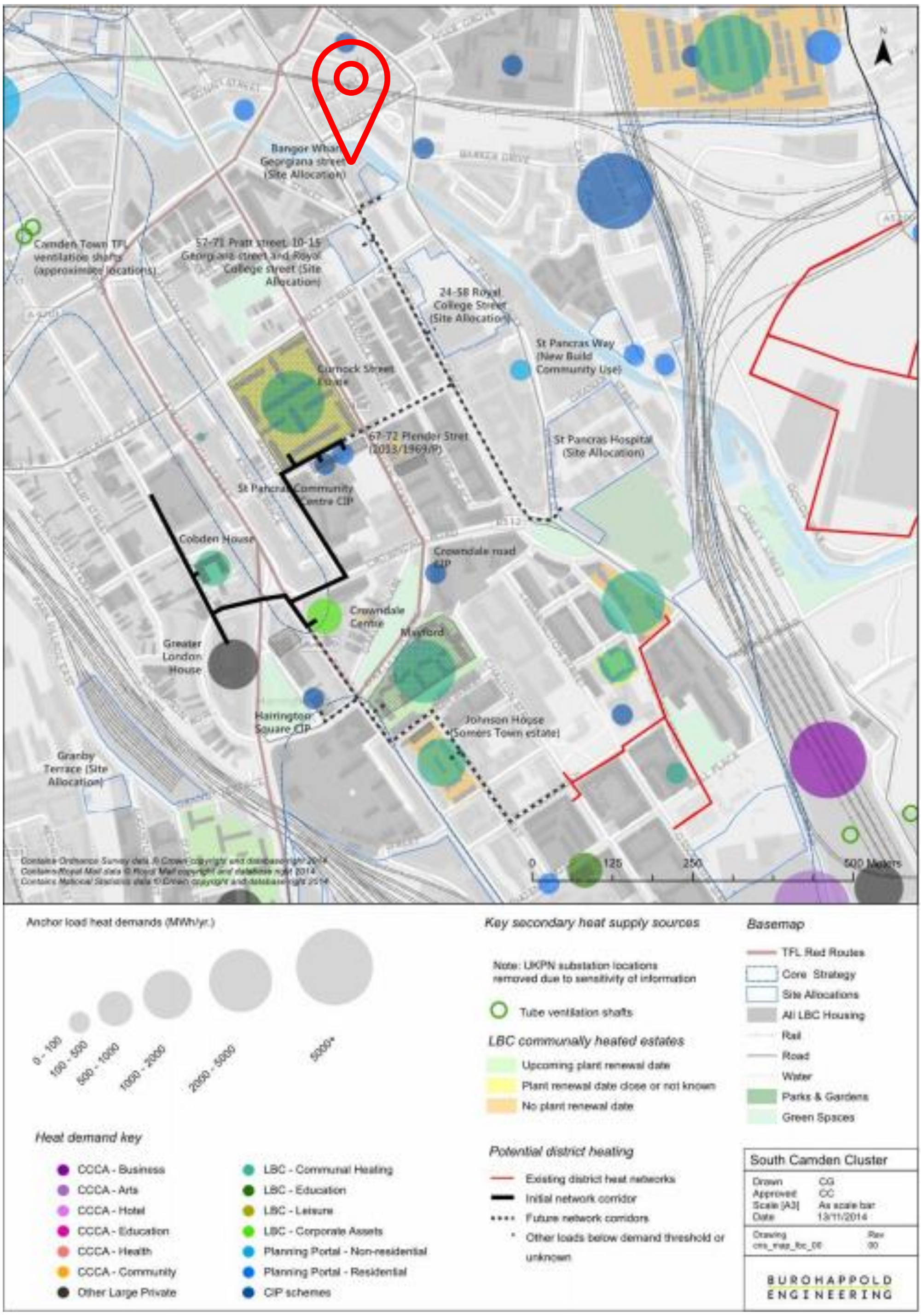

Figure 3 – Proposed nearby heat networks in orange, with the proposed site location shown by the red marker.

The proposed network is not compatible with the building's HVAC system. The air source heat pump will achieve high efficiencies which are likely to show improvements on what the Euston Road Heat Network can offer to the building.

4.2.4 Be Green

A detailed assessment has been undertaken to determine the feasibility of incorporating a range of LZC technologies. The assessment is detailed below.

4.2.4.1 Photovoltaics

Photovoltaic (PV) systems convert the energy from solar irradiation into electrical energy which can then be fed into the building or exported to the national grid.

The technology is low impact as it produces no noise and can be installed on the rooftop to mitigate its visual impact. PV systems offer the greatest economic advantage when the generated energy can be used on site rather than exported as the cost per unit of electricity is higher to purchase than the price paid for exported electricity.

Feasibility

The building is likely to have a large electric demand as office buildings have a high density of IT equipment, in addition to the ventilation and air conditioning requirements. As a result, it is likely that the majority of the generated energy can be utilised on site, maximising the benefit of a PV system.

Proposal

The roof space to the development offers a suitable area to locate PV panels. Spatial efficiency varies depending on the size and inclination of the panels but a spatial efficiency of 40% is achievable. This would allow for sufficient panel spacing to allow access and prevent shading of adjacent panels.

A PV array with an efficiency of at least 20% is recommended. The exact area and location of the PV array will be determined as the design progresses.

As the design progresses, the area available to a PV array may change and thus the total PV area may differ from the current recommendation.

4.2.4.2 Solar Thermal Systems

Solar thermal systems, or solar hot water systems, convert the energy from solar irradiation into hot water. to provide domestic hot water.

To ensure the maximum utilisation of solar thermal systems a sufficient hot water demand during the summer when the output is high is required and as such these technologies are typically associated with residential refurbishments.

As the output from the system will typically not occur at the same time as the peak demand storage vessels are required to store the energy generated during peak times (typically midday) to be used later when demand is higher.

Feasibility

Due to the nature of the site, there will be a very low hot water demand relative, to the other building demands. In this instance only a very small solar array would be feasible. Furthermore, the requirement for a storage vessel would require additional plant space which would reduce the available office space.

Proposal

Due to the limited hot water demand and additional plant space required for minimal benefit, any available roof space would be better allocated to PV panels. A solar thermal system is not recommended for this building.

4.2.4.3 Combined Heat and Power

Combined heat and power (CHP) units generate electricity on site and capture the waste heat to deliver it to the building and provide heating and hot water. When compared to traditional energy generation this offers significant efficiency gains.

Accounting for transmission loss and thermal efficiency in gas turbines, grid electricity generated from natural gas would typically have an overall efficiency of 30%. While on site CHP units have similar electrical efficiency, they can capture around another 50% of the energy in the form of heat. This results in an overall energy efficiency if around 80%.

CHP units work best with a consistent year-round base heat demand. If there is no heat demand when electricity demand a CHP unit will offer no benefit over grid supplied electricity.

Historically, CHP units offered large reductions in CO_2 emissions due to the high carbon emissions factors of gird supply electricity. However, as the grid has become decarbonised and CHP still relies on burning fossil fuels to generate electricity the savings are greatly reduced. This is demonstrated in the tables below using the government's SAP10 carbon factors:

Carbon emissions factors

	Part L2A Emissions factors (historical)	SAP10 emissions factors (Current)
Electricity	0.519 kg CO_2/kWh	0.233 kgCO_2/kWh
Natural Gas	0.216 kg CO_2/kWh	0.210 kgCO_2/kWh

Typical system seasonal efficiencies

	Efficiency
Natural Gas Boiler	90%
CHP Electrical Efficiency	30%
CHP thermal efficiency	60%
ASHP COP	350%

Carbon Calculations

	Historical Emissions Factors			Current Emissions Factors		
	Gas Boiler	CHP Unit	Heat Pump	Gas Boiler	CHP Unit	Heat Pump
Heat Demand	100KWh					
Electrical Input	0kWh	0kWh	28.6kWh	0kWh	0kWh	28.6kWh
Gas Input	110kWH	167kWH	0kWh	110kWH	167kWH	0kWh
Electrical Output	0kWH	50kWH	0kWh	0kWH	50kWH	0kWh
Carbon Emissions from Gas	24kg	36kg	0kg	23kg	35kg	0kg
Carbon emissions from grid Electricity	0kg	0kg	15kg	0kg	0kg	7kg
Carbon Savings from generated electricity	0kg	26kg	0kg	0kg	12kg	0kg
Net Carbon Emissions	24kg	10kg	15kg	23kg	23kg	7kg

Feasibility

The building will have a low hot water demand and as such is not well suited to a CHP unit. Furthermore, a CHP would have a negative impact on local air quality and would require management of the noise a CHP unit would create.

Proposal

Due to the low heat demand and the decarbonisation of the grid, CHP units would be unlikely to provide carbon savings and may even increase the CO_2 emissions when compared to other heat generating technologies.

4.2.4.4 Wind Turbines

Wind turbines work by converting the kinetic energy in the wind into electrical energy. To maximise their output, they require consistent wind speeds within their operating range, typically between 3m/s and 25m/s. They work best where there is little turbulence created by nearby obstructions and as such, are best suited to rural and coastal locations.

Wind turbines can create noise and a visual strobing affect, both of which can have a negative impact on the wellbeing of nearby building occupants and must be considered when determining the suitability of wind turbines to a site.

Feasibility

There is no external space to allocate the wind turbines and so any wind turbine would have to be mounted on the building. This would have significant structural implications. Furthermore, the city of London is largely built up and this would create turbulent wind flows at reduced speeds, reducing the output of the turbine.

Proposal

As the site has no suitable location to site a wind turbine and the local wind conditions would not be suitable, a wind turbine is not recommended for this building.

4.2.5 Air Source Heat Pumps

Air source heat pumps (ASHP) extract heat from the air and, through a cycle of expansion and compression, can extract heat from low external temperatures while still providing sufficient heat requirements. As the energy to heat the space is being extracted from the air, the amount of energy generated is greater than the electrical input. ASHPs can achieve a coefficient of performance (COP) in excess of 3, meaning that the heat output is three times the input.

Feasibility

As the site will require cooling, the same systems that provides cooling can also provide heating, reducing capital costs associated with plant and heating infrastructure.

Proposal

ASHPs are recommended to provide all space heating demand at Royal College Street, with the exception of small, isolated rooms where heating is required but cooling is not.

black&white engineering

4.2.5.1 Ground Source Heat Pumps

Ground source heat pumps (GSHPs) work in the same way as ASHPs except they extract heat from the ground via buried loops or bores rather than from the air. As the ground maintains a more consistent temperature than the air, which is warmer in winter and cooler in summer, COPs in excess of 4.5 are typical.

As the GSHPs are extracting heat from the ground the cooling and heating load must be balanced to allow the annual temperatures to recharge. If the heating demand is too large the ground temperature will slowly reduce, and the COP will be reduced.

Feasibility

While the site has a balanced heating and cooling demand there is no suitable area to locate the GSHP.

Proposal

Due to the site limitations, GSHP is not recommended for the site.

4.2.5.2 Biomass

Biomass boilers provide hot water by burning plant or animal material. Typically, this involves the burning of wood pellets or chips. Biomass is considered low carbon as the CO_2 emitted during the burning process is absorbed as the tree grows and will be absorbed again if the trees is replaced.

Biomass boilers are not zero carbon however, as the fuel requires delivery and emissions associated with the transportation.

To ensure security of heating supply, large storage silos are required to ensure that heating can be supplied between deliveries. Additionally, back up gas boilers are installed to further guarantee security of supply.

Biomass boilers work best when the deliver a consistent output and they do not have low turndown ratios. As a result, they should be sized to meet the base heating demand with peaks provided via either a thermal store, backup gas boilers or a combination of both.

Burning of biomass can have a negative impact on local air quality.

Feasibility

The building will have a low hot water demand and as such is not well suited to a biomass boiler. Furthermore, a biomass boiler would have a negative impact on local air quality and the plant area required for the floor area would reduce the lettable area of the building.

Proposal

Biomass is not recommended for this building.

4.2.6 Proposed Building – Renewable Technology (Green)

A PV array has been modelled on the roof of the office development with the following parameters:

Variable	Proposed Performance
Collector Area	$75m^2$*
Efficiency	20%

Nominal Cell temperature	44°C
Reference Irradiance	1000 w/m^2
Temperature Coefficient	0.30%
Degradation Factor	0.99
Invertor Efficiency	90%
Orientation	South-east
Inclination	10°

**PV area to be confirmed as the design progresses. This will be affected by the amount of roof space available and ensuring that the PV array is not visible.*

4.2.7 Results

The main areas of focus when conducting the energy assessment are:

- Improving the CO_2 emissions > 15% from baseline building to lean design
- Improving the CO_2 emissions > 35% from the baseline building to the green design
- Utilising heat network if available
- Offset any carbon shortfall

As has been addressed earlier in the document, no viable heat network is available for the proposed building. Therefore, a site-wide heat network will be integrated which is the air-source heat pump.

4.2.7.1 Total Improvement

	Emissions (t.CO_2/annum)	Improvement (%)
Baseline	9.5	N/A
Be Lean Savings	4.5	47.7%
Be Clean Savings	0.0	0.0%
Be Green Savings	2.8	29.5%
Total Savings	**7.4**	**77.2%**

The improvement from the baseline building to the lean building has an improvement > 15% which is satisfactory. The lean, clean, green building has an improvement > 35% which meets the criteria. There is no carbon shortfall.

4.2.8 Savings and Payback

The estimated savings payback periods and life cycle costs are shown below, the ASHP savings have been calculated by comparing this system to an equivalent system using gas fired boilers:

	PV	ASHP
Capital Cost	£26,250	£27,900*
Energy Generated	12.1 MWh	16.0 MWh
CO_2 savings	2.8 tonnes	2.4 tonnes
Annual Cost Savings	£1,373	-£221**
Annual Utilised Electricity	8.9 MWh	N/A
Annual Exported Electricity	3.1 MWh	N/A
Payback	19 years	Not achieved
Expected Lifespan	20 Years	15 Years
Net Life Cycle Cost	£2,773 (saving) ***	£46,100 (Cost)

**Approximate uplift from boiler to ASHP*
***Increase in annual cost due to electricity being more expensive than gas.*
****Allows for a PV efficiency degradation factor of 0.99*

4.2.9 Building Energy and CO2 Reduction

To determine the proportion of energy generated and CO_2 emission offset the performance has been compared the Part L model:

The results are as follows:

	PV	ASHP
Total Regulated Energy Demand	44.0 MWh	
Total Regulated CO_2 emissions	11.1 tonnes	
Energy Generated	12.1 MWh	16.0 MWh
Percentage of Energy Generated	27.5%	36.4%
CO_2 savings	2.8 tonnes	2.4 tonnes
% of CO_2 offset	25.2%	21.6%

As can be seen from the above table the recommended LZC technologies will provide **63.9%** of the building's energy demand and offset **46.8%** of the CO_2 emissions. This will result in a meaningful reduction in the total regulated CO_2 emissions.

4.2.10 Building Regulations

As 150 Royal College Street is a new development, it must meet the energy efficiency requirements as detailed in Approved Document Part L2A 2013.

As part of the analysis a design stage draft Energy Performance Certificate (EPC) has been produced. The EPC is predicted to achieve an A rating.

A draft EPC is shown in Appendix A.

4.3 Managing Heat Risk

To ensure occupant comfort and to minimise the building's energy demand the London Plan "Cooling Hierarchy" has been considered.

4.3.1.1 Reduce the amount of heat entering the building

The building will incorporate the following measures:

- low G-value glass and blinds to limit the solar gain through the windows
- A green roof is located on the top and the various layers of the system will help to absorb the heat of the sun, reducing its transmission into the building below. This in turn reduces the air-conditioning costs required to keep the temperature at a suitable level.
- The building fabric is of a medium weight construction, utilising a highly insulated brick façade to absorb direct solar gain, rather than allow it to permeate directly through a lightweight structure.
- The façade of the building uses façade features, such as overhangs of the deep recessed windows, to offer extra shade during summer months.
- The balance of windows to solid elements have been assessed are in line with the (London Energy Transformation Initiative) LETI recommendations and requirements.

4.3.1.2 Minimise Internal Heat Gains

The internal heat gain in the space will consist of occupants, office equipment and lighting. While the design team cannot not influence the future tenants occupancy and equipment loads, highly efficient LED lighting will be specified which will reduce the associated heat gains. Furthermore, this will be coupled with occupancy and daylight controls to ensure the lighting does not operate when it is not required.

Additionally, by utilising a VRF system rather than a low temperature hot water system, heat gains from assoicated pipework have been minimised.

4.3.1.3 Manage the heat within the building through exposed thermal mass and high ceilings

The exposed internal thermal mass of concrete slabs and exposed high ceilings will assist to manage the internal heat within the building.

4.3.1.4 Provide Passive ventilation

Opening windows will be provided to allow natural ventilation. This will allow for occupant control and to provide a level of free cooling.

4.3.1.5 Provide Mechanical Ventilation

Mechanical ventilation is provided in addition to opening windows.

4.3.1.6 Provide Active Cooling systems.

Active cooling systems are provided but due to the steps taking earlier in the cooling hierarchy, their demand will be reduced.

4.4 Water

4.4.1 Water Demand

To minimise potable water demand, low flow sanitaryware will be specified. To provide a metric to compare against the sanitaryware will be specified so that, as a minimum, it will comply with the BREEAM Excellent requirements for credit WAT 01. To achieve this, the water demand will be significantly lower than 105l/person/day.

The water will be sub metered and connected to a building management system to ensure that water consumption can be adequately monitored and managed.

4.4.2 Flooding and Surface Water

The site is located in Environment Agency Flood Zone 1 and is considered at low risk of surface water flooding and no risk of flooding from the canal.

The design of the building places the entrance door at the top of a slope which will further mitigate risks of flooding to the building.

4.4.2.1 Sustainable Drainage

The following sustainable drainage options are to be included in the development:

- Rainwater will be collected from the roof to be used for irrigation.
- Rainwater will be discharged directly to the adjacent canal.

4.5 Digital Infrastructure

Telecoms infrastructure will be provided to the building to ensure that each tenant will have full fibre connectivity which will be able to meet the demands of an office of this size.

4.6 Waste

Camden Council recognise that the amount of waste produced is increasing and the traditional ways of dealing with it (for example, exporting it to landfill sites outside London) are becoming increasingly unacceptable, financially and environmentally.

Significant amounts of waste arise from the construction and operation of new developments. Waste & Resources Action Programme (WRAP) confirm that the construction industry is the largest contributor of waste in the nation. One-third of all waste in the UK, i.e. 120 million tonnes of waste per year, is generated by the construction and demolition sector, of which up to 13% is delivered and unused, it therefore produces on average three times more waste than all UK households combined. 60 million tonnes of construction/demolition waste go straight to waste collection facilities due to inappropriate or over-ordering and damage resulting from poor storage. Around 25 million tonnes of construction waste are also disposed to landfill each year.

Therefore, it is important for new schemes to minimise waste through optimised design methods, which consider current and future needs, and respond to functional requirements and climate change adaptation. Camden Council are aiming to make Camden a low waste borough by reducing the amount of waste produced and increase recycling and the reuse of materials to meet the London Plan targets by 2031.

4.6.1 Re-use and Recycling of Materials

Our approach to material selection is based on the circular economy model of model of cradle to cradle rather than cradle to grave. We consider the recyclability of materials to essential in the selection of building products. Materials will be locally sourced where possible. All timber will be from responsible forest sources. The building frame is designed to be as light as possible whilst still providing a robust and flexible structure that has potential for future adaption and flexibility. The building is to be a steel frame construction and the roof will consist of timber joists. The deconstruction of the building has also been considered so that materials are not put into land waste but can be recycled and reused.

4.6.2 Recycling and Refuse

Policy 5.17 of London Plan (2016) and Policy CC5 Waste of the Camden Local Plan (2017) require all new applications to demonstrate that suitable waste and recycling storage facilities have been provided.

Refuse/recycling stores are located in Eagle Mews and are readily accessible from Royal College Street. Distances from front doors to refuse stores are kept to minimums for convenience. The space incorporates space allowance for general refuse, dry recycling and food waste. Bulk items can be temporarily stored prior to their specifically scheduled collection.

Waste management for the office workspace is specified by the property management as determined on their policys and London wide guidance. Specific recyclable waste storage space will be provided in accordance with the BREEAM criteria for WST 03. This will include provision of a dedicated space for the segregation and storage of operational recyclable waste generated. The space is:

- Clearly labelled, to assist with segregation, storage and collection of the recyclable waste streams
- Accessible to building occupants or facilities operators for the deposit of materials and collections by waste management contractors

- Of a capacity appropriate to the building type, size, number of units and predicted volumes of waste that will arise from daily or weekly operational activities and occupancy rates. The management would be responsible for transferring waste and recycling to street level in advance of the scheduled collection time by private contractor.

4.6.3 Construction Waste Management

Camden CPG Energy Efficiency and Adaption details the management of construction waste that should be implemented. During construction of the proposed scheme, opportunities will be taken to minimise and reduce waste. A pre-demolition audit of the existing building and hard landscaping has been carried out at RIBA Stage 2 to determine whether any of the materials can be recovered for subsequent application. The Pre-demolition audit has identified the following best practice opportunities for reuse and recycling:

- All hard/core and concrete will be recycled and crushed for reuse in the piling mat (100%) also reduces lorry movements (environmental)
- All scrap will be recycled at a licenced re-cycling centre (100%)

The Pre-demolition audit identifies the waste streams and quantities likely to be generated as a result of the proposed demolition works and describes how these should be managed. The Pre-demolition audit will be given to the Demolition Contractor/Principal Contractor upon appointment for inclusion in the Site Waste Management Plan (SWMP).

A Resource Management Plan (RMP) will be produced, setting construction resource efficiency targets. As part of the BREEAM assessment for the Site, the Principal Contractor should abide by the RMP which will include:

1. A target benchmark for resource efficiency, i.e. m^3 of waste per $100m^2$ or tonnes of waste per $100m^2$
2. Procedures and commitments for minimising hazardous and non-hazardous waste in line with the target benchmark
3. A waste minimisation target and details of waste minimisation actions to be undertaken
4. Procedures for estimating, monitoring, measuring and reporting hazardous and non-hazardous site waste. If waste data is obtained from licensed external waste contractors, the data needs to be reliable and verifiable, e.g. by using data from EA Waste Return Forms
5. 5. Procedures for sorting, reusing and recycling construction waste into defined waste groups, either on-site or through a licensed external contractor
6. 6. Procedures for reviewing and updating the plan
7. 7. The name or job title of the individual responsible for implementing the above

The current BREEAM assessment requires the Principal Contractor to produce ≤ 6.5 tonnes of waste per 100m2 (gross internal floor area), 95% of non-hazardous construction and 95% of demolition waste (in tonnage) is required to be diverted from landfill in order to achieve compliance with the BREEAM criteria.

4.7 Land Use and Ecology

4.7.1 Protection of Green Spaces

As the existing site is a car park with a very low ecological value there are no green spaces to protect. The existing features of ecological value consist mainly of introduced shrubs.

A Biodiversity Impact Assessment was undertaken and the site was determined to have an ecological value of 0.03 biodiversity units.

Under the development proposals the site would have a an ecological value of 0.05 biodiversity units representing a gain of 66%.

While the existing site is of low ecological value, it is adjacent to Regent's Canal and consideration has been taken so that the development does not have a detrimental affect on the canal. The inclusion of soft landscaping, the green roof and rainwater recycling for irrigation will ensure that the surface water run off is not increased. To protect the canal, a Construction Environmental Management Plan will be produce to limit negative impacts to the canal and surrounding foliage during the works.

There are a number of trees in the vicinity of the site and arboricultural assessment has been undertaken to ensure that removal of trees does not negatively affect the ecology of the site and affect the local character.

The only trees that are considered for removal are of low quality and character. The new scheme includes the planting of new trees which will improve upon the character of the site well beyond the short term.

4.7.2 Enhancing Ecology

A preliminary ecological appraisal has been undertaken to determine the current ecological value of the site and the following measures will be incorporated:

- Biodiverse green roofs – Areas of biodiverse living roof should be based of a low-nutrient substrate, plug planted and seeded with at least 30 species of known value to wildlife. The roof should be further enhanced through the inclusion of features such as log piles, rock piles, and sandy piles;
- Vertical greening consisting of trellises with climbing plants utilising native species of value for pollinators should be incorporated on suitable elevations of the new building;
- Wildlife friendly landscaping including native trees and shrubs and herbaceous planting should be included within the proposed areas of landscaping. Species included should be of known value for pollinators, in particular using species from the RHS Plants for Pollinators Guide. Recommended tree species should be native and be selected for the ecosystem services they provide, such as carbon sequestration, drought tolerance and pollution tolerance. Landscaping could include buffer planting along the site's boundary with the Regent's Canal, which could take the form of a floating reedbed island;
- Bird boxes – Provide nesting opportunities for birds, particularly targeting London BAP species like house sparrow. Specialised house sparrow terraces can be included that are fully integrated within new buildings. These boxes should be positioned near to any area of vegetation and be placed at least 2m above ground level. We recommend using 'woodstone' products that utilise a mix of concrete and FSC wood fibres, creating a strong, long-lasting and sustainable product. Swift boxes should also be installed along with a swift call system to encourage uptake.
- Bat boxes would provide potential roosting opportunity for London BAP priority species such as common pipistrelle. The boxes should be placed on the eastern and western elevations of the

buildings and like the bird boxes should be incorporated into the built form. We recommend using 'woodstone' products that utilise a mix of concrete and FSC wood fibres, creating a strong, long-lasting and sustainable product.

- Invertebrate habitat features – Within public landscaped areas, invertebrate habitat features should be incorporated to provide features of interest as well as ecological function. Stag beetle loggeries should be placed in shady areas amongst trees to provide forage and shelter for saproxylic invertebrates in larval stage, whereas bee bricks and habitat panels should be located in sunny areas.

5.0 Summary

The works at the Royal College Street in Kensington consist of demolition of the existing plant rooms, erection of single storey office accommodation with ancillary roof terrace and replacement plant room, revised ground floor pedestrian entrance and ancillary office alterations, provision of disabled persons parking, EV points and cycle facilities

In addition to the above, building services will be upgraded within the development. As this only includes internal works to a non-listed building, it is not subject to the planning requirements. This constitutes betterment that significantly reduces the carbon emissions of the building. It has therefore been included in this document to support the planning application for the development.

A range of measures to improve sustainability and reduce energy consumption have been included:

- The development will achieve a 77.2% carbon dioxide emissions reduction
- The development will achieve a BREEAM rating of Excellent
- Heating and cooling are to be provided by high efficiency ASHPs
- Ventilation is to be provided by high efficiency fans incorporating heat recovery.
- Lighting is to be provided by high efficiency LED luminaires.
- Lighting will incorporate occupancy and daylight linked controls to reduce demand.
- A PV array is to be situated on the roof to supplement the building's electrical demand.
- The building will achieve an EPC rating of **A**
- In response to the ongoing decarbonisation of the grid, the site will remove all fossil fuels and be entirely serviced by electricity. This is likely to offer further carbon reductions in future years as the grid continues to improve.

The table below shows the total predicted annual CO_2 emissions at each stage of the hierarchy:

	Emissions ($t.CO_2$/annum)	Improvement (%)
Baseline	9.5	N/A
Be Lean Savings	4.5	47.7%
Be Clean Savings	0.0	0.0%
Be Green Savings	2.8	29.5%
Total Savings	**7.4**	**77.2%**

6.0 Appendix A – Draft EPC

Energy Performance Certificate
Non-Domestic Building

HM Government

146-150 Royal College Street
Borough of Camden
London
NW10TA

Certificate Reference Number:
9569-8482-0533-8441-8135

This certificate shows the energy rating of this building. It indicates the energy efficiency of the building fabric and the heating, ventilation, cooling and lighting systems. The rating is compared to two benchmarks for this type of building: one appropriate for new buildings and one appropriate for existing buildings. There is more advice on how to interpret this information in the guidance document *Energy Performance Certificates for the construction, sale and let of non-dwellings* available on the Government's website at www.gov.uk/government/collections/energy-performance-certificates.

Energy Performance Asset Rating

More energy efficient

A+

Net zero CO_2 emissions

A 0-25

B 26-50

C 51-75

D 76-100

E 101-125

F 126-150

G Over 150

Less energy efficient

10 This is how energy efficient the building is.

Technical information

Main heating fuel:	Grid Supplied Electricity
Building environment:	Air Conditioning
Total useful floor area (m^2):	799.027
Building complexity:	Level 5
Building emission rate ($kgCO_2/m^2$ per year):	6.06
Primary energy use (kWh/m^2 per year):	82.16

Benchmarks

Buildings similar to this one could have ratings as follows:

29 If newly built

77 If typical of the existing stock

7.0 Appendix B - BRUKL Documents

7.1 Baseline BRUKL

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

RCSpartL As designed

Date: Thu Dec 17 09:38:52 2020

Administrative information

Building Details

Address: Address 1, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.13

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.13

BRUKL compliance check version: v5.6.b.0

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Criterion 1: The calculated CO_2 emission rate for the building must not exceed the target

The building does not comply with England Building Regulations Part L 2013

CO_2 emission rate from the notional building, $kgCO_2/m^2$.annum	22.2
Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	22.2
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	27.5
Are emissions from the building less than or equal to the target?	BER > TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.2	0.2	CR000000:Surf[1]
Floor	0.25	0.15	0.15	CC000000:Surf[0]
Roof	0.25	0.12	0.12	FF000009:Surf[1]
Windows***, roof windows, and rooflights	2.2	1.8	1.8	ST000002:Surf[1]
Personnel doors	2.2	-	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m²K)]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]
$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [W/(m²K)]

* There might be more than one surface where the maximum U-value occurs.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.
*** Display windows and similar glazing are excluded from the U-value check.
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	4

7.2 Lean BRUKL

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

RCSpartL As designed

Date: Wed Dec 16 16:48:52 2020

Administrative information

Building Details

Address: Address 1, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.13

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.13

BRUKL compliance check version: v5.6.b.0

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Criterion 1: The calculated CO_2 emission rate for the building must not exceed the target

CO_2 emission rate from the notional building, $kgCO_2/m^2$.annum	16.9
Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	16.9
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	13.9
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	$U_{a-Limit}$	U_{a-Calc}	U_{i-Calc}	Surface where the maximum value occurs*
Wall**	0.35	0.2	0.2	CR000000:Surf[1]
Floor	0.25	0.15	0.15	CC000000:Surf[0]
Roof	0.25	0.12	0.12	FF000009:Surf[1]
Windows***, roof windows, and rooflights	2.2	1.8	1.8	ST000002:Surf[1]
Personnel doors	2.2	-	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

$U_{a-Limit}$ = Limiting area-weighted average U-values [W/(m²K)]
U_{a-Calc} = Calculated area-weighted average U-values [W/(m²K)]
U_{i-Calc} = Calculated maximum individual element U-values [W/(m²K)]

* There might be more than one surface where the maximum U-value occurs.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.
*** Display windows and similar glazing are excluded from the U-value check.
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	4

7.3 Green BRUKL

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

RCSpartL

As designed

Date: Wed Dec 16 15:37:34 2020

Administrative information

Building Details

Address: Address 1, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.13

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.13

BRUKL compliance check version: v5.6.b.0

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Criterion 1: The calculated CO_2 emission rate for the building must not exceed the target

CO_2 emission rate from the notional building, $kgCO_2/m^2$.annum	16.9
Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	16.9
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	6.1
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	$U_{a-Limit}$	U_{a-Calc}	U_{i-Calc}	Surface where the maximum value occurs*
Wall**	0.35	0.2	0.2	CR000000:Surf[1]
Floor	0.25	0.15	0.15	CC000000:Surf[0]
Roof	0.25	0.12	0.12	FF000009:Surf[1]
Windows***, roof windows, and rooflights	2.2	1.8	1.8	ST000002:Surf[1]
Personnel doors	2.2	-	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

$U_{a-Limit}$ = Limiting area-weighted average U-values [W/(m²K)]
U_{a-Calc} = Calculated area-weighted average U-values [W/(m²K)]
U_{i-Calc} = Calculated maximum individual element U-values [W/(m²K)]

* There might be more than one surface where the maximum U-value occurs.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.
*** Display windows and similar glazing are excluded from the U-value check.
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	4

CONTACT US

DUBAI (Head Office)
Black & White Engineering
1801 Marina Plaza, Marsa Street,
PO Box 27793
Dubai, UAE

DubaiEnq@bw-engineering.com

ABU DHABI
Black & White Engineering
Office 2 - Mezzanine Level,
Al Walaa Tower,
Al Nahyan Camp, Delma Street,
PO Box 128981
Abu Dhabi, UAE

AbuDhabiEnq@bw-engineering.com

BAKU
Black & White Middle East - F.Z.E.
3, Inshaatchilar Ave, Baku City, AZ1073,
Republic of Azerbaijan

BakuEnq@bw-engineering.com

LONDON
Black & White Engineering Ltd
28-30 Worship Street, London
EC2A 2AH, UK

LondonEnq@bw-engineering.com

MANILA
Black & White Middle East (Philippines) Inc.
Units C & D, 9th Floor Cyberscape Beta,
Topaz & Ruby Roads,
Ortigas Center, Pasig City
Philippines

ManilaEnq@bw-engineering.com

NEWCASTLE
Black & White Engineering Ltd
Unit 2.8, First Floor,
Generator Studios,
Trafalgar Street,
Newcastle upon Tyne
NE1 2LA, UK

NewcastleEnq@bw-engineering.com

PERTH
Black & White Engineering Pty Ltd
507 Murray Street,
Perth, Australia

PerthEnq@bw-engineering.com

RIYADH
Black & White Engineering
c/o Proven SA
Moon Tower 3rd Floor, 7586
King Fahd Branch Road -
Ar Rahmaniyah
Riyadh, Kingdom of Saudi Arabia

SaudiEnq@bw-engineering.com

SINGAPORE
Black & White Engineering Pte Ltd
16 Raffles Quay #33-03,
Hong Leong Building,
Singapore 048581

SingaporeEnq@bw-engineering.com

enquiries@bw-engineering.com

www.bw-engineering.com