TWIN EARTH

32 Torrington Square, London

Energy and Sustainability Statement

Prepared for: Birkbeck, University of London

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EXECUTIVE SUMMARY

1. EXECUTIVE SUMMARY

The proposed development is a part new build - part refurbishment for a new Toddler Lab for the study of toddlers with autism and other behavioural conditions.

The **new build Annex** will be located on land between the Warburg Institute and 32 Torrington Square and new facilities will include a number of "true to life environments" such as home environments, pre-school, sleep laboratories and a 'cave' laboratory, where AV equipment can create an interactive environment of outdoor scenarios.

The **refurbished element**, **32 Torrington Square**, will primarily be used as office space. The building will also provide a seminar room, kitchenette facilities, and toilet areas to support the whole scheme. The listed nature of 32 Torrington Square significantly limits the upgrades and changes that can be made to the building. Therefore, changes will be limited mainly to the building services.

The proposed refurbishment of 32 Torrington Square has a Gross Internal Floor Area (GIA) of 380sqm spanning five floors (ground to third floor, including basement). The proposed annex has a GIA of 444sqm over ground to fifth floor levels including basement.

The total GIA of the scheme is 824sqm therefore is classified as a **"Minor Development"** where buildings are considered independently or as a whole.

This report has been developed with the aim of summarising the proposed energy and sustainability strategy for the development to demonstrate how this achieves compliance with the planning requirements for both new and refurbished elements. The energy strategy has been written in compliance with the GLA Guidance on preparing energy assessments (March 2016)[1] and the sustainability strategy aligns with the requirements of the GLA's Sustainable Design and Construction Supplementary Planning Guidance (April 2014).

1.1 Panning Policy

The following policies and regulations have been reviewed to establish the development planning energy and sustainability targets.

- National Planning Policy Framework
- Building Regulation Part L
- The London Plan
- Camden Local Plan - Adoption version June 2017
- Camden Planning Guidance (CGP) 3 – Sustainability

When reviewing the above the following has been noted:

- As previously described, the development comprises two buildings of 380sqm and 444sqm, therefore, whether considered separately or in combination, the development classifies as Minor (<1,000sqm)
- The Grade II Listed nature of 32 Torrington Square.

[1] Energy Planning – Greater London Authority guidance on preparing energy assessments (March 2016), Mayor of London.

1.2 Proposed Energy Strategy

The energy strategy for the development has been developed using the following energy hierarchy:

1. **Be Lean:** Design the building fabric and services (heating, ventilation and lighting) to be energy efficient
2. **Be Clean:** Where feasible, use heating infrastructure which is low carbon. This includes consideration of district heating and combined heat and power (CHP).
3. **Be Green:** Where feasible, integrate renewable energy. This includes consideration of technologies which complement the heating strategy and includes photovoltaic panels (PV), biomass heating, solar hot water panels (SHW), heat pumps and wind turbines.

The annex is a new build development, compliance with Criteria 1 and 3 of Part L2A of the Building Regulations has also been verified.

The following summarises the proposed energy measures for the development:

Energy Efficient Design (Be Lean):

- The thermal performance of the annex façade, will be optimised to minimise heat loss and solar gain including specifying U-values for the external envelope (walls, roof, glazing) that are below Part L2A 2016 minimum standards, and targeting low air permeability levels. Improvements to 32 Torrington Square are strongly constrained by the listed nature of the development; however, roof insulation is being specified which is deemed to have a very positive impact on the performance.
- Solar gain and cooling loads in the annex will be limited through high performance solar control glass. Glazing in 32 Torrington Square will remain the same due to the listed nature of the building.
- Low energy internal and external LED lighting with occupancy sensing will be specified for both new and refurbished parts of the development. Perimeter zones in the offices will be fitted with daylight dimming DALI controls.
- Fresh air will be supplied from central air handling units comprising low pressure ductwork, variable speed drives with heat recovery.

Heating infrastructure (Be Clean):

Evaluation of the Be Clean scenario has been undertaken following the hierarchy established by the London Plan policy 5.6 as follows:

1. **Connection to existing heating or cooling networks -** The development is located near to the Bloomsbury Heat & Power network[2]. However, connection is currently not viable due to the condition and capacity of the existing plant. There is a plan to complete such upgrade in the next few years[3] and therefore future connection has been considered and is discussed in further detail in point number 3 below.
2. **Site wide CHP network -** Installation of a CHP unit on site has also been considered, but has been deemed unfeasible due to the low domestic hot water demand anticipated for the development.
3. **Enabling future connection to DH –** In order to facilitate future connection to the Bloomsbury district heating network, a centralised water based system is proposed to provide space heating and Domestic Hot Water (DHW). The boiler room is proposed at the front of the building, which is where the district heating pipe fur future supply is currently located.

[2] https://www.theade.co.uk/members/district-heating/Bloomsbury-Heat-And-Power-Consortium

http://www.camden.gov.uk/ccm/content/environment/green/supplying-low-carbon-energy.en

[3] https://www.soas.ac.uk/estates/environment/energy-management/

In the meantime, heating will be generated via highly efficient low NOx emissions boilers.

Renewable Energy (Be Green):

A feasibility study to evaluate the potential for installation of renewable technologies has been completed as part of this exercise. Below is a summary of the conclusions:

- Whilst the use of solar thermal panels to generate hot water, or PV panels to generate electricity are in principle feasible technologies for the project, the visual impact of external roof features is considered inappropriate given the Grade II listed nature of number 32 Torrington Square. Wind turbines have been discounted also based on visual impact.
- Biomass based systems have been ruled out as the project cannot accommodate the spatial requirements for fuel loading and storage. Additionally, biomass has high NOx emissions and is therefore not deemed a suitable solution for central London, where air quality is a major concern.
- Heat pumps have also been considered, but have been concluded an unfeasible solution, as due to the poor building envelope performance of 32 Torrington Square as high flow and return temperatures would be required making the system operation inefficient.

Therefore, the installation of renewable energy technologies is not feasible for the project.

1.3 Energy Strategy Performance - summary

1.3.1 Summary of Carbon performance

The carbon emissions performance for both new and refurbished parts of the development was tested using government compliant energy modelling software (IES Virtual Environment) which is accredited for assessing non-domestic buildings against Building Regulation Part L2A.

The Annex

Figure 1 shows the average regulated carbon emissions for the annex. The graph shows the relative performance of the development against a Part L 2016 compliant development

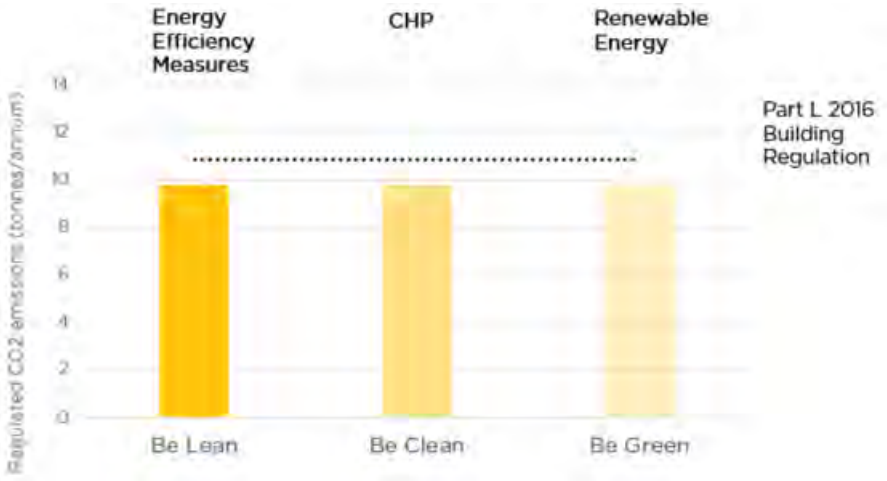


Figure 1. Carbon performance of the development at each stage of the Energy Hierarchy

The assessed building will meet the minimum energy performance requirements for a BREEAM '*Excellent*' rating.

The regulated CO_2 emissions of the annex after taking into account energy efficiency alone are below those of a Part L 2016 compliant development.

The regulated CO_2 emissions, after taking into account energy efficiency **is 10% below that of a Part L 2016 of the Building Regulations compliant development.**

The breakdown of both regulated CO_2 emissions (from heating, ventilation and lighting) and unregulated CO_2 emissions (e.g. small power) is shown in Table 1 after each stage of the energy hierarchy. In addition, Table 2 shows the relative savings in CO2 emissions versus a Part L 2016 compliant development.

CO_2 Emissions (Tonnes CO_2 per annum)	Regulated	Unregulated
Baseline (Part L 2016 Compliant Development)	10.9	12
After energy demand reduction	9.8	12
After CHP	9.8	12
After renewable energy	9.8	12

Table 1. CO2 emissions after each stage of the Energy Hierarchy

Savings from energy demand reduction	1.1	10%
Savings from CHP	0.0	0%
Savings from renewable energy	0.0	0%
Total Cumulative Savings	**1.1**	**10%**

Table 2. Regulated CO2 savings from each stage of the Energy Hierarchy

32 Torrington Square

To provide the CO_2 emission savings for the 32 Torrington Square, first the regulated CO_2 emissions of the unrefurbished - existing building should be calculated and form the baseline carbon performance of the development. Then, the average regulated carbon emissions for the proposed 32 Torrington Square should be calculated at each stage of the energy hierarchy. Figure 1 shows the relative performance of the proposed development at each stage compared to the unrefurbished development.

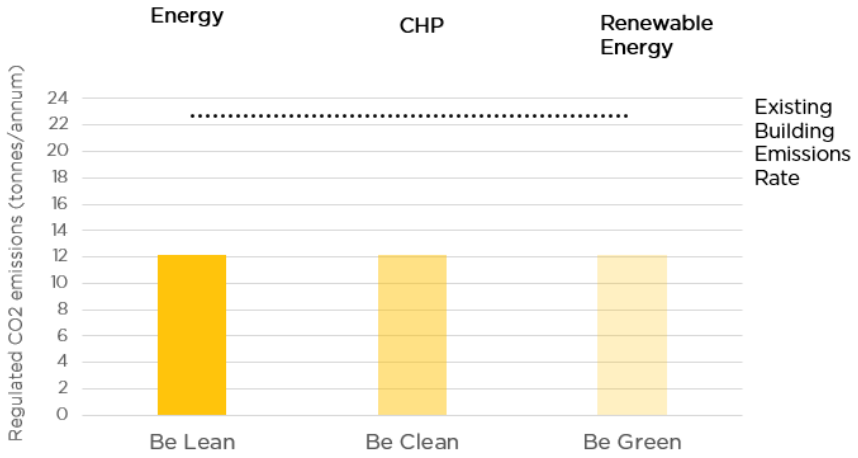


Figure 2. Carbon performance of the development at each stage of the Energy Hierarchy against Existing Building Emissions Rate.

The regulated CO_2 emissions of 32 Torrington Square after taking into account energy efficiency alone are below those of the existing building.

The regulated CO_2 emissions of the development, after taking into account energy efficiency**, is 47% below that of the unrefurbished development.**

The breakdown of both regulated CO_2 emissions (from heating, ventilation and lighting) and unregulated CO_2 emissions (from cooking and appliances) is shown in Table 3 after each stage of the

energy hierarchy. In addition, Table 4 shows the relative savings in CO_2 emissions versus the unrefurbished development.

CO_2 Emissions (Tonnes CO_2 per annum)	Regulated	Unregulated
Baseline (Existing building)	22.7	11
After energy demand reduction	12.1	11
After CHP	12.1	11
After renewable energy	12.1	11

Table 3. CO2 emissions after each stage of the Energy Hierarchy

Savings from energy demand reduction	10.6	47%
Savings from CHP	0.0	0%
Savings from renewable energy	0.0	0%
Total Cumulative Savings	**10.6**	**47%**

Table 4. Regulated CO2 savings from each stage of the Energy Hierarchy

1.3.2 Summary of Performance against targets

All efforts have been made to minimise carbon emissions associated to the building following a be lean, be clean, be green approach.

In addition, the development has been future proofed for connection to a district heating network. A centralised water based system served by highly efficient gas boilers is proposed which will allow easy replacement for a DH network supply.

Although, the development has strived to achieve a 20% reduction in carbon emissions from onsite renewable energy technologies, this is not possible due to site constraints. However, a robust strategy has been provided that achieves the following:

The Annex (New Part)

- 10% improvement over a Part L 2016 Building Regulations compliant development.
- Energy performance required to achieve a BREEAM 'Excellent' rating which is a planning requirement for all major development.
- Compliance with Criterion 3 of PartL2A Building Regulations

32 Torrington Square (Refurbished Part)

- 47% improvement over the existing refurbished development.
- The Net value of the proposed environmental improvements (e.g. lighting, lighting controls, heating etc.) will be at least 10% of the Net Construction Value.

1.4 Sustainability Strategy

The below section summarises the performance of the proposed development against the sustainability targets outlined within the LBoC Camden Planning Guidance (CGP) 3 – Sustainability.

1.4.1 Sustainable materials

As far as possible, materials have been responsibly sourced in accordance with BREEAM Mat 03 Responsible Sourcing of Materials. All timber will be legally harvested and traded in accordance with the UK Government Timber Procurement Policy.

The proposed redevelopment includes retention of the majority of the existing structure and fabric at 32 Torrington Square which will significantly contribute to the 10% of materials being from recycled / re-used sources target. The reinforcement for new build structure, including the annex will be 100% recycled and therefore also contribute towards the target.

1.4.2 Sustainable Assessment Tools

The proposed development is being assessed against BREEAM voluntarily by the Client. Please see section 1.5 within the executive summary for further details.

1.4.3 Green roofs

The current design proposes the specification of a green roof on the lower ground floor extensions within the annex which, in addition to the ecological benefit, will have a positive impact on water run-off minimisation.

1.4.4 Flooding

According to the Environmental Agency Flood Risk map, the site has a low risk of flooding and no Flood Risk Assessment is required to be submitted as part of this planning application.

Webb & Yates have been appointed to undertake a civil and structural report (Stage 2 Civil and Structural Engineering Report, April 2017) which identifies that an evaluation of the surface water run-off will also be undertaken to ensure that the peak rate of run-off from the site to the watercourses (natural or municipal) is no greater post-development at the 1-year and 100-year return period events including climate change allowance.

1.5 BREEAM target

The London Borough of Camden Local Policy requires that all non-domestic developments with a floor area of >500sqm must achieve a minimum BREEAM rating of 'Excellent'.

In addition to this, all developments must meet the following un-weighted targets in each of the following BREEAM categories:

- Energy – 60%
- Water – 60%
- Waste – 40%

Both buildings covered by this planning statement have an area below the 500sqm threshold and therefore the above requirements do not apply; however, the client has voluntarily decided to certify both buildings under BREEAM to demonstrate the sustainability credentials of the proposed design.

32 Torrington Square and the annex will be assessed as "Offices" for the purposes of this assessment. The annex is a new, fully-fitted owner occupied building and will therefore be assessed against the BREEAM New Construction 2014 manual. 32 Torrington Square is an existing building undergoing major refurbishment of central and local services and will be fully-fitted; and will therefore be assessed against the BREEAM Non-Domestic Refurbishment and Fit-Out 2014 manual (Parts 2, 3, 4).

A BREEAM pre-assessment strategy for both buildings has been developed with input from the design team to optimised the BREEAM performance.

- The Annex achieves an anticipated **BREEAM score of 72.5%, which corresponds to a rating of 'Excellent'.**
- 32 Torrington Square is constrained by its listed nature and achieves an anticipated **BREEAM score of 60.1% - 'Very Good'**

The following un-weighted score has been achieved for the proposed development:

	Camden Policy target	The Annex	32 Torrington Square
Energy	60%	61%	52%
Water	60%	67%	67%
Materials	40%	46%	38%

Table 5. Summary of performance against BREEAM categories in line with Camden policy

All environmental category thresholds have will be met for the new build element. For 32 Torrington Square, compliance with the water targets will be achieved; however, performance in the energy and materials section is strongly constrained by the listed nature of the development.

Pre-application advice from the London Borough of Camden has advised that specialist consideration will be made with regards to the BREEAM rating and minimum un-weighted targets for the Grade II* Listed building at 32 Torrington Square.

A copy of the BREEAM pre-assessment checklist for both buildings has been included in Appendix H.

INTRODUCTION

2. INTRODUCTION

Building on the renowned research carried out at the BabyLab within the Henry Wellcome building, Birkbeck now wish to explore research into methods exploring toddlers development between the ages of 12months to 4 or 5 years old, in naturalistic environments. Therefore, through methods developed in the BabyLab and new techniques currently being developed, it is proposed to create a purpose-built facility to carry out this research.

The building is to house the Toddler Lab. This state-of-the-art facility will be a world first in its application to toddlers with emerging developmental disorders, and will break new ground to bridge the divide between laboratory and clinical measures in near real-world environments.

The proposed new facility will be comprised of a refurbishment to the existing 32 Torrington Square Grade II Listed townhouse and the construction of an annex facility infilling the unaccommodated gap between 32 Torrington Square and The Warburg Institute.

Number 32 Torrington Square will be refurbished to primarily accommodate office space for the academics and will include a seminar room, kitchenette facilities and toilets.

The Annex will consist of new facilities including a number of "true to life environments" such as home environments, pre-school, sleep laboratories and a 'cave' laboratory, where AV equipment can create an interactive environment of outdoor scenarios.

The scheduled planning application to the London Borough of Camden (LBoC) will be for the entire site and therefore include both buildings: 32 Torrington Square and the Annex.

The proposed refurbishment of 32 Torrington Square has a Gross Internal Floor Area (GIA) of 380sqm spanning five floors (ground to third floor, including basement). The proposed annex has a GIA of 444sqm over ground to fifth floor levels including basement.

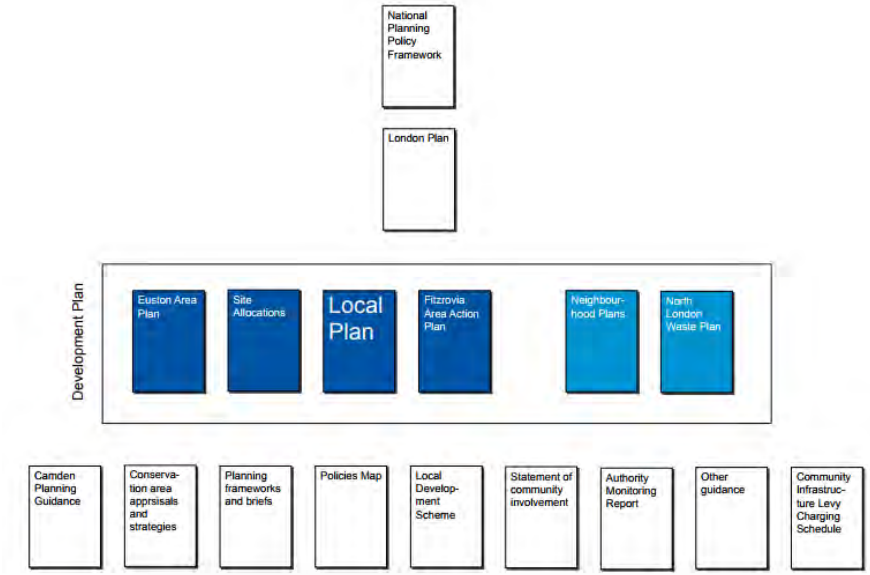
The total GIA of the scheme is 824sqm therefore is classified as a "Minor Development" whether buildings are considered independently or as a whole.

Figure 3. CGI of the front façade of 32 Torrington Square and Annex.

POLICY FRAMEWORK

3. POLICY FRAMEWORK

This section summarises the national and local planning policy and regulations applicable to 32 Torrington Square and Annex.



3.1 Development planning context

The development subject of this planning applications covers two buildings which are designed as independent areas. Current design proposed the following areas:

- 32 Torrington Square – 380 sqm
- Annex – 444sqm

Major developments are defined as those with a total area >1,000sqm. Based on the above, the project is a minor development whether considered independently or combined.

It must also be considered that 32 Torrington Square is a Grade II Listed development.

3.2 National Policy

National Planning Policy Framework

The National Planning Policy Framework was published on 27 March 2012 as a key part of Government reforms to make the planning system less complex and more accessible, to protect the environment and to promote sustainable growth. A review of the framework, called the Planning Practice Guidance has been published by the Government on 6 March 2014. Both frameworks outline Government's planning policies for England to support Local Authorities on the development of local policies.

Building Regulation Part L

Building regulation Part L considers 'conservation of fuel and power' in both existing and new build, and in both domestic and non-domestic buildings. The latest version of the regulations (Part L 2013) were introduced in April 2014, and are expected to be revised again in 2016. The regulations set minimum performance standards for the building fabric thermal efficiency, building services and also set targets for CO_2 emissions in new buildings. As with most local

authorities within England, Camden and the London Plan specify the Part L CO_2 assessment methodology as the basis for setting carbon emissions targets which are above those required by the building regulations.

3.3 Local Policy

3.3.1 The London Plan

London Energy and Sustainability planning policies within the London Plan relate mainly to major developments, consideration has been made of the guidelines and design principles stated within the document. Key policies reviewed are listed below, with further details included in Appendix A.

- Policy 5.1 Climate Change Adaptation
- Policy 5.2 Minimising Carbon Dioxide Emissions
- Policy 5.3 Sustainable Design and Construction
- Policy 5.4: Retrofitting
- Policy 5.5: Decentralised energy networks
- Policy 5.6: Decentralised energy in proposals
- Policy 5.7 Renewable Energy
- Policy 5.8 Innovative Energy Technologies
- Policy 5.9 Overheating and Cooling
- Policy 5.10 Urban Greening
- Policy 5.11 Green Roofs and Development Site Environs
- Policy 5.12: Flood risk management
- Policy 5.13 Sustainable Drainage

3.3.2 Camden's Local Plan

Camden Planning Policy has been recently updated with the adoption of the Local Plan 2017 on the 3rd July 2016 which sets out the Council's planning policies and replaces the Core Strategy and Development Policies planning documents (adopted in 2010). The Local Plan will cover the period from 2016-2031.

Additional Energy and Sustainability requirements are set in "Camden Planning Guidance (CGP) 3 – Sustainability" which remains an applicable document.

Relevant Energy and Sustainability policies applicable to the development are listed below. Please see appendix B for details of applicable policies wording.

- Policy C1 Health and wellbeing
- Policy C5 Safety and security
- Policy C6 Access for all
- Policy A3 Biodiversity
- Policy A4 Noise and vibration
- Policy D1 Design
- Policy CC1 Climate change mitigation
- Policy CC2 Adapting to climate change
- Policy CC3 Water and flooding
- Policy CC4 Air quality
- Policy CC5 Waste
- Policy T1 Prioritising walking, cycling and public transport
- Policy T2 Parking and car-free development
- Policy T4 Sustainable movement of goods and materials

The table below summarises key energy and sustainability requirements established by the policies above and further guidance on the CPG3.

Environmental issue	Requirement
Energy Efficiency	New Build • All new developments are to be designed to minimise carbon dioxide emissions • The most cost-effective ways to minimise energy demand are through good design and high levels of insulation and air tightness. • The London Plan notes that between the years of 2016-2019 non-domestic buildings are expected to comply with the guidance set out in the building regulations. • Whilst no specific energy performance target is reference within planning policy for minor developments. Refurbishments • As a guide, at least 10% of the project cost should be spent on environmental improvements. • Sensitive improvements can be made to historic buildings to reduce carbon dioxide emissions
Decentralised energy networks and combined heat and power	• Where feasible and viable your development will be required to connect to a decentralised energy network or include CHP.
Renewable Energy	• Developments are to target a 20% reduction in carbon dioxide emissions from on-site renewable energy technologies.
Natural Cooling (new building)	• Consider maximising the use of natural systems within buildings before any mechanical services are considered.
Water Efficiency	• At least 50% of water consumed in homes and workplaces does not need to be of drinkable quality re-using water. • All developments are to be water efficient. • Developments over 10 units or 1000sq m should include grey water recycling.
Sustainable materials	• Reduce waste by firstly re-using your building, where this is not possible you should implement the waste hierarchy. • The waste hierarchy prioritises the reduction, re-use and recycling of materials. • Source your materials responsibly and ensure they are safe to health. • All developments should aim for at least 10% of the total value of materials used to be derived from recycled and reused sources.
Sustainability assessment tools	New Build • Development of 500sq m or more of non-residential floorspace will need to be designed in line with BREEAM. Developments are encouraged to achieve the following ratings: From 2016 – BREEAM Excellent with the Minimum standard for categories (% of un-weighted credits): • Energy 60% • Water 60% • Materials 40% Both buildings covered by this planning statement have an area below the 500sqm threshold and therefore the above requirements do not apply; however, the client has voluntarily decided to certify both buildings under BREEAM to demonstrate the sustainability credentials of the proposed design.

Green roofs	• All developments should incorporate green and brown roofs. • The appropriate roof or wall will depend on the development, the location and other specific factors. • Specific information needs to be submitted with applications for green/brown roofs and walls. Special consideration will be given to historic buildings to ensure historic and architectural features are preserved.
Biodiversity	Proposals should demonstrate: • how biodiversity considerations have been incorporated into the development; • if any mitigation measures will be included; and • what positive measures for enhancing biodiversity are planned.
Flooding	• All developments are required to prevent or mitigate against flooding. • All developments are expected to manage drainage and surface water. • There is a hierarchy you should follow when designing a sustainable drainage system.
Adaptation to climate change	• All development should consider how it can be occupied in the future when the weather will be different. • The early design stage is the most effective time to incorporate relevant design and technological measures.

Table 6. Key sustainability targets / requirements that apply to the development

ENERGY STATEMENT

4. ENERGY STATEMENT

4.1 Approach to the Energy Strategy

This section summarises the considerations made and technologies proposed to reduce the energy consumption and to minimise carbon emissions associated with the development's operational energy.

The strategy has been developed following a 'Be Lean', 'Be Clean', 'Be Green' energy hierarchy which ensures that sustainability is integrated within the building design rather than achieved via "add-on" features and systems. In addition to this, consideration has also been made of the influence of the behavioural patterns and operation of the building on its "in-use" performance and measures have been proposed to minimise the "performance gap" between predicted and actual energy consumption.

Figure 4. Energy Hierarchy

4.2 Demand Reduction (Be Lean)

4.2.1 Passive design

Good passive design optimises winter and minimises summer solar gains to reduce the need for both, heating and cooling. As the development is for commercial use, the main regulated energy loads will be cooling and lighting.

The Annex is relatively well shaded to the west and east from surrounding buildings which will limit heat gain to the site. High performance solar control glazing with a g-value of 32% (0.32) and 40% (0.4) - *to limit solar gains whilst allowing good daylight transmission* - have been specified in the South and North façade respectively. The glazing is also set back from the façade with deep reveals which will provide additional shading.

Heat loss will be limited through specifying thermal performance of the glazing, façade, roof and floor which is significantly improved on the minimum values set out within PartL2A 2016.

32 Torrington Square is a listed building and therefore improvements are limited; however, the specification of high reflective internal roller blinds and loft insulation is anticipated to have a significant positive impact.

Figure 5. Passive energy measures (deep reveals)

4.2.2 Building envelope

Improving the thermal performance of the building envelope reduces the heat losses and gains through the façade resulting in a lower energy demand for heating and cooling.

Improved U-values from those specified in PartL2A will be targeted. Below is a summary of the targeted specifications for each building element in the annex.

Building Element	Building Regulations limiting fabric parameters	Notional Building	Proposed u-values
External walls (W/m^2K)	0.35	0.26	0.15
Ground Floor (W/m^2K)	0.25	0.22	0.10
Roof (W/m^2K)	0.25	0.18	0.10
Windows and glazed doors (W/m^2K)	2.2 (Whole window inc frame)	1.6 (Whole window inc frame)	1.4 (Whole window inc frame)
Windows South Facade (g-value)	-	-	0.32
Windows North Facade (g-value)			0.4
Air tightness ($m^3/m^2.h$ @ 50Pa)	10	3	8.5

Table 7. Targeted u-values and air permeability target (Part L2A 2013 limiting u-values shown for comparison)

4.2.3 Glazing levels

Glazing levels in the annex have been optimised to maximise daylight levels whilst limiting heat loss and heat gain through use of high performance solar control glass. The table below shows the relative glazing ratios for each façade in the annex.

	Façade Orientation			
	N	W	E	S
Facade Area (m^2)	76	-	-	86.7
Glazed Area (m^2)	15.5	-	-	32
Glazed/façade ratio (%)	20	-	-	37

Table 8. Glazed area ratio

4.2.4 Heating

Energy consumption and carbon emissions associated with space heating and domestic hot water (DHW) will be minimised by specifying high efficiency condensing boilers with low NOx emissions performance in both new and refurbished parts of the development.

Distribution and storage system heat losses will be minimised through the use of highly insulated pipework and thermal store in line with the latest building regulation standards.

4.2.5 Cooling

Space cooling will be provided only in the annex using high efficiency Air Cooled Chiller with an EER of 3.6. The system will be configured to provide cooling on a floor by floor basis, allowing full zonal control on each floor.

4.2.6 Ventilation

The Annex has been designed to be air-tight to limit heat loss in winter and heat gains in summer. An air tightness target of $8.5m^3/m^2.hr$ @ 50 Pa has been set which will delivered through attention to designing out air leakage paths through the building envelope.

All office spaces will be ventilated using a centralised air handling unit, comprising low pressure ductwork, variable speed drives, heat recovery and low specific fan power.

4.2.7 Lighting

Energy efficient internal LED lighting will be specified for all areas in both 32 Torrington Square and the annex, which will significantly exceed the minimum luminaire efficacy of 60 luminaire lumens per circuit watt, required by Building Regulations.

Lighting will be controlled via digital-addressable DALI controllers which will provide occupancy sensing in all areas of the building, and daylight dimming in perimeter zones.

All external lighting (except safety and security lighting) will be automatically switched off between 23:00 and 07:00. The average luminaire efficacy of the external light fittings will be no less than 60 luminaire lumens per circuit Watt.

4.2.8 Cost on Environmental improvements

Th LBoC requires that refurbishments spend at least 10% of the project cost on environmental improvements.

The refurbishment of 32 Torrington Square includes full building services replacement for more energy efficient systems. It has been confirmed by the cost consultant that, based on the Stage 2 Cost Plan, published in May 2017, the Net value of the proposed environmental improvements (e.g. lighting, lighting controls, heating etc.) will be **at least 10% of the Net Construction Value.**

4.2.9 Demand Reduction – Development performance

The Annex

The impact of the demand reduction measures for the annex was tested in government approved software (IES Virtual Environment) based on the proposed architectural design and M&E strategy. The regulated CO_2 emissions are calculated to be 10% less than a Part L compliant development.

CO_2 Emissions (Tonnes CO_2 per annum)	Regulated
Base line (PartL 2016 compliant development)	10.9
After energy demand reduction	9.8
% Improvement over baseline	**10%**

Table 9. Regulated carbon emissions improvement of the annex after taking into account demand reduction measures

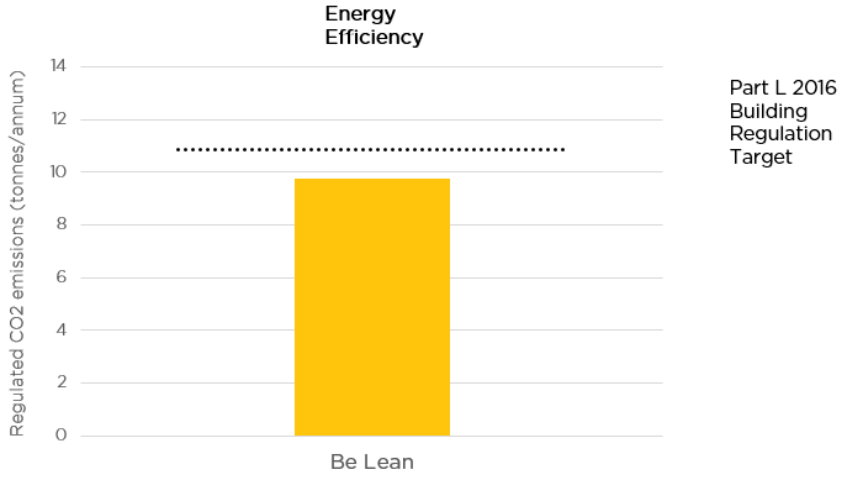


Figure 6. Regulated carbon emissions improvement of the annex after taking into account demand reduction measures.

32 Torrington Square

A different approach has been followed for 32 Torrington Square. As the building is a refurbishment, it is expected that an estimate of the CO_2 savings from the refurbishment of the building will be provided. Therefore, the regulated CO_2 emissions of the existing building should be calculated and form the baseline carbon performance of the proposed development. The regulated CO_2 emissions of the proposed development are calculated to be 47% less than the existing building.

CO_2 Emissions (Tonnes CO_2 per annum)	Regulated
Base line (Existing building)	22.7
After energy demand reduction	12.1
% Improvement over baseline	**47%**

Table 10. Regulated carbon emissions improvement of the 32 Torrington Square after taking into account demand reduction measures

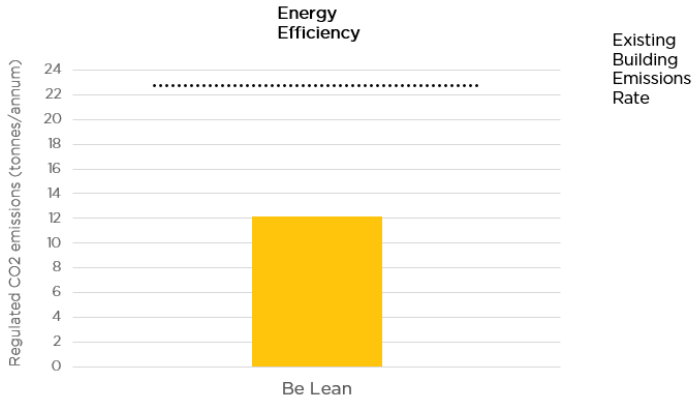


Figure 7. Regulated carbon emissions improvement of the 32 Torrington Square after taking into account demand reduction measures.

4.3 Energy Efficient Supply (Be Clean)

4.3.1 Heating infrastructure

The GLA Guidance on preparing energy assessments (March 2016) requires that all applications demonstrate how their energy systems have been selected in accordance with the order of preference in Policy 5.6B (London Plan).

1. **Connection to existing heating or cooling networks** – The development is located near to the Bloomsbury Heat & Power network4. However, connection is currently not viable due to the condition and capacity of the existing plant. There is a plan to complete such upgrade in the next few years5 and therefore future connection has been considered and is discussed in further detail in point number 3 below.

2. **Site wide CHP network** – Section 11.30 of the GLA guidance on preparing energy assessments (March 2016), states that a CHP unit will not be applicable for non-domestic developments with a simultaneous demand for heat and power for less than 5000 hours per annum. The proposed development is a relatively small offices space. As a result, the base load (represented by the Domestic Hot Water consumption) will make the use of a site CHP system technically and financially unfeasible.

   Enable Future Connection – In order to facilitate future connection to the Bloomsbury district heating network, a centralised water based system is proposed to provide space heating and Domestic Hot Water (DHW). The boiler room is proposed at the front of the building, which is where the district heating pipe fur future supply is currently located. In the meantime, heating will be generated via highly efficient low NOx emissions boilers.

[4] https://www.theade.co.uk/members/district-heating/Bloomsbury-Heat-And-Power-Consortium

http://www.camden.gov.uk/ccm/content/environment/green/supplying-low-carbon-energy.en

[5] https://www.soas.ac.uk/estates/environment/energy-management/

Heating option	Appropriate to development?	Reason why the option is / is not appropriate
Connect to existing low carbon heat network.	No	Bloomsbury Heat and Power network is near to the assessed development. However, it should be upgraded in order to enable future connection with new and existing buildings.
Create a site wide heat network	No	Installation of a CHP unit has been deemed unfeasible due to the anticipated low domestic hot water demand.
Enable future connection	Yes	Water based heating system as well as special allowances made to facilitate future connection.

Table 11. Appropriateness of heating infrastructure options

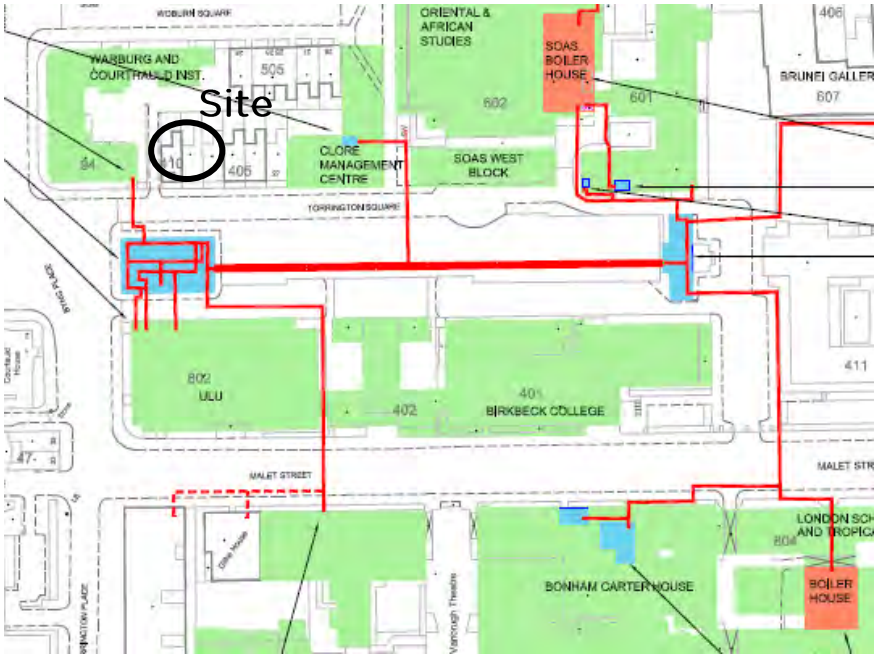


Figure 8. District Heating Site Plan (Provided by MKP Consultants).

4.3.2 Low Carbon Heating: Development Performance

As no CHP has been specified, the performance of the Be Clean remains the same as the Be Lean scenario for both 32 Torrington Square and The Annex.

The Annex

CO_2 Emissions (Tonnes CO_2 per annum)	Regulated
Base line (PartL 2016 compliant development)	10.9
After energy demand reduction	9.8
After CHP	9.8
% Improvement over baseline	**10%**

Table 12. Regulated carbon emissions for the Be Clean scenario.

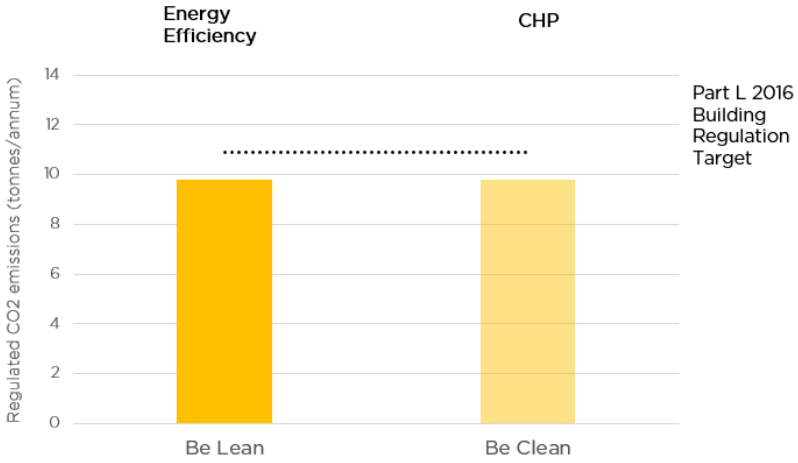


Figure 9. Carbon emissions reduction for the Be Clean scenario

32 Torrington Square

CO_2 Emissions (Tonnes CO_2 per annum)	Regulated
Base line (Existing building)	22.7
After energy demand reduction	12.1
After CHP	12.1
% Improvement over baseline	**47%**

Table 13. Regulated carbon emissions for the Be Clean scenario

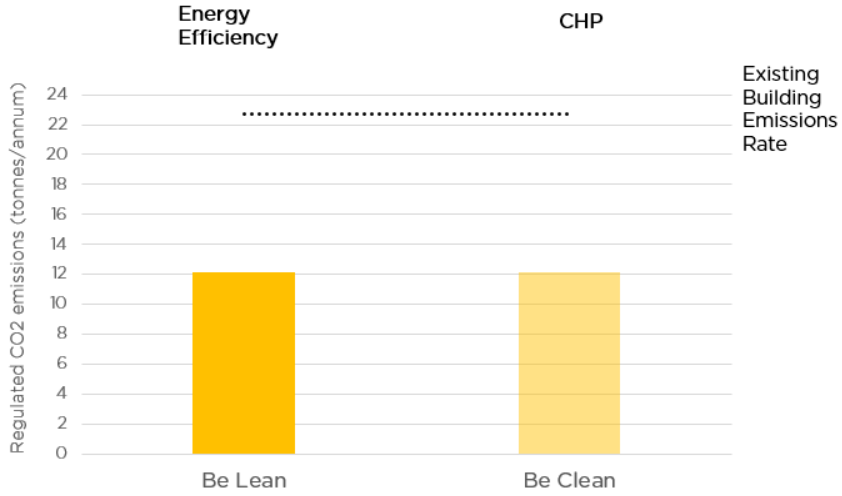


Figure 10. Carbon emissions reduction for the Be Clean scenario

TWIN EARTH

4.4 Renewable Energy (Be green)

4.4.1 Feasibility of renewable technologies

A feasibility study has been undertaken to evaluate the viability of incorporating low and zero carbon technologies within the development.

The suitability of each technology for the development has been evaluated based on technical viability, considering spatial requirements, suitability for the development, energy demand profile and potential for carbon emissions savings. In addition, the compatibility of each technology with the proposed heating strategy was considered.

Appendix E provides details of each technology and the appropriateness to the development. The following technologies were considered:

- Photovoltaic Panels
- Solar Hot Water
- Heat Pumps (air and ground source)
- Wind Turbines
- Biomass Heating
- Combined Heat and Power (CHP)

Following the review of each technology, none of the available renewable energy technologies was considered as viable for the assessed development.

Technology	Technical Feasibility	Recommended?
Photovoltaic panels (PV)	Whilst the use of PV panels is in principle a feasible technology for the project, they have been ruled out because of the visual impact of external roof features on the Grade II listed building. A copy of the pre-planning feedback letter from Camden stating the above has been included in Appendix I of this report. Therefore, the installation of Solar Thermal collectors is not feasible for the project.	No
Solar hot water (SHW)	Same as above	No
Heat Pumps	The installation of a VRF system could make use of heat recovery between the terminal units, helping to deliver excellent heating and cooling efficiencies. In addition, high carbon savings could be achieved. However, heat pumps cannot be considered as a viable solution as they would need to serve a listed building with poor infiltration and poor U-values and this would require high flow and return temperatures that cannot be efficiently provided by a heat pump.	No
Wind turbines	The visual impact associated to roof mounted turbines is unacceptable for the development. Please see solar thermal above for further explanation.	No
Biomass heating & biomass CHP	Biomass based systems have been ruled out as the project cannot accommodate the spatial requirements for fuel loading and storage. Additionally, biomass has high NOx emissions and is therefore not deemed a suitable solution for central London, where air quality is a major concern.	No

Table 14. Renewables – feasibility of each technology

4.4.2 Renewable energy: Development Performance

As no renewable technology has been specified, the performance of the Be Green remains the same as the Be Lean scenario for both 32 and The Annex.

The Annex

CO_2 Emissions (Tonnes CO_2 per annum)	Regulated
Base line (PartL 2013 compliant development)	10.9
After energy demand reduction	9.8
After CHP	9.8
After renewable energy	9.8
% Improvement over baseline	**10%**

Table 15. Regulated carbon emissions improvement of the development after taking into account demand reduction, CHP and renewables.

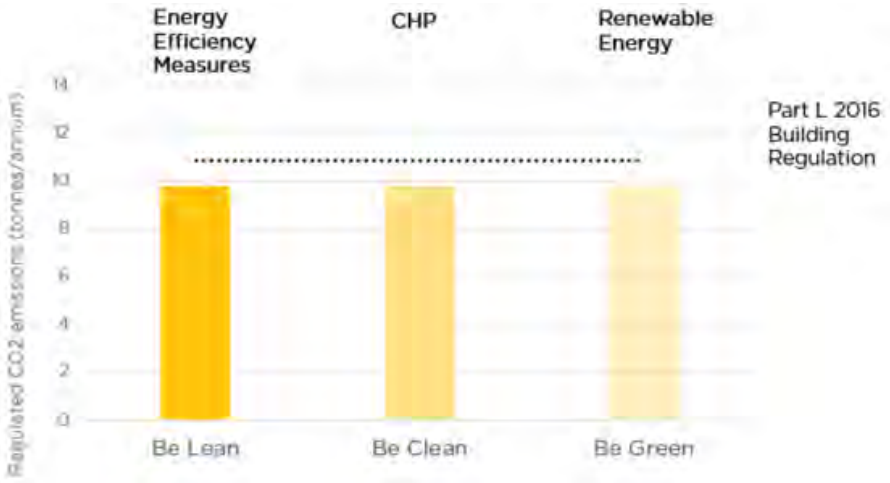


Figure 11. Regulated carbon emissions improvement of the development after taking into account demand reduction, CHP and renewables

32 Torrington Square

CO_2 Emissions (Tonnes CO_2 per annum)	Regulated
Base line (Existing building)	22.7
After energy demand reduction	12.1
After CHP	12.1
After renewable energy	12.1
% Improvement over baseline	**47%**

Table 16. Regulated carbon emissions improvement of the development after taking into account demand reduction, CHP and renewables.

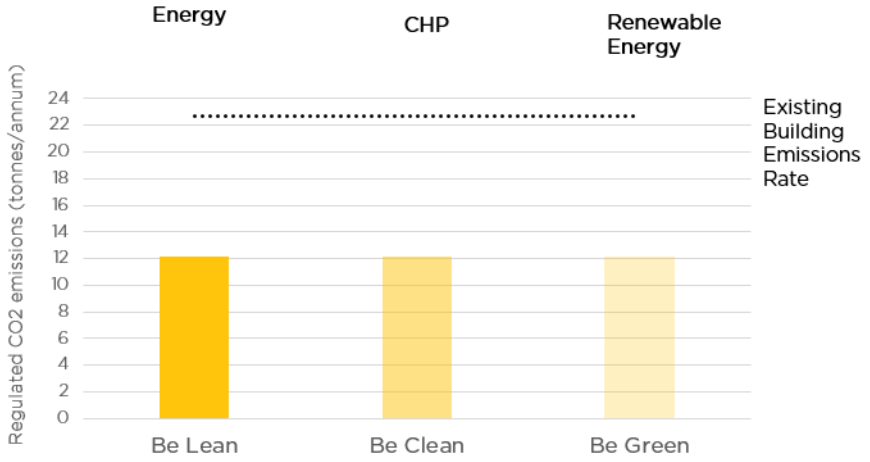


Figure 12. Regulated carbon emissions improvement of the development after taking into account demand reduction, CHP and renewables

4.4.3 Summary of Performance against targets

All efforts have been made to minimise carbon emissions associated to the building following a be lean, be clean, be green approach.

In addition, the development has been future proofed for connection to a district heating network. A centralised water based

system served by highly efficient gas boilers is proposed which will allow easy replacement for a DH network supply.

Although, the development should aim for a 20% on site renewable energy supply, this is not possible due to site constrains. However, a robust strategy has been provided that achieves the following:

The Annex (New Part)

- 10% improvement over a Part L 2016 Building Regulations compliant development.
- Energy performance required to achieve a BREEAM 'Excellent' rating which is a planning requirement for all major development.
- Compliance with Criterion 3 of Part L 2A Building Regulations

32 Torrington Square (Refurbished Part)

- 47% improvement over the existing unrefurbished development.
- The Net value of the proposed environmental improvements (e.g. lighting, lighting controls, heating etc.) will be at least 10% of the Net Construction Value.

4.5 Approach to minimising cooling energy

The development has been designed to limit the internal heat gains and optimising the façade to minimise the need for cooling. The approach to the design has followed the cooling hierarchy as set out in Policy 5.8 of the London Plan:

1. **Minimising internal heat generation through energy efficient design:**

All distribution pipework will be thermally insulated in compliance with minimum Part L standards.

Pipe lengths will be minimised, particularly lateral pipework in corridors

Pipe configurations will minimise heat loss e.g. through twin pipe / flow and return configurations.

Specification of energy efficient lighting will reduce the internal heat gains.

2. **Reducing the amount of heat entering the building in summer:**

The Annex includes carefully designed shading measures, including deep reveals and shading from surrounding buildings. In addition, the use of high performance solar control glass will limit solar heat gains.

High reflective internal roller blinds with low transmittance should be installed in both new and refurbished part of the development. Please see Appendix D for further details.

3. **Use of thermal mass and high ceilings to manage heat within the building**

Thermal mass has been considered; however, given the limited exposed facades and glazing, the amount of area receiving direct sunlight would not be sufficient to justify its use.

Floor to ceiling height varies across the development. However, the design has ensured that no floor has less than 2.7m height.

4. **Passive ventilation**

Due to the urban location of the development and impact from noise and air pollution, the annex will use fixed windows. This prevents the use of passive / natural ventilation.

Due to the Listed nature of 32 Torrington Square, the building will have natural ventilation through half openable sash windows.

5. **Mechanical ventilation:**

High efficiency mechanical ventilation with Heat Recovery will be provided in the annex as well as in specific rooms in 32 Torrington Square.

The Annex has been tested against Building Regulation Part L2A, Criterion 3 which assesses how the building has been designed to limit heat gains in the summer. As a result of the features detailed above, the building complies with the minimum performance standards set out in the regulation. Please refer to Appendix F which includes details of the Criterion 3 assessment results.

Natural ventilation only is proposed by 32 Torrington Square.

4.6 PART L COMPLIANCE

Compliance with PartL Building Regulations 2016 has been checked for The Annex as it is a requirement established by the planning authorities. Performance has been reviewed against the following criteria:

- Criterion 1 – Achieving the Target Emissions Rate
- Criterion 3 – Limiting the Effect off Heat gains in summer

The table below summarises the results:

	Office	Retail (based on shell and core)
Criterion 1	BER<TER	BER<TER
Criterion 3	No risk overheating	

Table 17 Summary of PartL compliance (pre-planning assessment)

The results show that compliance with PartL Building Regulations is anticipated. Assumptions as well as compliance reports have been included in Appendices C and F.

Note that assessment against Part L will need to be undertaken at the detailed design stage and post construction in compliance with building regulations.

SUSTAINABILITY STRATEGY

5. SUSTAINABILITY STRATEGY

This section reviews the development sustainability credential for a wide range of environmental aspects and demonstrates how issued raised within the LBoC Local Plan and the London Plan have been addressed.

5.1 WATER

5.1.1 Internal Water Use

Savings will be achieved by reducing the water consumption demand through the specification of water efficient sanitary ware. Three BREEAM credits have been targeted which will require a specification with an equivalent total consumption to the one below the development:

- 6/3l dual flush toilets for standard toilets
- 4/2l dual flush toilets for DDA toilets
- Hand wash basin taps – 5l/min
- Staff kitchenette taps – 5l/min
- Showers – 8l/min

No urinals have been specified for the development.

The above specification will achieve a 40% improvement over the BREEAM baseline, which exceeds the requirements of a BREEAM Excellent building.

A copy of the BREEAM calculator has been included in Appendix J of this report.

Whilst water usage can be limited through the building specification, delivery of these targets during operation will require occupants to conserve water use. Provision of a water meter with a pulsed output for connection to the BMS is being proposed to enable monitoring of water consumption, raise awareness and allow identification of potential system leaks through a leak detection system. Water wastage will also be prevented by installing solenoid valves linked to presence detectors in the toilet cores to automatically shut-off water supply during non-occupied periods.

The use of grey water recycling and rainwater harvesting has been considered; however, it has not been deemed suitable due to the lack of space to allocate the required storage.

5.1.2 External Water Use

External water use would only be requited for irrigation for the soft landscaping / planting provided at ground level. The use of potable water for irrigation will be prevented through the specification of native plants which solely rely on precipitation avoiding the installation of any permanent irrigation system. This measure will also ensure that planting is well maintained with minimum maintenance to avoid future replanting.

If permanent irrigation was to be installed, a drip-fed system would be specified.

5.2 MATERIALS

Whilst carbon emissions are often only associated with operational energy consumption, the embodied carbon of new developments can have a significant impact on the whole life environmental impact of the development.

Materials will be specified to minimise the environmental impact through the life of the building as well as the quality of the indoor environment. The following is being proposed:

- Specification of main building materials with a good rating on the Green Guide to specification aiming for A and A+ wherever feasible.
- At least 80% of all external hard landscaping and 80% of all boundary protection (by area) in the construction zone achieves an A or A+ rating, as defined in the Green Guide to Specification.
- The contractor will be required to develop and implement a sustainable procurement plan for materials.
- Insulation specified for Building envelope and building services has an Insulation index[6] no lower than 2.5.
- Specification of locally sourced materials wherever possible.
- Require contractor to demonstrate Chain of Custody (FSC or PEFC certification) for all timber used in the project including permanently installed timber and timber used during construction.
- Materials and products specified will be low or free of volatile organic compounds (VOCs). This is restricted in 32 Torrington due to the listed nature.
- Risk of degradation due to climate will be considered when specifying building envelope materials.
- Specification of materials with a recycled content wherever possible.
- Design for durability will be a key consideration. Vulnerable areas such as areas with high pedestrian traffic will be identified and suitable heavy duty materials and protection measures will be specified.
- Material efficiency will be considered at each stage of the project from feasibility to completion, with options being considered to reduce material waste, including: off-site prefabrication, re-using materials in-situ.

5.2.1 Re-used and recycling of materials

The LBoC policy identifies that at least 10% of the total value of materials should be derived from recycled or re-used sources.

The existing building at 32 Torrington Square will have a retained façade which will be deconstructed and made-good with minimal

[6] The Insulation Index is a parameter created by the BRE to measure Embodied Impact of materials which depends on the thermal properties of the insulation, the amount of insulation and the Green Guide rating of the product. Materials selected should have low thermal conductivity and a Green Guide rating of A or A+.

alteration to the existing structure thereby a significant portion of the existing building being retained. The majority of the internal partitions will be retained and upgraded for acoustic purposes. The floors will also be retained and structurally reinforced as necessary.

With a significant portion of the existing structure and fabric at 32 Torrington Square will be retained / re-used with repairs, this will to contribute to significantly more than 10% of the overall building materials being from a recycled / reused source in line with Camden Local Policy. With regards to The Annex, options for utilising recycled and re-used materials are limited and Webb & Yates have advised that is it unlikely that the aggregate can be sourced economically within a reasonable distance to the batching plant, however reinforcement is usually made from 100% recycled content.

As the total contribution is from existing materials, it is not possible to quantify the value in pounds as a percentage although it is anticipated that this is significantly more than 10% of the materials value.

5.3 WASTE

Waste minimisation has been considered during design, construction and building operation.

5.3.1 Waste minimisation through design

A careful design can minimise waste by reducing the amount of raw materials required to construct the building, minimising future replacements and incorporating materials with recycling content amongst others.

Design measures adopted by the project include:

- Review the potential to minimise the amount of raw materials used in the project at each RIBA Stage from early stages of design through construction.
- Considering the specification of recycled aggregates for high grade uses.
- Complete a building-specific functional adaptation strategy study to identify design improvements to facilitate future adaptation.

Functional Adaptability

A functional adaptability appraisal has been developed by the design team during the concept stages which considers design measures taken to accommodate future changes of use of the building over its lifespan. The aim of this is to design a building which will allow functional adaptability and thereby reduce the waste typically generated when a change in functionality / use takes place e.g. demolition, major refurbishment.

The current proposals at 32 Torrington Square and the Annex include a range of design measures to "future proof" the building including:

- Moveable partitions
- Dropped ceiling
- Easily replaceable light-weight cladding system on the façade
- Roof-mounted plant to allow for future expansion of service loads and plant replacement
- Transformable furniture to encourage multi-functional use of space by allowing on set of furniture to be folded away or stored and in cupboards
- Easily replaceable floor and wall finishes to accommodate change of tenant scenario

Both the superstructure and substructure of the proposed development at the Annex have been developed to ensure future changes of use can be accommodated e.g. a framed structure with column free spaces where possible, with internal partitions being non-loadbearing, utilising structural materials and forms which can be adapted to accommodate new services provision etc.

Research, office and meeting room spaces are of a scale that can be easily re-planned and/or subdivide to suit alternative future uses. The building has been designed to allow future conversion to office/research space should the client have need to expand the building.

Mechanical and electrical services will be designed to meet the current occupancy and loadings for the current proposals, but the incoming services will be sized to meet future increased loads both electrically and mechanically.

An allowance will be made within all risers and service routes to potentially allow additional services or larger services to be distributed around the building. The strategy for the proposed building is for all areas to be utilised by one tenant / user, but the potential for the building to be split on a floor by floor basis or by dividing floor plates can be accommodated by additional sub-metering where required.

5.3.2 Construction Waste

Waste minimisation during construction will be one of the key contractor responsibilities.

The contractor will be required to develop a Resource Management

Plan (RMP) prior to the commencement of any site works and to demonstrate implementation through waste carriage records. As part of the RMP, the contractor will be required to set project targets with regards to diversion from landfill as well as waste generation from non-hazardous waste.

Diversion from landfill

For the Annex, a minimum of 80% by weight (or 70% by volume) of the construction waste will be sent to recycling / diverted from landfill. For 32 Torrington Square this target is increased to 85% by weight (or 90% by volume).

Resource Efficiency

For the Annex, the total construction waste generation will be not higher than 7.5m^3 or 6.5 tonnes per 100m^2 GIFA and not higher than 4.5m^3 or 1.2 tonnes per 100m^2 GIFA for the refurbishment at 32 Torrington Square.

Waste streams arising during construction should be measured and compared with established benchmarks on a regular basis to track performance.

The Contractor will also be required to ensure that construction waste management is undertaken by certified carriers with a proven track record.

5.3.3 Operational Waste

Building occupants are more likely to recycle if easily accessible sorting facilities are provided.

The University of London (Birkbeck) have developed a standalone waste management policy (32 Torrington Waste Management Plans and Operations, March 2017) which is focused on the proposed redevelopment and relating to all waste streams arising from all business activities on this site. This includes how waste is segregated, stored and collected by the waste disposal contractor.

Waste in organised on site through the use of waste and recycling bins located on every floor of the buildings and collected daily in waste bin bags which are then collected and transferred to the waste compound approximately 50m from the site.

The compound also houses a compactor which can help free up-to two thirds of extra capacity per bin.

Birkbeck also operate a waste policy aimed at education key staff and other members of the Birkbeck community aimed at minimising operational waste and increasing recycling rates.