

# **Sustainability & Energy Statement**

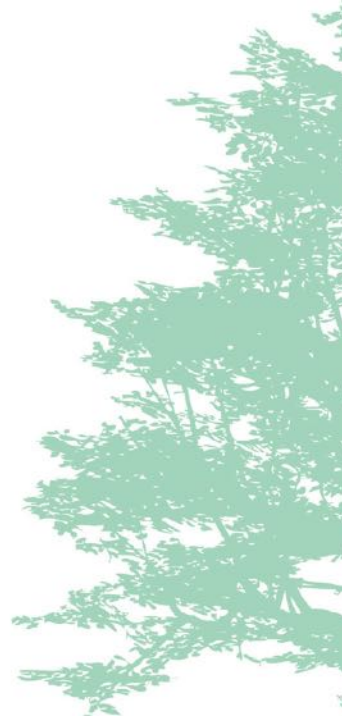
## **Arlington Works, 23 Arlington Road, Twickenham**

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## Executive Summary

This Statement has been prepared in support of a planning application to provide five commercial units totalling 610 m<sup>2</sup> and 24, 1, 2 and 3-bedroom apartments at the Arlington Works, 23 Arlington Road, Twickenham. It includes an energy demand assessment showing how selected energy efficiency, low carbon and renewable energy measures have been incorporated into the development design.

Working drawings have yet to be produced but SAP calculations have been prepared for a sample of the apartments and a SBEM calculation has been prepared for one of the commercial units based upon an agreed construction specification and the detailed planning drawings. When aggregated across all development these calculations provide an accurate estimate of the emissions from the site

It is proposed to enhance the fabric insulation standards of the buildings and to install an air source heat pump into each of the five commercial units. These systems will provide space heating and cooling if required. The apartments will be provided with individual gas condensing boilers. In addition it is proposed to install a photovoltaic array totalling 19.8 kW. This will be comprised of 66 x 300W panels and a Roof Layout is attached as Appendix 3 showing the possible location of the panels.

The site does not have sufficient baseload to efficiently sustain a communal heating system either with or without a combined heat and power unit and therefore neither is proposed.

The combined reduction as a result of the energy efficiency measures (Be Clean) and the use of renewable technologies (Be Green) can be summarised as follows;

	Total Emissions	% Reduction
	kg CO <sub>2</sub> per year	
Baseline (Building Regulations TER)	<b>39,321</b>	-
Be Lean - after energy efficiency (DER/BER)	35,064	10.83%
Be Green - after efficiency and renewable energy	<b>25,494</b>	<b>35.16%</b> (of TER)

The residual carbon dioxide emissions are **25.494 tonnes** and therefore the carbon offset payment required by the London Plan is **£44,089**.

The commercial accommodation will achieve BREEAM, 'Excellent' and a Pre-Assessment Estimator is included as Appendix 1.

The London Borough of Richmond Sustainable Construction Checklist is attached as Appendix 2.

The summer overheating risk to the most vulnerable apartments is assessed as 'Medium'. This meets the requirements of the Building Regulations for overheating criteria.

## 1.0 Introduction

This report has been commissioned by Sharpe Refinery Service (Hydro-Carbons) Ltd and provides a Sustainability and Energy Statement for the construction of five commercial units totalling 610 m<sup>2</sup> in floor space and 24, 1, 2 & 3-bedroom apartments on land at Arlington Works, 23 Arlington Road, Twickenham.

The report describes the methodology used in assessing the development and the initiatives proposed.

The buildings have been designed and will be constructed to reduce energy demand and carbon dioxide emissions. The objective is to reduce the energy demand to an economic minimum by making investment in the parts of the buildings that have the greatest impact on energy demand and are the most difficult and costly to change in the future, namely the building fabric. Once cost effective structures have been designed, low-carbon and renewable technologies will be considered for installation to provide heat and/or electricity.

The following hierarchy will be followed:

- Lean      reduce demand and consumption
- Clean     increase energy efficiency
- Green     provide low carbon renewable energy sources

The report has been prepared by Ivan Ball of Bluesky Unlimited who are sustainability consultants.

## 2.0 Planning Policy Context

### National Policy

The UK Government published its sustainable development strategy in 1999 entitled “A better quality of life: A strategy for sustainable development in the UK”. This sets out four main objectives for sustainable development in the UK:

- Social progress that recognises the needs of everyone.
- Effective protection of the environment.
- Prudent use of natural resources.
- Maintenance of high stable levels of economic growth and employment.

Sustainable Communities: Building for the Future, known colloquially as the Communities Plan was published in 2003. The Plan sets out a long-term programme of action for delivering sustainable communities in both urban and rural areas. It aims to tackle housing supply issues in parts of the country, low demand in other parts and the quality of our public spaces. The Communities Plan describes sustainable communities as: Active, inclusive and safe, well run, environmentally sensitive, well designed and built, well connected, thriving, well served and fair for everyone.

The most relevant national planning policy guidance on sustainability is set out in:

- National Planning Policy Framework - 2018

Paragraph 148 states;

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

## Regional and Local Policies

The Development Plan comprises the London Plan (2016) and the London Borough of Richmond Local Plan (2018).

**London Plan**, published March 2016 – the following policies are relevant to the application:

### **Policy 5.2 – Minimising carbon dioxide emissions**

A *Development proposals should make the fullest contribution to minimising carbon dioxide emissions in accordance with the following energy hierarchy:*

- 1 *Be lean: use less energy*
- 2 *Be clean: supply energy efficiently*
- 3 *Be green: use renewable energy*

B *The Mayor will work with boroughs and developers to ensure that major developments meet the following targets for carbon dioxide emissions reduction in buildings. These targets are expressed as minimum improvements over the Target Emission Rate (TER) outlined in the national Building Regulations leading to zero carbon residential buildings from 2016 and zero carbon non-domestic buildings from 2019.*

#### **Residential and Non-residential buildings:**

<b>Year</b>	<b>Improvement on 2013 Building Regulations</b>
2013 – 2016	35 per cent

C *Major development proposals should include a detailed energy assessment to demonstrate how the targets for carbon dioxide emissions reduction outlined above are to be met within the framework of the energy hierarchy.*

D *As a minimum, energy assessments should include the following details:*

- a *calculation of the energy demand and carbon dioxide emissions covered by the Building Regulations and, separately, the energy demand and carbon dioxide emissions from any other part of the development, including plant or equipment, that are not covered by the Building Regulations (see paragraph 5.22) at each stage of the energy hierarchy*
- b *proposals to reduce carbon dioxide emissions through the energy efficient design of the site, buildings and services*
- c *proposals to further reduce carbon dioxide emissions through the use of decentralised energy where feasible, such as district heating and cooling and combined heat and power (CHP)*
- d *proposals to further reduce carbon dioxide emissions through the use of on-site renewable energy technologies.*

- E The carbon dioxide reduction targets should be met on-site. Where it is clearly demonstrated that the specific targets cannot be fully achieved on-site, any shortfall may be provided off-site or through a cash in lieu contribution to the relevant borough to be ring fenced to secure delivery of carbon dioxide savings elsewhere.*

**Policy 5.3 – Sustainable design and construction**

- A The highest standards of sustainable design and construction should be achieved in London to improve the environmental performance of new developments and to adapt to the effects of climate change over their lifetime.*
- B Development proposals should demonstrate that sustainable design standards are integral to the proposal, including its construction and operation, and ensure that they are considered at the beginning of the design process.*
- C Major development proposals should meet the minimum standards outlined in the Mayor's supplementary planning guidance and this should be clearly demonstrated within a design and access statement. The standards include measures to achieve other policies in this Plan and the following sustainable design principles:*
- a. minimising carbon dioxide emissions across the site, including the building and services (such as heating and cooling systems)*
  - b. avoiding internal overheating and contributing to the urban heat island effect*
  - c. efficient use of natural resources (including water), including making the most of natural systems both within and around buildings*
  - d. minimising pollution (including noise, air and urban runoff)*
  - e. minimising the generation of waste and maximising reuse or recycling*
  - f. avoiding impacts from natural hazards (including flooding)*
  - g. ensuring developments are comfortable and secure for users, including avoiding the creation of adverse local climatic conditions*
  - h. securing sustainable procurement of materials, using local supplies where feasible, and*
  - i. promoting and protecting biodiversity and green infrastructure.*

**Policy 5.6 – Decentralised energy in development proposals**

- A Development proposals should evaluate the feasibility of Combined Heat and Power (CHP) systems.*
- B Major development proposals should select energy systems in accordance with the following hierarchy:*
- 1 Connection to existing heating or cooling networks*
  - 2 Site wide CHP network*
  - 3 Communal heating and cooling.*
- C Potential opportunities to meet the first priority in this hierarchy are outlined in the London Heat Map tool. Where future network opportunities are identified, proposals should be designed to connect to these networks.*

### **Policy 5.7 – Renewable Energy**

*B Within the framework of the energy hierarchy (Policy 5.2), major development proposals should provide a reduction in expected carbon dioxide emissions through the use of on-site renewable energy generation, where feasible.*

### **Policy 5.15 – Water Use and Supplies**

*B Development should minimise the use of mains water by:*

- a incorporating water saving measures and equipment*
- b designing residential development so that mains water consumption would meet a target of 105 litres or less per head per day*

### **Sustainable Design and Construction SPG – April 2014**

The SPG provides Guidance on how schemes should comply with the London Plan and this Sustainability Statement has been prepared in accordance with the Guidance provided.

### **London Borough of Richmond**

The London Borough of Richmond adopted its new Local Plan on the 3<sup>rd</sup> July 2018 and this supersedes the Core Strategy (2009) and the Development Management Plan (2011).

The following policy is of particular relevance to the topic area of this Statement and has been edited for clarity and relevance to the application in question.

### **Local Plan (2018)**

#### ***Policy LP 22 - Sustainable Design and Construction***

*A. Developments will be required to achieve the highest standards of sustainable design and construction to mitigate the likely effects of climate change. Applicants will be required to complete the following:*

- 1. Development of 1 dwelling unit or more, or 100sqm or more of non-residential floor space (including extensions) will be required to complete the Sustainable Construction Checklist SPD. A completed Checklist has to be submitted as part of the planning application.*
- 2. Development that results in a new residential dwelling, including conversions, change of use, and extensions that result in a new dwelling unit, will be required to incorporate water conservation measures to achieve maximum water consumption of 110 litres per person per day for homes (including an allowance of 5 litres or less per person per day for external water consumption).*
- 3. New non-residential buildings over 100sqm will be required to meet BREEAM 'Excellent' standard.*



### **Reducing Carbon Dioxide Emissions**

*B. Developers are required to incorporate measures to improve energy conservation and efficiency as well as contributions to renewable and low carbon energy generation. Proposed developments are required to meet the following minimum reductions in carbon dioxide emissions:*

- 1. All new major residential developments (10 units or more) should achieve zero carbon standards in line with London Plan policy.*
- 2. All other new residential buildings should achieve a 35% reduction.*
- 3. All non-residential buildings over 100sqm should achieve a 35% reduction. From 2019 all major non-residential buildings should achieve zero carbon standards in line with London Plan policy.*

*Targets are expressed as a percentage improvement over the target emission rate (TER) based on Part L of the 2013 Building Regulations.*

*C. This should be achieved by following the Energy Hierarchy:*

- 1. Be lean: use less energy*
- 2. Be clean: supply energy efficiently*
- 3. Be green: use renewable energy*

### **Decentralised Energy Networks**

*D. The Council requires developments to contribute towards the Mayor of London target of 25% of heat and power to be generated through localised decentralised energy (DE) systems by 2025. The following will be required:*

- 1. All new development will be required to connect to existing DE networks where feasible. This also applies where a DE network is planned and expected to be operational within 5 years of the development being completed.*

*Applicants are required to consider the installation of low, or preferably ultra-low, NOx boilers to reduce the amount of NOx emitted in the borough.*

*Local opportunities to contribute towards decentralised energy supply from renewable and low-carbon technologies will be encouraged where appropriate.*

### 3.0 Assessment Methodology

The baseline energy demand and carbon dioxide emissions for the development have been established using agreed building specifications and the detailed planning drawings.

A number of calculations have been prepared for a representative number of units.

A SBEM calculation prepared for one of the commercial units and the results have been aggregated across all commercial accommodation to provide a total emissions figure.

A range of SAP calculations have been prepared for the representative range of the residential units including a 1-Bedroom apartment of 50.6 m<sup>2</sup>, which has been modelled as a ground-floor and mid-floor unit (there are no top-floor 1-Bedroom apartments) and for a 3-Bedroom apartment of 76.1 m<sup>2</sup> modelled as a ground, mid and top-floor unit. It is assumed the two duplex apartments will have the same emissions as a top-floor 3-Bedroom unit.

The results from the SAP calculations have been aggregated across units of a similar floor area to deduce the total site emissions.

#### Emission Factors

The CO<sub>2</sub> emission factors, where applicable, used throughout this report have been taken from the Building Regulation Approved Document L - 2013.

	kg CO <sub>2</sub> /kWh
Natural Gas	0.216
Grid supplied electricity	0.519
Displaced electricity	0.519

In assessing this proposal we have also been informed by the following guidance:

- **London Sustainability Checklist**
- **BRE Green Guide to Specification**  
The Building Research Establishment Green Guide to Specification lists building materials and components, and ranks their potential life cycle environmental impact.

#### 4.0 Proposal

The proposal is for the erection of five, commercial units and 24, 1, 2 & 3-bedroom apartments.

The accommodation schedule is;

Unit Type	No.	Area	Totals
		m <sup>2</sup>	m <sup>2</sup>
<b>Commercial</b>			
Unit 5	1	75.2	75.2
Unit 3	1	133.0	133.0
Unit 1	1	133.2	133.2
Unit 2	1	133.8	133.8
Unit 4	1	134.8	134.8
<b>Sub-Total</b>	<b>5</b>		<b>610.0</b>
<b>Residential</b>			
1-Bedroom apartment	5	50.6	253.0
2-Bedroom apartment	2	62.0	124.0
2-Bedroom apartment	2	62.4	124.8
2-Bedroom apartment	1	71.5	71.5
2-Bedroom apartment	1	72.1	72.1
2-Bedroom apartment	1	74.1	74.1
3-Bedroom apartment	4	75.7	302.8
3-Bedroom apartment	3	76.1	228.3
3-Bedroom apartment	2	76.4	152.8
2-Bedroom apartment	1	78.0	78.0
3-Bedroom duplex apartment	1	101.0	101.0
3-Bedroom duplex apartment	1	101.1	101.1
<b>Sub-Total</b>	<b>24</b>		<b>1,683.5</b>
<b>Total</b>			<b>2,293.5</b>

## **5.0 Energy Efficiency**

### **5.1 Demand Reduction (Be Lean)**

#### **Design**

The energy performance of a building is affected by its design, construction and use and whilst occupant behaviour is beyond the remit of this statement, better design and construction methods can significantly reduce the life cycle emissions of a building and assist the occupant to reduce consumption.

Sustainable design is not just about incorporating renewable technologies; buildings should be designed at the outset to provide suitable environmental conditions for the occupants whilst also consuming as little energy as practical. It is possible to exceed Building Regulations requirements (Part L - 2013) through demand reduction measures alone, which typically include a combination of passive design measures (e.g. building design and efficient building fabric) and active design measures (e.g. variable speed motors).

#### **Passive Design Measures**

The passive design measures proposed include;

##### **Passive Solar Gain**

Passive measures include allowing for natural ventilation and exposed thermal mass coupled with high levels of insulation, air tightness and the control of solar gain.

The layout of the buildings are in the context of the shape of the site and surrounding development but broadly the commercial units and homes are arranged to provide all units with either a north-west and south-east or south-west and north-east orientation. There are six single aspect units (1-Bedroom apartments) which benefit from a south-east orientation.

There are no units with a solely northerly aspect and therefore all have access to sunshine at some point throughout the day.

##### **Natural Daylighting**

The orientation and the size of the windows have been optimised to maximise the amount of natural daylight and therefore reduce the demand for artificial lighting.

## Efficient Building Fabric

### Building Envelope

U-values of the building envelope must meet Building Regulations Part L standards and further improvements to U-values will reduce the building's heating requirements.

There is a commitment to exceed the minimum U-values required by the Building Regulations

Whilst the construction type has not been fixed both the residential and commercial units would suit the use of load bearing walls with either timber I beam or concrete intermediate floors.

The following U-values have been based upon the use of a 300mm load bearing cavity wall with 100mm cavity fully filled with XtraTherm CavityTherm or similar. Ground floors will be insulated with 150mm PIR insulation and flat roofs will be insulated with PIR insulation on top of the roof decking.

Windows are proposed as double glazed with Low 'e' soft coat and argon filled.

It is proposed to set maximum limits for the elemental U-values as follows:

Element	Part L Limiting U-values	Proposed U-values	Proposed Improvement
	W/m <sup>2</sup> K	W/m <sup>2</sup> K	
External Walls	<b>0.30</b>	<b>0.17</b>	<b>43%</b>
Flat Roofs	<b>0.20</b>	<b>0.16</b>	<b>20%</b>
Ground Floors	<b>0.20</b>	<b>0.11</b>	<b>40%</b>
Windows	<b>2.00</b>	<b>1.40</b>	<b>30%</b>

### Air Leakage

Large amounts of heat are lost in winter through air leakage from a building (also referred to as infiltration or air permeability) often through poor sealing of joints and openings in the building

The Building Regulations set a minimum standard for air permeability of 10 m<sup>3</sup> of air per hour per m<sup>2</sup> of envelope area, at 50Pa. The air tightness standards at this site will target a 60% improvement over the Regulations and will seek to achieve a permeability of less than 4m<sup>3</sup>/hr/m<sup>2</sup>.

### Thermal Bridging

The significance of Thermal Bridging, as a potentially major source of fabric heat losses, is increasingly understood. Improving the U-values for the main building fabric without accurately addressing the Thermal Bridging is no longer an option and will not achieve the fabric energy efficiency and energy and CO<sub>2</sub> reduction targets set out in this strategy.

Accredited Construction Details (ACD's) have been developed to provide the performance standards required to achieve the higher energy efficiency requirements of the Building Regulations. The bridging losses have been calculated using SAP Appendix K Table 1.

### **Ventilation**

As a result of increasing thermal efficiency and air tightness, Building Regulations Approved Document F18 was also revised in 2006 to address the possibility of overheating and poor air quality. It has been assumed that individual mechanical extract ventilation units will be provided to all WCs, bathrooms and shower rooms and that the apartments on the south-eastern side of the main building will benefit from natural ventilation and for those rooms on the north-western side of the main building acoustically damped ventilation units will be installed and ventilation systems will be used to allow windows adjacent to the railway to remain closed when required.

**Active Design Measures** will include;

### **Efficient Lighting and Controls**

Throughout the scheme natural lighting will be optimised.

Approved Document L1A requires three in four light fittings (75%) to be dedicated low energy fittings. The development will exceed this and all light fittings will be of a dedicated energy efficient type.

External lighting will be fitted with time controls and light sensors to ensure illumination is restricted to required times. External lighting will be limited to a maximum fitting output of 150w.

### **Heating**

Space heating and hot water demand will be provided to the apartments by natural gas fired combination boilers.

The SAP calculations have been modelled on the use of an Alpha Intec combination boiler, which has NOx emissions of 27 mg/kWh and therefore complies with the policy requirements governing boiler emissions.

The space heating to the commercial units is proposed to be provided by air source heat pumps, which could also provide cooling if required.

## 5.2 Establishing Carbon Dioxide Emissions

### Commercial Accommodation

The baseline emissions for the non-residential space has been established by using a SBEM calculation from similar accommodation built to a similar specification.

The specification has been assumed as follows and includes an installation of an air source heat pump to provide space heating and cooling:

Element	Specification
Ventilation	VRF with mechanical ventilation
SFP (W/l/s)	1.6
HR %	70
Heating	Electric Heat Pump
Efficiency %	450
Cooling	Electric
Efficiency %	4.5
Hot Water	Electric
Efficiency %	100%

The emissions are calculated as follows:

B1 Accommodation	TER CO <sub>2</sub> Emissions	BER CO <sub>2</sub> Emissions
	kg CO <sub>2</sub> /yr	kg CO <sub>2</sub> /yr
B1 accommodation	19.9	16.2
<b>Emissions (per year)</b>	<b>19.9</b>	<b>16.2</b>

### Residential

SAP calculations have been prepared for a 1-Bedroom Ground-floor and Mid-floor apartment at 50.6 m<sup>2</sup>, which are presented as representative of the five 1-Bedroom apartments. A SAP calculation has been prepared for a 3-Bedroom Ground, Mid and Top-floor apartment at 76.1 m<sup>2</sup>, which are presented as representative of all 2 and 3-Bedroom apartments.

It is assumed the two, 3-Bedroom Duplex apartments will have similar emissions to the Top-floor 3-Bedroom apartments.

The modelling has been based on the use of a gas combination boiler to provide space and hot water heating and the results can be summarised as follows:

1-Bed Ground-floor apartment 50.6 m <sup>2</sup>	CO <sub>2</sub> TER	CO <sub>2</sub> DER
	kg/m <sup>2</sup> /yr	kg/m <sup>2</sup> /yr
Space heating	5.92	5.79
Water heating	8.30	7.06
Electricity for pumps and fans	0.77	0.77
Electricity for lighting	2.43	2.43
<b>Total</b>	<b>17.42</b>	<b>16.05</b>

1-Bed Mid-floor apartment 50.6 m <sup>2</sup>	CO <sub>2</sub> TER	CO <sub>2</sub> DER
	kg/m <sup>2</sup> /yr	kg/m <sup>2</sup> /yr
Space heating	3.70	4.17
Water heating	8.39	7.07
Electricity for pumps and fans	0.77	0.77
Electricity for lighting	2.43	2.43
<b>Total</b>	<b>15.29</b>	<b>14.44</b>

3-Bed Ground-floor apartment 76.1 m <sup>2</sup>	CO <sub>2</sub> TER	CO <sub>2</sub> DER
	kg/m <sup>2</sup> /yr	kg/m <sup>2</sup> /yr
Space heating	7.82	7.27
Water heating	6.64	5.50
Electricity for pumps and fans	0.51	0.51
Electricity for lighting	2.28	2.28
<b>Total</b>	<b>17.25</b>	<b>15.56</b>

3-Bed Mid-floor apartment 76.1 m <sup>2</sup>	CO <sub>2</sub> TER	CO <sub>2</sub> DER
	kg/m <sup>2</sup> /yr	kg/m <sup>2</sup> /yr
Space heating	5.55	5.49
Water heating	6.69	5.51
Electricity for pumps and fans	0.51	0.51
Electricity for lighting	2.28	2.28
<b>Total</b>	<b>15.03</b>	<b>13.79</b>



3-Bed Top-floor apartment 76.1 m <sup>2</sup>	CO <sub>2</sub> TER	CO <sub>2</sub> DER
	kg/m <sup>2</sup> /yr	kg/m <sup>2</sup> /yr
Space heating	7.23	7.53
Water heating	6.65	5.50
Electricity for pumps and fans	0.51	0.51
Electricity for lighting	2.28	2.28
<b>Total</b>	<b>16.67</b>	<b>15.82</b>

### Total Emissions

Using the above information the total carbon emissions from the site following the energy efficiency measures detailed can be calculated as follows:

	Area	TER CO <sub>2</sub>	DER/BER CO <sub>2</sub>
	m <sup>2</sup>	kg/year	kg/year
<b>Commercial</b>			
B1 Office Accommodation	610.0	12,139	9,882
<b>Sub-total</b>	<b>610.0</b>	<b>12,139</b>	<b>9,882</b>
<b>Residential</b>			
1-Bed ground-floor apartments	50.6	881	812
1-Bed mid-floor apartments	202.4	3,095	2,923
2 & 3-Bed ground-floor apartments	399.0	6,883	6,208
2 & 3-Bed mid-floor apartments	531.7	7,991	7,332
2 & 3-Bed top-floor apartments (inc. duplexes)	499.8	8,332	7,907
<b>Sub-total</b>	<b>1683.5</b>	<b>27,182</b>	<b>25,182</b>
<b>Totals</b>		<b>39,321</b>	<b>35,064</b>

The total emissions based upon the TER for the units is assessed as:

- **39,321 kg CO<sub>2</sub> per year**

The total emissions based upon the DER and BER for the units is assessed as:

- **35,064 kg CO<sub>2</sub> per year**

The reduction in site CO<sub>2</sub> emissions as a result of the energy efficiency measures incorporated in the building is assessed as;

- **4,257 kg CO<sub>2</sub> per year, which equates to a reduction of 10.83%**

### 5.3 Overheating Assessment

As a consequence of the proximity of railway line to the north-west of the site a number of apartments will require noise attenuation measures. The apartments, which have a façade facing the railway line are all at least dual aspect and therefore the rooms to the south-west, south-east or north-east elevation can benefit from opening windows. In addition the rooms, which are orientated towards the railway line are north-west facing and therefore are not likely to suffer from excessive solar gain. The SAP modelling has assumed windows on the south-west (or north-east) and south-east elevations will be opening and that windows on the north-west elevation will be designed to be closed with ventilation to specific room provided by acoustically damped ventilation units.

The increased thermal mass provided by traditional construction will assist in stabilising summer night-time temperatures.

In addition, the 'g' value of the glazing has been reduced to 0.63 to reduce solar gain. This glazing has been selected as providing the best balance between winter solar gain to provide passive heating within the apartments and limiting summer solar gain to reduce passive overheating.

The Overheating Assessment for each of the modelled apartments can be summarised as follows;

	Likelihood of High Internal Temperature			Assessment
	June	July	August	
1-Bed Ground-floor	Slight	Medium	Medium	<b>Medium</b>
1-Bed Mid-floor	Slight	Medium	Medium	<b>Medium</b>
3-Bed Ground-floor	Slight	Medium	Medium	<b>Medium</b>
3-Bed Mid-floor	Slight	Medium	Medium	<b>Medium</b>
3-Bed Top-floor	Slight	Medium	Medium	<b>Medium</b>

**These results demonstrate the apartments all pass Building Regulations with regards to the overheating criteria.**

#### **5.4 Low-Carbon and Renewable Technologies (Be Clean and Be Green)**

The energy demand established above has been used to test the viability of various low-carbon and renewable technologies as follows.

This section determines the appropriateness of each renewable technology and considers the ability of each technology to comply with the planning requirements as set out above in Section 2.0.

The Government's Renewable Obligation defines renewable energy in the UK. The identified technologies are;

- Small hydro-electric
- Landfill and sewage gas
- Onshore and offshore wind
- Biomass
- Tidal and wave power
- Geothermal power
- Solar

The use of landfill or sewage gas, offshore wind or any form of hydroelectric power is not suitable for the site due to its location. The remaining technologies are considered below;

##### **Wind**

Wind turbines are available in various sizes from large rotors able to supply whole communities to small roof or wall-mounted units for individual dwellings.

The Government wind speed database predicts local wind speeds at Arlington Road to be 4.6 m/s at 10m above ground level and 5.4 m/s at 25m above ground level. This is below the level generally required for commercial investment in large wind turbines and in addition the land take, potential for noise and signal interference make a large wind turbine unsuitable for this development.

Roof mounted turbines could be used at the development to generate small but valuable amounts of renewable electricity but the small output and contribution to total emissions means any investment would be small and purely tokenism. In addition the use of wind turbines will have a detrimental aesthetic impact on the development.

##### **Combined Heat and Power and Community Heating**

Combined heat and power (CHP) also called co-generation is a de-centralised method of producing electricity from a fuel and 'capturing' the heat generated for use in buildings. The plant is essentially a small-scale electrical power station.

The production and transportation of electricity via the National Grid is very inefficient with over 65% of the energy produced at the power station being lost to the atmosphere and through transportation. Consequently CHP can demonstrate significant CO<sub>2</sub> savings and although not necessary classed as renewable energy (depending on the fuel used) the technology is low carbon.

For a CHP plant to be economic it needs to operate for as much of the time as possible (usually deemed to be in excess of 14 hours per day) and therefore the size of the unit are usually based upon the hot water load of the buildings with additional boilers meeting the peak space heating demand.

In order to optimise a combined heat and power or communal heating system, whether fuelled by biomass or a fossil fuel the site needs to be relatively dense with buildings close together and preferable multi storey in order to minimise infrastructure pipe work.

The total hot water load from the residential units is 44,726 kWh per year. Micro CHP units are available with outputs from around 12.5 kW<sub>th</sub> and 5.5. kW<sub>e</sub>, and with the anticipated baseload the unit would run for 9.80 hours per day, which is not economic. CHP is not proposed.

### **Ground Source Heat Pumps**

Sub soil temperatures are reasonably constant and predictable in the UK, providing a store of the sun's energy throughout the year. Below London the groundwater in the lower London aquifer is at a fairly constant temperature of 12° C. Ground source heat pumps (GSHP) extract this low-grade heat and convert it to usable heat for space heating.

GSHP operates on a similar principle to refrigerators, transferring heat from a cool place to a warmer place. They operate most efficiently when providing space heating at a low temperature, typically via under floor heating or with low temperature radiators.

Theoretically, ground source heat pumps could be used subject to satisfactory ground investigation to establish whether the sub strata is appropriate.

However, there is insufficient ground area to accommodate a horizontal 'slinky' collector system for the homes and bore-hole systems would be necessary and the installation of ground source heat pumps into apartment buildings is very complex.

GSHP systems are not proposed.

### **Solar**

#### **(i) Solar Water Heating**

Solar hot water panels use the sun's energy to directly heat water circulating through panels or pipes and the technology is simple and easily understood by purchasers.

Solar hot water heating panels are based generally around two types, which are available being 'flat plate collectors' and 'evacuated tubes'. Flat plate collectors can achieve an output of up to 1,124 kWh/annum (Schuco) and evacuated tubes can achieve outputs up to 1,365 kWh/annum (Riomay).

Panels are traditionally roof mounted and for highest efficiencies should be mounted plus or minus 30 degrees of due south. Evacuated tubes can be laid horizontally on flat roofs but flat plate collectors are recommended for installation at an incline of 30 degrees

Solar hot water panels are considered appropriate and evacuated tube panels could be installed horizontally on the flat roof of the apartment building.

However, servicing units on lower floors can be problematic and therefore it is only really practical to service Plots 17-20 and Plots 23 & 24. These units have currently been modelled with a combination gas boiler and the use of solar hot water panels would require a switch to a conventional boiler with accompanying hot water cylinder. This could detrimentally impact on internal space planning. The total hot water load from these six units is 12,725 kWh per year. Assuming panels could reduce energy demand by 50%, this equates to a reduction in demand of 6,363 kWh per year with an associated reduction in CO<sub>2</sub> emissions of 1,374 kg CO<sub>2</sub> per year.

When combined with the energy efficiency measures this equates to a total reduction in emissions of **5,631 kg CO<sub>2</sub> per year** or **14.32%** of total (TER) emissions.

Solar hot water panels are not proposed.

## (ii) Photovoltaics

Photovoltaic panels (PV) provide clean silent electricity. They generate electricity during most daylight conditions although they are most efficient when exposed to direct sunlight or are orientated to face plus or minus 30 degrees of due south.

PV panels can be integrated into many different aspects of a development including roofs, walls, shading devices or architectural panels. The panels typically have an electrical warranty of 20-25 years and an expected system lifespan of 25-40 years.

Photovoltaic panels could be used and could be installed on the flat roof of all buildings.

In order to achieve the requirements of the planning policy (and accounting for the reduction from energy efficiency measures of 4,257 kg CO<sub>2</sub> per year) a total of 66 x 300W photovoltaic panels would be required.

These could be accommodated on the roofs of the buildings and an indicative Roof Layout is attached as Appendix 3. This quantity of panels would reduce emissions by **9,570 kg CO<sub>2</sub> per year**, which when combined with the reductions from energy efficiency measures equates to a reduction of **35.16%** of TER emissions.

In addition the reduction in emissions from renewable technologies would equate to 27.29% of the DER emissions.

Photovoltaic panels are a viable method of achieving the policy requirement and there is sufficient roof area to accommodate the required quantity.

### **Air Source Heat Pumps (ASHP)**

Air sourced heat pumps operate using the same reverse refrigeration cycle as ground source heat pumps, however the initial heat energy is extracted from the external air rather than the ground. These heat pumps can be reversed to provide cooling to an area although this reduces the coefficient of performance of the pumps.

ASHPs are an appropriate technology for the commercial units where there is a low hot water demand but care will need to be taken to ensure the location of the outside unit does not create a noise nuisance either to the residential neighbours or to other occupants of the commercial accommodation.

## 5.5 Summary of Calculations and Proposals for Low-carbon and Renewable Technologies

The total site CO<sub>2</sub> emissions are calculated as **39,321 kg CO<sub>2</sub> per year (TER)** and **35,064 kg CO<sub>2</sub> per year (DER/BER)**.

To meet the requirements of the planning policy, a reduction of 35% of the total (TER) emissions need to be achieved and the DER emissions need to be reduced by 20% through the use of renewable technologies.

Various technologies are considered above and whilst wind turbines, combined heat and power, ground or air source heat pumps (for the residential units) and solar hot water heating panels are not considered appropriate the use of photovoltaic panels and air source heat pumps for the commercial units are considered feasible and appropriate.

### **Be Lean**

The construction standards proposed include U-values, which demonstrate good practice and improve upon those required by the Building Regulations. Air tightness standards are targeted at a 60% improvement upon the minimum required by the Building Regulations.

The DER/BER is reduced from the TER by **4,257 kg CO<sub>2</sub> per year** or **10.83%** as a result of the energy efficiency measures incorporated into the design.

### **Be Green**

It is proposed to install a total of 66 x 300W photovoltaic panels. The reduction in emissions as a result of the PV panels is **9,570 kg CO<sub>2</sub> per year**.

**The total reduction in emissions following the energy efficiency measures (Be Lean) and the photovoltaic panels (Be Green) is 13,827 kg CO<sub>2</sub> per year, which equates to a reduction of 35.16% of the TER emissions.**

**The reduction in (DER) emissions from renewable technologies is 27.29%**

## **6.0 Climate change adaption and Water resources**

### **Sustainable Drainage Systems (SUDS)**

The site lies within Flood Zone 1 and is classified as being of low risk.

### **Surface Water Management**

Rainwater harvesting butts will be provided for landscaping maintenance.

Consideration has been given to the use of grey water recycling. However, customer's resistance to the appearance of the recycled water and the cost of the systems does not currently make them a viable option. They have therefore not been included in the proposals.

### **Water efficiency measures**

In excess of 20% of the UK's water is used domestically with over 50% of this used for flushing WCs and washing (source: Environment Agency). The majority of this comes from drinking quality standard or potable water.

The water efficiency measures included will ensure that the apartments achieve a water use target of 105 litres per person per day.

Water efficient devices will be fully evaluated, and installed, wherever possible. The specification of such devices will be considered at detailed design stage and each will be subject to an evaluation based on technical performance, cost and market appeal, together with compliance with the water use regulations.

The following devices will be incorporated within the apartments:

- Water efficient taps.
- Water efficient toilets.
- Low output showers.
- Flow restrictors to manage water pressures to achieve optimum levels.
- Water meters with guidance on water consumption and savings.

Water consumption calculations have been carried out using the Water Efficiency Calculator provided by the BRE. Although not perfect this calculator gives a good indication of the probable water use in a dwelling.



Below is a typical specification, which would achieve the 105 Litres per person per day target.

Schedule of Appliance Water Consumption		
Appliance	Flow rate or capacity	Total Litres
WC	4/2.6 litres dual flush	14.72
Basin	1.7 litres/min.	5.98
Shower	8 litres/min	24.00
Bath	160 litres	25.60
Sink	4 litres/min	14.13
Washing Machine	Default used	16.66
Dishwasher	Default used	3.90
		104.99

## 7.0 Materials

The BRE Green Guide to Specification is a simple guide for design professionals. The guide provides environmental impact, cost and replacement interval information for a wide range of commonly used building specifications over a notional 60-year building life. The construction specification will prioritise materials within ratings A+, A or B.

Preference will be given to the use of local materials & suppliers where viable to reduce the transport distances and to support the local economy. A full evaluation of these suppliers will be undertaken at the next stage of design.

In addition, timber would be sourced, where practical, certified by PEFC or an equivalent approved certification body and all site timber used within the construction process would be recycled.

All insulation materials to will have a zero ozone depleting potential

### Construction waste

Targets will be set to promote resource efficiency in accordance with guidance from WRAP, Envirowise, BRE and DEFRA.

The overarching principle of waste management is that waste should be treated or disposed of within the region where it is produced.

Construction operations generate waste materials as a result of general handling losses and surpluses. These wastes can be reduced through appropriate selection of the construction method, good site management practices and spotting opportunities to avoid creating unnecessary waste.

The Construction Strategy will explore these issues, some of which are set out below:

- Proper handling and storage of all materials to avoid damage.
- Efficient purchasing arrangements to minimise over ordering.
- Segregation of construction waste to maximise potential for reuse/recycling.
- Suppliers who collect and reuse/recycle packaging materials

**Appendix 1 – BREEAM Pre-Assessment Estimator**



Building name	Arlington Works
Building score (%)	71.85%
Building rating	Excellent
Minimum standards level achieved	Excellent level

**MANAGEMENT**

**Man 01 Project brief and design**

No. of BREEAM credits available	4	Available contribution to overall score	3.33%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Assessment Criteria	Compliant?	Credits available	Credits achieved
Will stakeholder consultation (project delivery) take place?	Yes	1	1
Will stakeholder consultation (third party) take place?	No	1	0
Will a sustainability champion (design) be assigned?	Yes	1	1
Will a sustainability champion (monitoring progress) be assigned?	Yes	1	1
<b>Total BREEAM credits achieved</b>		<b>3</b>	
<b>Total contribution to overall building score</b>		<b>2.50%</b>	
<b>Total BREEAM innovation credits achieved</b>		<b>0</b>	
<b>Minimum standard(s) level</b>	N/A		

Comments/notes:

**Man 02 Life cycle cost and service life planning**

No. of BREEAM credits available	4	Available contribution to overall score	3.33%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Assessment Criteria	Compliant?	Credits available	Credits achieved
Will an elemental life cycle cost (LCC) analyses be carried out?	No	2	0
Will a component level LCC plan be developed?	No	1	0
Will the predicted capital cost be reported?	No	1	0
Expected capital cost of the project (if available)		£/m <sup>2</sup>	
<b>Total BREEAM credits achieved</b>		<b>0</b>	
<b>Total contribution to overall building score</b>		<b>0.00%</b>	
<b>Total BREEAM innovation credits achieved</b>		<b>N/A</b>	
<b>Minimum standard(s) level</b>	N/A		

Comments/notes:

Man 03 Responsible construction practices

No. of BREEAM credits available	6	Available contribution to overall score	5.00%
No. of BREEAM innovation credits available	1	Minimum standards applicable	Yes

Assessment Criteria	Compliant?	Credits available	Credits achieved
Is all site timber used in the project 'legally harvested and traded timber'?	Yes		
Will/does the principal contractor operate a compliant Environmental Management System?	Yes	1	1
Will a construction stage sustainability champion be assigned?	Yes	1	1
Will a considerate construction scheme be used by the principal contractor? (One credit where 'compliance' has been achieved. Two credits where 'compliance' is significantly exceeded.)	1	2	1
Will construction site impacts be metered/monitored?	Yes		
Will site utility consumption be metered/monitored?	Yes	1	1
Will transport of construction materials and waste be metered/monitored?	No	1	0
Will exemplary level criteria be met?			

Total BREEAM credits achieved	4
Total contribution to overall building score	3.33%
Total BREEAM innovation credits achieved	0
Minimum standard(s) level	Excellent level

Comments/notes:

**Man 04 Commissioning and handover**

No. of BREEAM credits available	1	Available contribution to overall score	0.83%
No. of BREEAM innovation credits available	0	Minimum standards applicable	Yes

Assessment Criteria	Compliant?	Credits available	Credits achieved
Will commissioning schedule and responsibilities be developed & accounted for?			
Will a commissioning manager be appointed?			
Will the building fabric be commissioned?	Yes	1	1
Will a training schedule for building occupiers/managers at Handover?			
Will a building user guide be developed prior to handover?			

Total BREEAM credits achieved	1
Total contribution to overall building score	0.83%
Total BREEAM innovation credits achieved	N/A
Minimum standard(s) level	N/A

Comments/notes:

**Man 05 Aftercare**

**Assessment issue not applicable**

No. of BREEAM credits available	N/A	Available contribution to overall score	N/A
No. of BREEAM innovation credits available	N/A	Minimum standards applicable	N/A

Assessment Criteria	Compliant?	Credits available	Credits achieved
Will aftercare support be provided to building occupiers?			
Will seasonal commissioning occur over 12months once substantially occupied?			
Will a post occupancy evaluation be carried out 1 year after occupation?			
Will exemplary level criteria be met?			

Total BREEAM credits achieved	N/A
Total contribution to overall building score	N/A
Total BREEAM innovation credits achieved	N/A
Minimum standard(s) level	N/A

Comments/notes:

**HEALTH & WELLBEING**

**Hea 01 Visual Comfort**

No. of BREEAM credits available	4	Available contribution to overall score	4.44%
No. of BREEAM innovation credits available	1	Minimum standards applicable	No

Assessment Criteria	Compliant?	Credits available	Credits achieved
Will the design provide adequate glare control for building users?	Yes	1	1
Will relevant building areas be designed to achieve appropriate daylight factor(s)?	1	1	1
Will the design provide adequate view out for building users?	Yes	1	1
Will internal/external lighting levels, zoning and controls be specified in accordance with the relevant CIBSE Guides/British Standards?	Yes	1	1
Will exemplary level criteria be met?	Yes	1	1

Total BREEAM credits achieved	4
Total contribution to overall building score	4.44%
Total BREEAM innovation credits achieved	1
Minimum standard(s) level	N/A

Comments/notes:

**Hea 02 Indoor Air Quality**

No. of BREEAM credits available	1	Available contribution to overall score	1.11%
No. of BREEAM innovation credits available	N/A	Minimum standards applicable	No

Assessment Criteria	Compliant?	Credits available	Credits achieved
Will an air quality plan be produced and building designed to minimise air pollution?			
Will building be designed to minimise the concentration and recirculation of pollutants in the building?			
Will the relevant products be specified to meet the VOC testing and emission levels required?			
Will formaldehyde and total VOC levels be measured post construction?			
Will the building be designed to, or have the potential to provide, natural ventilation?	Yes	1	1
Will exemplary level VOCs (products) criteria be met?			

Total BREEAM credits achieved	1
Total contribution to overall building score	1.11%
Total BREEAM innovation credits achieved	N/A
Minimum standard(s) level	N/A

Comments/notes:

Hea 03 Safe containment in laboratories

Assessment issue not applicable

No. of BREEAM credits available	N/A	Available contribution to overall score	N/A
No. of BREEAM innovation credits available	N/A	Minimum standards applicable	N/A

Assessment Criteria	Compliant?	Credits available	Credits achieved
Will an objective risk assessment of proposed laboratory facilities' design be completed?			
Will the manufacture & installation of fume cupboards and containment devices meet best practice standards?			
Will containment level 2 & 3 labs meet best practice safety & performance criteria?			

Total BREEAM credits achieved	N/A
Total contribution to overall building score	N/A
Total BREEAM innovation credits achieved	N/A
Minimum standard(s) level	N/A

Comments/notes:

Hea 04 Thermal comfort

No. of BREEAM credits available	1	Available contribution to overall score	1.11%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Assessment Criteria	Compliant?	Credits available	Credits achieved
Will thermal modelling of the design be carried out?	Yes	1	1

Total BREEAM credits achieved	1
Total contribution to overall building score	1.11%
Total BREEAM innovation credits achieved	N/A
Minimum standard(s) level	N/A

Comments/notes:



Hea 05 Acoustic Performance

No. of BREEAM credits available	1	Available contribution to overall score	1.11%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Assessment Criteria	Credits	Credits available	Credits achieved
Will the building meet the appropriate acoustic performance standards and testing requirements for: a. Sound insulation b. Indoor ambient noise level c. Reverberation times?	1	1	1

Total BREEAM credits achieved	1
Total contribution to overall building score	1.11%
Total BREEAM innovation credits achieved	N/A
Minimum standard(s) level	N/A

Comments/notes:

Hea 06 Safety and Security

No. of BREEAM credits available	2	Available contribution to overall score	2.22%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Assessment Criteria	Compliant?	Credits available	Credits achieved
Where external site areas are present, will safe access be designed for pedestrians and cyclists?	Yes	1	1
Will a suitably qualified security consultant be appointed and security considerations accounted for?	Yes	1	1

Total BREEAM credits achieved	2
Total contribution to overall building score	2.22%
Total BREEAM innovation credits achieved	N/A
Minimum standard(s) level	N/A

Comments/notes:

ENERGY

Ene 01 Reduction of energy use and carbon emissions

No. of BREEAM credits available	12	Available contribution to overall score	10.88%
No. of BREEAM innovation credits available	5	Minimum standards applicable	Yes

How do you wish to assess the number of BREEAM credits achieved for this issue?

Select the target number of BREEAM credits for the Ene01 issue:

Ene 01 Calculator

Country of the UK where the building is located	<input type="text"/>	Confirm building regulation and version to be used:	<input type="text"/>
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New Construction (shell only)

Building floor area	<input type="text"/>	m2
Notional building heating and cooling energy demand	<input type="text"/>	MJ/m2yr
Actual building heating and cooling energy demand	<input type="text"/>	MJ/m2yr
Notional building primary energy consumption	<input type="text"/>	kWh/m2yr
Actual building primary energy consumption	<input type="text"/>	kWh/m2yr
Target emission rate (TER)	<input type="text"/>	kgCO2/m2yr
Building emission rate (BER)	<input type="text"/>	kgCO2/m2yr
Building emission rate improvement over TER	<input type="text"/>	
Heating & cooling demand energy performance ratio (EPR <sub>ED</sub> )	<input type="text"/>	
Primary consumption energy performance ratio (EPR <sub>PC</sub> )	<input type="text"/>	
CO <sub>2</sub> Energy performance ratio (EPR <sub>CO2</sub> )	<input type="text"/>	
Overall building energy performance ratio (EPR <sub>NC</sub> )	<input type="text"/>	

Where specified, please confirm the energy production from onsite or near site energy generation technologies	<input type="text"/>
Equivalent % of the building's 'regulated' energy consumption generated by carbon neutral sources and used to meet energy demand from 'unregulated' building systems or processes?	<input type="text"/>
Is the building designed to be 'carbon negative' ?	<input type="text"/>
If the building is defined as 'carbon negative' what is the total (modelled) renewable/carbon neutral energy generated and exported?	<input type="text"/>

Total BREEAM credits achieved	8
Total contribution to overall building score	7.25%
Total BREEAM innovation credits achieved	N/A
Minimum standard(s) level	Outstanding level

Comments/notes:

Ene 02 Energy monitoring

Assessment issue not applicable

No. of BREEAM credits available	N/A	Available contribution to overall score	N/A
No. of BREEAM innovation credits available	0	Minimum standards applicable	Yes

Assessment criteria	Compliant?	Credits available	Credits achieved
Will a BMS or sub-meters be specified to monitor energy use from major building services systems?			
Will a BMS or sub-meters be specified to monitor energy use by tenant/building function areas?			

Total BREEAM credits achieved	N/A
Total contribution to overall building score	N/A
Total BREEAM innovation credits achieved	N/A
Minimum standard(s) level	N/A

Comments/notes:

Ene 03 External lighting

No. of BREEAM credits available	1	Available contribution to overall score	0.91%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Assessment criteria	Compliant?	Credits available	Credits achieved
Will external light fittings and controls be specified in accordance with the BREEAM criteria?	Yes	1	1

Total BREEAM credits achieved	1
Total contribution to overall building score	0.91%
Total BREEAM innovation credits achieved	N/A
Minimum standard(s) level	N/A

Comments/notes:

**Ene 04 Low carbon design**

No. of BREEAM credits available	3	Available contribution to overall score	2.72%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Assessment criteria	Compliant?	Credits available	Credits achieved
Will passive design measures be used in line with an analysis be carried out during concept design stage (RIBA stage 2 or equivalent)?	Yes	1	1
Will free cooling measures be implemented in the whole building in line with the passive design analysis?	No	1	0
Will a LZC technology be specified in line with a feasibility study carried out by the completion of the Concept Design stage (RIBA Stage 2 or equivalent)?	Yes	1	1

Total BREEAM credits achieved	2
Total contribution to overall building score	1.81%
Total BREEAM innovation credits achieved	N/A
Minimum standard(s) level	N/A

Comments/notes:

**Ene 05 Energy efficient cold storage**

**Assessment issue not applicable**

No. of BREEAM credits available	N/A	Available contribution to overall score	N/A
No. of BREEAM innovation credits available	N/A	Minimum standards applicable	N/A

Assessment criteria	Compliant?	Credits available	Credits achieved
Will the refrigeration system be designed, installed & commissioned in accordance with BREEAM criteria?			
Will the refrigeration system demonstrate a saving in indirect greenhouse gas emissions?			

Total BREEAM credits achieved	N/A
Total contribution to overall building score	N/A
Total BREEAM innovation credits achieved	N/A
Minimum standard(s) level	N/A

Comments/notes:

Ene 06 Energy efficient transportation systems

Assessment issue not applicable

No. of BREEAM credits available	N/A	Available contribution to overall score	N/A
No. of BREEAM innovation credits available	N/A	Minimum standards applicable	N/A

Assessment criteria	Compliant?	Credits available	Credits achieved
Will a transportation system analysis be carried out to determine and specify the optimum number, size and type of lifts that is most energy efficient?			
Will the relevant energy-efficient features criteria be met?			

Total BREEAM credits achieved	N/A
Total contribution to overall building score	N/A
Total BREEAM innovation credits achieved	N/A
Minimum standard(s) level	N/A

Comments/notes:

Ene 07 Energy efficient laboratory systems

Assessment issue not applicable

No. of BREEAM credits available	N/A	Available contribution to overall score	N/A
No. of BREEAM innovation credits available	N/A	Minimum standards applicable	N/A

Assessment criteria	Compliant?	Credits available	Credits achieved
Pre-requisite: Criterion 1 of Hea 03 - risk assessment of laboratory facilities			
Have the occupants' laboratory requirements & performance criteria been confirmed during the preparation of the initial project brief to minimise energy demand?			
Best Practice Energy Practices in Laboratories (table 27)			
Will the laboratory meet criteria item b) Fan power?			
Will the laboratory criteria item c) Fume cupboard volume flow rates?			
Will the lab meet item d) Grouping / isolation of high filtration/ventilation activities?			
Will the laboratory meet criteria item e) Energy recovery - heat?			
Will the laboratory meet criteria item f) Energy recovery - cooling?			
Will the laboratory meet criteria item g) Grouping of cooling loads?			
Will the laboratory meet criteria item h) Free cooling?			
Will the laboratory meet criteria item i) Load responsiveness?			
Will the laboratory meet criteria item j) Cleanrooms?			
Will the laboratory meet criteria item k) Diversity?			
Will the laboratory meet criteria item l) Room air-change rates?			

Total BREEAM credits achieved	N/A
Total contribution to overall building score	N/A
Total BREEAM innovation credits achieved	N/A
Minimum standard(s) level	N/A

Comments/notes:

Ene 08 Energy efficient equipment

Assessment issue not applicable

No. of BREEAM credits available	N/A	Available contribution to overall score	N/A
No. of BREEAM innovation credits available	N/A	Minimum standards applicable	N/A

Assessment criteria

Which of the following will be present and likely to be a/the major contributor to 'unregulated' energy use?	Present	Major impact
Ref A Small power and plug in equipment?		
Ref B Swimming pool?		
Ref C Communal laundry?		
Ref D Data centre?		
Ref E IT-intensive operation areas?		
Ref F Residential areas?		
Ref G Healthcare?		
Ref H Kitchen and catering facilities?		

Will the significant majority contributor(s) to 'unregulated' energy use above meet the BREEAM criteria?	Compliant	Credits available	Credits achieved

Total BREEAM credits achieved	N/A
Total contribution to overall building score	N/A
Total BREEAM innovation credits achieved	N/A
Minimum standard(s) level	N/A

Comments/notes:

Ene 09 Drying space

Assessment issue not applicable

No. of BREEAM credits available	N/A	Available contribution to overall score	N/A
No. of BREEAM innovation credits available	N/A	Minimum standards applicable	N/A

Assessment criteria

Will internal/external drying space and fixings be provided?	Compliant?	Credits available	Credits achieved

Total BREEAM credits achieved	N/A
Total contribution to overall building score	N/A
Total BREEAM innovation credits achieved	N/A
Minimum standard(s) level	N/A

Comments/notes:

**TRANSPORT**

**Tra 01 Public Transport Accessibility**

No. of BREEAM credits available	3	Available contribution to overall score	3.83%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Building type category (for purpose of Tra01 issue assessment)	Business (office/industrial)
--	------------------------------

Assessment Criteria	Compliant	Credits available	Credits achieved
Indicative public transport accessibility index (AI): Will the building have a dedicated bus service?	10.00	3	3 N/A

AI	Indicative Accessibility Index for pre-assessment
0	Poor or no public transport provision
1	A single BREEAM compliant public transport node available
2	Some BREEAM compliant public transport nodes/services available
4	A selection of BREEAM compliant public transport nodes/services available
8	Good provision of public transport i.e. small urban centre / suburban area
10	Very Good provision of public transport i.e. small/medium urban centre
12	Excellent provision of public transport, i.e. medium urban centre
18	Excellent provision of public transport, i.e. large urban/metropolitan city centre

Total BREEAM credits achieved	3
Total contribution to overall building score	3.83%
Total BREEAM innovation credits achieved	N/A
Minimum standard(s) level	N/A

Comments/notes:

**Tra 02 Proximity to Amenities**

No. of BREEAM credits available	1	Available contribution to overall score	1.28%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Assessment Criteria	Compliant?	Credits available	Credits achieved
Will the building be in close proximity of and accessible to applicable amenities?	Yes	1	1

Total BREEAM credits achieved	1
Total contribution to overall building score	1.28%
Total BREEAM innovation credits achieved	N/A
Minimum standard(s) level	N/A

Comments/notes:

**Tra 03 Cyclist facilities**

No. of BREEAM credits available	2	Available contribution to overall score	2.56%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Building type category (for purpose of Tra03 issue assessment)	Business - (office/Industrial)
How many compliant cycle storage spaces will be provided?	14
What cyclist facilities will be provided?	No compliant facilities

Assessment Criteria	Compliant?	Credits available	Credits achieved
Cycle storage spaces	Yes	2	1
Cyclist facilities	No		

Total BREEAM credits achieved	1
Total contribution to overall building score	1.28%
Total BREEAM innovation credits achieved	N/A
Minimum standard(s) level	N/A

Comments/notes:

**Tra 04 Maximum Car Parking Capacity**

No. of BREEAM credits available	2	Available contribution to overall score	2.56%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Building type category (for purpose of Tra04 issue)	Business - (office/Industrial)
Building's indicative Accessibility Index (sourced from issue Tra01)	10

Assessment Criteria	Compliant?	Credits available	Credits achieved
Will BREEAM's maximum parking capacity criteria for the building type/Accessibility Index be met?	Yes	2	2

Total BREEAM credits achieved	2
Total contribution to overall building score	2.56%
Total BREEAM innovation credits achieved	N/A
Minimum standard(s) level	N/A

Comments/notes:



Tra 05 Travel Plan

No. of BREEAM credits available	1	Available contribution to overall score	1.28%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Assessment Criteria	Compliant?	Credits available	Credits achieved
Will a transport plan based on site specific travel survey/assessment be developed?	Yes	1	1

Total BREEAM credits achieved	1
Total contribution to overall building score	1.28%
Total BREEAM innovation credits achieved	N/A
Minimum standard(s) level	N/A

Comments/notes:

**WATER**

**Wat 01 Water Consumption** Assessment issue not applicable

No. of BREEAM credits available	N/A	Available contribution to overall score	N/A
No. of BREEAM innovation credits available	N/A	Minimum standards applicable	N/A

How do you wish to assess the number of BREEAM credits to be achieved for this issue?

Please select the calculation procedure used

Standard approach data

Water Consumption from building micro-components	<input type="text"/>
Water demand met via greywater/rainwater sources	<input type="text"/>
Total net water consumption	<input type="text"/>
Improvement on baseline performance	<input type="text"/>

Key Performance Indicator - use of freshwater resource

Total net Water Consumption	<input type="text"/>
Default building occupancy	<input type="text"/>

Alternative approach data

Overall microcomponent performance level achieved	<input type="text"/>
Please select:	<input type="text"/>

Total BREEAM credits achieved	N/A
Total contribution to overall building score	N/A
Total BREEAM innovation credits achieved	N/A
Minimum standard(s) level	N/A

Comments/notes:

**Wat 02 Water Monitoring**

No. of BREEAM credits available	1	Available contribution to overall score	2.00%
No. of BREEAM innovation credits available	0	Minimum standards applicable	Yes

Assessment Criteria	Compliant?	Credits available	Credits achieved
Will there be a water meter on the mains water supply to the building(s)?	Yes	1	1
Will metering/monitoring equipment be specified on the water supply to any relevant			
Will all specified water meters have a pulsed output?	Yes		
If the site/building has an existing BMS connection, will all pulsed meters be connected to the BMS?	N/A		

Total BREEAM credits achieved	1
Total contribution to overall building score	2.00%
Total BREEAM innovation credits achieved	N/A
Minimum standard(s) level	Outstanding level

Comments/notes:

**Wat 03 Water Leak Detection and Prevention**

No. of BREEAM credits available	1	Available contribution to overall score	2.00%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Assessment Criteria	Compliant?	Credits available	Credits achieved
Will a mains water leak detection system be installed on the building's mains water supply?	Yes	1	1
Will flow control devices be installed in each sanitary area/facility?			

Total BREEAM credits achieved	1
Total contribution to overall building score	2.00%
Total BREEAM innovation credits achieved	N/A
Minimum standard(s) level	N/A

Comments/notes:

**Wat 04 Water Efficient Equipment**

Assessment issue not applicable

No. of BREEAM credits available	N/A	Available contribution to overall score	N/A
No. of BREEAM innovation credits available	N/A	Minimum standards applicable	N/A

Assessment Criteria	Compliant?	Credits available	Credits achieved
Has a meaningful reduction in unregulated water demand been achieved?			
Total BREEAM credits achieved	N/A		
Total contribution to overall building score	N/A		
Total BREEAM innovation credits achieved	N/A		
Minimum standard(s) level	N/A		

Comments/notes:

**MATERIALS**

**Mat 01 Life Cycle Impacts**

No. of BREEAM credits available	5	Available contribution to overall score	6.73%
No. of BREEAM innovation credits available	3	Minimum standards applicable	No

How do you wish to assess the number of BREEAM credits to be achieved for this issue? Define the number of Mat 01 credits achieved

Assessment Criteria	
Predicted total Mat01 credits achieved	3
Predicted total Mat01 points achieved	
Number of building elements assessed	
Green Guide exemplary level compliant?	No
Has IMPACT compliant software been used?	No
Total BREEAM credits achieved	3
Total contribution to overall building score	4.04%
Total BREEAM innovation credits achieved	0
Minimum standard(s) level	N/A

Comments/notes:

**Mat 02 Hard Landscaping and Boundary Protection**

No. of BREEAM credits available	1	Available contribution to overall score	1.35%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Assessment Criteria	Compliant?	Credits available	Credits achieved
Will ≥80% of all external hard landscaping and boundary protection achieve a Green Guide A or A+ rating?	No	1	0

Total BREEAM credits achieved	0
Total contribution to overall building score	0.00%
Total BREEAM innovation credits achieved	N/A
Minimum standard(s) level	N/A

Comments/notes:

**Mat 03 Responsible Sourcing**

No. of BREEAM credits available	4	Available contribution to overall score	5.38%
No. of BREEAM innovation credits available	1	Minimum standards applicable	Yes

Assessment Criteria	Compliant	Credits available	Credits achieved
All timber and timber based products are 'Legally harvested and trader timber'	Yes		
Is there a documented sustainable procurement plan?	Yes	1	1
Percentage of available responsible sourcing of materials points achieved	36.00%	3	2

Please confirm the route used to assess Mat03 Route 2: Proportion of materials responsibly sourced

Total BREEAM credits achieved	3
Total contribution to overall building score	4.04%
Total BREEAM innovation credits achieved	0
Minimum standard(s) level	Outstanding level

Comments/notes:

**Mat 04 Insulation**

No. of BREEAM credits available	1	Available contribution to overall score	1.35%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Assessment Criteria		Credits available	Credits achieved	
What is the building's targeted insulating index?	2.50	1	1	Note: An insulation
Total BREEAM credits achieved	1			
Total contribution to overall building score	1.35%			
Total BREEAM innovation credits achieved	N/A			
Minimum standard(s) level	N/A			

Comments/notes:

**Mat 05 Designing for durability and resilience**

No. of BREEAM credits available	1	Available contribution to overall score	1.35%
No. of BREEAM innovation credits available	0	Minimum standards applicable	N/A

Assessment Criteria	Compliant?	Credits available	Credits achieved
Will suitable durability/protection measures be specified and installed to vulnerable areas of the building?	N/A	1	1
Will suitable durability/protection measures be specified and installed to exposed parts of the building?	Yes		
Total BREEAM credits achieved	1		
Total contribution to overall building score	1.35%		
Total BREEAM innovation credits achieved	N/A		
Minimum standard(s) level	N/A		

Comments/notes:

**Mat 06 Material efficiency**

No. of BREEAM credits available	1	Available contribution to overall score	1.35%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Assessment Criteria	Compliant?	Credits available	Credits achieved
Will material efficiency measures be identified & implemented during all RIBA stages?	No	1	0
Total BREEAM credits achieved	0		
Total contribution to overall building score	0.00%		
Total BREEAM innovation credits achieved	N/A		
Minimum standard(s) level	N/A		

Comments/notes:

**WASTE**

**Wst 01 Construction Waste Management**

No. of BREEAM credits available	4	Available contribution to overall score	5.50%
No. of BREEAM innovation credits available	1	Minimum standards applicable	Yes

How do you wish to assess the number of BREEAM credits to be achieved for this issue? Define a target number of BREEAM credits

Select the number of BREEAM credits being targeted for issue Wst 01:  BREEAM Wst01 Innovation credits:

Assessment Criteria	Compliant?
Construction resource management plan	<input type="checkbox"/>
Compliant Pre-demolition audit	<input type="checkbox"/>
Does the excavation waste meet the exemplary level requirements?	<input type="checkbox"/>

**Key Performance Indicators - Construction Waste**

Measure/units for the data being reported	
Non-hazardous construction waste (excluding demolition/excavation)	<input type="text"/>
Total non-hazardous construction waste generated	<input type="text"/>
Non-hazardous non-demolition const. waste diverted from landfill	<input type="text"/>
Total non-hazardous non-demolition const. waste diverted from landfill	<input type="text"/>
Total non-hazardous demolition waste generated	<input type="text"/>
Non-hazardous demolition waste diverted from landfill	<input type="text"/>
Total non-hazardous demolition waste to disposal	<input type="text"/>
Material for reuse	<input type="text"/>
Material for recycling	<input type="text"/>
Material for energy recovery	<input type="text"/>
Hazardous waste to disposal	<input type="text"/>

Note: At the pre-assessment stage this figure will be a target  
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Total BREEAM credits achieved	2
Total contribution to overall building score	2.75%
Total BREEAM innovation credits achieved	0
Minimum standard(s) level	Outstanding level

Comments/notes:

**Wst 02 Recycled Aggregates**

No. of BREEAM credits available	1	Available contribution to overall score	1.38%
No. of BREEAM innovation credits available	1	Minimum standards applicable	No

Assessment Criteria	Total
What is the target total % of high-grade aggregate that will be recycled/secondary aggregate?	0%

% of high-grade aggregate that is recycled/secondary aggregate - by application	
Structural frame	
Bitumen/hydraulically bound base, binder and surface courses	
Building foundations	
Concrete road surfaces	
Pipe bedding	
Granular fill and capping	

Total BREEAM credits achieved	0
Total contribution to overall building score	0.00%
Total BREEAM innovation credits achieved	0
Minimum standard(s) level	N/A

Comments/notes:

**Wst 03 Operational Waste**

No. of BREEAM credits available	1	Available contribution to overall score	1.38%
No. of BREEAM innovation credits available	0	Minimum standards applicable	Yes

Assessment Criteria	Compliant?	Credits available	Credits achieved
Will operational recyclable waste volumes be segregated and stored?	Yes	1	1
Will static waste compactor(s) or baler(s) be specified where appropriate?	N/A		
Will vessel(s) for composting suitable organic waste where appropriate?	N/A		

Total BREEAM credits achieved	1
Total contribution to overall building score	1.38%
Total BREEAM innovation credits achieved	N/A
Minimum standard(s) level	Outstanding level

Comments/notes:

Wst 04 Speculative Floor and Ceiling Finishes

Assessment issue not applicable

No. of BREEAM credits available	N/A	Available contribution to overall score	N/A
No. of BREEAM innovation credits available	N/A	Minimum standards applicable	N/A

Assessment Criteria	Compliant?	Credits available	Credits achieved
Total BREEAM credits achieved	N/A		
Total contribution to overall building score	N/A		
Total BREEAM innovation credits achieved	N/A		
Minimum standard(s) level	N/A		

Comments/notes:

Wst 05 Adaption to climate change

No. of BREEAM credits available	1	Available contribution to overall score	1.38%
No. of BREEAM innovation credits available	N/A	Minimum standards applicable	N/A

Assessment Criteria	Compliant?	Credits available	Credits achieved
Will a climate change adaptation strategy appraisal for structural and fabric resilience be conducted by the end of Concept Design (RIBA Stage 2 or equivalent)?	No	1	0
Will exemplary level criteria – Responding to adaptation to climate change be met?			
Total BREEAM credits achieved	0		
Total contribution to overall building score	0.00%		
Total BREEAM innovation credits achieved	N/A		
Minimum standard(s) level	N/A		

Comments/notes:

Wst 06 Functional adaptability

No. of BREEAM credits available	1	Available contribution to overall score	1.38%
No. of BREEAM innovation credits available	0	Minimum standards applicable	N/A

Assessment Criteria	Compliant?	Credits available	Credits achieved
Will a building specific functional adaptation strategy appraisal be conducted by Concept Design (RIBA Stage 2 or equivalent) and will functional adaptation measures be implemented?	No	1	0
Total BREEAM credits achieved	0		
Total contribution to overall building score	0.00%		
Total BREEAM innovation credits achieved	N/A		
Minimum standard(s) level	N/A		

Comments/notes:



**LAND USE & ECOLOGY**

**LE 01 Site Selection**

No. of BREEAM credits available	2	Available contribution to overall score	2.60%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Assessment Criteria	Compliant?	Credits available	Credits achieved
Will at least 75% of the proposed development's footprint be located on previously occupied land?	Yes	1	1
Is the site deemed to be significantly contaminated?	Yes	1	1

Total BREEAM credits achieved	2
Total contribution to overall building score	2.60%
Total BREEAM innovation credits achieved	N/A
Minimum standard(s) level	N/A

Comments/notes:

**LE 02 Ecological Value of Site and Protection of Ecological Features**

No. of BREEAM credits available	2	Available contribution to overall score	2.60%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Assessment Criteria	Compliant?	Credits available	Credits achieved
Can the land within the construction zone be defined as 'land of low ecological value'?	Yes	1	1
Will all features of ecological value surrounding the construction zone/site boundary be protected?	Yes	1	1

Total BREEAM credits achieved	2
Total contribution to overall building score	2.60%
Total BREEAM innovation credits achieved	N/A
Minimum standard(s) level	N/A

Comments/notes:

**LE 03 Mitigating Ecological Impact**

No. of BREEAM credits available	2	Available contribution to overall score	2.60%
No. of BREEAM innovation credits available	0	Minimum standards applicable	Yes

Assessment Criteria	Compliant?	Credits available	Credits achieved
What is the likely change in ecological value as a result of the sites development?	Yes	≥0 species (i.e. no negative change)	Plant species richness

Total BREEAM credits achieved	2
Total contribution to overall building score	2.60%
Total BREEAM innovation credits achieved	N/A
Minimum standard(s) level	Outstanding level

Comments/notes:

**LE 04 Enhancing Site Ecology**

No. of BREEAM credits available	2	Available contribution to overall score	2.60%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Assessment Criteria	Compliant?	Credits available	Credits achieved
Will a suitably qualified ecologist be appointed to report on enhancing and protecting site ecology?	Yes	2	1
Will the suitably qualified ecologist's general recommendations be implemented?	Yes		
What is the targeted/intended improvement in ecological value as a result of enhancement actions?	<6 species (small positive change)		Plant species richness

Total BREEAM credits achieved	1
Total contribution to overall building score	1.30%
Total BREEAM innovation credits achieved	N/A
Minimum standard(s) level	N/A

Comments/notes:

**LE 05 Long Term Impact on Biodiversity**

No. of BREEAM credits available	2	Available contribution to overall score	2.60%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Assessment Criteria	Compliant?	Credits available	Credits achieved
Will a Suitably Qualified Ecologist be appointed to monitor/minimise impacts of site activities on biodiversity?	Yes	2	0
Will a landscape and habitat management plan be produced covering at least the first five years after project completion in accordance with British Standards?	No		
Number of applicable measures to improve biodiversity confirmed by SQE:	0		
Number of applicable measures implemented:	0		

Total BREEAM credits achieved	0
Total contribution to overall building score	0.00%
Total BREEAM innovation credits achieved	N/A
Minimum standard(s) level	N/A

Comments/notes:

**POLLUTION**

**Pol 01 Impact of Refrigerants**

Assessment issue not applicable

No. of BREEAM credits available	N/A	Available contribution to overall score	N/A
No. of BREEAM innovation credits available	N/A	Minimum standards applicable	N/A

Assessment Criteria

	Credits available	Credits achieved
Refrigerant containing systems installed in the assessed building?		
Do all systems (with electric compressors) comply with the requirements of BS EN 378:2008 (parts 2 & 3) & where refrigeration systems containing ammonia are installed, the IoR Ammonia Refrigeration Systems Code of Practice?		
Global Warming Potential of the specified refrigerant(s) 10 or less?		
What is the target range Direct Effect Life Cycle CO <sub>2</sub> eq. emissions for the system?		
Cooling/Heating capacity of the system		
Will a refrigerant leak detection and containment system be specified/installed?		

Total BREEAM credits achieved	N/A
Total contribution to overall building score	N/A
Total BREEAM innovation credits achieved	N/A
Minimum standard(s) level	N/A

Comments/notes:

**Pol 02 NO<sub>x</sub> Emissions**

Assessment issue not applicable

No. of BREEAM credits available	N/A	Available contribution to overall score	N/A
No. of BREEAM innovation credits available	N/A	Minimum standards applicable	N/A

Assessment Criteria

NO <sub>x</sub> emission level - space heating	
NO <sub>x</sub> emission level - water heating	
Does this building meet BREEAM's definition of a highly insulated building?	
Energy consumption: heating and hot water	

Total BREEAM credits achieved	N/A
Total contribution to overall building score	N/A
Total BREEAM innovation credits achieved	N/A
Minimum standard(s) level	N/A

Comments/notes:

**Pol 03 Surface Water Run off**

No. of BREEAM credits available	5	Available contribution to overall score	5.00%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Assessment Criteria	Compliant?	Credits available	Credits achieved
What is the actual/likely annual probability of flooding for the assessed site?	Low	2	2
Will a Flood Risk Assessment be undertaken?	Yes		
Will the site meet the BREEAM criteria for peak rate surface water run off?	Yes	1	1
Will the site meet the criteria for surface water run off volume, attenuation and/or limiting discharge?	Yes	1	1
Will the site be designed to minimise watercourse pollution in accordance with the BREEAM criteria?	Yes	1	1

Total BREEAM credits achieved	5
Total contribution to overall building score	5.00%
Total BREEAM innovation credits achieved	N/A
Minimum standard(s) level	N/A

Comments/notes:

**Pol 04 Reduction of Night Time Light Pollution**

No. of BREEAM credits available	1	Available contribution to overall score	1.00%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Assessment Criteria	Compliant?	Credits available	Credits achieved
Will the external lighting specification be designed to reduce light pollution?	Yes	1	1

Total BREEAM credits achieved	1
Total contribution to overall building score	1.00%
Total BREEAM innovation credits achieved	N/A
Minimum standard(s) level	N/A

Comments/notes:

Pol 05 Noise Attenuation

Assessment issue not applicable

No. of BREEAM credits available	N/A	Available contribution to overall score	N/A
No. of BREEAM innovation credits available	N/A	Minimum standards applicable	N/A

Assessment Criteria	Compliant	Credits available	Credits achieved
Will there be noise-sensitive areas/buildings within 800m radius of the development?			
Will a noise impact assessment be carried out and, if applicable, noise attenuation measures specified?			

Total BREEAM credits achieved	N/A
Total contribution to overall building score	N/A
Total BREEAM innovation credits achieved	N/A
Minimum standard(s) level	N/A

Comments/notes:

**INNOVATION**

Inn 01 Innovation

No. of BREEAM innovation credits available	10	Available contribution to overall score	10.00%
		Minimum standards applicable	No

Assessment Criteria	Compliant?	Credits available	Credits achieved
Man 03 Responsible construction practices	No	1	0
Man 05 Aftercare	N/A	N/A	N/A
Hea 01 Visual Comfort	Yes	1	1
Hea 02 Indoor Air Quality	N/A	N/A	N/A
Ene 01 Reduction of energy use and carbon emissions	No	5	N/A
Wat 01 Water Consumption	N/A	N/A	N/A
Mat01 Life Cycle Impacts	No	3	0
Mat03 Responsible Sourcing of Materials	No	1	0
Wst01 Construction Waste Management	No	1	0
Wst02 Recycled Aggregates	No	1	0
Wst 05 Adaption to climate change	N/A	N/A	N/A

Number of 'approved' innovation credits achieved?	0
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Total BREEAM innovation credits achieved	1
Total contribution to overall building score	1.00%
Minimum standard(s) level	N/A

Comments/notes:

**Appendix 2 – London Borough of Richmond Sustainable Construction Checklist**

## LBRUT Sustainable Construction Checklist - January 2016

This document forms part of the Sustainable Construction Checklist SPD. This document **must** be filled out as part of the planning application for the following developments: all residential development providing **one or more new residential units (including conversions leading to one or more new units)**, and all other forms of development providing **100sqm or more of non-residential floor space**. Developments including new non-residential development of less than 100sqm floor space, extensions less than 100sqm, and other conversions are strongly encouraged to comply with this checklist. Where further information is requested, please either fill in the relevant section, or refer to the document where this information may be found in detail, e.g. Flood Risk Assessment or similar. **Further guidance** on completing the Checklist may be found in the Justification and Guidance section of this SPD.

Property Name (if relevant):  Application No. (if known):

Address (include. postcode)   
Completed by:

For Non-Residential  
Size of development (m2)

For Residential  
Number of dwellings

### 1 MINIMUM COMPLIANCE (RESIDENTIAL AND NON-RESIDENTIAL)

#### Energy Assessment

Has an energy assessment been submitted that demonstrates the expected energy and carbon dioxide emissions saving from energy efficiency and renewable energy measures, including the feasibility of CHP/CCHP and community heating systems? If yes, please tick.

#### Carbon Dioxide emissions reduction

What is the carbon dioxide emissions reduction against a Building Regulations Part L (2013) baseline  
*Policy DM SD 1 and London Plan Policy 5.2 (2015) require a 35% reduction in CO<sub>2</sub> emissions beyond Building Regulations 2013.*

Percentage of **total** site CO<sub>2</sub> emissions saved through renewable energy installation?

### 1A MINIMUM POLICY COMPLIANCE (NON-RESIDENTIAL AND DOMESTIC REFURBISHMENT)

#### Environmental Rating of development:

*Non-Residential new-build (100sqm or more)*

BREEAM Level

Have you attached a pre-assessment to support this?

*Extensions and conversions for residential dwellings*

BREEAM Domestic Refurbishment

Have you attached a pre-assessment to support this?

*Extensions and conversions for non-residential buildings*

BREEAM Level

Have you attached a pre-assessment to support this?

Score awarded for Environmental Rating:

BREEAM: Good = 0, Very Good = 4, Excellent = 8, Outstanding = 16

Subtotal

### 1B MINIMUM POLICY COMPLIANCE (RESIDENTIAL)

#### Water Usage

Internal water usage limited to 105 litres person per day. (Excluding an allowance 5 litres per person per day for external water consumption). Calculations using the water efficiency calculator for new dwellings have been submitted.

1

Subtotal



## 2. ENERGY USE AND POLLUTION

### 2.1 Need for Cooling

- a. How does the development incorporate cooling measures? Tick all that apply:
- |   |                                     |   |
|---|-------------------------------------|---|
| Energy efficient design incorporating specific heat demand to less than or equal to 15 kWh/sqm    | <input type="checkbox"/>            | 6 |
| Reduce heat entering a building through providing/improving insulation and living roofs and walls | <input type="checkbox"/>            | 2 |
| Reduce heat entering a building through shading   | <input checked="" type="checkbox"/> | 3 |
| Exposed thermal mass and high ceilings  | <input checked="" type="checkbox"/> | 4 |
| Passive ventilation   | <input checked="" type="checkbox"/> | 3 |
| Mechanical ventilation with heat recovery   | <input type="checkbox"/>            | 1 |
| Active cooling systems, i.e. Air Conditioning Unit  | <input type="checkbox"/>            | 0 |

### 2.2 Heat Generation

- b. How have the heating and cooling systems, with preference to the heating system hierarchy, been selected (defined in London Plan policy 5.6)? Tick all heating and cooling systems that will be used in the development:
- |  |                                     |   |
|--|-------------------------------------|---|
| Connection to existing heating or cooling networks powered by renewable energy   | <input type="checkbox"/>            | 6 |
| Connection to existing heating or cooling networks powered by gas or electricity | <input type="checkbox"/>            | 5 |
| Site wide CHP network powered by renewable energy                                | <input type="checkbox"/>            | 4 |
| Site wide CHP network powered by gas   | <input type="checkbox"/>            | 3 |
| Communal heating and cooling powered by renewable energy                         | <input type="checkbox"/>            | 2 |
| Communal heating and cooling powered by gas or electricity                       | <input type="checkbox"/>            | 1 |
| Individual heating and cooling   | <input checked="" type="checkbox"/> | 0 |

### 2.3 Pollution: Air, Noise and Light

- a. Does the development plan to implement reduction strategies for dust emissions from construction sites?  2
- b. Does the development plan include a biomass boiler?  -  
If yes, please refer to the biomass guidelines for the Borough of Richmond, please see guidance for supplementary information. If the proposed boiler is of a qualifying size, you may need to completed the information request form found on the Richmond website.  -
- c. Please tick only one option below  
Has the development taken measures to reduce existing noise and enhance the existing soundscape of the site?  3  
Has the development taken care to not create any new noise generation/transmission issues in its intended operation?  1
- d. Has the development taken measures to reduce light pollution impacts on character, residential amenity and biodiversity?  3
- e. Have you attached a Lighting Pollution Report?  -

Subtotal **18**

Please give any additional relevant comments to the Energy Use and Pollution Section below

A Construction Plan will be prepared, which will seek to reduce dust, noise and other disturbances to immediate neighbours.

## 3. TRANSPORT

### 3.1 Provision for the safe efficient and sustainable movement of people and goods

- a. Does your development provide opportunities for occupants to use innovative travel technologies?

Please explain:

- b. Does your development include charging point(s) for electric cars?  2
- c. **For major developments ONLY:** Has a Transport Assessment been produced for your development based on TfL's Best Practice Guidance?  5  
If you have provided a Transport Assessment as part of your planning application, please tick here and move to Section 3 of this Checklist.
- d. **For smaller developments ONLY:** Have you provided a Transport Statement?  5
- e. Does your development provide cycle storage? (Standard space requirements are set out in the the Council's Parking Standards - DM DPD Appendix 4)  2  
If so, for how many bicycles?   
Is this shown on the site plans?  -
- f. Will the development create or improve links with local and wider transport networks? If yes, please provide details.  2

Subtotal **7**

Please give any additional relevant comments to the Transport Section below

Cycle storage is shown on the application drawings.

**4 BIODIVERSITY**

**4.1 Minimising the threat to biodiversity from new buildings, lighting, hard surfacing and people**

- a. Does your development involve the loss of an ecological feature or habitat, including a loss of garden or other green space? (Indicate if yes)  -2  
 If so, please state how much in sqm?  sqm
- b. Does your development involve the removal of any tree(s)? (Indicate if yes)   
 If so, has a tree report been provided in support of your application? (Indicate if yes)
- c. Does your development plan to add (and not remove) any tree(s) on site? (Indicate if yes)
- d. Please indicate which features and/or habitats that your development will incorporate to improve on site biodiversity:
- |   |   |                |                               |     |
|---|---|----------------|-------------------------------|-----|
| Pond, reedbed or extensive native planting                              | 6 <input type="checkbox"/>              | Area provided: | <input type="text" value=""/> | sqm |
| An extensive green roof   | 5 <input type="checkbox"/>              | Area provided: | <input type="text" value=""/> | sqm |
| An intensive green roof   | 4 <input type="checkbox"/>              | Area provided: | <input type="text" value=""/> | sqm |
| Garden space  | 4 <input checked="" type="checkbox"/>   | Area provided: | <input type="text" value=""/> | sqm |
| Additional native and/or wildlife friendly planting to peripheral areas | 3 <input type="checkbox"/>              | Area provided: | <input type="text" value=""/> | sqm |
| Additional planting to peripheral areas                                 | 2 <input type="checkbox"/>              | Area provided: | <input type="text" value=""/> | sqm |
| A living wall   | 2 <input type="checkbox"/>              | Area provided: | <input type="text" value=""/> | sqm |
| Bat boxes   | 0.5 <input checked="" type="checkbox"/> |                |                               |     |
| Bird boxes  | 0.5 <input checked="" type="checkbox"/> |                |                               |     |
| Other   | 0.5 <input type="checkbox"/>            |                |                               |     |

Subtotal

Please give any additional relevant comments to the Biodiversity Section below

Private terraces are provided to ground floor apartments and private communal space is available.

**5 FLOODING AND DRAINAGE**

**5.1 Mitigating the risks of flooding and other impacts of climate change in the borough**

- a. Is your site located in a high flood risk zone (Zone 3)? (Indicate if yes)  -2  
 Have you submitted a Flood Risk Assessment? (Indicate if yes)  -
- b. Which of the following measures of the drainage hierarchy are incorporated onto your site? (tick all that apply)
- |   |                                       |
|---|---------------------------------------|
| Store rainwater for later use   | <input checked="" type="checkbox"/> 5 |
| Use of infiltration techniques such as porous surfacing materials to allow drainage on-site | <input checked="" type="checkbox"/> 3 |
| Attenuate rainwater in ponds or open water features   | <input type="checkbox"/> 4            |
| Store rainwater in tanks for gradual release to a watercourse                               | <input type="checkbox"/> 3            |
| Discharge rainwater directly to watercourse   | <input type="checkbox"/> 2            |
| Discharge rainwater to surface water drain  | <input type="checkbox"/> 1            |
| Discharge rainwater to combined sewer   | <input checked="" type="checkbox"/> 0 |
- c. Please give the change in area of permeable surfacing which will result from your development proposal:  sqm  
 Please provide details of the permeable surfacing below *please represent a loss in permeable area as a negative number*

Subtotal

Please give any additional relevant comments to the Flooding and Drainage Section below

Rainwater butts will be provided for landscape maintenance.

**6 IMPROVING RESOURCE EFFICIENCY**

**6.1 Reduce waste generated and amount disposed of by landfill though increasing level of re-use and recycling**

- a. Will demolition be required on your site prior to construction? [Points will only be awarded if 10% or greater of demolition waste is reused/recycled]  1
- If so, what percentage of demolition waste will be reused in the new development?  %
- What percentage of demolition waste will be recycled?  %
- b. Does your site have any contaminated land?  1
- |   |                                       |
|---|---------------------------------------|
| Have you submitted an assessment of the site contamination? | <input checked="" type="checkbox"/> 2 |
| Are plans in place to remediate the contamination?          | <input checked="" type="checkbox"/> 2 |
| Have you submitted a remediation plan?                      | <input checked="" type="checkbox"/> 1 |
| Are plans in place to include composting on site?           | <input type="checkbox"/> 1            |

**6.2 Reducing levels of water waste**

- a. Will the following measures of water conservation be incorporated into the development? (Please tick all that apply):
- |   |                                       |
|---|---------------------------------------|
| Fitting of water efficient taps, shower heads etc | <input checked="" type="checkbox"/> 1 |
| Use of water efficient A or B rated appliances    | <input checked="" type="checkbox"/> 1 |
| Rainwater harvesting for internal use             | <input type="checkbox"/> 4            |
| Greywater systems                                 | <input type="checkbox"/> 4            |
| Fit a water meter                                 | <input checked="" type="checkbox"/> 1 |

Subtotal

Please give any additional relevant comments to the Improving Resource Efficiency Section below

**7 ACCESSIBILITY**

**7.1 Ensure flexible adaptable and long-term use of structures**

a. **If the development is residential**, will it meet the requirements of the nationally described space standard for internal space and layout?  1  
 If the standards are not met, in the space below, please provide details of the functionality of the internal space and layout

The standards of the SPD will be met.

**AND**  
 b. **If the development is residential**, will it meet Building Regulation Requirement M4 (2) 'accessible and adaptable dwellings'?  2  
 If this is not met, in the space below, please provide details of any accessibility measures included in the development.

For major residential developments, are 10% or more of the units in the development to Building Regulation Requirement M4 (3) 'wheelchair user dwellings'?  1

**OR**  
 c. **If the development is non-residential**, does it comply with requirements included in Richmond's Design for Maximum Access SPG  2  
 Please provide details of the accessibility measures specified in the Maximum Access SPG that will be included in the development

Subtotal **5**

Please give any additional relevant comments to the Design Standards and Accessibility Section below

**LBRUT Sustainable Construction Checklist- Scoring Matrix for New Construction**

**(Non-Residential and domestic refurb)**

TOTAL **60**

Score	Rating	Significance
80 or more	A+	Project strives to achieve highest standard in energy efficient sustainable development
71-79	A	Makes a major contribution towards achieving sustainable development in Richmond
51-70	B	Helps to significantly improve the Borough's stock of sustainable developments
36-50	C	Minimal effort to increase sustainability beyond general compliance
35 or less	FAIL	Does not comply with SPD Policy

**LBRUT Sustainable Construction Checklist- Scoring Matrix for New Construction**

**Residential new-build**

Score	Rating	Significance
81 or more	A++	Project strives to achieve highest standard in energy efficient sustainable development
64-80	A+	Project strives to achieve highest standard in energy efficient sustainable development
55-63	A	Makes a major contribution towards achieving sustainable development in Richmond
35-54	B	Helps to significantly improve the Borough's stock of sustainable developments
20-34	C	Minimal effort to increase sustainability beyond general compliance
19 or less	FAIL	Does not comply with SPD Policy

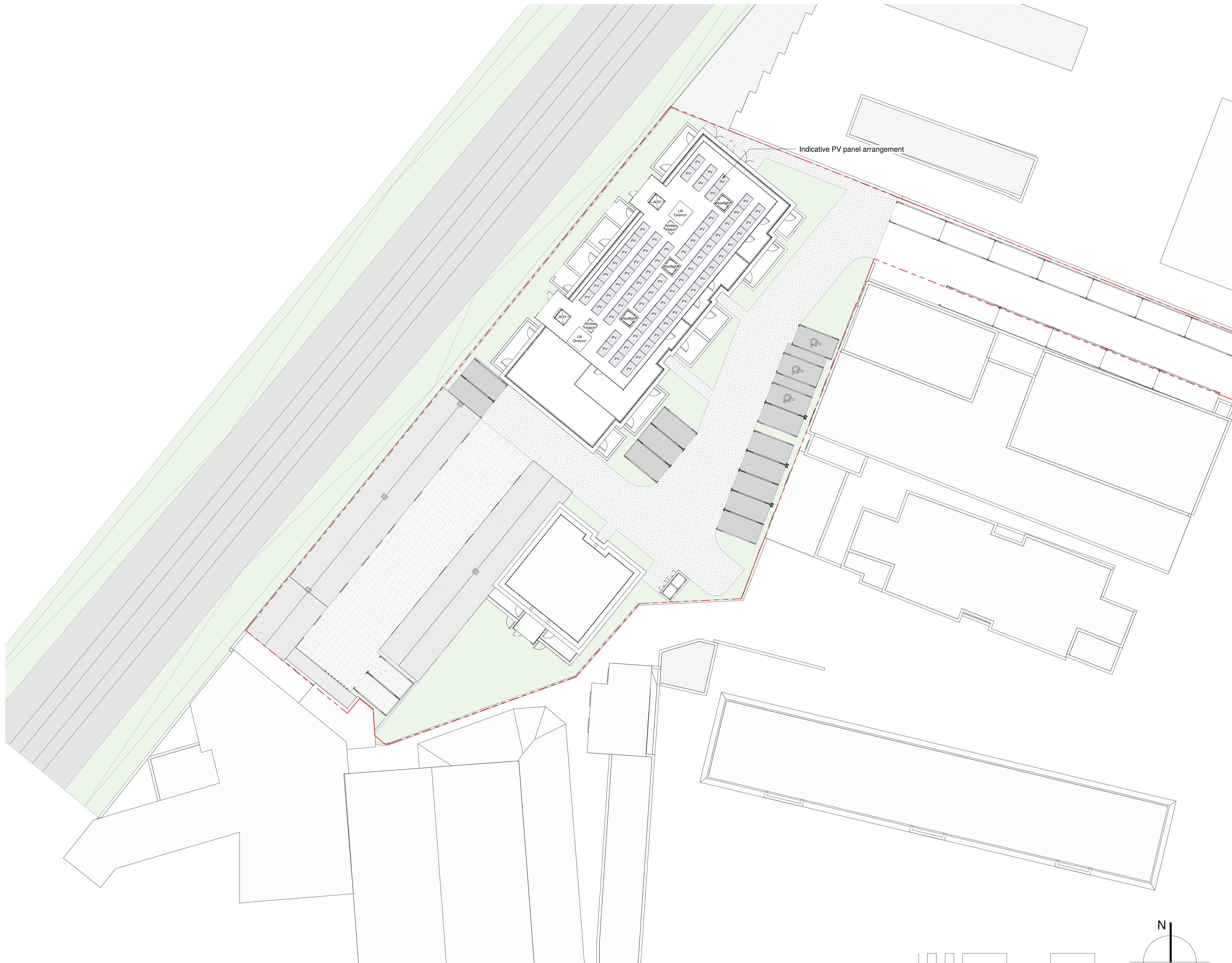
**Authorisation:**

I herewith declare that I have filled in this form to the best of my knowledge

Signature \_\_\_\_\_ Date \_\_\_\_\_

**Appendix 3 – Roof Plan showing Indicative Photovoltaic Panel Locations**





# PLANNING


A	Planning Issue	30/07/2018	PF	CH
Rev	Description	Issued	Dwn	Chk

Client  
Sharpe Refinery Service Ltd.

Project  
**Redevelopment of:  
Arlington Works  
Twickenham TW1 2BB**

Drawing  
**PROPOSED  
Mixed Use Scheme  
Roof Plan**

Scale	Date	Drawn	Checked
1 : 200@A1	30/07/18	PF	CH

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