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SUSTAINABILITY STATEMENT

for

**NEW D2 ACCOMMODATION
AND SIX APARTMENTS**

at

**275, SANDYCOMBE ROAD,
KEW**

22nd February 2016

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Executive Summary

This Statement accompanies a detailed planning application for the demolition of the existing building and the construction of a new building comprising 329 m² of D2 accommodation and six apartments at 275, Sandycombe Road, Kew. The Statement includes an energy demand assessment showing how selected energy efficiency and renewable energy measures have been incorporated into the development design.

The Ministerial Statement made on the 27th March 2015 has withdrawn the Code for Sustainable Homes and the Government have proposed local authorities do not seek to impose Code planning conditions with immediate effect. In addition the Ministerial Statement sets out a maximum carbon dioxide emissions target of 19%, being the equivalent of the now withdrawn Code Level 4. Whilst the Ministerial Statement takes precedent over the local policies London Borough of Richmond has confirmed they will continue to seek a 35% reduction in line with Policy DM SD1.

Working drawings have yet to be progressed but SAP calculations have been prepared based upon the detailed planning drawings and an assumed construction specification for the residential apartments and a SBEM calculation for similar accommodation built to a similar specification has been used to establish the energy demand and emissions for the D2 accommodation.

It is proposed to enhance the fabric insulation standards of the buildings and to install a flue-gas heat recovery unit into each apartment. In addition it is proposed to install a photovoltaic array of 4.578 kW. This will be comprised of 14, 327W panels.

The carbon dioxide emissions can be summarised as follows:

	Total	% Reduction
	kg CO ₂ /year	
Baseline (Building Regulations TER)	12,247	-
Be Lean - after energy efficiency (BER/DER)	10,682	12.78%
Be Green - after efficiency and LZCs	7,910	35.41%

The D2 accommodation will achieve BREEAM, Excellent standard and a Pre-Assessment Estimator is attached as Appendix 2.

1.0 Introduction

- 1.1 This report has been commissioned by Maven Plan and provides a Sustainability Statement for the proposed demolition of the existing building at 275, Sandycombe Road, Kew and the construction of 329 m² of D2 accommodation and six new apartments.
- 1.2 The report describes the methodology used in assessing the proposed development and the initiatives proposed.
- 1.3 The buildings will be designed and 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 a cost effective structure has been designed, 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

- 1.4 The report has been prepared by Maven Sustainability who are Sustainability Consultants, licensed Code for Sustainable Homes, Ecohomes and BREEAM Domestic Refurbishment Assessors.

2.0 Planning Policy

National Policy

2.1 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.

2.2 The 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 the South East, low demand in other parts of the country, 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.

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

- National Planning Policy Framework - 2012

“support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change, and encourage the reuse of existing resources, including conversion of existing buildings, and encourage the use of renewable resources (for example, by the development of renewable energy)”

Regional and Local Policies

2.4 The Development Plan comprises the London Plan (2015) and the Richmond Core Strategy and Development Management Plan.

2.5 **London Plan, published March 2015** – 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*

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.*

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.*

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*

2.6 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.

2.7 London Borough of Richmond

Core Strategy

The London Borough of Richmond Core Strategy was adopted in April 2009 and provides the policy framework for development within the Borough.

Of particular relevance are the following two policies, which are summarised as follows;

CP1 Sustainable Development

- 1.A The policy seeks to maximise the effective use of resources including land, water and energy, and assist in reducing any long term adverse environmental impacts of development. Development will be required to conform to the Sustainable Construction checklist, including the requirement to meet the Code for Sustainable Homes level 3 (for new homes), Ecohomes "excellent" (for conversions) or BREEAM "excellent" (for other types of development). **

CP2 Reducing Carbon Emissions

- 2.A *The Borough will reduce its carbon dioxide emissions by requiring measures that minimise energy consumption in new development and promoting these measures in existing development, particularly in its own buildings.*
- 2.B *The Council will require the evaluation, development and use of decentralised energy in appropriate development.*
- 2.C *The Council will increase the use of renewable energy by requiring all new development to achieve a reduction in carbon dioxide emissions of 20% from on-site renewable energy generation unless it can be demonstrated that such provision is not feasible, and by promoting its use in existing development.*

2.8 Development Management Plan

The London Borough of Richmond Development Management Plan was adopted in November 2011 and provides additional guidance to the Core Strategy.

Policy DM SD1 – Sustainable Construction

All development in terms of materials, design, landscaping, standard of construction and operation should include measures capable of mitigating and adapting to climate change to meet future needs. New buildings should be flexible to respond to future social, technological and economic needs by conforming to the Borough's Sustainable Construction Checklist SPD.

*New homes will be required to meet or exceed requirements of the Code for Sustainable Homes Level 3. **

*They also must achieve a minimum 25 per cent reduction in carbon dioxide emissions over Building Regulations (2010) in line with best practice from 2010 to 2013, 40 per cent improvement from 2013 to 2016, and 'zero carbon' standards from 2016. It is expected that efficiency measures will be prioritised as a means towards meeting these targets. These requirements may be adjusted in future years to take into account the then prevailing standards and any other national guidance to ensure the standards are met or exceeded. **

Policy DM SD 2 - Renewable Energy and Decentralised Energy Networks

New development will be required to conform with the Sustainable Construction Checklist SPD and:

- (a) *Maximise opportunities for the micro-generation of renewable energy. Some form of low carbon renewable and/or de-centralised energy will be expected in all new development*
- (b) *Developments of 1 dwelling unit or more, or 100 sqm of non-residential floor space or more will be required to reduce their total carbon dioxide emissions by following a hierarchy that first requires an efficient design to minimise the amount of energy used, secondly, by using low carbon technologies and finally, where feasible and viable, including a contribution from renewable sources.*

* The Ministerial Statement made on the 25th March 2015 by the DCLG said,

“From the date the Deregulation Bill 2015 is given Royal Assent, local planning authorities and qualifying bodies preparing neighbourhood plans should not set in their emerging Local Plans, neighbourhood plans, or supplementary planning documents, any additional local technical standards or requirements relating to the construction, internal layout or performance of new dwellings. This includes any policy requiring any level of the Code for Sustainable Homes to be achieved by new development; the government has now withdrawn the code, aside from the management of legacy cases. Particular standards or requirements for energy performance are considered later in this statement.”

“For the specific issue of energy performance, local planning authorities will continue to be able to set and apply policies in their Local Plans which require compliance with energy performance standards that exceed the energy requirements of Building Regulations until commencement of amendments to the Planning and Energy Act 2008 in the Deregulation Bill 2015.”

“This is expected to happen alongside the introduction of zero carbon homes policy in late 2016. The government has stated that, from then, the energy performance requirements in Building Regulations will be set at a level equivalent to the (outgoing) Code for Sustainable Homes Level 4. Until the amendment is commenced, we would expect local planning authorities to take this statement of the government’s intention into account in applying existing policies and not set conditions with requirements above a Code level 4 equivalent.”

3.0 Assessment Methodology

- 3.1 The baseline energy demand for the proposal has been established by preparing SAP calculations for a representative sample of the residential accommodation and by using a SBEM calculation for similar accommodation built to a similar specification for the non-residential unit.
- 3.2 These calculations have been based upon certain assumptions as to the building specification and these are clarified below. These are not design calculations but serve to establish the environmental, technical and economic viability of various renewable and low carbon technologies.

Emission Factors

- 3.3 The CO₂ emission factors, where applicable, used throughout this report have been taken from the Building Regulation Approved Document L.

Fuel	Kg CO ₂ /kWh
Natural Gas	0.216
Grid supplied electricity	0.519
Displaced electricity	0.519

- 3.4 In assessing this proposal we have 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

4.1 The proposal is for the demolition of the existing building and the erection of a two new buildings, which provide D2 accommodation and six apartments. The D2 accommodation has been designed to the required standards for a Judo hall and/or gymnasium.

The accommodation schedule in detail is as follows;

Unit Type	No.	Area	Totals
		m ²	m ²
Non-Residential Accommodation			
D2 accommodation (basement)		219.0	219.0
D2 accommodation (ground floor)		110.0	110.0
Sub-Total			329.0
Residential Accommodation			
1-Bedroom apartment	1	53.0	53.0
1-Bedroom apartment	3	54.0	162.0
2-Bedroom apartment	1	64.0	64.0
2-Bedroom apartment	1	80.0	80.0
Sub-Total	6		359.0
Total			688.0

5.0 Demand Reduction (Be Lean and Be Clean)

Design

- 5.1 The energy performance of a building is affected by the building design, its construction and its use. 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.
- 5.2 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) 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

- 5.3 The passive design measures proposed include;

Passive Solar Gain

- 5.4 The architectural and structural features of a building will affect energy consumption and the use of natural daylight; orientation, thermal mass, shading and mitigation of wind exposure will reduce heating, cooling and lighting requirements.
- 5.5 The design and layout of the building within the site is in the context of surrounding development. However, the residential apartments have been designed such that they all have multiple aspects and therefore benefit from good solar access throughout the day.

Efficient Building Fabric

Building Envelope

- 5.6 U-values of the dwelling envelope must meet Building Regulations Part L1A standards and further improvements to U-values will reduce the development heating requirements, favourably impacting in reduced energy demand.
- 5.7 The selection of high thermal density materials can help to stabilise temperature fluctuations in a building, reducing maximum demands on building services.
- 5.8 The construction type will utilise traditional materials within a load-bearing structure. External walls will be built in 300mm cavity construction with an external skin of 100mm facing brickwork, 100mm fully filled cavities and 100mm thermal block internally. Ground floors will be insulated with 150mm Celotex PIR insulation or similar. Sloping and flat roofs will be insulated with at least 150mm 'Celotex' insulation or similar.
- 5.10 It is proposed to set maximum limits for the elemental U-values as follows;

Element	Proposed W/m ² K
External Walls	0.17
Roof	0.13
Floor	0.11
Windows	1.40

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

Air Leakage

- 5.12 Large amounts of heat are lost in winter through air leakage from a building (also referred to as infiltration of air permeability) often through poor sealing of joints and openings in the building
- 5.13 ADL sets a minimum standard for air permeability of 10 m³ of air per hour per m² of envelope area, at 50Pa. Air tightness standards for the homes will be constructed to the 'Accredited Construction Details' as compiled by Department of Communities and Local Government (DCLG). These will average a 60% improvement over Building Regulations and will achieve a permeability of less than 4m³/hr/m².

Thermal Bridging

- 5.14 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 CO₂ reduction targets set out in this strategy.
- 5.15 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 and the SAP calculation for the modelled unit has been based upon a Y value of 0.062.

Ventilation

- 5.16 As a result of increasing thermal efficiency and air tightness, Building Regulations Approved Document F was also revised in 2006 to address the possibility of overheating and poor air quality. Mechanical ventilation will be used for control of air quality although maximum use will be made of natural ventilation and night-time cooling.

Overheating

- 5.17 The possibility of summertime overheating is addressed by providing opening windows to provide natural ventilation and night cooling. The increased thermal mass provided by traditional construction will assist in stabilising summer night-time.

Active Design Measures

- 5.18 The active design measures proposed include;

Efficient Lighting and Controls

- 5.19 Throughout the scheme natural lighting will be optimised.
- 5.20 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.
- 5.21 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. Daylight and PIR sensors will also be used in some communal areas and automatic dimming lights used in conjunction with the sensors.

6.0 Establishing Carbon Dioxide Emissions

Non-residential

- 6.1 The baseline energy demand for the non-residential space has been established by using a SBEM calculation from similar accommodation built to a similar specification.
- 6.2 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%

- 6.3 The emissions are calculated as follows:

D2 Accommodation	TER CO ₂ Emissions	BER CO ₂ Emissions
	kg CO ₂ /yr	kg CO ₂ /yr
D2 accommodation	19.9	16.2
Emissions (per year)	19.9	16.2

Residential - SAP Calculations

- 6.4 Detailed working drawing design has not been carried out but the SAP calculations have been prepared based upon the detailed planning drawings and an assumed specification. SAP calculations have been prepared for a ground-floor 1-bedroom apartment at 54 m², for a mid-floor 1-bedroom apartment at 54 m² and for a top floor 2-bedroom apartment at 64 m². These are presented as representative of all unit types on site.
- 6.5 The energy efficiency measures described above have been included within the calculation. The calculation has been based upon the use of gas combination boilers installed to each apartment.
- 6.6 The results from the SAP calculations are summarised as follows:

1-Bed apartment 54 sq m Ground-Floor (Unit 2)	CO ₂ TER	CO ₂ DER
	kg/m ² /yr	kg CO ₂ /m ² /yr
Space Heating	4.97	3.98
Water heating	8.20	8.25
Electricity for lighting, pumps and fans	3.46	3.46
Total SAP	16.63	15.70

1-Bed apartment 54 sq m Mid-Floor (Unit 4)	CO ₂ TER	CO ₂ DER
	kg/m ² /yr	kg CO ₂ /m ² /yr
Space Heating	2.86	2.14
Water heating	8.29	8.34
Electricity for lighting, pumps and fans	3.46	3.46
Total SAP	14.61	13.94

2 Bed apartment 64 sq m Top-Floor (Unit 5)	CO ₂ TER	CO ₂ DER
	kg/m ² /yr	kg CO ₂ /m ² /yr
Space Heating	6.42	5.13
Water heating	6.97	7.03
Electricity for lighting, pumps and fans	2.87	2.87
Total SAP	16.26	15.03

6.7 Therefore the total energy demand and TER and BER/DER emissions from the non-residential unit and the apartments are;

Unit	Area	CO ₂ TER	CO ₂ BER/DER
	m ²	kg CO ₂ /yr	kg CO ₂ /yr
Non-Residential			
D2 – Judo hall/ gymnasium	329.0	6,547	5,330
Sub-Total	329.0	6,547	5,330
Residential			
Ground-floor apartments	108.0	1,796	1,696
Mid-floor apartments	107.0	1,563	1,492
Top-Floor apartments	144.0	2,341	2,164
Sub-Total	359.0	5,700	5,352
Total		12,247	10,682

6.8 The Building Regulation maximum carbon dioxide emissions (based on the TER) are assessed as;

- **12,247 kg CO₂ per year**

With the actual carbon dioxide emissions (based upon the BER/DER) assessed as;

- **10,682 kg CO₂ per year**

The reduction in site CO₂ emissions as a result of the energy efficiency measures incorporated in the building is assessed as;

- **1,565 kg CO₂ per year, which equates to a reduction of 12.78%**

7.0 Renewable Technologies

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

7.2 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.

7.3 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

7.4 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

7.5 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.

7.6 The Government wind speed database predicts local wind speeds at Sandycombe Road to be 5.1 m/s at 10m above ground level and 5.9 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 site.

- 7.7 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 and investment would be small and purely tokenism.

Combined Heat and Power and Community Heating

- 7.8 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.
- 7.9 Consequently CHP can demonstrate significant CO₂ savings and although not necessarily classed as renewable energy (depending on the fuel used) the technology is low carbon.
- 7.10 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 is usually based upon the hot water load of the building (s) with additional boilers meeting the space heating demand.
- 7.11 Community heating schemes are similarly communal systems but seek to supply heat only without the electricity production. Therefore, unless using a biomass or biofuel a community heating system will not demonstrate significant CO₂ reductions
- 7.12 In order to optimise a combined heat and power system, the site needs to have a suitable minimum baseload. The baseload demand (hot water) for the residential apartments is 12,943 kWh per year, which if using a CHP with an output of 12.5_{th}/ 5.5_e would run for 2.84 hours per day. This is not viable and the use of CHP is therefore not proposed.

Ground Source Heat Pumps

- 7.13 Sub soil temperatures are reasonable constant and predictable in the UK, providing a store of the sun's energy throughout the year. Ground source heat pumps (GSHP) extract this low-grade heat and convert it to usable heat for space heating.
- 7.14 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.
- 7.15 There are generally two types of installation being a bore-hole (open loop) and a closed loop system.
- 7.16 Open loop bore holes extract energy from ground water located deep below the surface and discharge the water back to the ground reservoir whereas closed loop systems circulate a fluid around a series of boreholes or horizontal 'slinky' and extract heat from the ground.
- 7.17 Ground source heat pumps could be used subject to satisfactory ground investigation to establish whether the sub-strata is appropriate. There is insufficient ground area to accommodate a 'slinky' system and a borehole system would be required.
- 7.18 Ground source heat pumps could theoretically be used but there is insufficient ground area to accommodate a horizontal system and a bore-hole system would be necessary.
- 7.19 Prohibitive costs of providing bore-holes mean this technology is not proposed for this scheme.

Solar

(i) Solar Water Heating

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

7.21 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/year* and evacuated tubes can achieve outputs up to 1,365 kWh/year **

* Figures taken for Schuco Compact K

** Figures taken from Riomay

7.22 Panels are traditionally roof mounted and for highest efficiencies should be mounted plus or minus 30 degrees of due south.

7.23 There are two top floor apartments (Units 5 & 6) and servicing lower floors can be problematic for solar thermal panels. In addition the panels displace gas, which has a relatively low carbon factor and therefore the reduction in CO₂ emissions is not as great as when displacing electricity. The total hot water demand of the three top-floor apartments is 4,687 kWh per year and assuming panels would reduce energy demand by 50% the reduction in CO₂ emissions is 506 kg CO₂ per year, which equates to a reduction of 4.13%. This is insufficient to meet the requirements of the planning policy and additional technologies would be required. The use of solar hot water heating would also necessitate a change to a conventional boiler with hot water cylinder. This may impact on internal space planning.

7.24 Solar hot water heating panels are not proposed.

ii) Photovoltaics

7.25 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.

7.26 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.

- 7.27 As a result of the higher CO₂ emissions factors for electricity versus gas, PV can be effective where planning policies seek reduction in CO₂ emissions rather than production of renewable **energy**.
- 7.28 Assuming the use of 327W PV panels, to achieve the 35% reduction in emissions required by the planning policy a total of 18 panels would be required. The flat roof section of the main apartment building provides sufficient space for the array. The electricity produced would provide power to the landlords supply of the apartment building with any unrequired electricity being distributed back to the Grid.
- 7.29 Photovoltaic panels are an appropriate technology and when combined with the energy efficient measures incorporated into the design and specification an array of 18 panels would equate to a total reduction in emissions of **4,427 kg CO₂ per year**, which equates to a reduction of **36.15%**.

Air Source Heat Pumps (ASHP)

- 7.30 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.
- 7.31 ASHP tend to have a lower coefficient of performance (CoP) than GSHP and with the emissions factor for electricity being 2.61 times that of gas (emissions factor is the weight of CO₂ emitted per kWh) installations with CoPs of less than this figure show little real saving in CO₂ emissions.
- 7.32 The efficiency of ASHPs can be significantly reduced where there is a high hot water demand and therefore their use is not appropriate for the apartments. However, for the non-residential space ASHPs would prove an efficient space heating installation, which could also provide comfort cooling.

Other Technologies

- 7.33 New technologies are becoming available, which do not 'fit' into one of the above categories but which need to be considered and are regarded as low-carbon and/or renewable technologies.

Flue Gas Heat Recovery (FGHR)

- 7.34 One such system are flue gas heat recovery units. These devices are used in conjunction with gas-fired boilers and recover the heat exhausted through the boiler flue.
- 7.35 An additional set of SAP calculations have been prepared for the apartments but with the benefit of a flue-gas heat recovery system installed to each.

The reduction in emissions to each can be summarised as follows;

Modelled Apartment with Flue-Gas Heat Recovery unit	CO ₂ DER	Reduction in DER
	kg/ CO ₂ /m ² /yr	kg CO ₂ /m ² /yr
1-Bed Ground-floor apartment	14.11	1.59
1-Bed Mid-floor apartment	12.45	1.49
2-Bed Top-floor apartment	13.54	1.49

The total reduction in emissions from the use of FGHR to all apartments is **546 kg CO₂ per year**, which equates to a reduction of **4.46%**.

Flue-gas heat recovery units are an appropriate technology and although additional measures will be required to meet the requirements of the planning policy the use of FGHR units AND energy efficiency measures equates to a total reduction of **2,111 kg CO₂ per year**. This equates to a reduction of **17.24%**.

8.0 Summary of Calculations and Proposals for Low-carbon and Renewable Technologies

- 8.1 The total site CO₂ emissions are calculated as **12,247 kg CO₂ per year** (TER) and **10,682 kg CO₂ per year** (BER/DER).
- 8.2 To meet the requirements of the planning policy, the development need to achieve a reduction in emissions of 35%.
- 8.3 Various technologies are considered above and whilst wind turbines, combined heat and power, ground source heat pumps and solar hot water heating panels are not considered appropriate the use of photovoltaic panels and air source heat pumps (to the non-residential accommodation) and flue-gas heat recovery units (to the residential accommodation) are considered feasible and viable.

Be Lean

- 8.4 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 between 60% improvement upon the minimum required by the Building Regulations.
- 8.5 The BER/DER emissions are reduced from the TER emissions by **1,565 kg CO₂ per year**, which equates to a reduction of **12.78%** as a result of the energy efficiency measures.

Be Green

- 8.6 It is proposed to install a flue-gas heat recovery system to each apartment. In addition it is proposed to install a total of 14, 327W photovoltaic panels. There is sufficient space available on the flat roof portion of the apartment building roof and an indicative layout is shown on the Roof Plan within the architectural drawing pack.
- 8.7 The reduction in emissions as a result of low-carbon and renewable technologies is **2,772 kg CO₂ per year**, which as a percentage of the total site emissions equates to **25.95%** (% of DER).
- 8.8 **The total emissions following energy efficiency measures, low-carbon and renewables technologies are 4,337 kg CO₂ per year, which equates to a reduction of 35.41% (% of TER).**

9.0 Climate change adaption and Water resources

Sustainable Drainage Systems (SUDS)

- 9.1 The site lies within Flood Zone 1 and there is a low risk of flooding.
- 9.2 The surface water system will drain into the combined sewer within Sandycombe Road as does the existing system. However, if feasible attenuation will be provided to reduce the rate of flow of surface water runoff into the existing sewer.

Surface Water Management

- 9.3 Consideration has been given to the use of grey water recycling. However, the excavations required for storage tanks would necessitate the removal of additional subsoil and when coupled with customer's resistance to the appearance of the recycled water and the cost of systems it does not currently make them a viable option. They have therefore not been included in the proposals.

Water efficiency measures

- 9.4 In the South East of England, water demand exceeds the volume licensed for abstraction, with the shortfall being met from ground water. 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.
- 9.5 The water efficiency measures included in this development will ensure that the water use target of 105 litres per person per day is achieved using the measures described below.
- 9.6 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.

9.7 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.

9.8 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, although this is largely dependent on the way on which occupants use their homes.

9.9 Below is a typical specification, which would achieve the 105 Litres per person per year 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

10.0 Materials

- 10.1 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.
- 10.2 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.
- 10.3 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.
- 10.4 All insulation materials to will have a zero ozone depleting potential

Construction waste

- 10.5 A Site Waste Management Plan will be prepared which will monitor and report on waste generated on site into defined waste groups.
- 10.6 The Plan will indicate the setting of targets to promote resource efficiency in accordance with guidance from WRAP, Envirowise, BRE and DEFRA.
- 10.7 The overarching principle of waste management is that waste should be treated or disposed of within the region where it is produced.
- 10.8 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.

10.9 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

Construction waste is a key element to be considered in achieving a reduction in all waste – it is estimated that some 40% of all waste is construction related.

APPENDIX 1

Richmond Sustainability 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 CO₂ emissions beyond Building Regulations 2013.

Percentage of total site CO₂ emissions saved through renewable energy installation?

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

Please check the Guidance Section of this SPD for the policy requirements

Environmental Rating of development:

<i>Non-Residential new-build (100sqm or more)</i>		
BREEAM Level	<input type="text" value="Excellent"/>	Have you attached a pre-assessment to support this? <input checked="" type="checkbox"/>
<i>Extensions and conversions for residential dwellings</i>		
BREEAM Domestic Refurbishment	<input type="text" value="Please Select"/>	Have you attached a pre-assessment to support this? <input type="checkbox"/>
<i>Extensions and conversions for non-residential buildings</i>		
BREEAM Level	<input type="text" value="Please Select"/>	Have you attached a pre-assessment to support this? <input type="checkbox"/>

Score awarded for Environmental Rating: **Subtotal**
BREEAM: Good = 0, Very Good = 4, Excellent = 8, Outstanding = 16

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

Score

- 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 6
 - Reduce heat entering a building through providing/improving insulation and living roofs and walls 2
 - Reduce heat entering a building through shading 3
 - Exposed thermal mass and high ceilings 4
 - Passive ventilation 3
 - Mechanical ventilation with heat recovery 1
 - Active cooling systems, i.e. Air Conditioning Unit 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 6
 - Connection to existing heating or cooling networks powered by gas or electricity 5
 - Site wide CHP network powered by renewable energy 4
 - Site wide CHP network powered by gas 3
 - Communal heating and cooling powered by renewable energy 2
 - Communal heating and cooling powered by gas or electricity 1
 - Individual heating and cooling 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 **19**

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? 10
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 **2**

Please give any additional relevant comments to the Transport Section below

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)
If so, please state how much in sqm? -2 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"/> | sqm |
| An extensive green roof | 5 | <input type="checkbox"/> | Area provided: | <input type="text"/> | sqm |
| An intensive green roof | 4 | <input type="checkbox"/> | Area provided: | <input type="text"/> | sqm |
| Garden space | 4 | <input type="checkbox"/> | Area provided: | <input type="text"/> | sqm |
| Additional native and/or wildlife friendly planting to peripheral areas | 3 | <input type="checkbox"/> | Area provided: | <input type="text"/> | sqm |
| Additional planting to peripheral areas | 2 | <input checked="" type="checkbox"/> | Area provided: | <input type="text"/> | 4 sqm |
| A living wall | 2 | <input type="checkbox"/> | Area provided: | <input type="text"/> | 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

The existing site is mostly covered with building and hard standing and the proposal follows a similar footprint location.

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:
Please provide details of the permeable surfacing below sqm
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

A rainwater butt 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?
- | | | |
|---|--------------------------|---|
| Have you submitted an assessment of the site contamination? | <input type="checkbox"/> | 1 |
| Are plans in place to remediate the contamination? | <input type="checkbox"/> | 2 |
| Have you submitted a remediation plan? | <input 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

On site composting is not appropriate because of the constraints of the site.

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 **50**

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 2

BREEAM Pre-Assessment Estimator

BREEAM : Pre-Assessment Estimator

Total Predicted Score ; **D2** **70.75** **Excellent**

LESS THAN 30 Points

30 Points

45 Points

55 Points

70 Points

85 Points

UNCLASSIFIED

PASS

GOOD

VERY GOOD

EXCELLENT

OUTSTANDING

22nd Feb 2016

Site Address;

275, Sandycombe Road, Kew

Code Category	Description	A2		Information to be provided
		Credits	%	
Man 01	Sustainable procurement	6 of 8	3.27	
Innovation		1 of 1	1.00	
Man 02	Responsible construction practices	2 of 2	1.09	
Innovation		1 of 1	1.00	
Man 03	Construction site impacts	4 of 5	2.18	
Man 04	Stakeholder participation	3 of 4	1.64	
Man 05	Life cycle costs and service life planning	0 of 3	0.00	
Hea 01	Visual comfort	1 of 3	1.07	
Innovation		0 of 1	0.00	
Hea 02	Indoor air quality	2 of 4	2.14	

Hea 03	Thermal comfort	1 of 2	1.07	
Hea 04	Water Quality	1 of 1	1.07	
Hea 05	Acoustic Performance	2 of 2	2.14	
Hea 06	Safety and Security	1 of 2	1.07	
Ene 01	Reduction of CO2 Emissions	10 of 15	7.04	
Innovation		0 of 5	0.00	
Ene 02	Energy Monitoring	2 of 2	1.41	
Ene 3	External Lighting	1 of 1	0.70	
Ene 04	Low and Zero Carbon Technology	3 of 5	2.11	
Innovation		0 of 1	0.00	
Ene 06	Energy Efficient Transport System	2 of 2	1.41	
Ene 08	Energy Efficient Equipment	0 of 2	0.00	
Tra 01	Public Transport Accessibility	3 of 3	2.67	

Tra 02	Proximity to Amenities	1 of 1	0.89	
Tra 03	Cyclists facilities	0 of 2	0.00	
Tra 04	Maximum Car Parking Capacity	2 of 2	1.78	
Tra 05	Travel Plan	1 of 1	0.89	
Wat 01	Water Consumption	3 of 5	2.00	
Innovation		0 of 1	0.00	
Wat 02	Water Monitoring	1 of 1	0.67	
Wat 03	Water Leak Detection and Prevention	2 of 2	1.33	
Wat 04	Water Efficient Equipment	1 of 1	0.67	
Mat 01	Life Cycle Impacts	3 of 5	3.12	
Innovation		0 of 1	0.00	
Mat 02	Hard Landscaping and Boundary Protection	0 of 1	0.00	
Mat 03	Responsible Sourcing	1 of 3	1.04	
Innovation		0 of 1	0.00	

Mat 04	Insulation	2 of 2	2.08	
Mat 05	Designing for Robustness	0 of 1	0.00	
Wst 01	Construction Waste Management	4 of 4	4.29	
Innovation		0 of 1	0.00	
Wst 02	Recycled Aggregates	1 of 1	1.07	
Innovation		0 of 1	0.00	
Wst 03	Operational Waste	1 of 1	1.07	
Wst 04	Speculative Floor and Ceiling Finishes	1 of 1	1.07	
LE 01	Site Selection	1 of 2	1.00	
LE 02	Ecological Value of Site and Protection of Features	1 of 1	1.00	
LE 03	Mitigating Ecological Impact	2 of 2	2.00	
LE 04	Enhancing Site Ecology	2 of 3	2.00	
LE 05	Long Term Impact on Biodiversity	1 of 2	1.00	

Pol 01	Impact of Refrigerants	2 of 3	1.54	
Pol 02	Nox Emissions	1 of 3	0.77	
Pol 03	Surface Water Run-Off	5 of 5	3.85	
Pol 04	Reduction of Nighttime Light Pollution	1 of 1	0.77	
Pol 05	Noise Attenuation	1 of 1	0.77	

70.75