



# Hampton Waterworks Sustainability Statement

*For Waterfall Hampton Investment Ltd*

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# CONTENTS

HAMPTON WATERWORKS .....	1
1. INTRODUCTION .....	1
1.1 Purpose of Report .....	1
1.2 Site and Location .....	1
1.3 Development Details .....	1
2. PLANNING POLICY .....	2
2.1 The London Plan .....	2
2.2 London Borough of Richmond Upon Thames Local Plan .....	3
2.3 Sustainable Construction Checklist Guidance SPD .....	4
3. SUSTAINABILITY .....	5
3.1 Sustainable Design and Construction .....	5
3.2 Ecology .....	5
3.3 Flooding & Drainage .....	5
3.4 Water (Supply) .....	5
3.5 Waste .....	5
3.6 Transport .....	6
3.7 Pollution .....	6
4. OVERHEATING ANALYSIS .....	7
4.2 Residential Overheating Analysis .....	7
4.3 Overheating Results .....	7
4.4 Conclusions and Recommendations .....	7
5. BREEAM ASSESSMENT .....	8
5.1 BREEAM Overview .....	8
5.2 BREEAM Domestic Refurbishment .....	8
5.3 BREEAM Refurbishment and Fit Out .....	8
5.4 Conclusions .....	8

## Tables

Table 1: The BREEAM rating system .....	8
Table 2: Karlake TM59 results .....	20
Table 3: Ruston & Ward TM59 results .....	21
Table 4: Cottage TM59 results .....	21
Table 5: Storehouse TM59 results .....	21

## Figures

Figure 1: Site masterplan .....	1
Figure 2 - AQFA within LB Richmond upon Thames (red box areas) .....	3
Figure 3: Sustainable Construction Checklist Guidance Document SPD .....	4
Figure 4: EA Flood Map Zones .....	5
Figure 5: Waste Hierarchy .....	5
Figure 6: Internal heat gains .....	7
Figure 7: MVHR strategy .....	7
Figure 8: Comfort cooling DX unit (wall-mounted) .....	7
Figure 9: Predicted BREEAM scores per category .....	8
Figure 10: Summary of BREEAM scoring .....	8

## Appendices

<i>Appendix A</i>	<i>BREEAM Tracker</i>
<i>Appendix B</i>	<i>Sustainable Construction Checklist</i>
<i>Appendix C</i>	<i>Overheating TM59 results</i>

# Hampton Waterworks

## 1. INTRODUCTION

### 1.1 Purpose of Report

This document addresses key sustainability policy objectives as required by the adopted national, regional and local policy documents outlined in Section 2.

### 1.2 Site and Location

The development site is located in Hampton, London within the authority boundary of the London Borough of Richmond Upon Thames.

The site is bounded by Upper and Lower Sunbury Roads to the north and east, existing residential development to the west and the Water Treatment works reservoirs and buildings to the south and south west.

The site currently houses Grade II Listed former waterworks buildings comprising former engine houses with a single storey between; two cottages and the Storehouse.

### 1.3 Development Details

The development proposals include the refurbishment of four existing buildings into a mixed-use residential led development consisting of 36 apartments and commercial spaces. The key elements of the scheme are as follows:

- 16no. of 1-bedroom apartments;
- 11no. of 2-bedroom apartments;
- 9no. of 3+ bedroom apartments;
- Flexible commercial area; and
- 39no. car parking spaces.

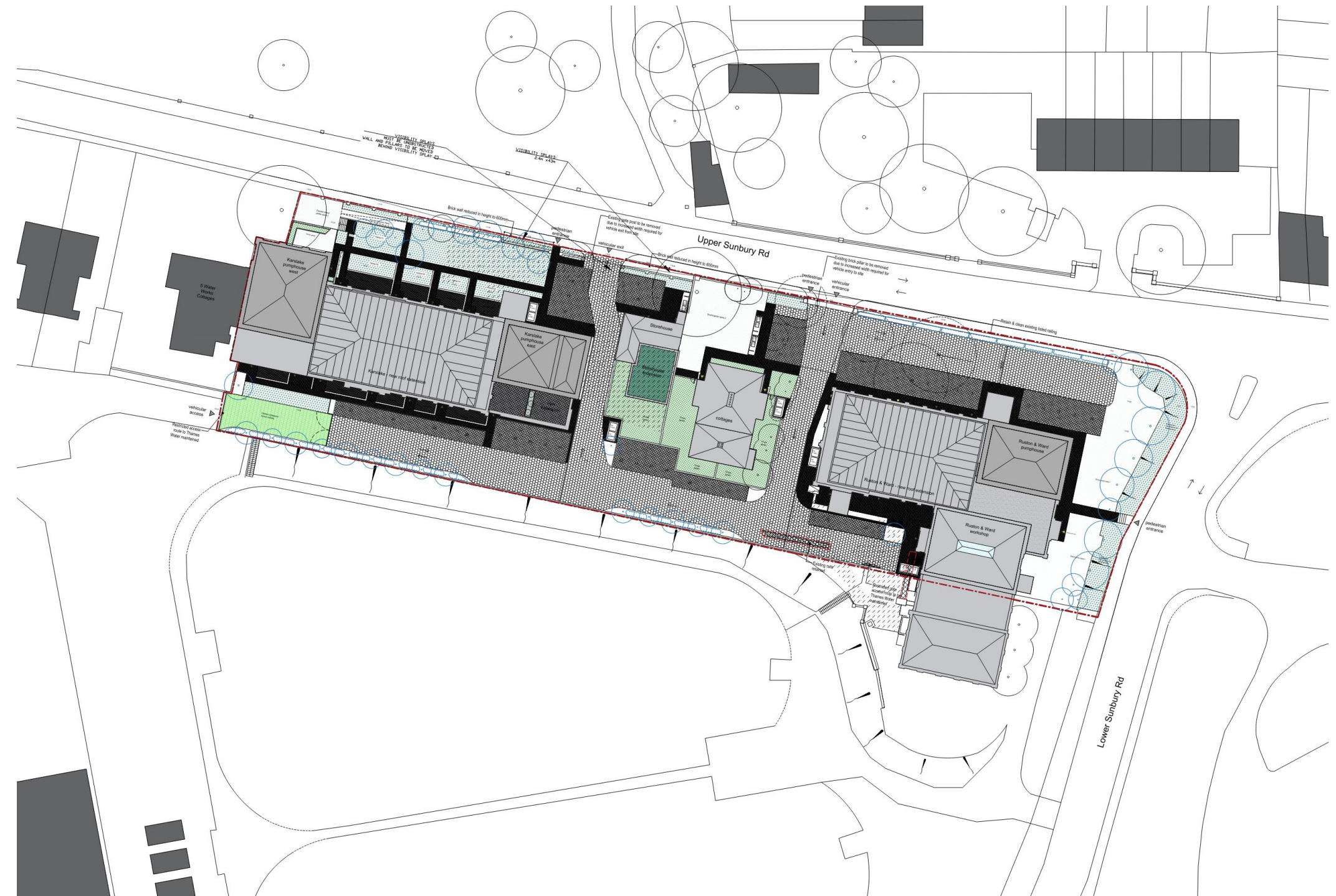


Figure 1: Site masterplan.

The current site masterplan is shown in Figure 1. The proposals fall under the thresholds for referral to the Greater London Authority (GLA).



## 2. PLANNING POLICY

### 2.1 The London Plan

Though the development proposals are not of a sufficient scale to be referred to the GLA, compliance with the relevant sustainability policies of the adopted London Plan should ultimately be demonstrated by the development proposals.

Adopted in March 2021, the new London Plan aims to re-balance development in London, co-ordinate growth between boroughs and tackle climate change by moving towards a zero-carbon city by 2050.

The key current London Plan policies are addressed below.

#### 2.1.1 Policy 2.18: Green Infrastructure

The policy aims to protect, promote, expand and manage the extent and quality of, and access to, London's network of open and green spaces.

#### 2.1.2 Policy 5.1: Climate Change Mitigation

This policy outlines the strategic target for the reduction of carbon dioxide emissions across London of 60 per cent (below 1990 levels) by 2025.

#### 2.1.3 Policy GG6 - Increasing Energy Efficiency and Resilience (emerging)

The policy updates the strategic position of the previous London Plan (Policy 5.1) by requiring development proposals to move towards a low carbon circular economy contributing towards London becoming a zero-carbon city by 2050.

Buildings and infrastructure must be designed to:

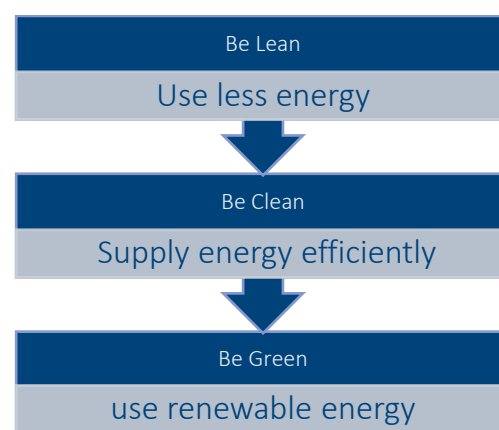
- adapt to a changing climate;
- make efficient use of water;
- reduce impacts from natural hazards like flooding and heatwaves;

- mitigate and avoid contributing to the urban heat island effect.

Development proposals should demonstrate that sustainable design standards are integral to both construction and operation, and ensure that they are considered at the beginning of the design process.

#### 2.1.4 Policy 5.2 Minimising Carbon Dioxide Emissions

Policy 5.2 sets out the Mayor's energy hierarchy as per the below, which developers are to follow when designing their schemes:



The policy also sets out the following current carbon dioxide emissions reduction targets in buildings:

- Zero carbon residential buildings;
- 35% improvement beyond Part L Building Regulation compliance for non-residential buildings.

Further detail is provided within the separate Energy Statement document which provides the relevant energy assessment and associated outputs in relation to the on-site carbon reduction targets of the London Plan and within the framework of the energy hierarchy.

It is noted that where 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 council to secure delivery of other CO<sub>2</sub> reduction projects.

#### 2.1.5 Policy SI2 - Minimising Greenhouse Gas Emissions

The policy updates the previous energy hierarchy as follows:

1. Be Lean – use less energy and manage demand during operation.
2. Be Clean – exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly.
3. Be Green – maximise opportunities for renewable energy by producing, storing and using renewable energy on-site.
4. Be Seen - monitor, verify and report on energy performance.

The priority is to minimise energy demand, and then address how energy will be supplied and renewable technologies incorporated. An important aspect of managing demand will be to reduce peak energy loadings.

The policy also sets out the updated carbon dioxide emissions reduction targets for new buildings:

- Major development should be net zero-carbon, providing an on-site carbon reduction of at least 35% beyond Part L Building Regulation compliance.

The above requirement must be demonstrated by an Energy Statement which provides the relevant energy assessment and associated outputs in relation to the on-site carbon reduction targets of the London Plan and within the framework of the energy hierarchy.

It is noted by Policy SI 2 that where 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 council to secure delivery of other CO<sub>2</sub> reduction projects.

#### 2.1.6 Policy 5.3 Sustainable Design and Construction

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.

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 the Plan and the following sustainable design principles:

- Minimising carbon dioxide emissions across the site, including the building and services (such as heating and cooling systems);
- Avoiding internal overheating and contributing to the urban heat island effect;
- Efficient use of natural resources (including water), including making the most of natural systems both within and around buildings;
- Minimising pollution (including noise, air and urban runoff);
- Minimising the generation of waste and maximising reuse or recycling;
- Avoiding impacts from natural hazards (including flooding);
- Ensuring developments are comfortable and secure for users, including avoiding the creation of adverse local climatic conditions;
- Securing sustainable procurement of materials, using local supplies where feasible; and
- Promoting and protecting biodiversity and green infrastructure.

#### 2.1.7 Policy 5.4 Retrofitting

The policy encourages the retro-fitting of measures to reduce carbon dioxide emissions, improve the efficiency of resource use (such as

water) and minimise generation of pollution and waste from existing building stock.

### 2.1.8 Policy 5.9 Overheating and Cooling

The policy states that developments should be designed to limit their contribution to the heat island effect and encourages spaces to be designed to avoid overheating, in accordance with the following cooling hierarchy:

5. Minimise internal heat generation through energy efficient design;
6. Reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls;
7. Manage the heat within the building through exposed internal thermal mass and high ceilings;
8. Passive ventilation;
9. Mechanical ventilation;
10. Active cooling systems (ensuring they are the lowest carbon options).

### 2.1.9 Policy 5.11 Green Roofs

Encourages the inclusion of green roofs and promotes the inclusion of planting within developments.

### 2.1.10 Policy 5.12 Flood Risk Management

The policy outlines the requirement to carry out flood risk assessments on relevant sites and that developments must comply with national planning policy on flood risk and management to ensure they are designed and built to be resilient to flooding.

### 2.1.11 Policy SI 13 - Sustainable Drainage

The policy supports the London Sustainable Drainage Action Plan which includes a particular emphasis on retrofitting. In all projects there should be a preference for green over grey features. The drainage hierarchy is updated to:

1. storing rainwater for later use;
2. use of infiltration techniques at ground or close to source;
3. rainwater attenuation in green infrastructure feature for gradual release;
4. discharge of rainwater direct to a watercourse;
5. controlled discharge of rainwater to a surface water sewer/drain; and
6. controlled rainwater discharge to a combined sewer.

### 2.1.12 Policy SI 5 - Water Infrastructure

Development proposal should minimise the use of mains water by:

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

New development should also seek to improve the water environment and ensure the provision of adequate waste water infrastructure. This includes minimising potential for misconnections between foul and surface water networks.

### 2.1.13 Policy 7.14 Improving Air Quality

The policy aims to reduce emissions from development, including during the demolition and construction phases and seeks new development to be 'air quality neutral'.

## 2.2 London Borough of Richmond Upon Thames Local Plan

The London Borough of Richmond upon Thames Local Plan was adopted in July 2018 and supersedes the previous Core Strategy and Development Management Plan policies. The following policies of Local Plan are relevant to the development proposals.

### 2.2.1 Policy LP 3 - Designated Heritage Assets

Amongst other measures to conserve and enhance heritage assets, the policy requires the retention and preservation of the original structure, layout, architectural features, materials as well as later features of interest within listed buildings and seeks to resist the removal or modification of features that are both internally and externally of architectural importance or that contribute to the significance of the asset.

### 2.2.2 Policy LP 8 - Amenity and Living Conditions

All development must ensure that design and layout of buildings enables good standards of daylight and sunlight to be achieved, where existing daylight and sunlight conditions are already substandard, they should be improved where possible.

### 2.2.3 Policy LP 10 - Local Environmental Impacts, Pollution and Land Contamination

#### Air Quality

The whole of Richmond has been declared an Air Quality Management Area (AQMA) for both nitrogen dioxide (NO<sub>2</sub>) and particulate matter (PM<sub>10</sub>).

In addition to the AQMA, Richmond has four Air Quality Focus Areas (AQFA). An AQFA is a location that has been identified as having high levels of pollution and human exposure.

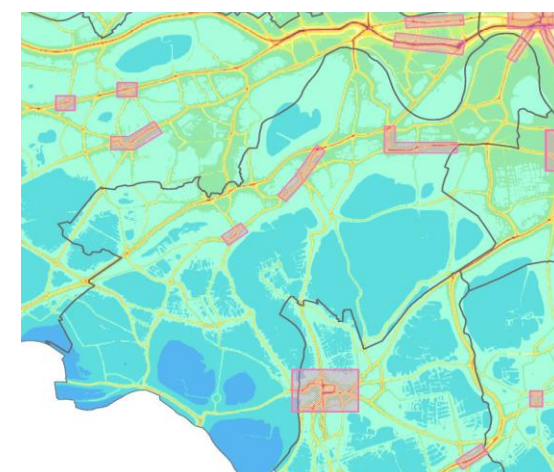


Figure 2 - AQFA within LB Richmond upon Thames (red box areas)

On this basis, developers should secure at least 'Emissions Neutral' development and may be required to provide an Air Quality Impact Assessment and details of mitigation measures to reduce the development's impact on any sensitive receptors and/or protect occupiers from existing sources.

#### Light Pollution

The Council will seek to ensure that artificial lighting in new developments does not lead to unacceptable impacts by requiring the following, where necessary:

- an assessment of any new lighting and its impact upon any receptors;
- mitigation measures, including the type and positioning of light sources;
- promotion of good lighting design and use of new technologies.

### 2.2.4 Policy SI1 - Improving Air Quality

The policy aims to reduce emissions from development, including during the demolition and construction phases and seeks new development to be at least 'air quality neutral' as demonstrated by an Air Quality Assessment for major development proposals.

Where emissions need to be reduced to meet the requirements of Air Quality Neutral or to make the impact of development on local air quality acceptable, this is done on-site where ever possible.

### 2.2.5 Policy LP15 - Biodiversity

Major developments are required to deliver net gain for biodiversity, through incorporation of ecological enhancements, wherever possible by incorporating and creating new habitats or biodiversity features, including trees, into development sites and into the design of buildings themselves where appropriate.

### 2.2.6 Policy LP 20 - Climate Change Adaption

The Council will promote and encourage development to be fully resilient to the future



impacts of climate change in order to minimise vulnerability of people and property.

Opportunities to adapt existing buildings, places and spaces to the likely effects of climate change should be maximised and will be supported.

### 2.2.7 Policy LP 21 - Flood Risk and Sustainable Drainage

In Flood Zones 2 and 3, all proposals on sites of 10 dwellings or more or 1000sqm of non-residential development or more a Flood Risk Assessment and a Flood Emergency Plan must be submitted.

In addition, the use of Sustainable Drainage Systems (SuDS) is required in all development proposals. Applicants will have to demonstrate that their proposal complies with the following:

- A reduction in surface water discharge to greenfield run-off rates wherever feasible.
- Where greenfield run-off rates are not feasible, this will need to be demonstrated by the applicant, and in such instances, the minimum requirement is to achieve at least a 50% attenuation of the site's surface water runoff at peak times based on the levels existing prior to the development.

### 2.2.8 Policy LP22 - Sustainable Design and Construction

Developments 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 to be submitted as part of the planning application.

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).

In addition, the following environmental standards will be required:

- New non-residential buildings over 100sqm will be required to meet BREEAM 'Excellent' standard.
- Proposals for change of use to residential will be required to meet BREEAM Domestic Refurbishment 'Excellent' standard (where feasible).

### Reducing Carbon Dioxide Emissions

High standards of energy and water efficiency in existing developments will be supported wherever possible through retrofitting. Where development proposals do not meet the thresholds set out in this policy developers are encouraged to complete and submit the Sustainable Construction Checklist SPD the Council will support opportunities for micro-generation of renewable energy in line with other policies in the Local Plan.

New development proposals are required to meet the following minimum reductions in carbon dioxide emissions:

- a. All new major residential developments (10 units or more) should achieve zero carbon standards in line with London Plan policy.
- b. All other new residential buildings and non-residential development over 100sqm should achieve a 35% reduction.

Targets are expressed as a percentage improvement over the target emission rate (TER) based on Part L of the 2021 Building Regulations.

This should be achieved by following the Energy Hierarchy as outlined in London Plan policy 5.2.

### 2.2.9 Policy LP 24 - Waste Management

All developments, including conversions and changes of use are required to provide adequate refuse and recycling storage space and facilities, which allows for ease of collection and which residents and occupiers can easily access, in line with the guidance and advice set out in the Council's SPD on Refuse and Recycling Storage Requirements.

### 2.2.10 Policy LP 33 - Telecommunications

The Council will promote the enhanced connectivity of the borough through supporting infrastructure for high speed broadband and telecommunications.

### 2.3 Sustainable Construction Checklist Guidance SPD

The Sustainable Construction Checklist SPD forms part of the assessment for planning applications for new build, conversion and retrofit properties within the London Borough of Richmond upon Thames. The Checklist forms a mandatory part of the planning application for major developments.

The guidance provides additional detail on meeting policy requirements and the supporting evidence that may be required in order to demonstrate this as part of the planning application, in addition to the completed checklist.

This guidance includes the provision of an independent third-party external consultant review for developments which do not comply with the required carbon emissions reductions and/or BREEAM ratings. The fee for this independent review is payable by the applicant.

The overall checklist score and associated rating reflects the positive contribution which the development proposals will make towards incorporating sustainable design measures.

For more information, the full Sustainable Construction Checklist can be found in Appendix B.

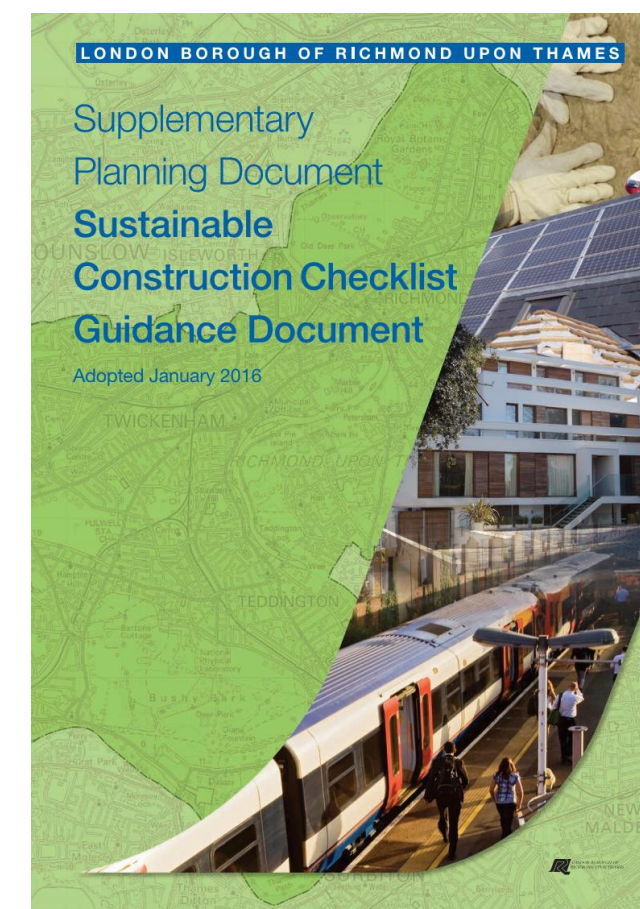


Figure 3: Sustainable Construction Checklist Guidance Document SPD

### 3. SUSTAINABILITY

#### 3.1 Sustainable Design and Construction

Passive design measures, including daylight access, natural ventilation and risk of overheating, and active design measures including building services, district or communal heating infrastructure and renewables are covered within the Energy Strategy prepared by Hydrock Consultants.

##### 3.1.1 Design & Access

The site will be designed to allow safe and easy access for all potential users, including pedestrians and cyclists. Car parking for 39 vehicles has been included on site.

##### 3.1.2 Material Selection

The BRE ‘Green Guide to Specification’ is proposed to be used when selecting the construction materials, to encourage the use of materials which have been produced with minimal impact to the environment in line with good-practice methodology. The Guide promotes the use of sustainable materials with low embodied energy, ecotoxicity and long-life span.

Additionally, the materials selected will be responsibly sourced and where practicable meet the following guidelines:

- ISO14001;
- BES6001;
- PEFC / FSC;
- Chain of Custody.

##### 3.1.3 Security

The development has been designed in a manner which minimises the risk of crime. The site will be designed securely and seeks to ensure a safe working environment and ensure that the building is safe and accessible.

#### 3.2 Ecology

##### 3.2.1 Biodiversity

It has been concluded that no direct or indirect effects are anticipated to the adjacent statutory sites to the development. Good practice guidelines will be adhered to during the construction phases to ensure protection for local wildlife sites from impacts such as contamination, dust and noise during the build of the proposed redevelopment, including the preparation of a Construction Environmental Management Plan (CEMP).

The site ecology could be enhanced further by providing bird and bat boxes within the new building design or on surrounding mature trees.

Please see the Preliminary Ecological Appraisal and Bat Survey Report prepared by RPS Group for more information.

#### 3.3 Flooding & Drainage

##### 3.3.1 Flood Risk

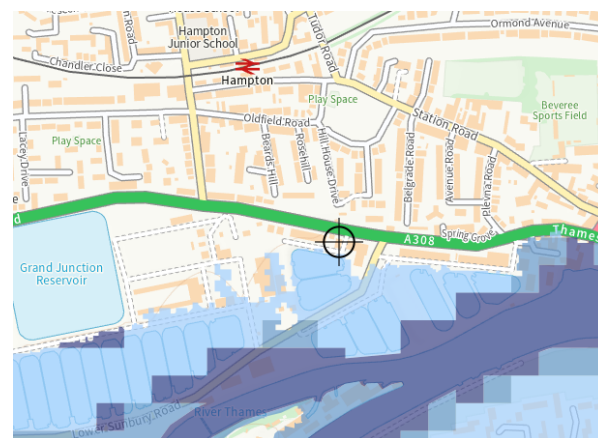


Figure 4: EA Flood Map Zones

Development proposals must comply with the flood risk assessment and management requirements set out in the NPPF and the associated Technical Guidance on flood risk over the lifetime of the development and have regard to measures proposed in Thames Estuary 2100 and Catchment Flood Management Plans.

Developments which are required to pass the Exceptions Test set out in the NPPF and the Technical Guidance will need to address flood resilient design and emergency planning by demonstrating that:

- the development will remain safe and operational under flood conditions;
- a strategy of either safe evacuation and/or safely remaining in the building is followed under flood conditions;
- key services including electricity, water etc will continue to be provided under flood conditions; and
- buildings are designed for quick recovery following a flood.

The site has been concluded as being at a low risk from all assessed sources of flooding, and therefore meets the requirements of the Sequential Test.

Please refer to the Flood Risk Assessment prepared by Hydrock Consultants for more information.

#### 3.4 Water (Supply)

To reduce the consumption of potable water, efficient sanitary ware and water-saving features will be specified.

This will include limiting flow rates and reducing flush levels of sanitary ware fittings. The development aims to reduce water usage and improvement in water efficiency over a notional baseline established by the BRE in line with best practice guidelines.

At present, and where applicable, this will include:

- Low and dual flush WCs - Dual flush cisterns with low effective flush volume will be specified;
- Taps – Wash hand basins and sinks will be water efficient.

- Showers – Aerated or low flow showerheads will be included to help reduce water consumption; and
- Kitchen appliances – Low water consuming equipment to be considered.

All external planting will rely on manual watering, or precipitation only.

Plumbed rainwater harvesting has not currently been included for the scheme, due to the practicality and cost of installing the system, in lieu of targeting other energy and water saving measures.

#### 3.5 Waste

The new development aims to minimise waste throughout construction and also to reduce waste throughout operations by providing appropriate facilities, in accordance with good-practice principles. Throughout construction, the appointed contractor will make effort to minimise waste and, where possible, divert waste from landfill through reuse or recycling.

Waste will be minimised throughout the demolition and construction phase through the implementation of the waste hierarchy. The principles of the waste hierarchy are shown below.

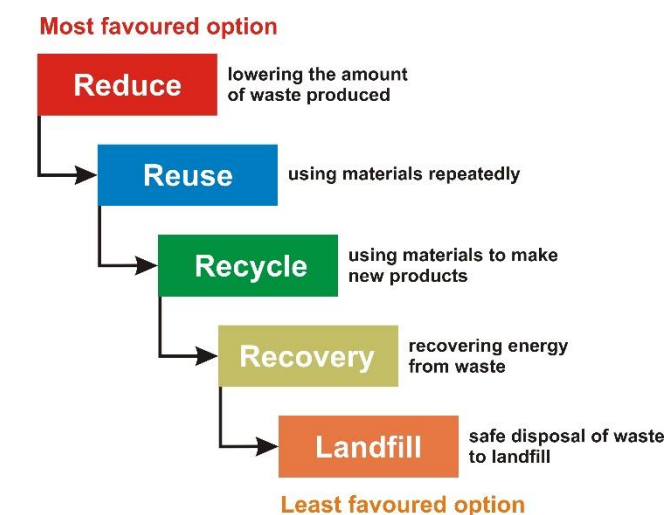


Figure 5: Waste Hierarchy.



Throughout the operation of the development waste storage facilities will be provided for recyclable and non-recyclable waste. The waste strategy has been designed to reduce walking distances to storage points and kept close to the road side for waste transport vehicles.

Waste will be segregated on-site into the main waste streams for recycling and collection purposes.

### 3.6 Transport

A transport assessment has been carried out by Markides Associates. The development will provide 39no. car parking spaces and additional cycle parking spaces.

The site is ideally situated for travel by sustainable modes given its proximity and access to public transport, good walking and cycling routes as well as all of the services and amenities that a city centre location can offer:

- Excellent pedestrian access;
- Located within easy access of the existing cycle network;
- High frequency bus services within 300m of the site; and
- High frequency train services within 500m of the site.

For more information please see the Transport Statement by Markides Associates.

### 3.7 Pollution

Pollution can harm both the natural environment and the human environment and consequently can negatively influence the wellbeing of wildlife and humans.

Best practice pollution prevention measures will be implemented throughout construction to reduce the potential negative impacts on water, and air, to minimise disturbance to the surrounding areas. In addition, the design of the building has been undertaken in a way which negates or reduces the impact of pollution.

#### 3.7.1 Air

The development will aim to reduce exposure to poor air quality, as well as reduce emissions from development, including during the demotion and construction phases.

The site is within an Air Quality Management Area (AQMA) for NO<sub>x</sub> and PM<sub>10</sub>.

The development will be designed to be 'air quality neutral' where practicable and minimise the generation of air pollution during the following stages:

- Construction – Minimise impacts using necessary mitigation measures relating to demolition, earthworks, construction, trackout, and non-road mobile machinery (NRMM), as appropriate.

#### 3.7.2 Land

A Phase 1 Desk Study has been completed to inform the land conditions of the site. The overall risk from land contamination at the site is considered to be low for the current development, and moderate for a redeveloped site.

An intrusive and Phase 2 investigation is recommended to confirm the actual risks to the receptors and confirm the ground conditions.

#### 3.7.3 Water (Foul)

All areas of the development will connect to the public foul sewer network.

Thames Water have confirmation has been received that the system has sufficient capacity for the proposed foul flows.

Further information on foul drainage is provided in the Foul & Surface Water Drainage Strategy prepared by Hydrock Consultants.

#### 3.7.4 Noise

The main sources of noise and vibration in the vicinity of the site are generated from:

- Road traffic; and
- Plant and mechanical equipment.

Internal noise will be controlled to provide a comfortable environment for the desired use and if required, attenuation measures will be specified.

#### 3.7.5 Light

Light pollution can result from any adverse effect of artificial lighting and includes the following:

- Glare – the uncomfortable brightness of a light source when viewed against a dark sky;
- 'Light trespass' – the spread of light spillage the boundary of the property on which a light is located; and
- 'Sky glow' – the orange glow seen around urban areas caused by a scattering of artificial light by dust particles and water droplets in the sky.

All external lighting for the site will be designed in line with current British Standards and ILP Guidelines. For more information please see the Lighting Impact Assessment by Hydrock Consultants.

#### 3.7.6 Broadband Connectivity

A review of broadband connectivity options has been carried out for the site to determine providers and expected bandwidths. High speed broadband is available from a number of different suppliers; standard broadband up to 11Mb and fibre optic up to 108Mb. Suppliers serving the area include BT, TalkTalk, Virgin Media and Vodafone.



## 4. OVERHEATING ANALYSIS

To assess the likelihood of overheating in summer months, the units have been assessed which are considered to be at the highest risk of overheating.

The overheating analysis has been carried out using the methodology outlined under CIBSE TM59 (Chartered Institute of Building Service Engineers, 2017).

A separate steady-state overheating check will be carried out by Hydrock as part of the SAP assessment for the scheme. All modelling has been carried out in accordance with the requirements of CIBSE AM11 Building Performance Modelling (Chartered Institute of Building Services Engineers, 2015).

### 4.1.1 Thermal Model

The analysis has been carried out using IES Virtual Environment 2019 software; a dynamic thermal modelling software tool in accordance with CIBSE AM11.

The model has been created and analysed based on the following information:

- Architectural layouts and elevations issued on 30th August 2022; and
- London Heathrow DSY01 2020, High emissions, 50 percentile.
- The following building fabric has been applied to the model. Infiltration is assumed to be 0.25 ach.

### 4.1.2 Assumptions

The following assumptions have been used during the modelling process:

- All internal gains are as per standard NCM parameters (in line with SAP methodology);
- Window opening types are as per the architect's elevations;
- Glazing light transmittance value is 0.4 (only for south, east and west facades).

## 4.2 Residential Overheating Analysis

### 4.2.1 Overheating Criteria

CIBSE TM52 was generated in response to the absence of an adequate definition of overheating in natural ventilated buildings. In the past overheating has been defined as a number of hours over a particular temperature, irrespective of conditions outside the building. Recent work embodied in European standards suggests that the temperature that occupants will find uncomfortable changes with the outdoor conditions in a predictable way. This can be referred to as adaptive thermal comfort.

The criteria are as follows:

- Uses DSY weather file.
- Based on operative temperature.
- Based on three criteria (need to pass two):
  1. Threshold temperature exceeded  $\geq 3\%$  of occupied hours per year.
  2. Daily weighted exceedance (degree hours)  $\geq 6$ .
  3. Temperature  $\geq$  upper limit.
- Threshold temperature based on running mean daily mean outside air temperature.

Further to the TM52 Analysis, the bedrooms and communal corridors will be assessed further using CIBSE TM59. The TM59 introduces two additional criteria designed to be used in conjunction with the first criterion outlined in TM52. TM59 compliance is based on passing both criteria 1 and 4.

4. The second criterion of TM59 sets a limit for the number of hours the operative temperature exceeds  $26^{\circ}\text{C}$  in the bedroom from 10pm to 7am, in order to guarantee comfort during the sleeping hours. In a predominantly naturally ventilated environment, this criterion dictates 1% of annual hours between 22:00 and 07:00, which is a 32-hour threshold.

5. The third criterion of TM59 pertains to overheating of communal corridors, and sets a limit for the number of annual hours that the operative temperature exceeds  $28^{\circ}\text{C}$ . The limit dictated is 3% of annual hours.

Whilst criterion 5 is not a mandatory target, failure to meet this requirement should be identified as a significant risk to the project.

### 4.2.2 Internal Gains

Solar gains are calculated automatically by the modelling software based on the orientation of the building, transmission coefficients of the glazing and solar angles.

To allow flexibility in the design, the standard NCM conditions have been used for all spaces. Occupancy rates are in line with CIBSE Guide A.

Zone	Lighting	Occupant Sensible	Occupant Latent	Small Power
Lounge	5 W/m <sup>2</sup>	70 W/m <sup>2</sup>	50 W/m <sup>2</sup>	5 W/m <sup>2</sup>
Bedroom	5 W/m <sup>2</sup>	70 W/m <sup>2</sup>	20 W/m <sup>2</sup>	2 W/m <sup>2</sup>
Circulation	5 W/m <sup>2</sup>	N/A	N/A	2 W/m <sup>2</sup>
Bathroom	5 W/m <sup>2</sup>	N/A	N/A	2 W/m <sup>2</sup>

Figure 6: Internal heat gains.

Occupancy profiles are provided by the NCM methodology and have been applied for this assessment as they are representative of typical occupancies for residential developments.

## 4.3 Overheating Results

The results show that the development is at risk of overheating. The analysis shows that the majority of residential spaces exceed the TM52 and TM59 overheating analysis, and therefore are likely to overheat.

The full overheating results for each block are summarised in Appendix C.

In each case windows are assumed to be open during occupied periods as specified by the NCM. Top hung windows and balcony doors are open from 0700 – 0900 and from 1700 – 2200, which is representative of the NCM occupancy profile for dwellings.

## 4.4 Conclusions and Recommendations

As the development is a residential development, natural ventilation is the main ventilation method. However, the design team have concluded that this will not be sufficient to provide enough fresh air to prevent overheating due to the nature of the development and the layout of the apartments.

Furthermore, the ventilation strategy will need to be revised to allow for air to move within the space effectively. Mechanical ventilation may also be required to ensure the thermal comfort of the apartments is met, particularly where there are mezzanine bedrooms.



Figure 7: MVHR strategy

In cases where mechanical ventilation is insufficient in providing thermal comfort, comfort cooling may be required, through DX units with an external compound.



Figure 8: Comfort cooling DX unit (wall-mounted)



## 5. BREEAM ASSESSMENT

### 5.1 BREEAM Overview

BREEAM is an assessment method which evaluates how sustainable buildings are by comparing proposed designs with a standardised set of criteria.

Each BREEAM assessment covers nine different categories:

- Management;
- Health & wellbeing;
- Energy;
- Transport;
- Water;
- Materials;
- Waste;
- Land Use & Ecology; and
- Pollution.

The predicted credits achieved are scored and totalled with the results for each category weighted to give the final score for the development. Each BREEAM section has a different number of credits and a different weighting meaning that credits in different categories have a different 'value' in terms of an overall percentage of the final score. This is worth bearing in mind when selecting additional credits and can help with value engineering the final BREEAM score.

The following total scores are required to achieve each BREEAM rating level.

Rating Level	Score Required
Unclassified	< 30
Pass	≥ 30
Good	≥ 45
Very Good	≥ 55
Excellent	≥ 70
Outstanding	≥ 85

Table 1: The BREEAM rating system.

### 5.2 BREEAM Domestic Refurbishment

#### 5.2.1 Preliminary Review

In line with policy LP 22, the new residences created by the refurbishment of existing buildings is required to undertake a BREEAM Domestic Refurbishment assessment.

Based on current information, the development is in line with a BREEAM Domestic Refurbishment 'Excellent' rating. There are also a number of potential credits that could also be incorporated as the design develops through the next stages in line with the aim and principles of the BREEAM Domestic Refurbishment assessment. The following scores are predicted:

- Likely score – 70.37% (Excellent)
- Possible score – 94.43% (Outstanding)

Please see BREEAM Domestic Refurbishment credit matrix in Appendix A for a more detailed review of each credit.

### 5.3 BREEAM Refurbishment and Fit Out

In line with policy LP 22, any new non-residential areas over 100m<sup>2</sup> are required to undertake a BREEAM assessment. For Hampton Waterworks, the areas being refurbished into workshops will be required to undertake a BREEAM Refurbishment and Fit Out assessment.

### 5.4 Conclusions

The design team are currently targeting a BREEAM Domestic Refurbishment score of 'Excellent' and a BREEAM Refurbishment and Fit Out score of 'Excellent'.

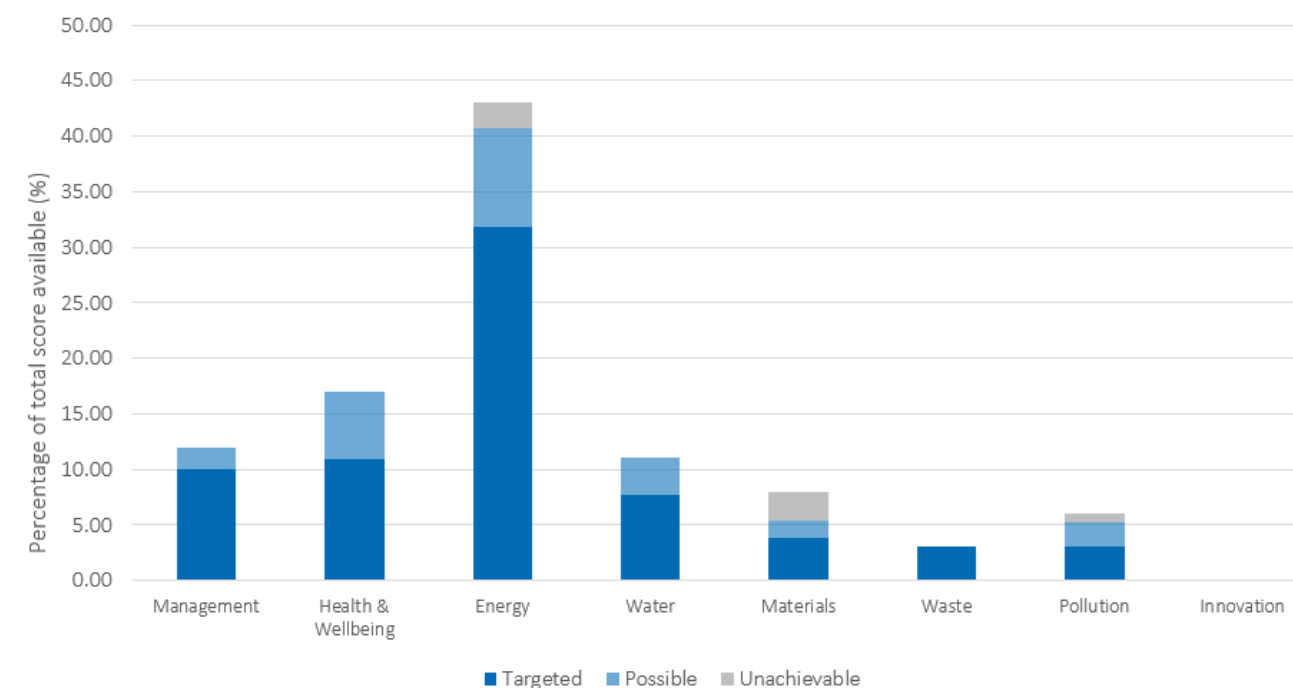


Figure 9: Predicted BREEAM scores per category.

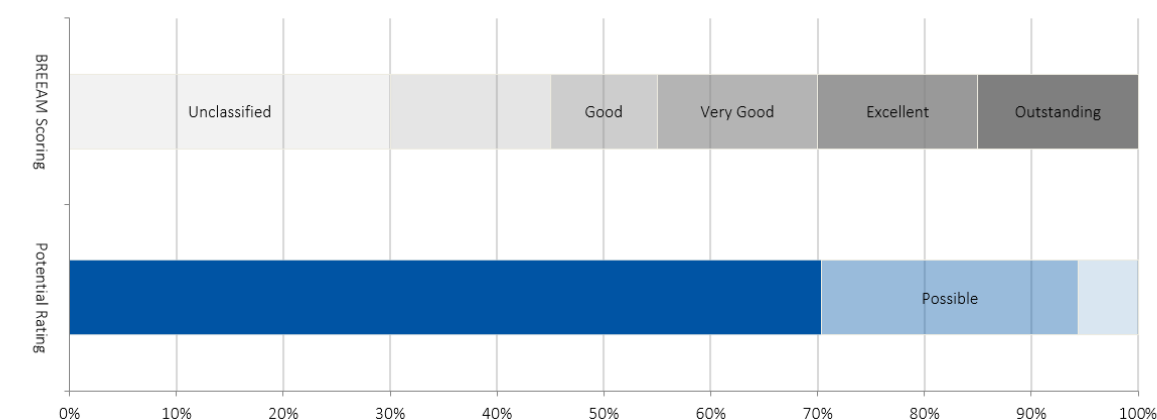


Figure 10: Summary of BREEAM scoring.



Appendix A BREEAM Tracker

Reference	Title	Credits	Status A/T/P/U	Summary Requirements (see credit details in all instances)	Comments	Owner
<b>Management</b>						
Man 01: Homes Users Guide	Homes User Guide	3	T	1. Provision of a home user guide: Where a home user guide containing the information listed in the 'user guide contents list' has been produced and supplied to all homes.		Contractor
Man 02: Responsible Construction Practices	Responsible Construction Practices	2	T	1. <b>Option 1:</b> Where the principal contractor has used the Considerate Constructors scheme (CCS) as detailed in CN1. Credits are awarded depending on the CCS Code of Considerate Practice score achieved. 2. <b>Option 2:</b> Where the principal contractor has used a compliant alternative scheme as detailed in CN4. Credits are awarded on the level of compliance with the alternative compliant scheme.		Contractor
Man 03: Construction Site Impacts	Construction Site Impacts	1	T	1. Where there is evidence to demonstrate the 2 or more of the sections a – e in Checklist A-4: Large scale refurbishments are completed.		Contractor
Man 04: Security	Secure Windows and Doors	1	T	1. Where retained, external doors and accessible windows comply with the minimum security requirements as set out in CN6. 2. Where the following newly added features are appropriately certified: 2a. External door sets; and 2b. Windows.		Architect
	Secured by Design	2	P	3. Where the principles and guidance of Secured by Design Section 2 – Physical Security are complied with. 4. A suitably qualified security consultant such as the Police Architectural Liaison Officer (ALO) or Crime Prevention Design Advisor is consulted at the design stage and their recommendations are incorporated into the refurbishment specification.		Security Consultant
Man 05: Protection and Enhancement of Ecological Features	Protecting Ecological Features	1	T	1. Where a site survey is carried out by a member of the project team or a suitably qualified ecologist to determine the presence of ecological features. 2. Where protected species have been identified as present on-site, the relevant Statutory Nature Conservation Organisation (SNCO) has been notified and protected species have been adequately protected. 3. Where all existing features of ecological value (including any of those listed in CN1) on the refurbishment site potentially affected by the works, are maintained and adequately protected during refurbishment works.		Ecologist



Reference	Title	Credits	Status A/T/P/U	Summary Requirements (see credit details in all instances)	Comments	Owner
Man 06: Project Management	Project Roles and Responsibilities	1	T	1. Where all of the project team are involved in the project decision-making and individual and shared roles and responsibilities are assigned in accordance with CN1 and CN2 as follows: 1b. For large-scale projects, the project manager assigns individual and shared responsibilities across the following key design and refurbishment stages: Planning and Building control notification; Design; Refurbishment; Commissioning and handover; and Occupation.		Project Manager
	Handover and Aftercare	1	T	2. Where a handover meeting is arranged. 3. Where two or more of items 3.a–3.c have been committed to determine project success: 3a. A site inspection within three months of occupation. 3b. Conduct post-occupancy interviews with building occupants or a survey via phone or posted information within three months of occupation. 3c. Longer term after care, e.g. a helpline, nominated individual or other appropriate system to support building users for at least the first 12 months of occupation.		
<b>Health and Wellbeing</b>						
Hea 01: Daylighting	Maintaining Good Daylighting	1	T	1. For existing dwellings and change of use projects (e.g. conversions): 1a. The refurbishment results in a neutral impact on the dwellings daylighting levels in the kitchen, living room, dining room and study with "no" answered for all questions in Checklist A-7: Daylight Factor, parts 1 and 2 (for existing dwellings) or parts 3 and 4 (for change of use e.g. conversions). 2. Where the property is being extended: 2a. New spaces achieve minimum daylighting levels 2b. The extension does not significantly reduce daylighting levels in the kitchen, living room, dining room or study of neighbouring properties.		MEP
	Minimum Daylighting	1	T	3. The dwelling achieves minimum daylighting levels in the kitchen, living room, dining room and study.		MEP
Hea 02: Sound Insulation	Sound Insulation	Up to 4	T	<b>Historic Buildings</b> 4. Where the dwelling is a historic building and sound testing results demonstrate existing separating walls and floor meet the historic building credit requirements, up to four credits may be awarded as shown in Table - 13 and described in CN10. OR 5. Where criteria 2 and 3 is achieved using Table - 13 OR 6. Where the dwelling achieves criterion 1 or 7 or 8.		Acoustician
	Avoiding the Use of VOCs	1	T	1. Where all decorative paints and varnishes used in the refurbishment have met the requirement in Table - 16. 2. Where at least five of the eight remaining product categories listed have met the testing requirements and emission levels for volatile organic compound (VOC) emissions against the relevant standards identified in Table - 16. 3. Where five or fewer products are specified within the refurbishment, all must meet the requirements in order to achieve this credit.		Architect
Hea 03: Volatile Organic Compounds						



Reference	Title	Credits	Status A/T/P/U	Summary Requirements (see credit details in all instances)	Comments	Owner
Hea 04: Inclusive Design	Minimum Accessibility	1	P	<p>1. An access expert or suitably qualified member of the design team (CN6) has completed section 1 of Checklist A8: Access statement template, accessibility template with evidence provided of the measures implemented in the refurbishment</p> <p>1a. The access statement demonstrates reasonable provision to provide accessibility to the dwelling covering section 1 of Checklist A8: Access statement template in accordance with CN3 and CN4.</p>		Architect / Access Expert
	Advanced Accessibility	2	P	<p>2. An access expert or suitably qualified member of the design team (CN6) has completed sections 1 and 2 of <a href="#">Checklist A8: Access statement template</a> with evidence provided of the measures implemented in the refurbishment</p> <p>2a. The access statement demonstrates reasonable provision to provide accessibility to the dwelling covering sections 1 and 2 of <a href="#">Checklist A8: Access statement template</a> in accordance with <a href="#">CN3</a> and <a href="#">CN4</a>.</p>		Architect / Access Expert
Hea 05: Ventilation	Minimum Ventilation Requirements	1	T	<p><b>Historic Buildings</b></p> <p>Where an assessment is carried out to establish the current levels of air tightness and structural moisture prior to the specification of fabric measures and heating systems. The assessment should establish the appropriate level of ventilation for the building, based upon:</p> <p>The minimum ventilation requirement to meet that set out in Building Regulations Approved Document Part F</p> <p>Ventilation rates in all habitable and inhabitable spaces are sufficient to allow structural moisture to be dealt with effectively. This may be required by Building Regulations Approved Document Part F where the structure or fixtures needs higher levels of ventilation in order to deal with moisture levels</p>		MEP
	Advanced Ventilation	2	P	<p><b>Historic Buildings</b></p> <p>The first credit is achieved and where the following testing was also carried out in order to develop the ventilation and air tightness strategy for the building:</p> <ul style="list-style-type: none"> <li>• Pressure testing was carried out before and after refurbishment in accordance with the appropriate standard; and</li> <li>• Temperature and humidity is monitored before and after refurbishment.</li> </ul>		MEP



Reference	Title	Credits	Status A/T/P/U	Summary Requirements (see credit details in all instances)	Comments	Owner
Hea 06: Safety	Fire and Carbon Monoxide (CO) Detection and Alarm Systems	1	T	<p>1. Where the dwelling is provided with a compliant fire detection and alarm system in accordance with relevant compliance notes 2-9.</p> <p>2. Where the dwelling is supplied with mains gas or where any other form of fossil fuel (e.g. coal) or biomass is used within the building (e.g. coal), a compliant carbon monoxide detector and alarm system is provided in accordance with relevant compliance notes 2-9.</p> <p>3. Where the project involves electrical rewiring the power supply for the smoke alarm and compliant carbon monoxide alarm systems are derived from the dwellings main electricity supply in accordance with <a href="#">CNS</a>.</p> <p>4. Where the project does not involve electrical rewiring the power supply for the smoke alarm and carbon monoxide alarm systems are derived from a battery supply.</p>		MEP
<b>Energy</b>						
Ene 01: Improvement in Energy Efficiency Rating	Improving the dwelling's energy efficiency rating (EER)	Up to 6	T	Where the refurbishment results in an improvement to the dwelling's energy efficiency rating. Credits are awarded based on percentage of improvement in EER.		MEP
Ene 02: Energy Efficiency Rating Post-refurbishment	EER post-refurbishment	Up to 4	T	Where as a result of refurbishment, the dwelling meets a minimum energy efficiency rating, credits can be awarded.	EER of 70 required for BREEM Excellent rating.	MEP
Ene 03: Primary Energy Demand	Primary Energy Demand	Up to 7	T	Primary energy demand targets in kWh/m <sup>2</sup> /year. Where as a result of refurbishment the dwelling meets the primary energy demand targets, up to 7 credits may be awarded.		MEP
Ene 04: Renewable Technologies	Renewable Technologies	2	T	<p><b>1 credit</b></p> <p>1. Where at least 10% of the dwelling's primary energy demand per annum is supplied by low or zero carbon technologies; AND</p> <p>2. Where the dwelling has reduced energy demand prior to the specification of renewable technologies with a maximum primary energy demand as follows:</p> <p>2a. For detached, semi-detached, bungalows and end terraces: 250 kWh/m<sup>2</sup>/year</p> <p>2b. Mid terraces and flats: 220 kWh/m<sup>2</sup>/year</p> <p><b>2 credits</b></p> <p>3. Where for mid to high-rise flats at least 15% of each dwelling's primary energy demand per annum is supplied by low or zero carbon technologies.</p> <p>4. Where for dwellings other than mid to high-rise flats at least 20% of each dwellings primary energy demand per annum is supplied by low or zero carbon technologies; AND</p> <p>5. Where the dwelling has reduced energy demand prior to the specification of renewable technologies with a maximum primary energy demand as follows:</p> <p>5a. For detached, semi-detached, bungalows and end terraces: 250 kWh/m<sup>2</sup>/year.</p> <p>5b. Mid terraces and flats: 220 kWh/m<sup>2</sup>/year.</p>		MEP



Reference	Title	Credits	Status A/T/P/U	Summary Requirements (see credit details in all instances)	Comments	Owner
Ene 05: Energy Labelled White Goods	Fridges, freezers, and fridge/freezers	1	T	1. Fridges and freezers or fridges/freezers have an A+ rating or better under the EU energy efficiency labelling scheme; OR 2. Where no white goods are provided to the dwelling(s) but the EU energy efficiency labelling scheme information leaflet is provided to each dwelling.		Architect
	Washing machines, Dishwashers, Tumble Dryers and Washer-Dryers	1	T	3. Washing machines have an A++ rating or better under the EU energy efficiency labelling scheme 4. Dishwashers have an A+ rating or better under the EU energy efficiency labelling scheme; AND EITHER 5. Washer-dryers and tumble dryers have an A rating under the EU energy efficiency labelling scheme (where a washer dryer is provided, it is not necessary to also provide a washing machine); OR 6. Where a washer dryer or tumble dryer is not provided, the EU energy efficiency labelling scheme information leaflet is provided to each dwelling.		Architect
Ene 06: Drying Space	Drying Space	1	T	1. An adequate, secure internal or external space with posts and footings, or fixings holding: 1a. 1–2 bedrooms: 4m+ of drying line. 1b. 3+ bedrooms: 6m+ of drying line.		Architect
Ene 07: Lighting	External Lighting	1	T	1. Where energy efficient space lighting (including lighting in communal areas) and energy efficient security lighting is provided; OR 2. Where energy efficient space lighting (including lighting in communal areas) and no security lighting is provided.		MEP
	Internal Lighting	1	T	3. One credit is awarded where the energy required for internal lighting is minimised through the provision of a maximum average wattage across the total floor area of the dwelling of 9 watts/m <sup>2</sup> .		MEP
Ene 08: Display Energy Devices	Display Energy Devices	2	T	<b>1 credit</b> 1. Current electricity OR primary fuel consumption data is displayed to occupants through a compliant energy display device. <b>2 credits</b> 2. Where current electricity AND primary heating fuel consumption data are displayed to occupants by a compliant correctly specified energy display device; OR 3. Where electricity is the primary heating fuel and current electricity consumption data are displayed to occupants by a compliant energy display device.		MEP
Ene 09: Cycle Storage	Cycle Storage	2	T	<b>1 credit</b> 1. Where individual or communal compliant cycle storage is provided for the following number of cycles: 1a. Studios and 1 bedroom dwellings - storage for 1 cycle for every two dwellings; 1b. 2 and 3 bedroom dwellings - storage for 1 cycle per dwelling. 1c. 4 bedrooms and above - storage for 2 cycles per dwelling		Architect

Reference	Title	Credits	Status A/T/P/U	Summary Requirements (see credit details in all instances)	Comments	Owner
Ene 09: Cycle Storage (cont.)	Cycle Storage	2	T	2 credits  2. Where individual or communal compliant cycle storage is provided for the following number of cycles: 2a. Studios or 1 bedroom dwellings – storage for 1 cycle per dwelling. 2b. 2 and 3 bedroom dwellings – storage for 2 cycles per dwelling. 2c. 4 bedrooms and above – storage for 4 cycles per dwelling.		Architect
Ene 10: Home Office	Home Office	1	T	1. Where sufficient space and services have been provided which allow the occupants to set up a home office in a suitable room with adequate ventilation.		Architect
<b>Water</b>						
Wat 01: Internal Water Use	Internal Water Use	Up to 3	T	1. Where terminal fittings meet the equivalent terminal fitting consumption standards; OR 2. Where the BREEAM Domestic Refurbishment Wat 01 calculator is used to determine the dwelling's water consumption, credits may be awarded depending on the calculated whole house water consumption.		MEP
Wat 02: External Water Use	External Water Use	1	P	1. Where a compliant rainwater collection system for external or internal irrigation use has been provided to dwellings; OR 2. Where dwellings have no individual or communal garden space.		MEP
Wat 03: Water Meter	Water Meter	1	T	1. Where an appropriate water meter for measuring usage of mains potable water has been provided to dwelling or dwellings.		MEP
<b>Materials</b>						
Mat 01: Environmental Impact of Materials	Environmental Impact of Materials	Up to 25	T	1. The BREEAM Domestic Refurbishment Mat 01 calculator is used to determine the number of credits awarded. Credits are awarded according to the impact of new materials according to their Green Guide rating and their impact on improving the thermal performance of the dwelling for the following elements: 1a. Roof; 1b. External walls; 1c. Internal walls (including separating walls); 1d. Upper and ground floors. 1e. Windows  2. Up to a maximum of 25 credits can be awarded through achieving a combination of the credits available for each element. 3. Retained elements, where no work is being carried out on them, are assessed against the Green Guide calculator. 4. Retained elements undergoing refurbishment (e.g. the installation of solid wall insulation) are assessed against the Green Guide calculator. 5. New elements such as new windows, a newly constructed roof or walls are assessed against the Green Guide to Specification with a maximum of 3 credits available depending on their Green Guide rating from A+ to E. 6. Additional credits are awarded for retained elements undergoing refurbishment as detailed in the calculation procedure.		Architect



Reference	Title	Credits	Status A/T/P/U	Summary Requirements (see credit details in all instances)	Comments	Owner
Mat 02: Responsible Sourcing of Materials	Prerequisite	0	T	1. All timber and timber-based products used on the project is 'legally harvested and traded timber' (see relevant definitions). Note:		Contractor
	Sustainable Procurement Plan	Up to 3	T	2. Where the principal contractor sources materials for the project in accordance with a documented sustainable procurement plan three credits can be awarded; OR 3. Where the principal contractor is a micro enterprise up to 3 credits are available.		Contractor
	Prerequisite	0	T	Any new insulation specified for use within the following building elements must be assessed: external walls; ground floor; roof; building services.		Architect / MEP
Mat 03: Insulation	Embodied Impact	4	T	1. Where the insulation index for new insulation used in the buildings is $\geq 2$ and is calculated using the BREEAM Domestic Refurbishment Mat 03 calculator. 2. Where Green Guide ratings, required by the BREEAM Domestic Refurbishment Mat 03 calculator are determined using the Green Guide to Specification tool.		Architect / MEP
	Responsible Sourcing	4	T	3. Where $\geq 80\%$ of the new thermal insulation used in the building elements is responsibly sourced.		Contractor
<b>Waste</b>						
Was 01: Household Waste	Recycling Facilities	1	T	1. One credit can be awarded where the dwelling complies with one of the scenarios detailed in Table 27 (i.e. recycling container capacity, location and position).		Architect
	Composting Facilities	1	T	Dwellings with significant external private space - all of the following are met: 2. Where a composting service or facility is provided for green/garden waste. 3. Where a composting service or facility is provided for kitchen waste. 4. Where an interior container is provided for kitchen composting waste of at least seven litres. Dwellings without significant external private space - all of following are met: 5. Where a composting service or facility is provided for kitchen waste. 6. Where an interior container is provided for kitchen composting waste of at least seven litres.		Architect
	Management Plan	1	T	1. Where a compliant level 2 SWMP is in place.		Contractor
Was 02: Refurbishment Site Waste Management	Good practice waste benchmarks	1	T	4. Where the first credit has been achieved. 5. Where non-hazardous construction waste generated by the dwellings refurbishment meets or exceeds the resource efficiency benchmark. 6. Where the amount of waste generated per £100,000 of project value is recorded in the SWMP; 7. Where a pre-refurbishment audit of the existing building is completed; 8. Where the demolition is included as part of the refurbishment programme, then the audit should also cover demolition materials.		Contractor

Reference	Title	Credits	Status A/T/P/U	Summary Requirements (see credit details in all instances)	Comments	Owner
Was 02: Refurbishment Site Waste Management (cont.)	Best Practice Waste Benchmarks	1	T	9. Where the first two credits have been achieved. 10. Where non-hazardous demolition waste generated by the dwellings refurbishment meets or exceeds the refurbishment & demolition waste diversion benchmarks.		Contractor
	Responsible Sourcing of Materials	Up to 12	T	4. The available RSM credits can be awarded where the applicable building materials are responsibly sourced in accordance with the BREEAM methodology.		
<b>Pollution</b>						
Pol 01: Nitrogen Oxide Emissions	Low NO <sub>x</sub> Space Heating and Hot Water Systems	Up to 3	P	1. Credits are awarded on the basis of NO <sub>x</sub> emissions arising from the operation of space heating and hot water systems for each refurbished dwelling as follows: 1a. One credit where the dry NO <sub>x</sub> emissions of space heating and hot water systems are ≤ 100 mg/kWh (NO <sub>x</sub> class 4 boiler). 1b. Two credits where the dry NO <sub>x</sub> emissions of space heating and hot water systems are ≤ 70 mg/kWh (NO <sub>x</sub> class 5 boiler). 1c. Three credits where the dry NO <sub>x</sub> emissions of space heating and hot water systems are ≤ 40 mg/kWh.		MEP
	Neutral Impact on Surface Water	1	T	1. Where there is no change in the size of the building footprint or hardstanding as a result of the refurbishment. 2. Where any new hardstanding areas are permeable, this must include all new pavements, driveways and where applicable public rights of way, car parks and non-adoptable roads (e.g. community scale refurbishment projects). 3. Where the building is being extended onto any previously permeable surfaces, or an impermeable surface that drains onto a permeable surface (e.g. paving slabs set on concrete that drained onto soft landscaped areas) the additional run-off for rainfall depths up to 5 mm caused by the area of the extension must be managed on-site using appropriate Sustainable Drainage Systems (SuDS) such as Soakaways. 4. Any calculations necessary to demonstrate that criterion <a href="#">2</a> will be achieved should be carried out by an Appropriately Qualified Professional (AQP).		Civil Engineer
Pol 02: Surface Water Run-Off	OR Reducing Run-Off from Site (Basic)	2	T	5. Where criteria <a href="#">1</a> , <a href="#">2</a> and <a href="#">3</a> have been achieved. 6. Where all run-off from the roof for rainfall depths up to 5mm, have been managed on-site using source control methods (e.g. through infiltration, soakaways, etc.). This should include run-off from all existing and new parts of the roof. 7. Where required, an appropriately qualified professional should be used to design an appropriate drainage strategy for the site, ensuring criterion <a href="#">1</a> is achieved.		Civil Engineer



Reference	Title	Credits	Status A/T/P/U	Summary Requirements (see credit details in all instances)	Comments	Owner
Pol 02: Surface Water Run-Off (cont.)	OR Reducing Run-Off from Site (Advanced)	3	T	<p>8. An appropriately qualified professional should be used to design an appropriate drainage strategy for the site.</p> <p>9. Where run-off as a result of the refurbishment is managed on-site using source control achieving the following requirements:</p> <p>9a. The peak rate of run-off as a result of the refurbishment for the 1 in 100 year event has been reduced by 75% from the existing site.</p> <p>9b. The total volume of run-off discharged into the watercourses and sewers as a result of the refurbishment, for a 1 in 100 year event of 6 hour duration has been reduced by 75%.</p> <p>9c. An allowance for climate change must be included for all of the above calculations.</p> <p><b>Option 1: Low Flood Risk</b></p> <p>1. Where a flood risk assessment (FRA) has been carried out and the assessed dwellings are defined as having a low annual probability of flooding.</p> <p><b>Option 2: Medium/high flood risk</b></p> <p>2. Where a flood risk assessment (FRA) has been carried out and the assessed dwellings are defined as having a medium or high annual probability of flooding.</p> <p>3. Two credits are awarded where as a result of the dwellings floor level or measures to keep water away the dwelling is defined as achieving avoidance from flooding</p> <p>4. Where avoidance is not possible, two credits are achieved where a full flood resilience/resistance strategy is implemented for the dwellings in accordance with recommendations made by a suitably qualified building professional.</p>		Civil Engineer
Pol 03: Flooding	Low Flood Risk or Flood Mitigation	2	T		Mandatory requirement of 2 credits for Excellent level.	Civil Engineer

## Appendix B Sustainable Construction Checklist

Checklist Section	Requirements	Information Location
Energy Assessments	An Energy Statement following Richmond Council and Greater London Authority Developers Guidance should be submitted with the application.	Energy Statement produced by Hydrock Consultants.
Carbon Dioxide Emissions Reduction	The existing London Borough of Richmond upon Thames policy DM SD 1 contained within the Development Management Plan and the London Plan (2015) require developments to reduce CO <sub>2</sub> emissions by 35% beyond Building Regulations 2013. The reduction in total site CO <sub>2</sub> emissions must be calculated using an energy baseline which includes both 'regulated' energy and 'un-regulated energy'. The CO <sub>2</sub> emissions associated with the total energy consumed by a development should then be reduced following the Mayor of London's Energy Hierarchy which first focuses on reduction in energy demand through energy efficiency measures, then on 'clean' energy supply through heat networks or community heating where appropriate, and finally considers applicability of renewable energy supply to the site.	Energy Statement produced by Hydrock Consultants.
Environmental Rating: BREEAM	All applications for non-residential uses as well as conversions to residential will be required to gain a BREEAM 'excellent' rating.	Section 5 and Appendix A of this report.
Water Usage	All residential developments are to be designed to ensure that mains water consumption meets the target of 105 litres or less per head per day (excluding an allowance of 5 litres or less per person per day for external water consumption).	Section 3.4 of this report.
The Energy Hierarchy	<p><b>Use less energy</b> The first step in the Mayor's Energy Hierarchy requests that buildings be designed to use improved energy efficiency measures.</p> <p><b>Supplying energy efficiently</b> The second stage in the Mayor's Energy Hierarchy is to ensure efficient and low carbon energy supply.</p> <p><b>Using renewable energy</b> Generating energy from renewable energy sources is the final step in the Mayor's 'Energy Hierarchy', and will enable developments to generate energy to meet their own demands.</p>	Energy Statement produced by Hydrock Consultants.
Pollution: Air, Noise and Light	Measures to reduce pollution during the construction process should be implemented including: air, noise and light.	<p>Air Quality Assessment produced by Hydrock Consultants.</p> <p>Noise Planning Report produced by Hydrock Consultants.</p> <p>External Lighting Assessment produced by Hydrock Consultants</p>
Provision for the safe, efficient and sustainable movement of people and goods	Provision for the safe, efficient and sustainable movement of people and goods.	Transport assessment produced by Markides Associates.
Provision of charging points for electric cars	Developments are to ensure that 1 in 5 parking spaces (both active and passive) provide an electrical charging point to encourage the uptake of electric vehicles.	Transport assessment produced by Markides Associates.
Provision of cycle storage	Provision of suitable levels of cycle storage for residents/building users is essential. Considerations for designing cycle storage should include security, weatherproofing, access and lighting.	Design and Access Statement produced by LOM Architecture and Design
Minimising the threat to biodiversity from new buildings, lighting, hard surfacing and people	Ensure there is no net loss of ecological features or habitats and aim to achieve a net gain of biodiversity features and habitats where possible. Aim to link existing and new biodiversity features and habitats into the wider green infrastructure network, and ensure that their adaptability to climate change is taken into account.	<p>Ecological Assessment produced by RPS Group</p> <p>External Lighting Assessment produced by Hydrock Consultants</p>
Is your site located in a high-risk flood zone?	A Flood Risk Assessment will be required for all developments, including extensions and conversions, in areas at risk from flooding (this also includes other sources of flooding, not just river flooding), and for sites greater than 1 hectare in low risk areas (zone 1).	Flood Risk Assessment produced by Hydrock Consultants.
Sustainable drainage and measures to mitigate surface water flooding risk	It is the responsibility of a developer to make proper provision for surface water drainage to ground, water courses or surface water sewer. It must not be allowed to drain to the foul sewer, as this is the major contributor to sewer flooding.	Foul & Surface Water Drainage Strategy produced by Hydrock Consultants.



Checklist Section	Requirements	Information Location
Re-use and recycling of construction materials	Developments are encouraged to include a Site Waste Management Plan pre-commencement.	A Site Waste Management Plan will be produced pre-commencement of the development.
Site on contaminated land	The DEFRA Circular 01/2006 Contaminated Land gives statutory guidance on the new regime for the treatment of contaminated land, as set out in Part IIA of the Environmental Protection Act 1990.	Land Contamination Desk Study produced by Hydrock Consultants
Composting	Composting food and organic waste on site can not only reduce the amount of waste sent to landfill, and harmful greenhouse gases produced as a result, but also provides free fertilizer for garden spaces.	Design and Access Statement produced by LOM Architecture and Design
Water Conservation	<p>Despite the perception of the UK as a wet country, water is a resource which needs to be carefully managed to ensure that the needs of our growing population are met. This is particularly crucial in the face of climate change, with hotter drier summers likely to put increased pressure on water resources.</p> <p>It is essential that developers demonstrate that adequate water supply and sewerage infrastructure capacity exists both on and off the site to serve the development and that it would not lead to problems for existing users. Developers will be required to provide evidence that capacity exists in the public sewerage and water supply network to serve their development. Developers should contact Thames Water with this regard.</p>	Section 3.4 of this report.
Ensure flexible and adaptable use of long-term structures	There should be reference to how the accessibility criteria have been addressed. Particular standards that affect plans and elevations include door widths, level access, turning circles, window heights, and adaptability for future lift provision.	Design and Access Statement produced by LOM Architecture and Design

## Appendix C Overheating TM59 results

Table 2: Karslake TM59 results

Space Name (Real)	Criteria 1 (%Hrs Top-Tmax>=1K)	Criteria 2 (Max. Daily Deg.Hrs)	Criteria 3 (Max. DeltaT)	Criteria failing	Pass / Fail	Bedroom test	Pass / Fail
Unit 1 - DB	2.2	33	4	2	Pass	30	Pass
Unit 1 - LRK	3.1	29	4	1 & 2	Fail		
Unit 2 - DB 1	0.8	19	3	2	Pass	28	Pass
Unit 2 - DB 2	1.9	25	3	2	Pass	338	Fail
Unit 2 - LRK	2.2	24	4	2	Pass		
Unit 3 - DB 01	3.9	30	3	1 & 2	Fail	211	Fail
Unit 3 - DB 02	11.6	64	4	1 & 2	Fail	428	Fail
Unit 3 - LRK	10.2	42	5	1 & 2 & 3	Fail		
Unit 4 - DB	3.6	34	4	1 & 2	Fail	254	Fail
Unit 4 - LRK	5.4	28	4	1 & 2	Fail		
Unit 5 - DB	8.5	53	4	1 & 2	Fail	368	Fail
Unit 5 - LRK	16.1	43	5	1 & 2 & 3	Fail		
Unit 6 - DB	3.3	33	3	1 & 2	Fail	276	Fail
Unit 6 - LRK	4.9	27	4	1 & 2	Fail		
Unit 7 - DB	11.4	60	5	1 & 2 & 3	Fail	389	Fail
Unit 7 - LRK	19.1	48	6	1 & 2 & 3	Fail		
Unit 8 - SB	8.9	60	4	1 & 2	Fail	611	Fail
Unit 8 - DB	9.9	63	4	1 & 2	Fail	633	Fail
Unit 8 - LRK	4	26	4	1 & 2	Fail		
Unit 9 - DB 1	12	70	4	1 & 2	Fail	644	Fail
Unit 9 - DB 2	13.2	71	4	1 & 2	Fail	593	Fail
Unit 9 - LRK	14.5	47	6	1 & 2 & 3	Fail		
Unit 10 - DB	1.3	26	4	2	Pass	49	Fail
Unit 10 - LRK	3.1	29	4	1 & 2	Fail		
Unit 11 - DB	1.4	24	3	2	Pass	136	Fail
Unit 11 - LRK	2.6	25	3	2	Pass		
Unit 12 - DB 1	1.4	25	3	2	Pass	74	Fail
Unit 12 - DB 2	2.2	32	4	2	Pass	45	Fail
Unit 12 - SB	1.7	26	3	2	Pass	71	Fail
Unit 12 - LRK	3.2	26	4	1 & 2	Fail		
Unit 13 - DB	1.8	28	4	2	Pass	97	Fail
Unit 13 - LRK	2	22	3	2	Pass		
Unit 14 DB 1	1.2	27	4	2	Pass	84	Fail
Unit 14 DB 2	1.2	25	3	2	Pass	92	Fail
Unit 14 K	2.9	30	4	2	Pass		
Unit 14 LR	3.8	36	5	1 & 2 & 3	Fail		

Space Name (Real)	Criteria 1 (%Hrs Top-Tmax>=1K)	Criteria 2 (Max. Daily Deg.Hrs)	Criteria 3 (Max. DeltaT)	Criteria failing	Pass / Fail	Bedroom test	Pass / Fail
Unit 15 - DB	1.7	28	4	2	Pass	22	Pass
Unit 15 - SB 1	2	30	4	2	Pass	22	Pass
Unit 15 - SB 2	2	33	5	2 & 3	Fail	21	Pass
Unit 15 - LRK	4.9	38	5	1 & 2 & 3	Fail		
Unit 16 - DB	3.9	42	5	1 & 2 & 3	Fail	22	Pass
Unit 16 - SB	5.1	48	6	1 & 2 & 3	Fail	23	Pass
Unit 16 - LRK	8.1	49	6	1 & 2 & 3	Fail		
Unit 17 - DB	2	32	5	2 & 3	Fail	22	Pass
Unit 17 - SB	2.2	34	5	2 & 3	Fail	22	Pass
Unit 17 - LRK	4.7	38	5	1 & 2 & 3	Fail		
Unit 18 - DB	3.9	41	5	1 & 2 & 3	Fail	23	Pass
Unit 18 - SB	4.1	43	6	1 & 2 & 3	Fail	23	Pass
Unit 18 - LRK	7.7	46	6	1 & 2 & 3	Fail		
Unit 19 - Study	3.3	32	5	1 & 2 & 3	Fail		
Unit 19 - DB 01	2.2	27	3	2	Pass	143	Fail
Unit 19 - DB 02	3.9	36	4	1 & 2	Fail	165	Fail
Unit 19 - DB 03	4.3	40	4	1 & 2	Fail	212	Fail
Unit 19 - LRK	4.3	39	5	1 & 2 & 3	Fail		
Unit 20 - DB	2.3	33	4	2	Pass	22	Pass
Unit 20 - LRK	4.2	32	5	1 & 2 & 3	Fail		

Room code	Room type
LRK	Living room / Kitchen
LR	Living room
K	Kitchen
DB	Double Bed
SB	Single Bed



Table 3: Ruston & Ward TM59 results

Space Name (Real)	Criteria 1 (%Hrs Top-Tmax>=1K)	Criteria 2 (Max. Daily Deg.Hrs)	Criteria 3 (Max. DeltaT)	Criteria failing	Pass / Fail	Bedroom test	Pass / Fail
Unit 1 -DB	4.6	39	5	1 & 2 & 3	Fail	185	Fail
Unit 1 -LRK	8.5	37	5	1 & 2 & 3	Fail		
Unit 2 -DB	3.9	39	5	1 & 2 & 3	Fail	161	Fail
Unit 2 -LRK	8.2	41	5	1 & 2 & 3	Fail		
Unit 3 -DB	3.1	31	3	1 & 2	Fail	244	Fail
Unit 3 -LRK	4.9	27	4	1 & 2	Fail		
Unit 4 -DB	6.4	45	4	1 & 2	Fail	289	Fail
Unit 4 -LRK	12.0	44	5	1 & 2 & 3	Fail		
Unit 5 -DB	2.4	26	3	2	Pass	242	Fail
Unit 5 -LRK	3.8	24	4	1 & 2	Fail		
Unit 6 - Study	7.3	27	3	1 & 2	Fail		
Unit 6 -DB 1	4.8	44	3	1 & 2	Fail	546	Fail
Unit 6 -DB 2	4.8	46	3	1 & 2	Fail	505	Fail
Unit 6 -LRK	5.5	31	4	1 & 2	Fail		
Unit 7 -DB	1.4	17	2	2	Pass	177	Fail
Unit 7 -LRK	2.2	18	3	2	Pass		
Unit 8 - DB	1.4	30	4	2	Pass	60	Fail
Unit 8 - LRK	3.4	32	5	1 & 2 & 3	Fail		
Unit 9 - DB	1.4	26	3	2	Pass	129	Fail
Unit 9 - LRK	3.1	29	4	1 & 2	Fail		
Unit 10 - DB	2.8	39	5	2 & 3	Fail	22	Pass
Unit 10 - LRK	4.2	33	5	1 & 2 & 3	Fail		
Unit 10 - SB	2.8	40	5	2 & 3	Fail	21	Pass
Unit 11 - DB	3.6	45	6	1 & 2 & 3	Fail	12	Pass
Unit 21 - LRK	6.9	47	6	1 & 2 & 3	Fail		
Unit 11 - SB 1	2.5	37	5	2 & 3	Fail	21	Pass
Unit 11 - SB 2	2.9	40	6	2 & 3	Fail	17	Pass
Unit 12 - DB	4.9	46	6	1 & 2 & 3	Fail	23	Pass
Unit 12 - LRK	5.8	42	5	1 & 2 & 3	Fail		
Unit 12 - SB	4.4	45	6	1 & 2 & 3	Fail	22	Pass
Unit 13 - DB 1	2.6	32	5	2 & 3	Fail	29	Pass
Unit 13 - DB 2	2.1	33	5	2 & 3	Fail	16	Pass
Unit 13 - DB 3	3.6	41	5	1 & 2 & 3	Fail	138	Fail
Unit 13 - LRK	5.5	43	5	1 & 2 & 3	Fail		
Unit 13 - Study	3.9	28	4	1 & 2	Fail		

Table 4: Cottage TM59 results

Space Name (Real)	Criteria 1 (%Hrs Top-Tmax>=1K)	Criteria 2 (Max. Daily Deg.Hrs)	Criteria 3 (Max. DeltaT)	Criteria failing	Pass / Fail	Bedroom test	Pass / Fail
Cottage No. 3 - DB 1	2.2	37	5	2 & 3	Fail	27	Pass
Cottage No. 3 - DB 2	2.2	37	5	2 & 3	Fail	24	Pass
Cottage No. 3 - K	3.8	37	5	1 & 2 & 3	Fail		
Cottage No. 3 - LR	3	32	5	1 & 2 & 3	Fail		
Cottage No. 4 - DB 1	3.4	36	5	1 & 2 & 3	Fail	29	Pass
Cottage No. 4 - DB 2	2	30	5	2 & 3	Fail	27	Pass
Cottage No. 4 - K	5.1	38	6	1 & 2 & 3	Fail		
Cottage No. 4 - LR	2.5	26	4	2	Pass		
Cottage No. 4 - SB	2.8	34	5	2 & 3	Fail	24	Pass

Table 5: Storehouse TM59 results

Space Name (Real)	Criteria 1 (%Hrs Top-Tmax>=1K)	Criteria 2 (Max. Daily Deg.Hrs)	Criteria 3 (Max. DeltaT)	Criteria failing	Pass / Fail	Bedroom test	Pass / Fail
Storehouse - DB 1	1.6	25	4	2	Pass	25	Pass
Storehouse - DB 2	1.3	30	4	2	Pass	41	Fail
Storehouse - SB	1.3	26	4	2	Pass	31	Pass
Storehouse - LKR	2.8	31	4	2	Pass		