Hydrock

Hampton Waterworks

Energy Statement

For Waterfall Hampton Investment Ltd

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Issued by	Hydrock Consultants Limited Merchants House North Wapping Road Bristol BS1 4RW United Kingdom T +44 (0)117 9459225T E bristolcentral@hydrock.com www.hydrock.com	Client	Waterfall Hampton Investment Ltd
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Prepared by		Francesca Canfield-Payne
Checked by		Rebecca Lydon
Approved by		Marcos DeCastro

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Hampton Waterworks

1. INTRODUCTION

1.1 Purpose of Report

This document addresses the energy reporting requirements of the London Borough of Richmond Upon Thames Local Plan and Sustainable Construction Checklist Supplementary Planning Document (SPD).

1.2 Site and Location

The development site is located within the authority boundary of the London Borough of Richmond Upon Thames and is bounded by Upper and Lower Sunbury Roads to the north and east. To the West lies an existing residential development as well as the Water Treatment works reservoirs and buildings which are also found to the South of the site.

The site currently houses Grade II Listed former waterworks buildings comprising former engine houses with a single storey between.

The existing site location and red line boundary is shown in Figure 1.

1.3 Development Details

The development proposes to refurbish 4 buildings into mixed use consisting of 36 residential units along with commercial spaces. The key elements of the scheme are as follow:

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

The proposals fall under the thresholds for referral to the Greater London Authority (GLA).

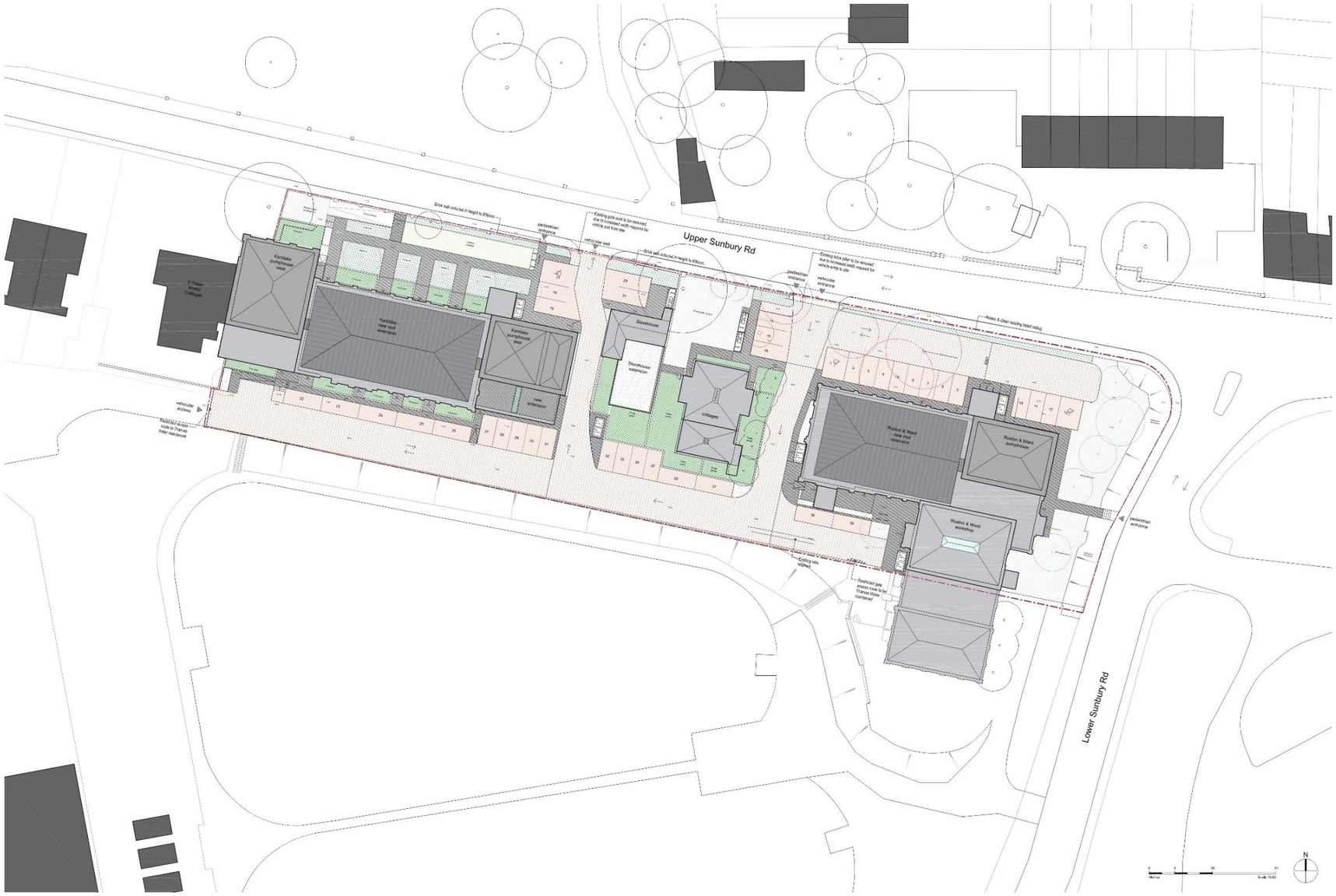


Figure 1: Site masterplan.

2. PLANNING POLICY

2.1 Building Regulations Part L

Building Regulation's Part L was recently updated on June 15th 2022, these regulations have revised the Part L calculations methodology. This includes much improved carbon factors which will greatly benefit fully electrified sites carbon emissions, however, will require new homes to produce around 31% less carbon emissions than Part L 2013 baselines, and non-domestic buildings such as offices and shops will have to cut emissions by 27%.

There are a number of key changes as part of the update, the most significant relating to the fuel emission factors. Gas has remained approximately the same as under the 2012 version but the carbon factor for grid derived electricity has reduced by 73%.

Fuel	SAP 2012 (Part L 2013) (kgCO2/kWh)	SAP 10.2 (Part L 2021) (kgCO2/kWh)
Gas	0.216	0.210
Electricity	0.519	0.136

Table 1: Part L carbon factors 2013 – 2021

These changes are likely to result in electric or heat pump derived heating and hot water becoming the standard industry approach for future developments, particularly as the country moves away from grid derived gas. This will be an important consideration when reviewing appropriate building services strategies for the development.

Table 2: Part L2 2013 and Part L2 2021 Notional Fabric Comparison

Building Element	Part L 2013 Notional Building Fabric	Part L 2021 Notional Building Fabric
Roof	0.18 W/(m²·K)	0.13 W/(m²·K)
Wall	0.26 W/(m²·K)	0.18 W/(m²·K)
Glazing	1.60 W/(m²·K)	1.20 W/(m²·K)
Floor	0.22 W/(m²·K)	0.13 W/(m²·K)
Air Permeability	5 m³/(h·m²) @ 50 Pa	5 m³/(h·m²) @ 50 Pa

2.2 The London Plan

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.

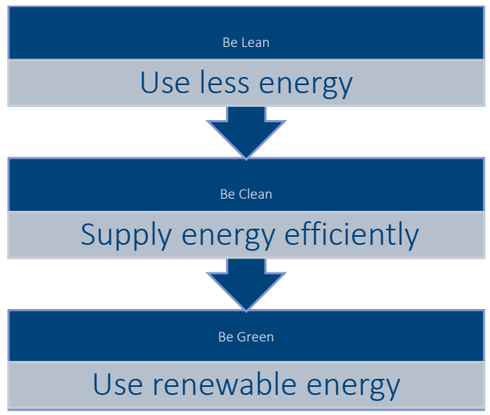
Many of the policies of the adopted London Plan are addressed within the separate Sustainability Statement document. However, the specific energy reporting requirements of adopted Policy 5.2 (and emerging Policy SI 2) as summarised below are addressed within this Energy Statement.

2.2.1 Policy 5.2 Minimising Carbon Dioxide Emissions

The policy 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.



Whilst the targets in policy 5.2 apply to major developments, it is acknowledged that for many schemes involving existing buildings it will be a challenge to meet these targets, except perhaps where a development can connect to a low or zero carbon energy source.

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_2 reduction projects.

2.2.2 Policy SI 2 Minimising Greenhouse Gas Emissions

The policy updates the previous energy hierarchy as follows:

Be Lean – use less energy and manage demand during operation.

Be Clean – exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly.

Be Green – maximise opportunities for renewable energy by producing, storing and using renewable energy on-site.

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_2 reduction projects.

2.3 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.

2.3.1 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.

In addition, the following environmental standards will be required:

- 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 110 litre/person/day or BREEAM thresholds, 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 Building Regulations.

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

2.4 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 (LBRT). 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.

Energy Performance

An assessment of the expected energy demand at the site should be submitted, showing how energy and carbon dioxide emissions will be reduced through the implementation of the London Plan energy hierarchy and in line with LBRT policy requirements.

Section 7 of the SPD provides additional guidelines on what should be included within an Energy Statement which have been followed during the preparation of this report.

Further information on the Sustainable Construction Checklist can be found in the Sustainability Statement report.

2.5 Emerging policies

London Borough of Richmond upon Thames are currently preparing a new Local Plan for Richmond borough, set to be adopted in Autumn 2024. This will replace the current Local Plan and the Twickenham Area Action Plan. The council is currently on the consultation stage of the 'Pre-Publication' Draft Local Plan

2.5.1 Policy 34. Green and Blue Infrastructure (Strategic Policy)

To ensure all development proposals protect and appropriately enhance and restore green infrastructure, the following will be taken into account when assessing development proposals:

- Enhance the existing blue and green infrastructure network, including open spaces and green corridors, providing habitats for biodiversity to flourish and expand.
- Protect and enhance biodiversity within the green and blue infrastructure networks, particularly on sites designated for nature conservation interest
- Enhance accessibility to open spaces as well as to the blue infrastructure network, particularly to the borough's rivers and their banks, for leisure and recreational use, while ensuring that the biodiversity value is protected.

2.5.2 Policy 28. Local Character and Design Quality (Strategic Policy)

- To ensure development respects, contributes to and enhances the local environment and character. Proposals must reflect and demonstrate the following principles:
- Ensure the development provides a high-quality sustainable design, construction and layout, including adaptability to climate change whilst responding positively to the local character as identified in the Urban Design Study and Conservation Area Appraisals/Statements;
- Maximise opportunities for urban greening, and integrate existing and incorporate new natural features into a multifunctional network that supports quality of place and biodiversity, which address climate change and resilience;
-

2.5.3 Policy 7. Waste and the Circular Economy (Strategic Policy)

The Council will ensure waste is managed in accordance with the principles of the Circular economy.

- The borough's waste sites are safeguarded. Proposals affecting existing waste management sites, as well as proposals for new or additional waste management facilities, will be assessed against the policies of the West London Waste Plan (2015) and the London Plan.

2.6 Policy Summary

Based upon discussions to date with the Council, the development must demonstrate as part of an Energy Statement submitted with the planning application, how the principles of the adopted London Plan energy hierarchy have been implemented within the proposals.

The development proposal will constitute a material change of use and a change to the energy status of the building(s) and is therefore considered to be subject to the energy efficiency requirements of Part L despite the listed status.

The above consideration may require flexibility with respect to the proposals to ensure that any potential unacceptable alteration of the character or appearance of the buildings is balanced against the energy performance of the residential and non-residential elements.

3. BASELINE CARBON EMISSIONS

This section of the report establishes the baseline energy consumption and associated CO_2 emissions for the scheme. The baseline carbon dioxide emissions have been established based on U-values suitable for the age of construction and a gas boiler efficiency in line with the existing plant.

3.1 Methodology

Energy modelling has been carried out using Part L accredited software. Residential areas of the development are to be assessed under the Standard Assessment Procedure (SAP) utilising FSAP, while non-domestic areas are assessed using the Simplified Building Energy Model (SBEM) via IES Virtual Environment

Both software packages predict the energy demand, energy consumption and carbon dioxide emissions for the proposed development for comparison against a 'notional building'. In this case, an estimate of the CO_2 savings from the refurbishment of the building is also provided.

The regulated CO_2 emissions of the un-refurbished, existing buildings are modelled to determine a BER/DER, which will be used to determine a baseline.

Existing fabric details were not available for the development. As such, values have been chosen that are suitable for the age of construction from the most suitable industry guidance.

The BER/DER of the refurbished building should also be determined at each stage of the energy hierarchy using building regulations compliance software.

The CO_2 reduction requirements have been assessed on an aggregate approach across the site, taking into account the orientation, number, size and type of dwelling.

It should be noted that calculations at this stage are approximate only, with final calculations still required across the whole development. This will be carried out upon completion of the design stages.

Proposed revised fuel emission factors have recently been published by UK Government under SAP 10.2. Emissions will undergo a significant change for electricity - from 0.519 $kgCO_2/kWh$ to 0.136 $kgCO_2/kWh$, which is now lower than mains gas at 0.210 $kgCO_2/kWh$.

This change has resulted from the increased use of renewable energy feeding electricity to the national grid.

3.2 Part L Assumptions

For projects where an existing building or group of buildings is refurbished it is still expected that developers provide an energy assessment, demonstrating how the individual elements of the energy hierarchy have been implemented within the project and how reductions in regulated CO_2 emissions have been achieved.

Evidence of how the development performs against overheating criteria is presented within the Sustainability Statement report along with an outline of the assumptions made.

3.2.1 Internal Gains

SAP and SBEM calculations both utilise weather data based on the UK average climatic data closest to the site location.

Solar gains are calculated automatically by each modelling software and are based on the orientation of the building, the transmission coefficients of the glazing and the solar angles. SAP also takes into account shading devices.

Gains from lighting, appliances, cooking and from the occupants are estimated from the floor area within SAP.

All occupancy, lighting and equipment gains are specified within the NCM internal conditions for each use class under SBEM.

3.2.2 Building Fabric

All fabric attributes for the baseline case have been selected to suit the construction types and age of the existing building. These have been taken from the SAP methodology for existing buildings where possible.

Building Element	Historic (Existing) Building Fabric U-value
Roof	1.5 W/m^2k
Wall	1.6 W/m^2k
Floor	1.2 W/m^2k
Glazing	4.8 W/m^2k

Table 3 Baseline building fabric values

3.2.3 Building Services

The baseline for change of use applications should be estimated assuming the existing building is the same as the proposed end use.

Where the existing building does not include certain building elements that should be included in the baseline, it is expected that the estimate of the performance of the building element would meet the recommended performance standards outlined in Approved Documents L1B and L2B, or the Government's Building Services Compliance Guidance for the purposes of estimating baseline CO_2 emission performance.

To calculate the baseline CO_2 emissions the commercial spaces are assumed to use electric heating and hot water, and grid derived electricity for all lighting and power.

For the improvements from energy efficiency alone to be understood, the heating system for the purpose of the 'Be Lean' calculation has been assumed to be an all-electric system aligned with the Part L notional building assumptions.

3.3 Baseline Regulated Carbon Emissions

The total predicted baseline regulated carbon emissions for the development proposals is **94,740 $kgCO_2$/annum.**

This is split into a domestic CO_2 emission per year figure of approximately **87,200 $kgCO_2$/yr** and a non-domestic figure per year of approximately **7,540 $kgCO_2$/yr**.

3.4 Unregulated Carbon Emissions

Unregulated emissions relate to any energy consuming activities that are not covered under Building Regulations Part L1A. This usually consists of small power (plug-in) devices or any other plant process or equipment. For Hampton Waterworks this will include:

- Small power – Televisions, computers, laptops and other electrical equipment.
- Kitchen equipment – Cookers, fridges, freezers and dishwashers etc.

The total unregulated carbon emissions for the development are estimated at **85,265 $kgCO_2$/yr**.

4. REDUCE THE DEMAND FOR ENERGY (BE LEAN)

This section looks at measures to reduce the new development against the notional building baseline. Energy demand reduction provides the greatest opportunity for minimising a building's potential CO_2 emissions.

Design strategies typically include building form and fabric measures (passive design) and energy efficient building services (active design). Focusing on form and fabric in particular at an early stage in the build process is often the most cost-effective way to reduce energy consumption and CO_2 emissions.

4.1 Passive Design

Passive design options are those which utilise building form, massing and glazing ratios to exploit the natural surroundings of the site to help reduce energy demand. This can include the following:

- The use of overhangs to reduce the risk of overheating and cooling demand in the summer, while allowing solar gain from the lower winter sun to help reduce heating demand;
- The inclusion of thermal mass via exposed stone to regulate internal room temperature;
- Increased efficiency of building fabric to reduce heat loss; and
- Strategic planting of trees on site to shelter lower level dwellings from high winds and provide shading from the sun.

Limiting fabric parameters have been used from L1A/L2A for upgraded elements (Table 4) whilst notional building values have been used for new thermal elements (Table 5).

Building Element	Proposed Building Fabric U-value (Upgraded)
Roof	0.20 W/m^{2}k
Wall	0.30 W/m^{2}k
Floor	0.25 W/m^{2}k
Glazing	1.60 W/m^{2}k

Table 4: Improved building fabric (where applicable)

Building Element	Proposed Building Fabric U-value (New)
Roof	0.13 W/m^{2}k
Wall	0.18 W/m^{2}k
Floor	0.13 W/m^{2}k
Glazing	1.20 W/m^{2}k

Table 5: New Building fabric (where applicable)

Wall elements are not proposed for thermal upgrade given the listed status of the existing buildings and the desire to maintain original features.

Reasonable provision should also be made to reduce unwanted air leakage through any new element of building envelope.

Air permeability is proposed to be 5m^3/m^2/hr @ 50 Pa.

Other proposed strategies include:

- The potential for natural ventilation to most apartments via openable windows, considering the following conclusions from the acoustic and overheating analysis:
  - » Mechanical ventilation or thermal cooling may be required to ensure the thermal comfort of the apartments is met, particularly where there are mezzanine bedrooms.
  - » In high noise exposure areas, a risk assessment should be undertaken at the appropriate design stage to assess whether alternative provision of thermal cooling may be required for acoustic reasons.

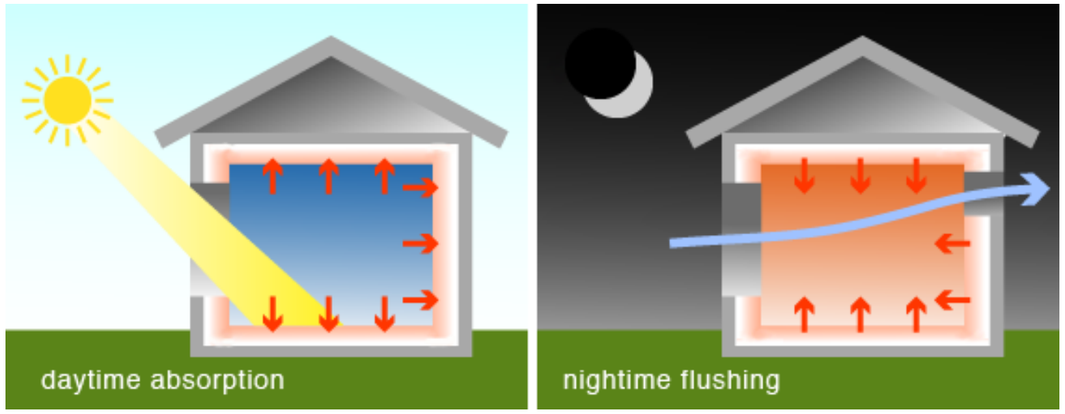


Figure 2 Operation of thermal mass

4.2 Active Design

Active design relates to energy efficiency measures that can be included within the building services specification to reduce energy consumption. All services will be designed to meet at least the minimum recommended performance requirements contained in the UK Government Domestic and Non-Domestic Building Services Compliance Guide (2013).

The following active design measures are recommended for inclusion within the scheme:

4.2.1 Regulated Energy

4.2.1.1 Mechanical Systems

- Wet areas within dwellings will be provided with local or centralised extract ventilation that has a low specific fan power (SFP) to reduce energy consumption.
- Natural ventilation is proposed for the scheme.
- Generally, all equipment will be specified to achieve a high efficiency (e.g. high thermal conversion efficiency for boilers) and low distribution losses (low fan and pump power, insulation in accordance with relevant standards).
- Heating and hot water is to be provided by individual ASHPs per dwelling.
- The commercial unit's building services strategy will be developed by the final occupier. At this stage shell and core services are to be provided (namely utilities provisions). For the purposes of CO_2 compliance assessment assumptions have been made on its anticipated usage and services. At this stage it is expected that heating and cooling will be derived from a form of heat pump (VRF type) while domestic hot water will be provided from point of use heaters. Ventilation is anticipated to be in the form of mechanical ventilation with heat recovery (MVHR).

4.2.1.2 Electrical Systems

- All spaces will be provided with energy efficient light fittings (in the form of pendants or downlights) including LEDs.
- A home energy display device may also be installed to provide residents with real time energy consumption information.
- The commercial unit will be lit according to the tenant requirements. At this stage it is expected that a mixture of linear and directional LEDs will be installed (each with suitable controls including daylight linking/dimming if appropriate).
- Plant controls would include temperature and time control for residents.

4.2.2 Unregulated Energy

Where white goods are specified, these will be chosen to be A/A+ rated under the EU Energy Labelling Scheme.

A second way in which unregulated energy consumption may be reduced at the development, is through the provision of information to occupants.

Upon the purchase or commencement of a tenancy dwelling occupants could be provided with information regarding energy efficiency equipment to help promote buying products which have a lower energy consumption and subsequently lower running costs and carbon emissions.

Due to the high reliance on occupant behaviour patterns, it is difficult to predict the reduction in energy consumption and carbon emissions that can be achieved through the inclusion of these measures.

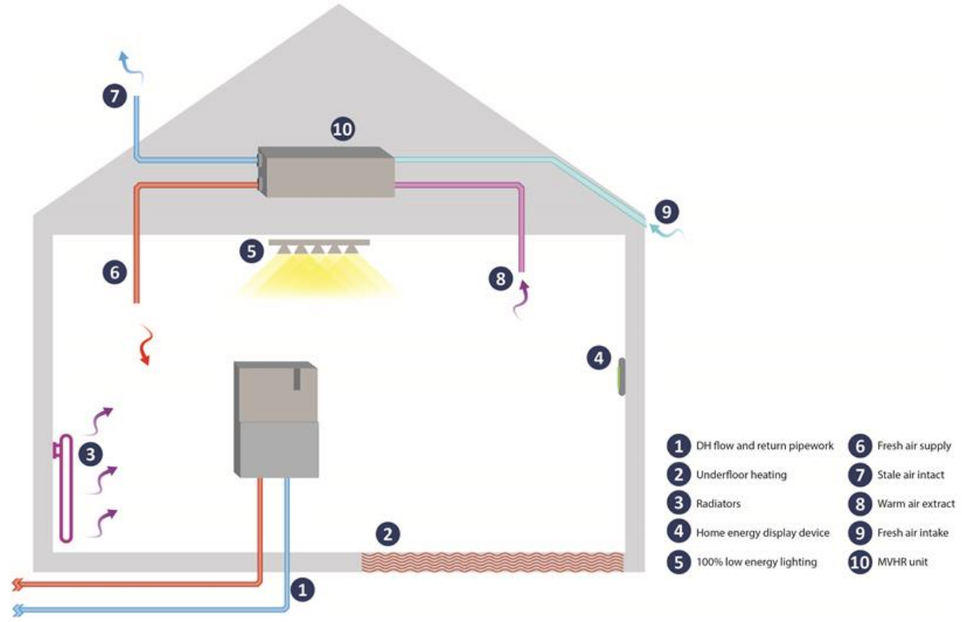


Figure 3 Active Design Options.

5. HEATING AND COOLING INFRASTRUCTURE (BE CLEAN)

5.1 Introduction

This section of the report relates to London Plan Policy 5.6 'Decentralised Energy in Development Proposals', whereby the developments heating, cooling and power systems have been designed to minimise CO_2 emissions in the following order:

- Connection to an existing heating or cooling network;
- Site wide CHP network; and
- Communal heating and cooling.

The London Heat map for the Hampton surrounding area is shown in Figure 7.

5.2 Connection to Existing Heat Networks

There are currently no existing or consented district heating schemes within the area surrounding the Hampton Waterworks development.

5.3 Site Wide Combined Heat and Power (CHP)

The heating and hot water loads for the development are not anticipated to be suitable for the use of combined heat and power (CHP) to provide on-site heating, hot water and electricity production.

Combined heat and power engines provide on-site heating and hot water by utilising the waste heat that is produced during electricity production.

This is more efficient than typical gas boilers as the system losses are much lower. However, the continued decarbonisation of the national electricity grid as supported by the draft SAP10 document published in July 2018, is dramatically reducing the carbon benefit of gas CHP systems.

Generally, for a site wide CHP to be viable there needs to be a high, constant heating demand. Typically, this would be more than 4,500 heat hours per year (equivalent to 12 hours a day, every day) which are seen on large mixed used developments with a varying heating profile.

In larger developments, the GLA require opportunities for supplying heat outside of the site boundary to be investigated. As the Hampton Waterworks development is relatively small, it is unlikely to be feasible to supply heat to outside of the site.

The Department for Energy and Climate Change (DECC) have developed a UK CHP Development Map for assessing potential for CHP networks. This has been used to determine the potential of a larger CHP system, which would include buildings outside of the Hampton Waterworks site boundary (Figure 6) and confirms that there is no significant heat demand which could be addressed by the development proposals.

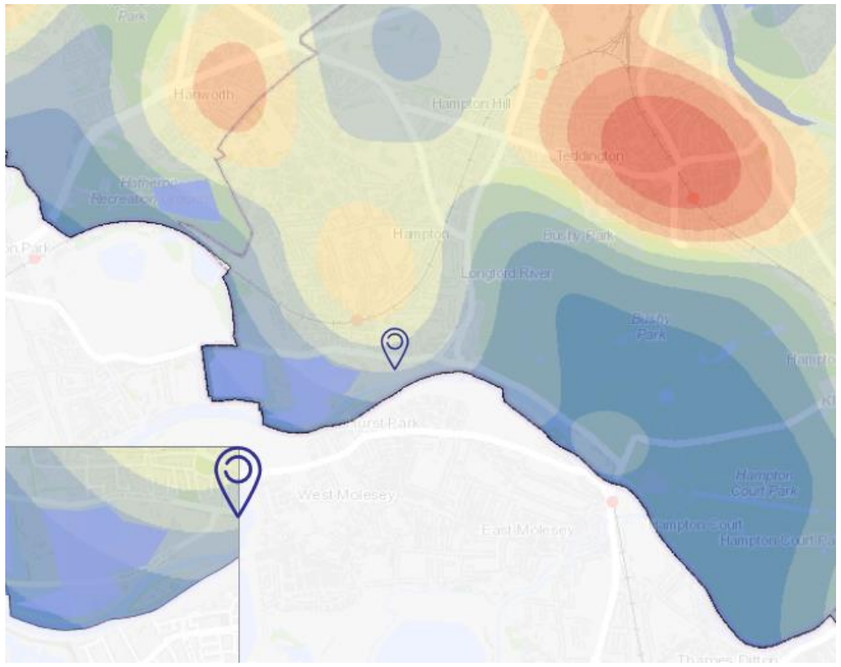


Figure 7 London Heat Map for the Hampton area.

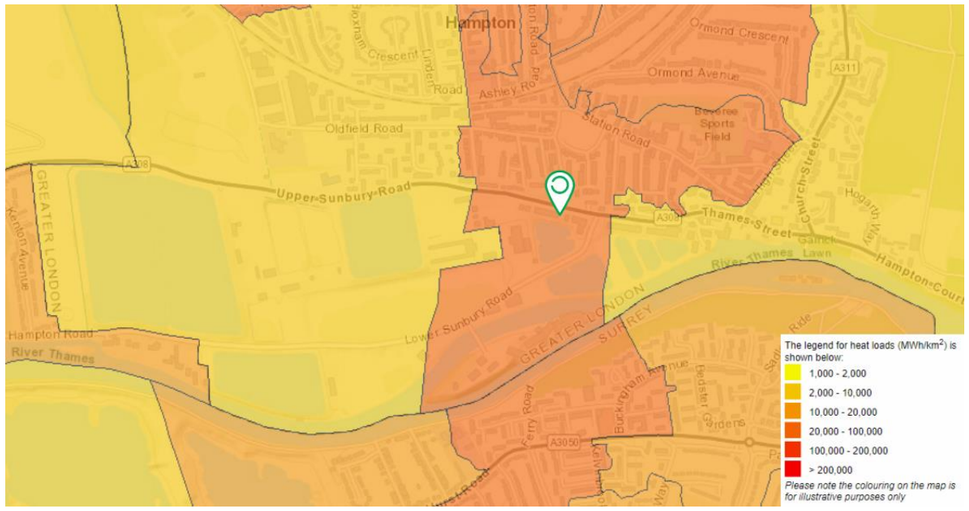


Figure 8: DECC CHP development map.

6. RENEWABLE ENERGY (BE GREEN)

6.1 Introduction

This section of the report discusses the renewable technologies that could be included at the Hampton Waterworks development to further reduce carbon emissions.

The dwellings and the commercial spaces are achieving carbon reductions in excess of the 35% on site requirement through the first two stages of the energy hierarchy (subject to SAP version).

6.2 Renewable Energy Options

A number of renewable technologies have been investigated for their viability for the Hampton Waterworks development.

6.2.1 Solar Photovoltaics

PV panels work by converting the energy from sunlight into usable electricity via photovoltaic cells placed on the roof of buildings. These can be integrated into the roof itself or tradition "bolt-on" panels. For this development, the most suitable panels would be integrated into the proposed roof works, keeping visual impact to a minimum.

These can vary in efficiency with the most efficient panel having an efficiency of 21%, while most perform at around 15-18%.

PV panels have limited effects on the local environment, and can be combined with battery storage if desired. They can also work well in conjunction with future district heating systems. However, the installation of PV panels would have a detrimental effect to the visual impact of the site and damage the character and appearance of the Grade II listed buildings.

6.2.2 Solar Thermal Hot Water

Solar thermal systems use a collector placed on the roof of the building to pre-heat water use for domestic hot water applications. As with PV solar collectors could be installed on the roof of the building with a Southerly orientation to maximise hot water generation.

As solar hot water offsets mains gas rather than electricity, the carbon emission reduction potential is not as great as for PV. Solar hot water panels will not be installed.

6.2.3 Wind Turbines

Small scale building mounted wind turbines can be installed on the roof of a development to generate on-site electricity. However, wind turbines have a high visual impact and can easily be seen from street level, which can have a negative impact on the surrounding amenity.

In addition to the visual impact, there are also considerations of the noise levels produced by the turbines. As such, wind turbines are not deemed to be a viable technology.

6.2.4 Biomass

A wood pellet of wood chip boiler could be used to provide low carbon heating and hot water to the development. This is likely to provide a significant CO_2 reduction. However, biomass is most efficient when there is a constant and reliable heat demand which is unlikely to be the case on this size of development. There are also spatial implications for storage of fuel and access to a first-floor plant area.

While biomass is a low carbon fuel source, providing it is designed properly and fuel is sourced locally, it produces other greenhouse gasses. These include high nitrogen oxide (NO) emissions, in addition to nitrogen dioxide (NO_2), particulates (PM) and sulphur dioxide (SO_2). For this development, biomass will be more polluting than the emission standards set out in London's SPG guidance for gas-fired boiler plants which must achieve an emission rate of < 40 mg/kWh.

6.2.5 Ground Source Heat Pumps (GSHPs)

A vertical or horizontal ground loop serving a heat pump system could be used to provide low carbon heating to the development. A GSHP would have the potential to reduce the energy consumption and subsequent CO_2 emissions significantly, however, there is unlikely to be sufficient area to lay ground coils to provide a substantial portion of the heating and hot water demand. Vertical boreholes could be used, but these are undesirable due to their high capital cost.

6.2.6 Air Source Heat Pumps (ASHPs)

ASHP's will be used to provide low carbon heating to the development. While ASHP's have a lesser efficiency than GSHP's, their relatively low cost makes them attractive as an alternative to gas heating.

This system would require an external heat pump unit per apartment, located in private amenity spaces or on flat roofs adjacent to the dwelling. This technology will provide significant CO2 reduction, particularly when considering the proposed reduction in carbon emissions from grid supplied electricity.

7. ENERGY SUMMARY

7.1 Overview

This report has provided a detailed assessment of the reduction in CO_2 emissions for the Hampton Waterworks development in the London Borough of Richmond Upon Thames.

The purpose of this report is to inform the London Borough of Richmond Upon Thames, of an energy assessment for Hampton Waterworks.

After analysis of predicted CO_2 emissions under Building Regulations Part L1 and L2 using SAP and SBEM respectively, having undergone a lean design process to reduce the demand for energy, it is proposed that the development will utilise a centralised heating system powered by Air-Source Heat Pumps to provide energy efficient heating and hot water.

Both the residential and commercial parts of the development are expected to achieve a 35% reduction in CO_2 emissions, when compared to an existing individual gas boiler baseline.

7.1.1 Be Lean - Reduce the Demand for Energy

With the development comprising of listed buildings, there are limitations to how far the energy demand of the site can be reduced.

The building locations are fixed but where practicable the fabric can be improved with modern materials, whilst limiting the impact on the façade of the buildings.

The building will benefit from high-spec building services, with high efficiency and low distribution losses. Additionally, all the lighting will be energy efficient light fittings (in the form of pendants or downlights) including LED.

7.1.2 Be Clean - Supplying Energy Efficiently

The development will utilise decentralised ASHP's and therefore the reduction of carbon emissions from the baseline associated with this will be considered in the Be Green section.

Different heating and cooling infrastructure strategies have been investigated in section 5 of this report, though none have been deemed viable for the project.

7.1.3 Be Green - Renewable Energy

Each dwelling and the workshop area will be fitted with an individual Air-source Heat Pump, to provide heating and hot water.

Other renewable technologies have been investigated in section 6 of this report, though no further technologies have been deemed viable for the project.

7.1.4 Summary

The following tables show the carbon emissions reduction at each stage of the energy hierarchy, in terms of SAP 10.2 emission factors, for the Hampton Waterworks development.

SAP 10.2

Non-residential Energy Summary

Energy Hierarchy Stage	Carbon Emissions ($kgCO_2/yr$)	Emissions Reduction ($kgCO_2/yr$)	Percentage Reduction (%)
Existing Baseline	7,540	N/A	N/A
After Be Lean	2,335	5,205	69%
After Be Clean	2,335	0	0%
After Be Green	935	1,400	19%
Total On-Site	**935**	**6,605**	**88%**

Table 6: Non-residential energy summary.

Residential Energy Summary

Energy Hierarchy Stage	Carbon Emissions ($kgCO_2/yr$)	Emissions Reduction ($kgCO_2/yr$)	Percentage Reduction (%)
Existing Baseline	87,200	N/A	N/A
After Be Lean	62,350	24,850	28%
After Be Clean	62,350	0	0%
After Be Green	20,840	41,510	48%
Total On-Site	**20,840**	**66,360**	**76%**

Table 7: Residential energy summary.

Site-wide Energy Summary

Energy Hierarchy Stage	Carbon Emissions ($kgCO_2/yr$)	Emissions Reduction ($kgCO_2/yr$)	Percentage Reduction (%)
Existing Baseline	94,740	N/A	N/A
After Be Lean	64,685	30,055	32%
After Be Clean	64,685	0	0%
After Be Green	21,775	42,910	45%
Total On-Site	**21,775**	**72,965**	**77%**

Table 8: Site-wide energy summary.