ENERGY & SUSTAINABILITY STATEMENT

Court Royal and Red Roofs

Produced by XCO2 for William George Group

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EXECUTIVE SUMMARY

The sustainability and energy strategy for the Court Royal and Red Roofs development has been developed to comply with the relevant policies of the London Plan and of the Royal Borough of Kingston upon policies. The proposals incorporate a range of sustainable design and construction measures, primarily addressing the sustainable management of resources, the protection and enhancement of the environment and the effective adaptation and mitigation of the development to climate change.

This report presents the sustainability strategy and assesses the predicted energy performance and carbon dioxide emissions of the proposed development at Court Royal and Red Roofs, located in the Royal Borough of Kingston upon Thames.

The proposed development comprises of a residential building consisting of 24 units over 6 storeys.

This document is divided into three parts:

1. Planning policies;
2. Proposed sustainability measures; and,
3. Energy Strategy.

The Planning Policy section provides an overview of the site and planning policies applicable to this development in accordance with the Royal Borough of Kingston upon Thames Core Strategy (2012) and the London Plan.

The second section on proposed sustainability measures outlines the sustainability measures that have been adopted in the team's aim to maximise sustainability within the site.

The third section describes the predicted energy performance and carbon dioxide emissions of the proposed development at Court Royal and Red Roofs. The development will be compared to notional buildings constructed to Part L1A standards.

Key sustainability features of the proposals include:

- The re-use of previously developed land;
- Effective site layout in response to the neighbouring context;
- Efficient design of the proposed massing, openings and internal layouts so that habitable spaces across the site benefit from abundant daylight and sunlight levels, whilst impacts to neighbouring buildings are kept to a minimum;
- The specification of water efficient fittings to limit water consumption to less than 105 litres per person per day for domestic uses;
- The provision of secure cycle storage to encourage low carbon travel for residents and visitors.
- Effective pollution management and control: the development is not expected to have any significant adverse effects to air, noise, land or watercourses.

The energy strategy for the scheme focuses on the efficiency of the fabric and building services, so that the energy demand is reduced to the extent feasible. Energy efficiency is primarily achieved through a highly insulated building envelope, a good air permeability rate and a thermal bridging y-value in line with the Accredited Construction Details. Highly efficient lighting, space conditioning and hot water systems, as well as appropriate controls further reduce the regulated energy demand and consumption of the development. The proposal also incorporates Air Source Heat Pumps (ASHP) for space heating and hot water which will further reduce CO_2 emissions on-site.

In total, the development is expected to achieve regulated CO_2 savings of 42.9% compared to a notional development that meets the minimum Part L 2013 Regulations standards of performance using SAP10 emission figures.

The proposed development therefore complies with the London Plan CO_2 savings target of 35% overall.

To achieve 'zero carbon' for the scheme, 13.7 tonnes per annum of regulated CO_2, equivalent to 411.0 tonnes over 30 years, from the new-build dwellings should be offset offsite.

Any carbon offset contributions will be subject to viability discussions and detailed design stage calculations.

The proposals in their entirety reflect the client and design team's aspirations in delivering a high-quality, energy efficient development that underpins the sustainability of the built environment.

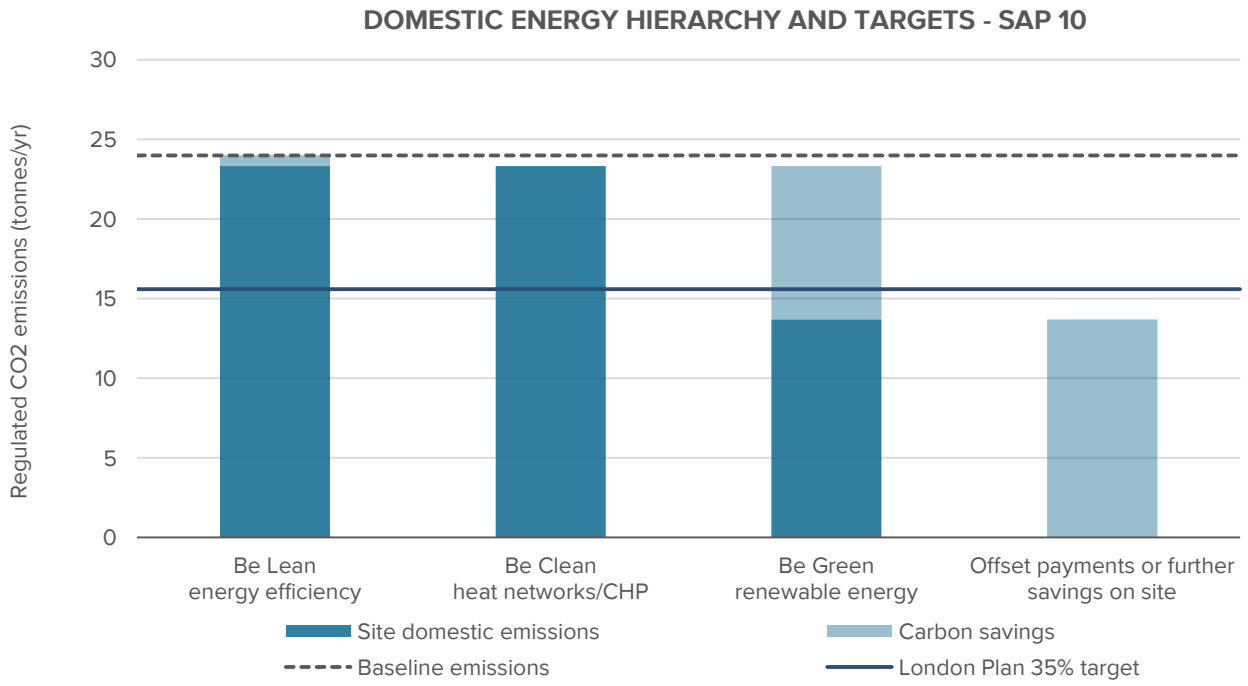


Figure 1: Energy savings for Court Royal and Red Roofs (SAP10)

INTRODUCTION

The proposed residential development is located in Surbiton, within the Royal Borough of Kingston upon Thames. This section presents the description of the site and of the development proposal.

SITE & PROPOSAL

The site is located in Surbiton on Church Hill road, near Surbiton and 0.3 miles from Surbiton Station. The site currently contains a residential building. The proposed development comprises a residential building consisting of 24 units over 6 storeys, ranging from 1 to 3 bedrooms.

The location of the development site is shown in Figure 2 below.

Figure 2: Location of the application site.

PLANNING POLICIES

The proposal will seek to respond to the energy and sustainability policies of the London Plan and of the policies within the Royal Borough of Kingston upon Thames Core Strategy (2012), the Housing Supplementary Planning Guidance as well as the Sustainable Design and Construction SPG.

The most relevant applicable energy policies in the context of the proposed development are presented below.

THE LONDON PLAN (2021)

The London Plan (2021) published 2nd March 2021 sets out the Mayor's overarching strategic spatial development strategy for greater London and underpins the planning framework from 2019 up to 2041. This document replaced the London Plan 2016.

The new Plan has a strong sustainability focus with many new policies addressing the concern to deliver a sustainable and zero carbon London, particularly addressed in chapter 9 Sustainable Infrastructure.

The following policies, related to Energy, are of relevance for the proposed development:

POLICY SI2 MINIMISING GREENHOUSE GAS EMISSIONS

This policy sets the requirements for all major developments to follow the energy hierarchy and achieve net-zero-carbon for both residential and non-residential schemes (via on-site carbon reductions and offset payments) and introduces new targets at Lean stage:

"...
This means reducing greenhouse gas emissions in operation and minimising both annual and peak energy demand in accordance with the following energy hierarchy:
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.
..."

"...
A minimum on-site reduction of at least 35 per cent beyond Building Regulations is required for major development. Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures. Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, in agreement with the borough, either:
1) through a cash in lieu contribution to the borough's carbon offset fund, or
2) off-site provided that an alternative proposal is identified and delivery is certain.
..."

This policy also sets the requirements to consider whole-life carbon emissions, including embodied carbon and unregulated emissions:

"...
Major development proposals should calculate and minimise carbon emissions from any other part of the development, including plant or equipment, that are not covered by Building Regulations, i.e. unregulated emissions.

Development proposals referable to the Mayor should calculate whole lifecycle carbon emissions through a nationally recognised Whole Life-Cycle Carbon Assessment and demonstrate actions taken to reduce life-cycle carbon emissions.
..."

The policy supporting text provides additional clarifications on the requirements for major developments:

- Developments including major refurbishments should also aim to meet the net-zero carbon target.
- All developments should maximise opportunities for on-site electricity and heat production from solar technologies (photovoltaic and thermal), use innovative building materials and smart technologies.
- Recommendation to use SAP10 carbon factors as per GLA Energy Guidance.
- Recommended carbon offset price of £95 per tonne CO_2.
- Requirement for major developments to monitor and report operational energy performance to the GLA.

POLICY SI 3 ENERGY INFRASTRUCTURE

This policy requires all major developments within Heat Network Priority Areas will need to utilise a communal low-temperature heating system and follow the energy hierarchy to determine the most suitable system Where developments are utilising CHP this policy also requires them to demonstrate that 'the emissions relating to energy generation will be equivalent or lower than those of an ultra-low NOx gas boiler'. Any combustion on site should meet the requirements of part B of Policy SI1.

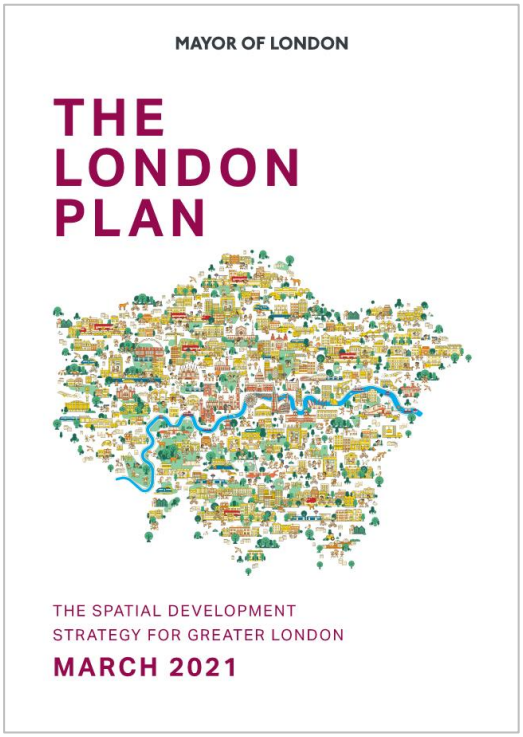
POLICY SI 4 MANAGING HEAT RISK

This policy requires:

A Development proposals should minimise adverse impacts on the urban heat island through design, layout, orientation, materials and the incorporation of green infrastructure.

B Major development proposals should demonstrate through an energy strategy how they will reduce the potential for internal overheating and reliance on air conditioning systems in accordance with the following cooling hierarchy:
1) reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure
2) minimise internal heat generation through energy efficient design
3) manage the heat within the building through exposed internal thermal mass and high ceilings
4) provide passive ventilation
5) provide mechanical ventilation
6) provide active cooling systems.

The London Plan also consists of a suite of guidance documents, such as the Energy Assessment Guidance: Greater London Authority guidance on preparing energy assessments as part of planning applications (April 2020)



GLA GUIDANCE ON PREPARING ENERGY ASSESSMENTS

This document (last updated in April 2020) provides guidance on preparing energy assessments to accompany strategic planning applications; it contains clarifications on Policy SI2, of the new London Plan, carbon reduction targets in the context of zero carbon policy, as well as detailed guidelines on the content of the Energy Assessments undertaken for planning.

The guidance document specifies the emission reduction targets the GLA will apply to applications as follows:

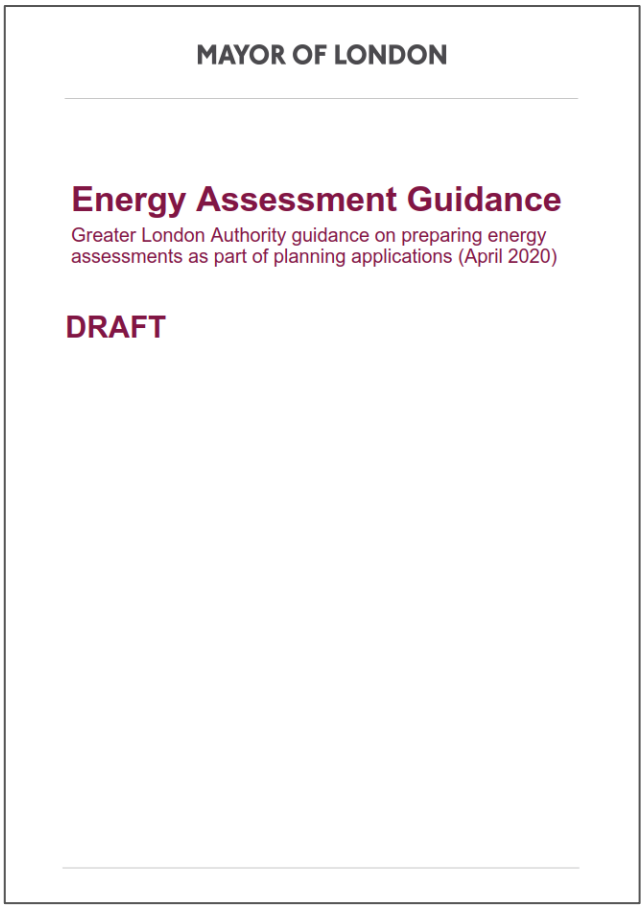
The regulated carbon dioxide emissions reduction target for major domestic and non-domestic development is net zero carbon, with at least a 35% on-site reduction beyond Part L 2013 of the Building Regulations.

The definition of zero carbon homes is provided on Page 54 of the guidance:

> *Zero carbon homes - homes forming part of major development applications (i.e. those with 10 or more units) where the residential element of the application achieves at least a 35 per cent reduction in regulated carbon dioxide emissions (beyond Part L 2013) on-site. The remaining regulated carbon dioxide emissions, to 100 per cent, are to be offset through a cash in lieu contribution to the relevant borough to be ring fenced to secure delivery of carbon dioxide savings elsewhere.*

The new guidance also includes changes to technical requirements relating to the use of updated carbon factors, cost estimates, overheating risk analysis, the structure of the heating hierarchy and scrutiny over the performance of heat pumps. The guidance also provides information on how the new stage of the energy hierarchy 'be seen' is expected to be carried out in energy assessments.

The structure of this report and the presentation of the carbon emission information for the development follows the guidance in this document.


MAYOR OF LONDON

Energy Assessment Guidance

Greater London Authority guidance on preparing energy assessments as part of planning applications (April 2020)

DRAFT

ROYAL BOROUGH OF KINGSTON UPON THAMES CORE STRATEGY (2012)

POLICY DM 1 SUSTAINABLE DESIGN AND CONSTRUCTION STANDARDS

The Council will require all new residential developments to achieve successively higher levels of the Code for Sustainable Homes Level category for energy/CO2 in accordance with the following timeline:

- *Up to 2016: Code for Sustainable Homes Level 4*
- *From 2016: Code for Sustainable Homes Level 6*

Major developments should meet Code level 5 from 2013. Residential developments are encouraged to meet the other Code for Sustainable Homes Level categories (water, materials, surface water run-off and waste) as well.

Where it is not possible to meet the standards, compelling reasons must demonstrate that achieving the sustainability standards outlined in policies DM1 to DM3 would not be technically feasible or economically viable, the Council will negotiate planning contributions with developers to fund other methods to offset the environmental impact of the development. Further guidance on the level of contributions expected will be outlined in the Council's Planning Obligations SPD, or Community Infrastructure Levy charge, in line with Policy IMP3.

New development should minimise air, noise and contaminated land impacts in line with industry best practice. Development proposals for contaminated land should include remediation measures.

It should be noted that Code for Sustainable Homes has been abolished by the government as part of the Deregulation Bill 2016. Therefore, Code for Sustainable Homes will no longer be implementable to new planning applications within the UK.

POLICY DM 3 DESIGNING FOR CHANGING CLIMATE

Design proposals should incorporate climate change adaptation measures based on the type and extent of the main changes expected in the local climate throughout the lifetime of the development, this is likely to require a flexible design that can be adapted to accommodate the changing climate, e.g. provision of additional shading or cooling.

All developments should provide communal or private spaces for residents and the community that:

- *ameliorate the urban heat island effect*
- *provide flooding attenuation if required*
- *increase biodiversity*

POLICY DM 4 WATER MANAGEMENT AND FLOOD RISK

It is required that the development is designed to take account of the impacts of climate change including: water conservation, the need for summer cooling and increase flood risk from fluvial and surface water flooding.

There is a requirement for a Flood Risk Assessment for major development proposals within Flood Zone 1 of one hectare or more and all new development in Flood Zones 2 and 3. It should address all sources of flooding, the future impact of climate change and take into account the findings of the SFRA, national guidance (currently PPS25) and good practice guidance.

POLICY DM 6 BIODIVERSITY

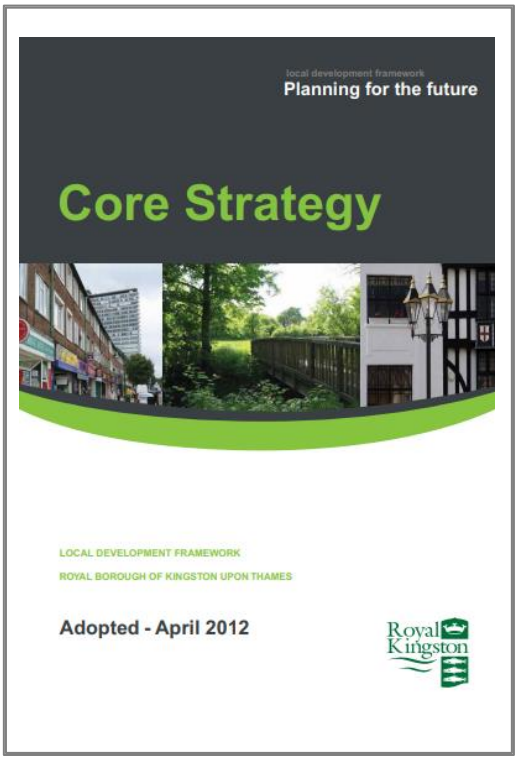
The Council will:

a) *ensure new developments protect and promote biodiversity as part of sustainable design, through the inclusion of sustainable drainage, tree planting, soft landscaping, habitat enhancement and/or improvement, green roofs and new or improved semi-natural habitats, where appropriate*
b) *require an ecological assessment on major development proposals, or where a site contains or is next to significant areas of habitat or wildlife potential. This should be completed before design work or submission of the planning application.*

POLICY DM 8 SUSTAINABLE TRANSPORT FOR NEW DEVELOPMENT

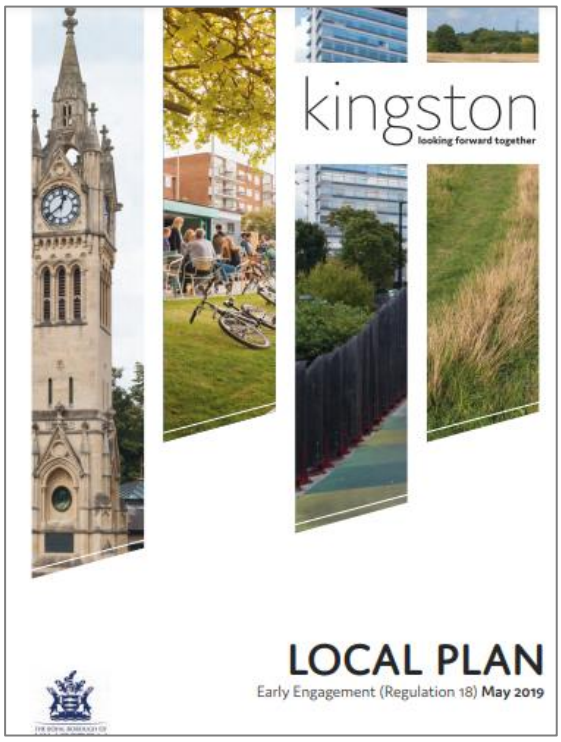
The council supports and encourages the use of public transport, cycling and walking. The council will:

a) require all significant new development, including schools, workplaces and residential developments to develop and implement a robust and effective Travel Plan.
b) prioritise the access needs of pedestrians and cyclists in the design of new developments and protect and enhance pedestrian and cycle access routes to, and where possible, through development sites, including the protection or enhancement of the strategic cycling and walking networks, as shown on the Proposals Map
c) require new development to provide facilities on-site for cyclists as appropriate, including showers, lockers and secure, convenient cycle parking, in accordance with minimum standards.



LOCAL PLAN - EARLY ENGAGEMENT (MAY 2019)

The current Local Plan was adopted in 2012 and now needs updating. This consultation is the first stage in the process towards our new plan, which is planned to be adopted in late 2021 or early 2022. The results of this consultation will feed into and help formulate the first draft of the new plan and there will be further opportunities for public engagement as the plan progresses.



PROPOSED SUSTAINABILITY MEASURES

This part of the report presents how the development complies with sustainable development policies and incorporates guidance on sustainable design and construction. The following sections are structured around the London Plan's Sustainable Design and Construction SPG and present the key elements of the proposal that underpin environmental sustainability.

RESOURCE MANAGEMENT

1. LAND

LAND USE

The land for this proposal is efficiently used as the scheme will be constructed on previously developed land. The site currently comprises two bungalows, known as Red Roofs & Court Royal.

IMPACTS ON NEIGHBOURS FROM DEMOLITION AND CONSTRUCTION

The Considerate Constructors Scheme will be used to ensure that contractors carry out their operations in a safe and considerate manner.

Construction impacts (e.g. dust generation) shall be minimised through adoption of best practice construction measures, formalised through the production of a Construction and Environmental Management Plan.

SURFACE WATER FLOODING

The development is designed with a view to minimising adverse impacts on surrounding water courses and to reduce the risks associated with surface water flooding. The area is found within a low flood risk zone.

BIODIVERSITY

Green spaces are incorporated into the proposed design and will contribute to enhance the biodiversity on the site.

2. SITE LAYOUT & BUILDING DESIGN

REUSE OF EXISTING BUILDINGS

There is no scope for reusing the existing buildings.

LAND FORM

The site is relatively flat since it has been previously developed and landscaped.

SITE LAYOUT

Consideration has been given to the layout and scale of the surrounding buildings. The height of the surrounding context is generally low rise, rarely exceeding five storeys height.

The scale of the development follows a principle of densification but, at the same time, it takes into account the neighbouring buildings with regard to height and overall volume.

The scheme comprises a residential building block, consisting of 24 units over 6 storeys.

DAYLIGHT & SUNLIGHT

All habitable spaces have adequate amounts of glazing to ensure that sufficient levels of daylight and sunlight will be achieved for all dwellings. All units have private amenity green spaces for occupants to utilise where light and sunlight will be abundant. Consideration has been given to amenity and open spaces which by virtue of appropriate massing of the building and the

proposed site layout is not anticipated to experience significant overshadowing effects.

MICRO-CLIMATE

The proposed scheme is not of a scale that could potentially have any significant impact on wind conditions around the site or any adverse effects on pedestrian and residents' comfort.

3. ENERGY & CARBON DIOXIDE EMISSIONS

The Energy Strategy for the development has been designed in line with the London Plan's Policy 5.2, which states that every effort should be made to minimise carbon dioxide emissions in accordance with the following energy hierarchy:

- Be lean: use less energy
- Be clean: supply energy efficiently
- Be green: use renewable energy

BE LEAN

The buildings have been thoughtfully designed to reduce energy demand through a highly insulated building fabric, limited heat loss through air infiltration, reduced reliance on artificial lighting and through the specification of low energy lighting and efficient space heating and hot water systems, coupled with advanced controls.

BE CLEAN

The size and location of this development does not lend itself to incorporation into an existing heat network.

Refer to the Energy Strategy section of this report for further details on these sections.

4. RENEWABLE ENERGY (BE GREEN)

A range of renewable technologies were considered for generating on-site renewable energy. Air source heat pumps were considered a suitable technology for this development due to easy installation process, and substantial CO_2 savings.

Further details about the renewable energy strategy, and site-wide CO_2 emission reductions can be found in the Energy Strategy section of this report.

5. WATER EFFICIENCY

The development aims to reduce water consumption to less than 105 litres per person per day, in line with the recommended target set out in the London Plan through the use of water efficient fittings.

Indicative maximum water consumption figures so that this level of water efficiency is achieved are listed in Table 2 for the various fittings applicable to this type of development.

This level of performance would be consistent with the 'optional' water efficiency requirement of Building Regulations Part G (2015 with 2016 amendments).

Table 1: Recommended specification for sanitary fittings.

Fitting	Fitting specification
WC	4/2.6 litres dual flush
Kitchen sink tap	6 litres per min
Wash basin tap	4 litres per min
Shower	8 litres per min
Bath	170 litres
Washing machine	8.17 litres/kg
Dishwasher	1.25 litres/place setting

6. NATURE CONSERVATION & BIODIVERSITY

The proposed plan incorporates private and public green spaces at both ground floor and levels throughout. The ecology on site will be improved via the introduction of these soft landscaped areas and planting within the proposed communal gardens and on land that is currently covered with hardstanding.

The intended planting strategy for these areas is simple low-level flora, with hedge planting and small ornamental trees. Native plant species will be introduced to these areas where possible. This will help to attract invertebrates, birds and other fauna to the area.

ADAPTING TO CLIMATE CHANGE AND GREENING THE CITY

1. TACKLING INCREASED TEMPERATURE AND DROUGHT

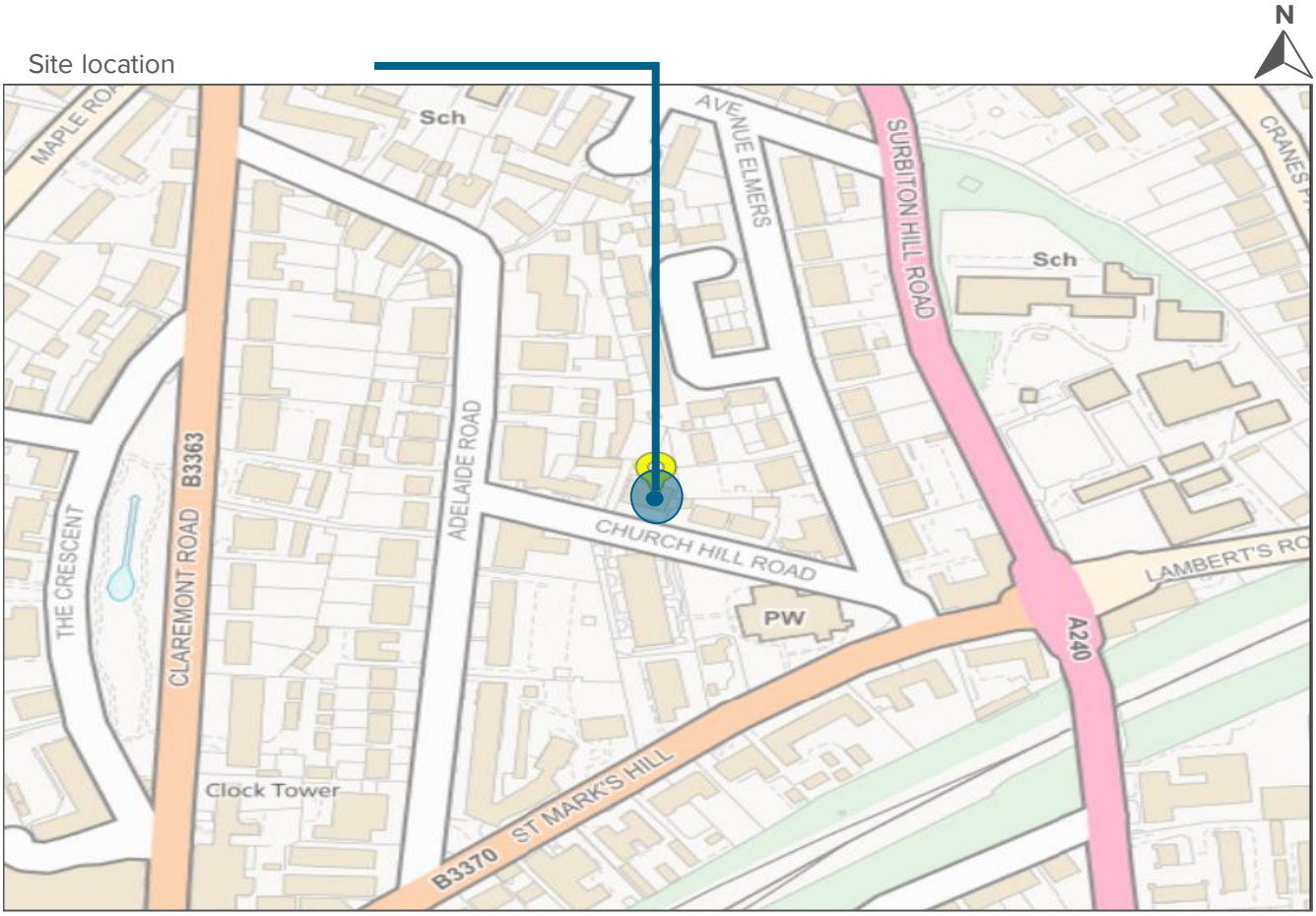
The potential risk of overheating will be mitigated by incorporating passive and active design measures, in line with the London Plan Cooling Hierarchy. These measures are presented in detail in the Minimising Overheating section of the Energy Strategy chapter of this report.

In summary,

- Internal heat generation will be minimised through energy efficient design and the specification of highly efficient lighting fittings;
- The amount of heat entering the building(s) will be minimised through effective ventilation design;
- Thermal mass coupled with night time ventilation will be utilised to dampen the peak internal conditions during the day and dissipate heat to the outside during the cooler evening hours;
- Natural ventilation will be employed as the main strategy for providing fresh air and dissipating heat that builds up within the buildings.

2. FLOODING

The Environment Agency flood map shows the proposed development is located in flood zone 1, within an area with a low risk to flooding. Please see flood map on the following page.



Flood Zone 3

Flood Zone 2

Flood Zone 1

Figure 3: Flood map for local area

POLLUTION MANAGEMENT – LAND, AIR, NOISE, LIGHT AND WATER

1. LAND CONTAMINATION

Due to the existing use of the site, there is unlikely to be potential for land contamination.

2. AIR POLLUTION

Air pollution risks from construction and demolition activities on site will be minimal in line with the London Plan SPG 'The control of dust and emissions from construction and demolition' under the following categories:

- demolition;
- earthworks;
- construction;
- track out; and,
- non-road mobile machinery (NRMM).

During the operational phase of the development, combustion of fossil fuels and associated combustion emissions for space heating and hot water will be eliminated by using an all-electric system at Green Stage through the specification of highly efficient heat generating systems (air source heat pumps). For further details please refer to the Energy Strategy section of this report.

Air source heat pumps with no on-site combustion will be proposed to further reduce impacts on air quality on site.

To protect internal air quality, 'healthy' materials will be specified for the buildings' fabric and internal finishes, where feasible; these will be non-toxic, and low emitters of VOCs and formaldehyde.

In order to underpin the reduction of emissions from transport, the development has been designed to encourage cycling; cycle parking will be provided to all flats and apartments in dedicated ground floor stores. To avoid overprovision of car parking and promote more sustainable means of transport, the proposals allow for two disabled parking spaces only.

3. NOISE

The development will incorporate design and building fabric measures to mitigate potential noise levels from the proposed development and ensure the impact of any external sources on internal ambient noise levels are within acceptable limits.

4. LIGHT POLLUTION

The lighting design of the proposed development will follow the recommendations of the Institution of Lighting Engineers' Guidance Notes for the Reduction of Obtrusive Light (2011), to minimise light pollution.

Further mitigation measures will be implemented to ensure disturbance to wildlife is minimal, in line with the ecologist's recommendations.

5. WATER POLLUTION

Contractors will adopt best practice policies to mitigate water pollution from construction activities on site.

The development will discharge domestic sewage via a connection to the public foul sewer or combined sewer network where it is reasonable to do so.

ENERGY STRATEGY

This section describes the predicted energy performance and carbon dioxide emissions of the proposed Court Royal and Red Roofs development based on the information provided by the design team. The overall regulated CO_2 savings *on site* against a Part L 2013 compliant scheme are estimated at 42.9% for the development.

METHODOLOGY - BE LEAN, BE CLEAN, BE GREEN

The methodology employed to develop the energy strategy for the scheme and achieve on-site carbon savings is in line with the GLA's Guidance on preparing energy assessments and is as follows:

The baseline CO_2 emissions are first established, i.e. the emissions of a scheme that is compliant with Part L 2013 of the Building Regulations.

The software used to model and calculate the energy performance and carbon emissions is Stroma FSAP 2012. The emissions are established by modelling representative dwelling types and multiplying the Target Emission Rate (TER) of each type with the cumulative floor area for that type to establish the total emissions for the domestic element of the proposal.

The same approach is followed to determine the energy performance and CO_2 emissions of the proposed scheme for each of the steps of the Energy Hierarchy. The CO_2 emissions are estimated based on the SAP Dwelling Emission Rate (DER) figures. The Energy Hierarchy aims at delivering significant carbon savings on-site.

The three consecutive steps of the Energy Hierarchy are:

- **Be Lean** whereby the demand for energy is reduced through a range of passive and active energy efficiency measures; as part of this step the Cooling Hierarchy (see Policy 5.9) is implemented and measures are proposed to reduce the demand for active cooling;
- **Be Clean** whereby as much of the remaining energy demand is supplied as efficiently as possible (e.g. by connecting to a district energy network or developing a site-wide CHP network), and,
- **Be Green** whereby renewable technologies are incorporated to offset part of the carbon emissions of the development. The uptake of renewable technologies is based on feasibility and viability considerations, including their compatibility with the energy system determined in the previous step.

The implementation of the Energy Hierarchy determines the total regulated carbon savings that can be feasibly and viably achieved on site.

The % improvement against the baseline emissions is compared to the relevant targets for each element and in case of a shortfall, savings through off-site measures should be achieved.

It should be noted that as the scheme is proposed with an electric based system to respond to the forthcoming changes to Part L building regulations and the proposed SAP10 carbon factors, the estimated CO_2 emissions reported are derived from FSAP with electric systems.

Due to the limitations of the FSAP software, it is not possible to obtain 'Be Lean' stage savings with an electric system. Therefore, to enable evaluation of the potential savings achievable from the 'Be Lean' stage with fabric and system efficiency measures, separate energy calculations using gas-based systems have been presented in the 'Be Lean' section, in line with GLA energy assessment methodology. The percentage savings derived from the gas based 'Be Lean' calculation will be applied as a proportion to the electric baseline for reference.

BE LEAN – USE LESS ENERGY

The proposals incorporate a range of passive and active design measures that will reduce the energy demand for space conditioning, hot water and lighting.

PASSIVE DESIGN MEASURES

ENHANCED U-VALUES

The heat loss of different building fabric elements is dependent upon their U-value, which is a measure of the thermal transmittance through the element. An element with low U-value provides better levels of insulation and reduced heating demand.

The proposed development will incorporate high levels of insulation and high-performance glazing beyond Part L 2013 targets and notional building specifications, in order to reduce the demand for space conditioning (heating and/or cooling).

The table below demonstrates the improved performance of the proposed building fabric beyond the Building Regulations requirements.

Table 2: Thermal Envelope U-values

Domestic (U-values in W/m^2.K)			
Element	Building Regulations	Proposed	Improvement
Walls	0.30	0.15	50%
Floor	0.25	0.10	60%
Roof	0.20	0.10	50%
Windows	2.00	1.30	35%

AIR TIGHTNESS IMPROVEMENT

Heat loss may also occur due to air infiltration. Although this cannot be eliminated altogether, good construction detailing and the use of best practice construction techniques can minimise the amount of air infiltration.

The proposed development will aim to improve upon the Part L 2013 minimum standards for air tightness by targeting air permeability rates of 5.0m^3/m^2 at 50Pa for all new build residential units.

REDUCING THE NEED FOR ARTIFICIAL LIGHTING

The design of the development incorporates large areas of glazing across all building elevations, to optimise daylight in occupied spaces. Good internal daylight levels will translate to less dependency on artificial lighting and will indirectly deliver energy and carbon savings, together with pleasant, healthy spaces for occupants.

ACTIVE DESIGN MEASURES

HIGH EFFICACY LIGHTING

The development intends to incorporate low energy lighting fittings throughout the residential spaces. All light fittings will be specified as low energy lighting and will primarily accommodate LEDs.

HEAT GENERATION

Space heating and domestic hot water will be provided in residential units by air source heat pumps.

CONTROLS

Advanced lighting and space conditioning controls will be incorporated, specifically heating controls will compromise time and temperature zone control by suitable arrangement if plumbing and electrical services.

MONITORING

Apart from the above design measures, the development will incorporate monitoring equipment and systems to enable occupiers to monitor and reduce their energy use.

Where possible, smart meters will be installed to monitor the heat and electricity consumption of each dwelling; the display board will demonstrate real-time and historical energy use data and will be installed at an accessible location within the dwellings.

MINIMISING OVERHEATING

The potential risk of overheating will be mitigated by incorporating passive and active design measures, in

line with the London Plan Policy 5.9 and the Cooling Hierarchy, as follows.

MINIMISING INTERNAL HEAT GENERATION THROUGH ENERGY EFFICIENT DESIGN

The development will be served by individual space heating and hot water systems therefore heat distribution pipework will be held at a minimum. Heat sources and pipework will be sufficiently insulated to reduce heat dissipation in occupied spaces.

Efficient lighting will be used to further minimise internal heat gains and reduce energy expenditure.

REDUCING THE AMOUNT OF HEAT ENTERING THE BUILDING IN SUMMER

The openings across the development have been appropriately designed to offer satisfactory daylight and views to occupied spaces, without disproportionately increasing solar gains and overheating risks.

The development also incorporates balconies, which apart from offering private amenity space for occupants, will also serve as shading elements for the openings of the floor below, obstructing direct solar gains during the peak hours of the summer.

USE OF THERMAL MASS AND HIGH CEILINGS TO MANAGE THE HEAT WITHIN THE BUILDING

In summer, and during peak hours of the day a high thermal mass building envelope will absorb and store excess heat that builds up into the space maintaining a cooler indoors compared to a low thermal mass building.

The stored heat will be released back into the space during the cooler hours of the evening; allowing for night time ventilation the released heat will be rejected to the outside.

PASSIVE VENTILATION

The development has allowed for passive ventilation as the main strategy for providing fresh air and dissipating heat that builds up within the building. The passive ventilation strategy includes single-sided ventilation, cross ventilation and night purge ventilation through openable windows and doors, operated by the occupants.

OVERHEATING RISK ASSESSMENT

The potential risk of overheating was assessed via the Part L Building Regulation compliance tools.

A ‘medium’ or ‘slight’ overheating risk was found for all representative dwelling types modelled in SAP which complies with Part L overheating Criteria. The SAP overheating risk assessment outputs for a sample of the dwelling types modelled can be found in Appendix A.

ENERGY USE

The table below shows a breakdown of carbon dioxide emissions associated with the proposed development's fossil fuel and electricity consumption for the different uses. The figures provide a comparison between the baseline condition and the proposed development once energy efficiency measures (Lean) have been applied.

This table demonstrates the energy savings achieved through energy efficiency measures (Lean stage of the Energy Hierarchy).

The energy calculations have been carried out using gas-based systems, in line with GLA energy assessment methodology.

Table 3: Breakdown of energy consumption and CO_2 emissions for the baseline and the proposed schemes after 'Lean' measures are implemented (gas-based calculation with SAP10 carbon factors)

	Baseline			Lean		
	Energy (kWh/yr.)	$kgCO_2$ /yr.	$kgCO_2/m^2$	Energy (kWh/yr.)	$kgCO_2$ /yr.	$kgCO_2/m^2$
Hot Water	51,990	10,917	6.7	52,460	10,611	6.5
Space Heating	52,150	10,952	6.7	52,000	10,645	6.5
Cooling	0	0	0.0	0	0	0.0
Auxiliary	1,800	420	0.3	720	408	0.3
Lighting	7,320	1,706	1.0	7,260	1,658	1.0
Equipment	61,120	14,241	8.8	61,120	14,241	8.8
Total Part L	**113,260**	**23,995**	**14.8**	**112,440**	**23,323**	**14.3**
Total (incl. equipment)	**174,380**	**38,236**	**23.5**	**173,560**	**37,564**	**23.1**

BE LEAN CO_2 EMISSIONS & SAVINGS

By means of energy efficiency measures alone, regulated CO_2 emissions are shown to reduce by 2.8% (0.7 tonnes per annum) across the whole site.

BE CLEAN – SUPPLY ENERGY EFFICIENTLY

The proposed development site is located within an area where there is no existing district heat network within close proximity and an on-site wide CHP network is unlikely to be viable in light of the new carbon factors.

ENERGY SYSTEM HIERARCHY

The energy system for the development has been selected in accordance with the London Plan decentralised energy hierarchy. The hierarchy listed in Policy 5.6 states that energy systems should consider:

- Connection to existing heating and cooling networks;
- Site wide CHP network; and,
- Communal heating and cooling.

Local heat and power sources minimise distribution losses and achieve greater efficiencies when compared to separate energy systems, thus reducing CO_2 emissions.

In a communal energy system, energy in the form of heat, cooling, and/or electricity is generated from a central source and distributed via a network of insulated pipes to surrounding residences.

CONNECTION TO AN EXISTING NETWORK

The London Heat Map identifies existing and potential opportunities for decentralised energy projects in London. It builds on the 2005 London Community Heating Development Study.

An excerpt from the London Heat Map can be seen on the following page which shows the energy demand for different areas. Darker shades of red signify areas where energy demand is high. The map also highlights any existing and proposed district heating networks within the vicinity of the development.

A review of the map shows that no existing district heating network exists within the close proximity of the proposed development.

SITE WIDE CHP

Taking into consideration the decarbonisation of the grid as well as the fact that the heat pumps are a substantially lower carbon system than gas-based or direct electric solutions, it is recommended the heating and domestic hot water production of the new building is served by a heat pump technology.

COMMUNAL/INDIVIDUAL HEATING AND COOLING

Individual ASHP are recommended for buildings with under 30 units. The reason for the applicability of individual systems for buildings with <30 units (and communal systems for buildings with >30 units) is given below due to:

1. Upfront cost

Individual ASHP systems requires a hydrobox and calorifier per unit. This is replaced by a HIU for a communal ASHP system which most often results in a higher cost system overall.

2. Running costs

Distribution runs are expected to be greater with the communal system as the ASHP would need to feed the buffer tanks in an internal plant room prior to feeding HIUs in the flats. There are also greater losses due to plate heat transfer within the HIU.

3. Maintenance

Individual ASHP systems requires no input from facility management perspective.

4. System Complexity

Communal ASHP system requires additional buffer vessels and potentially an additional heat pump to boost the water temperature.

5. Refrigerant pipe run limitations

Typical 4kW individual ASHPs have approximately a maximum refrigerant pipe run of 30m from the condenser to the hydrobox unit. Whereas, a communal ASHP system will be distributing LTHW pipework. For the development at Court Royal and Red Roofs, individual systems are likely to be feasible and more suitable for the scale of scheme.

The saving achieved from this is elaborated on the be Green Stage of the Energy Hierarchy.

BE CLEAN CO2 EMISSIONS & SAVINGS

Given that it has not been found feasible or viable for the proposed development to connect to an existing network in the foreseeable future, no carbon savings are achieved for this step of the Energy Hierarchy.

Figure 4: Excerpt from the London Heat Map. Existing district networks outlined in red, proposed networks in yellow.

BE GREEN – USE RENEWABLE ENERGY

The renewable technologies feasibility study carried out for the development identified air source heat pumps as a suitable technology for the development. The regulated carbon saving achieved in this step of the Energy Hierarchy is 40.1% over the site wide baseline level using SAP10 carbon factors.

RENEWABLE TECHNOLOGIES FEASIBILITY STUDY

Methods of generating on-site renewable energy (Green) were assessed, once Lean and Clean measures were taken into account.

The development of Court Royal and Red Roofs will benefit from an energy efficient building fabric which will reduce the energy consumption of the proposed development in the first instance. A range of renewable technologies were subsequently considered including:

- Biomass;
- Ground/water source heat pumps;
- Air source heat pump;
- Wind energy;
- Photovoltaic panels, and,
- Solar thermal panels.

In determining the appropriate renewable technology for the site, the following factors were considered:

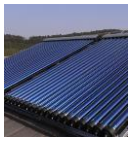
- CO_2 savings achieved;
- Site constraints;
- Any potential visual impacts, and,
- Compatibility with the 'Clean' stage proposals where applicable.

RENEWABLE ENERGY APPRAISAL SUMMARY

The table below summarises the factors taken into account in determining the appropriate renewable technologies for this project. This includes estimated capital cost, lifetime, level of maintenance and level of impact on external appearance. The final column indicates the feasibility of the technology in relation to the site conditions (10 being the most feasible and 0 being infeasible). It is important to note that the information provided is indicative and based upon early project stage estimates.

The feasibility study demonstrates that ASHP would be the most feasible renewable technology for the proposed Court Royal and Red Roofs development. Detailed assessments for the proposed technologies can be found in the following sections.

Table 4: Summary of renewable technologies feasibility study

		Comments	Lifetime	Maintenance	Impact on external appearance	Site feasibility
Biomass		Not adopted -burning of wood pellets releases high NOx emissions and there are limitations for their storage and delivery within an urban location.	20 yrs.	High	High	1
PV		Not adopted – roof space will be allocated to external units of ASHPs. The scheme meets the London Plan energy target with ASHPs in place.	25 yrs.	Low	Med	3
Solar thermal		Not adopted – roof space will be allocated to external units of ASHPs. The scheme meets the London Plan energy target with ASHPs in place.	25 yrs.	Low	Med	2
GSHP		Not adopted -the installation of ground loops requires significant space, additional time at the beginning of the construction process and very high capital costs.	20 yrs.	Med	Low	1
ASHP		Adopted – Technology deemed suitable considering the emissions factors for SAP10.	20 yrs.	Med	Med	9
Wind		Not adopted - Wind turbines located at the site will have a significant visual impact on the building.	25 yrs.	Med	High	2

DETAILED ASSESSMENT OF AIR SOURCE HEAT PUMPS

Air source heat pumps (ASHPs) employ the same technology as ground source heat pump (GSHPs). However, instead of using heat exchangers buried in the ground, heat is extracted from the external ambient air.

The efficiency of heat pumps is very much dependent on the temperature difference between the heat source and the space required to be heated. As a result, ASHPs tend to have a lower COP than GSHPs. This is due to the varying levels of air temperature throughout the year when compared to the relatively stable ground temperature. The lower the difference between internal and external air temperature, the more efficient the system.

ASHP is considered a suitable technology for the development for the following reasons:

- It is a high efficiency system that can cater for the space heating and cooling of the most energy-intensive areas of the proposed development;
- Requires less capital cost than GSHP and other renewable technologies;
- It can be integrated with the proposed ventilation strategy; and,
- It is simple to install when compared to other renewable technologies.

This technology may be employed to provide the space heating and cooling for future fit-out of the non-domestic parts of the development.

The table below summarises the technical data for the proposed ASHP and estimated CO_2 savings from the application of this technology. In total the ASHP technology would produce regulated CO_2 savings of 40.1% for the development.

Table 5: Summary of technical/operational data and estimated CO_2 savings for ASHP

ASHP for domestic spaces		
COP heating	1.7	
Carbon intensity of electricity	0.233	kgCO2/kWh
Proportion of space heating and hot water met by ASHP	100	%
Energy met by ASHP	56,382	kWh/yr.
Energy used by ASHP	33,730	kWh/yr.
Total CO_2 savings	9.6	t/yr.
Regulated baseline CO_2 emissions	24.0	t/yr.
Total baseline CO_2 emissions	38.2	t/yr.
% Regulated CO_2 reduction*	40.1	%
% Total CO_2 reduction*	25.1	%

* % reduction from site baseline

Figure 5: Outdoor unit of an ASHP

BE GREEN CO_2 EMISSIONS & SAVINGS

The incorporation of renewable technologies will further reduce CO_2 emissions by a further 40.1% (9.6 tonnes per annum) using SAP10 emission factors across the whole site.

CUMULATIVE ON-SITE SAVINGS

The overall regulated CO_2 savings *on-site* against a Part L 2013 compliant scheme with SAP10 emission factors are therefore 10.3 tonnes, equivalent to 42.9% of the baseline emissions.

CARBON OFF-SETTING

The proposed development complies with the London Plan CO_2 savings target of 35% overall.

To achieve 'zero carbon' for the residential portion of the scheme, 13.7 tonnes per annum of regulated CO_2, equivalent to 441.0 tonnes over 30 years, should be offset offsite.

CONCLUSIONS

The sustainability strategy for the scheme at Court Royal and Red Roofs has been developed in line with the relevant policies of the London Plan and of the Royal Borough of Kingston Upon Thames Development Plan and aims at the efficient management of resources, environmental protection and the effective adaptation and mitigation of the development to climate change.

The energy strategy has been developed in line with the three-step Energy Hierarchy and the cumulative CO_2 savings on site are estimated at 42.9% for the development, against a Part L 2013 compliant scheme.

SUSTAINABILITY

The proposed Court Royal and Red Roofs development will meet the targets set out by Royal Borough of Kingston Upon Thames and the London Plan.

Key sustainability features of the proposals include:

- The re-use of previously developed land;
- Effective site layout in response to the neighbouring context;
- Efficient design of the proposed massing, openings and internal layouts so that habitable spaces across the site benefit from abundant daylight and sunlight levels, whilst impacts to neighbouring buildings are kept to a minimum;
- The specification of water efficient fittings to limit water consumption to less than 105 litres per person per day for domestic uses;
- The improvement of biodiversity on site through the addition of green spaces, private gardens and rooftop green areas;
- Effective pollution management and control: the development is not expected to have any significant adverse effects to air, noise, land or watercourses.

The sustainability measures incorporated reflect the client and design team's aspirations in integrating sustainability measures and demonstrates that the project is designed to exceed the planning policy sustainability requirements.

ENERGY STRATEGY

By implementing the three step Energy Hierarchy as detailed in the previous sections, the Regulated CO_2 emissions for the development have been reduced against a Part L 2013 compliant scheme through on-site measures alone by 42.9% (10.3 tonnes per annum) across the whole site.

The proposed development complies with the London Plan CO_2 savings target of 35% overall.

To achieve 'zero carbon' for the residential portion of the scheme, 13.7 tonnes per annum of regulated CO_2, equivalent to 411.0 tonnes over 30 years, should be offset offsite.

Any carbon offset contributions will be subject to viability discussions and detailed design stage calculations.

The tables in the following pages summarise the implementation of the Energy Hierarchy for the proposed scheme and detail the CO_2 emissions and savings against the baseline scheme for each step of the hierarchy; as well as the savings achieved through carbon offset.

Overall, the proposed development has been designed to meet energy policies set out by the GLA and the Royal Borough of Kingston Upon Thames, which demonstrates the client and the design team's commitment to enhancing sustainability of the scheme.

SITE-WIDE CUMULATIVE SAVINGS

Table 6: CO_2 emissions after each step of the Energy Hierarchy for the development (SAP10 emission factors)

	Carbon dioxide emissions for domestic buildings (tonnes CO2 per annum)	
	Regulated	Unregulated
Baseline	24.0	14.2
After energy demand reduction	23.3	14.2
After heat network/CHP	23.3	14.2
After renewable energy	13.7	14.2

Table 7: Regulated CO_2 savings from each stage of the Energy Hierarchy for the development (SAP10 emission factors)

	Regulated domestic carbon dioxide savings	
	Tonnes CO_2 per annum	% over baseline
Savings from energy demand reduction	0.7	2.8%
Savings from heat network/CHP	0.0	0.0%
Savings from renewable energy	9.6	40.1%
Cumulative on-site savings	10.3	42.9%
Cumulative for offset payments	411.0 tonnes over 30 years	

Table 8: Site wide regulated CO_2 emissions and savings (SAP10 emission factors)

	Total regulated emissions (tonnes CO_2/year)	Regulated CO_2 savings (tonnes CO_2/year)	Percentage saving (%)
Baseline	24.0		
Be Lean	23.3	0.7	2.8%
Be Clean	23.3	0.0	0.0%
Be Green	13.7	9.6	40.1%
Total		10.3	42.9%
Offset to zero carbon for domestic		411.0 tonnes over 30 years	

APPENDIX A – OVERHEATING RISK ASSESSMENT

SAP Overheating risk outputs

Unit Reference	Overheating Risk
A.00.01	Medium
A.00.04	Medium
A.03.01	Slight
A.03.02	Slight
A.03.03	Slight
A.03.04	Slight
A.05.01	Slight

APPENDIX B – SAP RESULTS

The table below lists a sample of the typical flats that were modelled using SAP methodology, the TER and DER outputs and the % CO_2 reduction achieved after the Be Lean, Be Clean and Be Green measures have been applied.

The results from these 7 flats were extrapolated over the entire development, in order to predict the energy consumption and carbon dioxide emissions for the domestic spaces of the Development.

The following pages show the DER/TER FSAP2012 worksheets for a sample flat. The SAP outputs for all sample flats are available on request.

SAP Ref No.	Unit Ref.	TER ($kgCO_2/m^2/yr.$)	DER ($kgCO_2/m^2/yr.$)	% CO_2 reduction
1	A.00.01	25.94	21.69	16.4
2	A.00.04	27.08	22.37	17.4
3	A.03.01	21.36	16.9	20.9
4	A.03.02	25.5	21.35	16.3
5	A.03.03	25.21	20.75	17.7
6	A.03.04	22.32	18.15	18.7
7	A.05.01	26.17	21.68	17.2

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