St Columba's Close - Gravesend

Sustainability & Energy Statement

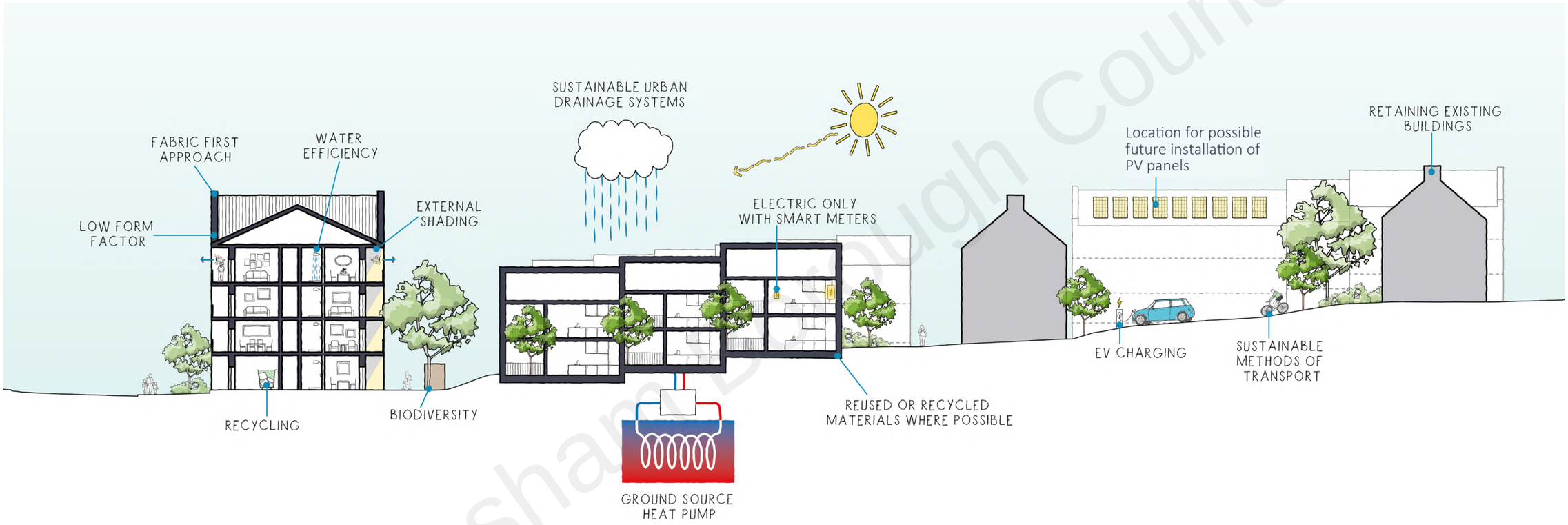
October 2022_Rev01

sustainability

REVISION	DATE	STATUS	PREPARED BY	CHECKED BY	SUMMARY OF CHANGES
-	17.10.2022	Draft for information	KM, SI	SH	-
01	26.10.2022	Final issue for planning submission	KM	SH	Project team comments, and updates incorporated

Contents

Executive Summary



> Create an enhanced connection with the garden and green amenity

> Considered design of balconies and windows avoids overheating (TM59) and flexibility in furniture arrangement

> Create greater potential for social interaction between neighbours through good design

> Robust ventilation strategy to maximise internal environment

> Promote a 'Fabric First' approach to ensure well insulated buildings

> Low carbon heat through Ground Source Heat Pumps and future carbon reduction possible through retrofit opportunity of PV panels.

Figure 1 : Sustainability Strategy overview (Source: BPTW, Design and Access Statement)

Themes	Measures
Operational energy and carbon 	• Passive design and good fabric performance to reduces carbon emissions, lower heating bills and deliver high comfort levels within the homes. • An all-electric low carbon solution with Ground Source Heat Pumps (GSHP) is proposed to meet the space heating and hot water demand. • The development's area-weighted regulated carbon emissions achieve a 52.4% reduction compared to Building Regulations' targeted carbon emissions. • The roofs of the development have been designed to support PVs in the future to further reduce the carbon footprint of the development towards a Net Zero Carbon status.
Resource efficiency 	• Where possible, existing buildings have been retained on the site. • Waste reduction by prioritising the reuse of materials and elements found on site. • The carbon intensity of materials is considered in their specification, e.g. timber cycle stores, play equipment and other landscape elements. • The design team will review a structural timber approach for the terraces (T01) and maisonettes (M01) in the detailed design development. • Building in layers principles are incorporated to ensure easy of access for maintenance, repair and replacement (e.g. Accessible services). • The communal waste stores are easily accessible and organised to increase composting and recycling rates in operation.
Water conservation 	• Efficient water fittings are specified to achieve a maximum of 105 litres per person per day. • Strategic SuDS design and a drought resistant planting strategy minimise the need for irrigation. • Water butts will be provided for all private gardens to collect rainwater for irrigation purposes
Biodiversity and landscape 	• The landscape design includes a range of local, native (minimum 60%) planting species, that have a known benefit to wildlife. • 5 trees planted for every tree felled resulting in an additional 48 new trees. • Nature-based sustainable urban drainage design, including rain gardens, green roofs on the bin and cycle stores and permeable paving to reduce flood risk and improve water quality. • New centrally-located communal landscape area, including play space for younger children, a ‘grow your own’ allotment area and an outdoor gym circuit.
Climate change resilience 	• Two dwellings have undergone provisional overheating modelling. Both have passed the two criteria from Building Regulations Part O. • The surface water drainage system is designed for a 1 in 100 year storm + 40% for climate change. • The increased number of trees will help to mitigate for increasing temperatures through evaporative cooling of the immediate environment and the provision of shading • Drought resilient planting is incorporated into biodiverse planting palette to resist long periods of drought.
Health and wellbeing 	• 100% affordable housing. • 84% of rooms will meet their target illuminance values for daylight and 100% of dwellings will have at least one room which meets for sunlight exposure. • The glazing, ventilation and roof construction will respond to a Sound Insulation Scheme developed in response to the environmental noise impact assessment. • Safety and security features are developed in collaboration with Kent Police and include increased natural surveillance from ground floor homes, a range of boundary treatments such as fencing and hedges, secure cycle and bin stores and improved external lighting.
Sustainable transport 	• Residents are connected to local amenities and public transport links through a network of existing and improved footways and cycle paths on the site. • 70 cycle parking spaces are provided in secure cycle stores. 5% of these spaces have charging infrastructure for electric bikes. • The proposed houses have 1 electric vehicle charging space provided per dwelling. For the proposed flats 20% of car parking spaces has active electric vehicle charging infrastructure at the outset, and 80% have passive provision to enable conversion to active charging points at a later date.

1. Introduction

KLH Sustainability have been appointed by Gravesham Borough Council (GBC) to prepare a Sustainability Statement in support of a planning application for the proposed development of St Columba's Close, in the Kent Borough of Gravesham.

The purpose of the report is to assess the design, performance and strategies of the proposed development against relevant national and local sustainability policies.

The sustainability strategy for the St Columba's Close proposal has been developed in collaboration with the wider design team through several sustainability workshops.

The following sections provide a description of the project and its surroundings, the planning policy context and the sustainability strategy centred around 8 themes.

Information from several documents that form part of this planning application has been incorporated in the description of the sustainability approach in this sustainability statement. Consulted documents include:

- Design and Access Statement - BPTW Architects (Oct 2022)
- Landscape DAS - ME Landscape Studio (Oct 2022)
- Preliminary Ecological Appraisal - Greenlink Ecology Ltd. (10.10.2022)
- Bat Survey Report - Greenlink Ecology Ltd. (10.10.2022)
- Draft Transport Statement - SWECO (14.10.2022)
- Overheating Analysis - E3 Consulting Engineers (Oct 2022)
- Daylight Analysis - Waldrams (19.10.2022)
- Flood Risk Assessment - RIDGE (August 2022)
- Below Ground Drainage Strategy - RIDGE (17.10.2022)
- Environmental Noise Survey, Noise Break-in Assessment & Sound Insulation Scheme - NOVA Acoustics (24.10.2022)

The following chapters provide a description of the project and its surroundings and the planning policy context to set the scene before setting out the specific sustainability measures taken in the following areas:

- Operational energy and carbon
- Resource efficiency
- Water conservation
- Biodiversity and landscape
- Climate change resilience
- Health and wellbeing
- Sustainable transport

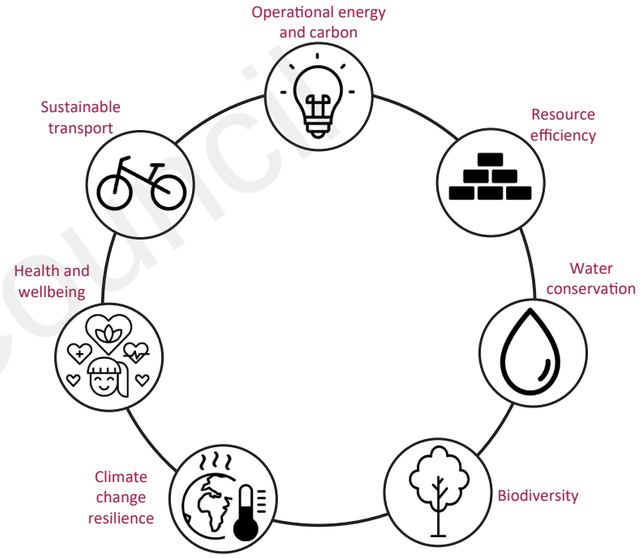


Figure 2 : The 8 key themes of the sustainability strategy for St Columba's Close

View of Block B form St. Patrick's Gardens (Source: BPTW - Design and Access Statement)

2. Overview of proposed development

The proposal comprise the demolition of 3no. existing buildings and the associated caretakers' facilities and erection of 2no. 2 storey buildings, 1 no. 3 storey building and 1no. part3/part4 storey building to provide 46 residential dwellings (Class C3 residential use), with associated vehicle and pedestrian access, amenity space with hard and soft landscaping, car and cycle parking, refuse and recycling storage provision, and other associated works.

Block A and Maisonette M01 are sited to enclose the improved amenity and provide active frontage onto Valley Drive and the new road. The new terrace of family homes (Terrace T01) is proposed to be located to the north of the new road where the existing maisonettes (28-42 St.Columba's Close) are located. Block B is proposed to be located to align with the Terrace T01 and the new road. The terrace houses and maisonettes front the new road stepping up with the existing gradient to provide a traditional street character.

The proposed scheme includes improvements across the existing estate including improvements to the communal areas and a sympathetic design of the communal open space and garden areas that will provide residents with a place to enjoy, an area for light physical exercise.

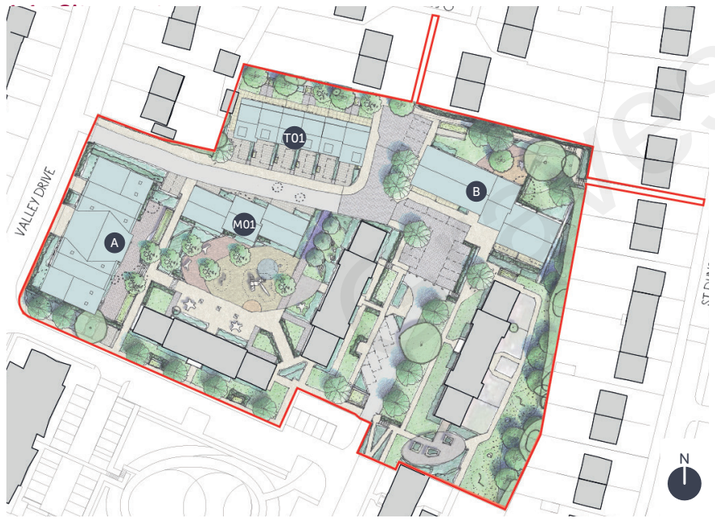


Figure 3 : Proposed site plan for St Columba's Close (Source: BPTW's Design and Access Statement)

2.1 Site context

The site is located between Valley Drive, St Dunstan's Drive, St Patrick's Gardens and St Columba's Close. It is bounded by housing to the north and east, Valley Drive to the west and the public amenity space and playground of St Patrick's Gardens to the south.

The site itself consists of seven residential blocks within the boundary which currently accommodates 26 homes and a centrally located open space which is surrounded by three of the blocks of flats..

Valley Drive connects the site to the A2 to the south, which provides a direct route into London. Gravesend Station is located approximately 2 miles to the north-west of the site. Train services to Charing Cross and St Pancras Stations run frequently to and from Gravesend. There are a number of bus stops within a short walking distance walk from the site with bus routes serving Gravesend, Bluewater Shopping Centre, Dartford, and Northfleet, as well as a number of the surrounding villages and housing estates.

There are a number of public amenity spaces within walking distance of the site including 2 golf courses, open green spaces and children's playgrounds. The area benefits from a primary school and a secondary school within a 15 minutes' walk with a further two primary schools within a 25-minute walk.

There are also two leisure centres within a 30-minute walk. Although there is no main 'high street' near the site, there are a number of convenient stores, takeaway restaurants, pharmacies and local businesses within a walking distance around the site.

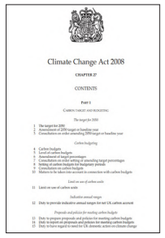
Figure 4 :Wider context (Source: BPTW's Design and Access Statement)

3. Planning policy context

The following planning policy and regulatory documentation has been considered in detail in the preparation of this Sustainability Statement.

3.1 National Policy and Regulations

The Climate Change Act 2008 (amended 2019)


Climate Change Act 2008

CHAPTER 27

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Part 1

CARBON TARGET AND REDUCTION

The target for 2050

1 The target for 2050
2 Amendment of 2050 target: general
3 Consultation on order amending 2050 target or baseline year

Carbon budgeting

4 Carbon budgets
5 Amendment of target percentages
6 Consultation on order setting or amending target percentages
7 Duty to ensure that net UK carbon account
8 Interpretation of carbon budgets

Limit on use of carbon credits

9 Limit on use of carbon credits

Inflation annual target

10 Duty to provide inducement annual targets for net UK carbon account

Proposals and policies for meeting carbon budgets

11 Duty to prepare proposals and policies for meeting carbon budgets
12 Duty to report on proposals and policies for meeting carbon budgets
13 Duty to have regard to most UK, domestic action on climate change

The Climate Change Act, passed in 2008, formalised the UK's commitment to tackling climate change. The Act was amended in 2019 and legally commits the UK to 'net zero' by 2050. As per the Climate Change Act, the independent Committee on Climate Change was created. The Committee has helped to ensure that UK's overall direction of travel on climate change has remained focused on the long term target, separate from political fluctuations. As such, the Committee's advice has been instrumental in the UK's success so far.

Environment Act (2021)


Environment Act 2021

2021 CHAPTER 30

An Act to make provision about targets, plans and policies for improving the natural environment; for statements and reports about environmental protection; for the Office for Environmental Protection, about waste and resource efficiency, about air quality, for the recall of products that fail to meet environmental standards; about water, about nature and biodiversity; about conservation covenants; about the Severn Bridges; and for connected purposes.

[9th November 2021]

BE IT ENACTED by the Queen's most Excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows:—

PART 1

ENVIRONMENTAL GOVERNANCE

CHAPTER 1

IMPROVING THE NATURAL ENVIRONMENT

Environmental targets

1 Environmental targets

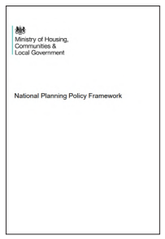
(1) For the purpose of Parts one to regulations set long-term targets in respect of any matter which relates to—

(a) the natural environment, or

(b) people's enjoyment of the natural environment.

The long-awaited Environment Act was finally passed into law in November 2021, nearly three years after a bill was first proposed to govern environmental matters after the UK's departure from the EU. The Act introduces a new framework for setting long-term, legally binding targets for environmental improvement, including for air quality, water, biodiversity, and waste reduction.

National Planning Policy Framework (NPPF) (amended 2021)


Ministry of Housing, Communities & Local Government

National Planning Policy Framework

The National Planning Policy Framework (NPPF) plays a key role in delivering the Government's objectives on sustainable development. The NPPF was first published in March 2012, a revised framework was published in 2021 and encourages ownership at the local level and provides guidance to promote effective environmental protection, economic growth and ensuring a better quality of life for all, both now and in future generations.

The NPPF defines three overarching, interdependent objectives:

- An economic objective: to help build a strong, responsive and competitive economy, by ensuring that sufficient land of the right types is available in the right places and at the right time to support growth, innovation and improved productivity; and by identifying and coordinating the provision of infrastructure;
- A social objective: to support strong, vibrant and healthy communities, by ensuring that a sufficient number and range of homes can be provided to meet the needs of present and future generations; and by fostering well-designed, beautiful and safe places, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being; and
- An environmental objective: to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.

Building Regulations - Part L


HM Government

The Building Regulations 2010

Conservation of fuel and power

APPROVED DOCUMENT

L

Volume 1: Dwellings

Requirement L1 Conservation of fuel and power
Requirement L2 On-site generation of electricity
Regulations: 6, 21, 23, 24, 25, 25A, 25B, 26, 26A, 26C, 27, 27A, 27C, 28, 40, 40A, 43, 44 and 44ZA

2021 edition – for use in England

Approved Document Part L (2021) sets out energy efficiency requirements for new dwellings (Document L1A) and non-domestic buildings (Document L2A). Changes made in the 2021 edition include a requirement for new dwellings to achieve or better a fabric energy efficiency target.

Building Regulations - Part G


HM Government

The Building Regulations 2010

Sanitation, hot water safety and water efficiency

G

APPROVED DOCUMENT

G1 Cold water supply
G2 Water efficiency
G3 Hot water supply and systems
G4 Sanitary conveniences and washing facilities
G5 Bathrooms
G6 Food preparation areas
Water efficiency calculator for new dwellings

2015 edition with 2016 amendments

For use in England

ONLINE VERSION

Approved Document Part G (2016) requires installation of water fittings and fixed appliances that use water efficiently. The baseline standard sets the water consumption to not exceed 125 litres/person/day. An optional 110 l/p/d standard can be used when required by planning permission.

Building Regulations - Part M


HM Government

The Building Regulations 2010

Access to and use of buildings

APPROVED DOCUMENT

M

Volume 1: Dwellings

M4(1) Category 1: Visitable dwellings
M4(2) Category 2: Accessible and adaptable dwellings
M4(3) Category 3: Wheelchair user dwellings

2015 edition incorporating 2016 amendments – for use in England

Approved Document Part M (2015) provides information about the ease of access to, and use of, buildings, including facilities for disabled visitors or occupants, and the ability to move through a building easily including toilets and bathrooms.

Building Regulations - Part S


HM Government

The Building Regulations 2010

Infrastructure for the charging of electric vehicles

APPROVED DOCUMENT

S

Requirement S1 The erection of new residential buildings
Requirement S2 Dwellings resulting from a material change of use
Requirement S3 Residential buildings undergoing major renovation
Requirement S4 Buildings undergoing major renovation which are not residential buildings or mixed-use buildings
Requirement S5 Buildings undergoing major renovation work which are not residential buildings or mixed-use buildings
Requirement S6 The erection of new mixed-use buildings and mixed-use buildings undergoing major renovation
Regulations: 44D, 44E, 44F, 44G, 44H, 44I, 44J

2021 edition – for use in England

Approved Document Part S (2021) provides a requirement for new homes and existing homes undergoing large renovations (of 10 more or dwellings) to have facilities for charging electric vehicles at home that may be parked on associated parking spaces at that home.

Building Regulations - Part O


HM Government

The Building Regulations 2010

Overheating

APPROVED DOCUMENT

O

Requirement O1 Overheating mitigation
Regulations: 40B

2021 edition – for use in England

Approved Document Part O (2021) covers the overheating improvement requirements and guidance on providing means of removing excess heat from residential buildings. The guidance in this approved document applies to new residential buildings only.

Building Regulations - Part F


HM Government

The Building Regulations 2010

Ventilation

APPROVED DOCUMENT

F

Volume 1: Dwellings

Requirement F1 Means of ventilation
Regulations: 39, 41 and 44

2021 edition – for use in England

Approved Document Part F Volume 1 (2021) provides information on the ventilation requirements to maintain indoor air quality in domestic dwellings.

3.2 Local Policy

Gravesham Local Plan Core Strategy (2014)

The Gravesham Local Plan Core Strategy sets out a long-term vision for the future of Gravesham based on evidence of what's needed to support communities and what makes Gravesham a distinctive and attractive place to live and work. The strategy guides the amount, type, location and detailed design of future development and provide a consistent basis against which planning applications can be assessed. Gravesham Local plan Core Strategy includes a range of policies that relate to Sustainable design and construction:

- *CS01 - Sustainable development*: Gravesham Council will rapidly approve any planning applications that considered the policies. The Council encourage any sustainable development and takes a positive approach with it. Gravesham Council will support applicants and work proactively to find solutions to secure development that improves the economic, social, and environmental conditions in the area.
- *CS12 - Green infrastructure*: The Council created a multifunctional network that links all key parts (green spaces, footpaths and cycle routes etc) together and improves access within the urban area, from the urban area to the rural area and along the river. Sites designated for their biodiversity value will be protected and there will be no net loss of biodiversity in the Borough. Where a negative impact on protected or priority habitats/species cannot be avoided a compensatory provision will be required either elsewhere on the site or off-site, including measures for ongoing maintenance. As for the landscape character and valued landscapes should be conserved,restored and enhanced.
- *CS18 - Climate Change:* The Council will seek to minimise the impact of drainage from new development on waste water systems. In particular, the Council will require that surface water run-off from all new development has, as a minimum, no greater adverse impact than the existing use; and require the use of Sustainable Drainage Systems on all developments where technically and financially feasible. The Council will seek to manage the supply of water in the Borough and reduce the impact of new development on the supply of potable water as much as possible. In particular, the Council will require all new homes to be built to at least level 3/4 of the Code for Sustainable Homes in terms of water use (105 litres per person per day consumption). the Council will seek 5% of homes on Key Sites to act as exemplars by meeting level 5/6 of the Code for Sustainable Homes in terms of water use (80 litres per person per day consumption).

DRAFT Gravesham Borough Council Climate Change Strategy (2022-2030)

Consulted to inform the design with the knowledge that Gravesham Borough Council declares we have a climate emergency and will begin to take action to prepare for the borough to become carbon neutral by 2030. Key priorities for the housing provider include:

- *SA 2.1:* Implement a GBC resident engagement strategy around Climate Change. Work with partners to promote climate change key messages and activities to all council housing tenants as a means to support them in adjusting behaviours and deliver their own climate change action agendas.
- *SA 2.3:* Ensure that all projects to deliver new council-owned housing target the achievement of net zero standards and include provision for electric vehicle charging.
- *SA 2.4:* Seek to secure an alternative energy supply through the procurement of renewable energy when the current supply contract for communal and other council-managed housing assets in 2024.
- *SA 2.5:* Explore alternative energy solutions for communal areas and council housing tenants, looking to encourage use of green energy companies wherever possible.
- *SA 2.6:* Develop and deliver a programme of investment in EV charging points in existing housing estates.
- *SA 2.7*: Work with council tenants to promote a better understanding of the benefits of alternatively-powered vehicles and active travel options.
- *SA 2.8:* Reduce the amount of waste generated by the service and tenants that is sent to landfill with the intention to increase recycling rates.
- *SA 2.9:* Ensure the principles of green infrastructure are incorporated into new council housing developments and major works to the existing estate.

Figure 5 : Proposed public amenity space (Source: BPTW's Design and Access Statement)

4. Operational energy and carbon

In response to the current state of climate emergency, the UK has pledged to be net zero carbon by 2050. The UK built environment is currently responsible for 25% of total UK greenhouse gas emissions buildings and infrastructure)[1]. To align with national net zero carbon ambitions, new developments need to reduce their operational energy demand through a fabric first approach and ensure power and heat is generated from clean sources.

The St Columba's Close development takes a 'net zero carbon ready' approach with a substantial reduction of regulated energy use beyond the Building Regulation requirements[2]. In order to achieve these reductions, the energy hierarchy of Figure 6 is implemented. Appropriate site layout and passive design of the thermal envelope reduce energy demand for heating, lighting and ventilation, and eliminates the need for active comfort cooling. Efficient building services together with a low carbon heating strategy further reduce the energy consumption and operational carbon emissions. The proposed all-electric approach eliminates future dependency on fossil fuels and will benefit from the decarbonisation of the electricity grid. The design is developed to suit ease of retrofitting PVs in future to further reduce carbon emissions of the development towards Net Zero Carbon The details of the proposed energy strategy are found in the following paragraphs.

A focus on passive design and fabric performance reduces carbon emissions, but also lowers heating bills for the residents and delivers high comfort levels within the living spaces.

After following the steps in the energy hierarchy, the development's area-weighted regulated carbon emissions achieve a 52.4% reduction compared to Building Regulations' targeted carbon emissions. Table 1 and Figure 7 summarise the result of the 'as designed' SAP assessments for St Columba's Close. The complete DER/TER SAP output reports for all modelled dwellings are included in (Appendix A).

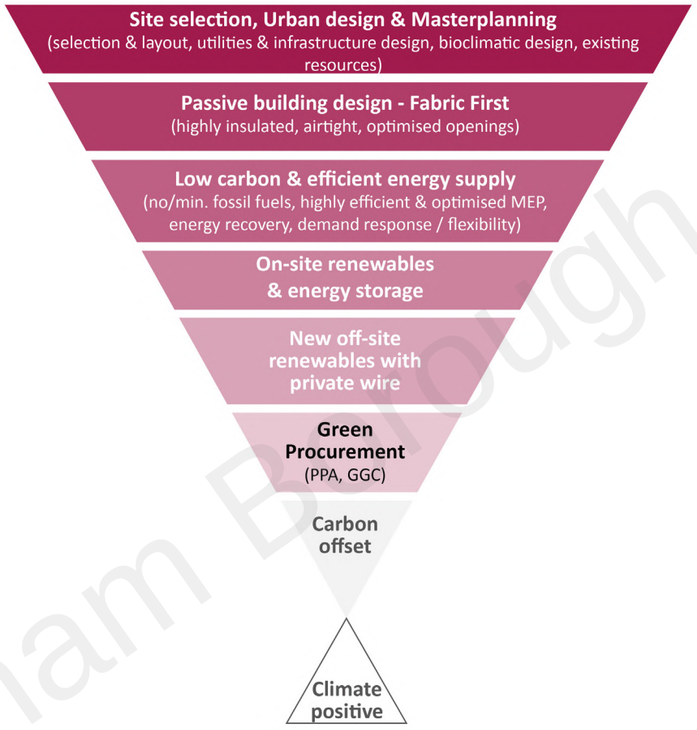


Figure 6 : Energy hierarchy

Target Emissions	Proposed Dwelling Emissions
47,350 kgCO_2e/year	22,545 kgCO_2e/year
14.7 kgCO_2e/m².year	7.0 kgCO_2e/m².year
Improvement of DER over TER: -52.4%	

Table 1. Proposed Development annual regulated carbon emissions against Building Regulations' target emissions.

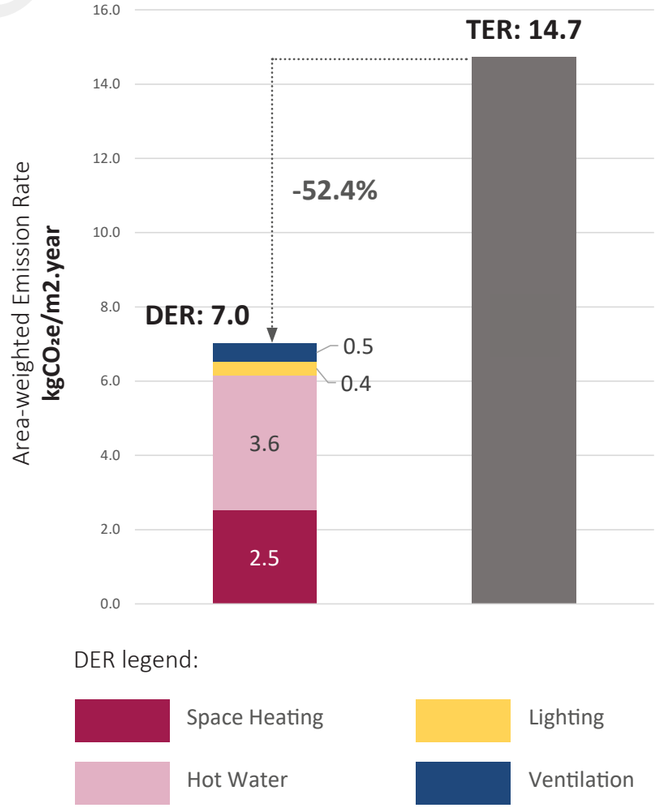


Figure 7 : Proposed development area-weighted DER and breakdown of carbon sources; comparison to TER and resulting total improvement.

1 UKGBC's Whole Life Carbon Roadmap (Nov 2021)

2 Approved Document L, Conservation of fuel and power, Volume 1: Dwellings, in effect as of 15th June 2022

Urban design & Masterplanning

The site is bound by housing to the north and east, Valley Drive to the west and the public amenity space and playground of St Patrick's Gardens to the south. The design aims to work with the constraints of the site (Figure 8) and responds to the microclimate characteristics of its location. The two storey blocks are located on the south part of the site. This height responds to the adjacent low rise building typologies, and lets sun- and daylight into the central courtyard. The building volumes are designed and orientated to allow a high number of double and even some triple aspect homes to provide enjoyable residential amenity spaces, optimise daylight and allow for natural ventilation opportunities.

Proposals for the Thermal Envelope	Target	Notional dwelling
External Walls	0.13 W/m²K	0.18 W/m²K
Ground Floor	0.11 W/m²K	0.13 W/m²K
Roof	0.10 W/m²K	0.11 W/m²K
Glazing (glazed doors, windows & rooflights; whole frame)	1.20 W/m²K	1.20 W/m²K
Glazing solar gains (g-value):	0.35 [-]	
Air Permeability	3.00 m³/hm²	5.00 m³/hm²
Thermal Bridging y-value	0.06 W/m²K	

Table 2. Thermal envelope design targets.

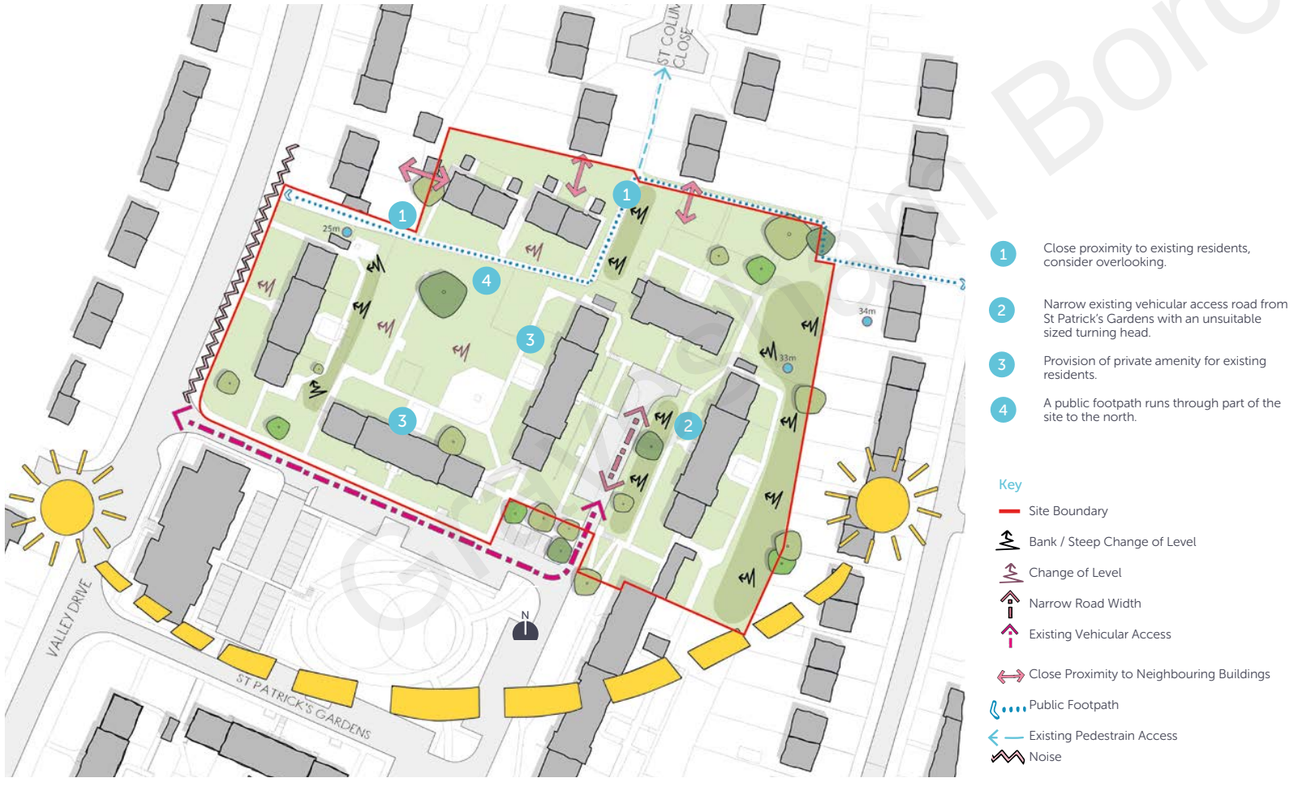


Figure 8 : Optimising passive heating by responding to sun path with urban design and facade layout (Source: BPTW's Design and Access Statement)

Passive building design

The building design makes maximal use of passive design principles to reduce energy demand in a cost effective way, and create a suitable context for the implementation of low carbon services. Passive building design utilises the free heat from the sun, and free cooling from natural ventilation to reduce heating bills and risk of fuel poverty for residents, create a healthy, thermally comfortable environment throughout the seasons. Key passive design strategies of the development include:

- The design of a simple volume with limited steps and setbacks, to create a good form factor (exposed surface area / usable floor area). This reduced surface area leads to less heat losses through the building fabric. Additional benefits of the simple volume of the proposal are: ease of construction of more straightforward details; reduced thermal bridging; reduced risk of condensation; and a less complicated airtightness strategy.
- Heat losses through the external envelope will be minimised through high insulation levels and low air permeability. The possibility to further improve airtightness levels will be reviewed by the project team during detailed design development. This reduces heating demand in winter and the risk of overheating on hot days (Table 2).
- Maximising the number of dual aspect units facilitates effective cross ventilation and reduces the risk of overheating. All windows and balcony doors in habitable rooms are designed for purge ventilation, openable to a free ventilation area suitable for the size of the room. Where there are single aspect homes (Block A), these have been carefully considered to benefit from a shallow floor plan, to facilitate ventilation and daylight levels across the space.
- Openings are placed and sized strategically to balance the need for daylight, sunlight and winter solar gains, while reducing the risk of overheating in the summer.
- Daylight levels into habitable spaces are generous, thus reducing energy demand for artificial lighting.
- The landscape design of the proposal seeks to retain existing mature trees and increase the site's green cover through new trees planting and diverse low-level vegetated areas. The overall landscape strategy will deliver a natural cooling effect of the local microclimate in summer, and help to further mitigate the summer overheating risk in outdoor areas and habitable spaces.

Energy efficiency

Building services are responsible for creating and maintaining healthy and comfortable indoor environments. Efficient and low carbon services can significantly reduce the energy consumption of buildings. Advances in domestic heat pumps and controls are providing significant carbon savings and heating systems that are fast to respond and easy to control. Key measures incorporated in the building services proposals for energy efficiency include:

- Domestic Hot Water (DHW) storage is proposed with appropriately sized, well-insulated tanks as follows: 150 litres for 1 bed apartments with a standing loss of 1.3 kWh/day; 160 litres for 2 bed apartments with a standing loss of 1.4 kWh/day; and, 180 litres for 3 and 4 bed apartments with a standing loss of 1.5 kWh/day.
- All ductwork to be semi-rigid, all hot water pipework to be fully insulated. Design development will also seek to optimise the services layout to minimise duct and pipework lengths, whereby unnecessary heat losses.
- Efficient LED lighting throughout the development with a minimum efficacy of 100 lm/cW (lumens per Circuit Watt) and occupancy sensors in the communal areas reducing energy used for lighting.

Low carbon heat

An all-electric low carbon solution with Ground Source Heat Pumps (GSHP) is proposed to meet the space heating and hot water demand. Dwellings will be served via radiators at low circulation temperatures further increasing the efficiency of the heat pumps. This all-electric approach is in line with the net zero carbon agenda, generating decreasing operational emissions, as the national grid decarbonises over the coming years (Figure 9).

Demand response

In tangent with above measures, a fundamental element in reducing energy use is applying demand side response principles. These are measures that incentivise or support occupants to reduce their energy use at times of peak demand, thus helping the grid to balance supply and demand without the need for additional generation (and associated new infrastructure). Whilst financial incentives are expected to be available through the network providers, the design will seek to incorporate the following measures to help reduce peak demand:

- Integration of good controls to use energy at the exact quantity and at the times needed. Installation of smart controls using artificial intelligence to optimise the building operation and battery storage will be investigated in later stages.
- Resident education at handover to inform and improve behaviour. This will be facilitated through the provision of energy display devices, potentially incorporating relevant signalling for occupants to prioritise energy use at non-peak times.

These measures do not only reduce the energy demand and bills that come with it, but also lower the risk of power cuts.

On-site renewables

The roofs of the development have been designed to support PVs in the future to further reduce the carbon footprint of the development towards a Net Zero Carbon status.

UK electricity grid decarbonisation scenarios to 2050

The electricity grid is decarbonising rapidly – The National Grid has provided four possible scenarios for rate of decarbonisation. These Future Energy Scenarios (FES) represent a range of different, credible ways to decarbonise the UK's energy system. FES has an important role to play in stimulating debate and helping to shape the energy system of the future. In the latest 2021 report, the country reaches net zero carbon emissions by 2050 or earlier in three out of four scenarios in the analysis, with two scenarios seeing Britain achieve its ambitious climate target. Each scenario considers how much energy the UK might need and where it could come from. Heat and road transport reach zero or almost zero emissions by 2050 across all scenarios except Steady Progression, whereas other sectors, such as waste and aviation, never get to zero emissions by 2050, therefore to reach net zero we need solutions that remove emissions from the atmosphere.

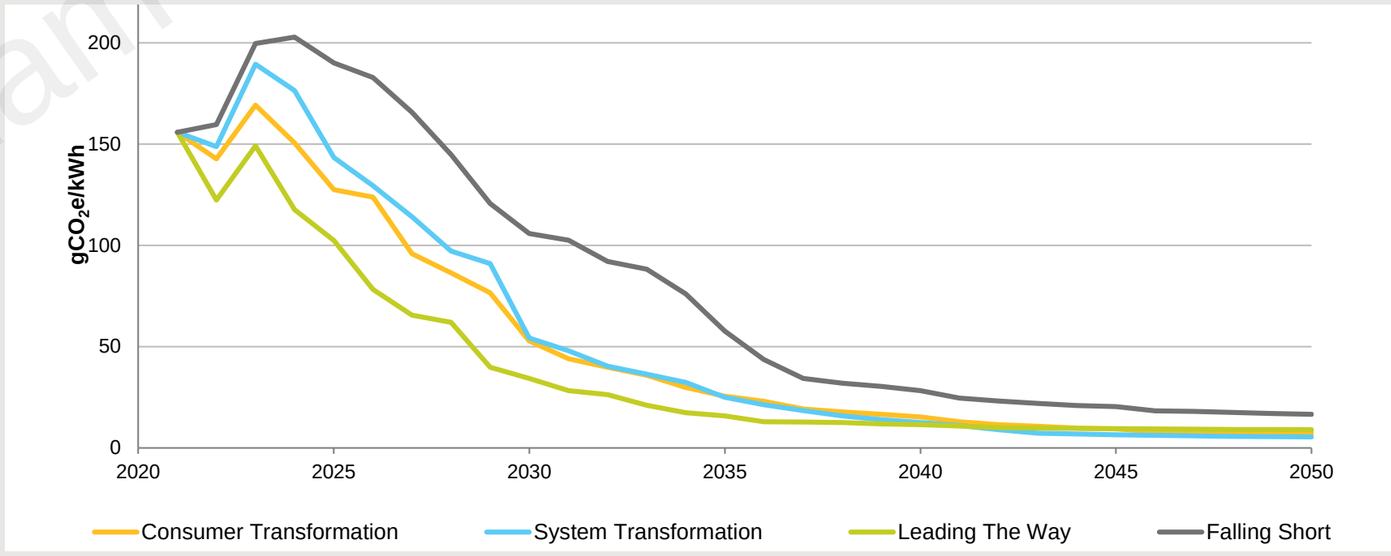


Figure 9 : Future CO_2e intensity of UK grid electricity generation excluding negative emissions from BECCS (gCO2/kWh). Source: Future Energy Scenarios, FES 2022 - Data workbook, ES.E.10: Power sector carbon intensity

5. Resource efficiency

Resource efficiency minimises the amount of materials we extract and to reduce the amount of waste created, by keeping materials in use for longer. Using materials in the way also reduced the amount of embodied carbon.

5.1 Reducing embodied carbon

Embodied carbon refers to the carbon emissions associated with building construction. These comprise the 'upfront' emissions stemming from the extraction and processing of materials and the energy and water consumption during production, assembly, and construction of the building. It also includes the 'in-use' stage (maintenance, replacement, and emissions associated with refrigerant leakage) and the 'end of life' stage (demolition, disassembly, and disposal of any parts of product or building) and any transportation relating to the above.

The resource efficiency strategy for St Columba's Close follows the embodied carbon hierarchy detailed in Figure 10.

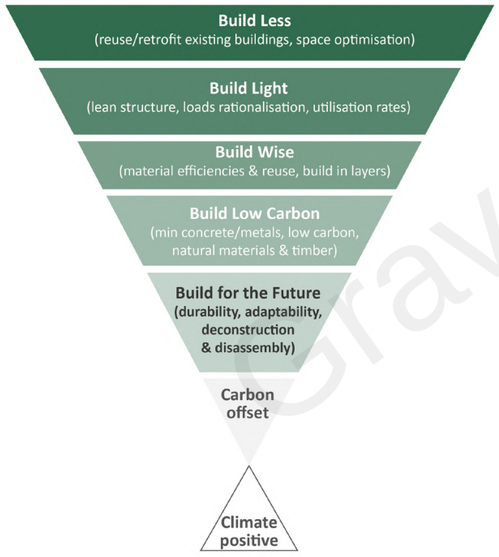


Figure 10 : Embodied carbon hierarchy

Build less

Developments on brownfield sites can significantly reduce the use of new materials by retaining infrastructure and/or building elements already present, or by reusing some of the existing materials found on site.
The retaining and retrofit of existing buildings on the St Columba's site was considered. Where possible, existing buildings have been retained however it was agreed that demolition of part of the existing buildings would be favourable (Figure 11), for the following reasons:

- Major improvements in both pedestrian and vehicular accessibility;
- More clearly defined, useable and secure communal amenity spaces;
- Natural surveillance and improvement of the public footpath that connects Valley Drive and St Dunstan's Drive;
- Provision of additional vehicular parking spaces (based on feedback from public consultation);
- A layout that doesn't compromise the potential for further redevelopment of the site in the future.
- New builds with increased energy efficiency

The reuse of demolition waste, such a crushed brick as aggregate in the substructure, will be explored with the design and contractor team as the design develops.

Figure 11 : Existing buildings to be demolished and existing trees to be removed (Source: BPTW's Design and Access Statement)

Build light

In the detailed development of the design, the architect and structural engineer will look to optimise the design towards a lean and efficient structure. This will reduce the amount of material required and reduce the overall weight of the development and therefore the material required for the substructure.

Build wise

By designing each layer to be as independent as possible, different layers can be refurbished, upgraded or replaced as required without damaging the adjacent layers. This approach considers that each building layer has a different intended life span (Figure 12).

Access to services is considered for durability and ease of maintenance. During detailed design, the project team will further explore opportunities for standardised elements across the scheme such as utility cupboards, bathrooms and ensuites, to optimise material efficiencies and minimise waste.

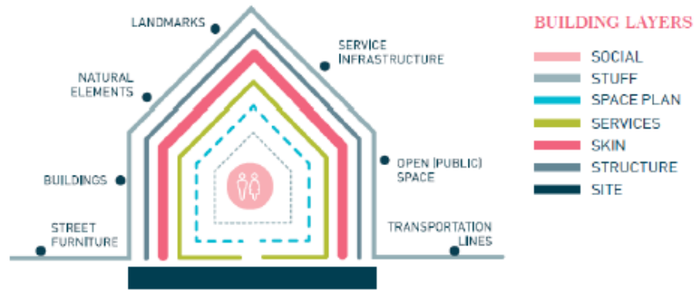


Figure 12 : Building in layers

Build low carbon

The design team will take embodied carbon into consideration in their detailed material specification. Favouring materials with low carbon intensity and high recycled contents. Such as the use of timber for the cycle storage units and other natural/low carbon materials within the landscape design (Figure 13). The external wall build up consisting of brick and mineral wool insulation has a lower embodied carbon content compared to many alternative solutions and provides additional fire safety benefits.

The design team will review a timber frame approach for the terrace (T01) and maisonette (M01) as the design develops to reduce the embodied carbon impact of the new construction.

Build for the future

The development offers a range of dwelling sizes and number of bedrooms ensures there is opportunity for residents to downsize or upsize as their needs develop in the future.

The flexible design accommodates future users through an open plan layout. Additionally, 80% of dwellings meet Part M4(2), incorporating features that make the development suitable for a wide range of occupants, including older people, those with reduced mobility and some wheelchair users.


Timber play equipment


Natural play


Sensory play


Traditional adults and children benches

Figure 13 : Natural and low carbon materials are proposed within the landscape design (Source: ME Landscape Studio)

5.2 Minimise waste

The proposal seeks to reduce the overall amount of waste generated, treated and disposed of to reduce the need for land for waste management thought the following measures:

- Target zero construction (non contaminated) waste sent to landfill.
- Prioritise re-use of demolition waste on site.
- Consider modular off-site construction systems.
- Incorporate easy to use waste recycle facilities within the individual homes and communal waste collection areas.
- Provide adequate space for composting of organic waste.

Sustainable waste management will be adopted during both the construction operational phases and end of life to enable waste minimisation high recycling rates and re use of materials in case of future demolition/adaptation. The proposed development provides easily accessible waste and recycling facilities during the construction and operational phases. The waste hierarchy detailed in Figure 14 is taken as a starting point for the approach.

Waste prevention

- During detailed design the project team will consider specifying off-site prefabricated elements across the scheme such as utility cupboards, bathrooms and ensuites, to minimise on-site waste and improve quality.
- Material suppliers with packaging take back schemes and clear waste reduction strategies will be sought out to reduce the amount of packaging waste on site.
- A 'just in time' material delivery system will be used wherever possible to avoid materials being stockpiled on-site for long periods with potential of damage.
- Attention will be given in the detailed design development to material quantity requirements to avoid over ordering and generation of wasted materials.
- The specification of materials will focus on durability and longevity to reduce waste from maintenance and replacement in future.
- The design team applies the idea of 'building in layers' to simplify the building and optimize the opportunities for circular development of parts of the building that all have their own lifespan. This retains value for longer and improves ease of maintenance and benefits the homeowners and tenants with regards to less disruption of maintenance and layout flexibility.
- Ease of access, maintenance and repair is at the forefront of the design to improve longevity of materials and services systems.

Reuse

- A pre-demolition audit will be undertaken to assess the existing structures and identify materials that can be re-used. This will help to set targets for waste management on site and engage contractors to maximise re-use and recycling opportunities from the onset. Materials will be reused on-site wherever feasible.
- Re-use of materials off-site will be sought where re-use on-site is not practical (e.g. through re-sale for direct re-use or reprocessing).

Recycle / compost

- Materials with high recycled content will be specified over virgin materials.
- Segregation of construction waste at source where practical.
- Recycling of construction materials off-site where on-site is not practical (e.g. through use of an offsite waste segregation facility).
- Internal layouts of residential units are optimised for ease of waste separation and supplied with kitchen waste composting caddies.
- The communal waste stores are easily accessible and organised to facilitate separation of waste (Figure 15).

Figure 14 : DEFRA waste hierarchy

Disposal

Communal waste and recycling stores are provided on the ground floor of Block A and Block B. These are accessed externally to prevent smells entering the buildings and provided with access control and level access routes of suitable width to wheel bins for kerbside collection.

Waste storage areas will be provided in line with best practice / guidelines as set out within British Standards (BS) 5906 2005.

Waste strategy to be further developed during detailed design in conjunction with Gravesham Borough Council refuse requirements.

5.3 Responsible sourcing

Following detailed design, the specification will take procurement into account to prioritise products with the following attributes:

- A responsible sourcing certification
- A Environmental Product Declaration (EPD)
- Locally sourced where possible to reduce emissions from transport.
- Low carbon
- Ethical

Figure 15 : Refuse strategy site plan (Source: Gravesham Borough Council)

6. Water conservation

Water supply in the South East of England is predicted to face increased pressure over the coming decades. Population growth increases the demand for water, while periods of droughts expected during hotter and drier summers could lead to water shortages.

The Environmental Agency predicts that if current trends continue, the South East could face severe water shortages by 2040, with demand exceeding supply as soon as in the next decade.

Demand reduction

The proposal incorporates low water consumption fittings (such as WCs, taps and showers) as outlined in Table 4, in accordance with the optional water efficiency requirements of the Building Regulations Approved Document Part G. This will also achieve the requirement of a maximum water usage of 105 litres per person per day in accordance with *Policy CS18: Climate Change* of the Gravesham Local Plan Core Strategy. This policy requires all new homes to be built to at least level 3/4 of the Code for Sustainable Homes, which includes a maximum water usage of 105 litres per person per day.

Measures to reduce the water demand for irrigation of green spaces include passive irrigation for communal spaces and residential gardens through a strategic SuDS design and a drought resistant, biodiverse planting strategy.

Alternative sources of water

In line with GBC's Employer's Requirements, water butts will be provided for all private gardens to collect rainwater for irrigation purposes. These water butts are located on paving slabs with sufficient additional paving to enable access around the water butt.

Water fitting	Maximum consumption
WC	4/2.6 litres dual flush
Shower	8 l/min
Bath	120-140 litres
Basin taps	5 l/min
Sink taps	6 l/min
Dishwasher	1.25 l/place setting
Washing machine	8.17 l/kilogram

Table 4. The proposed flow rate criteria for dwellings at the development

7. Biodiversity and landscape

Bringing the natural environment into our urban spaces is recognised as a necessity as opposed to a luxury. It provides a fundamental foundations for a healthy, successful living space.

7.1 Biodiversity and habitat strengthening

The landscape design focuses on naturalistic planting protecting the area's biodiversity, strengthening the local ecosystem and contributing to the environmental and social health of the local area.

The Preliminary Ecological Appraisal carried out in April 2022 found no habitats of conservation concern and no evidence of bats or breeding birds on the site. The proposed development is deemed an insignificant impact on the ecology of the site, and if designed sensitively may even enhance it.

In response to this, the landscape design includes a range of local, native (minimum 60%) planting species, that have a known benefit to wildlife such as trees and plants rich in fruit, nectar and seeds (Figure 16). Buffer planting to the boundaries of the site incorporate existing vegetation and provide new native planting contributing to green corridors in the wider area. Wall-integrated bat and bird boxes are incorporated in appropriate positions.

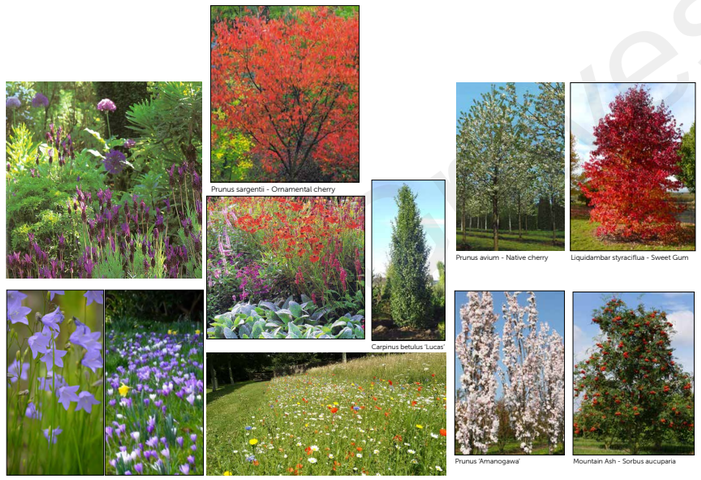


Figure 16 : Planting palette

7.2 Trees

A survey of exiting trees has been carried out. Of the 35 trees and 7 tree groups identified, 11 trees and 2 tree groups are proposed to be removed to make way for the development (Figure 17). An additional 48 new trees are proposed to be planted (Figure 18). This represents an approximate ratio of 5 new trees to 1 tree removed. Both the inclusion, retention and planting of trees in the development support the local identity and place making while enhancing local climate resilience, public health and wildlife. The integration of planning and trees within the landscape design actively benefits the following:

- Provision of a green character to the entrance route.
- Shading for the buildings and outdoor seating.
- Pollution buffer.
- Increasing habitat connectivity to habitats beyond the site boundary
- Providing wildlife benefits by focussing on nectar, fruit and seeds, as well as the density, structure and seasonality of the tree canopy.
- Reduce risk of flooding and mitigate the impacts of long periods of drought

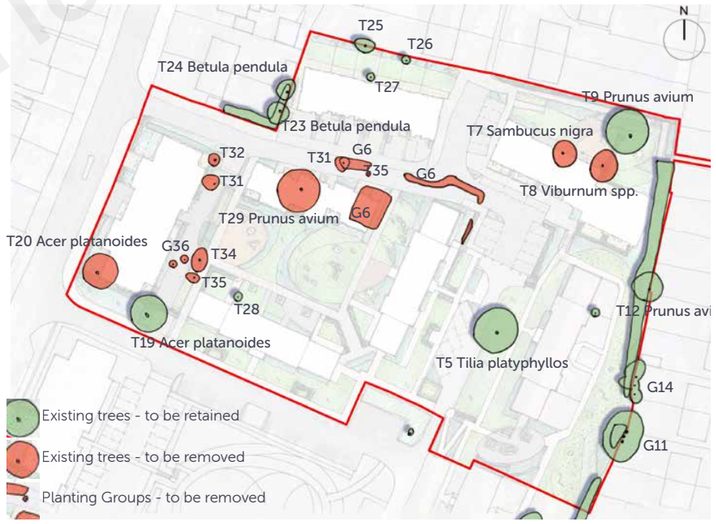


Figure 17 : Existing trees to be retained or felled (Source: ME Landscape Studio)

7.3 Sustainable rainwater management

The landscape design plays a central role within the water management of the site. This alleviates pressure on traditional drainage systems, reduces risk of flooding and improves the quality of water leaving the site. Rain gardens are strategically located to collect, control and filter stormwater runoff from hardstanding surfaces, green roofs have been incorporated on bin and bike storage. Where achievable and subject to further discussion with the civil engineer, further permeable paving, engineered tree pits, planting and grassed areas (amenity lawns and wildflower meadows) will be explored as part of the ongoing detailed design development to further reduce stormwater runoff.

Planting with low water requirements have been selected to reduce dependence on irrigation and planting with greater water holding capacity are selected as part of the SuDS to aid in rainwater attenuation.

Figure 18 : New trees to be planted (Source: ME Landscape Studio)

7.4 Landscaping, community and play spaces

Through accessible and inclusive design the outside spaces aim to meet the needs of the community at all stages of people's lives. In line with the principles of lifetime neighbourhoods, all residents can enjoy a good quality environment, as part of an active and supportive community (Figure 19 and Figure 20).

The creation of a new centrally located communal space between existing and new residential buildings offers space where residents can meet and interact with their neighbours. The space includes a range of facilities including play space for younger children, seating, lawn areas and planting including buffer planting to the existing properties.

Smaller communal gardens to other new residential blocks provide both private amenity spaces, defensible planting and communal amenity. Improved frontages to the existing dwellings tie in the new dwellings in with the existing.

Towards the eastern edge of the site there is the provision of a 'grow your own' allotment area with raised timber planters for use by the wider community. This area also provides an outdoor gym circuit for the residents to enjoy.

High quality landscaping materials are chosen to respond to the existing and emerging context of the area, creating a visually stimulating and accessible landscape for the people who live and visit the site

Extensive engagement with local residents has shaped the current landscape design. Further information on this can be found in the Landscape Design and Access Statement (document reference: SCC-MEL-XX-XX-DO-L-0100).

7.5 Maintenance and materials

Materials are selected for their durability, low maintenance and low embodied carbon characteristics. The frame of the bike stores and the play equipment are constructed using timber, where possible using locally sourced timber or reclaiming timber from trees felled on site. Where possible materials found on the site are re used, such as aggregates from the site incorporated into subbases for both roads and pavements.

High quality, durable hard landscaping will be employed throughout to minimise maintenance and compliment the architectural materials. The site will offer durable, authentic and engaging solutions for all seasons, enhancing the buildings architecture and making a positive contribution to its surroundings.

A Landscape Management & Maintenance Plan will be produced with Gravesham Borough Council to outline the long-term maintenance plan and specific maintenance tasks. The main objectives of this maintenance plan will be to:

- Maintain landscape character.
- Sustainably manage existing vegetation.
- Support the establishment of new planting.
- Maintain and enhance biodiversity.
- Ensure health and safety.
- Provide a mechanism for monitoring and review.

Figure 19 : Landscape concepts (Source: ME Landscape Studio)

Figure 20 : Communal garden elements (Source: ME Landscape Studio)

8. Climate change resilience

More extreme and unpredictable weather is becoming increasingly frequent as the effects of climate change continue their onset across the globe. While climate change mitigation continues to be of the utmost importance, we must also ad apt our infrastructure to increase its resilience to adapt to extreme weather events.

In the UK, the onset of climate change is already resulting in more frequent and severe flood events, and more frequent heat waves in summers causing overheating. Future predictions show that these will continue to increase, as well as other effects such as more frequent droughts impacting our water supply, and higher windspeeds impacting the durability and safety of existing buildings.

The design team acknowledges that the development will have to withstand weather events that are more extreme than what we are used to experiencing today. The proposed development aims to mitigate and adapt to the impacts of climate change to make the building more resilient and provide a safe and comfortable environment for the residents through the following measures:

Topic	Proposed development measures
Reduced heat entering the building	• Spacing and sizing of windows to optimise wither heat gain and daylight levels, while minimising summer heat gains. • External shading is proposed on all south, east and west facing windows to reduce heat gains and glare.
Minimise internal heat generation through energy efficient design	• Optimised energy efficient LED lighting reducing heat emissions • Specification of energy efficient equipment and services systems • Insulation of distribution pipework system to minimise heat loss
Manage the heat within the building through exposed internal thermal mass and high ceilings	• Detailed design development will review the opportunity to leave ceilings exposed in communal areas to providing thermal mass for cooling in summer.
Provide passive ventilation	• Windows sized to provide good daylighting and to allow large openings to promote air flow in and out of the dwellings. • Cross ventilation is provided where possible. • Window openings have been designed to provide the opportunity for secure night time ventilation during warm days.
Provide mechanical ventilation	• Residential units to have Mechanical Extract Ventilation (MEV).
Provide active cooling systems	• No active cooling required in residential dwellings (see section 8.1).

Table 5. Cooling hierarchy and proposed development measures.

- The surface water drainage system is designed for a 1 in 100 year storm + 40% for climate change.
- Rainwater harvesting is utilised where possible to alleviate the effect of droughts.
- Durable materials selected for the building cladding to prevent water damage, ingress and detrimental ponding.
- The residential units are detailed to be well-insulated and airtight to reduce the heating demand during cold events.
- The cooling hierarchy (Table 5) has been incorporated into the design to reduce the risk of overheating.
- The urban greening of the site is increased to reduce the urban heat island effect.
- Water efficient fittings specified throughout to reduce the impact of droughts.

8.1 Overheating

The current Gravesham planning policy does not require buildings to be assessed for overheating risk as part of the planning application. The project team for the St Columba's Close development decided to undertake provisional modelling to test the proposed design against the requirements in Building Regulations Part O, which covers domestic overheating. Building Regulations Part O was introduced in June 2022 and encourages building designs that reduce solar gains and maximise ventilation areas. The overheating mitigation design strategy for the proposal aligns with the cooling hierarchy presented in Table 5. It is deemed important to gain an understanding of this before planning submission as it can have an effect on the elevation and glazing design.

The two house types described below have been selected and modelled in the computer software IES Virtual Environment to assess the risk of overheating (Figure 21):

- House Type 1; ground floor, west facing, one bedroom apartment in block A. This unit has been chosen as it has a west facing bedroom and contains windows that are not likely to be secure enough to leave open over night
- House Type 2; middle, three storey terrace house. This unit has various window and room sizes that are repeated across the scheme.

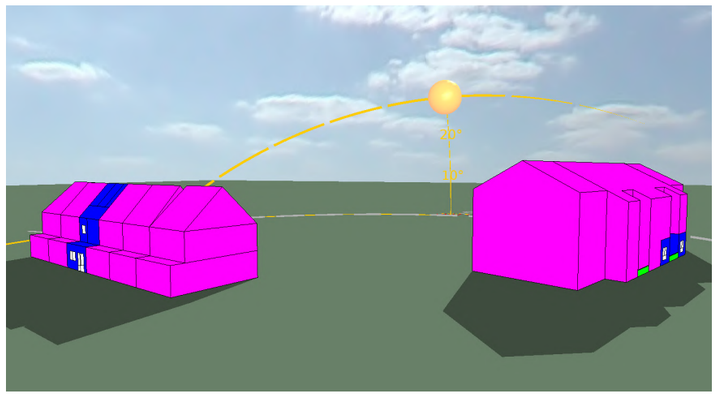


Figure 21 : House Type 1 and 2 used in the overheating risk assessment (Source: Waldrams Daylight and Sunlight Report)

To produce a set of results, standardised Part O profiles have been applied to the model that define window openings, internal gains and occupancy. CIBSE TM49 guidance was used to select the London Gatwick weather file for the analysis. Table 6 contains the modelling results with all rooms in both house types passing both overheating criteria for hours of exceedance and daily weighted exceedance.

A full analysis will be undertaken to demonstrate Part O compliance during detailed design stages which will provide commentary on overheating strategy and options for future adaptation and mitigation.

Room	Criteria 1 (must be <3%)	Criteria 2 (must be <32 hours)
Type 1: Bedroom	0.1	15
Type 1: Kitchen / Living	0.5	N/A
Type 2: Kitchen	0.7	N/A
Type 2: Living Room	0.6	N/A
Type 2: FF Bedroom 1	0	26
Type 2: FF Bedroom 2	0	16
Type 2: SF Bedroom	0.2	26

Table 6.Results from the overheating modelling for St Columba's Close

8.2 Flood risk management & surface run off

Flood risk has been assessed in line with BS 8533 (2017) and CIRIA C624 (2004), taking into account national, and local planning policy and guidance to consider all potential sources of flooding to the site. Based upon current information provided by the Environment Agency, the site demonstrates:

- Low probability of flooding (Flood Zone 1) from fluvial sources (Figure 22).
- Low flood risk from other potential sources such as surface water and sewers.
- High risk of groundwater flooding (Figure 23).

The surface water drainage system is designed for a 1 in 100 year storm + 40% for climate change. Mitigation measures for ground water flood risk include elevation of finished floor levels and groundwater level monitoring. The Drainage Strategy included in this application contains more detail on the surface water management of the proposal.

8.3 Landscape design in a changing climate

Following strategies have been incorporated in the landscape design to improve climate change resilience of the development:

- Increased number of trees to mitigate for increasing temperatures through evaporative cooling of the immediate environment and the provision of shading. This helps to create comfortable spaces for resident during increasingly hot summers and extreme heatwaves.
- Drought resilient planting to resist long periods of drought.
- A sustainable drainage strategy (SuDs) is in place to provide multiple benefits beyond the restriction of the run off rate, including improvement to water quality and provision of urban greening to promote increased biodiversity, recreation and amenity space. For more information on the SuDs strategy see chapter "7. Biodiversity and landscape".

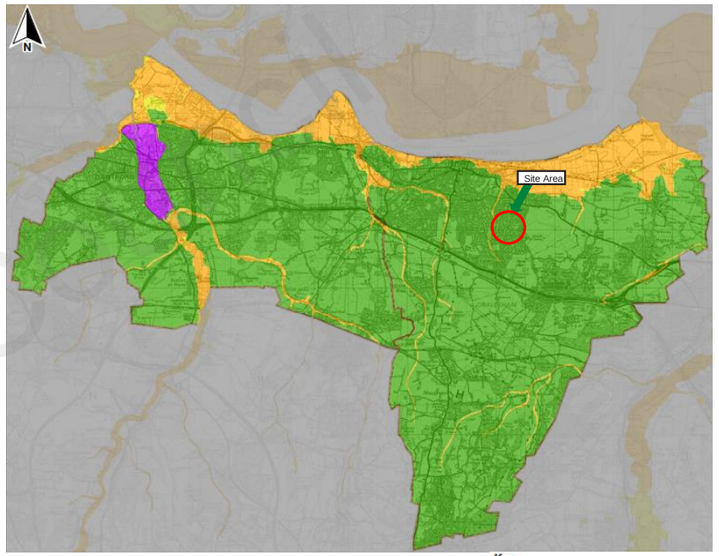


Figure 22 : Flood zone classifications (Source: Environment Agency)

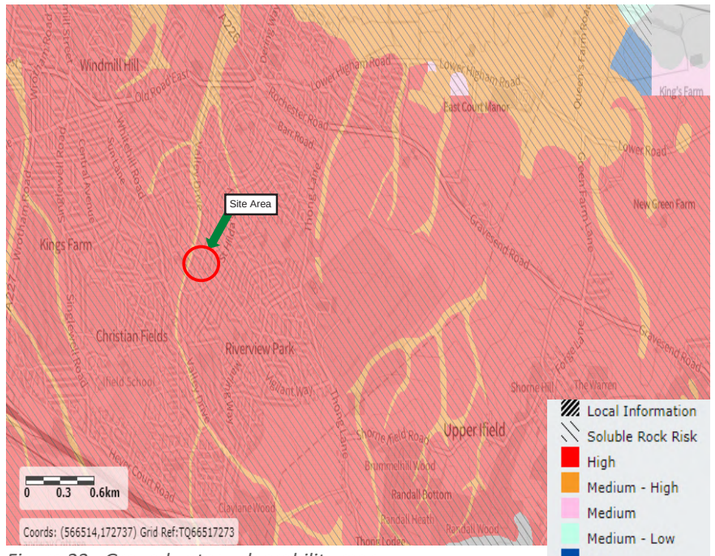


Figure 23 : Groundwater vulnerability map (Source: British Geological Society)